

# Directive 2010/40/EU Progress Report 2017 *Norway*

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# 1 Introduction

## 1.1 General overview of the national activities and projects

The national strategy and priority for utilising ITS in the transport sector is defined by the multimodal National Transport Plan (NTP). This plan has a 12 year horizon and is renewed every 4 years. A new NTP was adopted by the national parliament (Storting) in June 2017 and will apply for the period from 2018 to 2029. It is primarily a plan for development of transport infrastructures, but new technologies, new transport services and ITS, including automated and cooperative transport, has been given high attention.

ITS as a collective term for utilizing digitalisation and new technologies in the transport sector has been recognized by the authorities and administrations for all the transport modes (road, rail, sea and air), as well as with the private sector in Norway.

The Government's objective is to ensure that the future transport system is safe, promotes the creation of wealth and contributes to the restructuring of the nation into a low emissions society. A continuous increase in car traffic cannot be allowed to continue, especially not in urban areas. We must expect a large population growth in urban areas, and the goal is to cover the increased demand for transport with public transport, walking and cycling.

The NTP recognises that ITS and new technology will play an increasingly prominent role in the transport system. ITS and the introduction of new technological solutions, including connected, cooperative and automated mobility, will contribute significantly to reaching the goals for traffic flow, traffic safety, environmental impact and accessibility. Economic incentives are pointed out as effective instruments for accelerating the shift towards fossil free transport technologies.

The NTP recognises that the rapid evolution of technologies creates a demand for a proactive and flexible policy towards necessary update of national legislation and regulation, as well as the need to follow up on activities defining and harmonizing international regulations, standards and best practice. Legislation that allows for testing and piloting automated and cooperative driving is given the highest priority and is already well under way in 2017.

## 2 Current status of ITS in the road sector

The main responsibility for implementing the ITS Directive and the underlying Delegated Acts lies with the Norwegian Public Roads Administration (NPRA) in close consultation with the Ministry of Transport and Communication. The relevant activities and projects for this report are managed by the NPRA, or the NPRA has a significant role.

### 2.1 General progress since 2014

The NPRA works actively to develop new ITS solutions in line with the National Transport Plan, EU regulations and guidelines. The NPRA's commitment to ITS shall contribute significantly to a vision of the future mobility that is safe, efficient, green, seamless, service oriented and user friendly. The NPRA's ambition is to take a leading role in achieving this vision and is currently developing a new strategy for ITS describing priority areas, roles, guiding principles to follow and the concrete goals to achieve. The work will include broad cooperation for service development and innovative systems design.

The general progress since 2014 is substantial, and includes from among many achievements the following:

- A national ITS Act with secondary regulation to bring Delegated Acts into Norwegian law.
- The National ITS Advisory Board is replaced by a higher level forum chaired by the Minister of Transport and Communications (The Mobility and Technology Advisory Group).
- Establishment of the NPRA's Datex node, a vital part of our National Access Point. The node has by mid-2017 close to 300 registered users.
- Defining the data portal [www.data.norge.no](http://www.data.norge.no) as the Norwegian NAP.
- Starting the services for action C and B under the ITS Directive.
- Appointed the Norwegian Road Supervisory Authority as the national body designated to carry out the assessment of compliance.
- Updated national guidelines for public transport data submission to the national database (and NAP) for all scheduled public transport.
- Updated national guidelines for electronic ticketing including mobile apps and 3D bar codes.
- National initiatives regarding travel information, travel planning and electronic ticketing is coordinated within Entur AS, a company established following the national railway reform and wholly-owned by the Ministry of Transport and Communication.
- A proposal for an act to regulate testing and piloting of automated driving.
- Preparation for several trials and pilots for automated and cooperative ITS throughout the country.
- Development program for the five regional TMCs (Traffic Management Centres) for better reliability, efficiency, interoperability and data (SRTI) quality.
- Development and enhancement of the following services:
  - Map-based traffic information as a web-service adapted to mobile devices
  - Web video service with streaming capacity with more than 500 cameras
  - Real-time travel time information as a web service and as VMS information
  - Road weather service with enhanced prognosis capability

These developments are described in more detail in the following text and tables.

