Directive 2010/40/EU Progress Report 2017 *Denmark*

09/10/2017

1 Introduction

1.1 General overview of the national activities and projects

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, and to upgrade the signalling systems on the Danish rail network operated by Rail Net Denmark

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 lead to new possibilities for improved digital traffic information services.

Another major ongoing activity is a pilot project, regarding acquisition of real time data, regarding road traffic, from data brokers. As part of the project it is investigated how these data can support the above mentioned traffic information services and the daily operation in the traffic center.

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.

Regarding ITS related physical infrastructure such as Roadside equipment and Variable Message Signs (VMS) there is currently a significantly reduced activity in Denmark. In the later years, there have been a large number of construction projects, such as widening of motorways, in Denmark, and many of these projects have made use of ITS systems to reduce the consequences for the traffic flow during the construction work, but the number of such projects is drastically decreasing, and as a consequence the number of temporarily deployed ITS Systems has done the same.

However there has also been a number of permanent larger ITS systems on the Danish Ten-T road network. These systems have been operated under a special allocated budget that has run out. Due to the lack of financing, a political decision was made, in the spring of 2017, to turn off these systems temporarily while possibilities of new financing could be investigated (except especially critical systems in relation to tunnels and bridges that has remained in operation). As a consequence there has been no operational VMS based roadside ITS systems on the Danish TEN-T road network since spring 2017 except in conjunction with bridges and tunnels, and a single hard shoulder system on the M13 motorway. It is at the moment uncertain how this situation will evolve.

1.2 General progress since 2014

Danish authorities have actively participated in numerous European projects targeting at harmonious implementation of the actions required by the ITS Directive.
The NEXT-ITS, NEXT-ITS2 and NordicWay corridor projects contained numerous deployment projects and coordination activities in Northern Europe. The European ITS Platform (EIP) project and its successors EIP+ and EU EIP focused on the harmonized approach towards e.g. service quality criteria, quality requirements and measurement practices as well as harmonization of the data delivery services in Member States.
The above mentioned projects cover all the traffic information services 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) described under section 2 of this report.
Danish authorities have also participated in the HeERO2 project that focuses on the harmonized deployment of the eCall service in the Member States.

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

2.1.1.1 New Traffic Management Centre in the Traffic Tower

An entirely new enhanced Traffic Management Centre has been established in the so-called "Traffic Tower" and went into operation in 2015. The traffic tower is a newly constructed building to house various traffic management functions, including also rail traffic management. The road traffic management and the rail traffic management are today within separate organizations in Denmark.

Technical installations in the traffic management center comprise implementation of a common IT backbone setup, a video screen wall etc. In addition to the technical installations, dedicated efforts in development of traffic operator instructions including incident management processes are ongoing.

In the new Traffic Center The Danish Road Directorate has established an improved cooperation with the police and various local rescue services as well as a national group with representatives from the partners with the task to evaluate incidents on motorways. Ultimately, the long-term overall goal of the cooperation in the traffic tower is proactive traffic management with relevant interfaces to ensure co-modal transport planning, management and operation and where all systems and services are EU-harmonized. This goal is to be reached in collaboration between the Danish Road Directorate, municipalities, police and rescue services etc.

2.1.1.2 Real Time data procurement

After a real time data market analysis and benchmarking in 2014 the Danish Road Directorate launched a tender for procuring Real Time Floating Car Data (FCD) in early 2015, both for real time and statistical use. Only data based on GNSS measurements was requested.

Contract with a supplier was signed in June 2015 and the implementation phase started immediately after, and after testing procedures the system was sat in production in December the same year. The geographic coverage for real time data includes all state roads and some alternative routes. The statistical (historical) point based data includes all routes covered by the supplier.

There are several interfaces set up between the Danish Road Directorate and the supplier where the following are the main ones:

a) Real time data feed
b) Point based data feed
c) Parameter setting for Extra Ordinary Queuing (EOQ)

All interfaces operate using Datex 2.

a) Real Time data feed
Via a server pull service the Danish Road Directorate receives speed measurements for all road links updated every minute 24/7 including normal travel time and a flag indicating EOQ to improve incident detection. Traffic condition and forecasts are also part of the service as well as data quality indicators.

