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

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1 Introduction

1.1 General overview of the national activities and projects

Including national ITS legislations and/or strategies

According to Article 17 of Directive 2010/40/EU on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport (the Directive), following the initial report submitted in 2011 by Member States on their national activities and projects regarding priority areas, Member States shall report every three years on the progress made in the deployment of the actions referred to in paragraph 1 of the Directive.

This Report on national activities and projects in Sweden covers the period from 2020 to 2023. The Report is organized according to the Directive's Priority Areas and Actions as defined in Article 2, Priority areas, and Article 3, Priority actions.

1.2 General progress since 2020

1.2.1 Progress on Priority Areas since 2020

Sweden is one of Europe´s geographically largest countries, extending almost 1,600 kilometres from north to south. Its main population centres are in the southern one-third of the country, but its extensive natural resources are spread throughout its entire land area, including the far north above the Arctic Circle. The Swedish Road network consists of 98,500 km state roads, 42,500 km municipal streets and roads, 75 500 km private roads with government grants and a very large number of private roads without government grants, mostly forest roads. Safe, secure, green and effective road transport in combination with other transport modes is vital to Sweden's viability and sustainability.

Significant progress has been achieved in all Priority Areas since 2020. In the product life cycle for services, there is identified a shift from a focus on research projects to more of implementation projects. Decisions on investment projects at The Swedish Transport Administration are to be preceded by a review called the four-step principle[1]. This means that conceivable measures are to be reviewed step by step. The idea is that the fourth step should only be proposed if measures in the first steps are not enough to meet the needs and the most effective solution is chosen.

Optimal use of road, traffic and travel data

The Swedish Transport Administration has developed several alternative methods to provide access to static and dynamic traffic data for road and rail. Interfaces are available for both private individuals and companies to preview and obtain copies of data from the Transport Administration and other authorities. These data are provided free of charge with a minimum set of requirements for using the data. The Public Transport Authorities also have interfaces on national and regional

[1] [1] The four-step principle: The first step means that it is to be studied if it is possible to address an identified deficiency by reducing or changing demand. The second step is about identifying more efficient ways of using existing transport infrastructure. The third step includes considering limited renovations and the fourth step entails considering new investments or major renovations. The idea is that the fourth step should only be proposed if measures in the first steps are not enough to meet the needs.

level, to provide static and dynamic historical travel and traffic data, free of charge, to service providers.

The National Access Point for public transport travel data has been in operation since 2011 as a consequence of new national regulation for Public Transport. The national access point (www.trafficdata.se), according to the delegated regulations has been operational since 2017. The quality of data in the National Access Point is steadily improving. The public transport sector has actively participated on a regular basis in different activities. From the regional access points in Stockholm and Gothenburg, it is possible to obtain static and dynamic traffic and travel information for public transport authorities. Information on fare and products is still highly desired by service providers.

The National Road Database (NVDB) is a core resource regarding road data in Sweden. The Swedish Transport Administration buys travel time data from INRIX for the purpose of traffic management and planning, primarily covering the areas around Stockholm, Gothenburg and Malmö. Swedish Transport Administration cooperates with contractors to enhance winter maintenance of roads by using vehicle-generated data. Organizations interested in the exchange and reuse of data can find information about available services at the National Access Point(www.trafficdata.se).

Continuity of traffic and freight management services

The majority of traffic and freight management implementations of new technology can be attributed to the ITS-area. Digitization also of the transport system creates new opportunities in traditional road management. The Swedish Transport Administration strategy is to combine and include new digital ITS solutions in traditional road transport processes such as planning, maintenance and construction. A considerable number of activities have since 2020 been finalized or are ongoing.

In 2018, the Swedish Government launched a national freight strategy. The aim of the strategy is to create improved conditions for efficient, high capacity and sustainable freight transport. The Swedish Transport Administration should also intensify the promotion of intermodal rail transport (2018-2021.

Examples of ongoing activities in digitalisation field of freight is Sweden's work within the Digital and logistics forum (DTLF) where Sweden/Swedish partners also have taken an active role in the CEF project FEDeRATED. In this project the Swedish partners leads the living labs activities where use cases are started supporting multimodal solutions with a higher degree of data sharing and use of electronic documents.

The FEDeRATED living lab "**RFID in RAIL"** has set up a demonstrator between Sweden and Spain, sharing intermodal transport data. This demonstrator was showed at the European ITS Conference in Lisbon 2023. Another living lab "**MMIS"** has taken steps to integrate shippers with ports and operators creating visibility in the supply chain.

Road safety and security applications

Sweden continues to expand the Automatic Traffic Safety Control (*ATK – Automatisk trafiksäkerhetskontroll*) on major roads without lane separation.

The Swedish automotive industry is working intensively on developing advanced driving support systems for improved road safety, including *Cyclist and Motorcyclist Detection, Auto brake for crossing, turning and reversing scenarios, Lane keeping, Driver monitoring, assisted driving* etc. for all vehicle types in cooperation with The Swedish Transport Administration.

A number of projects focused on ITS and walking, cycling and micro mobility (i.e., electrical scooters and e-mopeds) has been carried out during 2017-2019. The aim has been to ensure a safe journey through ITS solutions that can be used before (i.e., booking and paying), during (i.e., connected cycle helmets) and after the journey (i.e., analysis of data from electrical scooters).

In 1997, the Swedish Parliament adopted a new long-term goal and strategy for road safety, Vision Zero. The goal is that no one should be killed or seriously injured through a road accident. Vision Zero is an ethical stance stating that it is not acceptable for human mistakes to have fatal consequences. It can be viewed as a paradigm shift, where the ultimate responsibility for road safety is shifted from the individual road-user to those who design the transport system, for example, road management bodies, vehicle manufacturers, legislators, commercial transport operators, the police authority and others. The responsibility of the road-user is to comply with laws and regulations. The work has yielded results. Since the Swedish Parliament adopted Vision Zero, the number of traffic fatalities in Sweden has been more than halved, at the same time as the volume of traffic has increased dramatically.

A national Geofencing research and innovation programme started in 2019. The purpose is to develop solutions that provide the standards for using geofencing as a tool in controlling and supporting the use of the transport system from a safety and sustainability perspective.

A study has been conducted on state owned rest areas suitable to be included in the information service providing information about safe and secure parking places for trucks and commercial vehicles.

Linking the vehicle with the transport infrastructure

Drive Sweden is a national triple-helix cooperation platform and a driver for developing cooperation between all stakeholders in and outside Sweden to be able to establish an eco-system where the vehicle is linked to the transport infrastructure. Vehicle manufacturers and other commercial actors as well as academia and the public sector are active contributors within Drive Sweden

The Swedish Transport Administration has been an active part in the High-Level Data Task Force with the goal to establish a common approach for data exchange focussing on vehicle-generated data for traffic safety related purposes. The Swedish Transport Administration is continuously working to identify its role in the eco-system and an overall strategy to link the vehicle with the transport infrastructure.

Sweden is a member in the CCAM Partnership, which aims at creating more collaborative research, testing and demonstration projects in order to accelerate the innovation pace and implementation of automated mobility. A goal is also to help remove barriers and contribute to acceptance and efficient rollout of automation technologies and services.

1.2.2 Major ITS Projects

MODI is a CCAM European cross-border project to accelerate the introduction of Connected, Cooperative and Automated Mobility solutions to significantly improve logistic chains. The project aims to speed up the introduction of highly automated freight vehicles through demonstrations and to overcome barriers for the roll-out of automated transport systems and solutions in logistics. A transport corridor from the Netherlands via Germany, Denmark, Sweden to Norway has been chosen for demonstration activities.

NorthStar innovation program was launched in February 2023 and with EU funding awarded in December 2022, Telia is developing 150 kilometres of 5G transport corridors along selected routes between important industrial and technology clusters around Sweden. The corridors will connect controlled test areas with public roads, with full-scale tests scheduled to start in the second quarter of 2024.

ODIN (Open Data in Nordic Countries). The ODIN project aims to accelerate and coordinate the work necessary to create a unified market within the mobility sector in the Nordic countries (participation from Denmark, Finland, Norway, and Sweden). ODIN activities focus at creating a Nordic NeTEx profile, collaboration with and use of OpenStreetMap, developer communication and work with Nordic journey planners.

Digital Winter. The objectives are to create prerequisites for the implementation of digital road condition monitoring based on vehicle-generated data and give the contractors possibility to develop production support tool using data from vehicles. The aim is to increase productivity (save money) and increase road safety. There are plans to expand the project to detect requirements supporting road maintenance all year around by using vehicle-generated data.

NEXT-ITS 3 The NEXT-ITS 3 project (2018-2021) was a continuation of the NEXT-ITS 1 and 2 projects on the deployment of harmonised ITS in the Nordic countries and Northern Germany. 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.

FEDeRATED. The Swedish Transport Administration and The Swedish Maritime Administration as beneficiaries working with federative platforms with the objective to increase efficiency in multimodal transports through increased data sharing and use of electronic documents. The Swedish Maritime Administration is leading one crucial activity to establish tangible results in the form of "Living labs". Around twenty (20) living labs is started through the project. This work has led to greater knowledge of e documents and establishment, via DG MOVE, of the eFTI regulation.

The common European mobility data space (EMDS) aims to facilitate data access, pooling and sharing for more efficient, safe, sustainable and resilient transport. It builds on initiatives and applications related to transport data and will be supported by initiatives to boost interoperability, security, and the availability and provision of data and services. Trafikverket together with RISE and city of Stockholm are partners in the deployEMDS, which is partly financed by the Commission's programme for DIGITAL Europe. The project will actively support real-life implementation projects across nine cities and regions in the EU, using a shared technical infrastructure and governance mechanisms.

Europe's Rail is the successor of Shift2Rail and consists of digital approaches in the whole programme but especially in freight and the project TRANS4M-R. Both workstreams consists of digitalisation as an enabler of a more intelligent rail freight concept. Trafikverket is very active- as founding member- in Full digital freight train operation as well as Seamless operations. Technologies and processes such as Digital Automated Couplers (DAC) and European Checkpoints/Intelligent video gates are going to be demonstrated in Sweden, Also CDM (collaborative decision making) will be a tool for better operational planning.

Project MT-LIV. The Swedish Transport Administration's development of a new traffic management system LAIV (Manage traffic, Supervise the infrastructure, Information about road traffic). This new technical platform will replace the current operational traffic management system NTS. Development is ongoing regarding functionality and simulators.

