Directive 2010/40/EU
Progress Report 2020
Sweden

Date 2020-10-20

1 Introduction

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 2017 to the present. 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.

1.1 General overview of the national activities and projects

The Swedish Action plan for ITS has since 2017 had 10 focus areas. The actual work has been done within the areas under the leadership of one person per area. The Swedish Transport administration has been responsible for the overall coordination on behalf on the government. Every year, starting in 2018, a conference has been held where results have been presented. Over the years the action plan has been developed. October 2020 an evaluation report has been presented to the Government.

The Swedish national ITS regulation was amended in May 2019 mainly due to the delegated regulation (EU) 2017/1926 on multimodal travel information services. At the same time an amendment was made regarding the task of reporting according to Article 17(3) of the ITS Directive.

In spring 2019 an inquiry was made regarding necessary changes in national regulation due to the delegated act on C-ITS. As a change in national law was required it was not possible to await the process of objection in which the delegated act was stopped.

1.2 General progress since 2017

1.2.1 Progress on Priority Areas since 2017

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 2017. 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. ITS activities usually ends up in step two.

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

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 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, Gothenburg and Malmö, it is possible to obtain static and dynamic traffic and travel information for public transport authorities. Information on fare 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 amount of activities have since 2017 been finalized or are ongoing.

[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.

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.

One of the assignments based on the national freight strategy is the task (2018–2021), that the Swedish Transport Administration should intensify its work to promote intermodal rail transport. The purpose is to initiate and promote collaboration between the relevant actors to achieve a transfer of freight transport from road to rail. The work includes identifying and disseminating information and knowledge about innovative solutions and new technologies that can contribute to more intermodal freight transport, including rail.

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 supporting 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. Some 25 living labs are handled in the project and among those about eight living labs are Swedish initiatives. This approach is also much in line with some actions identified within the Swedish National freight strategy launched 2018.

Road safety and security applications

Sweden continues to expand the Automatic Traffic Safety Control (Automatisk trafiksäkerhetskontroll, ATK) on major roads without lane separation and at the end of 2019; around 5 000 km of the road network was covered.

The Swedish automotive industry is working intensively on developing 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. In 2016, the Swedish Government decided on a new start to Vision Zero and in 2019 the Vision Zero Academy was established by the Swedish Transport Administration with the purpose to spread knowledge about Vision Zero and support and collaborate with different stakeholders around the world. Sweden hosted the 3rd Global Ministerial Conference on Road Safety in 2020 with the

theme Achieving global goals in 2030. The Stockholm Declaration is the outcome of this conference and connects road safety to the implementation of the 2030 Agenda for Sustainable Development. The United Nations General Assembly has then adopted the resolution to improve global road safety and endorsed the Stockholm Declaration.

A Geofencing research and innovation programme started 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 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 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, there is learnt a lot from the NordicWay2-project. 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 is continuously working to identify its role in the eco-system and an overall strategy to link the vehicle with the transport infrastructure.

1.2.2 Major ITS Projects

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.

A national roadmap for combined mobility. A national roadmap for combined mobility as a service in Sweden was published in May 2017. The roadmap is hosted by Swedish Transport Administration, Vinnova, Swedish Energy Agency and Samtrafiken. In the work of revising the roadmap the collaboration between the hosting organisations have resulted in a roadmap that can serve as a coordinating tool for each organisation's activities in the area of Combined Mobility as a Service. The Roadmap consists of five different activity areas: 1. Business & digital infrastructure 2. Legislation, policy & physical infrastructure 3. Pilots & Implementations 4. Effects & consequences 5. Process management & establishment of collaboration platform.

Digital Winter. The Swedish Transport Administration project is a continuation of the RSI (Road Status Information) project from 2017. 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. This project is in the forefront of using vehicle-generated data (primarily slippery road data) from Volvo Cars, Nira Dynamics and RoadCloud with the aim 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 is an ITS deployment cross-border cooperation project. It is a CEF funded project for deployment in relation to the core network corridors. NEXT-ITS 3 is one of the so called ITS corridor projects. It is a cooperation between partners in the Nordic countries and in northern Germany. The regional ITS deployment cooperation that is the basis for the project has been operational for over twenty years. This regional cooperation is the facilitator for cooperation between national administrations when setting up other projects with industrial participation like NordicWay. The potential for cross-border cooperation and harmonisation is an important contribution from administrations in that context. NEXT-ITS 3 is also the basis for partner's cooperation in relation to the European ITS platform EU EIP.

