Smart Mobility Market Study

2019 Report

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1. Introduction

Transportation plays a crucial role in the functioning of modern social-economic systems and is one of the most dynamically growing sectors in the world. The most important indicators showing the demand for transport services, such as automotive or personal and freight services, indicate global growth. For example, between 1990 and 2013 the number of personal cars in the EU has grown by 84 million, whereas the population in the EU grew by 30 million. In cities, road traffic is responsible for 40% of the CO_2 emissions but 70% of the overall pollution is caused by transportation. Because of this, in Europe, the economic loss is almost 100 billion EUR (ca. 1% of GDP)[1].

Hence, the European Commission (EC), e.g. in the project of changing the Directive on Promotion of Ecologically Clean and Energy Efficient Road Transport Vehicles, proposes that by 2020 37% (and at least 56% in 2030) of the buses bought through public tender procedures are to be non-emission buses[2].

Global megatrends mean that cities must be governed proficiently, their design needs to be compact, they must be more sustainable and socially coherent as well as powerful and competitive. Cities struggle to invent and deploy continuously evolving smart solutions in urban mobility and they need to do this in order to improve the overall quality of life[3].

There is a shift from private transport as the only means of mobility, to a more door-to-door and integrated approach to mobility. Megatrends, such as urbanization, pollution, congestion, connectivity and globalization are powering the shift from private vehicles to new business models like carsharing, carpooling, ride-hailing, integrated mobility and dynamic shuttles[4].

The megatrends in smart mobility introduced in this report has been studied in seven countries of the Baltic Sea Region: Estonia, Finland, Germany, Latvia, Poland, Russia and Sweden. The areas covered in the report are 1) policy strategies (including themes such as legal regulations, supporting strategies at state, region and municipal levels); 2) institutions, programmes and financial support; 3) market opportunities (with information on market trends and size, key customers and players, business models and solutions); and 4) digitalization in smart mobility. The presented results are from the carried out desk and field research (interviews and questionnaires with experts and startups (smartups[5]) and small and medium enterprises (SMEs)).

[1] Przybyłowski, *"Miasto przyszłości w aspekcie równoważenia mobilności, Akademia Morska w Gdyni"*, www.journals.pan.pl, http://journals.pan.pl/Content/103173/PDF/12+Przybylowski.pdf?handler=pdf
[2] https://ec.europa.eu/transport/themes/urban/vehicles/directive_en
[3] Ibid.
[4] https://ww2.frost.com/research/industry/automotive-transportation/future-mobility/
[5] Smartup is defined here as a startup that offers innovative sustainable solutions (in the fields such as smart homes, smart mobility and smart consumption)

2. Smart mobility trends

2.1 Policy strategies

Estonia

Road transport and fuel consumption in transport have increased at the same rate as the economy, which is why Estonia has one of the most transport intensive and fuel-intensive economies in Europe. Road transport accounts for 94% of the total greenhouse gas emissions of the transport sector. Trends show that while freight and bus transport has decreased, the demand for cars and vans has risen significantly. Over the past ten years, the number of passenger cars in Estonia has increased by almost 50%.

Economic efficiency and environmental sustainability have become the most important aspects of planning the development of the transport sector.

Legal regulations for the Smart Mobility Sector

The Estonian Parliament approved the Low Carbon Strategy until 2050 on April 5, 2017. The long-term vision and sectoral policy guidelines for the mitigation of climate change were agreed for the first time in this document.

A well-functioning transportation system shall be facilitated, and traffic force shall be reduced through the integration of settlements and transportation plans, and the design and implementation of mobility plans.

The economy of the vehicle fleet and the percentage of sustainable transport fuels will be supported mainly through targeted tax policies and the public sector acting as a role model. The investment and tax policies of the public sector will be used to influence the purchase of economical vehicles and sustainable alternative fuels – these are the preferred provisions in the public procurement procedures.

Means of transportation and mobility with low greenhouse gas emissions will receive preferential treatment by prioritizing the development of public transportation, non-motorised traffic and energy-efficient transportation of goods. The state and local governments will advance transportation management which sees the system as a whole, regardless of administrative divisions or the form of ownership of public transportation companies. For this purpose, the development of tax policy guided by the overall effect of transportation and the reduction of greenhouse gas emissions should be considered without an increase in the overall taxation.

The major transport emission reduction comes from a need to meet the Effort Sharing Regulation (ESR) goals. The Estonian goal is to reduce ERS emissions by 13% (compared to 2005) and transport is key in this drive. Estonia has a very high share of inefficient vehicles – more than 51% of new cars are in the E-G energy class in which fuel consumption is not dissimilar from the cars from 20 years ago.

Based on the target for the transport sector, as specified in the European Union (EU) Renewable Energy Directive (2009/28/EC), Estonia will have to ensure that by 2020, 10% of liquid fuels used in the transport sector come from renewable sources. Estonia's transport sector is also affected by the requirement of the Directive 2009/30/EC which stipulates that fuel suppliers must reduce greenhouse gas emissions of supplied fuels or energy by at least 6% by December 31, 2020.

Strategies supporting Smart Mobility (state, regions, municipalities)

State

The Low Carbon Strategy until 2050 is a document, where the principles and policies set out the need to be implemented through sectoral development plans.

The Ministry of Economic Affairs and Communications is responsible for the design and implementation of the following strategic documents related to smart mobility:

- the National Development Plan of the Energy Sector until 2030
- the Estonian Renewable Energy Action Plan for 2020
- the National Transport Development Plan 2014-2020

The Ministry of the Environment is responsible for:

- Climate Change Adaptation Development Plan until 2030 and the accompanying Implementation Plan (March 2, 2017)

In March 2011, the Estonian government signed a contract with the Mitsubishi Corporation for the sale of Assigned Amount Units (AAUs) at the amount of 10 million AAUs to start the Estonian electrical mobility programme.

Since November 2012, the purchase of plug-charged hybrid vehicles has also been supported. Estonia is the first country in the world to build a charging network for electric cars. There are 167 quick chargers in Estonia, and it is the biggest national charging grid in Europe[6].

From March 2017, testing of self-driving vehicles on all public roads has become legal throughout Estonia, if an operator of a vehicle can cause the vehicle to engage that person is deemed legally responsible. An independent expert group on self-driving vehicles examined a study on the introduction of self-driving vehicles into Estonia's transportation system. The group found that the adoption of innovative transportation technology could lead to zero traffic fatalities in Estonia, while also making Estonia's transportation sector more competitive.

According to the National Transport Development Plan (2014-2020),[7] Estonia's main requirements in the development of the transport sector include decreasing the use of vehicles in towns by improving the conditions for walking, cycling and using public transport and using smart solutions to offer various new services, particularly short-term bicycle and car rentals. Larger urban centres should have a carbon-free logistics system in place by 2030.

Regions, municipalities

Developing a bike-sharing system has been one of the mobility priorities of the City of Tartu. It is expected that the bike-sharing system will lead to a reduction of some environmental problems such as noise pollution and lead to better air quality, provide more parking and decrease traffic intensity. Bike-sharing is considered a part of the public transport system of the City of Tartu. The system will be designed as an electric bike-sharing system and will be mainly targeted at people who need to travel around two to five kilometres to work, school and home, etc.

The aim is that by 2019, 100% of public transportation buses in Tartu will run on gas. As such, Tartu is moving towards becoming the first city in Estonia to transform its public transport into a more environmentally friendly system. Currently, there are 25 contractual bus lines and two commercial bus

[6] http://elmo.ee/elmo/
[7] https://www.mkm.ee/en/objectives-activities/development-plans

lines in Tartu. In 2013, the number of passengers using public transport in Tartu was more than 12,8 million.

Finland

Legal regulations for the Smart Mobility Sector

The Transportation Services Act came into effect in three stages, from late 2017 to July 2018. It is a comprehensive transportation service legislation intended to support new smart mobility services and MaaS (Mobility as a Service)-ventures in Finland and to bring a customer-oriented approach to designing transportation services.

A key aspect of the new transportation law is the requirement to publish open data on transport usage. This helps new players entering the market to analyze potential business strategies and customer behaviours. Data on public transportation and car usage is systematically collected and published by Statistics Finland, Traficom and regional service providers such as HSL[8].

Road legislation in Finland allows automated vehicles on all roads. A unique aspect of the Finnish mobility legislation is that an automated vehicle does not require a driver, making Finland the best place to test automated vehicles in a real environment – as is currently being done by a number of automation companies and startups[9].

Strategies supporting Smart Mobility (state, regions, municipalities)

The Finnish government aims that by 2030 there shall be 250 000 electric vehicles and at least 50 000 natural gas vehicles. The goal is for the transport systems emissions to be reduced by 50% by 2030, compared to the emissions in 2005[10].

Liikenneverkkoyhtiö or LIVE – an initiative established by the Finnish government – with the aim to control the traffic routes in Finland. However, the initiative has not been implemented, and it is highly unlikely that it will be implemented by the new government in 2019. According to a study about a possible new business, the government lacks means to promote pedestrian, bicycle or public transportation, and the responsibility for these modes of transportation is left mainly to the municipalities. A new business would be able to support and advance initiatives, as it would be financed through usage fees[11].

Local strategies in the largest cities emphasize smart mobility solutions in the future development of transportation systems and aim, specifically, to decrease congestion in central areas as well as promote carbon-neutral modes of transportation. The City of Helsinki, for example, aims to make it unnecessary for any city resident to own a private car by 2025[12]. Helsinki also aims to increase the share of electric vehicles by building a comprehensive, market-driven electric vehicle charging system[13].

In Finland, tax on all new vehicles – are payable when a new vehicle is bought or registered and the level of tax is based on the current market price of that vehicle in Finland, its average emissions and environmental impact (regardless of its country of origin). Such tax solutions limit purchases of new cars and is detrimental to the transition to electric vehicles.

[8] Statistics Finland Transportation Statistics, Traficom Statistics, HSL Statistics (In Finnish)
[9] Helsinki Business Hub
[10] The Ministry of Employment and the Economy in Finland
[11] The Ministry of Employment and the Economy in Finland
[12] Helsinki Business Hub
[13] Helsinki City Strategy

Germany

The smart mobility market in Germany has developed primarily within the business sector. The Deutsche Post started to develop an electric fleet for delivering post and other companies use e-vehicles for their daily business or representative matters.

The German industry is significantly shaped by car manufacturers. Porsche, for example, formulates societal solutions which extend from the traditional car industry to smart housing, and collaborations to smart citizens fields, by developing shared-mobility structures and applications. The sharing economy is set to become one of the megatrends within the German market. This also can be seen when looking at Last Mile solutions (LMS) in German cities. Shared electric bikes, scooters or even autonomous driving public transportation are diffused into the market or currently being developed and tested. The German Autobahn partly serves as a test field for AI-driven transportation. The government has introduced a lot of projects and structures for the smart mobility sector.

Legal regulations for the Smart Mobility Sector

Germany defined its climate policy milestones for 2050: by the middle of the twenty-first century, Germany is to become largely greenhouse gas neutral. By 2050, the proportion of renewable energy sources of final energy consumption should grow to 60% and primary energy consumption should be 50% lower than in 2008.

For the first time, the Climate Protection Plan 2050 also sets targets for individual sectors. To reduce greenhouse gas emissions by at least 55% in all sectors of the economy by 2030 – as compared to 1990 – the sector target corridors should be established by 2030. The German climate policy is based on the European and international climate protection goals.

The transport sector accounts for almost 18% of emissions in Germany. In 2016, total emissions from the transport sector exceeded the 1990s levels for the first time since 2004.

Stronger sector grouping will influence the demand for electricity demand coupling, which means that interlinking energy needs of individual economic sectors and the available supply should be done in the most optimal way possible. This covers all areas of energy conversion and demand, such as fuels, electricity and heat.

Strategies supporting Smart Mobility (state, regions, municipalities)

With the Climate Protection Plan 2050, the federal government has decided to reduce transport emissions by 40% to 42% by 2030 as compared to 1990 (sector target). In doing so, it is focusing on increasing the energy efficiency of motor vehicles, alternative drive systems and fuels, more local public transport, rail transport, cycling and walking. Increasing links between modes of transportation, sharing models, digitalization and traffic-avoidance settlement and transport planning should also contribute to this goal.

The Electric Mobility Act was passed in 2014. The federal government is also promoting the purchase of plug-in hybrids and purely electric vehicles through a temporary purchase premium (environmental bonus). In addition, the federal government is promoting model projects such as bicycle parking with the federal competition "Climate Protection by Cycling".

Latvia

Legal regulations for the Smart Mobility Sector

The Ministry of Transport is the main governmental institution responsible for transport. The ministry has created Guidelines for Transport Development 2014-2020. The objective of the transport policy is a competitive, sustainable and co-modal transport system that provides high-quality mobility through the efficient use of resources, including EU funds. In addition to these guidelines, the Electromobility Development Plan for 2014-2016 was created.

The objective set in the plan was “to reduce the dependence of the Latvian transport system on oil by improving its [transport system] efficiency”, mobility and promoting the creation and use of innovative technologies in the Latvian transport sector. Part of this plan is to establish charging infrastructure for electric vehicles. During the implementation of the project, it is planned to build a maximum of 150 electric car fast-charging stations by the end of 2021.

For the implementation of the Latvian electromobility policy, the Electromobility Management and Coordination Body has been established. Its set up and functions are implemented by the Road Traffic Safety Directorate (CSDD).

Since March 1, 2018, there is a legal framework of operation for mobile ride-hailing apps (such as Uber). The new law stipulates that services can be provided by cars with up to four passenger seats. The ride can be offered, requested and approved only through the respective mobile app that also calculates the fare and manages the transactions, with only electronic payments being accepted.

The ministers of Latvia, Estonia, and Lithuania have signed the Memorandum of Understanding of the Baltic States on the Development of Interconnected and Automated Driving and 5G Technology in the Via Baltica digital corridor. In order to implement the memorandum, the three countries will support pilot projects for intelligent transport systems that will make roads safer, vehicles more environmentally friendly, and, importantly, driving will become more efficient. The memorandum is in line with the European Gigabit Society stipulations and the connectivity target – a continued deployment of 5G coverage on the main roads of the European Transport Network by 2025.

