

STATUS REPORT ON THE DANISH NATIONAL ITS ACTIVITIES AND PROJECTS REGARDING THE PRIORITY AREAS, DEFINED IN THE DIRECTIVE 2010/40/EU, ARTICLE 2

1. Introduction

This report is the initial report which has been prepared in accordance with Article 17, 1 in the Directive 2010/40/EU, then named the ITS Directive. Article 17, 1 requires that member States submit to the Commission by 27. August 2011 a report on their national activities and projects regarding the priority areas, cf. Article 2 in the ITS Directive.

The present report presents an overview of the national ITS activities also including ITS systems and services. The local systems and services are not described in the report.

To get a quick overview of the national ITS systems and services and their localisation, see the appendix at the end.

1.1 The context of the Danish ITS initiatives and actions

In December 2008 the Danish Government launched the Policy paper “Sustainable transport - Better infrastructure” with a chapter covering ITS aspects.

Already in January 2009 a political agreement, “A green Transport Policy”, was adopted whereupon different types of funds were decided, one of them being funds for “New Technological possibilities” including ITS as an important subject. 80 mill. € were allocated to the “ITS programme” covering the period 2009 to 2014. As part of this programme an “ITS Development Forum” was established. The Forum, which is to advice and evaluate ITS-projects, was set up with a majority of members originating from industry and research institutes.

1.2 Contact information in Denmark

Contact information:

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2. ITS systems and services

The Commission Decision C(2011) 4947 on guidelines for reporting by the Member States under Directive 2010/40/EC requires a description of the national activities and projects in each priority area with, as appropriate and deemed relevant by the Member State, a description of the relevant initiatives, their objective, timescale, mile stones, resources, lead stakeholder(s) and status.

In this chapter we will deal with and describe infrastructure based on ITS systems in section 2.1 and ITS information services in section 2.2. We will use one template to describe the ITS systems and another template to describe the ITS information services.

2.1 Description of major ITS systems

This section provides a concise description of major infrastructure based on traffic management and information systems. Where possible the text will comply with the above mentioned template being in a fixed format with the following headings:

- Kind of system and location
- Elements and components
- Objective of the system
- Costs of the system
- Coverage of the system
- Status and perspectives
- Relevant priority area(s), according to the ITS Directive, Article 2

This section includes 8 ITS-systems respectively assembly of systems which are numbered to make cross-referencing easy.

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

Kind of system and location

- Traffic information system, "TRIM", at the Copenhagen motorway network was implemented in the mid 90's. In the late 90's it was extended in order to cover the motorway network around Malmö (Sweden) and later the Øresund Link between Sweden and Denmark.

Elements and components

- Traffic information presented on the Internet and disseminated via the Danish Broadcasting Company and both local and regional radio stations.
- Traffic data are collected by loops, radar systems and Automatic number plate recognition, ANPR.
- Traffic information includes present travel time, predicted travel time, average speed and the detected actual delays.



Objective of the system

- The main objective is to provide traffic information of good quality, timely and by the information channels which are the best for the road users, also including the best overview of the traffic situation for the drivers.

Costs of the system

- Implementation costs were around 7 mil. € and operational and maintenance costs are roughly 30,000 € per year

Coverage of the system

- The system covers 120 km motorway in the Copenhagen area and 135 km including the fixed link to Sweden

Status and perspectives

- The system is working in a satisfactory way. No changes are foreseen for the time being

Relevant priority area(s)

- Priority area 1 about data and 3 about safety

2.1.2 Traffic management, information and bridge tolling at “The Øresund Link” between Sweden and Denmark

Kind of system and location

- Traffic management, information and bridge tolling systems were implemented around 2000 before the link was opened to the public. The motorway link goes across the isle of Amager through the tunnel of Tårnby, afterwards through the 4 km tunnel of Drogden, and thereafter onto a 4 km artificial island, Peberholm, and finally onward on a 8 km long bridge that ends on Lernacken near Malmö. The traffic volume for all vehicles is around 7 mil. € per year.