A comprehensive test system is set up for quality control of the supplier's data consisting of 14 test stretches where the delivered floating car data are compared with the Danish Road Directorates own fixed road sensor information. Each service level goal agreed upon is compiled into a monthly report and shared with the supplier as a basis for improvement and/or potential fine.

b) Point based data feed
Each day the Danish Road Directorate receives point based data from all routes driven the previous day. These routes are anonymized and cut off at endpoints for integrity/privacy reasons. Data is used for planning purposes, finding bottlenecks, intersection analysis and other special studies.

c) Parameter setting for Extra Ordinary Queuing
In order to accommodate the correct thresholds for different parts of the road network the Danish Road Directorate are able to configure the level for when the EOQ flag will be raised in the real time data feed.

Real time data are visualized on the new traffic map (see section 2.1.1.3) as well on mobile apps showing traffic conditions together with other forms of information, such as road works etc. (see section 2.1.1.4)

To improve incident management the Danish Road Directorate has from the start of the project worked on improving and fine tune the incident alert (EOQ). That is, for the Traffic Center to act more promptly on dangerous traffic situations. The ambition is to enable the Traffic Center to send rescue teams and police to incident sites more quickly, and finally ending up clearing the road faster and save travel time for road users as well as accomplish socio-economic benefits.
For this purpose a special map has been developed indicating stretches along the road which has unexpected slow traffic. The map includes functionality such as possibility to show delay time for any selected route. If deemed relevant this information can thereafter be forwarded to the road users by normal channels like RDS/TMC. This special map has been used actively by the Traffic Center personnel since August 2017, and the effect will be evaluated the coming winter (2017/2018).

During fall 2017 EOQ will be an integrated part of the Trafikman 2 system used in the Traffic Center, butl the EOQ information is still validated by humans before exposed to the road users. However the ultimate goal is to reach a full automated chain, from data collection to display of EOQ, but it has been clear that a correct display of EOQ need resources and continuous calibration to work properly.

2.1.1.3 New traffic map

The new Traffic Map was prepared during 2014. The tender was executed during winter 2015-2016, and the new traffic map was launched on the 8th of December 2015. The new map replaced 4 old maps and has an improved usability and responsive design and high performance as well as dedicated functionality for large trucks about headroom heights, dedicated rest areas etc.

Since the launch the map has had a smooth performance and high satisfaction rate among the users. 88 % of the users are very satisfied or satisfied with the map (User survey September 2017). The map is continuously under development and improved with new features. In 2017, some of these new things have been or will be added to the map: direct access button (phone call) to Traffic center (only mobile version), service levels for winter roads, radio announcements (last three), service messages for larger road works, clear headroom and weight limits in 16 municipalities, design improvements and parking information in Aalborg and Aarhus.
The new traffic map can be found on https://trafikkort.vejdirektoratet.dk/

2.1.1.4 New and improved traffic apps

Just as with the new traffic map a series of apps with local geographical coverage has been redesigned, improved and compiled to fewer apps that instead has national coverage. A list of relevant apps can be found on http://www.vejdirektoratet.dk/DA/trafik/apps/Sider/Trafik-på-din-mobil.aspx

2.1.1.5 Evaluation of M3

In 2015 the Danish Ministry of Transport initiated an evaluation project with the purpose to conduct an evaluation with trustworthy, reliable and easy-to-communicate results on the effect of the variable message signs in the Motorway Control System installed on Motorring 3 (M3) around Copenhagen.

The ITS system was originally established in relation to major construction works when widening the motorway from 4 to 6 lanes (2005-2011) in order to improve traffic conditions during the period with construction works. After the construction works ended, most of the system was kept for permanent traffic management on 15 km of the M3.

The ITS system on the M3 had not previously been evaluated as comparable before and after situations did not exist. In order to find the effects of the variable message signs (VMS) on traffic flows and speeds, it was decided to shut down all variable signs for a time period in 2015 and an evaluation was conducted by comparing the traffic conditions with and without the VMS in operation.

Results of the evaluation

Taking into account all the analyses performed the overall key result is that the variable message signs had a positive effect on the traffic flow on the M3. Especially on the travel times which in average was shorter with the VMS in operation. The evaluation also showed that the capacity during peak hours was higher with the VMS in operation, specifically in the maximum 15-minute peak. In addition, the road users were in general satisfied with the service that the VMS information provided.

