Directive 2010/40/EU
Progress Report 2020
Denmark

08-10-2020

1 Introduction

1.1 General overview of the national activities and projects

Including national ITS legislations and/or strategies

In Denmark the development, in areas related to the Directive 2010/40/EU (the ITS Directive), has in recent years, to a large extent, been focused on improving systems and procedures to handle and process different types of traffic related data relating to the road network,

One of the key activities has been the construction of an entirely new traffic centre, in the so called "Traffic tower" in Copenhagen. The traffic tower in Copenhagen houses both the main traffic management center for road traffic, covering all Danish state roads, and a new control center for the main railways and the S-bane in the eastern part of Denmark. A similar control center has been built in Fredericia, and from there the main railways in the western part of Denmark is controlled. The new traffic center has provided the staff with improved working facilities, that, among other benefits, has allowed different authorities to work side by side and develop new procedures for collaboration. The improved backbone systems and software solutions in the new traffic center, has also led to new possibilities for improved digital traffic information services. The control centers in the Traffic tower started operation in 2015 in relation to road transport, and in 2017 in relation to railways. The development of the new traffic center was carried out as part of the CEF supported NEXT-ITS projects

Another major ongoing activity is a project regarding acquisition of real time data from data brokers regarding road traffic. In the last reporting period (2014-2016) these activities were introduced as a pilot project. as part of the project it was investigated how these data could support the daily operation in the traffic center. Based on the experiences from the pilot project a tender was carried out in 2019, and the data purchased is now being used on a daily basis as one of the parameters on which the traffic management center bases its real time and historical information and services.

Another focus area has been the growing possibilities within the area of C-ITS, that has also actively been investigated through different international collaborations and projects.

As reported in the 2017 report there has been reduced activities Regarding ITS related physical infrastructure such as Roadside equipment and Variable Message Signs (VMS) in recent years due to a reduction in larger roadworks.

As also described in the last report a lack of financing meant that a number of permanent systems were shut down and scheduled for termination in 2017. Since then a part of the necessary financing has however been secured for the time being, and some of the systems have therefore been reactivated. The future of these systems does however depend on new future financing. for further details see annex 1 and 3

At the international level Danish authorities have actively participated in numerous European projects targeting a harmonious implementation of the actions covered by the ITS Directive.

- The CEF supported NEXT-ITS corridor projects contained numerous deployment projects and coordination activities in Northern Europe in relation to ITS for road transport. More information available at https://next-its.its-platform.eu/
- The CEF supported European ITS Platform (EU EIP) serves as a knowledge management centre by developing, providing, promoting and maintaining harmonisation tools and processes with substantial value to National Road Authorities and road operators, to private actors as partners in the ITS value chain and network, to the European Commission in implementing and advancing ITS policy and regulation as well as to relevant stakeholders and multi-stakeholder collaborations in the ITS community. Key achievements of EU EIP comprise the European Reference Handbook for harmonized ITS Core Service Deployment in Europe, an improved mechanism for Cross Corridor Cooperation, KPIs for ITS deployment and benefits, the ITS toolkit and the evaluation library, the community building on National Access Points, Innovation timelines and deployment roadmaps, information services quality frameworks and assessment methods, physical and digital infrastructure attributes for automated driving, good practices how to automate road operator's own ITS and integrating C-ITS into road operators day-to-day business. The entire EU EIP results address all of the ITS Priority Areas I-IV and contribute also to the knowledge on KPIs related to ITS Corridors. More information is available at www.its-platform.eu.
- The City of Copenhagen is involved in the SOCRATES 2.0 project with the aim of deploying interactive traffic management. More information available at https://socrates2.org/
- In the area of C-ITS national bodies has participated in the CEF supported NordicWay and C-ROADS activities as described in relation to priority area 4 (linking the Veichle with the transport infrastructure), More information available at www.nordicway.net and www.c-roads.eu, and at the City level the municipality of Copenhagen has been involved in the C-Mobile project with a focus on harmonization of C-ITS systems with other European Cities, more information available at https://c-mobile-project.eu/

The above mentioned projects cover all areas defined in the ITS Directive, and the learnings from these joint European activities have been brought into practice already in conjunction with the activities related to priority area 1 (Optimal use of road, traffic and travel data) and 3 (ITS road safety and security applications) described under section 2 of this report.

1.2 General progress since 2017

In relation to the specific priority areas the progress since 2017 is described under section 2 of this report, but a general progress compared to the status described in the 2017 report, which is not elaborated in section 2, relates to the above mentioned securing of funds to keep some permanent ITS systems in operation. Furthermore, the operation of the new traffic management center has

been consolidated and improved, and general updates and improvements has been applied to the backbone systems.

