Directive 2010/40/EU Progress Report 2023 *Finland*

1 Introduction

1.1 General overview of the national activities and projects

The administrative sector of the Ministry of Transport and Communications in Finland consists of the following authority and organisation roles, which are referred throughout this progress report.

Ministry of Transport and Communications is responsible for overall policy and planning in the transport and communications sector. The ministry prepares the political and strategic guidelines and legislation for its administrative branch in line with the Government Programme. The ministry provides guidance for the sectoral agencies.

Finnish Transport and Communications Agency Traficom is responsible for licence, registration and supervisory matters in the transport and communications sector, including approval matters related to vehicles and transport services. Regarding the implementation of the ITS Directive and its delegated regulations, The Finnish Transport and Communication Agency acts as the National Body and reports to the Ministry of Transport and Communications. The Finnish Transport and Communication Agency is currently also responsible for the National Access Point for Delegated Regulation 'a', mainly due to the national legislation.

The Finnish Transport Infrastructure Agency (FTIA) is responsible for developing and maintaining the state-owned road network, the railways, and the waterways, including maintaining the level of service of transport. FTIA operates in the planning of transport systems as the primary partner of regional councils, municipalities, urban regions, and other players. Finnish Transport Infrastructure Agency is the owner of national infrastructure databases including Digiroad, which is the database containing the static road data under the delegated regulation 'b'.

Traffic Management Company Fintraffic Ltd is responsible for providing traffic control and management services as well as collection, management and use of traffic control data. The company is a state-owned group with special assignment operating under the ownership steering of the Ministry of Transport and Communications. Fintraffic Ltd is responsible for maintaining the National Access Point (Digitraffic) for Delegated Acts 'b' and 'c' containing dynamic road and traffic information. The company has four subsidiaries with responsibilities of traffic management on the roads, rails, air and sea. The company and its subsidiaries were renamed in 2021, the former name being Traffic Management Finland Group. For clarity, the name Fintraffic is used throughout this

report when referred either to the company Fintraffic or its subsidiary Fintraffic Road Ltd responsible for road traffic management. Fintraffic Road also operates the road traffic management centres and roadside ITS infrastructure.

The reporting period in this report has been set to projects and initiatives that have been finished or started between the end of the year 2020 and August 2023.

There are several key initiatives accomplished during the reporting period, many of which take a holistic approach towards development of safe and sustainable society, and making use of digitalisation. The most important initiatives are presented below.

Digital Compass was published by the Finnish Government in 2022. Digital Compass refers to purpose of directing and managing the development of the digital transformation in Finland. The Digital Compass, based on European values and the Digital Decade 2030 programme, describes Finland's challenges and opportunities for the development and utilisation of digitalisation and the data economy.

Finnish national transport system plan (so called "Traffic 12 plan") is a strategic plan for the development of Finland's transport system. The preparation of the plan is based on the Act on the Transport System and Roads (503/2005). The Ministry of Transport and Communications prepares a national transport system plan in cooperation with key ministries, authorities and other actors in terms of the plan. The national transport system plan will be updated at the beginning of the government term. Impact assessment program was published in Autumn 2023, and it includes topics such as transport system digitalisation, electrification, automation and information security.

Strategic land use, housing and transport agreements (MAL) are concluded by the State of Finland with the largest urban regions. The agreements provide guidelines for sustainable solutions in the long term and prioritizes key measures in the short term. The MAL 2023 plan supplements and revises the previous MAL 2019 plan based on updated targets and changes in the operating environment.

Traffic Safety Strategy, published by the Ministry of Transport and Communications in 2022, aims to provide comprehensive guidance on traffic safety work over the next few years. The Strategy is to be adopted for 2022–2026. The strategy includes all modes of transport: road, rail, water and air traffic. According to the zero vision of the Strategy, by 2050 nobody shall die or be seriously injured in traffic, regardless of the mode of transport. The strategy includes strategic guidelines describing the focus areas of traffic safety work and describes over 100 measures. The seven strategic guidelines are

1) Traffic safety concerns everyone in society
2) Decision-making must be based on knowledge
3) Traffic skills must be improved
4) Attitudes in traffic must be changed
5) The transport system and all of its components must be safe
6) Technological advancement improves safety and
7) Legislation must promote safe mobility

ProDigial Research Programme developed tools and operating models to improve productivity and promote the utilisation of digitalisation throughout the lifecycle of infrastructure. The research

program is divided into four research entities: lifecycle information, acquisition and cooperation, change of operating culture and improvement of productivity. ProDigial was funded by the Finnish Transport Infrastructure Agency and ten Finnish cities.

Transport system accessibility vision was sent out for comments by the Ministry of Transport and Communications in Autumn 2023. According to the vision, everyone is entitled to a journey that they can plan and carry out in a smooth, safe and independent manner. The vision is part of the implementation process of the 12-year transport system plan. The vision determines national goals for accessibility, which are divided into four categories:

1. Transport infrastructure
2. Mobility services
3. Means of transport
4. Accessibility data.

There are also several initiatives that aim at fostering business development and import activities of the Finnish companies working in the field of transport system digitalisation and related services.

The Sustainable Growth Programme for the Transport Sector 2021-2023 promotes business-driven innovation, internationalisation, and growth based on sustainable solutions in the transport sector. The aim of the programme is to promote investment and international growth in the sector through ecologically, economically, and socially sustainable solutions. The programme encourages closer cooperation between private and public sector actors. The transport sector is undergoing significant changes, the key drivers of which include urbanisation, emission reduction targets, innovations and technological development in the sector, as well as companies' business opportunities in global markets.

The aim of the programme is to create international business ecosystems and 10,000 new jobs in the Finnish transport sector by 2025. The programme consists of a vision up until 2030. It describes the expertise and operational environment, determines the measures to be taken in the coming years, and lays out a framework for the programme's implementation and monitoring. Each of the programme's measure aims to promote the development of skills and solutions in businesses to solve the challenges posed by climate change, biodiversity losses, and urbanisation in Finland and the international markets. The principal toolbox consists of a wide variety of tools offered by digitalisation, fossil-free fuels for all movement and transport, and various cross-sectoral innovative products and services. https://tem.fi/en/the-sustainable-growth-programme-for-the-transport-sector-2021-2023

Fintraffic Ltd set up a national traffic data ecosystem in 2021 to foster opening, sharing and re-using traffic and transport system related datasets and to build new business opportunities and operational efficiency to the transport sector. The ecosystem has organised its work under several working groups and has also published a common traffic data ecosystem rulebook which creates a contractual framework that will facilitate data sharing and building mutual trust within the traffic sector. The Rulebook is a tool for sharing increasing quantities of data either free of charge or for a fee, as agreed jointly. In practical terms, this will improve confidence in data integrity, quality, security, operator identity, operator roles and terms and conditions of use.

The traffic data ecosystem's working groups started up at the beginning of 2021, and new members are welcome at any time. More than 160 organisations are already working to build the system. One

recent initiative is to activate municipalities to develop their own traffic-related datasets and to inform them about the related European regulations. Fintraffic as a national road operator and operator of NAPs can offer municipalities support in the digitalisation work, including recommendations, guidelines models and tools for the development and maintenance of the municipal datasets.

Cooperative Intelligent Transport Systems (C-ITS) have been successfully piloted earlier in Finland and recently the focus has moved towards full-scale deployment and roll-out preparations. Finland has strongly supported a technology neutral approach so that service providers could choose themselves the technologies that they see appropriate and most efficient to deliver quality services to their customers. Due to excellent wireless mobile communication networks, Finland has actively piloted and analysed use of commercial cellular networks to provide C-ITS services. Finnish authorities have collaborated with industry partners and Nordic countries in the EU CEF funded NordicWay 3 project. The European cross-border C-ITS specifications have been developed under the C-Roads Platform collaboration, where Finland is also a core member.

1.2 General progress since 2020

This chapter provides an overview of the progress made during the last three years period within the four Priority Areas of the ITS Directive. Overall, the taken progress is based on national principles for digitalisation and building the necessary competences, targeting the whole European market rather than merely solving national needs.

Looking at the first priority area and its target to *optimally use road, traffic and travel data*, the key developments have been introducing some new datasets to be distributed from the national access points, development of the linkage between municipalities IT systems and the Digiroad, harmonisation of the used data standards with the European recommendations and participating in the related European activities. The availability of e.g. real-time data from public transport has improved and the re-use of real-time road traffic related data has increased significantly. Fintraffic has taken an active role in developing their ecosystem work e.g. by joining the Waze ecosystem and DataForRoadSafety-ecosystem as well as developing the national ecosystem helping the Finnish industry to identify and further develop business possibilities related to transport system data.

In the priority area of *Continuity of traffic and freight management ITS services* development continues with a good pace. Fintraffic has invested in their traffic management systems. Investments have been directed to e.g. improvement of the situation awareness tool of the traffic management centres, operational redundancy, increased level of automatisation and several other digital tools. Regarding the shift from traffic management operated mainly with roadside equipment towards more digital and interactive traffic management, two regional pre-studies have been accomplished including also recommendations for national development actions. Regarding freight transport management, the Government of Finland published a resolution regarding the digitalisation of the logistics sector that aims at more efficient, safe and climate-friendly good transport. There is also ongoing work to implement the European-wide regulation of the Electronic Freight Transport Information. Finland is also a partner in the joint European project called eFTI4EU, which aims to harmonise the implementation of EFTI regulation within Europe. Also, the requirements regarding the European Maritime Single Window Environment will be fulfilled by through the implementation of a new national maritime information system NEMO, which is expected to be ready in 2025. NEMO

is intended for issuing port call notifications for passenger and cargo ships, which is intended for use by all operators who work with statutory notifications of port calls.

Other activities in this priority have been the participation to the EU EIP project, NEXT-ITS 3 project and outlining new service level requirements for road traffic management and monitoring systems as well as publishing updated guidelines for the evaluation road traffic management and ITS projects.

In the priority area of *ITS road safety and security applications* the main activities include renewal of the national traffic safety strategy, further implementation of the traffic lights prioritising system for emergency vehicles and the national general plan for the implementation of automated enforcement on highways. Important achievement in this domain has been 50% increase in the proportion of vehicles equipped with ADAS systems during the last five years, as this has a significant impact in the reduction of accidents. The eCall system is in operation in Finland.

In the Priority Area IV *Linking vehicles with the transport infrastructure* the development has continued to be strong as can be expected. In 2021 the Finnish Government published a resolution on promoting automation in all modes of transportation and set the goal of being one of the pioneers in the field worldwide. The resolution was accompanied with the Action plan on legislation and key measures of transport automation. One of the largest studies in the domain was the AUTOMOTO-project, in which the Finnish Transport Infrastructure Agency carried out a study on infrastructure support and classification for automated driving on Finnish motorways. The study proved that the current physical and digital infrastructures provide good support for the basic use cases of level 3 or 4 highway autopilot. No major defects that would require immediate corrective actions with regards to supporting automated driving on motorways were identified. The designed service level classification builds on the ISAD (Infrastructure Support for Automated Driving) levels very much focusing on the digital infrastructure but has been extended to other relevant attribute areas of physical infrastructure, environmental conditions, and dynamic elements. The Finnish Transport Infrastructure Agency also prepared a road transport automation action plan for the step-by-step development of digital and physical infrastructure support for road transport automation. Several other automation roadmaps have been developed in the biggest cities during the reporting period.

The testing of automated driving systems has continued strongly in the recent years. The Finnish Transport and Communications Agency has provided testing permits for the testing of Automated Driving Systems on open roads in Finland from 2016 onwards. The Agency issued 15 test plate certificates for automated vehicle trials in 2020-2022 and they involved 11 automated minibuses or similar purpose vehicles. Other vehicles in trials included automated passenger cars or last-mile delivery service robots. Some trials were conducted even in winter conditions. Cities like Tampere and Helsinki have been active in piloting automated shuttles on dedicated locations.