2.1.1.6 Unified Platform for Managing Traffic Signals

The Danish Road Directorate is responsible for managing and maintaining approximately 350 traffic signals located on the national highway grid. The task of traffic signal management is carried out with the help of four supplier specific surveillance platforms. In the present setup, the task of detecting and repairing faults in traffic signals is outsourced to a third party. The third party is also responsible for making any planned or unplanned changes to timing plans initiated by the Danish Road Directorate.

One common feature among these surveillance systems is that they use proprietary communication protocols making mutual exchange of information nearly impossible. Due to this incompatibility, the user does not have a collective picture of the state of the traffic signals. Another challenge with this fragmented setup is that these systems have been developed for technicians/expert users with advanced knowledge of traffic signals. This makes the task of monitoring and managing traffic signals in a traffic management center setup quite cumbersome as it would require allocation of dedicated

experts.
In order to overcome the above mentioned challenges, the Danish Road Directorate decided to consolidate monitoring and management activities on one platform developed specifically to cater the needs of the Danish Road Directorates Traffic Management Center. The unified platform uses open protocols to communicate with the built-in surveillance systems so that the traffic signals can be monitored and managed centrally from one location. This platform enables the Traffic Management Center to monitor traffic signals 24/7 and change the timing plans remotely if the need arises.

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

A National Access Point (NAP) has been established. It runs on an Amazon platform. Data from various sources are regularly (e.g. every 10 seconds) sent to the NAP. Data consumers get the data from the NAP. Both input and output of data is currently done via Pull services. The current NAP has 4 basic services: Deliver data (from data provider to data consumer), Discover data (the data consumer can search for data on the basis of metadata), Control access to data, and Manage and Monitor NAP (management functions used by the NAP manager). An additional data subscription service is being developed.

Connections to 6 data sources have been established, and further connections are in the process of being established. The common European standard for metadata, DCAT-AP is used for representing metadata. Basic metadata for the available data have been registered. Dynamic road status data and traffic data are delivered to the data consumers (service providers and users) in DATEX II Version 2.3 format. When the implementation is complete, the NAP will provide the static and dynamic data covered by the Delegated Regulations (c), (b) and (e).

In Denmark only 73 km of motorways exist outside the comprehensive trans-European road network (TEN-T) in Denmark, and these are still covered by the NAP. There are 1179 km of motorways in the comprehensive TEN-T in Denmark covered by the NAP. See details in Annex 2.

2.1.3 Progress since 2014

See the above section

2.1.4 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)

As mentioned in other reports to the European Commission, the Danish Road Directorate has for more than 12 years operated a Traffic Management Centre, which among other things collects, processes and distributes traffic information. The distributed traffic information includes safety-related traffic information.

The Traffic Management Centre handles and distributes data and information regarding a large part of the road network in Denmark.

A number of KPIs have been defined in the Traffic Management Centre in order to monitor its operation. 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 National Access Point. This latency corresponds to one of the quality parameters defined in the traffic information quality EIP projects, latest the EU EIP Sub Activity 4.1. The automated monitoring of this parameter (latency) shows that it is on the “Basic level” in some months and on “Enhanced level” in some months. The other quality parameters defined in the EIP projects have been measured intermittently by a manual process. From a print of actions done during the handling of the critical events the quality parameters are found. They all are on the “Enhanced level”. Work is going on to also automate the measurement of these other quality parameters.

The Danish Road Directorate participates actively in the work around quality of traffic information in EU EIP SA 4.1, and results from the EU EIP project are implemented in the Danish Road Directorate Traffic Management Centre.

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 last year the Independent Body in Denmark sent out requests for declaration of compliance to 13 data suppliers and service providers delivering safety-related traffic information (SRTI) or using SRTI in Denmark on 19 August 2016. The Declaration of Compliance form sent out with the requests was based on a similar form developed by the Dutch authorities, and it was similar to the later developed harmonised form. Still 3 service providers have not returned their Declaration of Compliance despite numerous reminders from the Independent Body.

In September 2017 one random inspection was done. It was at the data supplier of most of the SRTI, the Traffic Management Centre of the Danish Road Directorate (described above). Their Declaration of Compliance submitted last year was used as plan for the inspections. Paragraph by paragraph the representative from the Independent Body asked how the requirements were met. The Traffic Management Centre answered the questions and demonstrated the compliance with the requirements. The representative from the Independent Body was satisfied and concluded that the Traffic Management Centre fulfilled its obligations.

