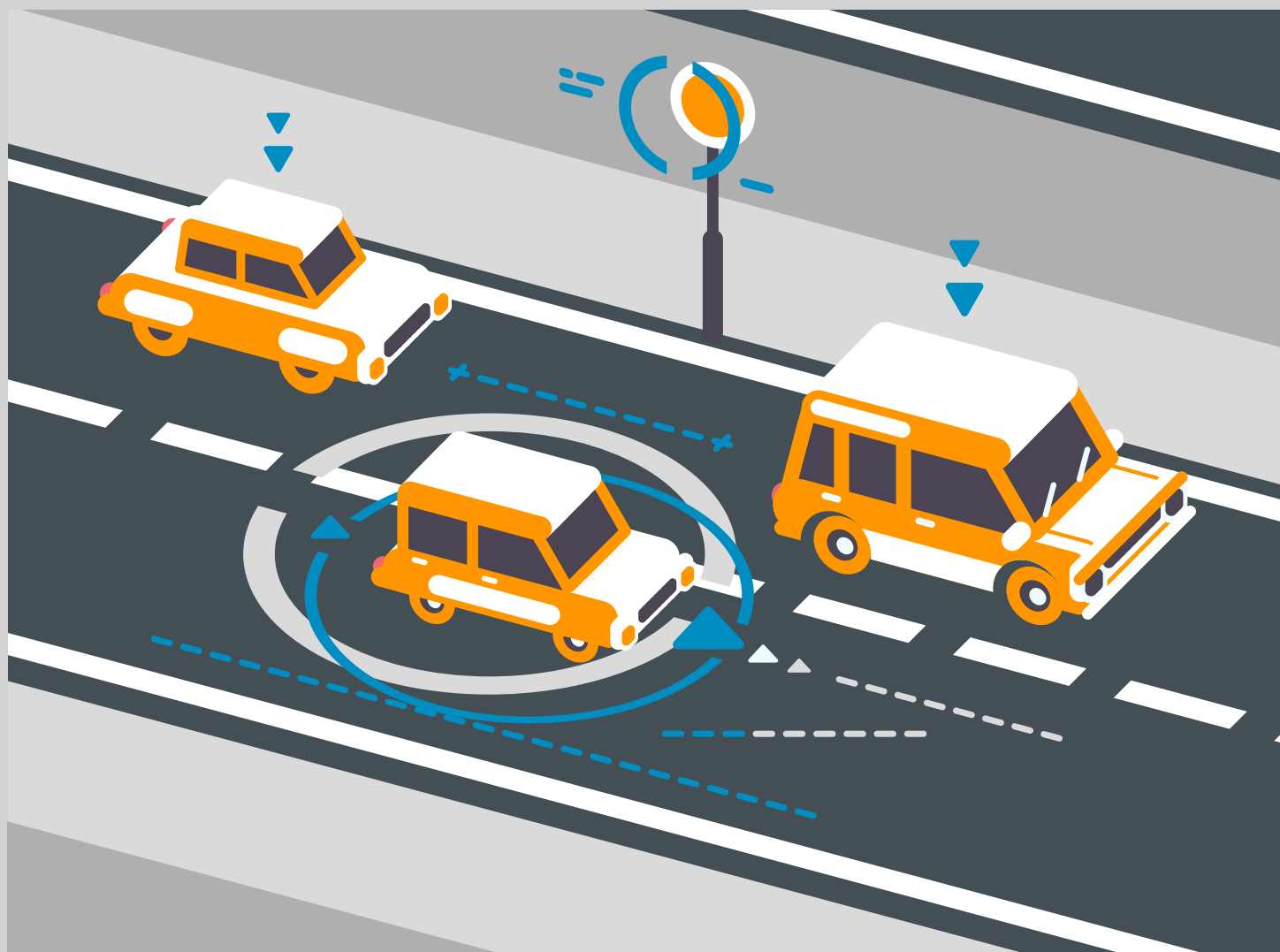




# ITS Strategy for the NPRA

Norwegian Public Roads Administration  
2018-23

A Road Map to the Future Transport System





## Foreword

Intelligent Transportation Systems (ITS) are developing at a faster pace than before. This applies both internationally and in Norway. It applies to technology as well as legislation and policy. We are preparing the implementation of cooperative ITS services and the testing of automated driving on open roads. All this is based on advanced sensor technology, communication and interaction between vehicles and centralised systems, as well as on the processing of large amounts of data using artificial intelligence. There is a significant development towards seamless transports, where different modes of transport can be integrated and coordinated.