Elements and components

- Variable message signs give traffic information and warnings about traffic conditions, wind and maintenance work and may suggest diversion. Pictograms of wind cone and other hazards are used.
- Speed control on VMS both in the tunnels and on the bridge.
- Lane control both on the bridge and in the tunnels
- Queue warning system to avoid rear end collisions
- Incident detection both in the tunnels and on the bridge
- Detection of ghost drivers in the tunnels by means of cameras per 60 meters and on the bridge with cameras per 500 meters but less accurate.
- Electronic toll collection system, ETC, at Lernacken near Malmö. The nature of the toll is a point charge for driving through a toll plaza, and the levy principles are a combination of vehicle class, length and height. The ETC system is DSRC 5,8 GHz



technology. The DSRC profiles used for Communication are the profiles already in use in the EasyGo service, PISTA, BROBIZZ and AutoPASS.

Objectives of the system

- The main objectives are to provide as efficient and safe transport as possible, toll service and traffic information of good quality, timely and by the information channels which are the best for the road users, also including the best overview of the traffic situation for the drivers.

Costs of the systems

- Not available

Coverage of the system

- The ITS systems cover around 24 km from Tårnby to Lernacken.

Status and perspectives

- The systems are working in a satisfactory way. No major changes in the traffic management systems or new ITS implementations are foreseen for the time being, but for the ETC system the CEN-standard EN 15509 will be included from 2012 at Storebælt and most likely also at Øresund.

Relevant priority area(s)

Priority area 1 about data and 3 about safety

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

Kind of system and location

- Traffic management and information systems at the Copenhagen Motorring 3, M3. The M3 should be widened from 4 to 6 lanes at a road section of 17 km from Gentofte to M11 (Holbækmotorvejen), and the traffic management and information systems were implemented during the years 2003 – 2005. The road works at M3 started in March 2005
- The main goals for the implementation of the different ITS systems were to ensure the best possible traffic flows and traffic safety during the road works.

Elements and components

- Traffic information presented on the Internet and disseminated via the Danish Broadcasting Company and local and regional radio stations.
- A separate homepage was carried out for M3, and an automated voice response phone service was developed.
- Queue warning and speed control were established on M3 and travel times for the closest exits were presented on variable message signs together with the distance to the tail of detected queues.



- When approaching entry slip roads to the M3 VMS's present information about the present travel times on M3.
- Traffic data were collected by loops, radar systems and Automatic number plate recognition also on parallel routes.
- Traffic information includes present travel time, predicted travel time and actual average speed.
- It was a strategic issue to keep as much of the traffic on the M3 and to reduce the number of accidents and incidents as much as possible.

Objective of the system

- The main objectives were to ensure the most efficient and safe traffic flows as possible and to provide traffic information of good quality, timely and by the information channels which are the best for the road users, also including the best overview of the overall traffic situation for the drivers.

Costs of the system

- Implementation costs were around 10 mil. € and operational and maintenance costs are roughly 1 mil. € per year.

Coverage of the system

- The systems covered around 17 km of motorway and small parts of some secondary roads.

Status and perspectives

- Today the systems comprise more or less the same systems as they were implemented and amended to some extent. For the time being no changes for the systems are foreseen.

Relevant priority area(s)

- Priority area 1 about data and 3 about safety

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

Kind of system and location

- The Storebælt fixed link was mainly constructed in the 90's and was taken into use in June 1998. Traffic management, information and bridge tolling systems were introduced at the same time. The Storebælt fixed link connects the two islands Sjælland and Fyn. The toll plaza is located at Halsskov on Sjælland, and the motorway goes from Halsskov via the easterly 7 km long suspension bridge and across the 3 km long island Sprogø in the middle of the belt. The motorway continues on the western 6½ km long bridge. The traffic volume for all vehicles together is around 11 mill vehicles per year.



Elements and components

- Variable message signs, VMS, are situated prior to the bridges. The VMS's provide traffic information and warnings about traffic conditions, wind and maintenance work.
- Signs are placed prior to the bridges and informs about the mandatory speed on the bridges. In specific cases lower speeds can be determined e.g. in connection with ice falling down on the motorway.
- Full graphic signs are used to illustrate the demanded use of the lanes, normally associated with operation and maintenance activities.
- Full graphic signs are also used to show fixed signs associated with different kinds of hazards, e.g. accidents where a blue flash will be activated. The full graphic signs will usually be placed on a trailer.
- Warning via VMS's are used e.g. when objects are lost or a vehicle has stopped in the emergency lane.
- Electronic toll collection system, ETC, at Lernacken near Malmö. The nature of the toll is a point charge for driving through a toll plaza, and the levy principles are a combination of vehicle class, length and height. The ETC system is DSRC 5,8 GHz technology. The DSRC profiles used for Communication are the profiles already in use in the EasyGo service, PISTA, BROBIZZ and AutoPASS.