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

As described in the report to the EC last year, DANISH ROAD DIRECTORATE has had a National Access Point (NAP), a web page giving the relevant references about how to get access to the traffic information from the Danish Traffic Management Centre has been established. Also some information about the data (metadata) - although not required in the Commission Delegated Regulation No 886/2013 - has been available. This access point is in the process of being moved to and included in the NAP described for the Delegated Regulation (b) (see above).

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

2.2.1 Description of the national activities and projects

2.2.1.1 Upgrade of the signalling systems on the Danish rail network

In 2009 it was politically agreed that the existing signaling systems on the Danish rail net operated by Rail Net Denmark should be replaced with a modern system as the old systems were becoming increasingly outdated.

Currently, the existing signaling system deployed at the "S-bane" (the rail net in Copenhagen and its surroundings) is being replaced by a communications-based train control system – CBTC. The first line deployed with CBTC has been in operation since February 2016. The rest of the rail net operated by Banedanmark will be deployed with the European standard, ERTMS (European Rail Traffic Management System).

The replacement of the existing systems will lead to improvements with regards to regularity, safety and passenger information. Furthermore, the replacement will allow for operating more effectively from the new control centres in the traffic towers and will lay the foundation for a later speed upgrade on certain lines.

2.2.1.2 New traffic map

See description in section 2.1

2.2.2 Progress since 2014

See the above sections

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

2.3.1 Description of the national activities and projects

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 and 2014 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 2016 can be found in Annex 1.

2.3.2 Progress since 2014

In the period from 2015-2017 the Danish Road Directorate has been a partner in the NordicWay project.

NordicWay is a pilot project that seeks to enable vehicles to communicate safety hazards through cellular networks on a road corridor through Finland, Norway, Sweden and Denmark. The project is a collaboration between public and private partners in the four countries.

During the project, cars has utilized cellular and ITS-G5 networks to share specific and low latency traffic safety information regarding e.g. obstacles on the road, weather conditions, slippery surfaces, accidents and road works.

The project goal is to pilot and facilitate specific C-ITS functionalities through a common architecture. The end goal of the project is to lay the foundation for automated cloud communication via cellular networks with data generated by vehicle on-board sensors and the surrounding infrastructure. Communication will be established between vehicles, smart devices on the road, service providers, road administrators as well as other public administrations.

More information can be found on www.NordicWay.net

2.3.3 112 eCall (priority action d)

National eCall PSAPs Infrastructure ready by 1st October 2017: Yes

Authorities that are competent for assessing the conformity of the operations of the eCall PSAPs:

Færdselsstyrelsen (Danish Road Safety Agency)
Sorsigvej 35
6760 Ribe
Denmark
Phone: +45 7221 8899

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 90 rest areas alongside the Danish part of the TEN-T road network. On these rest areas there are in total 879 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 (3,6 % of total amount of rest areas on TERN rod network) rest areas dynamic information on the availability of parking spaces is provided.

Additional information:
Static data is published on the European Access Point for Truck Parking hosted by DG MOVE, and dynamic data is published at the national access point. 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

In Denmark the work regarding priority area IV. "Linking the vehicle with the transport infrastructure" has been centred around three main activities, namely the work with ecall, the

involvement in the NordicWay project and the acquisition of real time data . Regarding ecall please see section 2.3.3 and regarding NordicWay see section 2.3. above. Furthermore the Danish Road Directorate has also conducted an Acquisition of real-time data which (depending on definitions) could also be described as linking the vehicle with the infrastructure, this project is described under section 2.1 “optimal use of road, traffic, and travel data”.

2.4.2 Progress since 2014

See the above sections.

3 Key Performance Indicators (KPIs)

All KPI in this report is, unless otherwise stated, calculated on the basis of the comprehensive Ten-T Road network which in Denmark covers 1603 km road. A list of roads covered and their respective lengths can be found in annex 3. In order to have comparable data regarding deployment and benefit KPI's all values are based on values from either end of 2016 (deployment) or from the period January-December 2016 (benefits to be calculated). It is therefore to be understood that since the deployment KPI's is as of end 2016 they does not reflect the closure of several systems as described in section 1.1. Relevant information regarding the effect of these possible closures on the KPI's can be found in annex 3.