NordicWay 2 and NordicWay 3 are C-ITS pilot projects that enable vehicles, infrastructure and network operators to communicate safety hazards and other road information in the Nordic countries between different stakeholders. The projects are a collaboration between public and private partners in Finland, Norway, Sweden and Denmark and build on the achievements from the previous NordicWay project.

FEDeRATED. The Swedish Transport Administration and the Swedish Maritime Administration as beneficiaries are 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 the activity to establish tangible results in the form of "Living labs". Around twenty (20) living labs is started through the project.

Shift2Rail. The initiative is based on digitalisation enabling various levels of automation and intelligence in the rail system. Multimodality is an important field where also ITS solutions/applications are developed. One subproject is about *intelligent video gates* (IVG) capturing data with help of optics and RFID enabling better information sharing and operational planning in e.g. intermodal terminals. The Swedish Transport Administration is one of the founding members of Shift2Rail.

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).

DriveMe. In 2014–2018, the project had the goal to put self-driving Volvo cars on public roads in Gothenburg. Although this goal was not met during the timeframe, the project resulted in a number of learnings, specifically regarding how to ensure safety when deploying autonomous vehicles (AV:s), but also regarding the effects on capacity.

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 travel and traffic data, free of charge, to service providers at national and regional levels through various channels.

On a national level 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 because of new Regulations 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 hackathons and arranges working meetings with transit service providers three-to-four times a year.
- From the regional access points in Stockholm, Gothenburg and Malmö, it is possible to obtain static and dynamic traffic and travel information for public transport authorities.
- Information on fare products is still highly desired by service providers who wish to develop ticketing functionality in addition to their other transport information services. Several different initiatives and investigations have looked deeper into this issue.
- 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 is obtained 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 entrepreneurs 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

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. This access point is used by smaller national actors because of its easy-to-use interface. Since the last report, also traffic flow data and position of road safety cameras (speed cameras) is available from the interface. A new data feed is developed for provision of dynamic data to Waze and Google maps.

	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 been possible to get 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 per year 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.
National project about open travel and traffic data with focus on public transport actors	This national project will promote the development and growth of combined mobility services in Sweden, and also providing conditions for public transport authorities and traffic operators to comply with the current EU regulation 2017/1926. The project of open travel and traffic data identifies a number of different types of data that are especially important to make available for third-party developers to develop new and smart combined mobility services. Implementation: 2018–2021 Costs: 28 Million SEK
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: 5,5 Million SEK yearly
EU EIP (European ITS Platform)	Sweden participates in EU EIP, through the Swedish Transport Administration, as an active member of the work in the sub-activity 4.6 "Monitoring & Harmonisation of National Access Points in Europe". The objectives of the sub-activity are to: • Monitor development of National Access Point (NAP) across Europe, identify improvement needs, and make recommendations. • Harmonise the approach towards NAPs in Europe, in particular in the field of Metadata in the scope of ITS specifications. • Knowledge exchange between the various MS in the field of NAPs. Duration: 2016–2020 Costs: 0,1 Million SEK per year
TISA (Travel Information Service Association)	The Swedish Transport Administration is participating in the TISA work on open Traffic and Traveller Information (TTI) standards and policies and the implementation of traffic and travel information services and products based on existing standards, including primarily RDS-TMC and TPEG technologies. The Transport Administration has been involved in three working groups: 1) ITS Directive; 2) public authorities; and, 3) business cases. Duration: 2007–2019 Costs: 100 000 SEK per year
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: 2018–2021 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. 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 Open Data scene. Duration: 2011 →