Strategies supporting Smart Mobility (state, regions, municipalities)

In order to promote the use of environmentally friendly vehicles in Latvia, the government is working on establishing a charging infrastructure for electric vehicles on national main roads (TEN-T roads) or close to them and in heavily populated areas. Additionally, several benefits and advantages have been set for electric cars and their owners:

- First registration of electric cars, as well as registration for special number plates for the first time, are free of charge;
- Electric vehicles are not subject to vehicle tax;
- The tax rate for a company-owned electric passenger vehicle is reduced.

To support the development of smart mobility in Latvia, one of the priorities for the new government is to foster the use of ridesharing amongst Latvian residents so it becomes common**.** This could reduce the number of cars being used by one person in city centres.

In Liepaja and Riga, electric cars can be parked free of charge in municipal car parks. In Jūrmala, electric cars are exempt from entry fees in the city administrative territory. Electric cars, which are equipped with special license plates, are allowed to drive along the public transport lanes.

Poland

In 2017 the government introduced two strategic documents for the electromobility development in Poland. To speed up the electrification of transport, in January 2018 the Electromobility Act was adopted.

Poland has a considerable industry base to become a significant player in the electric vehicle producer filed – the producers of buses are the strongest branch in this field. Data shows that by the end of 2020, 20% of buses sold for public transportation in cities will be electric, powered by battery-charged electricity, and another 10% will be plug-in. In 2030 it will be 50% and 15%, respectively[14].

However, there are challenges. One of the serious challenges connected to road transportation electrification in Poland is the charging infrastructure. At the time of writing of this report, there were only 300 public charging stations – in order to fully use the market potential, there should be about 130 thousand of such stations by 2020, and nearly 1 million by 2025. This means that the whole energy sector needs investment to improve energy transmission systems, develop solutions such as smart grids and smart metering. Because of such solutions, the Polish energy sector needs to be modernized, not least because the energy demand is projected to grow by 18 kWh by 2050.

Another obstacle is the popularity of diesel cars. In 2015 there were 17 million cars in Poland, 3,9 million of which were diesel cars. The process of a car fleet exchange is very slow (only 2.5% a year). Around 60% of cars entering the Polish market are imported second-hand cars. Unfortunately, the persistent demand for second-hand diesel cars might slow down the “natural” exchange of the car fleet and have negative effects on the environment and slow down the ambitious plans for the electrification of the public sector[15].

Legal regulations for the Smart Mobility Sector

The Electromobility and Alternative Fuels Act[16], signed on January 11, 2018, is based on the EU Infrastructure and Alternative Fuels Directive. It is the first act in Poland that details the electromobility sector regulations.

The Act introduces definitions of an electric vehicle, a hybrid, a non-emission bus and alternative fuels. The minimum number of charging stations to be installed in municipalities by the end of 2020 is proposed to be six thousand standard charging stations, 400 high-power charging stations and 70 CNG filling stations. Subjects responsible for delivering these goals are the municipalities working with energy distribution operators.

The new regulations are to stimulate the development of electromobility and the growth of alternative fuels usage. However, in the Act there are no provisions for direct supplementary payments for low-emission vehicles; instead, it abolishes excise duty for electric cars and plug-in hybrid (PHEV), parking payments, and better amortization conditions for companies. The updated Traffic Act allows environmentally friendly cars to use bus lanes (before available only for buses). The Act also opens the possibility for local self-governing bodies to create clean transport areas, where only alternative-fuel cars are allowed[17].

[14] Electric Vehicles Promotion Foundation, European Climate Foundation, “Fuelling Polish Future”, https://www.camecon.com/what/our-work/fuelling-europes-future/
[15] Ibid.
[16] http://prawo.sejm.gov.pl/isap.nsf/download.xsp/WDU20180000317/T/D20180317L.pdf (came into force on February 22, 2018)
[17] https://www.teraz-srodowisko.pl/aktualnosci/ustawa-o-elektromobilnosci-co-i-dla-kogo-zmienia-4517.html

Another important legal regulation improving the conditions for the growth of smart mobility is the Act establishing the Low-emission Transport Fund[18]. It introduces new instruments enabling the realization of the governmental policies in the area of electromobility and cleaner air. The fund shall support:

- creation and modernization of charging stations, CNG stations, and LNG stations
- producers of vehicles using: electricity, CNL, LNG, hydrogen, as well as producers of parts for such vehicles
- public transport using CNG, LNG, electricity or hydrogen, especially in municipalities
- purchase of new vehicles using CNG, LNG, electricity or hydrogen

The Ministry of Energy holds the fund, but it is managed by the National Fund for the Environment and Water Balance Protection.

Strategies supporting Smart Mobility (state, regions, municipalities)

State

The main provisions for electromobility are based on the Strategy for Responsible Development, established in 2017 that introduces a new development model: responsible, socially, and territorially sustainable.

The Plan for Responsible Development forms part of the strategy document, and its pillars are the following:

- reindustrialization
- development of innovative companies
- capital for development
- international expansion
- social and regional development

The Polish Development Fund (PDF) is the main instrument with which the above goals are to be implemented. The PDF has packages for entrepreneurs and innovations and branch development programmes.

The most important element of the strategy document is the Electromobility Development Programme which sets three main goals:

1. creating conditions for electromobility development in Poland;
2. development of the electromobility industry;
3. stabilization of the electrical grid.

The ministries responsible for the implementation of the strategies are the Ministry of Energy, the Ministry of Environment and Water Balance Protection and the Ministry of Development and Commission for Energy and Treasury.

Regions and municipalities

The following are the indicators and parameters used to measure smart mobility:

- local transportation availability

[18] http://orka.sejm.gov.pl/opinie8.nsf/nazwa/2411_u/$file/2411_u.pdf

- state and international transportation availability
- ICT infrastructure
- transportation systems sustainability

The implementation stage of the smart city concept in Poland remains limited when it comes to smart mobility. The biggest issue is the sheer number of car journeys with just one person in cities. There is a great need to change people's transportation preferences and usage. The mobility management policy should underpin a holistic city vision to promote sustainable transport and encourage people to use their cars less in favour of sustainable public transportation. It also involves changing behavioural patterns – towards environmentally friendly means of transportation[19].

In 2017, as instigated by the PDF, the Ministry of Development and the Ministry of Energy, local governments and institutions created a group supporting development of smart mobility. There were 41 signatories representing cities and communes, together with the representatives of the National Fund for Environment and Water Balance, the National Centre of Research and Development, and 26 partners of the Non-emission Public Transport Programme (instigated and managed by the National Centre for Research and Development). Within this backing, the PDF organized a series of workshops and conferences titled "Good Practices in Electromobility"[20]. Because of this, it was possible to create the Electromobility Programme to build the best possible conditions for electromobility development and it resulted in a manual titled "Electromobility in Public Transportation – Practical Aspects of Implementation" (2018).

From January 2018, local governments with more than 50 thousand people, are required to provide a minimum of 30% of zero-emission buses. Also, they must prepare regular analyses of costs and benefits to make sure that the planned changes have positive economic and social effects.

The institution financially supporting the implementation of the above stipulations is the National Fund of Environment and Water Balance Protection (which provided a non- returnable 10 million PLN budget for the implementation of the smart mobility strategy programme). The financial support aimed to cover around 100 different strategies in the years 2018-2019. Towns receive up to 50 thousand PLN, and cities up to 100 thousand.

Russia

Legal Regulations for the Smart Mobility Sector

The Ministry of Transport of the Russian Federation and the United Nations Development Programme (UNDP) with the assistance of the Global Environment Facility (GEF) in 2012-2017 implemented the project "Reducing GHG Emissions from Road Transport in Russia's Medium-Sized Cities". The objectives are to reduce the GHG emissions from transport systems by integrated land-use and transport planning by developing effective monitoring systems and promoting environmentally friendly modes of transportation[21].

During 2013 and 2014 the project was part of an action plan headed by the Ministry of Economic Development of the Russian Federation – the aim was to support the production and use of environmentally friendly transport. Since November 1, 2016, when the Resolution of the Government of the Russian Federation of 27.08.2015 No. 890 was enacted, gas stations were required to have charging sets for electric vehicles. On July 12, 2017, the Resolution of the Government of the Russian Federation No. 832 (Traffic Regulation) introduced new concepts (an electric vehicle, a hybrid car, and a safety

[19] Przybyłowski, *"Miasto przyszłości w aspekcie równoważenia mobilności, Akademia Morska w Gdyni",* www.journals.pan.pl, http://journals.pan.pl/Content/103173/PDF/12+Przybylowski.pdf?handler=pdf
[20] https://www.igkm.pl
[21] The Ministry of Transport of the Russian Federation, https://www.mintrans.ru/activities/214/199

island), new road signs and how they should be used. The UNDP project became key in interdepartmental interaction regarding city transport systems. The project created the platform for the dialogue between federal, regional and municipal authorities, business and the scientific community on environmental issues[22].

Strategies supporting Smart Mobility (state, regions, municipalities)

Modern smart city transport technologies focus on the active use of dynamic and multimodal information. From a technological point of view, the information provided by, and from, GPS systems, connected and pilotless transport, video surveillance and video-reading of licence number, dynamic modelling and traffic flow monitoring are important. Traffic congestion reduction positively impacts the environment and also cuts down the energy consumption of vehicles. These two considerations will play an important role in shaping the introduction of new technological solutions.

In some cities in Russia, in order to optimize traffic flow, traffic-adaptive control systems are used. For example, Tyumen (smart crosswalks), Moscow and St. Petersburg (Wi-Fi in the subway), Samara (smart trams), Magas (smart stops), Moscow and St. Petersburg (transport navigation system).

Sweden

Legal regulations for the Smart Mobility Sector

In Sweden, the income from transporting people in one's own car must be declared as an earning and taxed accordingly (reimbursements only when exceeding 18,50 SEK per 10 km). A person using their own car for carpooling to and/or from work is entitled to tax deductions for such journeys, this deduction must be reduced by the amount that has already been reimbursed by other passengers through carpooling. The exchange of petrol money is not taxed[23].

Strategies supporting Smart Mobility (state, regions, municipalities)

In Sweden, there are national-level initiatives that favour the development of smart mobility in the wider sense of the definition. Publicly financed programmes such as Drive Sweden and the projects it hosts are examples of driving innovation the field of travel and transport. Drive Sweden is a strategic programme that was instigated by the Swedish government to implement Sweden's transport policy objectives. Automated logistic services, data-driven policy development and systems and services for mobility are the examples of strategic projects that have been developed because of their relevance to Drive Sweden's focus areas. Drive Sweden also funds projects through open tenders and is the host of projects that support the 'Next generation travel and transport', of which KOMPIS (Combined Mobility Roadmap) is one example[24]. KOMPIS is run by the Research Institutes of Sweden. It coordinates efforts within combined mobility and MaaS (MaaS), such as creating beneficial conditions, lowering barriers and addressing gaps in policies or technology for private and public actors alike[25].

Sweden has been a "pioneering country" of MaaS and in 2013, for the first time, pilot testing of such services was carried out[26]. In 2011, the R&D projects started, and possibilities related to MaaS were explored. The goal was to double the share of public transportation in Sweden and, for example, the Swedish region Västra Götaland expressed its support for this goal in 2006. Exploring the MaaS

[22] The Ministry of Transport of the Russian Federation, https://www.mintrans.ru/press-center/news/8285
[23] Skatteverket.
[24] Sweden's Innovation Agency, 2018; Drive Sweden, 2018.
[25] Swedish Energy Agency, Samtrafiken, Swedish Public Transport Association, Swedish Transport Administration & Sweden's Innovation Agency, 2018.
[26] Smith, G. Sochor, J. & Sarasini, S. 2018.

possibilities had been an important part of the implementation of this goal, but barriers have been identified.

In terms of supporting sharing economy solutions, in general, Swedish municipalities have to look at their processes in a new light[27]. This means avoiding silo mentality and creating joint goals and strategies – lessons learnt from the Swedish experience of MaaS, show the importance of intersectoral collaboration, especially at the beginning of implementation[28].

One barrier to sharing economy solutions – as identified by the Swedish municipalities – is related to financing, namely the difficulties in allocating costs and income. The problem is related to the internal use of sharing services by municipalities and to the solutions they support or provide to consumers.

At the same time, the interest in smart solutions is increasing at the municipal level and four Swedish cities have joined the initiative *Sharing Cities.* This is an international project that offers a framework for collaboration between industries, cities and its people to support the development of smart city solutions[29]. In Stockholm, Göteborg, Malmö and Umeå, testbeds, learning processes and evaluation are key ingredients that foster this development[30]. Swedes are increasingly looking for public institutions to deliver more with fewer resources, and for them to create innovative partnerships and projects[31].

Many of the smart mobility initiatives are active in larger cities and this could be because these cities are able to find enough customers interested in the new solutions[32]. There are initiatives in smaller cities as well. The project SESMA (Sharing Economy, Smart Mobility) ran between 2019 and 2020 in Trollhättan and it included Trollhättan City, University West and a car manufacturer NEVS[33].

With the development of smart mobility, regulation and policies may become increasingly inefficient or ill-suited to development. From 2017 until 2020, researchers and strategists from the *Swedish National Road and Transport Research Institute, the Swedish Transport Administration*, and *KTH Royal Institute of Technology* worked on addressing this issue and providing relevant insights to the authorities[34].

[27] Swedish Waste Management and Recycling association, 2018.
[28] Smith, G. Sochor, J. & Sarasini, S. 2018.
[29] Sharing Cities.
[30] Sharing Cities Sweden.
[31] Swedish Transport Agency, 2014.
[32] Transport Analysis, 2016.
[33] University West, 2018.
[34] Sweden's Innovation Agency.

2.2 Institutions, programmes and financial support

Estonia

Organizations supporting the development of Smart Mobility

Several organizations promote smart mobility in Estonia, for example:

- Estonian Smart City Cluster[35]
- Estonian ICT Cluster[36]
- Estonian Association of Information Technology and Telecommunication[37]
- ITS Estonia[38]
- The Ministry of Economic Affairs and Communications
- The Ministry of Environment
- ELMO Rent Group OÜ
- University of Tartu
- Tallinn University of Technology
- Estonian Road Administration[39]
- Tallinn Transport Agency

Public support programmes

There are several ongoing projects in this field but there are also many smart mobility projects that have been completed, for example:

- the Electromobility programme (ELMO) – the goal of the programme was to speed up the commissioning of electric cars in Estonia and facilitate the implementation of the state goal to increase the use of renewable energy by 2020.
- The National Traffic Safety Programme (2016-2025) – as the name suggests, it ensures comprehensive traffic safety and its goal is to decrease the number of traffic-related deaths and serious injuries.
- FinEst Smart Mobility (2016-2019)[40] – the project aims were to improve the flow of people and goods in Helsinki West harbour and Tallinn Old City harbour areas with intelligent transport solutions.
- Pilot project FABULOS (2017-2020)[41] – focused on how cities can use self-driving minibuses in a systematic way.
- Pilot project SOHJOA Baltic (2017-2020)[42] – researched, promoted and piloted automated driverless electric minibuses as part of the public transport chain, especially for the First/Last Mile connectivity.
- FINEST Twins (2019-2026) – will build a multidisciplinary smart city Centre of Excellence (CoE) in Tallinn.