3.1 Deployment KPIs

3.1.1 Information gathering infrastructures / equipment (road KPI)

It is to be understood that for the basis of the KPI concerning road network equipped with fixed traffic monitoring it can be difficult to give a precise answer since a road network can have a number of different systems equipped with different purposes, some are just gathering data on a single spot, and therefore they are covering a spot that have a length of 0 km, likewise it could be argued that cameras are used for traffic monitoring, but the length of a road covered by a single camera is hard to quantify. For this reason 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) and is based on the length of the systems that can be found in annex 3. This will however not necessarily be the case in the future since it is possible to have larger systems to gather data but does not include Traffic management and traffic control measures such as VMS.

- KPI for road network equipped with road weather monitoring:
  1603 km/1603 km*100% = 100%

- KPI for road network equipped with permanent fixed traffic monitoring:
  147 km/1603 km*100% = 9%

- KPI for road network equipped with temporary fixed traffic monitoring:
  28 km/1603 km*100% = 2%

- KPI for road network equipped with permanent or temporary fixed traffic monitoring:
  (147 km + 28 km)/1603 km*100% = 11%

- KPI for road network equipped with mobile/probe traffic monitoring:
  1603 km/1603 km*100% = 100%

3.1.2 Incident detection (road KPI)

In Denmark automatic incident detection on the comprehensive Ten-T Road network is established in the Limfjord tunnel (0,6 km), the Øresund Tunnel (4 km), the Silkeborg tunnel (0,3 km) and the hard shoulder running stretch of the M13 motorway (2 km) which equal an approximate length of equipped road on 6,9 km. The total length of tunnels on Ten-T Road network is 6,1 km (see annex 2).

- KPI for comprehensive Ten-T Road network
  6,9 km/1603 km*100% = 0,4%
- KPI for tunnels on comprehensive Ten-T Road network
  (0,6 km + 4 km + 0,3 km)/6,1 km * 100% = 80%

3.1.3 Traffic management and traffic control measures (road KPI)

In Denmark all tunnels on the Ten-T Road network is equipped with ITS systems (meaning a KPI on 100%). Regarding larger ITS systems on the Ten-T road network a comprehensive list of motorways equipped with ITS systems can be found in Annex 2.

- KPI for comprehensive Ten-T Road network (permanent installation)
  174 km/1603 km*100% = 9%

- KPI for comprehensive Ten-T Road network (temporary installation)
  28 km/1603 km*100% = 2%

- KPI for comprehensive Ten-T Road network (permanent or temporary installation)
  (147 km + 28 km)/1603 km*100% = 11%

- KPI for tunnels on comprehensive Ten-T Road network
  6,1km/6,1 km * 100% = 100%

3.1.4 Cooperative-ITS services and applications (road KPI)

Through the NordicWay pilot project all safety related messages sent from the Traffic Center in Copenhagen are communicated through the NordicWay interchange Node, and 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. This Service covers all of Denmark which means that the KPI would be 100% regardless of the chosen road network. However it is to be understood that NordicWay is still a pilot

project, and not a full production system available to every road user, so seen from the average travellers point of view the coverage would be 0%.
According to The EC document on "ITS KPIs for the EU" the definition is “Cooperative-ITS services or applications means road based ITS infrastructure” which would also bring the KPI to 0% since the NordicWay pilot project is based on cellular communication and not road based ITS infrastructure.

3.1.5 Real-time traffic information (road KPI)

Real time traffic information can be obtained for all of the comprehensive Ten-T road network through the new traffic map or other channels.

- KPI for comprehensive Ten-T Road network
  1603 km/1603 km*100% = 100%

3.1.6 Dynamic travel information (multimodal KPI)

Concerning the length of the transport network this is hard 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 a 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 1603 km which is the length of the Ten-T comprehensive road network in Denmark, 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 railroad network in Denmark does to a large degree follow the Road network as can be seen in Annex 4.

In Denmark a national journey planer (www.rejseplanen.dk) has been in operation for several years, and since this planer covers all of Denmark the KPI for coverage is 100% regardless of the network chosen. Rejseplanen does at the moment include information about train, bus and walking, but pilot projects are ongoing to also include other modes of transport such as taxi, car sharing, biking etc.

Due to the above mentioned challenges in determining the exact area where relevant nodes (e.g. rail or bus stations) should be included the bellow 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.