Regarding C-ITS, a lot of development has taken place in the Nordicway 3 project, where the Finnish partners were especially focusing on piloting central systems and interchange network deployment, piloting Day 1 and Day 1.5 services and CCAM. Overall, 24 different studies and pilots were implemented under the Nordicway 3 project. Fintraffic has also prepared a proposal for a roadmap for national level deployment of C-ITS services, and so has many of the biggest cities in the country. The focus has clearly moved from verifying the proof of concepts and pilots into the preparations for full-scale deployment and roll-out. With early adoption and implementation Finnish players are

seeking for an active role in developing and introducing tested solutions for the Europeanwide market.

Traficom has been actively studying the performance requirements arising from C-ITS services. The current situation regarding mobile networks is that 4G networks are well deployed throughout the country with over 99% coverage of all roads and households. The 3G networks are being closed in 2023-2024 and the frequencies are being appointed for next generation communication networks. Numerous research projects are ongoing regarding the deployment of 5G and 6G networks.

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2 Projects, activities and initiatives

2.1 Priority area I. *Optimal use of road, traffic and travel data*

2.1.1 Description of the national activities and projects

Digitraffic is a service operated and developed by Traffic Management Company Fintraffic Ltd ("Fintraffic") offering real time traffic information from road, rail and maritime traffic. The service has been operational since 2008. The objective of the service is to connect stakeholders of the transport sector and enhance transport ecosystem services. Digitraffic enhances the road safety and boosts the efficiency of infrastructure use and traffic operations for both passengers and freight. The service is constantly updated.

Most of the data is gathered from Fintraffic's data sources, which include loop detectors, road weather stations and road weather & surface cameras. It also provides history data, road weather forecast, incident information, and as new datasets also cycling counts data as well as road maintenance status information. Digitraffic offers several APIs for developers. The data is available free of charge under the Open data licence Creative Commons 4.0 BY. For rail traffic, the open API provides data on train compositions and schedules including real-time traffic information, future schedules and history data. Regarding maritime data, the location of the ships, support system for wintertime and information on warnings are nowadays available.

Digitraffic is being developed towards a widely used national data marketplace with the aim of enabling other organisations such as municipalities and commercial operators to provide datasets to the service in the near future. https://www.digitraffic.fi/en/service-overview/

Digiroad is a national database that contains the geometry of the Finnish road and street network featured with the most important road attribute data. Digiroad has been available for users since 2004. The Finnish Transport Infrastructure Agency ("FTIA") administrates the service and it is constantly updated. Digiroad data covers the entire country and is available free of charge. The data enables and supports the development and commercialisation of services and applications for e.g. route planning, navigation, tourism, and intelligent transportation systems. Digiroad supports the optimal use of road, traffic and travel data. It also supports development of applications for traffic information and traffic management in the area of C-ITS. Digiroad data consists of the centre line geometry of the transport network, traffic-related attribute data and other transport system objects. The centre line geometry covers the vehicle-accessible roads, ferry and cable ferry connections, railways and separate pedestrian and cycle routes. Traffic-related attribute data include data of traffic elements as well as the restrictions, limits and other features of the road and street network.

The Road Traffic Act of 2020 sets requirements for opening the GIS information of traffic signs, traffic lights and other traffic control infrastructure, from both national roads and municipal streets, and setting that data available from the centralized content access point, namely the Digiroad.

Digiroad data is open for everyone to use and the material can be downloaded from the Finnish Transport Infrastructure Agency's service. The maintenance organisations are the National Land Survey of Finland, the Finnish Transport Infrastructure Agency, and the Finnish municipalities, whose maintenance activities are fostered with national legislation. The Digiroad Operator is responsible for adding and updating the Digiroad data in the database thereby ensuring high quality of the data.

Development activities are ongoing regarding the integration of municipalities' IT systems and the Digiroad database to allow direct and automated updates to the Digiroad database. TN-ITS interfaces are operational. More information can be found at https://vayla.fi/en/transport-network/data/digiroad

Regarding the maintenance of static road network data, traffic volume data and many other road attributes that are needed in the daily work, the Finnish Transport Infrastructure Agency has taken into use a new IT system called "Tievelho". The system can be seen as the first phase in the vision for road information management, which aims at building a real digital twin of the whole national road network. The virtual copy of the physical road infrastructure enables a comprehensive and up-to-date status information as well as utilisation of historical and predicted information in the steering, planning and decision-making of different investment and maintenance actions. Tievelho will also contain information on the condition of the road infrastructure.

Traffic situation service presents map-based graphic traffic information from all modes (road, maritime, rail, air) collected by Fintraffic and its partners. It covers all railway stations, ports and public roads. The service promotes optimal use of road, traffic and travel data, and improves the interoperability, continuity and seamless mobility.

Regarding road traffic, the service provides information about road traffic incidents, traffic volumes, roadworks, weight limitations, road conditions and weather (including forecast), road camera pictures and to mention few key topics. Information on rail traffic includes arrival and departure times of commuter and long-distance trains and their punctuality. The service also provides information of the maritime traffic (navigational warnings and vessels in port and arriving vessels).

Currently Fintraffic offers municipalities the possibility to present their information concerning traffic status, incidents and road works on municipal streets. The service is available in the internet at https://liikennetilanne.fintraffic.fi/pulssi/?lang=en

Fintraffic has been developing a new smartphone application that is soon to be published and will be an important channel to reach more users for the real-time data regarding the transport system. The contents are primarily similar to those of the traffic situation service but functionalities differ e.g. the application will also become a channel to collect user feedback about e.g. road conditions and repair needs.

Fintraffic has joined the Waze for Cities programme to further improve the reach of the traffic information shared through Digitraffic. The programme is based on two-way information exchange and in return Fintraffic receives Waze's travel time data that is used as an input in highway traffic management systems.

FINAP is an open transport service catalogue, to which transport service providers are obliged to submit essential information on their services via digital machine-readable interfaces. The goal of FINAP is to enable easy-to-use multimodal mobility and information services. FINAP is not an end-user service as such, but is it aimed for service providers and developers to publish and consume essential information regarding transport services. FINAP was originally initiated by the national Transport Services Act, but it also serves as a national access point for multimodal traffic and travel information as set out in the Commission Delegated Regulation 2017/1926. FINAP is currently

operated by Fintraffic Ltd and the Finnish Transport and Communications Agency Traficom acts as a supervisor. https://finap.fi/#/

The recent development activities regarding FINAP and its contents have been focusing on the future alignment of the national and EU regulation and the use of data standards presented in the MMTIS Delegated Act. The encountered challenge is that the transport service industry in Finland has not build its systems on Netex and Siri standards but is relying more on open GTFS and GTFS-RT standards. The national legislation allows the use of any machine-readable data standards. Regarding the use and harmonisation of the European standards Fintraffic is targeting the use of Nordic Profiles of Netex, developed by the Norwegian Entour.

Fintraffic, Traficom and the Finnish Transport Infrastructure Agency have started discussions on a possible fusion of the nowadays separate NAPs into a single, easily accessible National Access Point. In the preliminary planning the authorities are seeking synergies in the customer service for both data producers and users and well as in the maintenance of all documentation. The planning is now ongoing.

Digitransit Platform is an open source journey planning solution that combines several open source components into a modern, highly available route planning service. Route planning algorithms and APIs are provided by Open Trip Planner. In addition, Digitransit offers other developer tools such as Mobile friendly user interface, Map tile serving, Geocoding, and various data conversion tools. The platform is offered by HSL, Fintraffic and Waltti Solutions Ltd. The code is open-source so all interested parties can participate in the development of the service. Currently almost 90% of public transport services in Finland are included in the Digitransit service.

NAPCORE (National Access Point Coordination Organisation for Europe) is the name of the formed project to coordinate and harmonise more than 30 mobility data platforms across Europe. From Finland, both Traficom as a National Body and Fintraffic as well as Finnish Transport Infrastructure Agency (FTIA), both responsible for certain National Access Points, are partners in the project. With the help of the NAPCORE, the Finnish partners especially aim at

- harmonised interpretation of the Delegated Regulations, especially regarding RTTI and MMTIS
- guidelines how to further develop the API:s of the regulated datasets in a harmonised manner (e.g. recommended Datex2 profiles)
- guidelines how to publish metadata related to the regulated datasets
- guidelines how to organise the different NAPs into an easily accessible entity.
- guidelines and best practises what are the needed basic functionalities of NAPs.
- guidelines how to measure and inform users about data quality
- guidelines and best practices regarding the declarations of compliance

Traficom and Finnish Transport Infrastructure Agency have been working with the development of digitalisation of the traffic rules. The current plan is to concentrate in the first phase to the data included in the RTTI delegated regulation, namely the traffic signs i.e. their location and area of effect datasets. Also the possible changes that are required to the Digiroad-service (National Access Point) are being considered. The digital traffic rules may require changes to the processes of both the national and municipal road operators, in order to create a trustworthy information flow from the authority's official decision to the changes to both the roadside signs and their digital counterparts in the databases. The other general types of traffic regulations will be only developed in the second

stage, when the standardisation work of ISO/METR is finished and the required digital formats and profiles have been finalised and established. Meanwhile, Traficom is closely following the work of METR. The digitalisation of traffic rules and speed limits in particular is extremely important for the correct functioning of the ISA services that are required by the recent European regulation.

Regarding the development of transport system digitalisation and support for automatization in the biggest city regions in Finland, an important tool has been the contracts between the municipalities and the Ministry of Transport and Communications and national authorities. These contracts are called land-use, living and transport contracts (MAL-contracts) and they frame the common goals and related funding and most important activities and investments in e.g. transport infrastructure. In the existing MAL-contract city regions will e.g. enable new mobility services with digitalisation so that their usage will speed the shift towards sustainable and low-carbon transport system. Cities have also prepared roadmaps for transport automatization, taking into account the needed digital infrastructure. In the future, the MAL-contracts may be used as a tool to engage municipalities in the development of the digitalisation of the transport system and services.

The Finnish authorities have also started a renewal of the national legislation in relation to the updated European regulations regarding the implementation of the ITS Directive.

Fintraffic is also participating in the Open Mobility Data in the Nordics (ODIN) -project, which is a joint project initiated by public transport players in the Nordic countries. The project aims at establishing a common Nordic living lab for new mobility services by creating an easy-access platform with a wide enough coverage even for the biggest global market players. The project concentrates mainly on the datasets related to the MMTIS delegated regulation and has establish six working areas that are seen vital for the development. These working areas are datasets and services, conditions for re-use of data, standards and formats, leveraging EU regulations, shared technology and open source, and outreach and developer experience. The project has published a position paper that can be found here https://nordicopenmobilitydata.eu/wp-content/uploads/2019/03/ODIN-Position-Paper.pdf.

2.1.2 Progress since 2020

Description of the progress in the area since 2020:

The achieved progress has been related to introducing some new datasets under the European delegated regulations, development of the linkage between municipalities' IT systems and the National Access Point Digiroad, harmonisation of the used data standards with the European recommendations and participating in the related European activities. The availability of e.g. real-time data from public transport has improved and the re-use of real-time road traffic related data has increased significantly. Fintraffic has taken an active role in developing their ecosystem work e.g. by joining the Waze ecosystem and DataForRoadSafety-ecosystem as well as developing the national ecosystem helping the Finnish industry to identify and further develop business possibilities related to transport system data.

