Directive 2010/40/EU
Progress Report 2023
DENMARK

8 December 2023

1 Introduction

1.1 General overview of the national activities and projects

Please see section 1.2.

1.2 General progress since 2020

The Danish Road Directorate (DRD) is engaged in many initiatives to improve the optimal use of road, traffic and travel data. These activities contribute to fulfilment of priority area I of the ITS Directive. The ITS Directive was recently revised. Please note that the progress report for 2023 apply to the non-revised version of the Directive.

The Real-Time Traffic data and Floating Car Data Initiative strengthens DRDs ability to collect real-time traffic data, especially by making use of Floating Car Data (FCD). By 2020, DRD implemented a new process for the acquisition of data with the help of a new data broker. As the contract expires in 2024, we started the tendering process based on market dialogue input to ensure the best possible fit with DRDs requirements in order for us to secure high-quality traffic data for the years to come, supporting various aspects of transportation planning and traffic management.

The Weigh-in-Motion (WIM) Project initiated in 2021 serves the purpose of assisting Danish Police in identifying vehicles above the maximum weight limit, while also complying with the EU rules on maximum permissible vehicle mass. Six existing WIM stations were improved for better performance and accuracy. Furthermore, three new stations were established, and yet another station is currently being built. The future expansion of a motorway also includes establishing WIM stations near Hedensted on the E45 motorway.

Transformation Project for Traffic Signals was started in 2021. The overall aim is to create a uniform IT structure and align platforms between different vendors to improve IT security and the execution of program changes, also enabling vehicle priority based on central data exchange and preparation for future C-ITS extensions. The project is based on a new procurement strategy, separating the delivery of new traffic signals into deliveries of the single components. The tender for the components has been carried out in 2021, 2022 and the roll-out of tenders continue in 2023 and 2024 as the project progresses.

Tasks performed by the municipalities also contribute to the optimal use of road, traffic and travel data:

Aarhus Municipality uses a Bluetooth solution to monitor accessibility for creating a congestion index as a measure for the development in the level of service, and they use travel time data to assess the need for and the effect of changes made regarding traffic signal systems. They also aim to make the best use of infrastructure by providing information for drivers on dynamic signs, supporting informed decision making on choice of route.

Aalborg Municipality is in the process of creating an overview of available data, including data quality and format to prepare for making them available via the Danish National Access Point (NAP).

Several advances on the provision of EU-wide multimodal travel information services, cf. Delegated Regulation /EU) 2017/1926 (priority action a), has been made by supplying data to the NAP. Data covers spatial data and data on public transportation, e.g., timetables and accessibility covering all trains, national and international, including metro and light rails, as well as all regional and local busses, plus 40 % of ferry services.

DRD is responsible for the technical platform of the NAP, where a new version was launched in 2021, and the Danish Civil Aviation and Railway Authority (DCARA) is the competent authority for data providers and data users of Multi-Modal Travel Information Services (MMTIS). DCARA is planning for the review of data before new sets are provided. In 2023 it was decided that DCARA will take over the overall role as national body for ITS in 2024. One of its tasks will be to carry out a full data assessment.

The Danish Journey Planner is the national Passenger Information Profile, from where data is transferred to the NAP on a daily basis.

Regarding data and procedure for the provision, where possible, of road safety-related minimum universal traffic information free of charge to users (priority action c), cf. the reporting obligation under Delegated Regulation (EU) No. 886/2013:

DRD has operated the Danish Traffic Management Centre for many years, collecting, processing, and distributing traffic information on the state road network, both safety related and real-time. For distributing this traffic information DRD uses the NAP (https://du.vd.dk). The NAP cashes data so that users (service providers) can subscribe to changes and receive them in near real-time (using AMQP). Still more users find and uses this information in real life services. The NAP has been made with many useful functionalities both to support correct registration of metadata and supporting good data governance. DRD plans to continue the development of the NAP.

On 8 May 2023 TRACÈ was put into use, a renewal of the main traffic management system supporting the National Traffic Management Centre. This allows for a faster release of information on safety-related incidents, as well as making it easier for DRD to implement new workflows, data sources and data standards. Furthermore, TRACÈ accepts only standard compliant DATEX II messages, discarding the cumbersome messages with different syntax and semantics. The support for the standard extends to the digital solution OTMAN, where municipalities send information on roadworks and other events that interrupt traffic, which is then distributed on the NAP and the traffic website Trafikinfo.dk. Adding to the streamlining of workflows is the development of Power BI reports that present and visualize data from TRACÉ.

Furthermore, Denmark is involved in working groups under NAPCORE to support the harmonization of the national NAPs. This work has been very useful in learning from other countries' experiences on the building of the NAP. We look forward to the clarification of guidelines from NAPCORE WG5 harmonising the performance and frequency of the random inspections for compliance assessment for the reporting requirements for operators and service providers set out in article 3 and 8 of the Act.

On Priority area II, Continuity of traffic and freight management ITS services, the NEXT-ITS 3 project has enabled Northern European countries to carry out large ITS projects efficiently and to ensure exchange of knowledge among the countries. The aim of NEXT-ITS has been to enhance corridor and network safety and performance by deployment of ITS services that ensure interoperability and continuity of services, support harmonisation, and increase the cost-efficiency in the operation of traffic management. The primary achievements in Denmark were:

- Development and deployments in the national Traffic Management Centre in Denmark
- Improved incident and emergency handling on motorways
- Evaluation tool for consolidated, global assessment of impacts and benefits, NEXT-ITS 3 in common with Denmark as lead.

Progress on Priority area II also includes the Recharge City Project. Recharge City is a private organisation providing parking and electrical charging for trucks of variable length and private cars, as well as facilities for all drivers. Once installed, information on available parking spaces will be shown on variable message signs.