	Costs: 3 Million SEK/ yearly maintenance costs.
Government initiated work on Mobility as a Service	The Swedish Transport Administration work focusing on Mobility as a Service. One of the sub-activities was to investigate the possibility of a national access point with harmonized technical and business conditions, to enable third-party ticket sales and other combined mobility services. Duration: August 2019–March 2020 Costs: 1 Million SEK
KODA (Data Lab for public transport)	KODA is a development of the national platform for open traffic data, Trafiklab. The purpose and goal with this project is to move From providing APIs for snapshot of open data to an arena where quality-assured, 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
A national roadmap for combined mobility	A national roadmap for combined mobility as a service in Sweden was published in May 2017. The plan is for the roadmap to be revised and evaluated on an annual basis. The roadmap's host organisations, which also make up the roadmap's steering group, the Swedish Energy Agency, Samtrafiken, the Swedish Public Transport Association, the Swedish Transport Administration and Vinnova, have contributed actively to the task of revising the roadmap, so that it can serve as a coordinating tool for each organisation's work in the area of Combined Mobility as a Service. The Roadmap consist of five different activity areas 1. Business & digital infrastructure 2. Legislation, policy & physical infrastructure 3. Pilots & Implementations 4. Effects & consequences 5. Process management & establishment of collaboration platform Duration: 2017–2020 (Probably continuation 2021 →) Costs: 45 Million SEK
High Level Data Task Force	The Data Task Force 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 from almost the start 2018, but due to possible conflicts with the Swedish "Public Access to Information and Secrecy Act", Sweden has not been part of the current PoC (Proof of Concept). Despite of that, we agree to the general concept for data exchange established by the Data Task Force.

	Duration: May 2018–October 2020 Costs: 0,3 Million SEK
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. 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. 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 traffic signal data from authorities and municipalities. Several Swedish cities have conducted local projects to exchange data from traffic signals to vehicles and from vehicles to traffic signals. The Swedish Transport Administration has an ongoing dialogue with road operators and the vehicle industry to evaluate, test and develop solutions for exchanging data from and to vehicles and traffic signals. There are ongoing activities among road operators. The ambition is to clarify if a possible broad implementation could be carried out. Duration: 2016–2023 Costs: 1 Million SEK
Government assignment on a national ticket and payment system for all public transport in Sweden	An initiative to identify requirements for implementing a national ticketing system for all public transport throughout Sweden. The objective with this investigation analysis was for instance to: • Analyse the needs and obstacles associated with buying public transport tickets throughout whole Sweden • Mapping and analysing existing and ongoing initiatives in the area of public transport in Sweden regarding tickets • Define which traffic should be covered by a national ticketing system. • Suggest actions and time plan for the development of a national ticketing system for all public transport. • Mobility as a service was a specific focus in the analysis. • Submit the necessary constitutional proposals.

	Duration: August 2019–April 2020 Costs: 2,8 Million SEK
The National Road Database (NVDB)	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 and administrative and technical information on roads. 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 look 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 is 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. 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 Costs: Not available, the activity is part of a larger project

2.1.2 Progress since 2017

Se above, section 2.1.1.

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

The Swedish Transport Administration is appointed to provide and maintain a National Access Point (NAP) for this delegated regulation, according to the Swedish Regulation (2016:383) on Intelligent Transport Systems, complement to the existing national ITS law (2013:315).

In 2017, a National Access Point was launched at www.trafficdata.se for the previous delegated acts b, c and e. This national access point is modified to also cover the delegated regulation EU 2017/1926, since 18 of November 2019.

The Swedish national access point is a web portal with a discovery service. Organizations interested in exchange and reuse of data will find information about available services at the National Access Point. There will be links to organizations delivering data and the transport network their delivery covers.

The quality criteria's 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 with data and can be seen as a minimum data quality level.

A joint task has started together with the Swedish Transport Agency (National Body) to list all public and private actors who are affected from this regulation within the Swedish territory. Other planned activity is a communications task, to get all of these organizations to publish static data on the national access point. Information efforts have been specifically targeted towards the private and public transport companies.

A national project, initiated by the public and private transport actors, was set up in the beginning of 2018 to meet the requirements in the delegated regulation EU 2017/1926. This national database for public transport related data was established, and collection of both static and dynamic data is ongoing. *(Approx. 90 % of the total volume of static and dynamic public transport data is collected so far, including approx. 70 % of all dynamic data).*

The collected data is currently published in GTFS and NeTEx format for static data and in GTFS-RT for dynamic data. Implementation of the SIRI format is planned.

Collection of static traffic and travel data (level 1) from almost all public transport authorities is completed and collection of level 2 data is started and ongoing.

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.

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

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

The Swedish National Access Point (NAP) has been operational since 8 May 2017 and is adapted for all delegated acts under the ITS directive where a NAP is a required. It include services as:

- Discovery services for users.
- Possibility to publish and search datasets.
- Possibility to publish datasets for the entire transport network in Sweden.
- Support service.