2.1.3 Delegated Regulation (EU) 2017/1926 on the provision of EU-wide multimodal travel information services (priority action a)

Progress made in terms of the accessibility and exchange of the travel and traffic data types set out in the Annex:

The most important developments during the reporting period have been the improved data availability regarding taxi, demand-responsive transport and micromobility. From public transport services, there has been a significant increase in the availability of real-time data regarding vehicle locations, stop passing times and occupancy. It should be noted that many datasets are available in GTFS and GTFS-R formats that are currently the industrial standards among operators. There is ongoing work to improve the data availability in the Netex and Siri standards.

Geographical scope of the data set out in the Annex accessible via the national access point, and their quality, including the criteria used to define this quality and the means used to monitor it:

Geographical scope is national. Currently there is a quality assurance process in place regarding the GTFS-datasets, that are validated by a specific software, and data suppliers are informed about possible shortcomings.

Linking of travel information services:

n/a

Results of the assessment of compliance referred to in Article 9:

Traficom as the national supervisory authority is not aware of any shortcomings or deviations regarding the implementation of the Delegated Regulation. The national Traffic Services Act contains similar regulations that are partially stricter than the European Regulation. No declarations of compliance have been requested.

Where relevant, a description of changes to the national or common access point:

The National Access point FINAP is currently operated by Fintraffic and the Finnish Transport and Communications Agency acts as a supervisor.

The recent development activities regarding FINAP and its contents have been focusing on the future alignment of the national and EU regulation and the use of data standards presented in the MMTIS Delegated Act.

Additional information (e.g. have metadata catalogues been implemented?):

The NAP catalogue includes, for example, passenger transport services (by road, sea and air); stations, ports and terminals; vehicle-for-hire services and commercial shared mobility services; general commercial parking services and brokering services. Data is provided both by the actors own machine-readable interfaces or from the NAP after it has been digitised with the NAP tools. The NAP itself is machine-readable and the user interface allows filtering the content based on transport operator, transport name, type, operating area, mode of transport and interface content.

Some of the data categories of the delegated regulation ‘a’ are published in other access points and are referred to in the multimodal NAP, including topographic places, connection links and transfer times and road-, cycling- and pedestrian network.

All transport services are published in a GeoJSON export, which can be formed with the transport-operator-id and id fields in the service search API response default objects. The JSON-schema contains all the properties of the different transport-service types. NeTEx enumerations are used wherever possible. NeTEx is not yet provided by the public transport authorities and operators. Therefore, a GTFS to NeTEx conversion is being implemented in NAP as a first step. The Nordic countries have agreed on a Nordic NeTEx profile, which serves as a basis for further Finnish development.

According to national Act on Transport Services the interfaces to dynamic data has to be published in the NAP if they are available.

2.1.4 Reporting obligation under Delegated Regulation (EU) 2015/962 on the provision of EU-wide real-time traffic information services (priority action b)

(see guidance provided in Member States experts follow up meetings)

Progress made in terms of the accessibility, exchange and re-use of the road and traffic data types set out in the Annex:

The static data types, covering the data types regulated under the Delegated Act 2015/962, that are available in the National Access Point Digiroad have remained the same, but the data quality has improved especially from the municipal street networks as the municipalities are improving the data transfer from their street information systems and the NAP. Also more TN-ITS datasets have been developed during the reporting period.

Regarding road transport, the available datasets in the national access point for real-time data Digitraffic have remained in essence the same. There is more information available about the real-time status of road maintenance and cycling counts.

Regarding the re-use of RTTI-data distributed from Digitraffic, the amount of data within the road domain has increased roughly 75% during the reporting period.

Geographical scope and the road and traffic data content of real-time traffic information services and their quality, including the criteria used to define this quality and the means used to monitor it:

All sections of the road network as designated by the Member State.

The National Body Traficom is actively participating in the NAPCORE Working Group 5 “National Body” in order to develop harmonised compliance assessment methods (including quality).

Results of the assessment of compliance referred to in Article 11 with the requirements set out in Articles 3 to 10:

Traficom as the national supervisory authority is not aware of any shortcomings or deviations regarding the implementation of the Delegated Regulation. Traficom is actively participating in the NAPCORE Working Group 5 “National Body” in order to develop harmonised compliance assessment methods. Within the project, Traficom has implemented a test run of the designed assessment of compliance process.

Where relevant, a description of changes to the national or common access point:

n/a

Where relevant, a description of changes to the priority zones:

n/a

Additional information (e.g. which data types are being provided? Have metadata catalogues been implemented? Are quality requirements being checked?):

Currently there is no metadata catalogue implemented in Digitraffic, but Fintraffic is planning to implement a common European metadata catalogue in 2024.

2.1.5 Reporting obligation under Delegated Regulation (EU) No 886/2013 on data and procedures for the provision, where possible, of road safety-related minimum universal traffic information free of charge to users (priority action c)

(see guidance provided in Member States experts follow up meetings)

Progress made in implementing the information service, including the criteria used to define its level of quality and the means used to monitor its quality:

Regarding the safety related traffic information provided by Fintraffic through various channels and the NAP, the data types have remained the same but there have been improvements in the data production pcocesses. The operators in the traffic management centres have now a better situational awareness tool, that enables timely reaction to different safety-relevant events. For example the tool includes visualisation of travel time changes (provided by Waze Ltd) on the whole national main road network, which helps to identify sudden changes and events. Also the implementation of eCall improves the timeliness of road accident alerts delivered from the Emergency Response Centre to the Traffic Management Centre.

Fintraffic is also an active member in the Data for Road Safety ecosystem and is currently working on a study to utilise the available safety-related datasets in their own processes of information provision and traffic management.

As part of the Nordicway 3 project, Traficom implemented a study to clarify the views of the transport industry on real-time traffic information services. The study carried out an online survey for freight drivers, as well as interviews with representatives of transport companies working on driving arrangement and transportation planning, as well as representatives of companies providing transport information services. The most useful datasets among transport companies were road weather information services as well as incident and hazard warnings. These safety-related datasets may improve safety and punctuality and decrease costs through better logistics planning and better driver awareness when on route.

Results of the assessment of compliance with the requirements set out in Articles 3 to 8 of Delegated Regulation (EU) No 886/2013:

Traficom as the national supervisory authority is not aware of any shortcomings or deviations regarding the implementation of the Delegated Regulation. The National Body Traficom is actively participating in the NAPCORE Working Group 5 “National Body” in order to develop harmonised compliance assessment methods.

Where relevant, a description of changes to the national access point:

n/a

Additional information (e.g. sources of data used for the provision of safety related traffic information):

Fintraffic is using multiple methods to identify safety-related events and provide timely warnings to road users through various channels. An important source for unprotected accident area information is the API service of the Emergency Response Centre, through which Fintraffic receives most of the preliminary incident alerts on the whole national road network and municipal street networks.

2.2 Priority area II. *Continuity of traffic and freight management ITS services*

2.2.1 Description of the national activities and projects

Description of the relevant initiatives, their objective, timescale, milestones, resources, lead stakeholder(s) and status:

In May 2021, the Government of Finland published a resolution regarding the digitalisation of the logistics sector that aims at more efficient, safer and climate-friendly transport. The resolution includes, in particular, the central government measures to implement the digitalisation strategy for logistics published in October 2020. The measures laid down in the resolution aim to make more efficient use of information in transport chains and transport hubs. In addition, the regulatory framework and the information environment will be developed to achieve improved cyber and information security in logistics. The government resolution is in line with other sustainability projects for the transport system, such as the roadmap for fossil-free transport, the National Transport System Plan (Transport 12) and the Climate and Environmental Strategy for the ICT Sector. The introduction of digital solutions requires that the information transmitted in the supply chain is in a digitally readable format. A seamless flow of data enables the automated processing of data and the optimisation of transports. This increases efficiency and cost benefits in logistics and reduces the climate impact of transport. The impacts are scalable from individual delivery up to international transport chains. The digitalisation of logistics requires investments in the development of data environments and data management in logistics and the competences of the companies utilising them as well as common rules for different national and international transport operators.

Regarding the national implementation of the European Electronic Freight Transport Information (EFTI) regulation, Traficom and Fintraffic have been coordinating the development work that will be ready by the beginning of 2026 when the delegated act sets into force. Traficom is responsible for the implementation and Fintraffic will set up the necessary IT platform to enable data exchange between the supervising authority and the logistics companies and helps companies to fully utilise the new system. The digital freight information is expected to present many societal benefits such as improved safety, efficiency, trust and sustainability of freight transport. In addition, the reliability increases, the management costs decrease and communication between players in the logistic chain becomes easier. Fintraffic offers logistics companies a possibility to pilot the functioning of the electronic dispatch list before 2026. Finland is also a partner in the joint European project called eFTI4EU, which aims to harmonise the implementation of EFTI regulation within Europe. Nine

countries will test the data exchange in different use-cases nationally in cross-border within the project.

In 2019 the European Union issued a regulation (2019/1239) to establish a European Maritime Single Window environment (EMSWe). The main aim of the EMSWe Regulation is to lay down harmonised rules for the provision of the information that is required for port calls, in particular by ensuring that the same data sets can be reported to each Maritime National Single Window in the same way. This Regulation also aims to facilitate the transmission of information between declarants, relevant authorities and the providers of port services in the port of call, and other Member States. The requirements will be fulfilled by through the implementation of a new national maritime information system NEMO, which is expected to be ready in 2025. NEMO is intended for issuing port call notifications for passenger and cargo ships, which is intended for use by all operators who work with statutory notifications of port calls. Nemo changes the way information is distributed; the notification is sent to the system only once, and the information is then automatically sent forward to all relevant parties. In addition, the good declaration forms required by the Customs is also included in the system. The maritime information management system NEMO is built in close cooperation with port operators and authorities, which ensures that the system fulfils all functional requirements. Fintraffic Ltd will be responsible for the planning, development and maintenance of the new system. Nemo has also a connection to road transport, as the road logistics operators can prepare their own operations based on accurate information on the ships arrival time.

The Finnish Transport Infrastructure Agency and Traficom participated in the European harmonisation work in the EU EIP project. Within the framework of the European ITS Platform (EU EIP), co-financed by the European Commission, the ITS Deployment Guidelines, which were developed in previous projects (EasyWay, EIP+), were fundamentally revised to further harmonise the technical and organisational implementation of ITS. To comply with the delegated regulations of the ITS Directive, the revision of the ITS Deployment Guidelines was necessary. In addition, some new innovations and features were introduced, such as compilation of a single reference handbook, recommended Datex2 service profiles, references to C-Roads specifications for C-ITS services, to mention a few. The reference handbook is available here: https://www.its-platform.eu/wp-content/uploads/ITS-Platform/AchievementsDocuments/ReferenceHandbook/EUEIP-ReferenceHandbook_accessible.pdf

The NEXT-ITS 3 project (2018-2021) was a continuation of the NEXT-ITS 1 and 2 projects and the long-term VIKING cooperation on harmonised ITS implementations in the Nordic countries and Northern Germany. The VIKING cooperation has enabled northern European countries to carry out large ITS projects efficiently and to ensure exchange of knowledge. The VIKING community has promoted cooperation in solving common transport related problems and issues faced by partner countries since the mid 1990's. The NEXT-ITS projects covered the Northern part of the Scandinavian-Mediterranean corridor, including the TEN-T core road network and the key comprehensive network links. NEXT-ITS activities have contributed to achieving a European integrated road transport system building on the TEN-T core network.

The aim of the NEXT-ITS projects has been to enhance corridor and network safety and performance by full-scale deployment of ITS services that ensure interoperability and continuity of services, support harmonisation, and increase the cost-efficiency in the operation of traffic management.