Length of transport network type (in km) with provision of dynamic travel information services

- KPI for comprehensive Ten-T Road network
  1603 km/1603 km*100% = 100%

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

- KPI for Denmark
  33.766 nodes/ 33.766 nodes*100% = 100%

3.1.7 Freight information (multimodal if possible or road KPI)

- KPI for comprehensive Ten-T Road network
  1603 km/1603 km*100% = 100%

- Number of freight nodes Can't 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 describes in The EC document on "ITS KPIs for the EU" the benefit KPI's should be stated as a change in status. However in order to calculate a change it is necessary to establish a baseline a given dataset can be compared to. For Denmark it is the intention to use data for 2016 as a baseline. However due to technical difficulties in extracting new types of data (among other GNSS data) the complete dataset necessary to calculate the relevant baseline data for 2016 is not yet available. However it is still the intention to calculate and use the relevant data when the problems have been solved and the relevant dataset becomes available.

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 actions and projects described in the 2011 and 2014 reports as of September 2017.

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

The system has been integrated into the new overall map and services see main report section 2.1.1.3

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

The ETC system has been updated to comply with CEN-standard EN 15509, but otherwise there have been no major changes to the system which is working in a satisfactory way. No changes are foreseen for the time being.

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

The system has been in operation until spring 2017, but due to lack of finances it was decided to shut the system down and dismantle it. However a possibility to finance the system through the state budget from 2018 has resulted in a decision to postpone the removal of the system, and therefore the system is still intact, but has been out of operation since spring, and the future of the system is uncertain. See also main report section 1.1.

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

The ETC system has been updated to comply with CEN-standard EN 15509, but otherwise there have been no major changes to the system which is working in a satisfactory way. No changes are foreseen for the time being.

4.5 Traffic information and warning systems in the Triangle Area

The system was dismantled in 2014 as planned, but and the two ITS-systems in sections surrounding the Vejle Fjord Bridge and the New Little Belt Bridge were kept and remains in operation as planed (see section 4.12 Middelfart – Nørre Åby and 4.15 M60)

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 do to the financial uncertainty described under the main report section 1.1 these are currently not in function, and the future of the system is uncertain.

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

The system went in to operation in late 2011 as expected and has been working in a satisfactory way since, no major changes has been made to the system and no changes are foreseen for the time being.

4.8 Traffic management and information at the Guldborgsund Motorway tunnel

No changes have been made to the system since 2011, and no changes are foreseen for the time being.

4.9 Traffic management at Holbækmotorvejen, M11, between Folehaven and M3

The Traffic management and information systems on the Motorway M11 from Copenhagen to the ring motorway 3 (M3) was temporarily deployed to help with the ongoing road works at the location. The system went into operation in early 2014, and was discontinued after the road works was finalized ahead of schedule in 2017.

4.10 Traffic management at Køge Bugt Motorvejen, M10, between Greve and Køge

The system was originally implemented as a part of a road widening project. After completion of the road works the system has been discontinued

4.11 Pilot project using the hard shoulder on the Hillerød motorway, M13, for driving in the morning rush hour

Since 2014 an evaluation of the pilot project has been carried out, with a positive result. It has therefore been decided to keep the system running on a permanent basis, and no major changes to the system is foreseen for the time being.

4.12 M40 (Middelfart – Nørre Åby)

The system on the Motorway M40 from Middelfart to Nr. Aaby was deployed temporarily to help with the road works at the location. After road works was finalized a part of the system relating to the New Little Belt Bridge remained to be operated under the bridge operating budget.

4.13 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 discontinued in spring 2017.

4.14 Elsinore Motorway, M14, southern section

The system has been in operation until spring 2017, but due to lack of finances it was decided to shut the system down and dismantle it. However a possibility to finance the system through the state budget from 2018 has resulted in a decision to postpone the removal of the system, and therefore the system is still intact, but has been out of operation since spring, and the future of the system is uncertain. However there are ongoing negotiations with the City of Copenhagen to hand over a part of the system to the municipality in order to keep it operational in connection with the new Nordhavn tunnel currently under construction. See also main report section 1.1.

4.15 M60

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.