On the 1st of July 2019 a new amendment to the regulation of Public Transport Authorities entered into force. According to the new law Regional Public Transport Authorities, The Danish State Railways and The Copenhagen Metro shall make transport data available to third parties via The Danish Journey Planner. This data shall be made available free of charge. It also determines that the Minister of Transport, Building and Housing can establish detailed rules to specify which transport data are to be provided and which data standards are to be used.

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 general, it is difficult to make a clear differentiation between priority area 1 and Priority area 3 (*ITS road safety and security applications*) since for example data about a que (and a message/information about a que) can be regarded as both safety related (if you are approaching the backend of a que), and as information related (if you are far enough away from the que to use the information to find alternative routes), so depending on how one look at it, the initiatives stated below can be regarded as belonging to both priority areas.

In connection with the CEF supported NEXT-ITS projects the activities and projects listed under section 2.1.2 have been ongoing since 2017:

2.1.2 Progress since 2017

Description of the progress in the area since 2017:

2.1.2.1 Acquisition and use of real-time traffic data

At the national level The Danish Road Directorate has made investigations in order to prepare a better basis for the tender that was sent out in 2019:

- Defining internal demands and requests for data and services.
- Describing actual and future user stories.
- Discussing/deciding future stategy of IT structure and data format

The approach is a less complicated setup for the acquisition and handling of real time traffic data. This is based on a demand of less expenses due to the acquisition of data and the switch-over to a new data broker.

The Acquisition of real-time traffic data was carried out in 2019 and had a high level of dialogue with the tenderers in order to explain the requests and demands of DRD. The contract with the new data broker was signed in July 2019 andthe implementation process was completed in spring 2020. There has been focus on the technical matters but DRD is also starting to look at strategic and future goals.

To improve traffic management, a tool for extraordinary queuing and delays has been implemented, based on real-time and historical data.

DRD is taking the first steps to improve the use of point-based data for statistical use by developing different tools for analysing the data

2.1.2.2 Better corridor control around Funen motorway (E20)

The DRD has changed signalling programs in 3 signalized junctions around the motorway on the western part of Funen to support rerouted traffic to the parallel highway section in case of incidents. The implementation is intended to be manually controlled from the traffic management centre in Copenhagen, but can be enhanced to support real-time traffic data for semi-automatic or fully automatic control.

2.1.2.3 Pilot trial on improved incident management and emergency handling on the Funen motorway (E20)

From 2016 to 2018, the socio-economic cost due to loss of time related to incidents on the Danish motorways increased by 27%. Consequently, there is a great socio-economic potential in reducing the time it takes to clear the road and restore normal traffic conditions after an incident. A faster reopening of a motorway after an incident also reduces the risk of secondary incidents. Therefore the Danish Road Directorate decided to do a pilot trial on improved incident management and emergency handling on the Funen motorway (E20).

In total 32 different initiatives have been tested. A working group was set up across the participating authorities. The trial has continued until the end of 2019 and a thorough evaluation has been made. A number of the initiatives in the pilot project have been tested in practice when handling incidents on the Funen Motorway. The working group assesses that some of the initiatives which have had good effects are:

- Immediate dispatch of tow truck or breakdown truck to remove broken down or wrecked vehicles from the carriageway.
- rapid removal of broken down vehicles to the emergency lane.
- optimization of the alarm phase.
- joint access to cameras and direct dialogue between the Danish Road Directorate's Traffic Management Centre and the Police Incident Commander on site.

All of the above initiatives are supported by the traffic centres use of various ITS solutions which are used to monitor the situation, communicate with road users and emergency services and collect data for decision support and evaluation

Some initiatives have not been possible to test in practice, as there have been no situations to test them in. Testing of other initiatives has provided a good understanding of how further work can be done in the future in relation to e.g. dispatch of the right equipment as soon as possible or training. The working group has also worked with specific input to initiatives that cannot be tested locally, but which may be worked on later at a national level. These include specific input for a future revision of "Guidelines on incident handling on motorways" as well as considerations in relation to the national 112 alarm centre.

An important finding in the pilot is also the importance and effect of cooperation between authorities, although it has not been tested as a separate initiative. The overall assessment of the working group is that dialogue and cooperation have had a particularly good effect in the handling of incidents on the Funen Motorway.

2.1.2.4 Enhanced information on traffic consequences of road works and events

In relation to the CEF supported Next ITS projects the OTMAN solution was developed to be used by

municipal road authorities in Denmark to report road works and planned events to the national Traffic Centre.