On priority area III, ITS road safety and security applications, Revision of the eCall standards is ongoing to adapt to the use of eCall systems on modern 4G/5G telecommunications networks before the phasing out of the 2G/3G currently used. To produce the update, Greater Copenhagen Fire Department (DK: Hovedstadens Beredskab), the Danish Public Safety Answering Point (PSAP) must be able to receive and handle eCalls via 4G/5G from 1 January 2026.

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):

DRD has 91 rest areas along the roads of the Trans-European Transport Network, TEN-T. This information is available on the NAP. None of these are certified as safe and secure parking facilities. A few privately owned truck parking facilities located close to the TEN-T are certified as safe and secure.

Regarding Priority area IV, Linking the vehicle with the transport infrastructure, Denmark is part of the NordicWay 3 Project on enabling vehicles, infrastructure and network operators to communicate safety hazards and other information from roads in the Nordic countries between different stakeholders. While Denmark does not have a pilot of our own, we have verified that the concepts from other partners are easily transferable to Danish environments.

Besides the abovementioned, other initiatives/highlights deserve mention:

Legislation on licenses to test automated vehicles on public roads up to SAE level 4, passed in 2017, is currently in political process after an evaluation in 2023. Since 2020, four tests were conducted on one license granted.

Denmark is a member of the CCAM Association. The CCAM Association partnered with the European Commission to form the CCAM Partnership, which works to improve road safety, ensure mobility and

access to goods to increase the competitiveness of the European industry, at the same time reducing the environmental impact of road transport and building knowledge. Denmark is an Associated Partner of the MODI project under the CCAM Partnership. This means that we will follow the outcome of the project, especially the readiness of the physical and digital infrastructure.

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

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:

In 2023, the National Traffic Management Centre ended a project initiated in 2021 when a new traffic management system went into operation. The new system has several improvements on the provision of safety-related traffic information and real-time traffic information and is described in more detail in paragraph 2.1.5 below. Furthermore, progress on three initiatives, Real-Time Traffic Data and Floating Car Data Initiatives, Weigh-in-Motion as well as Transformation project for Traffic Signals are described below.

2.1.2 Progress since 2020

Real-Time Traffic Data and Floating Car Data Initiatives

The Danish Road Directorate (DRD) has been actively engaged in enhancing its capabilities in real-time traffic data acquisition, specifically through the utilization of Floating Car Data (FCD). This status update provides an overview of the key initiatives undertaken by DRD in this domain.

Acquisition of Real-Time Traffic Data (2019-2020)

In 2019, DRD signed a contract with a new data broker for the acquisition of real-time traffic data / FCD. The implementation process was successfully completed in the spring of 2020.

Upcoming Contract (2024 and beyond)

The current contract for FCD is set to expire in 2024. To ensure a seamless transition and to facilitate the selection of the most suitable data broker or supplier, DRD has initiated a new tendering process. This involves formulating a tendering strategy based on market dialogue input.

Market Dialogue and Tendering Process

DRD has actively engaged with the market, conducting a market dialogue to gather input and feedback from potential data brokers and suppliers. This engagement helps ensure alignment with the organization's specific needs. The next phases will involve the preparation of comprehensive tender documentation, publication of the tender, proposal submission, evaluation, contract award, and contract execution.

Benefits and Goals

These initiatives aim to secure high-quality traffic data for several years, supporting various aspects of transportation planning and traffic management.

The upcoming tendering process reflects the organization's dedication in selecting the best and most competitive data broker or supplier for the future needs.

Weigh-in-Motion Project

The primary objective of the project is to establish a number of new Weigh-in-Motion (WIM) stations strategically located across the country and upgrade several existing WIM stations. This is serving two main purposes:

1. Combatting Overloaded Vehicle Operations: The WIM stations serve as a tool (for the Danish National Police) to identify vehicles exceeding permissible weight limits, thereby enhancing efforts to combat overloaded vehicle operations on the roads.
2. Compliance with EU Legislation: The project ensures Denmark's adherence to the prevailing EU requirements in this area.

Status

The project was initiated in 2021 and is currently in the execution phase. The following represents the current status of the project:

- Upgrading existing WIM-stations: In the initial phase, six existing WIM-stations were upgraded to enhance their performance and accuracy.
- New WIM-stations: The first phase of establishing three new WIM-stations has been completed. These stations are located in Køge, Middelfart, and at the Øresund Bridge.
- Ongoing Phase (2023): This phase includes the establishment of a new WIM-station in Aarup on the island of Funen. Furthermore, this phase includes delivery of both a web based and a mobile app-based user platform for the personnel of the Danish National Police.
- Future Phases: Additional phases are planned, pending the completion of motorway expansion projects in the coming years. These phases include the establishment of new WIM-stations near Hedensted on the E45 motorway.

Transformation project for Traffic Signals (DK: Fremtidens Trafiksignaler)

Since 2021, the DRD has been running an IT transformation project for Traffic Signals. The project has been named ‘Fremtidens Trafiksignaler’ (in English: Traffic Signals of the Future). The purpose of the project is overall to establish a whole new IT infrastructure and services around Traffic Signals with the following purposes and benefits:

- Create a uniform IT structure and platforms across vendors
- Centralize traffic data from Traffic Signals
- Better programming

- Easier execution of program changes
- Improved IT security
- Vehicle priority based on central data exchange
- Preparation for future extensions (C-ITS)
- Better central surveillance and control

The implementation of the projects is based on a new procurement strategy, that splits the current turnkey signaling projects into multiple deliveries with Traffic Signal Controllers (TSC), separate logic programming, central system (SCADA) and IT network to avoid vendor lock-in. The new procurement strategy is implementing requirements into forthcoming tenders and accelerate the renewal of the portfolio for Traffic Signal Controllers.