[35] http://smartcitylab.eu/about
[36] https://itl.ee/estonian_ict_cluster
[37] https://itl.ee/index.php?page=181
[38] https://its-estonia.com/en/its-estonia-en/
[39] https://www.mnt.ee/eng
[40] http://www.finestlink.fi/en/finest-smart-mobility/
[41] https://fabulos.eu/
[42] http://www.sohjoabaltic.eu/en/

Financial support (private, public)

The two main areas funded as part of the transport system managed by the state are the following:

1. Public transport subsidy to regional and transnational transport, including connections with islands, which will be determined annually upon the development of the state budget.
2. Infrastructure construction and re-construction funded from the state budget as well as from the Structural Funds, the latter can be used for transport sector investments over a seven-year period.

A significant part of the transport sector infrastructure investments is made by state companies, Port of Tallinn, Estonian Railways Ltd. and Tallinn Airport. Harbours and Edelaraudtee Infrastruktuuri AS are the main private sector enterprises that invest in the transport infrastructure. The local governments fund the

Finland

Organizations supporting the development of Smart Mobility

Examples of national organizations that support smart mobility initiatives:

Organization	Financing	Information
Business Finland	X	X
Sitra Finnish Innovation Fund	X	X
ITS Finland		X

Helsinki regional organizations that support smart mobility initiatives:

Organization	Financing	Guidance	Spaces	Test sites
City of Helsinki Innovation Fund	X			
Helsinki Business Hub[43]	X	X		
Jätkäsaari Smart Mobility Hub[44] (by Forum Virium)		X	X	X
Maria 01 Startup Campus[45]		X	X	
A Grid Startup Campus			X	X

[43] Helsinki Business Hub
[44] Jätkäsaari Smart Mobility Hub
[45] Maria 01

Perille Asti – Last Mile smart mobility solutions programme [46]	X	X		X

Between 2016 and 2019, the Helsinki Metropolia University of Applied Sciences, the Finnish Transport Infrastructure Agency (FTA) and the Ministry of Transport and Communications (MTC) ran a co-organized and financed research project that aimed to promote solutions for flexible, non-polluting and user-friendly mobility services[47].

Public and private support programmes

The Finnish Ministry of Transport and Communications, the FTA, and many Finnish cities have expressed a lot of interest in, and support for, developing local smart mobility solutions and providing financial and administrative support for the new smart mobility initiatives.

Business Finland, the largest public agency that funds research and innovation in Finland, launched a smart mobility programme in September 2018. The goal of the programme is to attract significant international players, new businesses and innovations to Finland in order to use the existing test platforms and to create as well as strengthen the smart mobility ecosystem.

The programme has the following themes:

1. Disruptive mobility services and traffic systems through wide data usage and sharing.
2. Leading seamless logistics and people transportation solutions on a global scale.
3. Radical emission reduction and fossil-free mobility to exceed the climate agreement requirements.

The programme offers to provide around 50 M€ for smart mobility companies and services that aim to create new ecosystems, helps companies in networking and internationalization, and give guidance to companies and actors in the field. The programme is intended for companies, research organizations, municipalities and cities, for example in service, ICT and manufacturing industries. At the start of the programme, companies, or other entities, wanting to enter German, Swedish, Japanese, Chinese and American markets receive targeted support[48]. The programme also aims to create consortia that receive a significant amount of EU funding[49].

Germany

Organizations supporting the development of Smart Mobility

For founders and startups in Germany, there are many ways to find support. There are networks such as “Für-Gründer” or “Gründernetzwerk” and governmental aid agencies, which help startups organize themselves, build a scalable strategy, and find venture capital (VC) or supporters as well as starting cooperation with other organizations. The IHK, is present in major cities and often is the first port of call when companies are looking for funding. The support, programmes, or development support models vary by region and the business field in which an enterprise operates.

SME and startup traditionally get support from the founders’ personal networks or members of an organization. Established corporations like BMW, Porsche, VW, Lufthansa and others invest in digital innovations labs, or startup support structures to boost German innovation. These networks consist of

[46] Perille Asti
[47] Väylä-virasto
[48] Business Finland: Smart Mobility Program Starts
[49] Business Finland

experts, investors, VCs, governments and are interlinked with other stakeholders and interest groups. In the smart mobility sector, big players like car manufacturers collaborate with their competitors to find new and game-changing solutions for the future.

Support programmes

Supportive structures such as EXIST, HORIZON 2020 or GRW are funding instruments established by public authorities that want to increase the number of businesses founded in their region or boost a certain sector or a cause that is important for them. Furthermore, each region, municipality and state offer its own funding instruments, through their public budgets or semi-public organizations such as the IHK or the Handwerkskammer.

There are various ways to finance a young enterprise in Germany. Germany invests 0,04% of its GDP per year into venture capital. In Germany, 15% of the startups used venture capital, 80% used their own savings, 35% used state help, 30% used private investments and 12% took loans and only 3% used crowdfunding. Interestingly, crowdfunding has risen in popularity as an option to finance a startup. Germans are likely to invest in non-profit organizations and to support charitable causes this way.

Governmental support structures like EXIST help startups by providing a wage for the founder for the first year. Startups are also helped by being offered office space. Any kind of financial business support is possible, but startups need to reach to the startup community, via social media or physical network opportunities such as startup fairs.

Support organizations vary from governmental agencies, financial organizations to private equity organizations and business interests. The KfW is a leading fund, which receives governmental support for startups, founders, social or environmental investments, and SMEs. The BMWi supports investors with its INVEST campaign.

Latvia

Organizations supporting the development of Smart Mobility

- Smart City Cluster – its long-term objective is to promote new smart city solutions to ensure the growth of cluster members in export markets as the leading smart city niche players in Northern and Eastern Europe[50].
- Zero-emission Mobility Foundation – it aims to promote the development of sustainable, non-polluting and mobility-enhancing transport[51].
- Road Traffic Safety Directorate – has created a website about e-mobility. It publishes articles about different regulations and news about electric transport in Latvia and also in the world[52].

Another website dedicated to renewable energy, electric cars, energy storage and zero waste thinking is Uzladets[53].

Support programmes

Support programmes that foster smart mobility are mostly financed by EU funds. One of such projects is “BSR electric”. Its objective is to enhance the use of e-mobility, such as electric city logistics, e-bikes, e-buses, e-scooters and e-ferries in urban transport systems.

[50] http://smartcity.lv/
[51] http://www.bimab.lv/
[52] http://www.e-transports.org/
[53] https://uzladets.lv/

From a private business standpoint, all companies operating in the smart mobility sector can try to get support from the Latvian Investment and Development Agency (LIAA) and ALTUM – a state-owned development finance institution. Moreover, there are various VC funds available. One of them was established in 2019 by the Japanese government together with other companies. It aims to invest in the Nordic and Baltic tech companies, and one of the verticals that the Japanese government is interested in is autonomous mobility.

Poland

Organizations supporting the development of Smart Mobility

There are several organizations promoting smart mobility in Poland, many of them are non-governmental. Examples of such organizations are:

- The Polish Alternative Fuels Association (a member of AVERE – the European Association for Electromobility) – the largest industry organization dealing with the creation of the e-mobility and alternative fuels markets in Poland[54]
- The Mobile City Association – an organization fostering shared mobility solutions in Poland and CEE[55]
- Electric Vehicles Promotion Foundation – a branch supporting the development of electric cars[56]
- elektrowoz.pl – the biggest Polish webpage on electric and hybrid cars, and the future of automotive
- Polish E-mobility Association – established on the 7th of December 2016 in order to create the optimal conditions for electromobility development in Poland[57]
- Cluster for Electromobility – as the name suggests, focuses on the development of electromobility. The cluster is composed of enterprises and technical universities that collaborate on the development of electric buses, batteries and ways they can be charged.

Public support programmes

There are two flagship smart mobility support programmes that focus on electric buses and electric cars:

1. Electromobility Programme (2016-2025)

The programme introduces a series of legal regulations that are needed:

- The development of electromobility ecosystem
- Increased use of alternative fuels (i.e. LNG and CNG)

The Programme's goal is to create instruments in five areas:

- benefits for drivers
- benefits for infrastructure builders
- benefits for innovative companies
- benefits for public transportation
- benefits for vehicle producers

[54] http://pspa.com.pl/en/
[55] http://www.mobilne-miasto.org/en.html
[56] http://fppe.pl
[57] http://www.psem.pl/aktual_an.html

2. E-bus and E-car

This programme is part of the Electromobility Development Plan. It aims to create the e-buses market worth 2.5 billion PLN per year (producing 1000 electric busses per year). Thus, driving economic growth and creating new jobs (five thousand). The aims are to create Polish e-bus with key components produced in, and infrastructure provided by, Poland with the support of Polish R&D institutions. It is responsible for financial support for R&D.

Financial support (private, public)

Public

- Low-emission Transportation Fund – from the Ministry of Energy, the operator is the National Fund for Environment and Water Balance Protection
- The National Fund for Environment and Water Balance Protection
- Zero-Emission Public Transportation
- EU Funds – Operational Programmes: Infrastructure and Environment (6.1 Development of public transportation in the cities), Eastern Poland (2.1 Sustainable urban transportation); Regional Operational Programmes.

Private

- Cluster for Electromobility

A group of Polish enterprises and technical universities signed a letter of intent on creating a cluster for electromobility development (2016). The signatories (amongst them: Solaris – as a leader – EC Group, Ekoenergetyka Polska, Impact Clean Power Technology, Medcom, Instytut Napędów i Maszyn Elektryczbych KOMEL, SKB Drive Tech, the AGH University of Science and Technology (Krakow), the University of Technology in Poznan, the University of Technology in Warsaw, and ENEA) declared their will to collaborate in order to find solutions in such areas as e-buses construction, batteries and charging batteries. Over 100 million PLN has been earmarked for projects realized within the cluster.

Russia

Organizations supporting the development of Smart Mobility

In Russia, development institutes such as the Agency of Strategic Initiatives, Russian Venture Company (RVC JSC), Russian Direct Investment Fund, Fund of assistance to innovations, State Development Corporation VEB.RF, and others, support the smart mobility projects.

Public support programmes

RVC JSC provides support for the ecosystem development within the National Technological Initiative (NTI) and it functions as the NTI project office. The purposes of the NTI is to create conditions enabling the implementation of breakthrough technological projects and scaling their results[58].

Financial support (private, public)

- Subsidizing – financial support for the NTI projects

[58] https://asi.ru/nti/

- The competition "Development of NTI" – offering support for the NTI projects that help innovations; it aims to support R&D for the implementation of the NTI "road maps".
- Technological competitions – financial support for winning projects in technology, called UpGreat.

The VEB group unites its subsidiaries and focuses on the implementation of the federal law "About Development Bank". Organizations entering the VEB Group, work on improving the competitive edge of the Russian economy, its diversification and stimulating investment. Some of the priorities of the VEB Innovations are, financing the NTI projects, such as the "Digital Economy of the Russian Federation" programme and assisting innovative Russian companies entering international markets.

Sweden

Organizations supporting the development of Smart Mobility

Who	What
Almi[59]	Almi Invest has a greentech fund that has a direct or indirect effect on reducing emissions and provides business support, loans, and venture capital.
Volvo Cars Tech Fund[60]	Funding innovative ideas in mobility and tech.
Smarter Mobility - a cluster at Ideon Science Park[61]	A hub for accelerating business in autonomous driving, transportation and e-mobility.
MobilityXLab[62]	Strategic partnerships with large companies.
Swedish Energy Agency[63]	Capital, network with partners and investors. Research on energy technologies, vehicles, transport fuels etc. Support export of cleantech. Innovation competitions such as *Sustainable Mobility Challenge.*
Business Sweden[64]	Reviewing new market potential.
Drive Sweden[65]	Projects and partnerships related to mobility.
Synear Leap[66]	ABB hub for AI, industrial learning, startups.

[59] https://www.almi.se/; https://www.almi.se/en/almi-invest/
[60] https://group.volvocars.com/company/innovation/volvo-cars-tech-fund
[61] http://smartermobility.org/
[62] https://www.mobilityxlab.com/en
[63] http://www.energimyndigheten.se/en/
[64] https://www.business-sweden.se/
[65] https://www.drivesweden.net/
[66] https://synerleap.com/

2.3 Market opportunities

Estonia

Market trends in Smart Mobility – drivers and barriers

Digitalization of society and advanced e-government give Estonia an advantage because the implementation of e-services is more flexible, faster and costs less. Also, the country's digitalization is being continually improved. The private sector interest in digitalizing mobility is high.

The government aims to reorganize the public transportation system using self-driving vehicles. To do so, the government has implemented a plan to create a fleet management system, integrating self-driving vehicles into the public transport system with journey planning and call-to-order bus stops. Similarly, the government will launch pilot projects in other public service areas to seek new models of public service delivery based on autonomous mobility.

Size of the market

Revolutionary changes in the transport sector are expected in the coming years. Estonia has limited opportunities for large-scale long-term profits from infrastructure investments. The small size of the market (transport and logistics markets are also small), increases the need for the state to focus more on increasing the export capacity of companies (including product development and the growth of a highly skilled workforce).

Key customers and players

The public sector plays a key role in innovation in mobility management, as the provision of mobility services is heavily regulated at the national level.

Intelligent Transportation System (ITS) Estonia unites different organizations from the public, non-governmental and private sector in the field. The main objectives of ITS Estonia are:

- Providing a platform for cooperation and innovation for Estonian public and private sectors in the field of transport and logistics.
- Learning about innovative ITS solutions and future technologies from the ITS networks.
- Supporting export of Estonian ITS companies.
- Being the driving force starting ITS pilot projects at national and international levels.