The IT solution supports the automatic exchange of data about impacts of road works and planned events on traffic so that the information can be shown to road users via the service platforms of the Danish Road Directorate as well as via the data feeds on the NAP to external service providers (e.g. TomTom, Google etc.). The enhanced information to road users is especially useful at urban-interurban interfaces where the corridor passes an urban node.

After implementation, feedback has been gathered from the use of and experiences with the OTMAN solution. On the basis of this, an analysis on how to implement further flexibility to the solution has been made. This has resulted in a new architectural draft in the first half of 2019 and a startup on implementing the architectural changes to the solution in the last months of 2019. The Danish Road Directorate has presented the solution in newsletters and on a conference for road authorities, which resulted in new municipalities subscribing to the solution in the beginning of 2020.

By 2020, the IT-solution for enhanced information on traffic consequences of road works and events has been implemented by 47 of the 98 municipalities in Denmark.

2.1.2.5 General improvement of the operation of the national Traffic Management Centre and upgrading of backend systems

To improve the knowledge of the work done by the national Traffic Management Centre a set of operational KPIs has been developed, which has been further enhanced in the current period. The KPIs combines data from different systems in operation in the TMC.

Further a BI (Business Intelligence) system has been developed to get better usage of the data collected, produced and broadcasted by the TMC. The data includes a wide range of data on traffic situations (eg. 112 calls, traffic massages, serious incidents, ghost drivers, accidents, roadworks, events) and operational matters in a control room (eg. incoming and outgoing phone calls, cases and situations handled, time locks etc.).

2.1.2.6 Improved technical cooperation in the city of Copenhagen

At the City level the city of Copenhagen is working on improving the technical cooperation with service providers by improving data exchange between road operators and service providers backend systems regarding activation of different kind of programs/scenarios in order to inform users about poor air quality, warnings to cars about activation of signal programs to prioritize cyclists, larger events etc. this is done through the Socrates 2.0 project. More information available at https://socrates2.org/

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

Measures undertaken, if any, to set up a national access point and on the modalities of its functioning: (including information on the weblink to the NAP and discovery services available to users)

As mentioned in the report from December 2019, the existing NAP, established by The Danish Road Directorate for Delegated Regulation B, C and E will also be used for Delegated Regulation A. The Danish Road Directorate will be responsible for the technical platform, while The Danish Transport, Construction and Housing Authority will administrate and support data providers and data users for Multi Modal Travel Information Services. For a description of the NAP see section 2.1.4.

To support the implementation of the Delegated Regulation (EU) 2017/1926 a detailed plan for the further development of the Danish NAP has been elaborated by The Danish Road Directorate and The Danish Transport, Construction and Housing Authority in collaboration.

A series of user stories on delivery of MMTIS data have been established, covering delivery of MMTIS data, use of MMTIS data and the search functionality of the NAP. This work has led to a new design of the NAP solution with a series of mock-ups that illustrates the planned changes. The new design includes the following:

- Introduction of "themes" on the NAP, which means that MMTIS data will have its own theme. This will make it easier to get an overview of the available MMTIS datasets and to target communication directly to MMTIS data providers and users.
- The search functionality will be improved, which is necessary as the number of datasets will be significantly increased.
- The workflow for uploading data will be improved and allow for different options to deliver data. Either as a file upload, a delivery via URL or as a link to a webpage. A functionality to validate NeTEx and INSPIRE data to the relevant XSD schemes will be added.
- The functionality to deliver metadata will be improved and allow for metadata to be partly generated from the datasets.
- The administration part of the NAP will be improved to support a situation where The Danish Transport, Construction and Housing Authority will be admin for MMTIS data, and The Danish Road Directorate will be admin for datasets relating to the other delegated acts.

The development plans have been approved, but the actual development has not been initiated yet. The development is expected to be initiated shortly and will take approximately 3 months.

The planning process for the implementation of the Delegated Regulation (EU) 2017/1926 i.e. establishing an organizational, legislative and financial framework has been quite complex and therefore time consuming. The implementation has also proven to be more costly than expected, and this has resulted in a long and still ongoing administrative process to get the necessary funding in place.

Information on the progress made since 1 December 2019:

Work on clarifying the financing of the project is ongoing.

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

It has been decided to use a common Nordic profile as the Danish national profile for NeTEx. The Nordic NeTEx profile is based on the Norwegian profile.