The Norwegian Public Roads Administration (NPRA) has a leading position in the Norwegian ITS area and must take on key roles in the development towards the future mobility. This is made clear in the NPRA Corporate Strategy and the NPRA Strategy for Digitalisation. The NPRA Corporate Strategy provides us with strategic goals and role descriptions for our work towards the future transport system. The ITS strategy is linked to the strategic goals:



The NPRA also has a Strategy for Digitalisation, addressing technology as a driver of change. It specifies how the NPRA should use technology to renew, simplify and improve products and services. The strategy is directed at all work processes, dialogues and interactions with internal and external users and cooperation partners, including the ITS area.

The ITS strategy is a road map for how ITS may contribute to the implementation of the National Transport Plan and the NPRA Action Programme, so that we achieve the main goals for our national transport policy. This is reflected in the NPRA's leading roles, the contributions of ITS towards goal achievement, and our selected priority areas. The ITS strategy has the same time horizon as the Action Programme; 2018-2023, the first period of the NTP 2018-29, and should be updated and revised as required.

The ITS strategy has been developed by the NPRA Traffic Management Section, with the involvement of the entire ITS community of the NPRA.

Directorate of Public Roads, January 2018

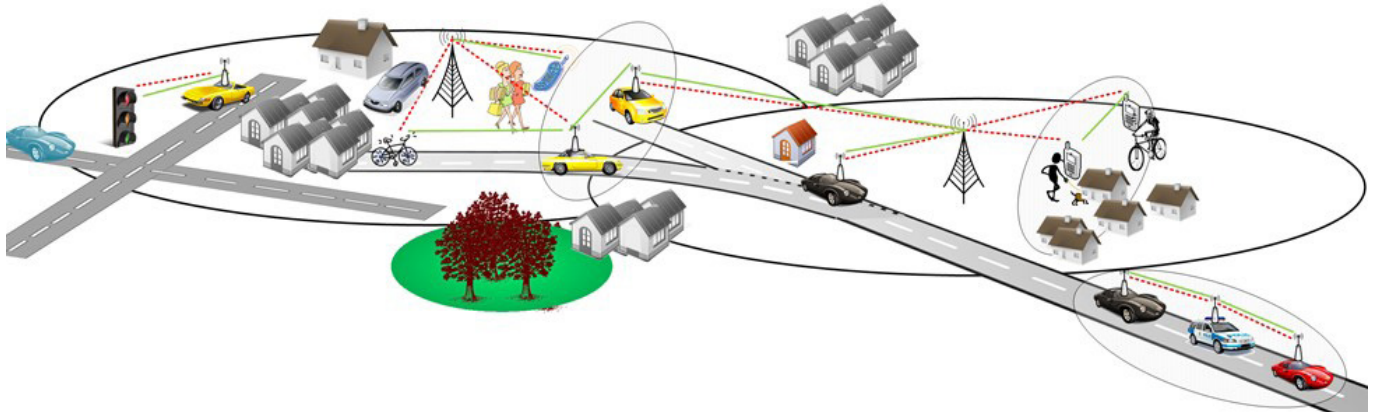
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# 1. The ITS vision

**People and goods utilise sustainable transport modes safely, easily and efficiently. Road transport is characterised by safe, fossil-fuel-free and cooperative services with visible elements of well-functioning automation. Road users can seamlessly plan, book, pay for and carry out their transports based on up-to-date and secure information.**



*illustration of C-ITS, source Ertico*

## 2. Background

A large increase in transport demand is expected in our major urban areas and important corridors. It is a goal that the growth of transport demand should be absorbed by public transport, walking and bicycling. In addition, we are facing major challenges in improving conditions for pedestrians and cyclists and for commercial transports. ITS can also improve the efficiency of transport chains that include multiple modes of transport.