Examples of smart mobility startups/SMEs:

- Starship[67]
- ELMO Rent Group OÜ[68]
- Ridango[69]
- Bolt[70]
- Stigo[71]
- Bikeep[72]

[67] https://www.starship.xyz/
[68] http://elmo.ee/en/
[69] https://www.ridango.com/en
[70] https://bolt.eu/et/
[71] https://stigobike.com/
[72] https://bikeep.com/

- Hepta Airborne[73]
- Bercman[74]
- High Mobility[75]
- Reach-U[76]
- Comodule[77]
- Lumebot[78]
- GoSwift[79]
- IB Foor[80]
- FleetComplete[81]
- Cleveron[82]
- Barking[83]
- Guardtime[84]
- Nortal[85]

Finland

Market trends in Smart Mobility – drivers and barriers

The benefits of founding a smart mobility company in Finland:

- ambitious and progressive mobility legislation
- a lot of financial and ecosystem support as well as information available from public and private institutions with relatively few competitors
- the mobile data network coverage is very good, stable and service is available also in remote locations
- availability of highly skilled workers in the technical, design and business fields
- customers are interested in new modes of transport in the largest cities
- great social stability and low risk
- small enough cities to be able to test ideas before scaling them, yet big enough to learn and gain customers on a relevant scale.

The barriers for smart mobility companies in Finland:

- a lack of significant public awareness for smart mobility initiatives
- a system that is heavily reliant on private car ownership outside of central areas of the largest cities
- labour costs are very high
- difficult weather conditions in the winter.

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[73] https://hepta.ee/
[74] https://www.bercman.com
[75] https://lumebot.com/about/
[76] https://www.reach-u.com/
[77] https://www.comodule.com/
[78] https://lumebot.com/about/
[79] https://www.goswift.eu/
[80] http://foor.ee/home/
[81] https://www.fleetcomplete.com/
[82] https://cleveron.com/en
[83] https://barking.city/
[84] https://guardtime.com/
[85] https://nortal.com/about-us/

Size of the market

Finnish households spend a total of 19 billion EUR per year on transportation. 15,1 billion EUR of this is used on private vehicles and 3,9 billion EUR on public transportation[86].

There are currently 2,5 million passenger cars registered in Finland, with a population of 5,5 million. The total amount of registered vehicles is 6,6 million[87]. In 2018, there were 2400 fully electric and 13 000 hybrid vehicles registered in Finland, the number of hybrid cars has risen significantly over the last few years. The last decade saw that average emissions per kilometre from registered new petrol cars declined from 180 g/km to 120 g/km. The emissions from biodiesel cars have declined at a similar rate but in 2016 they rose again[88].

Employee benefits such as travel cards are relatively widely used. The tax exemption applies to companies providing employee public travel cards (for both employees and employers) and this makes the benefit very attractive. Work travel cards can be bought from VR, the National Railways, Matkahuolto – a nationwide bus company, or the Helsinki Region Transport (HSL)[89].

Business models, key customers and players

MaaS and Car sharing

Companies:

- MaaS Global (product: Whim app)
- Ekorent (electric vehicle rentals)
- 24Rent, Shareit Blox Car (car sharing)
- Barking (parking space sharing)

Kutsuplus was an experimental public transportation service that provided shared rides on demand at affordable prices. However, Kutsuplus was defunded in 2015 as it had not reached a wide enough user base to cover their costs. A commercially viable solution is being researched by the HSL[90].

Public Bicycles

In several Finnish cities, public city bicycle systems have been launched in recent years, many with great public interest, success and subsequent expansion. In 2018, 48500 people had a season pass for the city bicycles, and the city bike system had the highest usage rate in the world[91]. In total, over 3 million bicycle trips were made over a five-month period. In 2019, 345 city bike stations were planned to be installed in the Greater Helsinki Region, bringing the total to 3450 bikes. From the summer of 2019, the city bicycles offered by different service providers and supported by public funding are in use in each of the six biggest cities in Finland (Helsinki, Espoo, Tampere, Vantaa, Turku and Oulu), with Jyväskylä following the suit in 2020, and many smaller cities testing suitable and more flexible city bike and bike rental solutions.

[86] Liikennealan kansallinen kasvuohjelma 2018-2022
[87] Statistics Finland
[88] Traficom
[89] Helsinki Region Transport HSL
[90] Kutsuplus, HSL
[91] Helsingin Sanomat

Autonomous vehicles and test environments

Companies and pilot projects:

- Sohjoa[92]
- Robusta[93]
- Sensible4[94]
- Valmet automotive

Recently, several autonomous vehicle companies have been founded in Finland and older vehicle companies have formed departments focused on vehicle automation. The boom for piloting automated vehicles in Finland is possible because of the progressive legislation that allows use on all roads.

Specified and unique test environments for automated vehicles also exist in several places. Aurora or E8 – the Aurora Borealis Corridor, located on the E8 – the road's arctic end, provides an arctic environment to test autonomous vehicles. The idea is that if the tested technology works in rough winter conditions, it will work anywhere[95].

Other modes of transportation

VOI Scooters debuted in Helsinki in March 2019[96]. A competing electric scooter company, Tier, was also established in Helsinki around the same time and is seeking to expand to Turku and Tampere.

The Finnish archipelago is a popular destination for locals and tourists, and to meet the demand for transport, several boat sharing startups have emerged to complement public ferry services. For example, Bout, on-demand boat ride, which is similar to the Uber's model; and Skipperi, a boat-sharing service for a fee.

Germany

Market trends in Smart Mobility – drivers and barriers

The transport sector final energy consumption is 30% which is due to its continuing high consumption of crude oil. Registered new passenger cars, that are either diesel or petrol, currently make 97% of all registered cars, and usage of these cars has fallen slightly since 2006. After a brief decline in 2009, because of the scrappage bonus, the share of diesel cars has increased significantly. However, as a result of the "diesel scandal" and the threat of driving bans, the sales figures fell again in 2017. Overall, larger and heavier vehicles continue to be popular.

At the same time, electric and hybrid vehicles are growing in popularity. As of January 1, 2018, alternative drive systems amounted to 1,7% (or 798 030 units) of the total German passenger car fleet. Compared to the previous year, the number of alternative driving systems increased by a total of 8,5%. Sales of electric cars have gone up by 58,3% while hybrid cars went up by 43,1% but plug-in hybrids rose by 111,8% which shows a particularly high growth rate. The registration of new alternative drive systems in 2017 was already 3,4%. As biofuels are used in the transport sector, it is expected that in 2017 (at the time of writing of this report) an equivalent of seven tons of CO_2 could be saved.

[92] Sohjoa
[93] Robusta
[94] Sensible4
[95] E8 Aurora - Väylä, Finland Paves the Way for Robotic Vehicles - Good News Finland
[96] VOI Scooters

Size of the market

The demand for state subsidies for e-cars has risen recently. Between its launch in July 2016 and the beginning of 2018, around 51,000 applications for subsidies for electric cars and plug-in hybrids had been submitted. At the same time, the development of public charging infrastructure has also intensified, which currently consists of around 25,000 connections in around 8,500 charging stations in Germany.

It is projected that between 2010 and 2030, rail freight will grow by 43%. Targeted investments in the rail network.

According to current estimates, there are more than three million pedelecs and e-bikes on German cycle paths – a growth of over 10% in 2017.

KPIs[97]:

- Share of goods transported on roads: 79% (2017)
- Number of registered cars: 46,5 million (2017)
- Number of new car registrations: 3441300 (+2,7% to 2016)
- Number of new motorbike and scooter registrations: (2017) 143900 (-21% to 2016)
- Number of new lorry registrations: (2017) 306600 (+3,7% to 2016)
- Number of new bus registrations: (2017) 6700 (+0,2% to 2016)
- Number of traffic fatalities: 3180 (2017)
- Number of passengers at the biggest airport: 64 million (FRA 2017)
- Goods in the biggest harbour: 118761000 t
- Length of roads: 2265000 km
- Length of train tracks: 441000 km
- Length of navigable waterways: 7300 km
- Length of oil pipelines: 2700 km
- Ease of doing business: 78,9%
- Starting a business: 83,58%
- Getting a construction permit: 78,18%
- Ease of protecting minority investors: 58,33%
- Registering a property: 65,70%
- Getting electricity: 98,79%
- Getting credit: 70,0%
- Ease of paying tax: 82.11%
- Ease of enforcing contracts: 70,39%
- Ease of resolving insolvency: 90,12%
- Tax revenue % of GDP: 11,2%
- CO_2 emissions (tons/capita): 8.889 t (2015)

Key customers and players

Historically, German car manufacturing industry, Audi, Opel, VW and Porsche are the main players in the mobility sector. Their traditionally conservative way of doing business is now open to innovative structures and organization culture. Most players are aware and understand the urgency of the changes in the mobility and transportation sector which led to openness towards new technologies and solutions.

[97] Statista, Worldbank.

Also, regions invest in networks and clusters in this field. For example, the state of Lower Sachsen started the *Netwerk Mobilität Niedersachsen*. The region-specific clusters, which can be found in most regions, focus on the development of regional infrastructure and mobility solutions.

Key players in the rail transport are *Deutsche Bahn* and *DB Schenker*, as well as the industry disruptors *FlixBus* and *FlixTrain*. Air transport is dominated by *Deutsche Lufthansa* and other major international airlines. Other important institutions are the ADAC, BASt, DVR, GDV, and the Federal Ministries.

Business models and solutions

The mobility industry is a dynamically growing field, products and services related to the *Internet of Things* (IoT) in the urban context will become increasingly important in Germany over the next few years.

In principle, most companies (81%) are certain that electric mobility will be the mobility concept of the future – this a complete reversal of the trend currently seen in the automotive industry.

Latvia

Market trends in Smart Mobility – drivers and barriers

The government has tried to promote the usage of electric vehicles; however, the total share of electric cars is still lower than expected. In 2018 there were 152 new electric vehicles registered in Latvia, 37% more than registered the year before. Right now, there are 598 electric vehicles registered in Latvia.

Carsharing and ride-hailing services using mobile platforms are growing, for example, a carsharing company Carguru has grown their user base to 9000 users since 2017 and plans to have close to 300 cars in 2019. Also, the ride-hailing company Bolt (formerly Taxify) is growing, serving even more customers. In 2018 a new competitor Yandex Taxi entered the market.

Latvian Mobile Telephone (LMT) is one of the big players in the smart mobility market. The company is working on providing the 5G network in the country.

New smart mobility companies have entered the Latvian market, the most popular of which are Bolt (Taxify), Yandex Taxi, Carguru, CityBee, ATOM, AutoLevi, and eMotion.

While the market is rather small, it is a great place for companies, both mature enterprises and startups, to test new solutions and business models.

Poland

Market trends in Smart Mobility – drivers and barriers

In Poland, the growth of smart mobility has been driven by the government's decision to recognize electromobility as the key element of sustainable and innovative development of the state. However, successful electromobility growth also depends on the private sector and it has to be able to deal with challenges.

Poland has a large number of well-educated technical experts, a stable economy and relatively low employment costs. These conditions led to the development of a strong network of automotive providers of combustion engines components – this might be a platform for the electromobile revolution. However, to use this potential, all the market players will have to adjust to the alternative driving systems trends as well as to using alternative fuels[98].

[98] https://polskiprzemysl.com.pl/raporty/rozwoj-elektromobilnosci-w-polsce-raport/

The biggest barriers in the development of electromobility in Poland are:

- low awareness of potential customers
- difficult access to public financing
- legal requirement to obtain permission to build charging stations
- the conditions of the OSD (in Polish: Operator Systemu Dystrybucyjnego) mean that in order to gain access to the charging network infrastructure at least ten months, often more, are needed.
- a low number of charging station – important especially for end-users
- a lack of definite integrators that would provide successful private-public partnerships

Size of the market

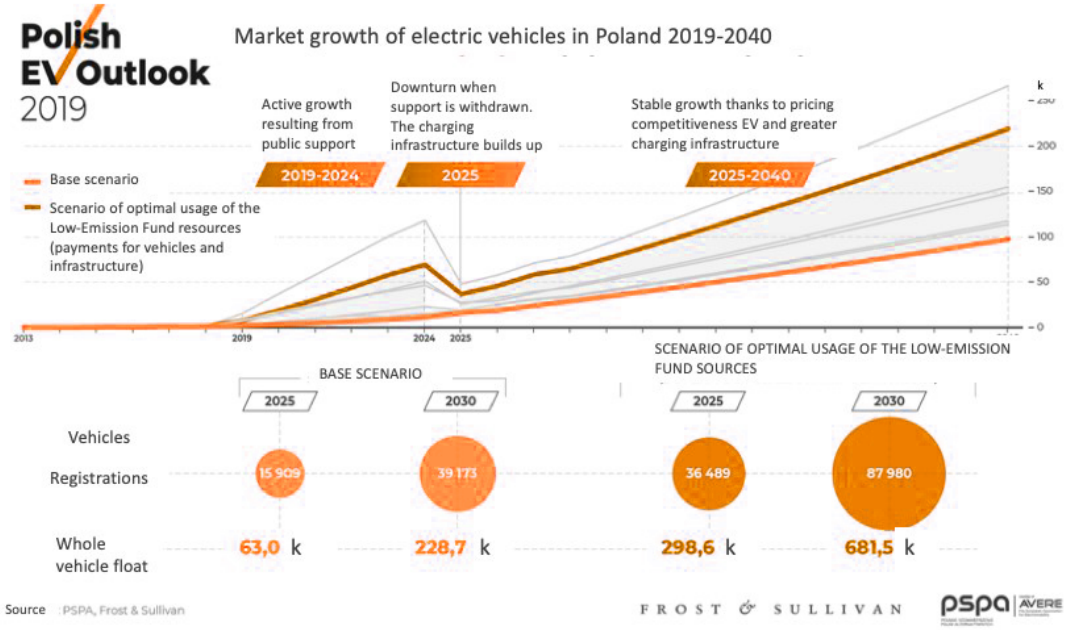

Figure 1. Market growth of electric vehicles in Poland 2019-2040

Using the Low-Emission Transportation Fund to its full potential means that the electric vehicles fleet in Poland in 2025 should reach 300k cars. Without the support of the fund, there would only be 60 thousand such vehicles. Reaching 1 million electric vehicles should be possible five years later, in 2030, with the additional support, such as VAT exemption[99].