All Swedish motorways are included in the comprehensive Trans-European Road Network except for a few shorter sections around the Stockholm area, on route 44 and on E 16.

No priority zones are designated in Sweden.

The following data types concerning DR 2015/962 have been listed in the Swedish NAP by the data providers:

Static road data

- Geometry
- Road width
- Number of lanes
- 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

Dynamic road status data

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

Traffic data

- Traffic volume
- Speed
- Locations of queues
- Travel times
- Traffic data at border crossings to third countries
- Expected delays
- Estimated travel times

- Waiting time at border crossings to non-EU Member States

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.

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

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

Identification of the road network and where the service will be provided on the network has been decided. It will cover the whole comprehensive TEN-T 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.

There has been no new assessment of compliance since 2017.

On 8 May 2017, the Swedish Transport administration launched the Swedish National Access Point (NAP) 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.

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 and reduced visibility.

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

2.2.1 Description of the national activities and projects

The majority of traffic and freight management implementations of new technology can be attributed to the ITS - area. Digitalization of the transport system also 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 investment.

Project/activities	Description
Traffic Management System (NTS)	The Swedish Transport Administration in cooperation with Norwegian Road Administration is developing a new Traffic Management System (NTS). The main purpose is to modernize the traffic management and information system for road traffic management in their respective countries. Duration: 2018–2019 Costs: 135 Million SEK
DTLF (Digital Transport and Logistics Forum) phase II	Sweden is participating in the work with the Digital Transport and Logistics Forum via Swedish Transport Administration, Swedish Maritime Administration, Swedish Transport Agency and several other Swedish partners (e.g. Ericsson, Research Institutes of Sweden (RISE), Lindholmen Science Park and Chalmers). The DTLF forum aims to improve the capability between various stakeholders of using digitalization as an enabler for efficient and seamless transport within the field of freight. DTLF first mandate was ending in 2018 with two 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 phase II (2018–2023). Duration: 2018–2023 Costs: 2,3 Million SEK
HCT (High Capacity Transport)	The main freight initiative in Sweden is 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 has 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 MCS at E4/E20 in Stockholm to increase its functionality. This activity is part of a project aiming to replace the current MCS in a part of Stockholm with a new system called LASSY developed by the Swedish Transport Administration. 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 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 (Fordonsstrategisk forskning och innovation/Strategic Vehicle Research and Innovation)	The Swedish Government and industry are investing in a long-term partnership within FFI. 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
Sub-urban logistics – more efficient use of infrastructure	A pre-study (2015- 2016) showed that existing roads could be used in a better way by letting certain types of freight traffic have access to priority lanes. With vehicles that are connected, traffic could be guided into specific traffic lanes depending on the traffic situation and if the vehicle meets certain requirements. The follow-up project (2016 - 2018), involves deeper analysis of the results that emerged from the pre-study from the perspective of feasibility and sustainability, as well as verifying the environmental and business benefits of more efficient approach and bypass logistics. The project's next stage also includes investigation of the practical possibilities of implementing a full-scale demonstration of the proposals for the solutions that were identified in the pre-study. The partners are the following: DB Schenker, CLOSER, Chalmers University of Technology, The Royal Institute of Technology Stockholm, the Swedish Transport Administration, Region Västra Götaland the cities of Gothenburg and Stockholm and Mindconnect. Duration: 2016–2018 Costs: Approx. 3,75 Million SEK