Objectives of the system

- The main objectives are to provide as efficient and safe transport as possible, toll service of good quality and traffic information of good quality, timely and by the information channels which are the best for the road users, also including the best overview of the traffic situation for the drivers.

Costs of the systems

- Not available

Coverage of the system

- The ITS systems cover around 20 km from Tårnby to Lernacken in Sweden.

Status and perspectives

- The systems are working in a satisfactory way. For the time being no major changes in the traffic management systems or new ITS implementations are foreseen, but for the ETC system the CEN-standard EN 15509 will be included from 2012 at Storebælt and most likely also at Øresund.

Relevant priority area(s)

Priority area 3 about safety

2.1.5 Traffic information and warning systems in the Triangle Area

Kind of system and location

- The Triangle Area consists of six municipalities located close to the cities Kolding, Vejle, Fredericia and Middelfart, and sometimes the western part of the island Fyn is regarded as part of the Triangle Area. The Triangle Area is important for the traffic because two of the main Danish corridors are crossing each other in the area. One of



the corridors is the E45 going from Frederikshavn in the north through Jylland to Germany via Frøslev at the German-Danish border. The other corridor is E20 coming from Sweden and via the Øresund fixed link, Copenhagen, Storebælt fixed Link and Odense to Esbjerg from where there are ferry boats to Harwich in UK.

Elements and components

- In 2004 – 2005 travel time information was introduced on the Internet and by means of radio channels for the whole motorway network in the Triangle Area from Odense to Kolding and further up to the north of Vejle.
- Traffic information on the Internet includes present travel time, predicted travel time, average speed and the actual delay.
- Later on the system was expanded and in the first half of 2011 the travel times were presented on VMS's on which a series of warnings also were available and always had the highest priority.
- Around Vejle there is often congestion and in 2006 both a Queue warning system and an Incident detection system was established on the motorway at Vejle Fjord.
- Traffic data are collected by loops, radar systems and Automatic Number Plate Recognition.

Objectives of the system

- The main objective is to provide traffic information of good quality, timely and by the information channels which are the best for the road users, also including the best overview of the traffic situation for the drivers.

Costs of the system

- Implementation costs were around 2.6 mil. € and operational and maintenance costs are roughly 350,000 € per year.

Coverage of the system

- The system covers 86 km motorways in the Triangle Area.

Status and perspectives

- The system is working in a satisfactory way. No changes are foreseen for the time being

Relevant priority area(s)

- Priority area 1 about data and 3 about safety

2.1.6 Traffic information and management at the KøgeBugt Motorway, M10, from Copenhagen to the City of Køge that is located around 40 km southwest of Copenhagen

Kind of system and location

- Traffic management and information systems at the Motorway M10 from Copenhagen to Køge. The systems which have been implemented on M10 are partly of the same character as the systems established earlier on at M3, cf. system no. 2.1.3. Also at



M10 the ITS systems are implemented in conjunction with large road works. Here is the motorway widened to six or eight lanes.

- M10 will be widened in four steps, where two of the sections have been accomplished, and the third section of 7 km is presently being implemented. The last section will be constructed later on.
- The main goals for the implementation of the different ITS systems on M10 are to ensure the best possible traffic flows and traffic safety during the road works.

Elements and components

- Traffic information presented on the Internet and disseminated via the Danish Broadcasting Company and local radio stations.
- A travel time detection system is implemented on 20 km on the M10. Travel times for the closest exits are presented on variable message signs. In addition to the information on the VMS's, they are also used for warning the drivers about the current traffic situation. This can be warnings about accidents, lost objects, stopped cars in one of the lanes, icy or oily road surface etc.
- Traffic data are collected by loops and radar systems.
- Traffic information includes traffic density, present travel time, predicted travel time and average speed.
- At the section where workers are working speed control is being implemented.
- As for motorway M3 it is a strategic issue to keep as much of the traffic on the motorway and to reduce the number of accidents and incidents as much as possible.

Objective of the system

- The main objectives are to ensure the most efficient and safe traffic flows as possible and to provide traffic information of good quality, timely and by the information channels which are the best for the road users, also including the best overview of the overall traffic situation for the driver.

Costs of the system

- Implementation costs have been around 5 million € and operational and maintenance costs are around 0.6 million € per year.

Coverage of the system

- The systems will cover around 20 km motorway.