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)

Measures undertaken, if any, to set up a national access point and on the modalities of its functioning:

As reported in the 2017 report a National Access point has been established running on an Amazon Platform. The NAP is still running, and updates has been made to make the platform more user friendly. The NAP consists of a user-oriented platform and an admin-login, where the administration can secure good data governance. The Danish Road Directorate has been, and still is, focusing on establishing a good data governance setup around the NAP since it is one of the important elements that needs to be in place for a NAP to work as intended. Content and metadata have to be updated, and we wish for all data owners to feel obligated to inform the users of their information feed if changes are made or data is not available. Data needs to be trustworthy, therefor NAP now supports easy information to the data users from the data owners.

To access data or to subscribe to a data feed, the users need to sign in.

The NAP is available at:

https://nap.vd.dk/

The language of the NAP is English.

Where relevant, the list of motorways not included in the comprehensive trans-European road network and identified priority zones:

In Denmark, 123 km of motorways exist outside the comprehensive trans-European road network(TEN-T), and these are also included by the NAP. There are 1175km of motorways in the comprehensive TEN-T in Denmark covered by the NAP. See details in Annex 2.

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

The metadata services of the Danish NAP are based on the standard vocabulary DCAT-AP using an RDF-based Platform. A DCAT-AP file is generated automatically when new data feeds or data sets are provided. A good data governance is at the moment being implemented in the Danish Road Directorate. This includes a quality checklist for when a third party provides data to the NAP. Data is provided in Datex II where possible.

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:

The Danish Road Directorate has for more than 15 years operated a National Traffic Management Centre, which among other things collects, processes and distributes traffic information. The National Traffic Management Centre handles and distributes data and information regarding highways 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.

The municipalities send information on roadworks and special events to the Traffic Management Centre according to agreements and the information is included in the information the Danish Road Directorate makes available (see also section 2.1.2.4).

The Danish Road Directorate distributes data on the NAP (https://nap.vd.dk/) and send out information on the traffic website: Trafikinfo.dk. Furthermore, data is distributed to 8 service providers, who display data on private services. The Danish Road Directorate has chosen to close down the three traffic information apps: “Trafikinfo”, “Vintertrafik” and “Trafikken Hovedstaden” (Capital area) based on the reason that the Road Directorate does not want to impede the private market.

The systems in the National Traffic Management Centre are constantly being improved. At the moment, the Road Directorate is working on performance and requirement specification for a new traffic management system in the National Traffic Management Centre. A tender is expected to be put out medio 2021. Market dialogue is taking place in autumn 2020.

Regarding the work with quality of the traffic information, a number of KPIs have been defined in the Traffic Management Centre in order to monitor its operation (see also section 2.1.2.5). One of these KPIs is the latency from the point in time when the operator in the Traffic Management Centre is informed about an event until it is made available at the NAP. This latency corresponds to one of the quality parameters defined in the traffic information quality parameters defined in the EIP projects (latest the EU EIP Sub Activity 4.1).

The latency is one of the important quality parameters, and the automated monitoring of this parameter shows that it is on the “Enhanced level” according to the definition in the most recent reports from EU EIP SA 4.1.
The Danish Road Directorate participates actively in the work around quality of traffic information in EU EIP SA 4.1.

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

As described in the report to the EC 2016 the independent National Body in Denmark sent out requests for declaration of compliance to 10 data suppliers and service providers delivering safety-related traffic information (SRTI) or using RTI in Denmark on 19th of August 2016. On 31 October

2018, the relevant parties were again contacted regarding compliance with the delegated regulation on real-time traffic information (RTTI). At the same time, the parties that had already submitted a declaration regarding SRTI were asked if there were any changes to their previously delivered declarations. Only six parties have delivered answers by 1 October 2019 despite several reminders. The National Body has by 28th of August 2020 sentnew reminders, and still not received answers. Furthermore, the Danish Road Directorate has had a dialogue meeting with a number of service providerson the 25th of August 2020. One of the subjects on the agenda was compliance with regulation, which hopefully will help raise awareness regarding the SRTI requirements.

Regarding quality monitoring, the Danish Road Directorate has, again this year, tested a number of commonly used traffic information services from major private service providers. Both SRTI and RTTI have been covered. Special focus has been on two important quality parameters: Latency (service side) and the event coverage compared to the transmitted events. Some problems were found at similar tests two years before (as reported in the 2018 and 2019 report), and the service providers in question have been informed about the results. The 2020 tests take place during June – October 2020, and the results will be used in the continuing dialogue between the DRD and the service providers with regard to the correct representation of data from the DRD and improvements to the DRD data delivery.

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

see section 2.1.4

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 today at the Danish Road Directorate is 112 messages distributed digitally from the emergency services, phone calls from police, drivers, contractors etc., information from the Danish Road Directorate's winter information system on eg. slippery roads, tunnel management systems (AID etc) and cameras. A pilot is currently under way on the possibility of using data from vehicles for incident detection and this may prove to be another important source in the future.