In 2018 there were 1.6 million passenger cars and lorries – the number includes 60% of imported used cars. The sale of electric vehicles (EV) amounts to only 0.2% (1324 units) of the total percentage of new car sales (in 2017 it was 1068 units). A year after the Electromobility and Alternative Fuels Act was introduced, there were 3.5 thousand EV (the whole vehicle fleet is around 20 million). In 2018 customers could buy 13 models of electric cars and 24 plug-in hybrids. The charging infrastructure has been developing much more dynamically. In 2017, 293 charging stations were installed, increasing their number to 552 in 2017 and to 845 in 2018.

[99] Polish EV Outlook 2019 report.

Key customers and players

The biggest companies that are key players in the smart mobility market are green companies and producers of electric vehicles. Examples of big companies:

- Solaris
- Urino
- Pesa
- PGE
- PGNiG
- Enea
- Tauron
- Energa
- Polskie
- Sieci Elektroenergetyczne
- Ursus
- Autosan
- Polska Spółka Gazownictwa
- Asseco
- Lotos
- PKN Orlen
- Innogy Polska

In 2016, four energy consortiums, namely PGE Polska Grupa Energetyczna SA, Energa SA, Enea SA and Tauron Polska Energia SA, created a company called ElectroMobility Poland SA.

Examples of smart mobility startups/SMEs:

- Enigma/Vozilla
- EasyShare
- blinkee.city
- Jeden Ślad
- Keratronik
- ELE Taxi
- Traficar
- Panek
- CityBee
- 4mobility
- Click2Go
- MiiMove
- Scroot
- Lime
- Nextbike
- BikeU
- Uber
- Taxify
- Mytaxi
- Itaxi
- GreenGoo
- mLeasing
- Nexity

Business models and solutions

The key principles of smart mobility are[100]:

- Flexibility: multiple modes of transportation allow travellers to pick the best option in a given situation.
- Efficiency: the journey should be short (as short as possible), minimally disruptive and get the passenger to their destination.
- Integration: the possibility to travel the entire planned door-to-door route without disruptions, regardless of which modes of transportation are used.
- Clean Technology: transportation moves away from polluting to zero-emission vehicles.
- Safety: Fatalities and injuries are drastically reduced.

In the future, the management of vehicles must include connected mobility and autonomous mobility (full or partial). Moreover, these new solutions shall be used for trains, trams and underground (metro). The created e-mobility ecosystems shall champion global processes of pollution reduction and decarbonization of economies. This might happen if in the energy-mix there will be less of coal, crude oil and gas, and more renewable energy sources. For the ecosystem to function, it must be based on the principles of circular (sharing) economy as they enable new business models dispersion (shared mobility, mobility on demand). The biggest challenge in the dissemination of e-mobility is the development of a new mobility culture, especially in Poland, as carsharing in cities is still growing. But also, because transportation preferences do not appear to be changing – these might prove difficult to change during the implementation stage of e-mobility. According to the Electromobility Development Plan, in Poland, electric vehicles and the use of other car-sharing models that are integrated with a smart grid will become important elements of the urban transport systems. Economies that promote innovative solutions might view e-mobility as a meaningful development direction.

In Poland, the same as in other EU member states, in 2021 the Real Driving Emissions procedure will start. This means that many vehicles will not be allowed on the market which might lead to a drastic decrease in personal cars being used, and new solutions might have to be implemented and/or sought (for example, cycling, e-biking and bike-sharing). Creating a market for new business models and solutions for smart mobility depends heavily on strategies, plans and financial support as well as on cultural and environmental awareness. In Poland, this process has only just started, and as such it might take some time before any substantial changes are visible - this is also relevant to new business models and solutions being monetized.

Russia

Market trends in Smart Mobility – drivers and barriers

AeroNet is the distributed system of remotely piloted aircraft. In the next 10 to 20 years the development of technological solutions for pilotless aviation and near-earth space systems as well as comprehensive solutions and services related to them will be significant. Within the NTI, this market is called AeroNet.

Development of pilotless aviation and space systems as well as wireless communication technology will lead to the growth of the distributed flights security systems and exchange of information. Greater reliability of the protected network communication means safe mass use of uncrewed/unmanned aerial vehicles (UAV) including in cities. By 2035, over the territory of the Russian Federation constantly (24/7/365) can be airborne not less than 100 thousand UAV united in the uniform system providing works and services for the satisfaction of various, constantly increasing requirements of the economy. Average number occupied in development and production of the pilotless aviation systems (PAS) will

[100] https://www.geotab.com/blog/what-is-smart-mobility/

be 50 thousand people, number occupied in the operation of PAS, providing comprehensive solutions and services on their basis will reach 500 thousand people by 2035.

Estimates show that by 2032, the PAS market, as well as services related to it, will be worth more than 200 billion dollars (at current prices). The market structure, as well as consumer demand, will change, and new leaders must adapt to these changes. Russia's current contribution to this emerging market is between 35-40 billion dollars.

Key customers and players

Key segments of the smart mobility market:

- Telematic transport and information systems
- Information-navigation systems and fleet monitoring systems as well as other telematic transport systems
- Systems of data collection, processing and analysis, artificial intelligence and cybersecurity
- Driver assistance systems and accessories
- Self-driving cars and high automation cars
- Smart city mobility
- Cluster of services and finding fellow passengers
- Rental
- Public transport and multimodal transportation
- Transport services with the use of self-driving cars
- Online services and services based on data
- Logistic transport services
- Cargo transportation and freight forwarding services
- Complex logistic services, including storage and distribution
- Logistics management, including optimization of logistic processes

Key players:

- GEOSCAN GROUP
- Kronstadt group
- Copter Express
- LLC Finko
- Aerob company
- Aerokon company
- INSPECTOR
- MariNet
- TRANZAS
- Yandex
- T-1 Group JSC
- Igoods Ru LLC and iGooods

Sweden

Market trends in Smart Mobility – drivers and barriers

Research in Sweden showed increasingly positive attitudes towards sharing personal belongings or assets with others. The reasons why people share, have changed from economic reasons – noted as the most important factor – to environmental reasons – viewed as more valuable. Transportation is the

field where Swedes expect to see the largest number of new solutions. The reasons for using sharing services are clear in large cities like Stockholm because of the lack of space. Big city dwellers, together with the younger generation, are more likely to adopt sharing economy solutions[101]. Additionally, high trust levels drive the implementation of the sharing economy and, historically, there is a long tradition of sharing within communities and neighbourhoods. However, research also shows a lack of trust in others hinders sharing services and that some people are still unsure about the solutions themselves as well as the quality of the provided services[102].

Size of the market

The percentage of household spending on transportation has varied a lot over the last 20 years, as shown in the diagram above. This variation can be traced back to shifts in pricing and market competition. In general, technological development means an increase in households spending on buying services rather than products. In 2018, an average of 12.6% of the total disposable household income was spent on transportation[103]. Swedes travel an average of 46 km per day. Passenger transport is increasing, and car travel is the main cause of this[104].

In Sweden in 2018, electric vehicles (EV) sales amounted to 8.01% of the total new passenger car sales (including plug-in hybrids and light vehicles). Globally, Sweden was surpassed only by Iceland (19.14%) and Norway (49.14%)[105]. In 2018, there were more than 5 million cars in use with a population of 10 million[106]. Also, in 2018, the number of chargeable vehicles increased by 52% as compared to the 2017 figures. This amounted to about 70 000 electric vehicles, the majority of which are plug-in hybrids. There was around 1 charging station per 10 EV. It is suggested that by 2030, battery electric vehicles (BEV) will be the most popular choice for car purchases. Moreover, by 2030, Sweden is projected to have 2,5 million EV, with 1,7 million being BEV[107].

Key customers and players

Several large Swedish companies (NEVS is one of them) are developing the smart mobility field. Volvo Cars is developing EVs and looking at opportunities within the mobility services and automation. The Volvo Cars Tech Fund invests in startups with ideas that can support the development of this field[108]. Other opportunities for startups can be available through MobilityXlab, which is situated in the Lindholmen Science Park – the park works on topics, specifically related to mobility, and large actors such as Ericsson and CEVT have offices there. Zenuity fund MobilityXLab is a place where startups can apply to collaborate with partners at MobilityXLab for a period of six months. One requirement is that at least two of the large companies are interested in initiating an exchange with a startup. Startups that are admitted are offered strategic partnerships, contact persons from partners, increased visibility, co-working space and more[109].

[101] Nordea, 2016; Nordea, 2017.
[102] Swedish Waste Management and Recycling association, 2018.
[103] Carlgren, F. 2019
[104] Transportföretagen, 2018
[105] Richter, F. 2019
[106] SCB, 2018
[107] Power Circle, 2018
[108] Volvo Cars, 2019
[109] MobilityXLab, Lindholmen Science Park.

Property owners are another group that is looking into the possibility of offering their tenants mobility services such as electric scooters, bikes and cars[110]. For example, the property owner *Wallenstam*, offers a car-sharing service Wallenstam Go through the American car-sharing company Zipcar[111].

Business models and solutions

Swedish solutions within the consumer cleantech and mobility sectors include electric scooter sharing company *Voi*, *The Car* (a subscription service for premium electric vehicles), electric taxi-pod *Bzzt,* electric boat *X Shore,* on-demand car-sharing service *Passenger* and a peer-to-peer car-sharing platform *Ciao Ciao Carsharing* to name but a few. There are also non-profit movements within the mobility sector, such as *Skjutsgruppe*, which is an app for arranging shared rides and it also makes it possible to retrieve data, providing insights into the use of their services by consumers[112]. *Sunfleet* is a carpooling service owned by Volvo and Hertz. Public bicycle rental programmes are also available – Styr&Ställ in Gothenburg is one.

However, some initiatives faced hurdles big enough to force them to move their business out of Sweden. DriveNow, owned by BMW, is one. It struggled with getting enough users as well as with high costs for parking and with congestion charges[113]. Another initiative that has been shut down is a car-sharing service Mobilsamåkning, which focused on car sharing outside of the largest cities. In order to find real alternative mass car ownership, the Transport Analysis (2016) carried out by a governmental agency, suggested that lots of different solutions need to be combined so that a comprehensive solution can be developed.

Further trends:

- In central parts of the largest cities, the share of people travelling by car has decreased.
- Chargeable hybrids have a larger growth rate than electric cars in the Nordics. The number of electric cars is increasing, but the number of EVs remains small.
- Use of renewable sources in transportation is increasing, but a larger traffic volume means CO_2 emission cannot be cut substantially.
- Sales of electric bicycles are growing. The government has previously issued grants for purchasing electric bicycles.
- Fewer young people get a driving licence or they get them much later in life. Meanwhile, the percentage of people aged 65 or over with a driving licence has increased, mostly over the last 30 years[114]

[110] Tollesson, N. 2018.
[111] Wallenstam.
[112] Wallenstam.
[113] DriveNow, 2018.
[114] Swedish Transport Agency, 2014; Swedish Transport Agency, 2018.

2.4 Two perspectives: Experts and Smartups

2.4.1 Methodology

Two groups of respondents were studied, 1) startups/SMEs and 2) experts from the following fields: legal regulations, support system and business development.

Startups completed an online questionnaire and experts were interviewed by the representatives of each country taking part in the project.

The questionnaire for startups/SMEs consisted of four parts:

1. Company's profile and product/service details (how it is financed, how advanced is the product/service, is it making money, customer profile, etc.).
2. Smart mobility legislation (starting a business, ease of doing business, financial solutions/instruments available, employment regulations, etc.).
3. Support system (the most efficient support instruments, the expected support outcome).
4. Business development (market and customers, level of market share, competition, participation in entrepreneurial networks and events, expectations towards accelerators).

Semi-structured in-depth interviews were carried out with the experts.

1. Legal regulations
   - basic smart mobility regulations
   - critical conditions for doing business in the smart mobility sector (stimulating, inhibiting)
2. Support system
   - support conditions for startups and SMEs
   - support processes and instruments (preincubation, incubation, acceleration, technology transfer)
   - funding sources
3. Business development
   - market trends in the smart mobility sector (drivers and barriers)
   - market opportunities for startups and SMEs (size and structure of the market, key customers and players, business models and solutions, investment trends)
   - In the results section, an overview of each country is provided.

2.4.2 Results – Experts

Estonia

Legal regulations

Self-driving vehicles are already being tested in Estonia – although in the Estonian context, “self-guiding” is still a foreign concept. Many cars travelling in Estonia have some self-driving features, such as cruise control or a track carrier. From a legal standpoint, self-driving car regulation raises many questions, both legal and ethical, and as such, this is a difficult area to regulate.

It is important to support and encourage (including investments) both public and private sectors to carry out pilot projects in digital mobility services development. New service models need to be possible when designing legal solutions for space technologies. To do this, it is necessary to stop restrictions and create new, market-openings and diversify legal regulations. It is equally important to develop the ecosystem for investment.

Support system

There are several drivers that will support the development of smart mobility in Estonia, such as increasing parking fees (reducing the use of cars) and implementing bike rental systems on a larger scale. When comparing cleantech to other markets, the supporting schemes are very similar. In terms of internationalization, the biggest obstacles startups face are the awareness of, and readiness to, use such products and services.

The biggest problem in Tallinn is mobility, but the public is not involved in solving the problem. It is noted that, more experts should be brought in and that the public should be also involved in the process.

At the state level, there is no support.

Support available to startups at different stages of growth is as follows:

1. Preincubation - there are different awareness-raising events (Cleantech Breeze etc); hackathons/idea days (Climathon – a mobility hackathon where different stakeholders come together and work on problem solutions); different pre-incubation programmes (Climate Launchpad – an idea-based programme; Prototron etc.).
2. Incubation - Tehnopol Startup Incubator is a great programme for smart cities and mobility-related startups. The incubator invests up to 10 000 EUR worth of expertise in startups, it lasts a year and it aims to find the first seed investment or to reach export markets.
3. Acceleration - Climate-KIC Accelerator is Europe's largest greentech accelerator for early-stage startups.

Business development

The public sector plays a key role in innovation in the area of mobility management, as the provision of mobility services is heavily nationally regulated, funded and managed. In Estonia, there are many great mobility startups, e.g. Bolt, Cleveron, Bikeep, etc.

Advancements in new technologies make it possible to reduce current costs by about tenfold, thus making most of today's solutions and business models uncompetitive.