Status and perspectives

- Today the systems comprise more or less the same systems as they were implemented in several phases and amended to some extent. For the time being no further changes for the systems are anticipated except for the present implementation in the third phase and for the coming systems for the fourth and last phase.

Relevant priority area(s)

Priority area 1 about data and 3 about safety



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

Kind of system and location

- Traffic management and information has been utilised for many years in Aalborg city and the surroundings because of its strategic location. The first large ITS implementation in Aalborg was constructed in the early 90's under the name of QUO VADIS which presented delays on VMS's before crossing the inlet Limfjorden via tunnel or bridge.
- The operation and maintenance costs became too high and the QUO VADIS System was scrapped. Afterwards several ITS initiatives have been implemented.

Elements and components

- Travel time detection and information are being implemented in the City of Aalborg with travel times presented on Variable message signs, VMS. The VMS's give highest priority to warnings i.e. accidents, ghost drivers, lost objects, closed bridge, stopped cars in lane, icy or oily road surface etc. When no warnings are relevant, the travel times are presented on the VMS's.
- Speed control systems are installed on both sides of the motorway tunnel for the traffic approaching the tunnel, and the systems also work as Queue warning systems to avoid rear end collisions.
- Speed harmonization is established in the tunnel to improve safety for the traffic leaving the tunnel.
- Incident detection is implemented in the tunnel including complementing cameras to support the police and other rescue services.

Objectives of the system

- The main objectives of the ITS systems are:
 - Improving traffic safety
 - Improving mobility
 - Provision of traffic information of good quality, timely and by most relevant information channels

Costs of the systems

- Implementation costs: 4 mil. €
- Costs per year for operation and maintenance: 0,6 mil. €

Coverage of the system

- The ITS systems connected to the motorway and tunnel cover around 11 km.
- The ITS systems in the city cover around 40 km

Status and perspectives

- The systems are in the last phase of implementation and testing and are expected to be put into operation in September 2011.



Relevant priority area(s)

Priority area 1 about data and 3 about safety

2.1.8 Traffic management and information at the Guldborgsund Motorway tunnel that connects the two islands Falster to the East and Lolland to the West and 10 km from the City of Nykøbing F

Kind of system and location

- The Guldborgsund tunnel is a strategic construction as it is a part of E47 coming from Helsingør and Copenhagen southwards to Rødby and further on to Germany and Central Europe. A fixed link from Rødby to Puttgarden is anticipated to be constructed and taken into use around 2020.

Elements and components

- Systems detecting the height of the vehicles including cargo are installed in the directions towards the tunnel. When a vehicle is too high, information signs and a strong flash will instruct the driver to take the first exit slip road. If he continues, he will be demanded to go aside to the right and the police will take over and close the tunnel.
- Outside and inside the tunnel variable information signs warn and inform the drivers about problems ahead and possibility to divert before the tunnel.
- In the tunnel lane control signs are installed and controlled by the police. Also Automatic Incident Detection is established. When incidents occur an alarm is sent to the police who can close the tunnel.
- In specific situations, the SRO system can close the tunnel totally or partially often based on failure in the security systems in the SRO or because of too faint light in the tunnel.
- Speed control on VMS's is used during maintenance work and other situations that demand extra safety e.g. when traffic have to shift to a lane in the other traffic direction.

Objectives of the system

- The main objectives of the ITS systems are:
 - Improving traffic safety
 - Improving mobility
 - Provision of traffic information of good quality, timely and by most relevant information channels.

Costs of the systems

- Implementation costs: 3.4 mil. €
- Costs per year for operation and maintenance: 0,5 mil. €

Coverage of the system

- The ITS systems connected to the motorway and tunnel cover around 11 km.



Status and perspectives

- The systems are working in a satisfactory way. No changes are foreseen for the time being

Relevant priority area(s): Priority area 1 about data and 3 about safety



MAJOR TRAFFIC MANAGEMENT SYSTEMS ON THE TRUNK ROAD NET

-  Dynamic traffic management and traffic information along the road
-  Future projects – Dynamic traffic management and traffic information along the road
-  Dynamic traffic information along the road
-  Dynamic traffic information on www.trafikken.dk
-  Other trunk roads



3. ITS activities

Additional to the ITS systems and services there is a need for other activities i.e.:

- to ensure progress using best practise
- to gain momentum by education, desk research etc.

Below a concise description of the most important ITS initiatives is outlined.