We need new measures that are effective and well-aimed to achieve our main goals for traffic safety, mobility and climate/environment. The classical measures of infrastructure expansion, physical design and traffic control must be supplemented with new measures. These will be based on new technology and include ITS.

To develop a future mobility that is sustainable, we must use solutions that cut across traditional fields of expertise and organisational borders. We must facilitate a near future with a large element of cooperative and automated mobility that comprise car traffic as well as public transport and commercial transport. This development will lead to major changes in society and in the transport sector, and influence road user mobility and behaviour.

We see that commercial stakeholders, often global ones, are entering the transport market with mobility services that may become competitive. This may mean attractive alternatives to private car ownership, in combination with public transport, cycling and walking. It is important to achieve good cooperation with such stakeholders to ensure that new services become sustainable, and that their data are open and accessible.

The NPRA must ensure that our efforts and investments in ITS contribute towards the transport policy goals in the National Transport Plan and towards the strategic goals in the NPRA Corporate Strategy. The ITS Strategy contains more specific guidelines for this work.

## 3. The NPRA's leading roles

The NPRA has three main roles in the transport sector; we are an authority, we have the overall sectoral responsibility and we are responsible for the management of roads and road traffic. To facilitate the development of the future transport system, the NPRA is to contribute to extensive utilisation of ITS. The NPRA should have a leading role in Norway's commitment to ITS; as a regulator, facilitator, knowledge developer and systems owner.

### 3.1. Regulator

The NPRA should be a leading stakeholder in developing the legislative basis, rules and regulations for ITS that will ensure harmonisation of Norwegian ITS solutions irrespective of road ownership and level of administration. As an authority, we must demand that ITS complies with other rules and regulations, such as for privacy protection, universal design and civil security. We must contribute to ensuring supervision and enforcement of the legal requirements that applies for ITS.

The NPRA should have an active role in international standardisation and harmonisation to ensure that Norwegian needs and interests are considered and accepted. We shall contribute to continuity of ITS services in Europe. This is of major significance for Norway and Norwegian businesses and industry. The NPRA will have a responsibility for achieving understanding and acceptance of a much-needed transition to a more sustainable transport system. The role of regulator means that we seek legal and ethical clarifications, define principles for ownership of data and the division of responsibilities between public and private stakeholders, as well as ensuring compliance to international legislation and agreements. This role requires active participation in international cooperation and in the legislative work of the European Commission.

### 3.2. Facilitator

The NPRA will have a leading role as a facilitator of pilot projects and testing of new technology and new ITS solutions. We should be active, stimulate the development of ITS and make test sites available. We shall contribute to instrumentation and to project financing. The NPRA also has an important role as a cooperation partner for Norwegian businesses and industry, and as a door-opener towards international networks and projects. We are to contribute to research projects, pilots and regulations that stimulate rapid technological innovation in the transport sector.

As facilitator, an important task is to ensure a good foundation of data for ITS, both dynamic and static, with data acquisition both from fixed installations and from vehicles in traffic. We shall contribute to achieving the intention of the ITS Directive for a continuous source of data and ITS services in Europe. Elements of this task may be procured services from private parties. The role as facilitator will imply that the NPRA operates its own services, but to a limited extent as described in Chapter 3.4.

The NPRA must take responsibility and ensure that the main road network has the necessary digital infrastructure that is reliable and has enough capacity and redundancy. This infrastructure will be used for data acquisition, communication, information, road user charging and traffic control. The NPRA should ensure coverage of cable pipes and fibre cables along the main road network and relevant places along other roads.

Cooperative and automated driving requires communication vehicle-to-vehicle and to roadside and centralised or cloud-based systems. The NPRA's work on ITS pilots will contribute to clarification of necessary extent, costs and responsibilities for a dedicated communications infrastructure along the road network and in urban

areas as a supplement to mobile data coverage. Such so-called hybrid communication will provide high redundancy and reliability, which is a prerequisite for cooperative and automated driving in areas with heavy traffic. This work requires close cooperation with telecom operators.