## 2.2 National ITS legislation

The ITS Directive has been included in the EEA (European Economic Area) agreement, and is applied as a framework legislation for ITS in Norway.

The Norwegian Parliament adopted an ITS Act in Norway in 2015 based on a proposal from the Ministry of Transport and Communications. This act is used for transposition of ITS legislation (the Delegated Acts) into Norwegian law. The act does not exclude regulations based on national policy and priorities and will provide the legal authority to ensure national coordination of ITS applications and services within the roads sector and covering the interfaces to other modes of transport.

A new national act for testing automated driving is under final preparation and is scheduled for adoption by parliament in late 2017.

By adopting these acts, Norway has the basic legal foundation for deploying ITS services. This is also the case for testing and piloting C-ITS and automated driving. There is still a need to have guidelines

and regulations related to the C-ITS vehicle data and define ownership and rules for privacy and security as well as securing openness and availability for both public and private data. It is also a need to define responsibility, ownership and business models for hybrid communication supporting C-ITS. Norway has a clear intention to participate in European work on harmonisation and legislation for these areas.

### 3 Projects, activities and initiatives

#### 3.1 Priority area I. *Optimal use of road, traffic and travel data*

##### 3.1.1 Description of the national activities and projects

Priority area I: Optimal use of road, traffic and travel data			
Services related to priority action "A" – multimodal travel information services	<input checked="" type="checkbox"/> Implemented	<input checked="" type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	<p>A public transport database is the foundation for a countrywide, competitively neutral information system with travel planning for all types of scheduled public transport. Prerequisites are that all service providers should have equal access to the database. In principle, data from the database shall be offered free of charge.</p> <p>Status 2017:</p> <ul style="list-style-type: none"> <li>• New national guidelines for collection of public transport data, static and dynamic, mandatory for all transport operators were adopted by the Government in 2016.</li> <li>• New organizational structure for public transport coordination on the national level was implemented 1.1.2017, transferring more responsibility to the Norwegian Railway Directorate.</li> <li>• Public transport data open and available at the national access point</li> </ul> <p>New national multimodal travel planner to be launched in November 2017.</p>		
Services related to priority action "B" – real-time traffic information services	<input checked="" type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	<p>Status 2017:</p> <p>Travel time registration: Real time travel time registration has been implemented in Norway's four largest cities in addition to the E18 from Oslo to Kristiansand. There is need to expand travel time registrations around the major urban areas and on important national corridors.</p> <p>Map-based travel information: The service (vegvesen.no/trafikk) offers a map-based traffic information system to users. The service is adapted to PCs, tablets and smartphones.</p> <p>Web camera service: The web camera service offers road-users a picture of the traffic situation and driving conditions from more than 500 cameras. The system has been enhanced and will soon offer a video streaming service with image updates every second.</p> <p>Static road data service: Spatial data related to the road network (Elveg) is a cooperation between national mapping authority and NPRA. The National Road DataBase offers APIs for relevant static data about the road infrastructure available in the NAP. The service facilitates frequent updating of datasets in order to ensure that operational ITS systems have correct, high quality underlying data.</p> <p>ITS out-station register: The ITS out-station register covers all types of ITS stations along the road for which the Norwegian Public Roads Administration is responsible. The register contains all characteristics and meta data necessary for the operation.</p>		
Services related to priority action "C" - Road safety related traffic information services	<input checked="" type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	<p>Status 2017:</p> <p>The service has been in operation from 2015 according to the best effort quality level. The service covers the whole TEN-T and national road network with all the 8 data elements included. The national body appointed is the Norwegian Road Supervisory Authority. Assessment of compliance has been carried out in 2016 and 2017.</p>		