3.1 Standards and National road notes

It is important to create a coherent and efficient transport system across the road authorities' road networks. We adapt not only to the European standards but often also to the international ones. We work on harmonization of the ITS systems and services to the benefit of road users and to improve transport efficiency for the society.

We have prepared national road notes for both the roads and for ITS e.g. Variable message signs.

3.2 Education, Professional Training, Literature and Desk Research

For twenty years Denmark has been active in ITS and has worked with research, development and in the last decade primarily with implementation, operation and maintenance in ITS. For the bigger ITS implementations we carry out evaluations to expand our knowledge about costs and benefits etc. For some years it has been rather difficult to get personnel in the ITS units in the national road administration. We have focus on the missing competences and have taken action in the following ways:

- Employees from the national road administration have carried out professional ITS courses at university level and on-site the university.
- Employees from the national road administration have established network with the municipalities and other stake holders with personnel working with ITS and have upgraded them by teaching at seminars and disseminating information about ITS.
- To support the work on ITS in the municipalities and among other stake holders an ITS handbook has been prepared and published in 2010.

3.3 Description of traffic information services

This section provides a concise description of the major traffic information services. Where possible the text will comply with the above mentioned template being in a fixed format with the following headings:

- Information service
- Purpose
- Milestones (if any)
- Resources for 2011 in K€, including both implementation, operation and maintenance costs
- Partners (if relevant)
- Status
- Priority area related to the service



This section includes 9 traffic information services. See the descriptions in the table below.



DESCRIPTION OF TRAFFIC INFORMATION SERVICES AND PROJECTS IN DENMARK

Information Service	Purpose	Milestones (if any)	Resources 2011 (K€)	Partners (if relevant)	Status	Relates to priority area ...
Smartphone application	To give live updated road and traffic information – using sound files – to the drivers when and where it is needed, in order to improve mobility and traffic safety.	Launch an app for android in 2011	65	-	One iPhone application is in operation.	I + III
Mobile web service	To give live updated traffic information – easy to access with any mobile browser, in order to improve mobility and traffic safety	-		-	The mobile service is found here. http://mobil.trafikken.dk	I + III
Phone service – voice response system (1888)	To give access to live road and traffic information and travel times for selected high way sections, using a voice respond system, so solo drivers can get information “hands free”, in order to improve mobility and traffic safety	An update of the service is planned for 2011	33	-	In Denmark you can call 1888. The price is your normal phone rate.	I + III
Web based Road and Traffic Information Map service	To present the live road and traffic information to the users in a way that gives them freedom to customize the map, so it contains the information they find relevant - in order to improve mobility and traffic safety.	An updated version of the map, with more features. ultimo 2011	77	-	The map can be found on www.Trafikken.dk	I + III
A-B multi modal travel planner.	To increase the use of public transport, by making car users	A mobile version is	266	Rejseplanen.dk (representing most	The travel planner can be found here:	I

	aware of the realistic travel times for cars and comparing it to public transport on the same journey. Fewer cars on the roads will improve mobility.	planned for launch in 2011		public transport companies)	www.bilrejseplanen.dk	
RDS-TMC	To broadcast free and language independent Road and Traffic messages to the drivers on the move, in order to improve mobility and traffic safety.	Continuously updating	83	Danish Broadcasting (DR)	The service is running, and messages are broadcasted using DRs broadcasting network	I + III
Regional internet portals	Presenting the travelers (primarily commuters) with an overview of live traffic information, so they can choose the best suitable mode of transport and hereby increase mobility.	A new regional portal was launched this year (2011)	97	Several municipalities, local police and public transport operators.	4 regional portals exists: Trafikken.dk/hovedstaden Trafikken.dk/Trekanten Trafikken.dk/Østjylland Trafikken.dk/Nordjylland	I
Text TV	Presenting live traffic information on Text TV – easy access on any TV – all in order to improve mobility and traffic safety.	Redesign of several Text TV pages this year (2011)	8	DR and TV 2	Text TV has been used as medium for many years, and we are now looking into automating the updates and redesigning the information pages	I + III
Web TV	Present multi modal road and traffic information to a broad audience in journalistic edited format, using the web and mobile web solutions as medias for broadcasting all in order to improve mobility and traffic safety.	To run a pilot during the UCI Road World Championships (Sep. 2011)	15	Several municipalities, local police and public transport operators.	Web TV is a pilot project at the moment. DRD produces one national and one local announcement every weekday. Link: http://www.trafikken.dk/vm	I + III