A major element of the project is the implementation of the OCIT protocol for communication between central system and TSCs in the field. For programming logic, the DRD has chosen the LISA software from Schlothauer & Wauer to develop and deploy signal programs. DRD will seek to achieve all the benefits from this setup with the procurement of a new SCADA system for uniform surveillance and control, data exchange, remote program logic uploading and vehicle priority.

Status

The tender for TSCs has been carried out in 2022 with delivery from two suppliers on a 4-year framework contract. The LISA program deliveries have been ongoing with both consultants and suppliers since 2021. In ultimo 2023, the tender for a new OCIT based central system will go out with expected implementation at the end of 2024. A new IT network will be a costumer delivery and will be implemented along with the central system.

Input from Aarhus Municipality

1. Monitoring accessibility.

Aarhus municipality monitors accessibility via a Bluetooth solution. The historical data is used to create a congestion index to visualize the development of the level of service for car traffic over the years on arterial roads and ring roads.

2. Use of travel time data to improve accessibility.

Aarhus municipality uses travel time data to assess the need for changes in, e.g., traffic signal systems, and to assess requirements and solutions in relation to roadworks. Travel time data is also used to assess the effect of projects implemented by the municipality.

3. Dynamic signs.

Aarhus municipality share information on travel times for drivers on dynamic signs. At several locations, information is provided on journey times for alternative routes. This is to ensure the best possible utilisation of the infrastructure.

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:

Advances made since the last Progress Report in 2020 are described below.

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 following data is available on the NAP:

- Addresses (INSPIRE)
- Administrative units (INSPIRE)
- Named places (INSPIRE)
- Road network and facilities (INSPIRE)
- Public transport (NeTEx)

The spatial data in the INSPIRE standard covers all of Denmark and is provided by The Danish Agency for Data Supply and Infrastructure via weblinks.

The public transport data in NeTEx contains access nodes, network, operators, operational calendar, timetables as well as wheelchair accessibility in vehicles and covers all trains (including metro, light rail, international trains etc.) and all regional and local busses in Denmark. Additionally, around 40% of the ferries in Denmark are covered. The data is provided by The Danish Journey Planner and by the ferries' booking system supplier.

Linking of travel information services:

The Danish NAP platform can be found here: https://du.vd.dk

DRD is responsible for the technical platform, while The Danish Civil Aviation and Railway Authority is responsible for administrating and providing support for data providers and data users of Multi-Modal Travel Information Services (MMTIS).

The NAP platform is prepared for upload of static MMTIS data. It is possible to provide data either as a reference to a webpage, a static file upload, a dynamic file delivery via URL updated at a fixed frequency or as events via a web service. For data users, there are search and filtering functionalities and it is possible to receive data by downloading a complete file or by subscribing to a web service for real time data.

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

Since travel and traffic data from several data providers have only been available for a short time, a systematic assessment has not been made of the compliance with the requirements of the Delegated regulation A. However, prior to publication of new data sets, the data is reviewed and only data that meets the profile is approved for publication.

The overall role as national body for ITS will transfer from the DRD to DCARA in 2024..Expectedly, from 2024, a full assessment will be carried out.

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

The European Passenger Information Profile (EPIP) has been adopted in Denmark and additional technical information about the national use of EPIP for scheduled modes has been prepared.

The company behind The Danish Journey Planner has implemented a NeTEx export functionality and transfers daily NeTEx data to the NAP. In addition, some ferries' booking system supplier exports NeTEX data to the NAP when their sailing schedules are updated.

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

The metadata services of the NAP are based on the EU EIP SA46 Coordinated Metadata Catalogue. Metadata is created and maintained by the data provider.

Input from Aalborg municipality

In 2023, Aalborg Municipality initiated work on the fulfilment of Act A, the provision of EU-wide multimodal travel information services. Currently Aalborg municipality is in the process of creating an overview of the data available, which must be provided for Act A. In this process, Aalborg Municipality also formed an overview of the quality of the available data and the format in which it currently exists. This is preparation for contributing to making data available via the NAP.

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)

Member states are not required to report on Delegated Regulation (EU) 2015/962 in 2023, as the reporting obligation as of 1 January 2023 became article 13 in Delegated Regulation (EU) 2022/670. The reminder articles in that regulation are, however, not applicable until 1 January 2025.

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

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

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

DRD has operated the National Traffic Management Centre for many years. Among other things, the National Traffic Centre collects, processes and distributes traffic information. The National Traffic Management Centre handles and distributes data and information regarding primary roads and motorways (the state road network) in Denmark, including the TEN-T road network.

The distributed traffic information includes both safety-related traffic information and real time traffic information. Information on roadworks and special events is also distributed. DRD has developed a digital solution, called OTMAN, for municipalities to send information on roadworks and special events that cause traffic disruption. The municipalities send traffic information via OTMAN to the Traffic Management Centre according to agreements and the information is included in the information that DRD makes available (see also section 2.1.1). Via OTMAN, the municipalities send traffic information in the same data standards as DRD and contribute to better accessibility across the road network and authorities.

DRD distributes data on the NAP (https://du.vd.dk/) and disseminates information on the traffic website Trafikinfo.dk. Service providers can sign up and access data on their own. Today we have 16 service providers and OEMs that have signed up and read one of the two available data feeds. One feed is a whole dataset containing a snapshot of all current traffic messages and updated every 10 minutes while the other is a service (an AMQP queue) where every update on individual messages are made available instantly.

In order to back the harmonization of NAPs, the work to measure and improve the data quality, the different data formats; Datex II, INSPIRE, TN-ITS, the development of a new metadata profile (mobility DCAT-AP), harmonization of the National Bodies tasks, and much more, Denmark is involved in NAPCOREs different working groups with various activity levels depending on the relevance for Denmark. The cooperation has so far proven to be very useful in order to identify all the work needed to implement the ITS Directive, with a strong focus on getting the service providers on board and create solutions that can support and ease real life implementation of traffic information data (not only SRTI-data) into real end user solutions. Solutions that will benefit the safety and mobility on the roads across road operators, data suppliers, and national borders.