Geofencing research and innovation programme. An action plan for geofencing was launched in 2018. The goal is to implement geofencing in Swedish cities to ensure safety and security demands through creation of geographical areas with assigned rules for connected vehicles in the area. This action plan resulted in the start of a research and innovation programme in 2019. The purpose of the research and innovation programme is to develop standards for using geofencing as a tool in controlling the use of the transport system from a sustainability perspective. It also aims to identify areas that require development and where projects need to be initiated to ensure scalability and to act as a facilitator where the necessary public and private actors come together to support the recommendations of the action plan

Drive Sweden. A cross-functional collaboration platform that drives the development towards sustainable mobility solutions for people and goods. Members of Drive Sweden jointly develop and demonstrate efficient, connected and automated transport systems that are sustainable, safe and accessible for all. Drive Sweden is organised in thematic areas (among them "Digital infrastructure") and projects (among them KRABAT in which traffic signals are made available through cloud technology).

1.3 Contact information

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2 Projects, activities and initiatives

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

The Swedish Transport Administration has developed several alternative methods to provide access to static and dynamic traffic data for road and rail. Interfaces are available for both private individuals and companies to preview and obtain copies of data from the Transport Administration and other authorities. These data are provided free of charge with a minimum set of requirements for using the data. The Public transport authorities provide static and dynamic historical travel and traffic data, free of charge, to service providers at national and regional levels through various channels.

The following activities are the most significant in the area of road, traffic and travel data:

- The National Access Point for public transport travel data has been in operation since 2011 due to new national regulation for Public Transport. According to this regulation, timetables have to be sent to a database, operated and managed by *Samtrafiken AB*. (*Samtrafiken AB is a national service development company in the public transport sector which was established in 1993 and owned by 37 different operators.)*
- The public transport sector has actively participated on a regular basis in different community meetings and arranges working meetings with transit service providers three-to-four *times a year.*
- From the regional access points in Stockholm and Gothenburg, it is possible to *obtain static and dynamic traffic and travel information from public transport authorities.*
- Information on fare and products is still highly desired by service providers who wish to develop ticketing functionality in addition to their other transport information services. The regional public authorities are opening up tickets for third party sales.
- The National Road Database (NVDB) is a core resource regarding road data in Sweden. It includes data for the whole road network in Sweden. Data obtains from all road owners including the municipalities and the forest industry.
- The Swedish Transport Administration buys travel time data from INRIX for the purpose of traffic management and planning, primarily covering the areas around Stockholm, Gothenburg and Malmö. Swedish Transport Administration is also part of Waze Connected Citizens Program in order to get incident data and all four Traffic Management Centres in Sweden use these data operational.
- In the project Digital Winter, Swedish Transport Administration cooperates with contractors to enhance winter maintenance of roads by using vehicle-generated data. In the current pilot Swedish Transport Administration obtains slippery road data from three commercial actors Volvo Cars, Nira Dynamics and RoadCloud.

2.1.1 Description of the national activities and projects

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

Project/activities	Description
API for dynamic road data	The Swedish Transport Administration has developed an API for dynamic road traffic information for the main Swedish road network. The API has been available since 2014 and is a complement to other national data access points for the dynamic road data that use the DATEX II standard. As of September 2017, data about safe and secure parking is also available from the new API. Traffic flow data and position of road safety cameras (Speed cameras) is available from the interface. A data feed for provision of dynamic data to Waze and Google maps is developed. This access point is used by smaller national actors because of its easy-to-use interface. Duration: 2014 → Costs: 2 million SEK/yearly, maintenance costs. Data collection is not included in these costs.
API for dynamic rail data.	An API service for dynamic train traffic information) from passenger trains has been developed and released in 2013. From this API it is possible to obtain train timetable data and interchanges. Information about rail-crossings is available from this interface, since beginning of 2020. Duration: 2013→ Costs: 2 million SEK/yearly maintenance costs. Data collection is not included in these costs.
DATEX II & RDS-TMC for dynamic road data	From 1990, It has it been possible to obtain dynamic road data via RDS-TMC. Since 2000, there is a DATEX interface for service providers. The users of the DATEX interface are often larger and more established international companies. Since mid-2020, version 3.0 of DATEX II, is up and running. Duration: 2001 - Costs: 3.7 million SEK per year for DATEX and 1,3 Million SEK for RDS-TMC. Data collection is not included in these costs.
API for static road and rail data	This API provides Swedish road- and rail data available for both private persons and companies. One example of an area of use is creating travel planners for cyclists. Duration: 2002 - Costs: 1 million SEK/yearly maintenance costs. Data collection is not included in these costs.

Project on national ticket and payment standard	The national ticket and payment standard (BoB) has been jointly developed by thirty industry partners. The first version was published in 2017 and the standard has since then been maintained by Samtrafiken. The aim of the development of the standard is to create opportunities for interoperability, not only between different ticket systems, but also between different components of a ticket system. Duration 2017 → Costs: 6,0 million SEK yearly
ODIN (Open Data in Nordic Countries)	The ODIN project aims to accelerate and coordinate the work necessary to create a unified market within the mobility sector in the Nordic countries. ODIN activities focus in creating a Nordic NeTEx profile, collaboration with and use of OpenStreetMap, developer communication and work with Nordic journey planners. Duration: 2018-2024 Costs: 4 million SEK
Trafiklab	Trafiklab is a community for open traffic data. Trafiklab provides an API-access point for all Public Transport data in Sweden as well as data files. In conjunction with providing data, Trafiklab and its crew also aim to spur on innovation on open data in general, and Public Transport data specifically. Trafiklab started in 2011 and has since then grown into a go-to-place for knowledge and expertise within the Swedish public transport Open Data scene. Duration: 2011 → Costs: 3 million SEK/ yearly maintenance costs.
KODA (Data Lab for public transport)	KODA is a development of the national platform for open traffic data, Trafiklab. The purpose and goal, is to move APIs for snapshot of open data to an arena where quality-assured, static and dynamic historical data in combination with data processing tools is made available. The project contributes to improve conditions for creating value in public transport by means of open data, and finding related business- and research cases for artificial intelligence and machine learning. Duration: June 2019 - June 2021 Costs: 3.9 million SEK
Data for Road Safety Platform	The Platform is a cooperation between many vehicle manufacturers, service providers and road authorities, to establish a sustainable and scalable way to exchange safety related data between all relevant stakeholders.

	Swedish Transport Administration has been part of the work almost from the start 2018. The goal is to build a scalable solution where any industry partner in the transportation, mobility and traffic data domain and public authorities can join and start using to exchange safety related traffic data and information. Duration: 2021 → Costs: 300 000 SEK/ yearly maintenance costs.
Digital Winter	The project Digital Winter is a continuation of the RSI (Road Status Information) project from 2017. Digital winter is a project at Swedish Transport Administration with the objective to: • Create prerequisites for the implementation of digital road condition monitoring with vehicle-generated data. • Give the contractors possibility to develop production support tool using data from vehicles. There are plans for expanding the project to detect needs and support maintenance all year around by using vehicle-generated data. Implementation: 2018 - 2021 Costs: 42 million SEK
Traffic signals	The vehicle industry, manufacturers, suppliers and service providers have expressed their interest in receiving traffic signal data from authorities and municipalities and several cities have conducted local projects. Swedish Transport Administration has an ongoing dialogue in order to evaluate, test and develop solutions for exchanging data from and to vehicles and traffic signals. Duration: 2016 - 2023 Costs: 1,0 million SEK
The National Road Database (NVDB)	The Swedish National Road Database (NVDB) is a core database providing national static road data. It contains all roads in Sweden that are intended and built for motor vehicle use (state, municipal and private roads). It also provides geographically positioned road related features such as traffic regulations, administrative and technical information. The Swedish Transport Administration is responsible for NVDB data collection, data maintenance and data provision. Duration: Development of NVDB started in 1996 through a government mandate, and was deployed in production 2001. Costs: Yearly data production and maintenance costs are approximately 3,5 million Euro.

Project rail-crossings	The project looks into innovative solutions to warn drivers, to avoid accidents at unguarded railway-crossings. Data from railway crossings (e.g., position, Road protection addition, signal lights) is open since May 2020, from an API managed by Swedish Transport Administration. There are already possibilities for service providers to develop services from rail-crossing data. The Swedish Transport Administration is also preparing a pre-commercial innovation procurement, of a solution to inform road users, about warning of trains at unguarded railway crossings. Duration: 2020 – 2021 Costs: 4,5 Million SEK
Data from INRIX and Waze	The Swedish Transport Administration acquires travel time data from INRIX for the purpose of traffic management and planning, primarily covering the areas around Stockholm, Gothenburg and Malmö. The Swedish Transport Administration is also part of Waze Connected Citizens Program in order to get incident data and all four Traffic Management Centres in Sweden use these data operational. Duration: 2019 – 2023
AQSensor 2	AQSensor 2 (Air Quality Sensing for Estimation and Control of Trafficinduced Emissions) is a research project that aims to use air quality sensors to provide spatial and temporal data and, in combination with traffic measurements, create an integrated model to analyze traffic emissions and develop measures to reduce the impact of traffic on the environment (KTH, 2021). Duration: 2018 - 2021 Costs:1,7 Million SEK
KomILand 3.0	Create sustainable travel in rural and small urban areas through combined mobility. KomILand is financed by Region Västra Götaland and Vinnova. Duration:2019 - 2023 Costs: 5.5 million SEK
Context-aware travel support for public transport disruptions	Context-aware travel support during public transport disruptions is developing an application for sharing bilateral real-time information between travellers and public transport operators. Data collection takes place via the traveller's smart phone to, for example, individualize redirection during traffic disruptions. Duration: 2021 - 2022 Costs: 1.1 million SEK