	<p>Road weather data and prognosis: The road weather information system is implemented and under continuous development. Further development of information dissemination is on-going. The system is called Vegvær, and will be established as the decision-making support system for contractors and for road user information of road weather. Inclusion of friction data from vehicles in traffic are tested in the CEF-project Nordic Way.</p> <p>Traffic incident management: Traffic incident management based on close cooperation between the TMCs and police and rescue services will be improved with a new telephony and communication system from 2018. The on-going project to develop an incident based user interface, will make the TMCs more interoperable and efficient. It will enhance incident and emergency detection and lead to higher quality for data required under the regulations 886/2013 and 962/2015.</p>		
National access point - NAP	<input checked="" type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	<p>Status 2017:</p> <p>The Norwegian NAP is data.norge.no. See chapter 3.1.2.</p>		
Assessment of compliance	<input checked="" type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	<p>Status 2017:</p> <p>The appointed national body to carry out the assessment is the Norwegian Road Supervisory Authority. Assessment of compliance has been carried out twice – in 2016 and 2017. See chapter 3.1.3</p>		

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

#### Existing real-time information services in Norway

##### Road network coverage

Existing real time information services, both static and dynamic, do not exclude any part of the national road network. The coverage of certain data elements will be extended during the coming years. TEN-T roads and motorways have the highest priority for instrumentation. Static road data and incident warnings and information cover the comprehensive national road network, including TEN-T and all other motorways. This coverage will also apply for the implementation of Delegated Act (EU) 2015/962.

##### Dynamic data in the Norwegian National Access Point (NAP)

The Norwegian Public Roads Administration (NPRA) has had a national traffic information service in operation since the early 1990's. The service is based on NPRA's five regional Traffic Management Centres (TMCs) as the coordinating actor for the service. Dynamic data on driving conditions, traffic, travel times, road works and incidents are either automatically collected from roadside units (traffic- and road weather stations, tolling road side units, cameras etc.) or reported to the TMCs by the police, contractors, media or road users. Information regarding incidents, road works, restrictions and closures are registered in the national TIC system (Traffic Information Centre)

The NPRA operates a national DATEX-node where dynamic road and traffic data are available in DATEX II version 2.3 format. Currently, the following dynamic data categories are available free of charge:

- real time road weather data
- travel times
- web camera images
- incidents
- road works
- driving conditions
- road closures and diversions

#### Static data in the Norwegian NAP

The NPRA is responsible for the National Road DataBase (NRDB). This database covers the comprehensive road network of Norway; national, county and municipal roads as well as private roads. NRDB stores both basic data and calculated data like traffic accidents and average annual daily traffic. It contains basic data on airports and all stop points and terminals for bus, subway, railway and ferries. Other static data are road geometry, driving restrictions, traffic plans, permitted axle load, surface material, road curvature, speed limits, road width, tunnels and bridges, road furniture, rails, traffic signs, manholes, ditches, brick walls etc. Environmental data are also registered into the database.

The database offers a standardised web application based on the standard REST-API, for retrieving road and road traffic data. Data types will be road network geometry, road characteristics, traffic regulations, speed limits and many other types relevant for digital maps and information systems such as travel planners and navigations services. The data are available for use by service providers and digital map producers.

#### Traffic data in the Norwegian NAP

The traffic data collection system in Norway for national and county roads has been substantially modernized during the last years. More than 1500 traffic registration points collect basic data elements using real time communication for updating the central database. Data for bicycling and manual traffic registrations are also included in the central database. This database offers an API for retrieving traffic data statistics free of charge. The real time traffic data for volume, speed and vehicle categories from the registration points will shortly be made available in the NPRA Datex-node and therefore also the NAP.

#### Additional external data sources in the NAP

The Norwegian NAP, data.norge.no, includes links and metadata for road and traffic data from NPRA as well as external sources. Examples are charging points for electric vehicles (static and dynamic), parking information, travel planner for road traffic and public transport data (static and dynamic).

## **National access point**

The national access point (NAP) for open public data free of charge, is a web portal run by the Norwegian Agency for Public Management and eGovernment (DIFI). The URL is [www.data.norge.no](http://www.data.norge.no). In parallel, traffic information and other road related data is available at the NPRA website, [vegvesen.no](http://vegvesen.no), and at websites operated by external service providers.