Since the latest reporting in 2020, the main traffic management system supporting the National Traffic Management Centre has been renewed. The new system, named TRACÉ, was put into operation on 8 May 2023 and include the following improvements with relevance to the provision of both safety-related traffic information and real-time traffic information:

- The workflow for safety-related incidents has been made faster and now allow for earlier release of safety-related traffic information when a new incident is discovered.
- Much improved support for the Datex II standard: Previously, safety-related and real-time traffic messages from the National Traffic Management Centre only followed the Datex II standard in terms of the syntax used while the contents of the messages, i.e., the semantics of the Datex II model, was to a large degree non-standard and thus difficult for service providers and OEMs to process. The new traffic management system is built such that only standards-compliant messages can be created along the rules of a set of defined editorial guidelines for how to use the Datex II standard in a semantically correct way. The editorial guidelines cover all use of Datex II within the National Traffic Management Centre, but they are also applied to the OTMAN messages to ensure a consistent use of the standard across data sets. The editorial guidelines form part of improved metadata made available on the NAP.
- The new software platform makes it easier for DRD to implement new working flows, data sources or data standards (e.g., TN-ITS or more data from the municipalities) relevant in the coming years.

Parallel to the launch of the new traffic management system TRACÉ, DRD has developed a series of Power BI reports that present and visualize data from TRACÉ. The Power BI reports serve as a tool to monitoring traffic trends, support daily operational management and has immensely heightened the continuous focus on improving our data quality. Overall, the Power BI reports have streamlined workflows that were previously manual and time-consuming.

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

As reported to the EC in 2022[1], 8 parties, both service providers and data suppliers, have since the entry in to force of the delegated regulation submitted self-declarations forms to the national body, all of them upon the request of the national body. Since the report of 2022, no further requests or reminders have been sent out by the national body, nor have the national body received any unsolicited self-declarations or information about changes to services.

Denmark is involved in NAPCORE, including Working Group 5 (WG5) related to National Bodies and Compliance Assessment. It is one of the tasks of WG5 to develop strategies to address private organisations to comply with the delegated regulations. It is therefore Denmark's hope and expectation that the work being done in WG5 will lead to the facilitation of the collection of declarations in the future.

The national body hasn't carried out any random inspections in the past year. This is primarily because the national body is waiting for the pending outcome of the work done in WG5. It is Denmark's expectation that one of the results of the work by WG5 will be a clarification and a common understanding of how and how frequently random inspections should be carried out, thus leading to a set of guidelines and harmonization of the random inspections and subsequent compliance assessment among member states.

Finally, it should be mentioned that Denmark in the past year has been working on a new, more viable and effective setup for the national body. This, among other things, means that the role of the national body across the different delegated regulations will be united in one unit, transferring from DRD toDCARA in 2024, as well as the allocation of more resources.

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

Denmark launched a new NAP in November 2021. The new access point has a higher level of security and better opportunities for self-service and easy data sharing. The NAP has built in validation tools to validate the Datex II schema profiles. The new Danish NAP is now one the most advanced in Europe. Further development of the NAP is already planned.

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

Some of the most important sources for safety-related traffic information at DRD is 1-1-2 emergency messages distributed digitally from the emergency services, phone calls from the Danish Police, drivers, contractors working on the road etc. The National Traffic Management Centre is also connected to winter information systems (providing a real-time overview of slippery roads, salting and snow clearing), tunnel management systems and cameras.

[1] 2022 Reporting from Denmark on the Commission Delegated Regulation (EU) 886/2013 and (EU) 2015/962, dated 5 October 2022.

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:

NEXT-ITS 3 project

The NEXT-ITS 3 project (2018-2021) was a continuation of the NEXT-ITS 1 and 2 projects and the long-term VIKING cooperation on coordinated and harmonised ITS implementations in the Nordic countries and Northern Germany. The cooperation has enabled Northern European countries to carry out large ITS projects efficiently and to ensure exchange of knowledge among the countries. The NEXT-ITS projects covered the Northern part of the Scandinavian-Mediterranean corridor, including the TEN-T core road network and the key comprehensive network links.

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

The ITS services in NEXT-ITS:

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

Traffic Management Centres have played a key role in the service provision, regardless of service.

The key achievements in Denmark were:

- Development and deployments in the national Traffic Management Centre in Denmark
- Improved incident and emergency handling on motorways
- Evaluation tool for consolidated, global assessment of impacts and benefits, NEXT-ITS 3 in common with Denmark as lead.

Recharge City

Recharge City (autumn 2023 and onwards) is a private organization that provides roadside facilities such as: parking for trucks, electrical charging of trucks, and facilities for personal vehicles as well as drivers.

Recharge City wishes to inform truck drivers on the motorway about available parking spaces for the trucks of various lengths. This will be done by using variable message signs similar to the ones DRD uses on a testing basis for our own roadside facilities.

The project will be completed in two stages. As DRD is running project on expanding the motorway, the first step will be a temporary set-up (December 2023), while the last step will be a permanent set-up, established at the time of the motorway expansion. This is done to avoid additional costs of moving the variable message signs. The first stage has four temporary variable message signs: Two will be placed in the roadside of the motorway, one in each direction, and two will be placed on state operated road at the entrance way to Recharge City.

The details of the permanent stage are yet to be finalized, but the number of variable message signs will be increased compared to the temporary stage.

DRD will handle installation of the temporary and permanent set-up, but Recharge City will cover the costs related to the signs.

2.2.2 Progress since 2020

Description of the progress in the area since 2020:

The abovementioned planning of the Recharge City project is the first step in this project.

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:

Refer to descriptions in section 2.3.3 and 2.3.4.