The ITS services in NEXT-ITS were the following:

- Information services enabling the road users to make good decisions
- Traffic management services to manage traffic flow, enhance safety and reduce emissions
- Incident Management to restore normal traffic flow as quickly as possible
- Traffic management from a network perspective
- Data collection through various sources of information as well as data mining and fusion
- Distribution and sharing of traffic data to promote wider dissemination.

Traffic Management Centres have played a key role in the service provision, regardless of service. The key achievements in Finland were:

- Enhanced traffic management and information services via traffic management systems integrated to increase the coverage on the core and comprehensive TEN-T network (Helsinki, Turku, Tampere, Oulu; Finland).
- Traffic management infrastructure and systems deployed on motorway E8 south from Oulu, Finland.

The Finnish Transport Infrastructure Agency's operation as a road authority is based on set service levels, which the agency has determined for its various functions. The defined service levels guide the agency's operations nationwide, and they describe the goals set for each route for the functionality and quality of road maintenance and road network operation. The set goals are needed when deciding on the content and quality level of different road maintenance products (for example, winter maintenance) and the allocation to different parts of the road network within the available financial resources.

The guideline for dynamic road traffic management and monitoring systems was updated in 2022. The update was seen necessary as there have been major changes in the production of traffic management services and available technologies in recent years. These changes have affected the content of the services as well as their needs and investments. The progress of in-vehicle systems, networking and automation, and cooperative (C-ITS) services will change the requirements for different services and their coverage in the future. The advancement of traffic digitalization and the opportunities and threats it brings also affect this line of action.

The service level requirements for variable control and monitoring systems presented in this report differ from each other in principle. The service level requirements for tracking systems describe the minimum service level for each operating environment on the entire road network, while the service level requirements for variable control describe the service level for each operating environment only in those cases where variable control is profitable to implement.

The service level requirements describe how the services must be functionally implemented. Some of the requirements also determine the technical implementation. The policy applies to both new and replacement investments. Implementation decisions on traffic management systems are made individually in each case based on local or regional needs, traffic policy guidelines, implementation effects, costs and profitability, as well as available funding opportunities.

In late 2020, the Finnish Transport Infrastructure Agency renewed the national guidelines for the evaluation of road traffic management and ITS projects. The goal was to prepare guidelines for the evaluation of road traffic management and ITS projects in accordance with the general project evaluation procedure of the transport sector for the use of the Finnish Transport Agency and also for regional ELY centers, Fintraffic Ltd. and other operators in the field. The instructions only apply to road traffic, i.e. road traffic management and road ITS applications. The aim of the guideline is to cover all road traffic management and ITS implementation, development and renewal investment projects in which the Finnish Transport Agency participates as a customer and/or financier. The guidelines cover the effects of projects throughout their entire life cycle. The instructions also deal with the question how the future changes in traffic system and society may affect to the development on the procedures of project evaluations. The guideline focuses on socio-economic assessment. The guidelines are broadly in line with EU guidelines (e.g. EC 2016).

The guideline covers the following types of systems:

- road traffic information
- variable traffic management systems
- road traffic demand management, access management and technology solutions for road user charges
- road traffic incident management
- automatic monitoring of driving speeds and compliance with traffic lights
- cooperative driving, C-ITS Day 1 and Day 1.5 services
- selected high level automated driving services including maintenance vehicle automation
- selected parts of the road traffic digital infrastructure (possible e.g. digital traffic management plans, digital maps, telecommunications infrastructure, satellite positioning support services), which are implemented as separate investments and not as part of the implementation of a specific service.

During the reporting period Fintraffic has implemented many improvements in their traffic management systems. Currently there is a digital channel for road project contracts to provide information on the upcoming road works. The operators have a better situation awareness tool that enables flexible integration of new datasets to the operator's view. The company has also improved the redundancy of system operation for e.g. cases where one TMC location is not able to operate because of an unexpected event. Fintraffic is currently working with developing systematic descriptions of its products and services, including the production of the datasets regulated under the ITS directive. For the wider future implementation of C-ITS services, Fintraffic has produced a proposal for a roadmap, has participated in many pilot projects and is offering an interchange node service for partners that are interested in experimenting C-ITS services.

Fintraffic has increased the level of automated operation of traffic management systems especially regarding traffic situation based operations. Most of the systems operate fully automatically nowadays. Regarding road weather information product, Fintraffic has an ongoing development project in place. The development aims at improved analysis of the current and short-term future road weather status based on data fusion from various sources. The aim is to pilot the new product in traffic management systems and to integrate it to the production of road weather information services and warnings. Fintraffic is also ingesting travel time data provided by Waze and is initiating a

pilot to present the travel time information on roadside information panels on Ring Road III in the Helsinki Region.

The mission of the Traffic Management 2.0 concept (founded in 2014) is to achieve convergence of mobility services and traffic management, create synergies between actions of individual travellers with the collective mobility objectives and to bridge the innovative developments in the vehicle and in the traffic management while giving value to the legacy and creating new business opportunities. In Finland there have been two regional initiatives that aimed at evaluating the feasibility of the concept in the Finnish operating environment and preparing a concrete plan how to proceed in the implementation, following the experiences from the other European projects such as Socrates 2.0:

- Traffic management 2.0 in the Helsinki region, pre-study (finished 2022)
- Traffic management 2.0 plan in the Oulu Region (finished October 2023)

In these studies, special focus was laid on

- development of high-quality content to the end-user services by digitalization
- regulated datasets such as SRTI and RTTI
- multimodal and sustainability perspective
- higher synergies between public organisations
- development of viable ecosystem and organizational models
- phased action plan that brings concrete value for all players in all phases.

It is noteworthy that the renewed European RTTI regulation sets new requirements for service providers to process and include in the relevant services some of the datasets that relate to the traffic management objectives of the road authorities. The most potential datasets, that can be called as tools for 'digital traffic management' are

- traffic Regulations and restrictions (incl. UVAR)
- traffic circulation plans
- temporary traffic management measures.

The Finnish stakeholders expect that the RTTI delegated act may be an anticipated lever to align the information services of the private service providers and authorities traffic management principles on the whole European wide road network starting January 2025.

2.2.2 Progress since 2020

Description of the progress in the area since 2020:

Notable progress has been achieved regarding the development of the road traffic management systems owned and operated by Fintraffic. Investments have been directed to e.g. improvement of the situation awareness tool of the traffic management centres, operational redundancy, increased level of automatisation and several other digital tools. Studies have been made regarding the shift from traffic management operated mainly with roadside equipment towards more digital and interactive traffic management (implementation of the Traffic Management 2.0 concept).

Considering freight transport management, the Government of Finland published a resolution regarding the digitalisation of the logistics sector that aims at more efficient, safe and climate-friendly good transport. Also significant advancement has been achieved regarding the national implementation of European EFTI regulation and the European Maritime Single Window.

Other activities in this priority have been the participation to the EU EIP project, NEXT-ITS 3 project and outlining new service level requirements for road traffic management and monitoring systems as well as publishing updated guidelines for the evaluation road traffic management and ITS projects.

2.3 Priority area III. *ITS road safety and security applications*

2.3.1 Description of the national activities and projects

Description of the relevant initiatives, their objective, timescale, milestones, resources, lead stakeholder(s) and status:

The Finnish Government has adopted the Traffic Safety Strategy 2022–2026 including all modes of transport. According to the zero vision of the strategy, by 2050 nobody shall die or be seriously injured in traffic, regardless of the mode of transport. The strategy includes seven strategic guidelines describing the focus areas of traffic safety work. The guidelines are 1) Traffic safety concerns everyone in society, 2) Decision-making must be based on knowledge, 3) Traffic skills must be improved, 4) Attitudes in traffic must be changed, 5) The transport system and all of its components must be safe, 6) Technological advancement improves safety, and 7) Legislation must promote safe mobility.

The action plan for the Traffic Safety Strategy describes 103 measures. The measures are grouped under the strategic guidelines and each has a responsibility party. Some of the measures have been prioritised and a verbal impact assessment based on a more extensive impact assessment carried out during the preparation process is available for each measure. With regard to the domain of the ITS directive the measures specifically highlight the development of automated enforcement and facilitation of road vehicle automation with road safety focus.

Traffic light prioritising system for emergency vehicles (HALI*)* prioritises traffic lights for emergency vehicles on a mission. The development of HALI was kicked off in the city of Oulu in 2004 as a regional development but has later grown into a national system coordinated by Association of Finnish Municipalities and Fintraffic. The service has been implemented already for over 400 emergency vehicles and for every fifth traffic light in Finland with over 500 traffic light controller intersections.

Currently Finnish cities have their own systems to run the HALI service, but the goal is to centralise the service in one location to create a national system with sufficient cyber security. Aim is to reach as wide coverage as possible for the HALI service, i.e., emergency vehicles to be able to pass through the whole of Finland on a green wave. Aim is also to develop unambiguous system interface specification to allow international use of the HALI system.

Due to the HALI system, the safety of the emergency vehicles on the mission has increased and travel time have been reduced. Because of the benefits provided by the HALI system in traffic light intersections for emergency vehicles, it is possible to reduce intersection accidents that occur during emergency driving by at least 80%.

Driver assistance systems existence in the car fleet of Finland was studied by the Finnish Transport and Communications Agency in 2022 (study on the existence of driver assistance systems). The study estimated the current extent of the most important driver assistance systems available for the most common passenger car models in Finland and illustrated the spread of these systems in recent years. The study complements the preceding reports on the existence of driver assistance systems

published in 2017 and 2018. The assistance systems observed for this study were electronic stability control system, eCall emergency call system, three emergency braking systems of different levels, four lane assist systems of different levels, three parking systems of different levels, adaptive cruise control, driver alertness monitoring system, traffic sign identification system, and adaptive head lights. Six of these support systems had not been included in previous studies.

According to the study, all the examined assistance systems have become more common relatively quickly in recent years. In many cases, the share of vehicles equipped with different assistance systems in the passenger car stock had doubled on average between 2018 and 2022. Out of all the support systems included in the study, the lane-change assist and the automatic parking system were the least common ones, whereas emergency braking systems, the parking radar or camera, the lane departure warning system and the driver alertness monitoring system were among the most common technologies. Passenger cars commissioned in 2022 included the widest range of assistance systems.

The Finnish Transport and Communications Agency has produced a series of informative videos to the general public about the operation of "Invisible driver assistant ADAS - Advanced driver-assistance systems". These videos are available in a Finnish – English – Swedish language Youtube playlist with the purpose of accelerating the take up of the systems by making the car buyers aware of the operation and benefits of the systems. In addition, descriptions of the systems are provided in textual form in the three languages at the Agency's web site.

Automated enforcement has long been identified as one of the ITS safety measures with the highest benefit to cost ratio. The Finnish Transport and Infrastructure Agency commissioned a study on the development of automated enforcement on highways. The study made an inventory of the current knowledge of the impacts of traffic safety cameras. The automated enforcement of vehicle speeds is estimated to reduce the number of injury accidents by 20 % and the number of severe injury or fatal accidents by 36 %. The study produced a proposal for the common automated enforcement vision for the stakeholders involved. The vision stresses, among others, user acceptance, importance of replace investments, and the common management of the related information assets. The study assessed the regional proposals for new speed enforcement deployment sites based on existing safety and speeding problems as well as the expected injury accident benefits separately for road links and junctions. The study also briefly discussed the application of automated enforcement for short following headways and the compliance to regulations on traffic signals, wearing of seat belts, lane use restrictions, handling of mobile devices while driving, noise restrictions, and access control. The study concluded with listing the development needs related to automated enforcement and its deployment programming.