At present, the Norwegian NAP contains metadata only in Norwegian language and not entirely in compliance with the metadata catalogue issued by the EIP+ project. The plan is to implement the metadata catalogue based on the D-CAT standard and CKAN software with a discovery service that is required, and in both English and Norwegian. Norway participates in harmonisation activities both in EIP and in meetings hosted by DG MOVE. Norway will follow the recommendations and standards resulting from this work.

The NPRA and the Ministry of Transport and Communications will consider establishing a separate web portal / NAP that will cover all the Delegated Acts that requires a NAP dedicated to multimodal transport and transport related data.

## **Summary**

The NPRA considers that the service defined by the Delegated Act 962/2015 is in operation. There is a need for adaptations and improvements, primarily related to language, metadata standard and the harmonised discovery service. The service covers most of the data elements listed in the annex of 962/2015.



### **3.1.3 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)**

#### **Status for implementing the information service**

##### Road network coverage

The Norwegian Public Roads Administration's five regional traffic management centres (TMCs) are the hubs in the agency's emergency preparedness. They give warnings and information about events and road conditions based on reports mainly from NPRA employees, road users, road maintenance contractors and from the police. TMCs have access to video surveillance from selected road sections, mainly tunnels, and to real time traffic data. In many tunnels, video surveillance is supplemented with automatic incident detection that responds to vehicle stops and objects in the road.

Based on experience with the information service, we now find that there is little reason to limit the road network covered by the service, as stated in earlier reports. The Norwegian traffic information services do not have different service levels depending on the road category. The ability to detect traffic safety-related incidents varies naturally with the degree of instrumentation, traffic volume and personnel on the roads. Therefore, the complete national road network can be considered to be covered by the information service.

##### Events and conditions covered by the service

The information service in operation is based on open data available in DATEX II format in the national access point. The NPRA's DATEX node has in 2017 close to 300 registered users, including the main international service providers.

In earlier reports, Norway stated that the service was limited to data elements a, b, d, g and h. Based on experience with the service, we believe that we now can declare that we cover all data elements with a best-effort quality level for the entire national road network, including TEN-T.

##### Planned development of the service

The Norwegian Public Roads Administration will continue to work to increase service and data quality for all eight data elements. This will require investment in more instrumentation along the roads, in enhanced reporting procedures and in the near future, data capture from cooperative ITS (C-ITS). This progress and investment levels depend on annual budgets. In addition, central databases and applications need to be upgraded. Guidelines will be updated and personnel will be educated to secure compliance with the regulation. This will also create the best possible benefit from investment in instrumentation and new technology.

#### **National access point**

The national access point is described in section 3.1.2

### Dissemination of information

The TMCs represents the main data source for the dissemination of information. The main national information services are provided by the national broadcaster, NRK, and by the NPRA. Early in 2016, the NPRA extended its basic information services to include a new map-based service developed in responsive design, where the selected event categories are visually indicated. On parts of the main road network, traffic safety related information is displayed on VMS boards.

### **National body**

The Ministry of Transport and Communications has designated the Norwegian Road Supervisory Authority (RSA) as the national body for ensuring that requirements are met. The formal assignment is based on the national ITS Act adopted in the Parliament December 2015.

### Assessment of compliance

The RSA completed the first assessment of compliance in 2016. Main findings were included in our 2016 report. The RSA has performed an assessment of compliance also in 2017, this time both towards the NPRA and NRK (the national broadcaster). The assessment was this time based on the use of the standardised form for self-declaration developed by the follow-up expert group and coordinated by the Commission.