Linköping MaaS	Linköping MaaS is an application developed through a collaboration between mobility actors in Linköping for combined travel planning, booking, ticketing, payment and real-time information for, among other things, bike pools, rental cars, car sharing and public transport. Duration: 2020 - 2021 Costs: 6 million SEK
MaaS in Skåne	MaaS in Skåne intends to test and develop a new scalable service for combined and integrated mobility that will offer an attractive alternative to travel by car and promote a more resource-efficient mode of transport. Duration: 2020 - 2022 Costs: 6 million SEK
Mistra SAMS fas 2	Mistra SAMS phase 2 aims to create future scenarios for a sustainable transport system and provide suggestions on how to strengthen the transformative capacity of public actors in relation to new accessibility and mobility services. Duration: 2021 - 2024 Costs: 45 million SEK
MMiB	MMiB (Modern Mobility in Barkarbystaden) used a MaaS application and self-driving shuttle buses to create the conditions for sustainable travel in an urban environment. The project has integrated new technology, public transport and infrastructure. Duration: 2020 - 2021 Costs: 3 million SEK
National Scaling of Open Data (NSÖD)	National Scaling Open Data (NSÖD) is part of ODIN (Open Mobility Data in the Nordics) and is a joint Nordic effort to get municipalities to increase the amount of open data. Duration: 2019 - 2022 Costs: 16 million SEK
ODIN II	ODIN II (Open Mobility Data in the Nordics II) is a collaborative platform between Nordic actors in public transport that aims to make available and harmonize open data and APIs that stimulate new mobility services (RISE, 2021). Duration: 2019 - 2024 Costs: 1.7 million SEK
Project Open Data	

	Project Open Data is a ready-made service for the collection, aggregation, consolidation and distribution of harmonized public transport data via Trafiklab.se. Collected data must also be able to be linked to the Swedish Transport Administration's NAP in accordance with EU Regulation 2017/1926. Duration: 2018 - 2022 Costs: 27 million SEK
SMART	SMART (Spacial Modelling Analytics & Real-time Tracking) develops an application for more efficient traffic planning and energy use of existing transport solutions with a focus on public transport in and between cities. Duration: 2020-2022 Costs: 4 million SEK
National Access Point (NAP)	National access point is a service provided by the Swedish Transport Administration where designated actors in the transport sector shall publish their existing travel and traffic data. The ITS Directive's adopted delegated act A requires Member States to provide a national access point and according to the current Swedish regulation, the Swedish Transport Administration is designated responsible. To fulfil the requirements, a national website has been created; www.trafficdata.se. Duration: 2019 - Costs: 2.6 million SEK per year
Verification system BoB	The BoB verification system is a further development of the industry-wide ticket and payment standard (BoB) so that all transport companies can validate their own and others' tickets and sell their own and others' tickets. Samtrafiken supports with expertise for implementation. Duration: 2018 - Costs: 5.5 million SEK per year
DATEX II	DATEX II is a European standard for data exchange used by Trafikverket to deliver road traffic information to various external service providers (Trafikverket, 2021). Duration: 2016 - 2021 Costs: 2.5 million SEK
NAPCORE	NAPCORE is a new EU initiative to strengthen National Access Points (NAPs) as the backbone of the digital ITS infrastructure. The initiative will also provide national and EU-wide coordination for its harmonization and implementation. Germany is the coordinator Duration: 2021 - 2024

	Costs: 3.76 million SEK
DyMoN	Provide conceptual and empirical understanding of the potential to combine real-time, user-generated and publicly available environmental and transport data with nudging methods to promote sustainable urban mobility behaviours. Examines how effective nudging strategies are designed, while ensuring privacy and inclusion of citizens in smart cities. Duration: 2021 - 2024 Costs: 3 million SEK
Digital Fleet Optimizer	Optimize the match between selected fleet vehicles and customer needs to reduce customer waiting time and increase the time fleet vehicles are used by customers. Duration: 2021 - 2022 Costs: 3 million SEK
Modern Mobility in Södertälje (MMiS)	Using AI to understand travel patterns and automate traffic system redesign. Duration: 2021-2022 Costs: 2.5 million SEK
MaaS for Sustainable Cities	Exchange experiences between stakeholders to optimize the benefits of MaaS solutions. Duration: 2021 - 2023 Costs: 2.5 million SEK
DREAMIT 2.0 - Efficient access management	Examines how automated information exchange between trucks can reduce truck waiting times at terminals. Duration: 2020 - 2023 Costs: 10 million SEK
Coordination of business trips by rental car	Create a digital platform where companies can coordinate their business travel. Duration: 2022 - 2023 Costs: 2.4 million SEK
Accessible Public transport for special needs - digital accompaniment in complex environments	Increase the accessibility of public transport for people with different disabilities, mainly visual impairments, including through open traffic data and accessible routes. Duration: 2021 - 2023 Costs: 3 million SEK
Stockholm Digital Parking	Using AI and information from taxis, real-time data on street parking is collected to update maps with available parking spaces.

	Duration: 2020 - 2022 Costs: 2.6 million SEK
VAMLAV	Collect data during all seasons and weather conditions at AstaZero's Rural roads test track and create a detailed map for future stakeholders to use for simulations such as mobility as a service. Duration: 2019 - 2022 Costs: 11 million SEK
E-comstrat: The right conditions for planning to meet new delivery patterns in e-commerce	Examines how transport data sharing between actors can facilitate peri-urban deliveries. Duration: 2021 - 2022 Costs: 2.5 million SEK
eSPARK	Compile user patterns of e-scooters and investigate how e-scooters can contribute to a more transport-efficient society. Duration: 2021 - 2023 Costs: 6.4 million SEK
MMIS III	MMIS Phase III aims to increase transparency and efficiency in global supply chains by introducing new ways to share and retrieve key logistics data. Duration: 2020 - 2023 Costs: 5.8 million SEK
Major Projects and Programs	
FEDeRATED	The Swedish Transport Administration and The Swedish Maritime Administration as beneficiaries working with federative platforms with the objective to increase efficiency in multimodal transports through increased data sharing and use of electronic documents.
Scandinavia - Mediterranean corridor	The main focus is to increase transparency and traceability in logistics supply chains, both first and last mile and long-distance transportation through Finland, Sweden and Denmark. This will be achieved through invisible data integration throughout the supply chain that connects the different actors.
Europes Rail	The successor of Shift2Rail and consists of digital approaches in the whole programme but especially in freight and the project TRANS4M-R. Both workstreams consists of digitalisation as an enabler of a more intelligent rail freight concept. Trafikverket is very active- as founding

	member- in Full digital freight train operation as well as Seamless operations.
CCAM	*Sweden is a member in the CCAM* Partnership, which aims at creating more collaborative research, testing and demonstration projects in order to accelerate the innovation pace and implementation of automated mobility.
Drive Sweden	A cross-sector collaboration platform that drives the development towards sustainable mobility solutions for people and goods.
Innovation Cloud	Innovation Cloud is a cloud platform by Ericsson and is the basis for several sub-projects in Drive Sweden - including several pilot tests with connected self-driving vehicles and new mobility services.

2.1.2 Progress since 2020

Description of the progress in the area since 2020:

Se above, section 2.1.

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:

A common process for collection of all public transport travel and traffic data, both static, dynamic and historic data to the access point (Trafiklab.se) for public transport information is agreed with all public transport authorities (PTA) authorities and the public transport operators (PTO).

Trafiklab is a proxy (third party database) where entities can provide data. Metadata from Trafiklab.se are published via the national access point (trafficdata.se).

A new national technical Infrastructure for collection, storage and publication of data in accordance with EU regulation 2017/1926 (MMTIS) is implemented through a national project during 2018-2023. Due to new formats, standards and extended amount of data, new harmonization solutions have been implemented to be able to use the data in different services. The process and technical infrastructure for collecting data, and the infrastructure for publication of data is new and adjusted to be compatible with each other.

All static and real-time data, including historical data, are available in machine readable format from the public transport sector via the national access point.

Static data can be collected in NOPTIS- DOI and DII or NeTEx standards. Dynamic data can be collected in both NOPTIS-ROI and SIRI. Static data can be provided in NeTEx and GTFS standard. Dynamic data can be provided in SIRI and GTFS-R. A web based-portal has been developed to help operators to provide data to Trafiklab.se, for those operators (e. g. smaller operators) who is not able to provide data in a digital format.

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:

The quality criteria used for the data are, quality indicator and update frequency. These are mandatory, free text field, documented by the data providers when updating the national access point (trafficdata.se) with data and can be seen as a minimum data quality level.

For data collection, a new validation tool has been developed and implemented to ensure high data quality for both static and dynamic data.

The geographical coverage of the static travel and traffic data published on Trafiklab, corresponds to the TEN-T network, the urban- and rural transport network and some of the privately operated interlinks between cities are also covered.

Linking of travel information services:

The Implementation of the OJP standard is handled in collaboration with Samtrafiken and partners to Samtrafiken. The implementation of OTP (Open Trip Planner), and to make these implementations OJP ready, is so far only done in the south region of Skåne. Initially, the plan was that both Samtrafiken and Skånetrafiken should implement OTP and OJP in order to exchange information between respective travel planners. Samtrafiken has chosen a different solution than OTP for its national sales/travel planning, which is why OTP with preparation for OJP has only been implemented by Skånetrafiken.

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

The Swedish Transport Agency has participated in the NAPCORE-project as a follower/partner. This work has been aimed at harmonizing the requirements set to EU member states. The standardized documents developed in this field will be utilized by Sweden in upcoming oversight inspections. The project has also provided improvements regarding who our data holders are, and how we reach them.

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

None.

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

A metadata catalogue (DCAT-AP) has been implemented. Metadata can be registered and data providers are asked to record metadata when publishing data sets.

During 2022-2024, Samtrafiken is implementing a new technical infrastructure for multimodal national travelling including services for booking and distribution of tickets as well as travel planning solutions for multimodal travelling.

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)

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

There are currently 13 organizations and 51 datasets registered on the National Access Point. Since the status report in 2022, three additional organizations and two new datasets has been registered.

All data providers offer data types included in the DR 2015/962.

Sweden is engaged in NAPCORE and in the clarifying activities stemming from the initiatives taken by ITS service providers, TM 2.0, TISA and others. National projects on how to provide data on regulations and restrictions in a harmonised way for national and local authorities are ongoing, as are several initiatives on how to increase the accessibility and usage of in-vehicle generated data.

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:

The geographical scope of the static data types registered in the National Access Point varies from covering mainly motorways and arterial roads to extended coverage including regional, urban and local roads. The dynamic road status data types and the traffic data types covers motorways and arterial roads, regional, urban and local roads.

It is mandatory for the data providers to declare the quality of the data when they update the National Access Point with data according to the delegated regulation and can be seen as a minimum level for the declaration. Quality criteria for the data to be declared are: 1. quality indicator (description of quality) and 2. Update frequency, the user can choose among predefined update frequencies.

The responsibility for compliance with the specified quality indicator lies on the data provider.