Finland[115]

Legal regulations

The mobility field is heavily regulated by international standards ratified by governments of the participating states. The standards are designed in field-specific organizations, such as the ICAO (International Civil Aviation Organization) or IMO (International Maritime Organization). Basic mobility regulations are shared in the EU. Specific, additional national legislation may be implemented, but it has been the goal of the Finnish government to lessen strict regulations that may prevent new players from entering the market.

New businesses entering the field need to find out which permits they need as these are case-specific and which sections of legislation affect them. Newcomers should start by contacting Traficom (Finnish Agency for Transport and Communications) that provides counsel and offers a traffic laboratory for testing new services and technologies – using this service may also result in gaining valuable new contacts.

The goal of the Finnish mobility and transport legislation is to make entering the market easy for new players. To ensure this, the Transport Service Act 2017 was introduced. The Act simplifies the required bureaucracy for transport service providers and formalises the requirements for providing open data gathered on passenger transport. The open data requirements make Finland the forerunner of the future development-oriented transportation legislation. However, further clarification on cargo transportation is needed.

In terms of automated vehicles, the Finnish legislation is very supportive – tests can be carried out on public roads, and while a driver is required, they do not need to be located inside the vehicle during tests.

Support System

The experts agreed that in Finland, public authorities have taken a very enthusiastic approach towards supporting smart mobility innovations, new companies and startups. Traficom runs a test area and supports mobility pilot ventures. Business Finland is the key national funding and support instrument for new companies, innovations and expanding international businesses into Finland. A publicly owned company Finnvera provides funding and loans for companies expanding their business in Finland and, especially, to those aiming for international markets. Many of the funding instruments are only available to companies that are headquartered in Finland. Private funding is also available, however, currently, most private funding in the smart mobility field goes to companies outside of Europe.

For businesses seeking to expand their activities into Finland, Helsinki Business Hub (HBH) is a significant source of support. Co-owned by the cities in the capital region. HBH provides a number of services to companies such as, connecting companies to funding opportunities, helping set up their activities there as well as soft landing services, which include guidance in getting the company a business ID, and connecting it with suitable local recruitment, accounting, legal and communication services. The Hub also help businesses find clients in Finland, before making the final decision to launch their activities there.

Cities are key actors that support smart mobility startups locally, however, their role could still be greater. Helsinki has, led by current mayor Jan Vapaavuori, taken an ambitious stance towards building a comprehensive ecosystem for smart mobility. Many of the activities are centred around Forum Virium,

[115] Interviewed: Raimo Tengvall, Project manager, Jätkäsaari Smart Mobility, Forum Virium Helsinki; Marko Tamminen, Senior Business Advisor, Helsinki Business Hub; Touko Kotro, Startup Business Advisor, Newco, City of Helsinki; Joni Lehto, Project Manager, Newco, City of Helsinki; Henrik Keinonen, Partnerships, Newco, City of Helsinki.

a city-owned company running several smart mobility projects and providing support and test areas. Currently, it has ten active smart mobility projects, including the large scale Jätkäsaari Smart Mobility Hub and Perille Asti – the latter provides funding and test areas for businesses creating Last Mile mobility solutions together with the cities of Espoo and Vantaa. Outside of Helsinki, the 15 Centres for Economic Development, Transport and the Environment also provide financial support for, and guidance to, new companies.

Newco is a department of the City of Helsinki which provides services for businesses moving to Helsinki, including soft landing services for startups, and its specific goal is to help individual workers, job seekers, entrepreneurs and their families a smooth integration process. One of the continuing issues that require their support is the opening of a Finnish bank account, which is a requirement for many online services[116]. Moreover, it helps businesses to connect with each other and build a network, which makes it easier to find clients and peer support.

According to the experts from Newco Helsinki, a critical factor influencing whether foreign professionals decide to stay in Finland is the quality of services and more significantly the support of a new community that their families can receive, and they have tried to target these issues. There is, however, room for improvement especially in the number of school places for English speaking students.

The experts also criticised tightened immigration policies – as a non-EU citizen, one may enter the country on a startup visa, but sometimes the visas are not extended despite the recommendation of Business Finland (required for the first visa) – even when the company had funding and significant potential – if the individual cannot show that they have a certain amount of money saved for each month of residence. For employees of a financially stable company, the residence permits are more secure. For EU nationals, no restrictions are in place, and although one must apply for a residence permit for longer stays, these are readily granted.

All of the experts hoped that cities would buy small scale projects from mobility startups more systematically, allowing them to get a high-profile reference which would ease their international market entry. This would also allow cities to test new ideas and implement beneficial innovations in mobility early.

The experts agreed that the Finnish business ecosystem and support for mobility startups, especially in the Helsinki region, but also in other metropolitan areas is one of the most comprehensive in the world, with a lot of support available for non-Finnish (speaking) entrepreneurs and professionals. It could be one of the leading smart mobility ecosystems in the world if national immigration policies were updated to serve the international transfer of knowledge and innovations. However, even now, the possibilities to develop and test smart mobility services and innovations in an environment big enough, yet stable, safe and manageable size, with comprehensive support services, are second to none.

Business Development

As MaaS gains ground, licensing and selling services are slowly replacing sales of vehicles. Examples of this include Uber, MaaS Global and DriveNow, all of which are pioneers of using vehicle transport in new ways. All vehicle companies will have to deal with electrification and automation as well as prepare for the eventuality of having one driver responsible for multiple vehicles simultaneously.

The experts are referred to the National Growth Program on the Mobility Sector[117], which details the mobility market in Finland. The user market is still heavily focused on private car sales, which make 15,1 billion EUR per year, with 3,9 billion EUR spent on other modes of transportation. The total size of the market was 61,6 billion EUR as of 2012, where the largest sectors are vehicles, logistics and motive power, which account for over 80% of the whole market. The Finnish data market makes up 2,5% of the

[116] The manual for immigrant entrepreneurs can be found here: https://newcohelsinki.fi/lupamateriaali/How_to_become_an_entrepreneur_in_Finland.pdf
[117] National Growth Program on the Mobility Sector (In Finnish)

country's GDP, which is higher than the EU average – Finland is a forerunner in the use of digital services.

In Finland, market drivers in mobility are, for example, flexible legislation which allows the testing of new products efficiently and at an early stage. The high cost of owning and using a private vehicle or vessel – this makes looking for solutions more interesting as it might lead to savings – also drive the mobility market. The ability to quickly test new products and services allows Finland to function as a test market for companies that aim for international markets with viable products once they have been developed. The amount of usable open data about mobility is a key factor in how new companies identify needs and create services to satisfy them. Recently, after significant pressure to do so, the interface of the online ticketing system of the public transportation company HSL was opened to outside actors, allowing MaaS-providers better access to different ticketing types.

The experts mentioned that the Startup Genome recently ranked Finland as the most networked startup ecosystem – the community is relatively small, very well connected and supported. There is an atmosphere of trust between new companies, institutions and the public that is helpful when bringing innovations to the public. There are also highly educated individuals for companies to hire, and the public is connected and attuned to using digital services. There is also expertise on intellectual property rights, signified by a high number of patents.

Barriers include the small size of the Finnish market, and the fact that owned vehicles are old, which mostly stems from high taxation of new vehicles. While the taxation has been adjusted to factor in emissions caused by vehicles engine type, the experts agreed that the transition to electric vehicles and other modes of transport should be supported more with tax breaks and legislative measures.

The experts called for a more proactive approach toward entering an international platform economy so that Finnish companies and officials could have a more active role in developing digital platforms, instead of just being users of the existing platforms where they have little say in goals or methods used. The experts also thought that Finnish companies could put more emphasis on designing and manufacturing components for international mobility companies.

The experts also thought that Finland should use the upcoming presidency of the EU Council to advocate for shared data standards throughout the EU, which would benefit mobility companies and make their digital solutions ready for wider markets. They also thought that the Finnish mobility business ecosystem should serve as a gateway to Chinese markets.

The experts agreed that the mobility market in Finland is in a state of flux – while in older generations wealth correlated with a greater percentage of income used for mobility, younger generations are neither as wealthy nor as willing to purchase private vehicles. Some brands, such as Tesla, have managed to create a new luxury vehicle demand among younger people. However, many people in this group are eagerly looking forward to new solutions for more time-efficient, comfortable and sustainable mobility.

Germany

Legal regulations

The market incentive package focuses on three financially effective measures 1) temporary purchase incentives, 2) expansion of the charging infrastructure and 3) public procurement of electric vehicles. A purchase premium, the so-called environmental bonus, is paid for new vehicles – 4000 EUR for purely electric cars, 3000 EUR for plug-in hybrids. The environmental bonus is paid for vehicles with a maximum list price of 60 000 EUR. The total subsidy amount is set at 1,2 billion EUR. The federal government and the automotive industry each bear half of the costs. The federal government provides funding if the manufacturer provides the necessary funding. Since July 2, 2016, car buyers have been able to submit their applications to the Federal Office of Economics and Export Control (BAFA), which has also set up an information phone line for this purpose.

To improve the charging infrastructure, the federal government is making 300 million euros available: 200 million euros for the rapid charging infrastructure and 100 million euros for the normal charging infrastructure. The aim is also to ensure that at least 20% of the federal fleet will be electric vehicles. Whether employees recharge electric vehicles at their workplace, is irrelevant as this no longer represents a monetary advantage.

The Energy Industry Act 2011(EnWG), laid out the legal foundations for the energy industry, data protection and data security for intelligent power grids (smart grids). As part of the amendment to the EnWG, the prerequisites were created for reducing grid fees for the use of electric vehicles in the future, thus making charging cheaper.

By classifying charging points for electric vehicles as final consumers in the Electricity Market Act, under the EnWG, it was also possible to significantly improve the framework conditions for setting up a charging infrastructure tailored to demand and to create legal and investment security. In this way, investors from all sectors and with a wide variety of market can contribute to the development of charging facilities in fair competition. Charging points are not subject to strict regulations of network operations and operation monopoly is avoided. The energy-related obligations of the charging infrastructure operators are also limited to the necessary extent.

Support system

The future of mobility and logistics is being created now. Plug and Play, the world's largest innovation platform, and DB, Europe's largest transport company, provide startups with the resources they need to implement their ground-breaking ideas in a 100-day accelerator programme.

This industry is rapidly changing due to new technologies and innovative businesses setting up. To actively integrate these changes into today's transportation ecosystem, Germany incorporated Beyond1435 into a platform that allows its partners to jointly develop innovative technologies or scale new businesses by gaining access to the right mix of assets. Many other industries, not only rail, will play an important role to shape the future of transportation.

The progress of electric mobility is unstoppable as well as desirable as this will reduce the use of fossil fuels. Nevertheless, critical questions about charging stations and e-mobility are appropriate, as many technical inadequacies, safety issues and high costs remain unresolved. Batteries life cycle and their recycling, as well as boundary conditions in the industrialized regions of Europe, have changed substantially.

Economic restructuring processes, ageing population and migration of young people have led to a significant population decline in many rural areas of Europe.

The number of support organisations in the cleantech field is constantly growing. Accelerators, incubators and interest groups of many kinds flourish. Politicians realise how important accelerators and/or incubators are in the cleantech sector. Raising awareness of, and openness to, the importance of climate protection in Germany is evident. This is a good sign and it is hoped that the country will continue to move in this direction.

Business development

This anonymous interviewee observed that:[118]

- The market is growing constantly, especially Last Mile Solutions and delivery services – but also services and fields which would not seem connected to Porsche, like ride-sharing or smart weather forecasting – are growing and opening opportunities for quick development. This is

[118] Interviewed: anonymous

mainly driven by the need to change the way innovation in the digital era is approached. Efficiency, interconnectivity and lifestyle trends lead to an incredible diversity of future solutions. In the 21st century, the whole technological evolution means that it is vital for societies and companies to change and innovate.

- The barriers in the German market, exist mainly because of the long-term relations within it. Of course, it is not easy to compete with the rail freight transport system, or for a startup to compete with us. We are open though, but one must approach. Data security also is an important topic in the German markets. Often, new ways of doing [things, creates] new problems. An open mind towards possibilities and a reflective debate on the issues and ethics of technology and evolution, in general, will happen. As a startup, you need to keep in mind that the customer chooses and that the customer is sensible.

Then, they reflected on the market key players, business models and solutions as well as investment trends:

- All of the traditional car manufacturers, ourselves, VW, Mercedes etc., as well as the local transport companies. Of course, the Deutsche Post, DHL and Schenker in the sector of transported goods.
- There is a profound difference between volatile and viable solutions. These days there is no one recipe or solution. We see new ways of making money and new ways to monetize. This is, on the one hand, an insecurity of the existing models and, on the other hand, the chance to digitalise society.
- Lately, we could see that many startups are as sophisticated in bringing support into the later rounds. VCs are always there, but entrepreneurs see and use the money provided by states and institutions.

Lastly, they noted that:

- A trend towards non-conventional corporations and towards facing really big challenges, like competing with the DB, has started. 20 years ago, a startup would not tackle the big players directly. Nowadays, the speed of business [development] and solution development make such behaviours possible. Therefore, we work closely with ideation innovators and entrepreneurs to build a future together by using existing competencies and strengthening new structures as well as solving global problems.

Latvia

Legal regulations

There are no special legal regulations for smart mobility in Latvia. As in many cases around the world, the existing regulations and laws cannot keep up with the speed of innovation. That is why, first new services come, and proper legal regulations follow.

However, companies from the smart mobility sector are open to speak and work together, with the government and local municipalities to create proper legal regulations if that can support their business.

During our conversations, the experts said that factors inhibiting the smart mobility sector are legal tax regulation for the sharing economy (no standardized way of how it should be done) and the missing infrastructure for many of the new solutions. The stimulating factor for smart mobility is, for example, the project called *Smart City Playground*, implemented by the Ministry of Economics. The project will involve academia (the University of Latvia and Riga Technical University), industry, and government (the Ministry of Economics as the main facilitator, joined by the Ministry of Transport and other ministries), the plan is to create an environment with a developed ecosystem where new solutions could be created.

It is also planned to work on regulatory improvements and political support of smart mobility. Also, there will be several pilot areas where new solutions can be tested.