Based on the assessment report of 2016, the NPRA made plans to improve the service. This work has been delayed due to the lack of resources (mainly technical personnel). The following bullet points are included in the work plan for 2017 and 2018:

- Establish a filtering capability for the SRTI in the national access point (2017)
- Update guidelines and routines for traffic management and SRTI (2017-18)
- Carry out education and training of traffic operators in the relevant TCCs/TMCs (2017-18)
- Consider establishing a new national access point for all transport data and Delegated Acts under the ITS Directive (2018)

## 3.2 Priority area II. Continuity of traffic and freight management ITS services

### 3.2.1 Description of the national activities and projects

Priority area II: Continuity of traffic and freight management ITS services			
ITS Framework Architecture	<input checked="" type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	ARKTRANS is the official ITS framework architecture for Norway. The architecture is further developed in cooperation with EU projects, in particular EasyWay and EIP.		
Management of freight along transport corridors	<input type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input checked="" type="checkbox"/> Not planned
	Status 2017: No new development		
Tracking and tracing of freight across all modes of transport (freight transport logistics, eFreight)	<input checked="" type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	Status 2017: No new development. Most freight operators have good tracking services for all types of freight as proprietary solutions with limited interoperability.		
Urban ITS architecture	<input type="checkbox"/> Implemented	<input checked="" type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	Status 2017: No new development		
Road traffic management centers (TMCs)	<input checked="" type="checkbox"/> Implemented	<input checked="" type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	Status 2017: Ongoing project to enhance interoperability between control systems for all TMCs. The project includes an integrated and incident based user interface that offers minimal chances of error. The first new application to be deployed is a new telephony and communications platform. Harmonized traffic management and control for tunnels is part of the project. In addition to increased traffic safety and life-saving, the system development for the TMCs will enhance incident and emergency detection and lead to higher quality for data required under the regulations 886/2013 and 962/2015.		
Electronic ticketing for public transport	<input checked="" type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	<p>In December 2012, a standard for the use of mobile apps and two-dimensional bar codes for ticketing was published. In 2014, a standard and infrastructure for the use of telephones with Near Field communication (NFC) technology was established for the distribution of tickets to travel cards, and for information on the contents of travel cards.</p> <p>Status 2017: New national organisational structure for public transport. Responsibility for electronic ticketing and travel data is transferred from the NPRA (Road Directorate) to the new Norwegian Railway Directorate. Part of this reorganisation is the establishment of a national company owned by the Government (Entur AS)</p>		
Variable speed limits	<input checked="" type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	Status 2017: Policy and criteria are under development. The NPRA have since 2015 implemented a pilot on sections of motorway E18 South of Oslo.		

### 3.3 Priority area III. ITS road safety and security applications

#### 3.3.1 Description of the national activities and projects

Priority area III: ITS road safety and security applications			
Automatic emergency call (eCall)	<input type="checkbox"/> Implemented	<input checked="" type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	Status 2017: The government has decided that the PSAP for the pan European eCall service in Norway will be Fire and Rescue service. Preparation for service start-up is on-going.		
Information services for safe and secure parking places for trucks and commercial vehicles	<input type="checkbox"/> Implemented	<input checked="" type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	Status 2017: The government aims to establish a substantial number of new rest places in the coming years. When data collection is reliable and complete, Norway will reconsider starting the information service based on the ITS Directive priority action e) and utilise the EU Open Data Portal, probably in addition to the NAP for Norway.		
Reservation services for safe and secure parking places for trucks and commercial vehicles	<input type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input checked="" type="checkbox"/> Not planned
	Status 2017: No new development		
Automatic speed enforcement	<input checked="" type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	Status 2017: Active use of automatic speed enforcement since the mid 1980's. Supplemented with average speed enforcement on road sections with higher speed related accident rates.		
Automatic incident detection	<input checked="" type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	Status 2017: AID is implemented in high volume road tunnels in combination with video monitoring. Testing of new technologies for AID is also on-going. AID is a mandatory requirement according to the security level, traffic volume and length of the tunnel explained in the NPRA manuals		

#### 3.3.2 112 eCall (priority action d)

National eCall PSAPs Infrastructure ready by 1<sup>st</sup> October 2017: YES / NO. If NO, please explain:

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

The Norwegian government has decided that the fire service are to process automatic and manually triggered eCall for a two-year trial period (in Norway there are three separate emergency numbers – police, health and fire – with their own separate emergency centers). The Ministry of Justice and Public Security has therefore asked the Directorate for Civil Protection (DSB) to prepare and establish a technical solution to be implemented in one or more of the 12 fire services emergency centers that will work for two years from April 2018.