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:

No dedicated activities, see section 3.1.7

2.2.2 Progress since 2017

Description of the progress in the area since 2017:

No dedicated activities, see section 3.1.7

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:

According to article 17 paragraph 3 in the ITS Directive (Directive 2010/40/EU) this report shall describe the progress in national activities and projects regarding the priority areas made since 2011, and in the reports from 2011, 2014 and 2017 a list of larger ITS systems on the Danish road network was provided. An updated list with the status of the mentioned systems as of December 2019 can be found in Annex 1.

Besides the activities mentioned under section 2.1.2 a special activity has also been carried out under the CEF supported NEXT-ITS 3 project with regards to Priority area 3. This relates to remote monitoring and control of bridges and tunnels. This subject is elaborated below in section 2.3.2

2.3.2 Progress since 2017

Description of the progress in the area since 2017:

As described above a special focus has been to investigate the possibilities to move the monitoring and control of bridges and tunnels from the actual location to the national traffic management center. The first result of this work was that the system for remote monitoring and control of the Kronprins Frederiks Bridge has been implemented and started trial operation in early 2020.

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:

No changes since last report

Additional information:

N/A

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

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

There are 91 parking places alongside the Danish part of the TEN-T road network. On these parking places there are in total 1332 parking spaces for lorrys.

Percentage of parking places registered in the information service:

Static information about all of the above-mentioned rest areas are available in the EU database.

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

On 4 (4,4 % of total amount of parking places on TERN rod network) parking places dynamic information on the availability of parking spaces is provided.

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, and dynamic data is published at the NAP. All data is data from a Public source (The Danish Road Directorate).

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

2.4.1 Description of the national activities and projects

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

The Danish authorities have been involved in the CEF supported EU EIP Activity 4.2 (Facilitating automated driving) and Activity 4.4 (Cooperative ITS Services Deployment Support). The scope of these activities is to prepare road authorities and operators to make decisions on facilitating automated driving and automating their own core business, and to gain knowledge of best practises in implementation of C-ITS solutions and systems

Futhermore Danish authorities have been involved in the CEF supported NordicWay projects (1, 2 and 3) which have developed hybrid C-ITS services since 2015. The cloud-oriented NordicWay concept is relying on the use of existing cellular networks and stakeholder clouds to achieve cost-efficient C-ITS provision with the potential of covering most of the vehicle fleet already by 2030. The concept building on interchange nodes can via the federation of the interchange nodes be easily extended to cover all Europe and the whole TEN-T network, for instance.

NordicWay 1 showed that the concept works for selected Day 1 C-ITS services with sufficiently low latencies and high reliability, good user acceptance, and expected safety impact. NordicWay 2 extended the service portfolio to cover relevant Day 1 and Day 1.5 C-ITS services and some automated driving use cases as well as the road network coverage. It also proved the feasibility of the federation of interchange nodes. The assessments focused now on user acceptance, technical performance, eco-systems and socio-economy. NordicWay 3 further extends the scope of C-ITS services to cities, changing thereby also the focus of service portfolio to include more traffic signal-oriented services such as GLOSA, TTG, SPAT-MAP etc.

The NordicWay partners have been very active in European harmonisation activities within C-Roads, and in the forefront especially with regard to hybrid solutions and evaluation.

For more information visit www.nordicway.net and www.c-roads.eu

As also described under section 1.1 the city of Copenhagen is active in C-Mobile project, and has among other activities, aimed at providing road users (both motorised and cyclists) with information suchs as GLOSA, Road Works Warning and Road Hazard warnings primarily via cellular communication, but also through 50 signalized intersections equipped with ITS 5G based road side stations.

For more information visit https://c-mobile-project.eu/

2.4.2 Progress since 2017

Description of the progress in the area since 2017:

As described above the focus since 2017 within this area has very much related around harmonisation and standardisation. From a more concrete point of view connection has been established between the backbone systems of the national traffic management centre in Denmark and the common NordicWay interchange system so that all partners connected to the common system can retrieve the same real-time information through this system as the dynamic information available on the national access point (NAP).

As described in section 2.1.5. a pilot project is currently under way on the possibility of using data from vehicles for incident detection.

Since 2019 the DRD has been involved in testing real-time traffic data for the use of traffic control in signalized intersections. Two different initiatives have been lauched.