Support system

There is a lot of support available to all startups and SMEs. For foreign founders who would like to start their business in Latvia, Investment and Development Agency of Latvia (LIAA) together with the government of Latvia offer the Startup Visa – the permission to live and work in Latvia, for non-EU citizens. The LIAA and numerous universities in Latvia are offering preincubation programmes in their business incubators.

Acceleration funds are not managed by the LIAA, but by different VC funds. Three out of four accelerator programmes are financed with the EU support, where each of the funds receives 5 million to invest in startups. For companies working in the smart mobility sector, the most suitable would be the Buildit accelerator and Commercialization Reactor. Buildit works with hardware and IoT startups, while Reactor focuses on deeptech companies. Riga Technical University also runs Climate KIC Programme, where startups working in the smart mobility field can get financial support and mentorship.

All of the interviewed experts were optimistic about smart mobility and business development opportunities in Latvia. Organizations and companies see Latvia as a great place for startups to test their solutions and they are open to working together. For example, Latvia Mobile Telephone (LMT) has done a great job by bringing some initiatives and projects to life, e.g. the Digital Baltic Road Memorandum was signed in order to support connected and autonomous mobility as well as to continue the development of 5G.

The Ministry of Economics is acting as the main facilitator between all parties of the ecosystem – academia, industry and government – to create a better legal framework and the smart mobility needed infrastructure. In 2021, the first solutions from the *Smart City Playground Project* will be carried out.

Business development

LMT could be the most or one of the most involved big companies in the smart mobility sector development. Smart mobility is a big part of its future business and the company is testing different solutions in this sector. It is interesting for the company because, in the near future, a lot of solutions will use the 5G network and LMT has the resources to implement this network in Latvia. That is why LMT is working closely with the government and other companies.

Most companies that are working in this field could be divided into startups, technology companies (LMT and Accenture) and logistics companies (for example Kreiss). Key players and customers are LMT, Latvia's State Forests, Accenture, Kreiss, Mapon, Carguru, SIXT, Dots and the Electronic Communications Office of Latvia.

In terms of solutions already popular or known in Latvia, the interviewees mentioned carsharing (by Carguru) and the growing popularity of electric scooters in Riga appears as one of the most important.

Poland

Legal regulations, Support system, Business development

In this section, the perspectives of two senior business leaders on the subject matter are given prominence. The first business leader noted that:

- Poland is one of the European countries that has started the low-emission/electric revolution in transportation, but there are still many challenges ahead.

- The Electromobility and Alternative Fuels Act (enacted 22nd of February 2018), the legal cornerstone, marked the moment of transition from an amateur to professional phase. However, there is plenty of legal regulations waiting in the queue. The practical application and interpretation of new legal regulations have not yet stabilized.
- Economic disadvantages of new technologies, i.e. the high cost of new vehicles, means that subsidies are still needed. Additionally, the availability of vehicles and the density of the charging infrastructure for low-emission vehicles prevent the market from exploding [sic]. It's the chicken or the egg dilemma.
- In the EV sector, me and my team [sic] in PGE Nowa Energia, are working hard to eliminate the problems with the availability of the infrastructure. To do this we are expanding the public charging stations network. However, this addresses only one side of the market problem.
- At the European and national level, rules and ways of supporting market players have not been transparently defined. These things need to be standardized (transactions, actors, infrastructure, etc.). This allows cooperation and interoperability at every level and gives startups the space to search for the innovative and cost-effective application of such standards. We have to wait a little bit longer. However, it is possible that the standards will be developed.
- Currently, the situation for SMEs and startups in the smart mobility area is already extremely demanding. Some standards have been already set (even unofficially, e.g. the Open Charge Point (OCPP) protocol in Electric Vehicle Service Equipment (EVSE)-CPO communication, while other standards are still absent or have not yet been defined. Thus, small entrepreneurs and innovators have to stay tuned and be connected to current trends. Although it is very difficult to become a trend-setter without having influencing opportunities and publicity, but these can be provided by a large corporation.
- This area [of smart mobility] is much more demanding than other greentech areas, but it creates an environment for successful cooperation between small and large businesses.
- Still, there are many niches to be explored, such as value-added services or infrastructure maintenance – this can add a revolutionary element of the current set of products or services. And will bring it into a new level[119].

The second business leader had similar observations:

- The company [that he currently works for] has been working in new technologies for over 20 years. The customers are cities, transport organizations, railway companies, the public sector – including the smart city sector.
- What we have seen is an evolution in thinking. Organizations – meaning people standing behind them – are more open to dialogue. As there's access to the existing solutions worldwide, it is easy to see how things work in Paris or Berlin, what systems they are using and what their advantages are. There is also an awareness that defective systems are detrimental to their functioning right from the start. Simplifying everything by cutting costs leads to many problems which stems from the anxiety of those who order new solutions. As they say, "buy cheap, buy twice."
- In the big cities, it is much easier to get budgets for the development of things such as a City Information Model (CIM), passengers information data models and so on. Hence, it is natural that it is the big cities that become leaders of transformation. Nowadays in Silesia (one of the South-West regions of Poland), we are building one of the biggest passengers information data models. Public transport has been preparing for this task for many years.
- Unfortunately, there are also places where changes are needed, but there is no money. The EU funds make it a bit easier, but there it is a double-edged sword: some of the regions might not be able to learn how to develop without subsidies. This means it is very difficult to plan anything

[119] Interviewed: Jacek Błaszczyński, Projects Director at PGE Nowa Energia.

unless there are [parliamentary] elections or donations – and this creates room for instability and unpredictability.

- To us, the best model is the one where somebody is looking for specific solutions and paying for a specific product. We create solutions that are adjusted to the customer's needs, location, surroundings, architecture. Our model is based on the philosophy of acting locally and thinking globally.
- What is important for the future, is the quality of information and connecting the fragments – for example, as is needed in a passenger information data model. The integration of new solutions with smartphone technologies is an interesting trend. Another trend towards lowering the consumption of energy, devices independent from the sources of power – this means, using more renewable energy[120].

Russia[121]

Legal regulations

The experts agreed that there are some positive signs in the Russian Federation regarding the development of smart mobility law. The Ministry of Economic Development developed a complex plan of action for production support and the use of environmentally friendly transport. The Resolution of the Government of the Russian Federation from August 27, 2015 No. 890 was enacted. This requires all petrol stations to have charging stations for electric vehicles. Resolution No. 832 introduced new concepts (electric vehicle, hybrid car, safety island) and new road signs into the Road Traffic Regulations. These decisions allowed the introduction of a vehicle tracking system that records its ecological class and in so doing enabling a flexible reduction of ecologically unfriendly cars.

According to the experts, there is a positive attitude towards the development of smart mobility friendly legal regulations and that the authorities will continue to improve them. At the same time, there is a feeling that the infrastructure is not developed enough to enable smart mobility to flourish in the Russian Federation.

The experts agreed that cutting the harmful effects of transport and its impact on the environment is important for Russian society. What is more, the society is aware of the role ecological factors play in the development of urban areas. The transport strategy of the Russian Federation stipulates that by 2030 there shall be a rapid development of the smart city transport system and new transport services shall be completed as well as modes of transportation, traffic control and management systems shall be developed.

Support system

According to the experts the drivers are government programmes (for instance, NTI of RVC) and legal regulations (for instance, programmes of the Ministry of Economic Development and the Ministry of Transport of the Russian Federation). Whereas the difficulties include the highly protracted process of gaining permissions for pilot projects.

The experts described support processes and instruments in the areas of:

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[120] Interviewed: Paweł Kryszak, CEO Dysten Sp. z o.o.

[121] Interviewed: Sergey Baranov, Head of Technology Transfer, St. Petersburg Technopark; Aleksandr Belykh, Project Manager, St. Petersburg Technopark; Tatyana Loginova, Member of the Mentors Club of "Ingria" business incubator; Aleksandr Petrenko, Project Manager, Sole Entrepreneur; Andrey Dmitriev, Commercial Director, Composite Group; Grigoriy Ivanov, Representative of Rollma Group.

- Preincubation – business incubators at universities (for instance, in St. Petersburg there are business incubators at ITMO, St. Petersburg University, St. Petersburg Polytechnic University, St. the Petersburg University of Economics, the Higher School [it is a higher education institution despite what the name suggests] of Economics, etc.). These incubators work with student teams that mostly interact with professors.
- Incubation – Ingria business incubator in St. Petersburg works with small innovative companies that need support such as consulting services. Also, Ingria organizes a vast number of events for residents. It collaborates with business, professionals, experts, investors, startups, government, etc.
- Acceleration – RVC is the state's fund of funds – a development institution in the Russian VC market. Its mission is to create a mature VC market through the consolidation and development of resources, skills and initiatives on the part of investors, investment portfolio managers and entrepreneurs to create and promote innovative products and technologies in the priority technology areas. Thus, making Russia the leader in the global technology market. GenerationS is a department of the RVC that runs several acceleration programmes.
- Technology transfer – Ingria business incubator focuses on technology transfers, especially in technological projects.

Business Development

According to the experts, the drivers for business development in smart mobility are the popularity of ecology in Russia, the improvements in the green transport legal regulations, the necessity to cut the operational costs of logistics.

Factors slowing down smart mobility are the following: the lack of infrastructure for electric transport and labour-intensive process for attracting financing for smart mobility startups.

The experts call for a more proactive approach in tapping into the market opportunities for startups and SMEs in the smart mobility field.

Moreover, the experts talked about investment trends. Electric cars and pilotless transport are new technological trends. Russia has effective tools for finding, selecting and supporting promising high-tech projects, especially ones focused on private-public partnership. The aim of this support is to provide stable and continuous GDP growth, creating jobs for highly skilled employees, ensuring technological independence and strengthening national security.

Sweden

Legal regulations, Support system, Business development

In Sweden, a lot of labour, time and money is being invested in MaaS and MaaS is on the agenda of car manufacturers and other companies. While there are many ideas within Maas, legal and institutional obstacles hinder the launch of some of the available mobility solutions that spread through collaboration. For example, public transportation companies hesitate to allow third parties to sell tickets, which inhibits solutions that would give consumers access to a wide range of transportation choices. The parking rules set by cities and municipalities, which reduce the flexibility of property owners in picking parking solutions, are also detrimental. In theory, property owners can offer a subscription to MaaS services for tenants. However, the parking rules and uncertainty about the time frames in which property owners will able to provide such services stunts this development.

The development of sharing services and smart mobility is further undermined by road tax and parking – who should pay them when the vehicle is shared? Some countries leading the sharing solutions revolution exclude shared vehicles from these costs, but this is not the case in Sweden. Some sharing

services disappeared from the Swedish market, at least partially, because of this and the challenges of getting public authorities onboard.

Employers in Sweden can offer employees a company car or a fringe benefit car. If the employee selects an environmentally friendly vehicle, they receive a tax break. In the current legislation, no tax break is available for using a bicycle or a bus card. Therefore, it can be said that there is a gap in legislation. Another problem relates to the differences between towns and cities, and the different opportunities these present for smart mobility. Sweden's three largest cities are actively pursuing the development of MaaS. But many smart mobility solution startups are present in the larger cities. However, the majority of the Swedish population does not live in the cities where it is easier to enter the market with innovations. This means that barriers for people to start using sharing solutions outside of the largest cities need to be explored so that the solutions are based on relevant findings – SESMA is following this path.

There are Swedish examples of companies, both interviewed and not, in the automotive industry that is actively looking into the possibilities of creating sharing services, connecting with startups and reducing the number of cars. These actors recognized that it is possible to change lifestyles and maintain the same quality of life and that they can play a part in defining how to do this. The experts welcome the already existing initiatives but also have suggestions for further development. While it is difficult to make legislative and regulatory changes – interestingly, the term 'carpool' is yet to be defined in Swedish law – without concrete cases to relate these changes too, actions can be taken to support the development of smart mobility. However, this has been identified and the Swedish government started a review in order to understand the challenges in the smart mobility sector – the review is expected (at the time of writing this report) by the end of 2019.

There is also the possibility to run projects with a number of different actors. The experts identified that mobility is a field where such collaborations could be valuable from a sustainability and development point of view because of its long value chain. Mobility projects can provide opportunities, and some already do, for geographical or time-related exemptions for testing or changing legislation according to new findings. The existing projects and platforms already have experienced working with companies and the strengths of such collaborations. It is also suggested that, although Sweden has a strong position within mobility, it is valuable to follow the development in other countries for both for benchmarking and inspiration. Another aspect when looking at larger versus smaller actors is that the former is from the car manufacturing sector which means that they have the experience, contacts and financial strength that the latter lack. This lack makes scaling of innovative mobility services more challenging. However, the advantage that smaller and/or younger companies have is that they are free from the history of traditional car manufacturing, which means that they do not have the same obligations linked to previous investments and that they are able to quickly adapt to, and drive new changes. Startups also tend to have a lot of software competence, which can make exchanges between these companies even more beneficial.

One expert thinks that consumers, generally, understand the importance of the sharing economy. While some barriers remain, partly due to the lack of experience of the sharing economy, trends may change quickly – there are Swedish mobility startups that have gained thousands of users in a matter of months. Historically, outside pressures such as the oil crises have driven people to carpooling. In larger cities, there is already a broader acceptance of travelling with others.

Once smartphones were something consumers did not know they needed. Now it is an object that people use daily and for an ever-growing range of purposes. The meaning of mobility can change, and when it does, it will happen overnight. It is also very much a question of generations as young people are not interested in getting a driving licence or buying a car.

2.4.3 Results - Smartups and SMEs

Estonia

Legal regulations

For startups, the most useful information related to starting and running a business in the smart mobility sector focuses on sales channels, IP and other regulations, certifications and market entering. Currently, overall, legislation is quite supportive.

Support System

Startups highlighted several support institutions that have efficient instruments that offer business support, i.e. Enterprise Estonia, incubators, the Tallinn Science Park Tehnopol, Prototron and other SMEs. The main value lies in the network and contacts that are conducive to starting a business, availability of co-working places and financial support as well as mentoring activities. Startups want to be supported especially in the following areas, working with government, financing, market know-how from other countries, product development and network contacts.

Global development support for companies includes raising people's awareness of sustainability, keeping legislation current, partnership with other large companies in the local market, learning how to enter a new market and paid pilot programmes. The most desired result from the offered support is finding a client and network expansion. This is followed by the availability of grants and investors. When looking at foreign business support institutions, the biggest motivating factors for engaging with them are the possibility of network expansion and growth, sharing experience and technical knowledge, and gaining access to a good and talented workforce.