### 3.3.3 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: **39**

Percentage of parking places registered in the information service: **0**

Percentage of parking places providing dynamic information on the availability of parking spaces and the priority zones: **0**

Additional information: Norway has **not yet started a service** for the Delegated Regulation 885/2013. See table on Priority Area III.

## 3.4 Priority area IV. Linking the vehicle with the transport infrastructure

### 3.4.1 Description of the national activities and projects

Priority area IV: Linking the vehicle with the transport infrastructure			
Integration of different ITS in an open in-vehicle platform	<input type="checkbox"/> Implemented	<input checked="" type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	Status 2017: Test Site Norway in Trondheim is equipped for testing of such communication platforms. Several pilots that includes C-ITS services are in planning for start-up in 2018. The present activities related to connected, cooperative and automated mobility are linked to the CEF-project Nordic Way and to the cross-border project on the E8 between Norway and Finland.		
Cooperative systems (vehicle-vehicle, vehicle-infrastructure, infrastructure-infrastructure)	<input type="checkbox"/> Implemented	<input checked="" type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	Status 2017: Several pilots that includes C-ITS services are in planning for start-up in 2018.  A Norwegian specification for ITS station has been developed based on ETSI and CEN/ISO standards and will be tested out by Norwegian industry in the planned pilots. The ITS stations will establish hybrid communication (ITS G5 and 4G) and connectivity.  A new national regulation for testing automated driving is under final preparation and is scheduled for adoption by parliament in late 2017.		
DSRC-based multi-purpose infrastructure	<input checked="" type="checkbox"/> Implemented	<input checked="" type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	Status 2017: The AutoPASS tolling system is fully interoperable, also cross-border. Tags are used to measure travel times in real-time. Other piggy-back applications are under discussion. Multipurpose DSRC based on G5 technology will be part of the C-ITS pilots.  The NPRA will conduct studies to determine the criteria for investing in hybrid communication along the road network.		
Participation in European cooperation platforms	<input checked="" type="checkbox"/> Implemented	<input type="checkbox"/> Planned	<input type="checkbox"/> Not planned
	The NPRA participates in the following platforms and fora: <ul style="list-style-type: none"> <li>• EIP</li> <li>• Amsterdam Group</li> <li>• CEDR</li> <li>• ASECAP</li> <li>• POLIS</li> <li>• C2C-CC</li> <li>• ERTICO</li> <li>• C-ITS platform</li> <li>• C-roads</li> </ul>		



## 4 Key Performance Indicators (KPIs)

### 4.1 Deployment KPIs

KPI	Region East		Region South		Region West		Region Mid		Region North		Norway in total		
	TEN-T	nat. roads	TEN-T	nat. roads	TEN-T	nat. roads	TEN-T	nat. roads	TEN-T	nat. roads	TEN-T	% of TEN-T	nat. roads
Number of km in total	1313	1110	1002	902	1126	879	1029	236	2563	640	7033		3767
Number of km with real time registration of travel time	181	25	220	0	73	39	12	10	0	0	486	6,9	74
Number of km with camera surveillance	67	31	35	14	88	13	31	2	7	0	228	3,2	60
Number of km with automatic incident detection (AID)	31	14	25	10	10	0	18	2	7	0	91	1,2	26
Number of km with traffic management and traffic control measures	69	29	200	40	8	16	65	4	10	0	352	5	89

Figure 1 ITS instrumentation on the Norwegian road network

#### 4.1.1 Information gathering infrastructures / equipment (road KPI)

Different types of data gathering equipment are installed on parts of the Norwegian road network with high traffic volumes, high incident rates and demanding weather conditions. In addition, more than six hundred road tunnels are equipped with various degrees of data gathering and traffic management equipment. The figure above shows the total length of roads by type (TEN-T comprehensive network and the rest of the national road network, county roads are not included). The length of road equipped with the different kinds of equipment are distributed on the five regions and for the country in total. These numbers are the source for calculating the KPIs for Norway. The numbers are collected by the regional offices and based on different statistics. There is on-going work to establish higher quality data of this kind in our National Road DataBase.