2.3.2 Progress since 2020

Description of the progress in the area since 2020:

A key development affecting road safety has been the continuous increase in the proportion of vehicles equipped with advanced driver assistance systems ADAS. These systems can reduce the the number of injury accidents considerably – the [1]eIMPACT estimate was a more that 50% reduction

[1] Wilmink, I., Janssen, W ., Jonkers, E., Malone, K., van Noort, M., Klunder, G., Rämä, P., Sihvola, N., Kulmala, R., Schirokoff, A., Lind, G., Benz, T., Peters, H., & Schönebeck, S. (2008). *Impact assessment of Intelligent Vehicle Safety Systems:* eIMPACT Deliverable D4.

due to the combined use of 12 ADAS systems. In five years, the proportion of cars with the most common types of ADAS had more than doubled. As new cars are driven more than older ones, the proportion in vehicle kilometres has increased even more.

In automated enforcement, the progress has mainly been on the policy level. The report on the development of automated enforcement clarified the policy objectives, roles of the various stakeholders and the methods for prioritising the deployment proposals. The separate document specifying the guidelines on how to implement automated enforcement provides instructions to the planners and practitioners about the details related to deployment. Two road sections of in total ca. 8 km (E18 and highway 12) have been added to the network covered with automated speed enforcement.

2.3.3 112 eCall (priority action d)

Information on any changes regarding the national eCall PSAPs Infrastructure and the authorities that are competent for assessing the conformity of the operations of the eCall PSAPs:

The information system of the Public Safety Answering Points (PSAP) operated by the six Emergency Response Centre Administration in Finland was updated in 2019 and this also caused a new eCall implementation for emergency response centres in Finland. The new information system (ERICA) required deployment testing of eCall and restart of compliance assessment of emergency response centres between 2019–2022. The final round of comprehensive deployment testing was done in 2022.

The eCall test results in 2022 concluded successful operation of basic functionalities of eCall at all Finnish emergency response centres. During the tests, some deficiencies, and issues, such as network-based positioning of emergency calls using foreign subscriptions and sending of MSD message resend requests during call-backs, were found that require further research. Final conformity assessment of the eCall was to be conducted by the end of 2023, but will likely be delayed.

Future development plans and recommendations of eCall in Finland include, for example, preparation on the packet-switched Next Generation eCall (NG eCall) using mobile networks and to take account eCall standards updates in the compliance assessment of eCall.

Additional information:

- The deployment of Europe-wide emergency call system for vehicles, eCall, in Finland between 2015 and 2022 was collected in a report published by Finnish Transport and Communications Agency (Traficom) in 2023. The report includes description and results of eCall projects related to deployment of Finland in 2015–2022.
- Finnish telecom operators' have announced of closing their 3G networks during the years 2023-2024. Also, 2G cellular mobile networks telecommunications license conditions in 900- and 1800-megahertz frequency bands in Finland will be reviewed in 2023 and possible closing of 2G discussed. (see Chapter 2.4.1 and sub-chapter Communication Infrastructure for more information)

2.3.4 Reporting obligation under Delegated Regulation (EU) No 885/2013 on the provision of information services for safe and secure parking places for trucks and commercial vehicles (priority action e)

Number of different parking places and parking spaces on their territory:

At the moment there are no parking places in Finland that fall under the criteria of Safe and secure parking places for trucks and commercial vehicles that are defined in the Delegated Regulation 'e'. Therefore, no data is available in the National Access Point either.

There are more than 5000 traffic rest areas on main roads in Finland, of which 10% are commercial, 25% are commercial refuelling points and 65% owned by the Government. The development needs of the service areas have been studied (amount, locations, services). There is no market in Finland for parking services that are safer and more secure, due to the already existing high quality parking services as well as good overall safety and security situation in Finland. Crime is not a major problem in the rest areas (primarily fuel thefts). The rest areas on highway E18 are reported to the common European information portal.

TRANSPark portal offers detailed information of over 4 000 parking areas in 41 countries with regard to services, number of parking slots and security level. In Finland, 300 refuelling points and two ports (Hanko and Vuosaari) offering parking areas are listed in the service. The portal is maintained by the International Transport Forum (IRU).

Vaalimaa border crossing between Finland and Russia has a service that informs vehicle owners of estimated waiting time (www.evpa.fi).

Percentage of parking places registered in the information service:

As explained above.

Percentage of parking places providing dynamic information on the availability of parking spaces and the priority zones:

As explained above.

Additional information: (e.g. has a national access point been set up to provide truck parking data? Does it include dynamic data? What is the source of data (public / private)? Is data published on the European Access Point for Truck Parking hosted by DG MOVE? If not, is there any intention to do it in the future?)

The rest areas on the highway network are listed in the European Access Point for Truck Parking because of the good safety and security situation in the country overall.

2.4 Priority area IV. *Linking the vehicle with the transport infrastructure*

2.4.1 Description of the national activities and projects

Description of the relevant initiatives, their objective, timescale, milestones, resources, lead stakeholder(s) and status: in particular, provide information on the C-ITS deployment initiatives and their technical specifications.

The deployment of Cooperative, Connected and Automated Mobility CCAM is based on new innovations produced by public and private organisations. Research and innovation are supported by the main EU programmes e.g. Horizon Europe, Horizon 2020, CEF and the Regional Development Funds. National research activities and projects belong usually to some national ongoing research programme. Transport is seen in Finland as a strategic innovation area for research and piloting, especially because of opportunities provided to companies as well as society by smart mobility.

In November 2021, the Finnish Government adopted a resolution on promoting automation in the transport sector covering all modes of transport. It is Finland's aim to be one of the pioneers of transport automation, and with the resolution the Government wishes to guide the automation development to meet people's needs in a sustainable and safe manner.

The resolution was accompanied with the Action plan on legislation and key measures of transport automation. This document consists of three parts: 1) Government resolution on promoting automation in the transport sector, issued on 25 November 2021, 2) more detailed action plan on legislation and key measures of transport automation, and 3) a background review. The key policies laid down in the resolution that apply to all modes of transport are a) human-centred development and utilisation of automation, b) more efficient exchange of information, and c) comprehensive development of regulation. These are to be implemented through seven sets of measures:

1) development of regulation
2) development of physical infrastructure
3) development of digital infrastructure
4) utilisation of data
5) increase in experimentation and testing
6) competence development
7) impact assessment.

The Finnish Infrastructure Agency carried out a study on infrastructure support and classification for automated driving on Finnish motorways. The study proved that the current physical and digital infrastructures provide good support for the basic use cases of level 3 or 4 highway autopilot. No major defects that would require immediate corrective actions with regards to supporting automated driving on motorways were identified. The service level classification builds on the ISAD (Infrastructure Support for Automated Driving) levels very much focusing on the digital infrastructure but has been extended to other relevant attribute areas of physical infrastructure, environmental conditions, and dynamic elements. The five ISAD levels from E to A have been maintained and the new attribute areas have been labelled following the original logic in digital infrastructure. The enhanced ISAD classification can likely be utilised also in other countries. The study also identified many topics that require active follow-up of international standardization of AV support and related technological development. Topics suitable for national development include the need and requirements for positioning-support landmarks, new solutions for fast detection of road surface

defects, and the development of improved road weather information. The study was included in the EU-supported NordicWay 3 project.

The study of proposal for road transport automation action plan for Finnish Transport Infrastructure Agency was aimed to prepare a proposal for the step-by-step development of digital and physical infrastructure support for road transport automation (Finnish Transport Infrastructure Agency 2023).

The result of the study was fifteen proposed actions for the development of road transport automation support for the Finnish Transport Infrastructure Agency. The proposed actions were classified in five categories: 1. physical infrastructure, 2. digital infrastructure, 3. knowledge management, 4. national and international stakeholder cooperation & lobbying, and 5. road network service levels.

A roadmap was developed to support the implementation of the proposed actions. Because the development paths of road transport automation are still uncertain, and not all digital and physical infrastructure measures cannot yet be confirmed, the proposed actions were classified into four categories (A–D) on the roadmap: A) essential, B) no-regret, C) technology evolution dependent, D) monitoring of development. A) Essential: actions that have to be carried out during the next years anyhow as they are mandated by European and national regulations or strategies; B) no-regret: actions that are beneficial for both conventional and automated vehicles and will be needed in any case independent of the timing of the roll-out of automated driving; C) technology evolution dependent: actions that are best to implement only when we are convinced of the required technology solution and thereby have minimal risk of misplaced investment; D) monitoring of development: actions that need to be carried out on a continuous basis to remain aware of the development of ADS related technologies and their use, benefits, costs and feasibility for Finnish conditions.

In addition to the national roadmaps, some roadmaps towards automated driving have been developed for the bigger cities. The Helsinki area automation road map was specified in 2021-2022. The automation of road transport requires, in particular, regulation by the different parties in the Helsinki region to steer the development of automation towards economically, climatically and socially sustainable mobility in line with the land use, housing and transport goals. Recommended priority measures for road transport include opening and standardization of data resources, development of up-to-date situation awareness, promotion of accessible routes and promotion of the machine-readability of lane markings and traffic signs.

City of Oulu region automation road map study had a goal to produce a traffic automation road map for the Oulu region, which defines appropriate measures for the Oulu region in order to guide automation development in the desired direction and at the desired speed in terms of agreements concerning land use, housing and transport goals. The road map is drawn up for the years 2024–2035, because there would be a lot of uncertainty associated with longer-term planning, e.g., related to the development of technology.

The study was limited to cover modes of transport in the development of which regional actors can play a key role, i.e., regional public transport (buses, minibus fleet, taxi service), passenger vehicle traffic, lorry and lorry traffic, infrastructure maintenance and construction equipment, terminal operations (port, possibly other freight terminals) and parcel delivery with drones. The final result of

the study was a regional strategic road map in accordance with the land use, housing and transport agreement to promote traffic automation with the means available to regional and national operators.

The Finnish Transport and Communications Agency has provided testing permits for the testing of Automated Driving Systems on open roads in Finland from 2016 onwards. The Agency issued 15 test plate certificates for automated vehicle trials in 2020-2022 and they involved 11 automated minibuses or similar purpose vehicles. Other vehicles in trials included automated passenger cars or last-mile delivery service robots. Some trials were conducted even in winter conditions.

Autonomous delivery robots have gained ground in the city streets of Finland. By 2023, already eight cities have piloted Starship Technologies robot delivery vehicles which delivery purchases to the customers with an hour on average of the order. Small battery-powered robots use artificial intelligence, GPS positioning, cameras, sensors and mobile networks while moving among the pedestrians' and carrying groceries. Starship Technologies work in collaboration with a Finnish retailing cooperative organisation.

Stora Enso and VTT tested a self-driving truck for transporting softwood chips among the normal traffic at Stora Enso's Uimaharju plant in Joensuu, Finland. The test lasting for almost one year highlighted the potential of automated driving for reducing emissions and improving safety in raw material transport within the factory area.

The test site in Tampere has hosted several CCAM-related pilots and pre-deployments listed below.

- SHOW / Ride2Autonomy / EAKR AutoOperation project pilot execution on 02/2022 – 09/2022 styding the feasibility of automated shuttle bus services in Tampere/Hervanta.
- StarDust piloting in 2021-2022 to test how the GLOSA and infrastructure cameras support driving behaviour in urban area.
- IN2CCAM living lab studies to be done in 2023 – 2024 to enable feeder transport to tram line via exchanging data from Tampere city services (scooters, taxies, etc.) to schedule automated shuttle service
- KDT_AI4DI 2020 – 2022 using artificial intelligence for modality shifts between transport modes. Reading data from public transport services and use AI for continuous scheduling of robot taxies to provide door2door mobility for people
- 5G-MOBIX 2021 – 2022 utilising 5G-NSA networks to exchange MCM/CPM messages between vehicles to make overtaking and intersection driving safes. Tests also included use of 5G-SA network improvements for message delivery times
- EU-5G-DRIVE 2019 – 2021 piloting GLOSA and SPAT message exchange between vehicles and infrastructure via 5G infrastructure. The action was benchmarking latencies and data capacity between EU and China.