2.3.2 Progress since 2020

Description of the progress in the area since 2020:

Currently, the Delegated Regulation regarding eCall standards is undergoing revision following the conclusion of the public consultation. The legislation is sought to be updated because eCall currently initiates emergency calls via 2G and 3G telecommunications networks, which are being phased out in Europe. In Denmark, the phase-out is expected to occur between 2023 and 2027. The proposed revision aims to update the technical provisions on telecommunication standards and communication protocols to enable the use of eCall systems on modern 4G/5G telecommunications networks.

2.3.3 112 eCall (priority action d)

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

The legal act requires that Public Safety Answering Points (PSAPs), such as Hovedstadens Beredskab for eCall in Denmark, must be capable of receiving and handling eCalls via 4G and 5G from 1 January 2026, through 4G or 5G telecommunications networks. This involves an adaptation of the infrastructure, as the current 2G and 3G networks operate on Circuit-Switched (CS) telecommunications networks, while the new 4G and 5G networks are based on Packet-Switched (PS) telecommunications networks.

Additional information:

None.

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:

DRD has 91 rest areas along the TEN-T road network with direct access from the motorway. They all have parking spaces for trucks. However, none of these are certified as safe and secure parking places for trucks and commercial vehicles.

There are a few privately owned Truck Parking facilities located close to the TEN-T network that has safe and secure parking facilities.

Percentage of parking places registered in the information service:

At the moment all 91 are registered, but as they are not formally Safe and Secure parking areas, they are to be removed from this information service. Information on the static data of these rest areas will still be available from the Danish NAP.

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

Only 4 (4,4%) of the 91 rest areas has systems that provide dynamic information on the availability of parking spaces for trucks.

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

Static data is published on the European Access Point for Truck Parking hosted by DG MOVE, anddynamic data is published at the NAP. All data is data from a public source (The Danish RoadDirectorate).

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.

2.4.2 Progress since 2020

Description of the progress in the area since 2020:

NordicWay 3

NordicWay 3 is a C-ITS pilot project that enables vehicles, infrastructure and network operators to communicate safety hazards and other information from roads in the Nordic countries between different stakeholders.

The project is a collaboration between public and private partners in Finland, Norway, Sweden and Denmark and build on the achievements from the previous NordicWay projects and the C-Roads platform.
Denmark does not have its own pilot but has been testing and verifying that the NordicWay concepts developed or utilised by the other partners in NordicWay 3 (and in C-ROADS) are easily transferable to Danish conditions**.**

NordicWay 3 has four so-called flagship pilots: Traffic Signals, Dynamic Zones, Emergency Vehicle Warnings and Road Works Warning (https://www.nordicway.net/).

Motorway control systems

We are in process of planning an update of our control system to our ITS systems, so that we can get lane management where the ITS systems enable this. The implementation will take place in 2024.

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:

Pilot on automated vehicles

Since July 2017 it has been possible to get a license to conduct tests with automated vehicles on public roads up to SAE level 4 in Denmark. The basis for the tests is new legislation passed unanimously in the Danish parliament in May 2017. The test legislation was evaluated in 2023 and is currently under political processing.

The CCAM Partnership

Like its sister organisations in other European countries, DRD is a member of the CCAM Association. The CCAM Partnership is a collaboration between the European Commission and the CCAM Association. The CCAM Association is a public/private partnership between private stakeholders, companies, research institutes, associations, public and local authorities.

The goal of the CCAM Partnership is to:

- Improve road safety for road transport
- Ensure mobility and access to goods and services for all access to good mobility for both people and goods
- Increase the competitiveness of European industry
- Reduce the environmental impact of road transport
- Accelerate the development and implementation of CCAM solutions through knowledge building

The MODI project

The MODI project is a project under the CCAM Partnership. It 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.

The project comprises five use cases, each describing a part of the logistics chain. It identifies what is required for automated driving without human interaction (known as SAE level 4), and what is not possible yet. The project will focus on understanding and overcoming the regulatory barriers and physical and digital infrastructure shortcomings on the motorway corridor for public roads. The confined areas and terminals are located at and around Rotterdam, Hamburg, Gothenburg, and Moss ports. Each terminal focuses on challenges like access control, charging, coordination with automated guided vehicles, loading/unloading and handover from public to confined areas.

In addition to the demonstrations, MODI provides detailed business models for the logistics sector, demonstrating that CCAM vehicles can lead to greater profits, especially when driving in a coordinated way. The output will also be proposals for adaptation of regulation and infrastructure and technical and socio-economic impact analyses. The project is planned to be carried out on a transport corridor from the Netherlands through Germany, Denmark, Sweden and Norway.

MODI received an EU funding grant of nearly €23 million by the European Commission under the programme Horizon Europe and has a total budget of approximately € 28 million. Project coordinator is ITS Norway, and the project duration is 1 October 2022 to 31 March 2026.

DRD participates in the project as "Associated partner" without EU funding. DRD has special focus on the readiness of the physical and digital infrastructure, but will also, to some extent, follow and comment on other relevant topics and evaluation results.

2.5.2 Progress since 2020

Description of the progress in the area since 2020:

Pilot on automated vehicles

Since 2020, one license has been granted to test at low speed with Level 2/3 autonomous shuttles in Lyngby. Four tests were conducted since the test legislation passed in 2017. There are currently no new applications for automated vehicle testing.

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).

All the KPIs in this report are, unless otherwise stated, calculated based on the Comprehensive Ten-T Road network in Denmark which covers 1555 km. Further, the KPIs are in most cases also reported for the state road network which covers the Comprehensive Ten-T Road network plus the main roads in Denmark (length is 3820 km in end of 2022).

To have comparable data regarding deployment KPIs for the future, all numbers are based on values from the end of 2022.

For the benefit KPIs it has not been possible to extract and generate the necessary data to calculate the KPIs for this reporting period.