- KPI for real time travel time registration = **6,9**

KPI for all types of data gathering equipment is not available as a fixed number. On the Norwegian road network there is traffic counting equipment measuring traffic volumes, speed and vehicle length on the entire road network. On TEN-T roads there are 454 traffic counting stations and on the rest of the national road network there are 255. This registration equipment is online with the central database and the data can be used in real time by ITS services.

#### 4.1.2 Incident detection (road KPI)

- KPI for automatic incident detection = **1,2**
- KPI for incident detection based on cameras = **3,2**

#### 4.1.3 Traffic management and traffic control measures (road KPI)

- KPI for traffic management and traffic control measures = **5**

#### 4.1.4 Cooperative-ITS services and applications (road KPI)

No C-ITS services deployed.

#### 4.1.5 Real-time traffic information (road KPI)

Real-time traffic information covers the whole road network:

- KPI for real-time traffic information =**100**

#### 4.1.6 Dynamic travel information (multimodal KPI)

**Not available**

Oslo and many other Norwegian cities have dynamic travel information for public transport. The information is available on APIs and on stops and terminals. No KPI is calculated because the services are not linked to roads and road length.

#### 4.1.7 Freight information (multimodal if possible or road KPI)

**Not available**

More work has to be performed in order to determine data sources and calculate KPIs.