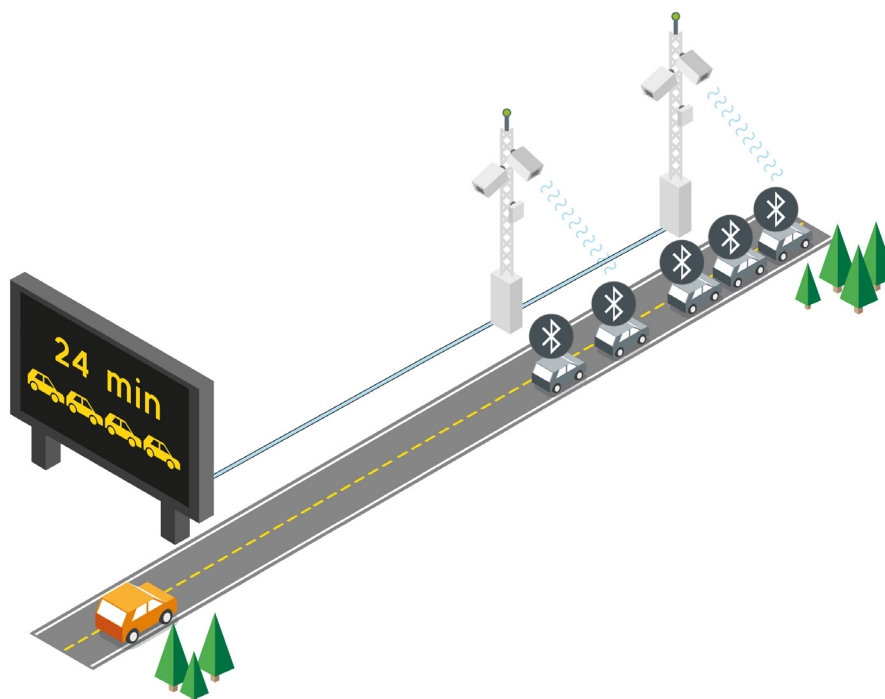
### 3.3. Knowledge developer

The NPRA should be an acknowledged R&D institution both nationally and internationally. We shall promote Norwegian technology and specialist expertise, and ITS solutions that are adapted to conditions in Norway. The NPRA's own R&D programmes will support our role as a knowledge developer. We shall develop improved methodology and knowledge for the evaluation and impact assessment of ITS. This is the tool to document how ITS contributes to achieving the transport policy goals. The NPRA has a responsibility to influence availability of education and training, and must contribute to recruitment within ITS. We shall cooperate with and stimulate knowledge development within the research and university sector.

The NPRA needs access to expertise from various disciplines to support ITS investments. Active cooperation with colleges, universities and other specialist environments is therefore important both for knowledge development and for recruitment. There is a need to build up inter-disciplinary environments where traditional road and traffic competence is combined with ICT, and supported by other fields such as behavioural science, law, privacy protection and economy. There should be a good balance between external and internal competence. The NPRA should as a minimum have high competence within procurement and systems ownership, supported by strong internal competence in the field of traffic management.

The NPRA shall focus on innovation in cooperation with Norwegian industry, service providers and professional communities, for example by:

- Participating actively in ITS Norway and other platforms and networks for cooperation
- Stimulating innovation and the development of products and services from Norwegian business and industry companies
- Contributing to the development of a competent and competitive market for consultants and suppliers
- Requiring use of open protocols, formats and systems specifications



### 3.4. Owner of systems and services

The NPRA's ITS solutions must comply with the national requirements for public ICT systems. The principles of service-oriented architecture must be reflected in the system architecture of ITS in the NPRA. It is important to use international standards for formats and interfaces, and to counteract proprietary solutions. Operation and management of NPRA's systems and databases for ITS may be performed by NPRA internally and / or as procured services. Either way, ITS will require good cooperation between the NPRA's ITS and ICT units.