3.1 Deployment KPIs

3.1.1 Information gathering infrastructures / equipment (road KPI)

Figures to be provided by type of network / zone.

Figures to distinguish fixed and mobile equipment.

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

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

This KPI has been calculated in relation to larger systems where numerous detectors are connected over a given stretch of road. This in practice means that this KPI is identical to the one in section 3.1.3 (Traffic management and traffic control measures) except for the KPI for mobile/probe traffic monitoring.

The KPI is based on the length (coverage) of the motorway systems that are listed in annex 3 plus tunnel control systems. This will however not necessarily be the case in the future since it is possible to have larger systems to gather data but not including traffic management and traffic control measures such as VMS.

- KPI for road network equipped with road weather monitoring (comprehensive Ten-T Road network):
  1555 km/1555 km*100% = 100%

- KPI for road network equipped with road weather monitoring on the state road network (state road network):
  3820 km/3820 km*100% = 100%

- KPI for road network equipped with permanent fixed traffic monitoring (comprehensive Ten-T Road network):
  122 km/1555 km*100% = 8%

- KPI for road network equipped with temporary fixed traffic monitoring (comprehensive Ten-T Road network):
  0 km/1555 km*100% = 0%

- KPI for road network equipped with mobile/probe traffic monitoring (comprehensive Ten-T Road network):

1555 km/1555 km*100% = 100%

- KPI for road network equipped with mobile/probe traffic monitoring (state road network): 3820 km/3820 km*100% = 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).

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

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

In Denmark, automatic incident detection (AID) on the comprehensive Ten-T Road network is established in several tunnels: The Limfjord Tunnel (0.6 km), the Øresund Tunnel (4 km), the Silkeborg Tunnel (0.3 km) and as well at the hard shoulder running stretch of the M13 motorway (2 km). This equals in total an approximate length of AID equipped road of 6.9 km.

The total length of tunnels on the comprehensive Ten-T Road network is 6.1 km (see annex 2).

- KPI for Automatic Incident detection on the comprehensive Ten-T Road network
  6.9 km/1555 km*100% = 0.4%

- KPI for Automatic Incident detection in tunnels (comprehensive Ten-T Road network)
  (0.6 km + 4 km + 0.3 km)/6.1 km * 100% = 80%

- KPI for manual incident detection (comprehensive Ten-T Road network)
  1555 km/1555 km*100% = 100%

- KPI for manual incident detection (state road network)
  3820 km/3820 km*100% = 100%

The Road Directorate has furthermore implemented another kind of incident detection or rather Extra Ordinary Queuing detection (EOQ) which is based on probe traffic monitoring and algorithms specially developed for this purpose. KPI for EOQ incident detection (comprehensive Ten-T Road network)

1555 km/1555 km*100% = 100%

- KPI for EOQ incident detection (state road network)
  3820 km/3820 km*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).

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

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

In Denmark, all tunnels on the Ten-T Road network are equipped with tunnel control systems (meaning a KPI on 100% for tunnels). Regarding larger ITS systems on the comprehensive Ten-T Road network a list of ITS systems on motorways can be found in Annex 3.

- KPI for traffic management and traffic control systems (incl. tunnel control) on the comprehensive Ten-T Road network
  122 km/1555 km*100% = 8%

- KPI for traffic management and control measures in tunnels (comprehensive Ten-T Road network)
  6.1km/6.1 km * 100% = 100%

3.1.4 Cooperative-ITS services and applications (road KPI)

Figures to be provided by type of network / zone.

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

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

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

In Denmark, there are no C-ITS services or applications available.

- KPI for C-ITS services or applications = 0%

3.1.5 Real-time traffic information (road KPI)

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

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

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

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

Real-time traffic information can be obtained for the entire comprehensive Ten-T Road network through the Danish NAP or via road user services like the traffic map or other channels. The map can be seen at https://trafikkort.vejdirektoratet.dk/

- KPI for real-time traffic information (comprehensive Ten-T Road network)
  1555 km/1555 km*100% = 100%

- KPI for real-time traffic information (state road network)
  3820 km/3820 km*100% = 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:

- 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

Concerning the total length of the transport network, this difficult to calculate since it is unclear what should be included, for example should a railway running along a motorway be counted by itself or should it be considered as the same network as the motorway? Should a bus line running along a motorway corridor, but on twisting rural roads through the cities along the motorway be counted by itself or as the same corridor?

For this reason the length of the transport network included has been set to 1555 km which is the length of the Ten-T comprehensive road network, but It should be understood that this is meant to cover also the railways and bus routes covering the same areas (the Ten-T comprehensive rail network in Denmark does to a large degree follow the road network as can be seen in Annex 4).

In Denmark, a national journey planner, www.rejseplanen.dk (EN: www.journeyplanner.dk), has been in operation for several years. Rejseplanen.dk includes travel information about several modes: Train, metro, bus, domestic flight, taxi services, cycling and walking in all of Denmark.

Within this travel planner it is possible for all operators to update with real time information such as delays, planned and unplanned changes in time plan, specific information such as demands for seat reservations etc., and based on these technical possibilities the KPI has been set to 100% for the comprehensive TEN-T network (road, rail and bus). It should however be understood that the amount of actual dynamic travel information in the planner depends among others on the routes and

bus lines etc., and that the KPI on 100% therefore doesn't mean that all delays etc. on the covered network is reported to the journey planner. An estimate for the KPI based on where dynamic information is provided is for the moment very difficult to calculate, among others because of unclear definitions on the criteria needed to decide whether to include a route or not.

Due to the above-mentioned challenges in determining the exact area where relevant nodes (e.g., rail or bus stations) should be included the below number of nodes include all of Denmark, but since the KPI is 100% the KPI would be the same no matter which area is chosen.