The RESPONSE project pilot was hosted in Turku in March 2023 focusing in the execution of user study and feasibility of electric vehicles for robot taxi service and carrying out of data collection for assessing the impacts of those vehicles.

The robot vehicle operator Remoted has in 2023 started bus and/or shuttle pilots in Lahti and Kuopio in addition to its Tampere pilots (SHOW/EAKR).

The Helsinki area CCAM tests were overseen and organised by Forum Virium. The FABULOS project piloted self- driving buses in mixed traffic with regular speeds utilising remote supervision in Spring-Autumn 2020. The project utilised Pre-Commercial Procurement in the project.

The Ride2Rail project carried out a pilot in the autumn of 2021 combining flexible (ride-sharing) and scheduled transport services by testing the use of an automated shuttle bus as part of a multi-modal last-mile journey, integrated into the public transport route planner. The Sohjoa Last Mile project pilots looked at remote operation and supervision of automatic electric shuttle buses in 2021. The R-bus utilised the driverless bus concept for providing the travellers and art experience in 2023.

The Aalto university is piloting the C-ITS service-supporting edge solutions in Helsinki as part of the SMARTEDGE project.

The LMAD project gathered information related to the national legislation of autonomous logistics robots and enabled a delivery robot to operate for the first time in two different real urban environments in Helsinki. The project also gathered information on residents' attitudes towards autonomous robots operating on the streets of Helsinki. The work is continued in the URBANE project utilising a solution from LMAD at the Helsinki test site. URBANE tests various last-mile solutions in cities in order to reduce traffic congestion and emissions caused by urban logistics distribution. The project pilot various solutions, such as autonomous distribution platforms, and seek commercially viable operating models for last-mile challenges.

Muonio Intelligent Road in North of Finland provides an opportunity to conduct testing and research to road transport automation and automated driving. Northern latitudes have several challenges that are required to be overcome for safe Connected and Automated Driving, such as low accuracy of Global Navigation Satellite Systems (GNSS), adverse weather conditions such as snow and ice disrupting the vehicle sensors, rural conditions offer less traffic and therefore less real-time data for the vehicle and low availability of cellular mobile network infrastructure and therefore connectivity. The Muonio Intelligent Road provides approximately 10 km of public road test section with roadside equipment for testing. The Muonio area also provides private industry test support, facilities, and test tracks.

Sensible 4 Ltd tech-startup developed vehicle automation solutions for public transport and industrial automation from 2017 to 2023. Sensible 4 had experience on remote driving using cellular communication and demanding automation driving conditions, such as snow and ice. What started from a development of automated vehicle prototype and automated shuttle bus, and continued to autonomous driving platform and trucks partnership, unfortunately ended in mid-2023 to bankruptcy. In 2023, it was still unclear how the future will play out and if there will be continuity for the Sensible 4 developed technology and products.

Due to the large interest of cities regarding automated shuttles and buses, the Finnish Ministry of Transport and Communications organised a series of meetings in 2023 in the form of a round table discussion on automation in public transport. The stakeholders invited covered the transport authorities, municipalities, public transport authorities, automated transport related companies, research and academia. The objective was to describe and agree on the vision of public transport automation in road transport and to form a common view on the benefits and risks of automation, measures required by deployment, and the roles of the various stakeholders.

The results of Finnish automatic bus trials have been compiled in the report "The development path of automatic buses as part of cost-effective public transport" The report estimates that by 2030, automatic buses will be technically ready to operate in a wide range of conditions. In addition, it is estimated that even before that, automatic buses can become common, especially on fixed routes, if the service concepts can be developed to be functional and the services cost-effective. The study report summarised vehicle manufacturers and service providers views about future of automatic bus traffic that could be as well followed in Finland:

- 2021–2022: Automated driving in urban and suburban areas 0–40 km/h (last and first kilometre services, connecting traffic), safety driver in the vehicle. Mainly experiments and piloting.
- Q2/2022: The vehicle for last and first kilometre services is ready for fully autonomous driving in closed areas where there is no other traffic.
- 2023: A fully automatic service solution is available, no safety driver in the vehicle, the bus drives in its own lane in open areas.
- 2024: Operational environment for last mile operations (ODD – Operational Design Domain), simple routes, shared with other traffic lanes, public roads.
- 2025: True last-mile autonomous operation in commercial environment on complex routes, on request in urban and suburban areas
- 2026: Trunk lines and motorways 0–80 km/h.

Impact mechanisms of new technologies and services in traffic project started in 2023. In Finland, the transport policy has traditionally relied on informed decisions. Thereby, also the deployment of the digital, physical and operational infrastructures and regulations required by CCAM requires good knowledge of the impacts, benefits and costs of CCAM services and the related infrastructures. A project started in early 2023 will provide answers to the following questions in 2024:

- What are the most important likely technologies, mobility services and changes in the operating environment of mobility for people that should be assessed?
- Through which impact mechanisms the technologies and services assessed can affect the mobility system?
- How do the technologies and services assessed affect the regional and community structures?
- How can the regional and community structures affect the take-up of the technologies and services assessed in different rural and urban areas?
- Which technologies and services have the highest potential for commercial and attractive mobility services?
- Which public sector actions are required to accelerate the deployment of the most beneficial technologies?

A street cleaning robot was tested by City of Espoo, City of Helsinki Stara and Forum Virium together with Finnish Trombia Technologies in 2021. The automated street sweeping robot in urban residential areas was tested in Helsinki as a part of the Helsinki Jätkäsaari Mobility Lab project. The electric street cleaning robot was operational at nighttime and monitored by a human operator.

NordicWay 2 (2017–2020) and NordicWay 3 (2019–2023) projects are EU CEF funded C-ITS pilot projects that enable vehicles, infrastructure, and network operators to communicate safety hazards and other information from roads in the Nordic countries between different stakeholders. The projects are a collaboration between public and private partners in Finland, Norway, Sweden and Denmark and build on the achievements from the previous NordicWay project. Finland, together with other NordicWay partners, is working as a core member in the C-Roads Platform, to harmonise the European C-ITS cross-border interoperability. (https://www.nordicway.net/, https://www.c-roads.eu/platform.html)

NordicWay 2 project was successfully finalised in the end of 2020. The final evaluation report summarised results of C-ITS technical, ecosystem, user acceptance, socioeconomic and driver behaviour evaluation.

The NordicWay 3 Nordic countries' four common flagship pilots are Traffic Signals, Dynamic Zones, Emergency Vehicle Warnings and Road Works Warning (https://www.nordicway.net/flagship). NordicWay 3 - Urban Connection, has more cities involved than NordicWay 2. The following NordicWay 3 projects are Finnish national subprojects and studies that are co-funded by the EU:

Activity 4: Coordinated pilot on Central Systems and Interchange network deployment

- Concept for transport data related services. Definition of the roles and operations of centralized services and NAPs (Fintraffic)
- Definition of the most important ecosystem services, data flows between them, roles and responsibilities (Fintraffic)
- Prestudy of the current state of traffic data ecosystem in Finland. (Fintraffic)
- Interchange Node pilot on exchange of C-ITS messages using NordicWay and later C-Roads developed specification of Interchange Node cloud concept. (Fintraffic)
- TLEX interchange node implementation, C-ITS traffic signal pilot of signal phase and timing information in city environment (City of Tampere)

Activity 5: Coordinated pilot on Day 1 and Day 1.5 C-ITS services

- HGV user acceptance of C-ITS (Finnish Transport and Communications Agency, Traficom)
- Geofence and UVAR pilot pre-study (Finnish Transport and Communications Agency, Traficom)
- Authorities' roles in implementation and operational use of C-ITS services in Finland studies stakeholder roles and European as well as national legislation, including cybersecurity, in Finland. (Finnish Transport and Communications Agency, Traficom)
- EU handbook MAPEM-SPATEM version 2 (Finnish Transport and Communications Agency, Traficom)
- Pre-study of C-ITS traffic light systems interoperability (Fintraffic)
- Pre-study of C-ITS Emergency Vehicle Approaching (Fintraffic)
- Pre-study of TM2.0 and C-ITS.

Activity 6: Coordinated pilot on Cooperative, Connected and Automated Mobility (CCAM)

- Road network service levels for CCAM (Finnish Transport Infrastructure Agency)
- CCAM implementation plan (Finnish Transport Infrastructure Agency)

- Preliminary study of traffic rules and restrictions digitalization – the process of digitizing traffic rules and identifying digital capabilities. (Finnish Transport Infrastructure Agency)
- Prestudy on needs, capabilities and willingness of the Finnish municipalities to provide and use traffic information (Fintraffic)
- Planning of the next generation Finnish NAP for traffic data and services. Focus on data availability, data accessibility, metadata and discovery services. (Fintraffic)
- Development of datamodels and exchange protocols for mobility/MaaS services and C-ITS. Improvements to data cataloque and data security /access (Fintraffic)
- Cellular V2X (C-V2X) Public Key Infrastructure (PKI) study pilots the European Union C-ITS Security Credential Management System (EU CCMS) using C-V2X communication. (Finnish Transport and Communications Agency, Traficom)
- Utilisation of commercial mobile networks in C-ITS service in Finland includes study of Key Performance Indicators, development of measurement methods, state-of-the-art, and implementation of C-ITS service level requirements in commercial mobile network in Finland. (Finnish Transport and Communications Agency, Traficom)
- Educational films on automated driver assistance systems (ADAS) to make safety features and warnings used in advanced driver assistance systems easily perceivable and understandable by every driver, including the elderly and persons with disabilities. (Association of Automobile Industry in Finland, Finnish Transport and Communications Agency, Traficom)
- A mobile reporting and work management system called m-reporting includes hourly reporting, work management and digital solutions for vehicle fleet management for the purpose of road and street maintenance. (Helsinki City Construction Services, Stara)
- Drone as a service. (Helsinki City Construction Services, Stara)
- Digital analysis of pavement conditions and road network assets with an automated survey methodology. The RoadAI application combines geospatial videos, driver-made annotations, and computer vision analysis into a highly functional tool to support road maintenance and other services. (Helsinki City Construction Services, Stara)

CEDR CCAM-oriented CAD working group has been been participated by the Finnish Transport and Communications Agency Traficom and Finnish Transport Infrastructure Agency, and also Finnish researchers have participated in the CEDR projects MANTRA (Making full use of Automation for National Transport and Road Authorities – NRA Core Business, 2018-2020) and TM4CAD (Traffic Management for Connected and Automated Driving, 2021-2023) discussing on and providing new knowledge about the physical, digital and operational infrastructure support by road operators and traffic managers. (https://mantra-research.eu/, https://tm4cad.project.cedr.eu/)

Communication infrastructures

Performance required by C-ITS services from the cellular networks was commenced in 2023 by the Finnish Transport and Communications Agency (Traficom). This is evidently the first such study carried out in Europe and perhaps even globally on the topic. The study will identify the key performance metrics and indicators relevant for C-ITS messaging and propose recommendations for the quality of service with regard to each indicator depending on the C-ITS service and operating environment.

2G cellular mobile networks telecommunications license conditions in 900- and 1800-megahertz frequency bands in Finland will be reviewed in 2023. 2G network voice and data services must together cover 99 percent of the population of mainland Finland unless this is deemed unnecessary in the mid-term review in 2023. Large number of systems, meters and control devices for example related to electricity, water, gas, district heating, cooling networks (2G M2M/IoT) and vehicle emergency call system eCall, have a long-life cycle, will impact to future decisions on 2G networks.