In the Greater Copenhagen area the DRD has joined a project in collaboration with the Municipality of Vallensbæk regarding a motorway junction and a closely located intersection with high risk of spill-back during rushhour periods. the aim is to create a better coordination between the junctions, and on top of this apply real-time GPS data to measure travel times for actuated program time settings instead of fixed clock-based settings. The project is carried out with Technolution as an integrator using the MobiiMaestro platform for traffic management based on Inrix real-time data.

During 2020 the DRD are incorporating new modules to its traffic management system to use the real-time traffic data from the new broker mentioned in **Fejl! Henvisningskilde ikke fundet.**. The new logic module will be designed to both handle real-time data based on travel times combined with detector loops generated from the traffic management system. Both inputs can be combined for a signalling control overlay regarding program setting, queue priority etc.

Effects for both projects will be evaluated using real-time traffic data during 2020/2021.

Furthermore a national action plan for the rollout of 5G cellular network has been adopted (see section 2.5.2), and a contract has been signed between TDC and Ericsson to rollout a 5G network in Denmark. more information available at:

https://ens.dk/en/our-responsibilities/telecom/5g-denmark

https://www.ericsson.com/en/press-releases/2019/3/tdc-selects-ericsson-for-5g-and-ericsson-operations-engine-managed-services

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:

Since July 2017 it has been possible to get a licence 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.

2.5.2 Progress since 2017

Description of the progress in the area since 2017:

So far three licences have been granted for autonomous vehicle testing. All tests include low speed autonomous shuttles. The tests take place in Aalborg, Copenhagen and Slagelse. The two former tests have been implemented. The last is expected to be implemented during the fall/winter. Further applications are expected in the near future.

On the 5th of March 2020, Aalborg Municipality became the first in Denmark to implement self-driving busses in mixed traffic on a part of Astrupstien in Aalborg East. By implementing self-driving mini electric busses, Aalborg municipality aims to help mobilize a number of citizens, as well as enhance both environmental and social sustainability in a residential area over a period of 2 years. Thus, the project supports the ambition of creating a more cohesive Aalborg East, where increased mobility is counteracting segregation and strengthening social capital. The 2.1 km route will have 10 stops and each vehicle will be able to carry 11 passengers. The bus will navigate using a variety of sensors and software that enables it to detect the surroundings in a 60-meter circumference 360 ° around the bus.

In August of 2020, a similar project to the project in Aalborg Municipality has been implemented in the Nordhavn district in Copenhagen. The shuttle route in the project has six stops around the Nordhavn area and travels in a continuous loop. By connecting these locations on the route with the nearby train station and local parking facilities, the area will become more accessible for everyone and connect Nordhavn within its own district, as well as within the greater Copenhagen area. The private company Holo is overall responsible for the project in close collaboration with CPH City & Port Development, Homeowners' association Århusgadekvarteret, The City of Copenhagen, The regional public transport company Movia and Copenhagen Metro. The project is part of the EU Horizon 2020 funded AVENUE-project.

As mentioned in section 2.4.2 a national action plan for the rollout of 5G cellular network has been adopted, and a contract has been signed between TDC and Ericsson to rollout a 5G network in Denmark.

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 2020).

In order to have comparable data regarding deployment and benefit KPIs for the future, all numbers are based on values from either end of July 2020 (for deployment KPIs) or from the period January-December 2018 (for benefit KPIs) as traffic and accident statistics do not exist for 2020 yet and for some statistics neither for the year 2019.

Since the deployment KPIs are as of medio 2020 they include the closure of some systems during 2018 as described in section 1.1. Relevant information can be found in annex 3.

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 that do not include 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.

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 (see section 2.1.2.1) .

- 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

Through the CEF supported NordicWay projects, all safety related messages and many other real-time information messages sent from the Danish national Traffic Center in Copenhagen are communicated through the common NordicWay Interchange system and thereby made available to all project partners for C-ITS applications. In the same manner, messages from all partners can be shared with the Danish Traffic Center through the NordicWay Interchange Node. The service covers all of Denmark meaning that the KPI is 100% regardless of the chosen road network. However, it is to be understood that NordicWay is still a pilot project and not a fully operational production system which is available to every road user and every service provider, so seen from the average travellers point of view the coverage would be 0%.

Furthermore the EC document on "ITS KPIs for the EU" states that Cooperative-ITS services or applications means road based ITS infrastructure enabling services or applications using infrastructure to vehicle or vehicle to infrastructure communication. In Denmark the NordicWay activites related to the Ten-T network are based on cellular communication (hence no physical roadside installation), so if the ITS infrastructure in the definition is to be understood as physical installations the KPI is 0%, but if it is to be understood as digital infrastructure the KPI is 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):

- 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 (see sections 2.1.4 and 3.1.7).