Smart Urban Traffic Zones	Traffic zones enabling safer and environmental friendly living in the cities. Duration 2019– Costs: Approx. 1 Million SEK
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
DIGILOG (Swedish round table group with + 40 members)	Digitalization of freight transport chains aims to streamline freight transport by digitizing the transport chains to increase transparency, which is important in multimodal transports not the least. This group shares knowledge and initiates projects and research in the field of ITS etc. Duration: 2018– Costs: In-kind contributions from members
Intelligent video gates (IVG)	RFID and optical solutions capturing data in the gates of intermodal terminals enabling data sharing and better operational processes with the use of IOL (internet of logistics) principles. The activity belongs to the Shift2Rail programme. Duration: 2016–2022 Costs: 8 Million SEK
Multimodal information chains (MMID/MMIS)	Use cases in supply chain showing a higher grade of visibility throughout the entire chain of deliveries. The project is a development inside the PortCDM and STM (Sea Traffic Management) approach. Duration: 2018–2020 with continuation 2020–2022. Costs: Approx. 5 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: 2,75 Million SEK
Improved disruption information in the Stockholm region	Increased ability to inform about traffic disruptions. Preliminary studies and investigations are ongoing. Trafik Stockholm, Swedish Transport Administration, the City of Stockholm. 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. Swedish Transport Administration Duration: 2018–
Project AV Traffic Control Tower (AVTCT)	Concept for fleet management and remote control of vehicles. Technical tests are ongoing. Integrated Transport Research Lab (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. The Royal Institute of Technology Stockholm (KTH), Linköping University (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 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 is currently analysing results. Swedish National Road and Transport Research Institute (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 automated vehicles. Project 1 completed, Project 2 just started. KTH, LiU, Centre for Traffic Research (CTR), Swedish 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. Stockholm Air and Noise Analysis (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 (EVA)	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 Duration: 2017–
High Level Data Task Force	Establishing agreed Data exchange concept between Vehicle Manufacturers-Service Providers-Road Holders for Road Safety Applications. PoC (Proof of Concept) for vehicle-generated data June-19–June-20. Volvo Cars, Scania, Here, TomTom, Nira Duration: 2017–2020
CEDR CAD working group (Connected Autonomous Driving)	Task forces on Infrastructure, Transport system impact and Data. Related to High Level Data Task Force. Swedish Transport Administration
NordicWay2	Access control/geofencing. Emergency vehicles on the road. Traffic signals connection. Hazardous Location Warning. Duration: 2018–2020

NordicWay3	Implement 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. Swedish Transport Administration Duration: 2020–2023
Socrates2	EU project containing many participants and 4 test sites in Europe to show different models for collaboration between road users and service providers with the aim of harmonizing traffic information with traffic control. No Swedish active participation, but Swedish Transport Administration has a collaboration with Socarets2 via project Collaborative traffic management. Duration: 2017–2020
Traffic Management 2.0 (TM2.0)	Collaboration platform in Europe to develop a more interactive traffic management and collaboration between all stakeholders. Relates to Collaborative Traffic Management and Socrates2. Swedish Transport Administration Duration: 2014–

2.2.2 Progress since 2017

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

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 Costs:
V2Cyclist	The project aims to promote road safety, mobility and the attractiveness of cycling as a mode of transport in future connected traffic environments. A technical infrastructure has been developed to convey

	information from vehicle to cyclist through V2X communication. In addition, it has an alternative technical infrastructure, which is based on a cloud solution, adapted for transferring information to the cyclist. The project consortium consisted of RISE, POC, Scania, Volvo Cars, Swedish Cycling and Kapsch. Duration: 2017–2018 Costs: 3 million SEK
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) have 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).

2.3.2 Progress since 2017

See Section 1.2.1 General progress.

2.3.3 112 eCall (priority action d)

Since 2017, there have been no new activities. There have been no changes in the infrastructure for eCall. There are possible upcoming activities due to frequency changes.

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)

A study has been conducted on state owned rest areas suitable to be included in the information service. However, on several of those locations truck parking is provided as parking lanes with no fixed parking spaces. Hence, there are not a fixed number of parking spaces.

A study on which commercial installations that could be included have been carried out in a first step. Further analysis are foreseen.

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

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.

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

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
DriveMe	DriveMe had the goal to put self-driving Volvo cars on public roads in Gothenburg. Although this goal was not met during the timeframe, the project resulted in a number of learnings, specifically regarding how to ensure safety when deploying autonomous vehicles (AV:s), but also regarding the effects on capacity. The project was a joint initiative of Volvo Cars, the Swedish Transport Administration, Lindholmen Science Park and the City of Gothenburg. Drive Me was supported by the Swedish government. Duration: 2014–2018 Budget: 12 Million Euro
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

2.4.2 Progress since 2017

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 leading 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, when connecting the infrastructure with the vehicles, 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:

Initiatives	Description
Develop 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. Sweden is an "active" participant in the related project activities. Sweden is also leading the Deployment roadmap sub-activity and is a member of the JTS (Joint Technical Secretariat). Thus also actively participating in the strategic analysis of the future role for the platform. EU EIP activities are mirrored and discussed within the NEXT-ITS 3 (ITS corridor project) organisation. EU EIP deliverables such as the Reference Handbook are communicated and assessed within the STA (Swedish Transport Administration).