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

Since the last report, preparations has started to meet the changes in the upcoming revised RTTI. Some workshops has also been offered to invited actors for more targeted information about the ITS Directive and its delegated regulations. The Swedish Transport Agency has as a National Body participated in the NAPCORE-project as a follower/partner. This work has been aimed at harmonizing the requirements set to EU member states. The standardized documents developed in this field will be utilized by Sweden in upcoming oversight inspections. The project has also provided improvements regarding who our data holders are, and how we reach them.

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

No changes of the National Access Point have been made since the last report.

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

No priority zones are designated in Sweden.

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

The following datatypes categorized as belonging to DR 2015/962 are currently available via the National Access Point:

Static road data:

- Geometry
- Road width
- Number of lanes
- Gradients
- Junctions
- Road classification
- Access conditions for tunnels
- Access conditions for bridges
- Permanent access restrictions and other traffic regulations
- Speed limits
- Traffic circulation plans
- Location of charging points for electric vehicles and the conditions for their use
- Location of compressed natural gas, liquefied natural gas, liquefied petroleum gas stations

Dynamic road data:

- Road closures
- Lane closures
- Bridge closures
- Road works
- Accidents and incidents
- Poor road conditions
- Weather conditions affecting road surface and visibility
- Availability of charging points for electric vehicles

Traffic data:

- Traffic volume
- Speed
- locations of queues
- Travel times
- Waiting time at border crossings to non-EU Member States

Additional data types registered:

- Traffic data at border crossings to third countries
- Expected delays

- Estimated travel times

Metadata catalogues are implemented. The quality requirements are currently not checked by the National Access Point, as it is a web portal, and the compliance are depending on the data provider.

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)

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:

Identification of the road network and where the service will be provided on the network has been decided. It will cover the whole TERN road network in Sweden.

Organizations interested in the exchange and reuse of data can find information about available services at the National Access Point (www.trafficdata.se). There are links to organizations that deliver data and the transport network their delivery covers.

Metadata can be registered and data providers are asked to record metadata when publishing data sets. The responsibility for compliance with the specified quality indicator lies on the data provider.

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

The Swedish Transport Agency has since 2021 participated in NAPCORE as a representative of National Body for Sweden. During 2023 Sweden has carried out a compliance assessment regarding this regulation under the framework of NAPCORE´s Pilot Trial. The purpose of the pilot project is to harmonize the setting of requirements within the EU´s member states. The results from Pilot Trial are also used for an adjustment in the projects harmonized documents and random inspections. The experience from the Pilot Trial also includes the service provider views of the compliance assessment.

Our ambition is to continue to use the material that NAPCORE has developed in their working groups.

The Swedish Transport Agency has not noted any discrepancies during our oversight inspections of our service provider.

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

On 8 May 2017, the Swedish Transport administration launched the Swedish National Access Point (NPA) www.trafficdata.se for priority actions B (real-time traffic information), priority action C (safety related traffic information) and priority action E (truck parking information). The National Access Point was launched during a combined information and “proof of concept” meeting with future users of www.trafficdata.se, including private service providers such as TomTom, HERE and Media mobile.

One of the objectives of the meeting was to show the advantages of being part of the community and to make the information service providers familiar with the updating procedures for their information in the portal. In addition, the harmonized "self-declaration" was presented by The Swedish Transport Agency.

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

For priority action C, a description of dataset from Swedish Transport administration and Mediamobile is available at the Swedish National Access Point, www.trafficdata.se. Today you can find the following safety-related traffic information data at the NAP. Exceptional weather conditions, unmanaged blockage of a road, Wrong way driver, Temporary slippery road, obstacle on the road, unprotected accident area, Short-term Road works, reduced visibility at the access point.

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:

The majority of traffic and freight management implementations of new technology can be attributed to the IT'S - area. Digitalization of the transport system also creates new opportunities in traditional road management. The Swedish Transport Administration strategy to combine and include new digital ITS solutions in traditional road transport processes such as planning, maintenance and investment.

Project/activities	**Description**
DTLF (Digital Transport Logistic Forum) 2.0	Sweden is participating in the work with the Digital Transport and Logistic Forum via The Swedish Transport Administration, Swedish Maritime Administration, Swedish Transport agency and several other Swedish partners (e.g. Ericsson, RISE, Lindholmen Science Park and Chalmers). The DTLF forum aims to improve the capability between various stakeholders of using digitalisation as an enabler for efficient and seamless transport within the field of freight. DTLF 1.0 mandate was ending in 2018 with two (2) reports from the established subgroups with recommendations for further action. This action list was partly implemented in a CEF call where finally two projects was nominated namely FENIX and FEDeRATED. Sweden participates strongly in FEDeRATED with The Swedish Transport Administration and The Swedish Maritime Administration as beneficiaries.

	The projects are catalysts for the work in the new mandate of DTLF 2.0 (2018-2023). Duration: 2018-2023 Costs: 2,3 Million SEK
HCT (High-Capacity Transport)	The main freight initiative in Sweden is High-Capacity Transport (HCT), which also holds components with ITS relevance, such as access management. In HCT, higher total loads will be allowed on parts of the network while axle loads will be unchanged. The programme have also started to look in to multimodal aspects and last mile efficiency where digital solutions plays an important role. Duration: 2016-2020 Costs: 50 Million SEK
NEXT-ITS 3, NordicWay 2 & 3 and European ITS platform (EU EIP) - Freight management.	Freight issues are also addressed in the corridor cooperation project (NEXT-ITS) and the European ITS platform (EU EIP). The Swedish Transport Administration coordinates NEXT-ITS 3, participates actively in the EU EIP expert group and in the ITS deployment cooperation on northern part of Scan-Med corridor. In the NordicWay 2 & 3 projects, there are also more dedicated freight initiatives. Hybrid technology and results from NordicWay1 are used to improve ring road logistics. Duration: 2016-2020 Costs: 7-8 Million SEK per year
NEXT-ITS 3 – Traffic management.	In Sweden three main activities (3-5) are conducted within the NextITS-3 project: **Activity 3 – Motorway Control System (MCS) at E4/E20 Stockholm, Sweden** The objective of this activity is to replace parts of the Motorway Control System (MCS) at E4/E20 in Stockholm to increase its functionality. This activity is part of a global project to replace the MCS between Bredäng and Pampas (including the major Stockholm bypass Essingeleden) with a new system developed by the Swedish Transport Administration called LASSY. The new equipment will offer better possibilities to manage traffic for the traffic management centres as the lane signals installed offer enhanced functionality. This will lead to greater possibilities to manage the traffic flows on the corridor in different situations. **Activity 4 – Motorway Control System (MCS) Gothenburg, Sweden** The objective of this activity is to equip the road stretch between Marieholm (E45) and Tingstad (E6) with Motorway Control System to bridge the gaps between the MCS that exist today and the ones that are being built to create complete coverage at important road stretches partly under construction, partly new. This activity will ensure that there is consistent level of service on the road network through

	Gothenburg by equipping a stretch of the road without MCS between road stretches with MCS. This will enable traffic management operations on the complete road. **Activity 5 –LAIV (prev. MTLIV) – Replace NTS with NGS, Sweden** The objective of this activity is to replace the National Traffic Management System (NTS) with a New Generation System (NGS) in four traffic management centres (Stockholm, Gothenburg, Malmö and Gävle). NGS provides several benefits: - NGS is better prepared for the new technologies that are up and coming (i.e. autonomous vehicles, platooning and High Capacity Transports (HCT)). - It will be built up with different modules and can be easily expanded with new modules. - It will be easier to add new parts of the road network to the system, e.g. Bypass Stockholm that is currently being built. - The NGS will increase the possibilities for automation within the system. This will lead to quicker handling of different events which in turn will increase the network performance in connection to incidents on the road network. - NGS will be developed in cooperation with the Norwegian Public Roads Administration and will support and facilitate interoperability between Swedish and Norwegian traffic management centres.
Drive Sweden	Drive Sweden is a Strategic Innovation Program launched by the Swedish government that gathers the best in the area – from all sectors of society. The challenges tackled along the way could pertain to road safety, adaptation of infrastructure and legislation that needs updating. Partners in the program, e.g., Ericsson, Swedish Transport administration, Scania, Volvo Cars Company, Volvo Trucks. In total, Drive Sweden has more than 40 partners. Drive Sweden establishes an open environment for developing cloud services, and that data access and data exchange can be done efficiently, as well as creating data exchange capabilities through open APIs and a library of interfaces and the ability to store data in the cloud. Duration: 2015 - 2025 Costs: 20 Million SEK per year
FFI (Strategic Vehicle Research and Innovation)	The Swedish Government and industry are investing in a long-term partnership within FFI (*Fordonsstrategisk, Forskning och Innovation/ Strategic Vehicle Research and Innovation*.) FFI funds R&D that focuses on energy, environment, safety and automation. The effort is ongoing and includes 90 million Euro per year, half of it comes from public funds through VINNOVA, Swedish Transport Administration and the Swedish Energy Agency. An equivalent amount is invested by the four industrial partners: Volvo Trucks, FKG (Scandinavian Automotive Suppliers), Scania and Volvo Cars Company.