- 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 and walking in all of Denmark

Within this travel planer 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 actually 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. 34 000

- KPI for Denmark
  34 000 nodes/ 34 000 nodes*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 the Danish Road Directorate where information such as bridge hights, 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. – will be provided through the COCOM 112 questionnaire

3.2 Benefits KPIs

As the benefits of the services cannot be directly measured, they will have to be estimated. The benefit calculations for road transport regarding change of travel time, fatalities, injury accidents and emissions are based on estimates by the NEXT-ITS Evaluation group made within the CEF supported projects NEXT-ITS and NEXT-ITS2[1].

The services are primarily benefitting the state road network and therefore the benefit KPIs are calculated for the state road network with the length of 3815 km (length in 2018). The state road network includes the TEN-T Comprehensive Road network and the main roads in Denmark.

The network and accident statistics as well as the estimated values for vehicle hours and vehicles hours spent in congestion are shown below for the year 2018:

THE STATE NETWORK – 3815 km	**2018**
Vehicle kilometres driven (million/year)	25530
Vehicle hours driven (million/year)	302.8
Vehicle hours spent in congestion (million/year)	13.7
Fatalities (number/year)	55.5
Non-fatal injury accidents (number/year)	475.5
CO_2 emissions (million tonnes/year)	6.4

1) Data statistics on vehicle hours and vehicle hours in congestion are based on GPS-data from 2016
2) Accident numbers and fatalities are average of two years 2017-2018
3) Source: "Interaktiv årsstatistik", Vejdirektoratet.dk
4) CO_2 emissions based on vehicle kilometres driven and an average emission factor of 250 gr/km

3.2.1 Change in travel time (road KPI)

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

[1] NEXT-ITS Evaluation Report, Final version, January 2016 (Lone Dörge et al.), NEXT-ITS 2 Evaluation Report, Version 1.0 Final, January 2018 (Lone Dörge et al.)

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

ITS measures deployed are mostly supported by TEN-T and CEF programmes (VIKING, EasyWay, NEXT-ITS). The measures and services have been roughly estimated to reduce total travel times on the state road network by 164 400 vehicle hours in 2018 (excluding the motorway ITS systems).

- KPI (road) for change in travel time on the state road network
  0.164/302.8*100% = 0.05%

The KPI for change in delay time has also been estimated with a reduction of total delays (= vehicle hours spent in congestion) of 32 900 vehicle hours in 2018 (excluding the motorway ITS systems).

- KPI (road) for change in delay time on the state road network
  0.0329/13.7*100% = 0.24%

However, it should be noted that the impacts of the information services are extremely difficult to estimate, especially in this era of technology disruption due to connected and automated driving, the internet of things, digitalisation etc.

The KPI for public transport in relation to dynamic travel information has not been calculated/estimated.

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:

The impact of the measures and services on road accidents resulting in death or injuries cannot be directly measured because a range of factors are influencing this KPI. As the accident numbers vary during the years, there is a large statistical uncertainty and various attempts of statistical analyses on accident numbers have been inconclusive. However, rough estimates can be made and the NEXT-ITS projects performed such effect estimations, but due to a cautious approach principle with very conservative safety effect estimates the resulting change in personal injury accidents was very limited.

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

The measures and services have been roughly estimated to reduce CO_2 emissions on the state road network by 3500 tonnes in 2018 (excluding the motorway ITS systems).

- KPI (road) for change in CO_2 emissions on the state road network
  3500/6 400 000*100% = 0.05%

The KPI has been calculated based on vehicle kilometres driven and an average emission factor of 250 gr/km.

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):

As described in section 1.1 there has been reduced activities Regarding new ITS related infrastructure such as Roadside equipment and Variable Message Signs (VMS) in recent years, and while investments in software and backbone systems have been made these are negligible compared to overall infrastructure investments during the reporting period (three years). Therefore, the KPI on annual investment in road ITS (as a % of total transport infrastructure investments) can't be calculated in a meaningful way for this 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, this KPI can only be given as a rough estimate.

In annex 3 an estimate of operating & maintenance costs for the relevant roadside based systems are given (systems marked with NA is excluded since the operating & maintenance costs of these systems are covered by separate companies and also includes tolling systems). This gives a total of 2,62 mio. € pr. Year for 72 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

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 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 projects described in 2017 report.