As a public agency, the NPRA has a duty to provide information, which in our case means that we are obliged to provide information directly to the public and road users. This applies first to basic traffic information services ("Vegkart", "vegvesen.no/trafikk", web cameras, travel times, re-routing of traffic, etc.). This information is made available via the National Road Data Base (NRDB) and the NPRA's DATEX node. It is also required that NPRA perform basic traffic management like road and tunnel closures, re-routing and measures to maintain traffic flow. It may be necessary to establish end user services that are beneficial to the society where there are no commercial alternatives. Often, commercial services do not meet national requirements with regards to neutrality, quality or nationwide accessibility.

The NPRA should normally not provide services that compete with equivalent services from commercial service providers. If the NPRA develops and provides their own services to end users, this must be based on the following criteria:

- To ensure a basic level of services for the public
- To protect important public interests
- To address important social or health-related concerns
- To comply with instructions from the national Government or with mandatory international legislation and agreements.

It is important to emphasise the interests of the end-users of ITS services. The NPRA must apply the focus of the user, both in our development of services and to the extent that we can influence external services. ITS solutions must meet traffic safety requirements and distraction hazards must be carefully considered. Both service contents and user interface must serve the specific purpose and be user-friendly. Principles for universal design should be applied where this is relevant to ensure accessibility for all. Users should be involved in the development of services and be given the opportunity to provide input during the development phase. der dette er relevant for å sikre tilgjengelighet for alle. Ved utvikling av tjenester bør brukerne involveres og få anledning til å gi synspunkter i utviklingsfasen.





## 4. ITS contributes towards transport policy goals

**An overall transport policy goal is “a transport system that is safe, promotes value creation and contributes towards the desired transition into a low-emission society” (NTP 2018-29). The main goals in the NTP is mobility and traffic flow, traffic safety and climate/environment. ITS will contribute significantly towards these.**

### 4.1. Mobility and traffic flow

The NPRA in cooperation with other authorities, will contribute to the goal of mobility and traffic flow by:

- Facilitating the provision of attractive and accessible public transport. Good ITS solutions for public transport will enhance data acquisition, signal priority at intersections, traffic management, fleet control, journey or route planning, and real-time information.
- Contributing to provide transport users with updated information before, during and after their journey, and contributing to make the use of public transport simple, efficient and seamless.
- Facilitating the use of universal design at public transport stops and contributing to the inclusion of relevant information to road users with special needs in journey planning services, real-time information and ticketing.
- Cooperation towards integrated transport services (mobility packages) and pilots for “Mobility as a Service” (MaaS).
- Facilitating the introduction of flexible and in time automated transport services that can improve the mobility of user groups who today have limited access to the transport system.
- Ensuring efficient traffic flow on the road network through new tools that include prediction and reduce the risk of incidents and traffic disruptions.
- Enabling traffic control systems for efficient and safe traffic flow on critical road sections, like what we have today in tunnels with heavy traffic.
- Operating traffic control and rerouting systems as far as possible by remote control and based on pre-planned diversion routes.
- Increasing the efficiency of incident management through improved communication and interaction procedures between the NPRA, the police and emergency services.
- Utilising cooperative ITS (C-ITS), sensor technology and emergency call systems such as eCall for the detection and notification of incidents.

### 4.2. Traffic safety

The NPRA will contribute towards Vision Zero and traffic safety goals by:

- Utilising ITS to improve traffic safety and promote new technology for active safety in vehicles and for roadside solutions.
- Using ITS to influence road users to behave more safely in traffic.
- Ensuring that ITS does not cause increased distraction and thus reduced safety gains.
- Facilitating the use of advanced driver assistance, cooperative ITS and automated driving to reduce the risk and severity of accidents.

- Exploiting the traffic safety potential of ITS in urban areas in close cooperation with municipalities, county administrations and other local parties, for coordinated efforts on all parts of the road network.