	Duration: 2016- Costs: Approx. 900 Million SEK per year
Geofencing	Safe and environmental friendly zones with access control for a sustainable living. Duration 2018-2022 Costs: Approx. 10 Million SEK
SESAM	Digital based locking systems for efficient city distribution and e commerce. Duration: 2019 Costs: Approx. 2,3 Million SEK
Intelligent video gates (IVG)	RFID and optical solutions capturing data in the gates of the terminals enabling data sharing and better operational processes with the use of IOL (internet of logistics) principles. The activity is belonging to the Shift2Rail programme. Duration: 2016-2022 Costs: 8 Million SEK
Multimodal information chains (MMID/MMIS)	RFID and optical solutions capturing data in the gates of the terminals enabling data sharing and better operational processes with the use of IOL(internet of logistics) principles. The activity is belonging to the Shift2Rail programme. Duration: 2016-2022 Costs: 8 Million SEK
RFID in Rail	Using readers in terminals and network for logistic purposes making the planning processes and supply chain visibility greater. Focus on multimodal transports. Duration: 2019-2023 Costs: Approx. 4 Million SEK
Digitalization of transport chains	Digitalization of freight transport chains aims to streamline freight transport by digitizing the transport chains to increase transparency, enabling the buyer to see how the goods are transported. This in turn gives the buyer the opportunity to choose the most transported goods. Digitization, and the transparency that it enables, is a key to sustainable transport. When transport buyers and consumers understand how a product has been produced and transported, their choices can influence sustainable, efficient and safety related transports. Transparency enables industry-leading players to show buyers that they are actively working to use the most efficient modes of transport, environmentally

	friendly vehicles and sustainable social conditions for the people who work in the distribution. Partners; Lund Technical University. Duration: 2017 Costs: Approx. 2,75 Million SEK
Improved disruption information in the Stockholm region	Increased ability to inform about traffic disruptions. Preliminary studies and investigations are ongoing.. Duration: 2016-2020 Costs: 3,3 Million SEK
Development of ITS use as a subset of the Action Plan for large cities, a business area-wide platform with metropolitan connections.	The aim is to strengthen and coordinate measures aiming to achieve increased accessibility, reduced congestion, reduced emissions and reduced delays. Ongoing operations within the Swedish Transport Administration's Region Stockholm, examples of current activities: • New traffic control project • Smart Intersection Traffic Signals Test • Testing of GPS in tunnels • Work with Service Levels - impact assessments Research projects on environmental management and highway management are also included as parts of the action plan. Duration: 2018-
Project AV Traffic Control Tower	AV Traffic Control Tower Project AVTCT Concept for fleet management and remote control of vehicles. Technical tests are ongoing. KTH ITRL, AB Volvo, Ericsson, Scania, Telia, Carmenta, Swedish Transport Administration. Duration: 2019-2021 Costs: 7,4 Million SEK
POST2 - Prediction And Scenario Based Traffic Management	Traffic models adapted for Sweden that can become part of operational decision support. KTH, LiU Duration: 2019-2021 Costs: 4,1 Million SEK

Collaborative traffic management	Concept for collaboration between road users and service providers to reach out with traffic information that is coordinated with traffic control. Implementation report ready, results taken into development plan for Traffic Management Road at the Swedish Transport Administration. Swedish Transport Administration, RISE Duration: 2018-2020 Costs: 5,5 Million SEK
The impact of Incidents on capacity and traffic management	Analysis of how incidents affect traffic flows. The project works with results. VTI, LIU, KTH Duration: 2017-2020 Costs: 2 Million SEK
Simulation and Modelling of Automated Road Transport – part 2 (SMART2)	Traffic effects of automation. Traffic models that include AV. Project 1 completed, Project 2 just started. KTH/LiU CTR, VTI, Swedish Transport Administration Duration: 2016-2019 + 2020-2022 Costs: 4,3 Million SEK
Active traffic control for improved air quality and reduced climate impact along the government road network	New knowledge about the use of VH as an alternative on roads where air quality problems exist. SLB, Movea, Swedish Transport Administration Duration: 2019-2021 Costs: 2 Million SEK
Pre-study on driving simulation and micro-simulation for impact studies of C-ITS services such as "Emergency Vehicle Approaching"	Summarized new knowledge in a report and formulate project proposals for a larger study with a new method combining micro simulation and driving simulation to study the effect on accessibility and traffic safety for different ways of conveying EVA messages in different traffic situations and at different levels of traffic flows. VTI, Swedish Transport Administration Duration: 2019-2020 Costs: 0,5 Million SEK

CTR-Evaluation of improved motorway control - a case study	Evaluate the effects on accessibility, safety and the environment that are caused by the further developed motorway control on the test section at Södertälje. VTI, Swedish Transport Administration Duration: 2020-2022 Costs: 2,2 Million SEK
CTR-Air quality measurement for active traffic management and control	A) Use a network of innovative and inexpensive air quality sensors to provide sufficient spatial and temporal information on air pollution levels, e.g. NOx. B) By utilizing this data in combination with traffic measurements, create an integrated model for analysis of traffic-induced emissions near highways. C) Design and develop green traffic management measures (e.g. eco-based VSL) to reduce traffic impacts on climate and air quality and contribute to compliance with EU regulations. KTH, SkySmart, Swedish Transport Administration Duration: 2019-2020 Costs: 1,8 Million SEK
C-ROADS	Collaboration platform for C-ITS implementation in Europe. Swedish Transport Administration
CEDR CAD working group (Connected Autonomous Driving)	Task forces on Infrastructure, Transport system impact and Data. Related to High Level Data Task Force.
NordicWay3	Implementing pilots for e.g. EVA (emergency vehicle approach), geofencing, traffic signal info, roadwork info and develop long-term sustainable digital infrastructure. Relates to NordicWay 2. Duration: 2020-2023
DenCity 3	DenCity 3 is the third stage of the DenCity project which aims to implement sustainable transport solutions in dense urban areas (CLOSER, 2021). Duration:2019-2021 Costs: 6.7 Million SEK

Data-driven governance of micromobility in public space	Intelligent and self-learning traffic control with 3D & AI aims to demonstrate how intelligent sensors based on stereo vision (3D) and artificial intelligence (AI) open opportunities for new and more efficient ways to control traffic through signalized intersections. Demonstration is planned through practical installation and evaluation in one to two intersections in Uppsala (Vinnova, 2021). Duration: 2020-2021 Costs: 1.4 Million SEK
MMTL	Multimodal Traffic Management, MMTL is a continuation project linked to POST - Prediction and Scenario Based Traffic Management. The aim is to enable multimodal traffic management by extending the dynamic estimation of OD matrix and route selection. This can provide a larger palette of alternative measures and a better basis for selecting measures for traffic control centers (Trafikverket, 2021). Duration: 2021-2023 Costs: 4Mkr
Simulation models, method and technology for Nordic C-IT services	Simulation models, method and technology for Nordic C-ITS services is a doctoral project at VTI that aims to develop a simulator-based method for optimal development of Nordic C-ITS services in so-called "Day 1 and 1.5 services". The project will be closely linked to the ongoing NordicWay3 project (Trafikverket, 2021). Duration:2020-2023 Costs: 9.4 Million SEK
SMART 2	SMART 2 consists of two PhD projects that aim to further develop current traffic models to enable analysis of future automated traffic systems. The project investigates the potential of developing and applying traffic simulation for analyzing the effects of traffic system automation (Centre for Traffic Research, 2021). Duration: 2019-2022 Costs: 4.3 Million SEK
Next generation motorway traffic management system	The next generation highway traffic management system is a continuation project. The project aims to evaluate the effects on accessibility, safety and the environment of the further developed highway control on the test section at Södertälje (CTR, 2021). Duration: 2020-2022 Costs: 2.2 Million SEK

BOOSTLOG	BOOSTLOG is a three-year EU project that aims, among other things, to identify gaps and priorities for future funding programs aimed at increasing the impact of future EU-funded projects. CLOSER is mapping and evaluating the projects based on, among other things, urban logistics, multimodal transport and sharing of freight and logistics data (CLOSER, 2021). Duration: 2020-2023 Costs: 14 Million SEK
EU-EIP	EU-EIP is a platform for European road operators that aims to optimize the deployment of ITS services in a harmonized way in Europe (European ITS Platform, 2021). Duration:2016-2021
GeoSence	GeoSence is a European collaboration on geofencing in traffic management and planning involving partners from Sweden, Norway, Germany and the UK. The aim is to design, test and evaluate geofencing concepts and solutions for specific urban cases and to propose new ways to successfully deploy geofencing technologies (CLOSER, 2021-07-09). Duration:2021-2024 Costs:16 Million SEK
Mobile rural areas	Make public transport more efficient by coordinating publicly paid trips with other modes of transport. Duration: 2021-2025 Costs: 2.2 Million SEK
Digital Transport Southern Stockholm (DTSS)	Develop a consensus between key actors in the southern part of the Stockholm region on how smart, multimodal forms of operation and governance can be established for freight transport. Duration:2022-2023 Costs: 2.8 Million SEK
5G for Connected Autonomous Vehicles in Complex Urban Environments	Use new mobile communication technologies to enable safe interaction between connected vehicles and predict road user behavior. Duration:2019-2024 Costs: 15.8 Million SEK

From Connected to Sustainable Mobility (FREEDOM)	Analyze data from connected cars to understand the efficiency of current transport systems and the factors affecting CO2 emissions. Duration: 2021-2024 Costs:10.5 Million SEK
PROactive SENSorics for autonomous vehicles(PROSENSE)	Increase knowledge about traffic congestion and possible scenarios that could lead to congestion caused by autonomous vehicles. Duration: 2021-2024 Costs: 32.5 Million SEK
Implementation of Digital Winter Road Layer Information for Efficient and Sustainable Municipal Winter Road Management.	Connected vehicles are used to collect data on winter road surfaces to facilitate road maintenance. Examples of data to be collected include road friction data and temperature. Duration:2021-2024 Costs: 1.9 Million SEK
EPIC – Trafikljusprioritet för utryckningsfordon i urban miljö EPIC - Traffic light priority for emergency vehicles in urban environments	Develop and demonstrate a system that enables blue light vehicles to send a request for a green light at traffic lights. This will increase safety at traffic lights by avoiding the need for blue light vehicles to run a red light. Duration:2020-2022 Costs: 5.7 Million SEK Källa:OVB-22
SMART 3	Further develop current traffic models to investigate whether the current infrastructure is ready for autonomous vehicles. The project is a continuation of SMART2 and consists of two PhD projects. Duration:2022-2024 Costs:6.2 Million SEK
Highly Automated Freight Transports	Identify the need for physical and digital infrastructure on public roads to enable safe, productive and automated freight transport. Duration:2017-2022 Costs: 27.5 Million SEK

In the Hub- Interaction between operators and driverless vehicles in future transport systems	Explore how people will interact with driverless vehicles in connected transport systems. Duration:2020-2022 Costs: 12.2 Million SEK
FOKA	Explore how autonomous vehicles can be integrated into public transport from a technical, legal, psychological and social science perspective. Duration:2021-2023 Costs: 5.8 Million SEK
Major Projects and Program	
FEDeRATED	FEDeRATED is an EU CEF project for digital co-operation in logistics which consists of 15 partners located in 6 EU Member States (Luxemburg, Italy, Finland, Netherlands, Spain, Sweden). FEDeRATED is an open data-sharing infrastructure for smooth, safe and sustainable freight transport and logistics in Europe and its trading partner countries. Duration:2019-2021
MMIS fas III	MMIS Phase III aims to increase transparency and efficiency in global supply chains by introducing new ways to share and retrieve key logistics data. Duration: 2020-2023 Costs: 5.8 Million SEK
RRTCDM	RRTCDM (Rail Road Terminal Collaborative Decision Making) aims to create more effective collaboration between the intermodal terminal, shipping companies, train operators and truck operators by enabling digital collaboration on forecasting available capacity to increase the fill rate of train commuters. Tests are taking place in Jönköping and Nässjö. Duration:2020-2023 Costs:3.5 Million SEK