The use of bicycles and public transport has been encouraged by making parking in city centres difficult. For example, by making parking expensive and increasing the number of paid parking spots. The implementation of bicycle rental systems helped strengthen the eco-friendly drive but also means that the state had to develop the infrastructure, make it user-friendly and safe. Also changing people's lifestyles plays an important role and financial support is not always the key. For example, the provision of free public transport did not reduce the number of cars on the roads. It is an area where it is difficult to make rapid changes because decisions depend on many parties. The technological ability exists but needs to be regulated at the state level, otherwise, there will be no rapid change. It is clear that mobility is a big and important problem but at the state level there is little information available and there are no public consultations.

Business development

Each company reported different barriers preventing effective business activity. For some companies, the climate and poor infrastructure play a big role, for others financing and contacts. Commonly, a support system and/or other companies help to reach customers via introductions to potential clients. Many Estonian companies also cooperate with foreign enterprises.

Most companies compete by providing better quality products, service and technology but flexibility, speed, branding, etc can also be a competitive advantage. All interviewed companies use outside services, including marketing, accounting, legal and software developments. Their priorities for the coming years are mainly related to growing their business and teams as well as entering new markets.

Finland

Finnish startups view the national-level MaaS law and regulations as the most useful information available to them. They note that legal regulations that are worth changing are the ones relating to travel

service combinations (it is not possible to show adverts of, for example, hotel services, since this would be considered offering service combinations).

The most efficient instruments of support are provided by ITS Finland (business advisory), NewCo (business advisory), Climate KIC (funding and business advisory) and KasvuOpen. According to the startups, the best way to support a startup in its global development is by mapping potential business partners.

Finnish startups expect accelerators to provide concrete business contacts, good sparring opportunities and well-run programmes that challenge startups.

Germany

For the interviewed German startups, the most efficient instruments supporting the business are networks, coworking, sub-entrepreneur network and creative alliances. The biggest barriers in an entrepreneurial environment are legal regulations and stiff competition. When asked what they expect from accelerators, they answered that they need their networks and to support them in navigating legal restrictions. They expect accelerators to provide access to networks and support them in navigating legal restrictions.

Latvia

Most of the startups explained that they would like to know what are the government's plans regarding smart mobility and when it comes to new regulations, they would like to be part of the consultation process and work together with ministries so that the regulations are friendly for the already existing businesses as well. The companies would like to see the government being more proactive in changing legal regulations that support smart mobility companies.

In case of a support system, almost all the interviewed startups mention the LIAA, where they either participated in some grant competition to get financial support or went to their educational seminars. Other than the LIAA, universities and their business incubators and programmes (e.g. Climate KIC) were also mentioned.

When asked about what kind of support they would like to get, the startups most often said that they would like some help in expanding their network or help finding investors or other financial support tools.

In terms of business development and existing markets, companies said that smart mobility is a relatively new market and one without many players. The market size was also mentioned as one of the disadvantages of the Latvian market. The startups said that if more players and solutions were created, bigger investments would follow, from investors and the government. When asked who helped them create their business network, nearly all of the startups answered that it is mostly their own work.

In terms of their expectations towards accelerator, the startups mostly mentioned two things 1) contacts (either from experts in specific fields or contacts from investors) and 2) financial investment in the company. But in general, they saw accelerator as a steppingstone that should help the company get better and reach the next level of their development.

Poland

From the legal regulation perspective, the most important issues that the startups noted are the approval procedures for their solutions, designing car parks for shared mobility services, city or parking fees policy, regulations and regulating carsharing. Business-wise, there is no infrastructure in the cities, and this is viewed as one of the vital barriers for some smart mobility businesses.

For the startups, the most effective tools are institutions that offer business support, i.e. accelerators as well as working in conditions that are conducive to business development. The startups really need support in growing their networks, especially of the future potential investors and partners. Moreover, the startups need accelerators to offer mentoring and help with branding as this helps them gain investors.

Sweden

In Sweden, in general, there is a large demand for green and traditional mobility. The startups presented interesting ideas. For example, introducing a few different versions or similar services could be important in making a real change. This is because a plethora of choice might lead to new approaches to mobility and transportation.

In working towards these ideas, however, the startups noted that it can be difficult to work in a field where definitions are imprecise and under development. There are not many solutions readily available and some startups said that talking about market share is not necessarily applicable to them, or that their services are that unique that their market share is almost 100%.

It can be beneficial to be players that develop new solutions and connect public and private organizations relevant to the startup. When entering a new city, talking to politicians or actors such as the Traffic and Public Transport Authority can be a signal that entering the city is welcome.

In Sweden, in comparison to other European countries, regulations in different cities are typically convergent. In striving for access to new markets, collaborating with companies that have similar experiences can be a valuable insight. Working with larger companies can also be important for exposure, testbed opportunities, credibility and being included in the ecosystem and its networks. This is something that smartups view as benefiting larger companies in making their services and/or products more appealing. For example, property owners offering mobility solutions.

Other relevant support areas for support included information about the costs of market expansion, infrastructure, culture and the size of the market – are consumers interested and ready? Many of these aspects are also applicable to the Swedish context. Most startups do not participate in entrepreneurial events. Some entrepreneurs select only a few events but only if they want to find partners or investors. The startups reported that they dedicated a tiny proportion of their time to attend such events and that even when they do find relevant opportunities is hard.

While the startups that are in Swedish partnerships or interact with large actors in the Swedish market see great potential in this, it comes with challenges. For example, large company slow payment procedures can contribute to liquidity problems for smaller companies. Generally, descriptions of public and private collaboration are described as positive, offering a valuable channel to decision-makers.

In terms of more specific suggestions, changes in tax law for company cars, or offering free parking spaces or access to bus/taxi lanes for sustainable solutions were mentioned. Startups often present innovative solutions and redefine mobility or transportation but fall under the already existing categories that do not really fit the descriptions. The startups suggested that sustainability policies could be further improved, and that law could be better aligned with the set policies related to climate action. Continuous investments in testbed opportunities and hubs as new solutions are being developed is potentially a good way to support comprehensive sustainability strategies. The startups also suggested more incentives or nudged to move away from inefficient use of resources for consumers as well as organizations and increase awareness.

In the complex market of consumer cleantech, there is not enough targeted support. In general, the support system is concentrated in Stockholm. Some startups launched their solutions and products, mainly, in largest cities, and describe their customers typically as 25 years old or older, urban citizens either commuting or travelling during work or privately in the evening and during weekends.

2.5 Digitalization

Estonia

The Estonian government is very engaged and open to digitalization[122]. The primary objective of the Estonian Association of Information and Technology (ITL) is to unite Estonian IT and telecommunications companies and organisations, to promote their cooperation in Estonian's development towards information society. One of the ITL's projects is FinEst Smart Mobility. The project brought new tools for smart mobility development in a cross-border environment – it improved traffic flow in the congested port surroundings of Helsinki West Harbour and Tallinn Old City Harbour. During the project (2016-2019), several pilot projects were carried out to create a smoother, safer and smarter traffic environment in the Helsinki and Tallinn regions. Also, a long-term plan for sustainable mobility was laid out for the Tallinn region. The new solutions are based on open data. For the benefit of public transport, FinEst Smart Mobility enabled the import of Digitransit, an open-source journey planning platform, to Estonia[123].

Finland

In cooperation with Estonia, an app called Digitransit was created[124] that support the planning of travel – it is now used by the public transport operators in all the major cities in Finland.

Business Finland[125] supports Finnish consortiums to make Finland the most attractive global hub for future mobility, by forming ecosystems for smart mobility development and utilization. The country already has the world's best autonomous maritime and MaaS solutions[126]. The SmartRail ecosystem, led by Skoda-Transtech and the VTT Technical Research Centre of Finland, intends to become the market's most attractive provider of functions and services integrated into tram systems.

Germany

In Germany, the smart city trend has been relatively slow to catch on with urban developers. But since 2017, there has been a growing number of municipalities that are working on the digital agenda and want to develop smart cities. The industry association Bitkom identified 50 pioneering cities in Germany, showing how they approach digitalization from a strategic and organizational standpoint, how they include citizens, partners and other local players. The cities mainly want to improve the quality of life and commercial appeal through digitalization. These main objectives are divided into sub-goals with individual steps. For instance, several cities are working on a solution for better control of the traffic flow and helping drivers easily search for parking spaces. In Darmstadt, sensors at traffic light junctions record traffic data in order to optimize traffic control, and thereby reducing emissions. In Ludwigsburg, an app is to be developed that will lead drivers directly to free parking spaces. Lemgo[127] uses an IoT infrastructure to optimize the city bus network: the networked busses can locate each other and indicate whether their passengers are reaching their connecting busses. The app also allows people to find current locations of busses while the busses themselves record the current traffic situation[128].

[122] http://smartcityhub.com/governance-economy/how-estonia-became-the-most-digital-country-in-the-world/
[123] https://www.itl.ee/en/estonian-ict-cluster/projects/finest-smart-mobility/
[124] https://digitransit.fi/en/
[125] The Finnish Government Organization for Innovation Funding and Trade, Travel and Investment Promotion.
[126] https://www.businessfinland.fi/en/whats-new/news/2019/smart-mobility-future-defined-in-finland/
[127] https://www.future-customer.com/the-smart-midsize-town-of-lemgo/
[128] https://www.future-customer.com/map-of-public-digitization-germanys-smart-cities/

Latvia

In 2017, the Baltic and Nordic ministers[129] in charge of digital development declared their intention to make the Nordic-Baltic region a digital frontrunner by enhancing the digital single market and strengthening the competitiveness of enterprises through digitalization.

The Electronic Communication Office of Latvia, in cooperation with the Office of Prime Minister of the Republic of Latvia, the Nordic Countries Ministers, 5G Automotive Association (5GAA) and the International Communication Union, organized 5G Forums (5G Techritory) – the platform for cross-border, cross-sectoral (including smart mobility solutions), and cross-level collaboration setting the 5G agenda in the Baltic Sea Region[130].

Poland

In 2020, the Foundation Digital Poland started the Digital Innovation CEE, a platform supporting collaboration between startups and investors that also includes solutions supporting smart mobility digitalization. The foundation aims to make Poland one of the leading global digital innovation hubs[131]. According to the Polish government digitalization strategy, the strategy should enable Polish companies to participate in the European and global value chains. Poland can leverage the potential of state-owned companies using digitalization to enhance key transport and energy infrastructures through smart grid technologies, and the deployment of horizontal and platform solutions[132].

Russia

Digitalization of individual sectors, including transportation, is low and should be developed. As the potential of the transport industry remains unexplored it is near impossible to make it more efficient. At the same time, the Russian market is big and open to modern digital technologies. The use of digital technologies in the transport industry should enter such vast markets as this would improve the safety of cargo and passenger transportation, create united digital spaces for interaction between carriers, forwarding agents and passengers, or lead to software optimization for calculation of the rational route.

Sweden

Sweden is one of the countries leading the way in digitalization. It implemented a national digital strategy and is expanding its high-speed fibre-optic network[133]. The country implements smart public transport – connected solutions for shared passenger transport services such as buses, trains and ferries. This transport includes apps for connected vehicles and related infrastructures, such as passenger information, ticketing and payment systems, cloud and analytics services as well as traffic management and control. Digitalization drives the increasing importance of ICT providers and tech startups to enable smarter public transport[134].

[129] From Norway, Sweden, Denmark, Finland, Iceland, Faroe Islands, Estonia, Latvia and Lithuania.
[130] https://www.5gtechritory.com
[131] https://www.digitalpoland.org/en/
[132] Poland going digital, New Direction the Foundation for European Reform, 2017.
[133] https://www.bertelsmann-stiftung.de/en/our-projects/smart-country/project-news/sweden-on-the-way-to-the-digital-future
[134] A. D. Little, Smart Public Transport - New digital ecosystems unlock the growth potential of the smart city, 2017.

3. Conclusion and recommendations

Conclusion

The market studies ran in seven countries of the Baltic Sea Region (BSR) showed that:

- Economic efficiency and sustainable development have become the most important aspects of the strategies of the BSR countries.
- The transport sector is going through a dynamic and complex transformation, in order to improve traffic safety, air quality, and other economic and environmental aspects – all of which have happened in the last decade in each country (some countries only noted this strong reversal trend after 2010).
- The studies countries develop their new smart mobility strategies, starting at a state level, engaging cities, support institutions and business, with startups playing a crucial role in this development.
- New solutions for products and services emerged to support the carbon-free logistics system, such as electric and/or hybrid vehicles (including charging infrastructure), car or bike-sharing and MaaS. These services focus on strategies towards a customer-oriented approach. The countries aim to decrease the number of fuel and diesel vehicles and adapt to the whole infrastructure accordingly.
- All of this requires a very strong turn towards energy efficiency, meaning that all the big players are also changing their positions on the market.
- Each country offers strong packages for startups to support innovative solutions in smart mobility (legal changes, support financial and organizational instruments).
- This creates a great monetization potential for innovative products and companies, even if this market is in the early stages of development.
- Smart mobility is strongly connected to smart citizen solutions – in this field interconnection can be clearly seen.

Recommendations

According to global indicators, there is a distinct trend in transportation, and it is an irreversible trend. This means there is a great development potential there, not only business-wise, but also in terms of societal changes. The trend is connected to the idea of the sharing economy that is revolutionizing global markets. The main value of the sharing economy – its currency so to speak – is trust, and it is a necessary ingredient of cooperation. This, in turn, leads to the creation of different solutions which means that all parties have secured access to the goods and services they need without wasting resources.

Hence, it is highly recommended that the smart mobility ecosystem, with its consumer-oriented approach (B2C models), involves more parties because this will help its growth. This might be the greatest opportunity for future generations, for business, for the environment and better social relations. All these factors create a new paradigm and as this research shows, now is the perfect time to grow.

Area-specific recommendations:

1. Legal regulations – there should be more flexibility and the changes should be implemented dynamically; at the state and municipal level, faster legislative adjustments are needed that recognize the innovative character of this sector. Municipalities also need support, so that they can deliver legislative changes with speed.
2. Support system – more smart money on the market for smart mobility is needed; in terms of support institutions, more programmes dedicated to this specific sector would be beneficial.

3. Business development – open innovations model of the transportation industry, such a model would support the implementation of innovative solutions for new big companies but also such products and services that are designed by startups.