5 Annex 2 Length of relevant road network in Denmark

5.1 Motorways

ADMVEJNR	ADMVEJDEL	Lgd. (km)	Comprehensive Ten-T motorways	Non Ten-T motorways
3	Motorring 3	26,299	26,299	
4	Motorring 4	3,000	3,000	
6	Motorring 4	4,101		4,101
11	Holbækmotorvejen	11,000		11,000
12	Fr.sundmotorvejen	6,547		6,547
13	Hillerødmotorvejen	18,000		18,000
61	Århus S motorvejen	9,209		9,209
68	Messemotorvejen	17,897		17,897
75	Mariendals Mølle Motorvejen	1,675		1,675
76	Kridtsvinget	0,976		0,976
	Lyngby Omfartsvej	4,000		4
4	Motorring 4	5,605	5,605	
8	Vallensbæk Mose	1,312	1,312	
9	Taastrup	1,333	1,333	
10	Køge Bugt Motorvejen	27,536	27,536	
11	Holbækmotorvejen	80,000	80,000	
12	Fr.sundmotorvejen	4,000	4,000	
14	Helsingørmotorvejen	36,030	36,030	
20	Vestmotorvejen	69,171	69,171	
30	Sydmotorvejen	120,545	120,545	
40	Fynske Motorvej	90,836	90,836	
41	Svendborgmotorvejen	35,473	35,473	
50	Sydjyske Motorvej	97,343	97,343	
51	Sønderborgmotorvejen	25,474	25,474	
52	Esbjermotorvejen	65,828	65,828	
60	Østjyske Motorvej	93,185	93,185	
64	Midjykske Motorvej (Vejle-Herning)	80,100	80,100	
66	Herningmotorvejen	74,717	74,717	
70	Nordjyske Motorvej	113,671	113,671	
72	Djurslandmotorvejen	17,928	17,928	
80	Frederikshavnmotorvejen	51,796	51,796	
90	Hirtshalsmotorvejen	57,445	57,445	
Total (km)			**1179**	**73**

5.2 Other types of roads within the Comprehensive Ten-T network

	Strækning	Length (km)	Type: Motortrafikvej	Type: Landevej
Rute 43	Odense-Faaborg	26,2		x
Rute 8	Faaborg -Bøjden	10,2		x
Rute 8	Fynshav- Sønderborg N	12		x
Rute 8	Sønderborg N - Dybbøl	5,8	x	
Rute 9	Svendborg - Spodsbjerg	26		x
Rute 9	Tårs - Maribo	32,3		x
E55	Eskilstrup - Gedser	34,2		x
Rute 243	Ishøj strand - Høje Taastrup	6		x
Rute 531	Høje Taastrup - Høje Taastrup S (Tværvej)	3,6		x
Rute 21	Tuse - Odden	43,8	29	14,8
Rute 23	Nykro - Kalundborg	41,2	25,4	15,8
Rute 21/15	Ebeltoft - Aarhus	35	16,7	18,3
E20	Esbjerg SØ - Esbjerg Havn	2	1,3	0,7
E45	Sæby N - Frederikshavn	6,5		x
E47	Kvistgård - Helsingør	6,6		x
Rute 11/18/26	Herning - Hanstholm	132,7	29,2	103,5
Total (km)		**424,1**		

5.3 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

	Permanent motorway system end 2016 (km)	Temporary motorway system end 2016 (km)	Shut down in 2017 as described in Section 1.1 (km)
Traffic management, information and bridge tolling at "The Øresund Link" between Sweden and Denmark	24		
Traffic information and management at the Motorring 3, M3, around Copenhagen	17		17
Traffic management, information and bridge tolling at The Storebælt fixed link.	20		
Traffic information and management at the Køge Bugt Motorway, M10	20		20
Traffic management and information at the motorway tunnel across the inlet Limfjorden and at the City of Aalborg	11		
Traffic management and information at the Guldborgsund Motorway tunnel	11		
Traffic management at Holbækmotorvejen, M11, between Folehaven and M3		5	
Traffic management at Køge Bugt Motorvejen, M10, between Greve and Køge		14	
Hard shoulder running on the Hillerød motorway, M13	2		
M40 (Middelfart – Nørre Åby)	10		
Elsinore Motorway, M14, northern section	5	9	5
Elsinore Motorway, M14, southern section	7		7
M60	20		
Total (km)	**147**	**28**	**49**

7 Annex 4 Map of Comprehensive Ten-T network

Comprehensive Ten-T road network

Comprehensive Ten-T rail network