RFID in Rail	RFID in Rail (Identification and Positioning of Railway Vehicles) aims to improve the supply chain through the use of readers to identify train wagons at terminals. Duration:2019-2023 Costs: 4 Million SEK
Terminal Flow (BetTerFlow)	Terminal Flow (BetTerFlow) aims to streamline the flow of goods between Sweden and Finland via the Wasaline ferry and the transshipment between the port and the Hillskär freight train terminal. Duration:2019-2023 Costs:2 Million SEK
Sustainable Intermodal Chain (SIMC)	Sustainable Intermodal Chain (SIMC) creates opportunities for information exchange between different roles in the transport chain from the perspective of the transport buyer. Duration:2019-2023 Costs: 2 Million SEK
Optimized Port Operation by Cargo Owner Integration(OptiPort)	Optimized Port Operation by Cargo Owner Integration focuses on optimizing Kvarken Port's and Umeå's port operations to meet tomorrow's digital logistics solutions based on the needs and requirements of cargo owners. Duration:2019-2023 Costs:1 Million SEK
Scandinavia - Mediterranean corridor	The main focus is to increase transparency and traceability in logistics supply chains, both first and last mile and long distance transportation through Finland, Sweden and Denmark. This will be achieved through invisible data integration throughout the supply chain that connects the different actors. Duration:2021-2023
B.E.A.st. – ELSA	The focus is on jointly establishing a way forward for applicable semantics and data exchange mechanism of climate data for construction and maintenance of road and rail infrastructure. Duration:2022-2023 Costs:3.5Mkr

FR8HUB	FR8HUB aims to improve the efficiency of freight handling in the railway system at nodes, hubs and terminals. The project will also develop future freight locomotives and develop a strategy for implementing relevant technologies (CLOSER). Duration: 2017-2021 Costs:100.7 Million SEK
FR8RAIL II	FR8RAIL II - Digitalization and automation of freight trains has the main objective of developing functional requirements for increased performance and intelligence in e.g. the wagon fleet and surrounding processes that through increased automation lead to sustainable and attractive European rail freight (CLOSER, 2021). Duration:2018-2021 Costs:12.5 Million SEK
FR8RAIL III	FR8RAIL III - aims to further develop rail technologies, engage stakeholders and promote rail-related research and innovation and develop demo stations (CLOSER, 2021). Duration:2019-2022 Costs:130 Million SEK
FR8RAIL IV	FR8RAIL IV - further develop technologies such as condition-based maintenance, automatic coupling, telematics and electrification as well as new concepts for intelligent wagons and long trains. (CLOSER, 2021) Duration:2020-2022 Costs:180 Million SEK
Intelligent Videogates (IVG)	Intelligent Videogates (IVG) are used to automatically collect data from freight wagons to create smoother and more efficient operations at terminals. This is part of FR8HUB. Duration:2017-2021 Costs:10 Million SEK
PERFORMIN G-RAIL	PERFORMINGRAIL - aims to reduce risks to the market through optimal traffic management and rail signaling with train positioning methods but also by updating regulations (Shift2Rail, 2021).

	Duration:2020-2023 Costs:13 Million SEK
IMPACT-2	Continuation of IMPACT-1 and will evaluate how Shift2Rail meets the overall objectives of railway system performance. Includes various work packages on standardization and intelligent vehicle maintenance. Duration:2017-2022 Costs: 70 Million SEK
AI Aware	Purpose: AI Powered Awareness for Traffic Safety (AI Aware) is a concept for investigating and testing traffic control that supports connected and automated vehicles. The project aims to combine multiple data sources from the traffic system in a city and apply AI algorithms to identify and predict different events in the traffic system. Duration:2020-2022 Costs:4 Million SEK
AVTCT	Automated road vehicle traffic control tower (AVTCT) is a Drive Sweden project that aims to investigate the traffic effects of automated vehicles and traffic management of commercially operated car pools and public transport. The project is currently in phase 2. Duration: 2019-2021 Costs: 7.4 Million SEK
Innovation Cloud	Innovation Cloud is a cloud platform by Ericsson and is the basis for several sub-projects in Drive Sweden - including several pilot tests with connected self-driving vehicles and new mobility services. Duration:2016-
Stockholm Virtual City	Stockholm Virtual City produces virtual and dynamic representations of the urban environment - digital twins. These models can be used to analyze, optimize and plan concepts in areas such as mobility, traffic flow and infrastructure management. Through mobile 3DAI Engine on Taxi Stockholm's fleet, traffic signs will be mapped, traffic flows monitored in real time and geofencing implemented.

	Duration:2020-2021 Costs:3.4 Million SEK
EVOLVE	Integrate autonomous transport from different actors to enable them to work together. Will be implemented at strategic and tactical level. Duration:2022 Costs:4 Million SEK
Data-driven governance of micromobility in public space	Collect data from all e-scooter operators to better plan traffic and facilitate how e-scooters and other modes of transport can complement each other. Duration:2021-2022
Cooperative Autonomous Transport (SAT)	Investigate what happens when several different self-driving transport modes coexist in an urban environment in order to produce a knowledge base that facilitates the long-term planning of the transport system. Duration:2022-2023 Costs:4 Million SEK
Campus2030	Create a digital twin of KTH's road infrastructure to conduct experiments and research on smart transportation. Duration:2020-2023 Costs:3.8 Million SEK

2.2.2 Progress since 2020

Description of the progress in the area since 2020:

See Section 1.2.1 General progress.

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:

Project/activities	**Description**
NordicWay 2 and 3	Through the NordicWay projects, a collaboration between public and private partners in Finland, Norway, Sweden and Denmark, an information exchange solution for different enterprise-specific clouds has been developed. The projects enable vehicles, infrastructure and network operators to communicate safety hazards and other information. Duration: 2016-2023
Geofencing research and innovation programme	The Swedish Transport Administration together with Scania AB, AB Volvo, Volvo Personvagnar AB, Veoneer, the city of Stockholm, the city of Gothenburg and the Swedish Transport Agency launched an action plan for geofencing in 2018. The goal is to implement geofencing in Swedish cities to ensure safety and security demands through creation of geographical areas with assigned rules for connected vehicles in the area. This action plan resulted in the start of a research and innovation programme in 2019. The purpose of the research and innovation programme is to develop solutions that provide the standards for using geofencing as a tool in controlling the use of the transport system from a sustainability perspective. It also aims to identify areas that require development and where projects need to be initiated to ensure scalability and to act as a facilitator where the necessary public and private actors come together to support the recommendations of the action plan. https://www.Swedish Transport Administration.se/en/startpage/operations/Operations-road/vision-zero-academy/Vision-Zero-and-ways-to-work/comprehensive-action-plan-joint-mobilization-on-digitalization-for-secure/ https://closer.lindholmen.se/en/closer-projects/geofencing Duration: 2019-2022 Costs: 2,9 million SEK/year

SAFE-ePMVs Bikeable city Communicating Bicycle Helmet SOM (Smart Public Spaces) Bike Data Project	A number of projects focused on ITS and walking, cycling and micro mobility (i.e. electrical scooters and e-mopeds) has been carried out during 2017-2019. The aim has been to ensure a safe journey through ITS solutions that can be used before (i.e. booking and paying), during (i.e. connected cycle helmets) and after the journey (i.e. analysis of data from electrical scooters).
Data-driven governance of micromobility in public space	Data-driven management of micromobility in the public space is a project that, through the collection and analysis of data from electric scooters in Stockholm, aims to develop the city and participating operators as well as better manage the electric scooters (Drive Sweden, 2021). Duration:2021-2021
Geofencing FOI program	Geofencing FOI program aims to identify areas in geofencing that require development and where projects need to be initiated to drive the work forward. Geofencing is an umbrella term that covers the application of technical solutions in combination with appropriate digital and organizational processes to ensure that vehicles follow certain characteristics within certain geographical areas. This program works closely with the Nordic Way and Smart Urban Traffic Zones (CLOSER, 2021) projects. Duration:2018-2023 Costs: 10 Million SEK
HITS2024	HITS2024 (Sustainable & Integrated Urban Transport Systems) is a cross-industry collaboration between property owners, municipalities, logistics companies and academia. The goal is to develop sustainable transport solutions for an attractive and safe city (CLOSER, 2021). Duration:2020-2024 Costs:35 Million SEK
Smart Urban Traffic Zones	Smart Urban Traffic Zones is a project that aims to create, demonstrate and require basic conditions for smart traffic zones. The project includes an innovation zone on Hornsgatan in Stockholm that will be used to collect data on when and how loading bays are used. Other parts of the project examine the development of specifications for smart zones, the resulting system effects and the design of smart exits to improve safety at construction sites (CLOSER, 2021). Duration:2020-2022 Costs: 14 Million SEK

Teleoperated & Autonomous Machines in the mining process	More effective use of machinery in the mining environment to remove people from the mining environment and thereby increase safety. Duration: 2020-2023 Costs:22.6 Million SEK
MICA2 - Modeling Interaction between Cyclists and Vehicles 2	A continuation of MICA1 and aims to increase the safety of overtaking cyclists in traffic, now at higher speeds. The results will lead to new safety systems in cars. Duration:2019-2023 Costs:23.3 Million SEK
5G mobile positioning for vehicle safety	Provide a precise 3D position using 5G that can be used in safety-critical vehicle applications such as warning systems and road safety. Duration:2020-2022 Costs:13.4 Million SEK
	Using smart technology and algorithms to determine whether a driver is not fit to drive, for example due to alcohol. The technology is based on head, eye and face recognition. Duration: 2020-2022 Costs:9.1 Million SEK
Major Projects and Program	
AI Aware	AI Powered Awareness for Traffic Safety (AI Aware) är ett koncept för att undersöka och testa trafikkontroll som stöder uppkopplade och automatiserade fordon. Projektet syftar till att kombinera flera datakällor från trafiksystemet i en stad och tillämpa AI-algoritmer för att kunna identifiera och förutsäga olika händelser i trafiksystemet. AI Powered Awareness for Traffic Safety (AI Aware) is a concept for investigating and testing traffic control that supports connected and automated vehicles. The project aims to combine multiple data sources

	from the traffic system in a city and apply AI algorithms to identify and predict different events in the traffic system. Duration:2020-2022 Costs: 4 Million SEK

2.3.2 Progress since 2020

Description of the progress in the area since 2020:

See Section 1.2.1 General progress.