Finnish Ministry of Transport and Communications launched an interim review in accordance with the Act on Electronic Communication Services (917/2914) with a public opinion round where stakeholders were asked to comment on 2G license condition of telecom operators' network licenses in the 900- and 1800-megahertz frequency bands and whether it is appropriate to oblige telecom operators to maintain 2G technology in their mobile communication networks in mainland Finland in the future as well.

3G networks licenses for mobile communications granted to telecom operators that are technology neutral, meaning that telecom operators can choose the technology they use based on market conditions. According to Finnish telecom operators' announcement, they are closing their 3G networks during the years 2023-2024. The frequencies used by the current 3G networks will then be used by newer mobile communication technologies. With the decline of 3G networks, terminals that only support 2G/3G technology will use the 2G network in the near future. Consequently, the use of the 2G network will increase from the current level in the coming years, unless devices using older technology are replaced by terminals using 4G/5G technology.

The 3G network will continue to be maintained in Åland, Finland, by one operator but their 2G networks will be closed by the end of 2024. The 2G coverage obligation only applies to mainland Finland.

The Finnish Transport and Communications Agency Traficom has published information on their website on the closing of 3G networks (and the 2G network by one operator in Åland) and is following possible reported problems.

The closure of 2G and 3G networks is ongoing worldwide. Finland has actively participated in the work at EU level (e.g., RSPG and BEREC).

4G networks are well deployed throughout the country, with (technology neutral) coverage obligations of 99 % of households and all roads and railroads (basic coverage). 5G networks have been deployed throughout Finland from 2020, with a basic coverage of more than 90 % of households. A fast (100 Mb/s) mobile connection is available to 87 % of households with 4G or 5G technology. At the end of 2022, high-speed 4G mobile communication networks (100 Mb/s) covered approximately 60% of the highway and trunk road network. Correspondingly, fast 5G networks covered about 38% of main and main roads.

A number of 5G and 6G research and development projects have been undertaken in Finland during 2020-2023. Those have been listed below.

The DEDICAT6G project develops sixth generation (6G) wireless networks, which will be deployed in the early 2030s. The main aims are to achieve dynamic coverage extension and distributed intelligence for human-centric applications. The aims also include a more efficient use of resources;

the reduction of latency, response time and energy consumption; the reduction of operational and capital expenditures, and the reinforcement of security, privacy and trust. The project involves four use cases to be demonstrated: smart warehousing, an enhanced user experience, public safety and a smart highway.

The SecurePax project developed methods to better identify passengers and check that no prohibited items are taken to ships. Potential future security and ICT solutions were piloted in the passenger harbours of both Turku and Stockholm. The project also involved the testing of a 5G network in the port area.

The 5G-Safe-Plus project aimed to prevent traffic accidents and avoid casualties by delivering 5G-enabled time-critical road safety services to vehicles. To ensure smooth transition to a "5G world" and to maximize the reliability, the project applied hybrid network environments, including 4G/LTE, 5G, ITS-G5 and satellite communication.

The 5G-MOBIX project develops and tests automated vehicle functionalities using 5G technology. The project will develop and test automated vehicle functionalities using 5G core technological innovations along multiple cross-border corridors and urban trial sites, under conditions of vehicular traffic, network coverage, service demand, as well as considering the inherently distinct legal, business and social local aspects.

The 5G ROUTES project will conduct advanced field trials of innovative CAM (connected automated mobility) applications seamlessly functioning across a designated 5G cross-border corridor ('Via Baltica-North') spanning across three EU member states borders (Latvia-Estonia-Finland). The aim is to accelerate the widespread deployment of 5G end-to-end interoperable CAM ecosystems and services in digitised motorways, railways and shipways throughout Europe.

*T*he PORT OULU Smarter digitalisation project aims to develop and promote the utilisation of modern port digitalisation between Port of Oulu customers and actors. A new type of data platform will be set up jointly in a multi-actor environment to collect data about the Port functions and situational picture. The activities aimed at developing the digital infrastructure in the area also include solutions for local connectivity needs.

The 5GFINLOG (5G Future Innovation Platform for Logistics) project created a new kind of 5G logistics and port testing and innovation platform for the Port of HaminaKotka.

ARPA (Applied Research Platform for Autonomous Systems) is a joint RDI initiative of Turku University of Applied Sciences (TUAS) and Novia University of Applied Sciences. The project will create an ambitious new platform for applied research on autonomous systems, one that enables different operators' concrete RDI work on smart operating environments.

2.4.2 Progress since 2020

Description of the progress in the area since 2020:

In the field of connectivity, the emphasis has been on piloting and pre-deployment of numerous 5G applications for mobility of both people and goods. 4G/5G has also been used increasingly often as the connectivity solution connecting the vehicle to the infrastructure. Activities are already ongoing to think up new ideas on how to use 6G for the same purposes.

Many operational devices and services are dependent on 2G and 3G cellular mobile networks, such as eCall service. National 2G telecommunications 900- and 1800-megahertz frequency licenses together with coverage requirements will be reviewed in 2023 by the Finnish Ministry of Transport and Communications. 3G networks network licenses are technology neutral and therefore telecom companies can choose the technology they use based on market conditions. Finnish telecom companies' have announced to close their 3G networks during the years 2023-2024 and are moving to newer mobile communication technologies such as 5G.

With regard to C-ITS, Finland has strongly advocated for a technology neutral approach so that service providers could choose themselves the technologies that they see appropriate and most efficient to deliver quality services to their customers. Finland has also stressed the need to agree on the co-existance mechanisms that allow the effective use of dedicated radio-frequencies between different technologies. Considering the wide coverage and penetration rate of wireless mobile communication networks and their capacity to transmit relevant data, including data on all road users, Finland has actively supported efforts to analyze how commercial cellular networks could be used to support the provision of C-ITS services and thereby promote traffic safety, sustainability, efficient mobility, take-up of new automated solutions as well as the overall ability to respond to customer needs in the widest possible scale. In general, the focus in this field has clearly moved recently from verifying the proof of concepts and pilots into the preparations for full-scale deployment and roll-out.

Finnish road authorities together with industry partners have taken part to the EU CEF funded NordicWay 3 C-ITS pilot project in collaboration with other Nordic countries. Several Finnish NordicWay 3 C-ITS subprojects have been completed to support the C-ITS deployment in Finland. NordicWay 3 partner Finland is also a core member in C-Roads Platform, where Finland has supported the development of European cross-border C-ITS specifications.

Concerning connected and automated road vehicles, the national strategies and roadmaps have identified the key principles and lead policies for the development of and preparation for highly automated road vehicles. The national road authority and major cities have taken major steps forward towards the deployment of the physical, operational and especially digital infrastructure for connected and highly automated vehicles. The related road maps are focusing first on the no-regret actions, which is in full compliance with the conclusions of the EU's single platform for CCAM. Autonomous delivery robots are a common view street of large Finnish cities. Also, shuttle busses have been piloted and several Finnish start-up companies have taken part on developing these automation products and services. In addition, automated driving test sites and extreme weather condition services such as test sections with snow and ice are provided in Finland.

2.5 Other initiatives / highlights

2.5.1 Description of other national initiatives / highlights and projects not covered in priority areas 1-4:

Description of the relevant initiatives, their objective, timescale, milestones, resources, lead stakeholder(s) and status:

The City of **Oulu** and the Centre for Economic Development, Transport and the Environment in **North Ostrobothnia** have three ITS related development projects which are about to be completed in autumn 2023:

- Cooperative and interactive traffic management (Traffic Management 2.0 concept)
- Update of Oulu region traffic management plan
- Traffic automation road map 2035

In all of development projects above, appropriate measures and pilot projects for Oulu and North Ostrobothnia region have been identified.

The city of Oulu is currently making benchmarking and market research about traffic light C-ITS features in order to set appropriate technical and functional requirements for the new traffic light controllers and remote monitoring system in the upcoming procurements.

In **Turku** region a Mobility map service (https://palvelukartta.turku.fi/en/mobility/driving) has been implemented as part of Horizon 2020 Scale-up project. In addition, a parking HUB service containing real time parking information from Turku city center has been implemented as part of the Scale-up project. Both of the new services have been implemented with open source code.

Turku is also involved in Horizon 2020 project USER-CHI which focuses on developing intelligent electric charging services.

Regional Council of Southwest Finland has commissioned in 2022 a report about the current state and future use cases of digital traffic-related information resources in the Turku urban area.

In **Tampere** some major development and pilot projects from years 2020–2022 are:

- SHOW project: piloting robot buses as part of public transport system
- Implementation of remote control/monitoring center for autonomous vehicles
- NordicWay3 -pilots related to traffic signal C-ITS functions and their system architecture
- SmartRail Ecosystem and other development projects related to Tampere light rail (operation began in August 2021)

In **Helsinki** the Mobility Lab, a test platform which enables companies to develop products and services based on their needs and potential business development, has been active in the last years. Two major themes that have been advanced lately are the digital twin for mobility and urban air mobility.

Some major development and pilot projects from Helsinki:

- LIDO-TIKU project – collecting traffic data from various sources to a centralized data platform and developing its usability for situation awareness and statistical purposes
- Traffic signal development (information, control, monitoring)
- Logistics Accessibility Data project – providing information about reachability of residential houses, companies and other delivery recipients in Helsinki urban area available to all logistics operators in the form of open, standardised data
- MaaS ticket interfaces for water transport services
- Projects related to digital twin for mobility theme. Lately, the main focus has been in gathering and updating infrastructure data, taking the street maintenance needs and aspects into consideration.

2.5.2 Progress since 2020

Description of the progress in the area since 2020:

During the recent years many cities and public organisations have commissioned research or action programs or had practical development projects related to collection, processing and distribution of

road and traffic data. Distributing public actors' data as open data and on the other hand, the use on third party traffic data for traffic management and other official purposes have been key aspects in the research and development projects. Municipalities also have certain obligations to produce and distribute particular data from their street network.

In many regions, public organisations have goal to be "enablers" and to make the operating environment for private companies functional and attractive.

What comes to C-ITS services, public organisations foresee the C-ITS services to become more common in the next few years and this is already taken into account in new roadside device and system procurements by setting requirements for C-ITS compatibility.

3 Key Performance Indicators (KPIs)

Note: ***The EC document on "ITS KPIs for the EU" is to be used for comprehensive definitions of the KPIs and further guidance. The EU EIP Activity 5 report on "ITS Deployment and Benefit KPIs definitions" is a complementary document providing in particular estimation methods.***

KPI will be reported separately by type of road network / priority zone / transport network and nodes (when appropriate).

The deployment KPIs are calculated for the TEN-T road network with the length of 5188 km. [3]

The values used and their sources are described in the table below.

As the benefits of the services cannot be directly measured, they have to be estimated. The benefits calculations for road transport regarding change of travel time, injury accidents and emissions are based on estimates by Risto Kulmala made for the projects NEXT-ITS and NEXT-ITS2. The travel time benefit calculations for public transport are based on a national travel survey[1] and a report[2] on a journey planner for the region of Helsinki.

	Length (km)	Vehicle km travelled (million / year)	Veh. hours driven (million/year)	injury accidents (accidents / year)	CO_2 emissions (million tonnes/year)
TEN-T network	5188[3]	15079[3]	169.6[5]	495[4]	2,82[5]
Information gathering: road weather and traffic volume	5188[6]				
Information gathering: travel time	150[6]				

Traffic management and control measures	531[7]				
Cooperative ITS services and applications	5188[6]				
Real time traffic information	5188[6]				
Dynamic travel information	366[8]				

[1] National Travel Survey 2010–2011. Finnish Transport Agency, Transport Planning. Helsinki 2012.