### 4.3. Climate and environment

The NPRA will contribute to the climate and environment goals by:

- Introducing ITS solutions that will influence the population's transport behaviour in a sustainable direction and result in lower greenhouse gas emissions and improved local air quality
- Managing traffic flow so that we achieve the zero-growth objective for private car traffic, and that we reduce the contributions of road transport to air pollution, noise and congestion.
- Active cooperation to ensure liveable urban environments through promoting new mobility solutions, ITS and vehicle technologies that will make more room for low-emission zones and reduced car traffic in our cities.
- Facilitating smarter and more environmentally friendly solutions for urban logistics such as the transfer of goods to fossil-free transport modes, reservation of loading and unloading zones, control systems, access control, dynamic parking control and efficient goods and traffic management.



## 5. NPRA priority areas

- **Digitalization and technology**
- **A sustainable transport system**
- **Cooperative and automated mobility**

### 5.1. Digitalization and technology

**The NPRA will be a professional owner and supplier of digital road and traffic data. The NPRA will arrange for efficient acquisition of data, exploit external and new data sources, and ensure optimal quality for dynamic and static data. The NPRA will be a leading stakeholder for development, testing and implementation of new technology in the road transport sector so that we protect important public interests.**

The NPRA will:

- Establish and organise a national access point (NAP) for road and traffic data with dynamic and static data elements that meet the legal requirements in the ITS Directive and the Delegated Acts of the ITS Directive.
- Establish routines and systems for data acquisition and for making data available, ensuring optimal quality and precise descriptions of our open data sets.
- Ensure that data on planned and ongoing diversions and altered traffic plans, both temporary and permanent, are made available. This applies to roadworks, new design or traffic regulation, serious incidents, and major events.
- Define a national architecture that describes secure data flow, data ownership, quality criteria and division of roles and responsibilities with regard to handling sensor data from vehicles in traffic (C-ITS), including cloud computing and the processing and analysing of large amounts of data.
- Further develop technologies and systems for vehicle control and statistics that can utilise data from freight and heavy vehicles.
- Prioritise the introduction of new technology that is workable and has potential for benefits to the society, evaluate the need for new framework, rules and regulations and study other non-technical aspects as a consequence of new technology

Expectations from information users, businesses and industries as well as demands from increasingly advanced systems make high quality data a necessity. C-ITS is developing fast and will make it possible to access an enormous amount of data from traffic and the road network through the vehicle sensors and communication systems. In general, there is a demand for reliable supply of both static and dynamic high-precision data.

In the Delegated Acts of the ITS Directive there is a requirement for member states to set up a National Access Point (NAP) with defined content. National access points will be set up in the entire EU/EEA area. The NAPs and their content are important building blocks for facilitating cooperative and automated transport. The NPRA will establish a NAP portal in compliance with the delegated acts and harmonised with the rest of Europe. The data will be accessible in a standardised, user friendly and practical way and fulfil requirements for metadata and searchability. The Norwegian NAP service will be based upon today's services from the National Road Data Base (NRDB) and DATEX.

To benefit from new sources of data on a large scale it is necessary to know the quality of the raw data and have high capacity computing to process large amounts of data (big data analytics). This requires cooperation and agreements with commercial service providers.

The principle for ITS services should be to avoid the use of personal data. In systems where personal data are still involved, privacy protection must be integrated in the design of the solution. We have to meet the requirements of the EU's new General Data Protection Regulation (GDPR).

In general, it is important that ITS solutions have a high level of security. Misuse of data and hacking of systems may be catastrophic for traffic and traffic safety and must be prevented. Good information management means that the processing of data is documented at all steps in the value chain, from the acquisition of raw data to the end-user service. For example, who has handled the data, how have they been anonymised, aggregated, stored and possibly enriched or changed. Data from ITS solutions should have a clear description of ownership, re-use and quality, preferably based on agreements.

Technology provides enormous possibilities for solving challenges within traffic safety and mobility. The NPRA will continue to facilitate the development and use of new technology that can contribute to achieving goals for safety, climate, environment and mobility.

At the same time, the NPRA will continue to exploit existing technology as efficiently as possible as long as the solutions meet requirements for privacy protection, costs, technical reliability and benefit. This applies to technologies such as AutoPASS for tolling, vehicle inspection technologies, variable message signs, cameras and roadside sensors.