#### 4.1.8 112 eCalls (road KPI)

### 4.2 Benefits KPIs

#### 4.2.1 Change in travel time (road KPI)

**Not available**

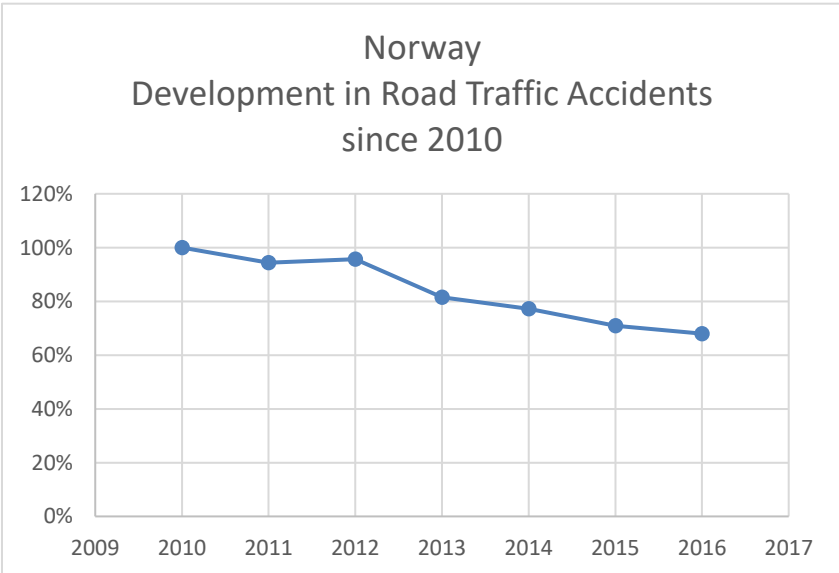
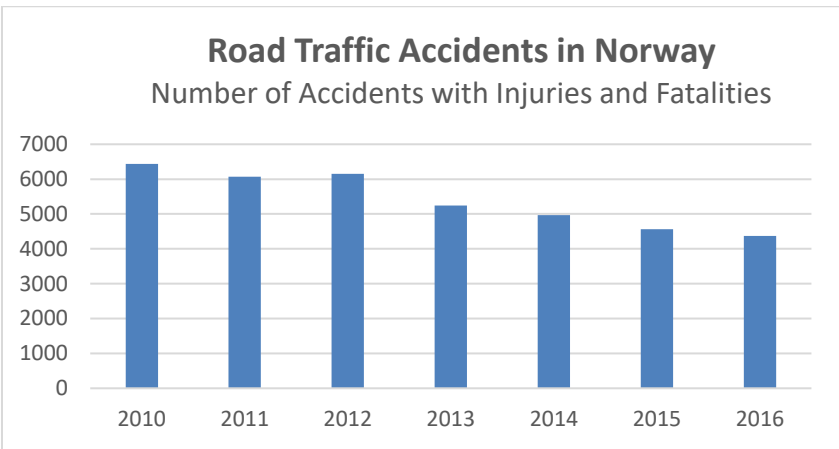
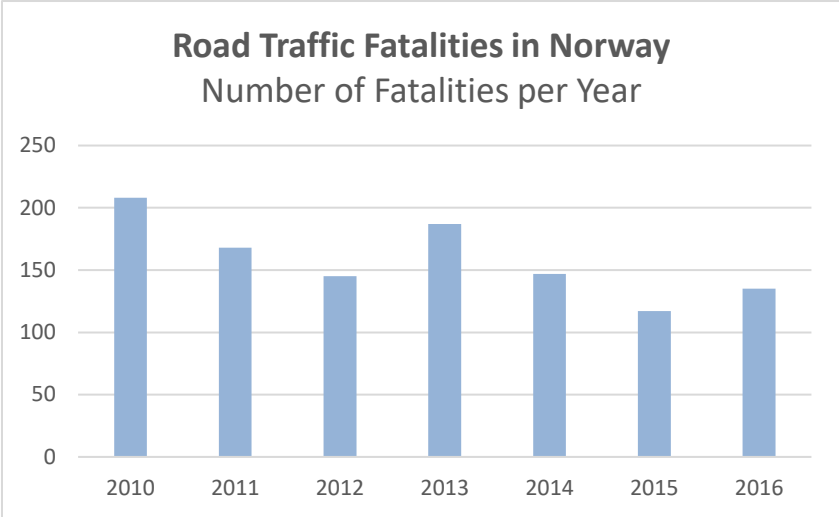
Norway has an automatic real time registration of road travel time. This service covers the main road network in the four largest urban areas and also a motorway corridor between Oslo and Kristiansand. This system uses toll tag equipped vehicles as probes and measures individual travel time anonymously. The data is then aggregated and made available at the NAP, and used in several information services including VMS. The data is stored in a historic database which will be the source for this KPI. The KPI is currently under development, and is planned to be available during 2018.

#### 4.2.2 Change in road accident resulting in death or injuries numbers (road KPI)

- Number of road accident resulting in death or injuries before ITS implementation or improvement: **Not available**
- Number of road accident resulting in death or injuries after ITS implementation or improvement: **Not available**

Data describing ITS implementation and improvement (implementation date, investment, etc.) is not available without detailed investigations. These KPIs are therefore not available for Norway at the moment. We include general traffic accident statistics covering the comprehensive road network. We are not able to link this to ITS implementation and improvement precisely, but ITS investment has increased substantially from 2010. Key services, like road weather information, travel time information, web camera service and traffic management systems have been introduced or enhanced mainly after 2012.





#### 4.2.3 Change in traffic-CO2 emissions (road KPI)

**Not available**

Lowering CO2 emissions has been a priority in Norwegian politics for several years already. Norway has introduced economic incentives for electric and non-fossil vehicles which has been very successful. Today, Norway has the highest share of electric vehicles in the world. In addition, the largest Norwegian cities have introduced toll rings with demand management as congestion pricing and also a price structure based on the type of fuel. Calculations for the development of CO2 emissions are available, but it is at the moment impossible to link this to ITS implementation. Hopefully, Norway will be able to submit this KPI at a later stage.

#### 4.3 Financial KPIs

Annual investment in road ITS (as a % of total transport infrastructure investments): **Not available**

Annual operating & maintenance costs of road ITS (in euros per kilometre of network covered): **Not available**