- KPI for dynamic travel information (comprehensive Ten-T network (road, rail, bus))
  1555 km/1555 km*100% = 100%

Number of transport nodes (e.g., rail or bus stations) with provision of dynamic travel information services: approx. 37 500

- KPI for Denmark 37 500/ 37 500*100% = 100%

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.

- 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

The generic information services offered on the internet, mobile applications and roadside VMSs are also used by freight operators, but beside this there are dedicated services as for example functionalities incorporated on the traffic map developed by DRD where information such as bridge heights, weight limits etc. can be shown for the entire Ten-T Road network. Based on this, the KPI has been set to 100%

The map can be seen at https://trafikkort.vejdirektoratet.dk/

- KPI for freight information (comprehensive Ten-T network (Road KPI))
  1555 km/1555 km*100% = 100%

Number of freight nodes cannot be calculated at present.

3.1.8 112 eCalls (road KPI)

N.A.

3.2 Benefits KPIs

3.2.8 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

N.A.

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.

- 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:

N.A.

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.

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

N.A.

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):

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

The KPI on annual investment in road ITS (as a % of total transport infrastructure investments) cannot be calculated in a meaningful way for the reporting period.

Regarding the KPI on annual operating & maintenance costs of road ITS, this is also difficult to calculate due to lack of precise definitions. As an example, how many kilometres are covered by a VMS sign, how do you divide the maintenance cost of a backbone IT system when it covers different types of systems etc. For this reason, the KPI will be estimated as a rough estimate.

In annex 3 an estimate of operating & maintenance costs for the relevant roadside based systems are given (systems marked with N.A. is excluded since the operating & maintenance costs of these systems are covered by separate companies and includes tolling systems). This gives a total of 2,64 mill. € pr. year for 73 km of roadside based ITS systems, which gives a rough estimate of a KPI around 35.000 €/km/year.

4 Annex 1 Status of ITS Systems and Traffic Management

According to article 17 point 3 in the ITS Directive (Directive 2010/40/EU) the member states shall every 3 years report on the progress made in the deployment of their national activities and projects regarding the priority areas as described in Article 17 point 1. Therefore, this Annex contains a status of all the ITS projects/systems described in the last report (from 2020).

4.1 Traffic management, information, and bridge tolling at The Øresund Link, E20, between Sweden and Denmark

No major changes have been carried out or are foreseen in the near future.

4.2 Traffic information and management at the Motorring 3, M3/E47/E55, around Copenhagen

In 2020, the algorithms for the automatic operation of the motorway control system (automatic control of variable speed limit signs, queue warning etc.) were upgraded.

4.3 Traffic management, information, and bridge tolling at The Storebælt fixed link, E20.

No major changes have been carried out or are foreseen in the near future.

4.4 Traffic information and warning systems in the Triangle Area, E20/E45

No major changes have been carried out or are foreseen in the near future.

4.5 Traffic information and management at the Køge Bugt Motorway, M10/E20, from Copenhagen and around 40 km southwest of Copenhagen (M10 system)

The M10 system was originally implemented as a part of a road widening project. After completion of the road works, parts of the system whole were discontinued, and other parts (including VMS information signs) were continued. However, the entire system was disconnected in 2018.

4.6 Traffic management and information at the motorway tunnel (E45) across the inlet Limfjorden and through the City of Aalborg

In 2020, the algorithms for the automatic operation of the motorway control system (automatic control of variable speed limit signs, queue warning etc.) were upgraded.

4.7 Traffic management and information at the Guldborgsund Motorway tunnel, E47

No major changes have been carried out or are foreseen in the near future.

4.8 Dynamic Hard shoulder running on the Hillerød motorway, M13, for driving in the morning rush hour

No major changes have been carried out or are foreseen in the near future.

4.9 Traffic management M40/E20 (Middelfart – Nørre Åby)

No major changes have been carried out or are foreseen in the near future.

4.10 Elsinore Motorway, M14/E47, northern section

The system was in operation until spring 2017. The system was originally implemented as a part of a road widening project and covered approximately 14 km. The entire system was turned off in spring 2017and permanently disconnected in 2018.

4.11 Elsinore Motorway, M14/E47, southern section

The system has been in operation until spring 2017. The entire system was turned off in spring 2017 and permanently disconnected in 2018.

4.12 M60/E45 Vejlefjord

The system on the Motorway M60/E45 was deployed temporarily to help with the road works at the location. The system was discontinued when the road works were finished, but a small part relating to the Vejlefjord Bridge remained to be operated.

4.13 M60/E45 Skanderborg

The system on the Motorway M60/E45 is deployed to help with a merging problem after a part of the motorway was widened from 2 to 3 lanes in each direction from the city of Skanderborg to Aarhus. At the end of the stretch there was a safety problem at the merging nearby Skanderborg and it was decided to establish a warnings system with variable speed signs and a variable information sign. No changes are foreseen for the time being.

4.14 M40/E20 Odense

The system on the Motorway M40/E20 is deployed to help with a merging problem after a part of the motorway was widened from 2 to 3 lanes in each direction. It was predicted to be a safety problem with the merging nearby Odense (like the problem at the M60 Skanderborg). Therefore, it was decided to establish a warning system with variable speed signs and variable information signs.