4.1 Traffic information at the Copenhagen motorway network and around Malmö (Sweden)

No major changes has been carried out, or are foreseen in the near future

4.2 Traffic management, information and bridge tolling at "The Øresund Link" between Sweden and Denmark

No major changes has been carried out, or are foreseen in the near future

4.3 Traffic information and management at the Motorring 3, M3, around Copenhagen

As described in the 2017 report the system was turned off in spring 2017 due to lack of finances. However as described in section 1.1 financing for some systems has been secured, and because of this the system was reactivated. In 2020 the algorithm for the automatic operation of the system (automatic control of VMS speed signs, que warning etc) was upgraded.

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

No major changes has been carried out, or are foreseen in the near future

4.5 Traffic information and warning systems in the Triangle Area

No major changes has been carried out, or are foreseen in the near future

4.6 Traffic information and management at the Køge Bugt Motorway, M10, from Copenhagen to the City of Køge that is located 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 the system as a whole was discontinued, but parts of the system (including VMS information signs) was made permanent, but due to the financial situation described under the main report section 1.1 the systems was permanently disconnected in 2018.

4.7 Traffic management and information at the motorway tunnel across the inlet Limfjorden and at the City of Aalborg

In 2020 the algorithm for the automatic operation of the system (automatic control of VMS speed signs, que warning etc) was upgraded.

4.8 Traffic management and information at the Guldborgsund Motorway tunnel

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

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

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

4.10 M40 (Middelfart – Nørre Åby)

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

4.11 Elsinore Motorway, M14, northern section

The system has been in operation until spring 2017. The system was originally implemented as a part of a road widening project and covered approximately 14 km, and it had been planned to keep approx. 5 km as a permanent system after the end of the construction work. However, due to the financial situation described in section 1.1., the entire system was turned off in spring 2017and permanently disconnected in 2018.

4.12 Elsinore Motorway, M14, southern section

The system has been in operation until spring 2017. However, due to the financial situation described in section 1.1., the entire system was turned off in spring 2017 and permanently disconnected in 2018.

4.13 M60 Vejlefjord

The system on the Motorway M60 was deployed temporarily to help with the road works at the location. The system was discontinued when the ongoing road works was fialized, but a small part relating to the Vejle Fjord Bridge remained to be operated under the bridge operating budget.

4.14 No changes are foreseen for the time being.M60 Skanderborg

The system on the Motorway M60 are deployed to help white a merging problem after a part of the motorway was widening from 2 to 3 lanes in each direction from Skanderborg to Aarhus. At the end of the project there was a safety problem at the merging nearby Skanderborg and it was decided to put up a warnings system with variable speed signs and a variable information sign.

4.15 M40 Odense

The system on the Motorway M40 are deployed to help white a merging problem after a part of the motorway will be widening from 2 to 3 lanes in each direction from Skanderborg to Aarhus at the end of 2020. At the end of the project it was predicted to be a safety problem with the merging nearby Odense like the problem at the M60 Skanderborg. Therefor it was decided to put up a warnings system with variable speed signs and a variable information sign.

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	(km)	Automatic Incident Detection (km)	ITS (km)
Øresundstunellen	4	4	4
Tårnbytunellen	0,7	0,7	0,7
Silkeborgtunellen	0,3	0,3	0,3
Limfjordstunellen	0,6	0,6	0,6
Guldborgsundtunellen	0,5	0	0,5
Total	**6,1**	6,1	6,1

6 Annex 3 Length of relevant ITS systems described in the 2017 and 2020 report

	Permanent motorway system end 2019 (km)	Temporary motorway system end 2019 (km)	Shut down (permanently) in 2017-2019	Approx. operation and maintenance cost (Mio € pr. Year)
Traffic management, information and bridge tolling at "The Øresund Link" between Sweden and Denmark	24			NA
Traffic information and management at the Motorring 3, M3, around Copenhagen	17		-	1
Traffic management, information and bridge tolling at The Storebælt fixed link.	20			NA
Traffic information and management at the Køge Bugt Motorway, M10			20 (closed down stepwise, see section 4.6)	
Traffic management and information at the motorway tunnel across the inlet Limfjorden and at the City of Aalborg	11			0,6
Traffic management and information at the Guldborgsund Motorway tunnel	11			0,3
Hard shoulder running on the Hillerød motorway, M13	2			0,1
M40 (Middelfart – Nørre Åby)	10			0,1
Elsinore Motorway, M14, northern section			5 (closed down stepwise, see main report section 4.11)	
Elsinore Motorway, M14, southern section			7	
Traffic management and information at M60 Vejlefjord	20			0,5
Traffic management and information at M60 Skanderborg	1			0,02

Traffic management and information at M40 Odense	(will open end 2020)			
Total (km)	116	0	32	2,62

7 Annex 4 Map of Comprehensive Ten-T network

Comprehensive Ten-T road network

Comprehensive Ten-T rail network