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:

At the Swedish eCall PSAP, SOS Alarm Sverige AB, there has since 2020 been work on adaptation to emergency communications through packet-switched technologies.

Additional information:

At the EU level Swedish stakeholders are participating in the Commission initiatives on Next Generation (NG) eCall.

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:

There are around 230 state owned rest areas along major roads[2] in Sweden, depending on how the road network and the ownership is defined. The number of commercial parking places is around 60 for the same road network.

135 or 59% of the state-owned rest areas are considered as suitable for truck parking and are provided at the national access point. The data are also published on the European Open Data portal for Truck Parking hosted by DG MOVE. There will be an inventory of all state-owned rest areas along the major road starting 2023, with new up-to-date data attributes regarding safety levels and truck

[2] The number of state owned rest areas is adjusted in relation to previous reporting depending on redefinition of road network concerned and ownership of rest areas.

parking capacity. Commercial truck parking facilities found suitable will, if possible, be included later on.

Percentage of parking places registered in the information service:

State owned rest areas and commercial installations found suitable would be included in the service.

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

An implementation of Priority zones is not foreseen hence only static data will be handled within the framework of the delegated act. Subsequently there will be no dynamic information on the availability of parking spaces.

Additional information:

The Swedish National Access Point (NAP) www.trafficdata.se also include data for priority action e (truck parking information) and the Swedish state-owned rest areas for the delegated act e is published on the European Access Point for Truck Parking hosted by DG MOVE.)

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.

Initiatives	Description
Drive Sweden https://www.drivesweden.net/en	Drive Sweden is a cross-functional collaboration platform that drives the development towards sustainable mobility solutions for people and goods. Members of Drive Sweden jointly develop and demonstrate efficient, connected and automated transport systems that are sustainable, safe and accessible for all. Drive Sweden is organised in thematic areas (among them “Digital infrastructure”) and projects (among them KRABAT in which traffic signals were connected to the cloud). Drive Sweden is managed by Lindholmen, Science Park, It is a Strategic Innovation Program financed by the Swedish government. Duration: 2017-2028 Currently approx. 140 members Costs: Will be specified per project during duration.
InfraSweden2030 https://www.infrasweden2030.se/english/	InfraSweden2030 makes open calls for innovation in transport infrastructure, approximately once per year. The programme also organizes seminars and workshops with industry experts to promote collaboration and innovation in the Swedish transport infrastructure sector. One focus area is connected transport infrastructure.

	InfraSweden2030 is a Strategic Innovation Program financed by the Swedish government. Duration: 2015-2030 Costs: Will be specified per project during duration.
Geofencing program https://closer.lindholmen.se/en/closer-projects/geofencing	A Swedish action plan for geofencing was released at the end of 2018. A research and innovation program for geofencing has been set up as a result of the action plan. CLOSER at Lindholmen Science park coordinates the program. A primary task for the program is to Support and pursue demonstration and pilot projects, but the program covers all aspects of geofencing: • legislation and regulations • organizational and digital processes as well as data for geofencing zones • systems, procedures and processes for self-regulating systems and control in • smart zones. • socioeconomic and business potential • national and international harmonization. Duration: 2019-2022 Approx. 20-25 active actors Costs: 2,9 Million SEK/year
NordicWay2 https://www.nordicway.net/	The objective of the NordicWay2-project is to test and demonstrate interoperability of C-ITS services both for passenger and freight traffic. Core of the project has been cellular communication and the use of an interchange-node. The following pilots have been implemented and tested: Emergency Vehicle Approaching, Road Works Warning, Dynamic access control of designated infrastructure, Dynamic environmental zones, Time to Green, Green Light Optimal Speed Advisory, and Traffic Signal Priority for designated vehicles. Duration: 2017-2020 Total budget approx. 6.5 million Euro 14 implementing bodies
Digital Winter	Digital winter is a project at Swedish Transport Administration with the objective to: • Create prerequisites for the implementation of digital road condition monitoring with vehicle-generated data. • Give the contractors possibility to develop production support tool using data from vehicles. This project is in the forefront of using vehicle-generated data (primarily slippery road data) from Volvo Cars, Nira Dynamics and RoadCloud to be able to increase productivity (save money) and increase road safety. Winter maintenance cost around 200 million Euro each year in Sweden, optimizing the maintenance will save a substantial amount of this money.

	Plans for expanding the project to detect needs and support also maintenance all year around by using vehicle-generated data. Duration: 2018-2022
GLAD	GLAD (Goods delivery during the last mile with self-driving vehicles) aims to develop a knowledge base on the efficiency, safety and experience of small autonomous electric delivery vehicles during the first and last mile. Interactions with e.g. pedestrians and cyclists will be in focus (RISE, 2021). Duration:2020-2022 Costs:11.7 Million SEK
Ride the future	Ride the future is a research project to test how self-driving buses can become part of the modern city's sustainable mobility solutions. Since 2020, two buses have been in use in Linköping. There are also other research projects linked to Ride the future such as KoDa and Linköping MaaS (Ride the future, 2021). Duration:2019-2021 Costs:11 Million SEK
5GCroCo	5GCroCo is a project within 5G-PPP and aims to test how 5G technologies can work when crossing national borders. Volvo Cars and Ericsson are part of the consortium for this and some of the small-scale tests are carried out at AstaZero in Borås. The large-scale tests take place on the border between Germany, France and Luxembourg (5GCroCo, 2021). Duration:2018-2021 Costs:170 Million SEK
HEADSTART	HEADSTART (Harmonized European Solutions for Testing Automated Road Transport) is an EU-funded project that aims to test and validate different functions for connected and automated driving. Some of the tests are performed at AstaZero (HEADSTART, 2021). Duration:2019-2021 Costs: 60 Million SEK

L3Pilot	L3Pilot is a European research project that aims to test the ability of autonomous driving to be used safely and effectively in the transportation system. The project uses 1000 drivers and 100 cars spread across Europe to test the systems whose functionality should be at level 3 on the SAE scale. L3Pilot has its final event in October 2021 (L3Pilot, 2021). Duration:2017-2021 Costs: 360 Million SEK
Planning for Autonomous Vehicles (PAV)	PAV (Planning for Autonomous Vehicles) aims to stimulate greater use of autonomous vehicles. One of their pilot projects is being carried out in Varberg where a self-driving bus will be deployed to reduce car traffic near the beach (PAV, 2021). Duration:2019-2022
Demonstration of self-driving carriers for summer road operation	Using autonomous vehicles for municipal road operations to identify opportunities and limitations of current technologies. Duration:2021-2022 Costs:3.2 Million SEK
Future 5G Ride	Enabling scaled-up, safe and efficient driving with driverless vehicles. The project consists of two steps where the first step aims to increase monitoring and communication between vehicles. The second stage aims to enable autonomous vehicles to cope with more traffic situations than before. Duration:2021-2025 Costs:15 Million SEK
AllDrive	Develop an autonomous vehicle system that can drive safely in critical weather conditions, such as on wet or icy roads. Duration:2022-2026 Costs: 46.8 Million SEK
iQDeep	Increase knowledge about artificial intelligence linked to autonomous heavy vehicles and increase safety for Scania's customers.

	Duration:2019-2022 Costs: 42.7 Million SEK
MIMO-PAD	Improve the ability of self-driving cars to position themselves, allowing the vehicle to better cope with demanding situations such as dense cities and bad weather. Duration:2019-2023 Costs:11.4 Million SEK
iDecide	Develop movement planning algorithms for how heavy autonomous vehicles should interact with other road users in an urban environment. Duration:2021-2024 Costs:11.5 Million SEK
H2020 - SHOWSHared automation Operating models for Worldwide adoption	Deploy autonomous vehicles that interact with urban traffic and public transport in various locations across Europe. In Sweden, demonstration sites are located in Gothenburg and Linköping. Duration:2020-2023 Costs:22.6 Million SEK
Major Projects and Program	
FR8RAIL II	FR8RAIL II – Digitalisering och automatisering av godståg har som huvudsyfte att utveckla funktionella krav för ökad prestanda och intelligens i exempelvis vagnparken och omkringliggande processer som via ökad automation leder till hållbar och attraktiv europeisk järnvägsfrakt. (CLOSER, 2021) FR8RAIL II - Digitalization and automation of freight trains has the main objective of developing functional requirements for increased performance and intelligence in e.g. the wagon fleet and surrounding processes that through increased automation lead to sustainable and attractive European rail freight (CLOSER, 2021).

	Duration:2018-2021 Costs:12.5Mkr
AVTCT	Automated road vehicle traffic control tower (AVTCT) är ett projekt som ingår i Drive Sweden och som syftar till att undersöka trafikeffekterna på automatiserade fordon och trafikledning av kommersiellt drivna bilpooler och kollektivtrafik. Projektet är just nu inne i fas 2. Automated road vehicle traffic control tower (AVTCT) is a Drive Sweden project that aims to investigate the traffic effects of automated vehicles and traffic management of commercially operated car pools and public transport. The project is currently in phase 2. Duration: 2019 – 2021 Costs:7.4 Million SEK
KRABAT	KRABAT is part of Drive Sweden and aims to run projects regarding self-driving, electric and shared vehicles in a system solution, which can drive Sweden towards a transition of the transport system. KRABAT comprises six sub-projects including S3 and Autopilot, some of which have already been completed (Drive Sweden, 2021).
S3 fas 2	S3 (Shared Shuttle Services) phase 2 is a project within KRABAT that ended on June 30, 2021. The aim was to continue the work on S3 by testing on a new route functions for driving without a host and increasing the speed of the bus (RISE, 2021). Duration:2019-2021 Costs:13 Million SEK
SCAT (Safety Case for Autonomous Trucks)	SCAT (Safety Case for Autonomous Trucks) is a project within Drive Sweden that aims to ensure safe handling of remote assisted trucks at higher speeds in a mixed traffic environment. Testing takes place at AstaZero and demonstration takes place at Lindholmen (RISE, 2021). Duration: 2020-2022
EVOLVE	Integrate autonomous transport from different actors to enable them to work together. Will be implemented at strategic and tactical level Duration: 2022

	Costs:4 Million SEK
PreMAT	Answer the question of how to ensure that an autonomous vehicle never leaves a predefined physical area and thus increase safety. Duration: 2022-2024 Costs:10.3Mkr

2.4.2 Progress since 2020

Description of the progress in the area since 2020:

Drive Sweden is a platform and a driver for developing cooperation between all stakeholders inside and outside Sweden to be able to establish an eco-system where the vehicle is connected to the transport infrastructure. The three vehicle manufacturers (Volvo Cars, AB Volvo and Scania), other commercial actors as Ericsson as well as academia and the public sector are active contributors within Drive Sweden. A key resource within Drive Sweden is the Innovation cloud developed by Ericsson.