5 Annex 2 Length of relevant road network in Denmark

5.1 Relevant Road length in km

Member State	**Total road network** (i.e., only paved roads) (a)	**Total Motorways** (b)	**Comprehensive trans-European road network** (i.e., core and non-core road network) (c)	**Motorways** (i.e., only those **not included** in the comprehensive trans-European road network) (d)	**Priority zones** (i.e., according to the definition of each country) (e)	**Total road network covered by Delegated Regulation 2015/962** (f)=(c+d+e)	**State road network**
DK	74.784	1.298	1.555	123	-	1.678	3.820

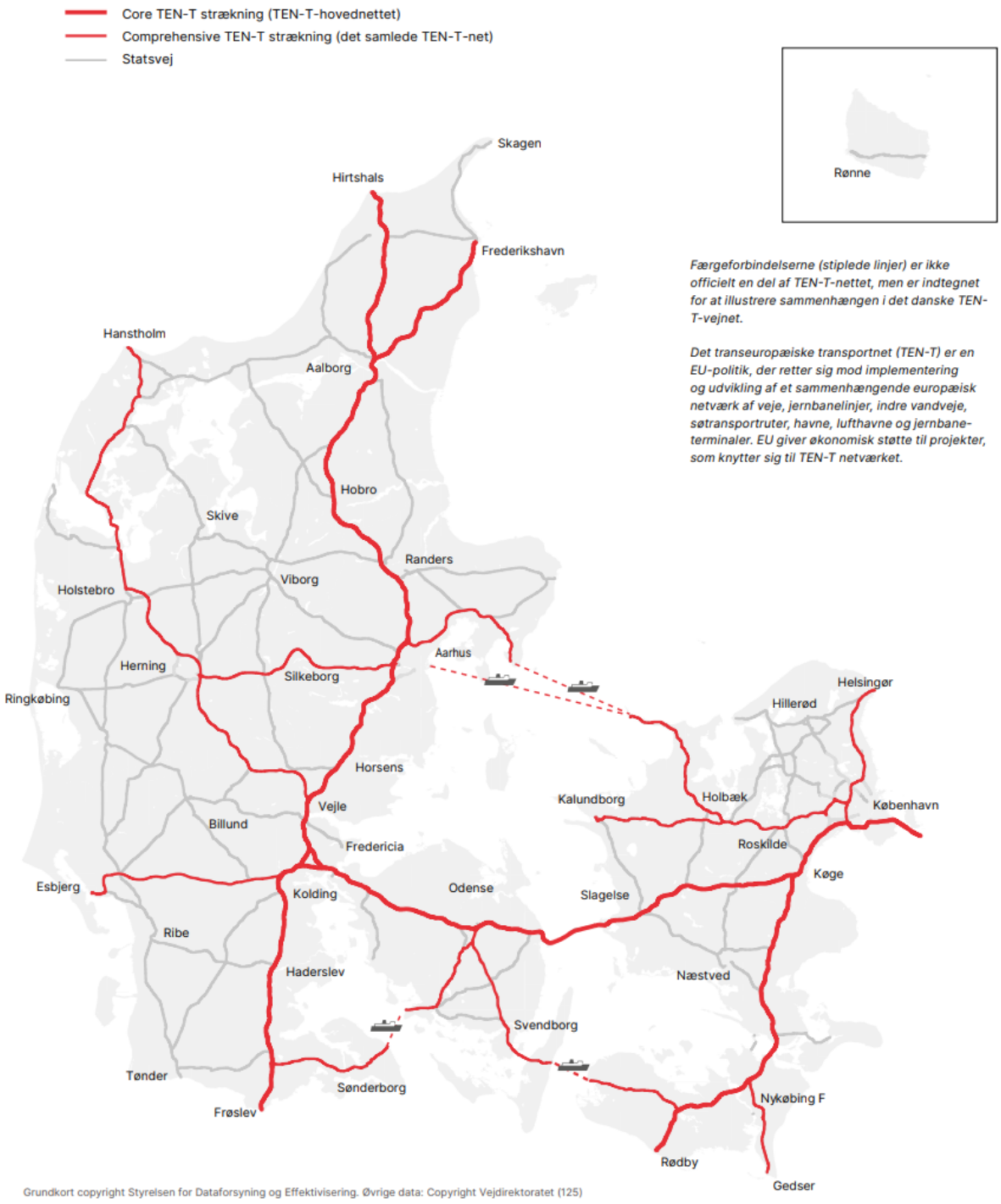
5.2 Length of tunnels on the Comprehensive Ten-T network

Tunnels on Comprehensive Ten-T Road network	**Length (km)**	**Automatic Incident Detection (km)**	**ITS (km)**
Øresundstunnelen	4	4	4
Tårnbytunnelen	0,7	0,7	0,7
Silkeborgtunnelen	0,3	0,3	0,3
Limfjordstunnelen	0,6	0,6	0,6
Guldborgsundtunnelen	0,5	0	0,5
Total	**6,1**	6,1	6,1

6 Annex 3 Length of relevant ITS systems described in the earlier 2017 and 2020 reports.

	Permanent motorway system end 2022 (km)	Temporary motorway system end 2022 (km)	Approx. operation and maintenance cost (Million € pr. Year)
Traffic management, information and bridge tolling at "The Øresund Link" E20 between Sweden and Denmark	24		N.A.
Traffic information and management at the Motorring 3, M3/E47/E55, around Copenhagen	17		1
Traffic management, information and bridge tolling at The Storebælt fixed link E20.	20		N.A.
Traffic information and management at the Køge Bugt Motorway, M10/E20	0		0
Traffic management and information at the motorway tunnel E45 across the inlet Limfjorden and at the City of Aalborg	11		0,6
Traffic management and information at the Guldborgsund Motorway tunnel E47	11		0,3
Hard shoulder running on the Hillerød motorway, M13	2		0,1
M40/E20 Middelfart – Nørre Åby	10		0,1
Elsinore Motorway, M14/E47, northern section	0		0
Elsinore Motorway, M14/E47, southern section	0		0
Traffic management and information at M60/E45 Vejlefjord	20		0,5
Traffic management and information at M60/E45 Skanderborg	1		0,02
Traffic management and information at M40/E20 Odense	1		0,02
Total (km)	117	0	2,64

7 Annex 4 Map of Comprehensive Ten-T network



Comprehensive Ten-T Road network

Comprehensive Ten-T Rail network and Comprehensive Ten-T Road network