## 5.2. A sustainable transport system

**The NPRA will be a key stakeholder working for passengers and goods transport to take place with minimal negative impacts on the environment and climate.**

The NPRA will:

- Contribute to a more sustainable modal split in transport, inter alia through starting up a pilot for Mobility as a Service (MaaS) in cooperation with local stakeholders.
- Contribute to a robust charging station infrastructure to make it easy to use zero-emission vehicles
- Test new forms of non-fossil-fuel-powered ferries
- Further develop measurement databases, modelling tools and weather forecasts as decision making basis for immediate response and preparedness for infrastructure that is exposed to rough weather and climate.
- Further develop measurement databases, modelling tools and information services as the basis for preventive action and forecast and alerts to the public regarding local air pollution.
- Contribute to ITS services that will encourage cycling and walking and gain public health.
- Promote better utilisation of passenger seat capacity in cars through carpooling and ridesharing, particularly for work trips and commuting.

It is important to contribute to the zero-growth objective for private car traffic, to liveable urban environments and to health-promoting transport modes. The development towards fossil-fuel-free transport requires change, innovation and new requirements for infrastructure.

A growing number of cities adopt ambitious political goals for a green shift. This requires ample access to data and should include investment in digitalisation and in services that connect different transport modes. Cities will need to address their policies on parking, goods delivery, signal control, and strategies for traffic management. The NPRA should contribute with competence and expert assistance so that cities can make their own mobility plans with ITS solutions that are harmonised and follow common standards.

Between the urban areas and in regions with small transport demand it is difficult to establish traditional public transport services. In these cases ITS and new mobility services can contribute to the green shift. In corridors with a high proportion of freight transport, ITS may contribute to lower emissions and a larger share of fossil-free and intermodal transports without reductions in efficiency and reliability.



### 5.3. Cooperative and automated mobility

**The NPRA will contribute to a rapid introduction and testing of cooperative and automated driving for traffic safety, mobility, climate/environment and data acquisition.**

The NPRA will:

- Contribute to the implementation of the regulation for testing autonomous vehicles on the road network, and to the necessary procedures and organisation.
- Follow and contribute to international development of harmonized regulations for cooperative and automated driving.
- Perform studies and explore how to adjust our work, our organisation and the road user training following the increased use of automation and cooperative ITS.
- Implement major pilot projects that include cooperative ITS and automated mobility in cooperation with public and private stakeholders.
- Closely follow the development of technologies and contribute in the standardisation of automated transport systems. Clarify the architecture, extent, costs and responsibilities for a communications infrastructure required to enable cooperative and automated mobility with high benefits for the society.
- Contribute to studies and pilots to determine how increasing levels of automated transport may improve public transport services, make freight transport services more sustainable and efficient, and possibly also give other forms of socio-economic benefits.
- Clarify the need for changes to principles and guidelines for the processing of personal data in ITS solutions to comply with the General Data Protection Regulation (GDPR).

The evolution of technologies and infrastructure for cooperative ITS and automated driving is closely connected and will lead to major changes for the transport sector. It is important that the responsibility for basic and essential services to society should remain with the authorities. This applies primarily to traffic management, prioritisation of environmental friendly transport, utilisation of road infrastructure capacity, requirements related to vehicles and equipment, as well as basic traffic information.

The NPRA should take active part in international activities and hold a key role in the testing of cooperative and automated mobility in Norway. The NPRA will implement pilot projects in cooperation with the automobile industry and other stakeholders. The pilots will comply with the current legislation for the testing of automated driving and provide useful input to the final regulations and international harmonization.

The pilot projects will also help to clarify new requirements that a cooperative and automated transport system poses on the road infrastructure. This applies to quality of road maintenance, road marking, signs and other road equipment, as well as to the need for a separate infrastructure for communication in addition to mobile networks. The automobile industry is responsible for ensuring that vehicle technology is adapted to actual road networks. The NPRA will still hold a special responsibility for ensuring that the road network is adapted to an increasing extent of automated driving, to maximise the benefits to traffic safety and mobility.





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