Since 2017, we have learned a lot from the NordicWay2-project where basic functionality for C-ITS-services as the interchange-node and pilots of day 1- and day 1.5-services have been developed. Linked to the NordicWay2-project is our participation in C-ROADS and driving the hybrid communication approach within C-ROADS.

Volvo Cars and Scania are active partners in the High-Level Data Task Force to establish a common approach for data exchange focussing on vehicle-generated data for traffic safety related purposes.

The Swedish Transport Administration has been working to identify its role in the eco-system and an overall strategy to connect the vehicle with the transport infrastructure. Important building blocks are:

- Cellular communication is prioritized in Sweden; however, we have no objections on the implementation of hybrid solutions.
- Provide data in a harmonized and quality assured way.
- Collect only the data you need for streamlining the procedures, as well as processes of planning, traffic management and maintenance.
- Not compete with commercial service providers.
- Primarily reach travellers and vehicles via brokers, service providers and the vehicle back-end systems.
- Vehicle manufacturer and service providers are responsible for handling the information in a correct way.
- Real time data intended for vehicles and machines should be sensor generated.

An information exchange platform has been established within the Swedish Transport Administration, to ensure harmonized data exchange with all external actors. This platform together with the National Road Data Base will be fundamental resources when connecting the infrastructure with the vehicles.

Deployment of C-ITS-services in Sweden, linking the vehicle to the transport infrastructure, will be based on the above initiatives, all of them developed since 2017. We have an eco-system-view where different kind of actors can and will contribute to the deployment.

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:

Initiatives	Description
Investigate proposals for horizontal collaborations and open data for increased fill rates	The Swedish Transport Administration was commissioned the investigation in 2018. The investigation runs throughout the decided planning period 2018-2029. The aim is to develop proposals for systems for information exchange and open data for horizontal coordination in dialogue with the relevant stakeholders, as well as increased transport efficiency and reduced environmental impact through increased filling capacity.
Swedish ITS Strategy and action plan for ITS	Is updated 2017. www.trafikverket.se/its.
EU EIP and ITS corridors	Harmonised ITS deployment across the TEN-T and its Core Network Corridors to make mobility more safe, reliable and green, and to improve corridor performance, is the core mission of the CEF co-funded ITS Corridors – Arc Atlantique, Crocodile, MedTIS, NEXT-ITS and URSA MAJOR – and the EU ITS Platform (EU EIP). Sweden is involved in NEXT-ITS and EU EIP. EU EIP serves as a knowledge management centre by developing, providing, promoting and maintaining harmonisation tools and processes. This has a substantial value for National Road Authorities and road operators but also a potential substantial value for private actors as partners in the ITS value chain and network, for the European Commission in implementing and advancing ITS policy and regulation as well as for relevant stakeholders and multi-stakeholder collaborations in the ITS community. EU EIP have provided a substantial amount of various key achievements and can thus provide an arena instrumental for facilitating harmonisation and cross-border cooperation. The entire EU EIP results address all of the ITS Priority Areas I-IV (and, in doing so, have also relevance for the sections 2.1 to 2.4) and contribute

	also to the knowledge on KPIs related to ITS Corridors. More information is available on www.its-platform.eu. Specific Swedish priorities so far have been Expert groups, Automated driving, Deployment road map, C-ITS, National access points and Evaluation.

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).

3.1 Deployment KPIs

3.1.1 Information gathering infrastructures / equipment (road KPI)

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

The deployment KPIs are calculated for the TEN-T road network in Sweden with the length of 6395 km. KPI = (kilometres of road network type equipped with information gathering infrastructures / total kilometres of same road network type) x 100

KPI = (6070/6395)*100 = 94.9

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

KPI = (97354/98432)*100 = 98.9

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

KPI = (6070/6395)*100 = 94.9

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).

Road KPIs for incident detection are calculated for the road network in the following regions:

Region	Length of road network (km)
West	2442
Stockholm	1887
South	540
Total	4869

- 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):

  Length of road network (in km) equipped with ITS (MCS) to detect incident: 170 km
  Length of road network (in km) with mobile equipment to detect incident: 4869 km
  Total length of same road network: 4869 km

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

  Incident detection KPI for fixed equipment: (170/ 4869)*100 = 3,49%
  Incident detection KPI for mobile equipment: (4869/4869) *100 = 100

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).

Road KPIs Traffic management and traffic control measures are calculated for the road network in the following regions:

Region	Length of road network (km)
West	2442
Stockholm	1887
South	540
Total	4869

- 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):

Length of road network (in km) covered by traffic management and traffic control measures (MCS): 170 km

Length of road network (in km) with mobile equipment for traffic management and traffic control measures: 4869 km

Total length of same road network: 4869 km

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

Traffic management and traffic control measures KPI: (170/ 4869)*100= 3,49%

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).

The implementation of C-ITS services is still in an early piloting phase. KPI is not available at present.

- 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

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):

  The Swedish Transport Administration provides real-time traffic information on the national roads- and highways (98500km). The private actors have coverage where their customers travel and that can be for the whole road network.

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

  Real-time traffic information KPI = 100

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):

- Number of transport nodes (e.g. rail or bus stations) covered by dynamic travel information services & Total number of the same transport nodes:

  Number of transport nodes (railway stations) with dynamic signs for traffic information: 504
  Total number of number of transport nodes (railway stations): 574

- KPI = (kilometres of transport network type with provision of dynamic travel information services / total kilometres of same transport network type) x 100

- KPI = (number of transport nodes with provision of dynamic travel information services / total number of same transport nodes) x 100

  Number of transport nodes (railway stations) with dynamic signs for traffic information: approx. 88 %

3.1.7 Freight information (multimodal if possible or 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.

There are a limited number of dedicated freight services commonly available in Sweden. They cover the entire road network or a specific network such as TERN. In addition, there are locally provided services as an integrated part of different stakeholder's businesses. Development and deployment of cellular hybrid communications is expected to facilitate various priority services with freight relevance such as access management and capacity allocation. Geofencing (access management) can be enabled by digital distribution of traffic regulations. For freight services the most relevant regulations are speed limits and weight limit restrictions of roads. Static information is distributed in digital format to some extent today and ongoing work with geofencing aims to improve the quality and distribution format of this information so that it can be integrated into fleet management systems. Some heavy-goods vehicle manufacturers offer zone management or geofencing as a service so that the vehicles can act upon information to control access or speed in certain areas.

- 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):

- Number of freight nodes (e.g. ports, logistics platforms) covered by freight information services & Total number of the same freight nodes:

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

- KPI = (number of freight nodes with provision of freight information services / total number of same freight nodes) x 100

3.1.8 112 eCalls (road KPI)

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

3.2 Benefits KPIs

3.2.1 Change in travel time (road KPI)

Figures to be provided also include vehicle.km for the route / area considered

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

There are no travel time measures before/after specific ITS installations available. Changes in traffic congestion index depends on several of factors e.g., congestion taxes in Stockholm. Through the STRESS system, average travel times in our major cities can be calculated. The graphs and tables below show travel times and average speeds for Stockholm, Gothenburg, and the South region during the period 2020-2022.

Average travel times Gothenburg

Year	Average speed
2020	77.84
2021	76.64
2022	73.11

Average travel times Stockholm

Year	Average speed
2020	77.79
2021	74.70
2022	74.74

Average travel times South

Year	Average speed
2020	86.40
2021	84.19
2022	84.46

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

Results shall be provided / aggregated at national level to be representative enough. If possible, distinction can be made between accidents resulting in deaths, serious injuries or slight injuries.

Figures to be provided also include vehicle.km for the route / area considered.

Automatic Traffic Safety Control (Automatisk trafiksäkerhetskontroll, ATK). There are no before/after measures on installations of road safety cameras. During the period 2020-2022 the Swedish Transport Administration has established 471 places with Automatic Traffic Safety Control which together cover around 1 170 km of the road network, and in total 2504 cameras cover around 6 200 km of the road network. The 471 new cameras have saved lives of 5 people between the years 2020-2022 according to assessment by the Administration.

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

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

3.2.3 Change in traffic-CO2 emissions (road KPI)

Routes / areas where ITS has been implemented or improved should be specified. Length along / area within which the change in CO2 emissions is calculated should be long / wide enough to be representative.

A CO2 KPI on network level is not available. There is no direct general relation between ITS implementation and effect on CO2 emissions, since the effect will depend on several factors. The main issue is to find an adequate way to use existing ITS tools with other measures. However, values for CO2 affects from ATK and road-price scheme can be estimated, which is presented below.

CO2-effects from ATK	
2020	16000 ton
2021	15200 ton
2022	1300 ton

Starting from 2022, the Swedish Transport Administration has developed a significantly more precise method for calculating CO2 effects from ATK. The previous method overestimated the effects and therefore the data is now significantly lower.

During spring 2023 a general estimate of the effects of the congestion tax in both Stockholm and Gothenburg were made. At that time, we estimated the effect to be about 0.75% of national transport emissions. For 2022, the total national transport emissions were 12.4 million tons, which means that the congestion tax would have reduced emissions by an estimated 90,000 tons of CO2 emissions in 2022 (compared to if we had not had the congestion tax, so it should not be compared to 2021 but to 2022 in a scenario where we had not had a congestion tax).

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

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):

	Utfall 2021	Utfall 2022	Prognos 2023	Genomsnittlig budget/år
Namngivna väginvesteringar (NVAG, TRAS, TRAG, SPE)	9 305 000	9 973 000	7 342 605	8 873 535
Trimningsåtgärder, väg (SINV)	1 231 000	1 405 000	1 346 995	1 327 665
Regionala planer, väg (REGINV)	2 289 000	2 208 000	1 684 017	2 060 339
Totalt (tkr)	12 825 000	13 586 000	10 373 617	12 261 539

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

The reinvestment cost for ITS and ATK on the TEN-T road network for the period 2021-2023 is 43 653 SEK per kilometer (approximately 279 million SEK on average per year)

The maintenance cost for ITS and ATK on the TEN-T road network for the period 2021-2023 is 31 203 SEK per kilometer (approximately 199 million SEK on average per year)

Annual road ITS investments as a % of total road transport infrastructure investments: approx. 2%

End of report.