[2] Laine, T., Pesonen, H., Moilanen, P. (2003). An assessment of the effects and cost-effectiveness of a public transport journey planner. FITS publications 22/2003, Ministry of Transport and Communications.

[3] Calculated based on TARVA MT Finnish Road data (11th August 2023), traffic volumes used were average daily traffics from 2021

[4] Calculated based on TARVA MT Finnish Road data (11th August 2023) using estimated number of injury accidents at present

[5] NEXT-ITS3 based figure.

[6] Check chapter 3.1 "Deployment KPIs.

[7] Matti Huju, Traficon Ltd & Jarkko Johansson, Fintraffic, August 2023

[8] Matti Huju, Traficon Ltd, August 2023

3.1 Deployment KPIs

3.1.1 Information gathering infrastructures / equipment (road KPI)

Figures to be provided by type of network / zone.

Figures to distinguish fixed and mobile equipment.

KPI to be calculated by type of network / zone (when relevant).

- Length of road network type / road sections (in km) equipped with information gathering infrastructures & Total length of this same road network type (in km):

- KPI = (kilometres of road network type equipped with information gathering infrastructures / total kilometres of same road network type) x 100

For road weather and traffic volume services: KPI = 100

KPI for road weather and traffic volume services was 100 already in previous 2020 progress report. However, the quality of data has improved since then because many older measurement stations have been replaced by newer models.

For travel time services: KPI = 150/5195*100 = 3

KPI for travel time services is calculated based on the floating car data (FCD) service which was used in Helsinki region during part of the reporting period. The end of year 2022 was transition period and Fintraffic plans to start distributing Waze travel time data on the Helsinki ring road at the end of 2023. In the first stage the new service will cover approximately 30 km but it is likely to be expanded if user experiences are positive.

In addition, dynamic average speed information measured from traffic measurement points is available from Fintraffic's Traffic situation service and as open data.

3.1.2 Incident detection (road KPI)

Figures to be provided by type of network / zone.

KPI to be calculated by type of network / zone (when relevant).

- Length of road network type / road sections (in km) equipped with ITS to detect incident & Total length of this same road network type (in km):

- KPI = (kilometres of road network type equipped with ITS to detect incident / total kilometres of same road network type) x 100

For manual incident detection: KPI = 100

For all TEN roads (except for critical sections such as tunnels), the EasyWay service quality requirement is to detect incidents within either 15 (sections of safety or flow concerns) or 30 minutes of their occurrence. This is implemented manually via road users or manually/automatically by police/rescue authority reports.

Automated incident detection has mostly been deployed in tunnels in Finland, complying with the service level objectives agreed by EasyWay for Europe. It is deployed on 9.3 km of tunnels (the total length of road tunnels in Finland is about 15.1 km). In addition, an automatic incident detection is used on 1 km open road section on E18.

3.1.3 Traffic management and traffic control measures (road KPI)

Figures to be provided by type of network / zone.

KPI to be calculated by type of network / zone (when relevant).

- Length of road network type / road sections (in km) covered by traffic management and traffic control measures & Total length of this same road network type (in km):

- KPI = (kilometres of road network type covered by traffic management and traffic control measures / total kilometres of same road network type) x 100

KPI = 531/5188*100 = 10.2

531 km is the length of Finnish TEN-T road network equipped with variable speed limits and / or variable message signs. The KPI is lower compared to 2020 situation (592 km) as some older traffic control systems have been decommissioned. The decommissioning was done because the service level preconditions for replacement investments were not fulfilled.

3.1.4 Cooperative-ITS services and applications (road KPI)

Figures to be provided by type of network / zone.

KPI to be calculated by type of network / zone (when relevant).

- Length of road network type / road sections (in km) covered by C-ITS services or applications & Total length of this same road network type (in km):

- KPI = (kilometres of road network type covered by C-ITS services or applications / total kilometres of same road network type) x 100

KPI = 0.

At the end of 2022 no C-ITS services or applications were in use on Finnish TEN-T road network. There were no ongoing pilot projects on TEN-T road network either.

3.1.5 Real-time traffic information (road KPI)

Figures to be provided by type of network / zone / node.

KPI to be calculated by type of network / zone / node (when relevant), and if relevant indicate the proportion of services accessible to passengers with reduced mobility, orientation and/or communication.

- Length of road network type / road sections (in km) with provision of real-time traffic information services & Total length of this same road network type (in km):

- KPI = (kilometres of road network type with provision of real-time traffic information services / total kilometres of same road network type) x 100

KPI = 5188/5188*100 = 100

Traffic situation service (web page and phone application maintained by road operator Fintraffic) covers the entire Finnish road network. Real-time traffic information KPI was 100 already in previous 2020 progress report. However, nowadays the traffic information is more comprehensive and more accurate.

3.1.6 Dynamic travel information (multimodal KPI)

Figures to be provided by type of network / zone / node.

KPI to be calculated by type of network / zone / node (when relevant), and if relevant indicate the proportion of services accessible to passengers with reduced mobility, orientation and/or communication.

- Length of transport network type (in km) with provision of dynamic travel information services & Total length of this same transport network type (in km):
- KPI = (kilometres of transport network type with provision of dynamic travel information services / total kilometres of same transport network type) x 100

Railway KPI = 100

For TEN-T rail network comprehensive dynamic travel information is available for whole network.

Road KPI = 366/5188*100 = 7.1

Comprehensive dynamic travel information including both long-distance and local bus transport is not currently available from Finnish TEN-T road network. However, many urban regions provide real-time travel information for their local transport network which contains routes on TEN-T roads. Some long-distance bus operators may provide dynamic travel information for their own services.

KPI is calculated based on the estimated length of TEN-T road network whereof dynamic travel information about local bus traffic is available through Digitransit or other platform used by the particular city or area. Dynamic travel information is available from 17 cities or regions.

- Number of transport nodes (e.g. rail or bus stations) covered by dynamic travel information services & Total number of the same transport nodes:
- KPI = (number of transport nodes with provision of dynamic travel information services / total number of same transport nodes) x 100

Railway KPI = 142/142*100 = 100

There are 142 passenger stations on the Finnish TEN-T railway network. Dynamic travel information is available for whole network and thereby for all stations.

Bus transport KPI = 25/33*100 = 75.8

Along the Finnish TEN-T road network, there are 33 urban regions with a population of at least 15 000 inhabitants (population data from the end of 2019). Dynamic travel information about bus transport is available from 25 regions.

3.1.7 Freight information (multimodal if possible or road KPI)

- Length of road network type / road sections (in km) with provision of freight information services & Total length of this same road network type (in km):
  KPI = (kilometres of road network type with provision of freight information services / total kilometres of same road network type) x 100

KPI = 0.

There are no specific information services by road authorities for the freight/logistics sector. The generic information services offered on the internet, mobile applications and roadside VMSs are also used by freight operators.

- Number of freight nodes (e.g. ports, logistics platforms) covered by freight information services & Total number of the same freight nodes:
  KPI = (number of freight nodes with provision of freight information services / total number of same freight nodes) x 100

KPI = 0.

Information about vessels in ports and the scheduled departure and arrival times of vessels is available from Fintraffic Traffic situation service and as Digitraffic open data. Some ports have their own public information services for freight transport but the information is not distributed by the road authorities.

3.1.8 112 eCalls (road KPI)

N.a. – will be provided through the COCOM 112 questionnaire

3.2 Benefits KPIs

The effects of road ITS systems and services on the TEN-T network on the travel times were estimated using the service specific effectiveness percentages based on Finnish and other Nordic evaluation studies utilised in the NEXT-ITS projects. The travel time KPI estimate was a 1.5% reduction in travel times on the whole TERN with 15 079 million vehicle kilometres in 2022. The vehicle hours spent in congestion were reduced by 18%.

In addition, the improved road safety due to advanced driver assistance and support systems reduced the amount of accident related congestion and thereby also travel times. The crude assessment indicated a travel time decrease of 0.14% on the TERN due to this impact.

Hence the these key ITS services and systems produced a 1.7% reduction in travel times. The vehicle hours spent in congestion were reduced in total by 19%.

KPI = ((travel time before ITS implementation or improvement – travel time after ITS implementation or improvement) / travel time before ITS implementation or improvement) x 100 = 1.7% (reduction)

KPI = ((172.5-169.6)/172.5) x 100 = 1.7% (reduction)

3.2.1 Change in road accident resulting in death or injuries numbers (road KPI)

The effects of road ITS systems and services on the TEN-T network on road safety were estimated using the service specific effectiveness percentages based on Finnish and other Nordic evaluation studies utilised in the NEXT-ITS projects. The road safety KPI estimate was a 22% reduction in fatal accidents and a 13% reductions of non-fatal injury accidents on the whole TERN with 15 079 million vehicle kilometres in 2022.

Furhermore, road safety was also affected by advanced driver assistance and support systems (ADAS) utilised in the vehicles driven on the TERN. The effects of the following ADAS were considered:

electronic stability control (ESC), driver drowsiness monitoring, eCall, in-vehicle signage, automatic emergency braking (highways), adaptive cruise control (ACC), lane departure warning, blind spot monitoring, and lane change assistant. The total effect of these systems in 2022 on road safety was the reduction of fatal accidents by 17 % and injury accidents by 8.8%.

Number of road accident resulting in death or injuries before ITS implementation or improvement:

- 60 fatal road accidents (2022, estimated on the basis of effectiveness estimates)
- 577 non-fatal road accidents (2022, estimated on the basis of effectiveness estimates)

Number of road accident resulting in death or injuries after ITS implementation or improvement:

- 39 fatal road accidents (2022, statistics)
- 456 non-fatal road accidents (2022, statistics)

KPI = ((60-39)/60) x 100 = 35% (reduction of fatal injury accidents)

KPI = ((577-456)/577) x 100 = 21% (reduction of non-fatal injury accidents)

3.2.2 Change in traffic-CO2 emissions (road KPI)

The effects of road ITS systems and services on the TEN-T network on the CO_2 emissions were estimated using the service specific effectiveness percentages based on Finnish and other Nordic evaluation studies utilised in the NEXT-ITS projects. The CO_2 emissions KPI estimate was a 1.4% reduction in CO_2 emissions on the whole TERN with 5188 road kilometres and 15 079 million vehicle kilometres in 2022.

Furthermore the reduction of accident-related congestion due to improved road safety resulting from the deployment of ADAS produced an additional decrease of 0,15% in CO_2 emissions. Thereby the total reduction of traffic-related CO_2 emissions on the TERN due to ITS in 2022 was 1.5%

KPI = ((traffic CO2 emissions before ITS implementation or improvement – traffic CO2 emissions after implementation or improvement) / traffic CO2 emissions before ITS implementation or improvement) x 100

KPI = ((2.859-2.815)/2.859) x 100 = 1.5% (traffic CO2 emissions, reduction)

3.3 Financial KPIs

ITS includes any types of systems and services altogether.

Annual investment in road ITS (as a % of total transport infrastructure investments):

The annual investment into renewal and development of road management systems is approximately 13,4 M€ annually, including new and renewal investments into road ITS and the related ICT systems. The amount of road investments on the TEN-T road network was 205 million euros (2022), **hence the KPI is 6,5 %.**

Annual operating & maintenance costs of road ITS (in euros per kilometre of network covered):

The annual maintenance costs of road ITS systems and the related ICT systems is approximately 7,8 million euros. The costs for the TMC operations are 4 million euros annually for the whole national operation. It is not possible to separate the operational costs for different parts of the national road network accurately.

The KPI calculated for the TEN-T road network (5 188 km) is hence 2 269 euros/km.

The above mentioned investment and maintenance costs exclude the costs for electricity, tunnel lightning and traffic lights.