2.5.2 Progress since 2017

3 Key Performance Indicators (KPIs)

3.1 Deployment KPIs

3.1.1 Information gathering infrastructures / equipment (road KPI)

Figures to be provided by type of network / zone.

Figures to distinguish fixed and mobile equipment.

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

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

  The deployment KPIs are reported for the comprehensive TEN-T road network in Sweden with the length of 6 409 km.

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

Road weather KPI[2] = 100
Traffic volume services KPI = 100

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	1 915
Stockholm	1 847
South	458
Total	4220

- 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: 138,2 km
  Length of road network (in km) with mobile equipment to detect incident: 4 220 km
  Total length of same road network: 4 220 km

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

  Incident detection KPI for fixed equipment: 3
  Incident detection KPI for mobile equipment: 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	1 915
Stockholm	1 847
South	458
Total	4 220

- 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):

[2] The road weather Information is gathered from road weather information systems, the Swedish Meteorological and Hydrological Institute and from contractors.

Length of road network (in km) covered by traffic management and traffic control measures (MCS): 138,2 km

Length of road network (in km) with mobile equipment for traffic management and traffic control measures: 4 220 km

Total length of same road network: 4 220 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: 3

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 (17 354 km). 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: 479
  Total number of number of transport nodes (railway stations): 519

  By 2022, all of the railway stations will be equipped with dynamic signs for traffic information.

- 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. 92 %

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 stakeholders 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, weight limit and height restrictions of roads. This static information is distributed in digital format to some extent today and ongoing work with geofencing aims to improve the quality of this information and facilitate that heavy-goods vehicles and fleet management functions can act upon this information to control access to or control 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 factors e.g., congestion taxes in Stockholm. The higher the index value is, the more traffic congestion.

Traffic congestion index	2017	2018	2019
Stockholm	86	82	85
Gothenburg	94	91	920
Malmö	101	103	102

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. Since 2017, the Swedish Transport Administration has established 587 places with Automatic Traffic Safety Control which together cover around 1 460 Km of the road network, and in total around 5 000 km of the road network is covered. The 587 new cameras have saved lives of 9 people between the years 2017–2019 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. (Individual projects can be assessed.) There is no general relation between ITS implementation and effect on CO2 emissions. The effect will depend on how traffic volume and overall vehicle mileage is affected. It is also dependant on perspective in terms of area studied (for example city-centre and region). The main issue is how to use potential and existing tools in the ITS toolbox together with other measures. If a road-pricing scheme is in operation, changes in price levels will most likely have greater effect than improvement of the system as such. Assessments are made based on calculations of a socioeconomics models for CO2 emissions. During 2017–2019, the carbon dioxide emissions are estimated to have decreased thanks to ATK by 46 000 tonnes. The large improvement from the previous period (2014–2017) depends on increased installations of road safety cameras.

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

3.3.1 Investments

Common ITS investment measures are such as e.g. Motorway Control Systems, Tunnel control systems, Variable Message Signs, Variable speed limits, Cameras for speed control, Cameras for monitoring, Travel time detection, Weigh In Motion etc.

Annual investments in road infrastructure 2018-2019 in (SEK) and prognosis for 2020:

	Result	Result	Prognosis
Million SEK (MSEK)	2018	2019	2020
Total budget for road transport infrastructure investments	10 794	11 742	11 626
Road ITS investments	172	148	295
% of total road transport infrastructure investments	2%	1%	3%

Average investments for 2018-2019 and prognosis for 2020: 11 387 Million SEK per year

Annual investments in ITS for 2018-2019 and prognosis for 2020: 205 Million SEK per year

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

3.3.2 Operating & maintenance costs per Km network covered

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

Reinvestment costs for ITS equipment and ATK for the period 2018–2020: 26 252 SEK/km (170 Million SEK per year)

Maintenance costs of road ITS (electricity/telephone costs, preventive and supportive maintenance) for ITS equipment and ATK for the period 2018–2020: 28 085 SEK/km (180 Million SEK per year)

End of report.