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Content

1 Introduction

This report has been drawn up within the framework of the European ITS Directive (2010/40/EU), under which Member States are required to submit reports at certain moments. This report is a follow-up on the progress report previously submitted to the European Commission (EC) in 2020.

In this report, the Ministry of Infrastructure and Water Management (the Ministry) gives an overview of progress made on the deployment of Intelligent Transport Systems (ITS) in the Netherlands, including Key Performance Indicators (KPIs). Also, the report describes the progress made regarding the implementation of the ITS Delegated Acts and gives an overview of ITS in the Netherlands at large.

To provide good insight into the progress made in the area of ITS in the Netherlands, the report mainly focuses on the projects, services and activities that have been started, undertaken, or completed in the 2020-2023 period. It is worth mentioning that the list of activities and projects mentioned in this report is not exhaustive, rather, the activities and projects are chosen as the most relevant ones with regards to the European context. Consideration has also been given to the potential value of these projects for other European countries.

In an attempt to ensure this report is informative yet concise, the focus lies on presenting facts, figures and images. This report is the result of a thorough desk study, in combination with nine interviews with policy makers from the Ministry, senior advisors of the Directorate-General for Public Works and Water Management (Rijkswaterstaat (RWS)) on ITS, senior advisors from provinces and project leaders.

1.1 Document structure

Chapter 1 describes the general overview of the national activities and, moreover, the general progress since 2020.

Chapter 2 describes the progress made in implementing the European ITS actions in the Netherlands. These actions are contributing to the compatibility, interoperability and continuity of ITS solutions across the European Union (EU) and are also complementary to the Dutch ITS strategy. Furthermore, the chapter describes the activities, projects and initiatives on the four priority areas determined at the European level. The four priority areas are:

- Priority area 1: Optimal use of road, traffic and travel data.
- Priority area 2: Continuity of traffic and freight management ITS services.
- Priority area 3: ITS road safety and security applications.
- Priority area 4: Linking the vehicle with the transport infrastructure.

Chapter 3 describes the impact of projects, activities and initiatives on the determined KPIs.

Finally, appendix 1 contains the list of abbreviations used throughout this report.

1.2 General progress since 2020

To realize the ambitions as formulated by the Ministry in its "Smart mobility Dutch reality"[1] long-term vision on mobility in the Netherlands, Intelligent Transport Systems and Services (ITS) are recognized as an important instrument. In the period of 2020 to 2023, efforts were directed towards transitioning smart mobility – and ITS in particular – initiatives, from pilots to scaling up, and working on its integration and incorporation into policies, laws, and regulations.

[1] Kamerstuk 31305-264

A multitude of (inter)national projects and initiatives have taken place in the Netherlands to launch, research and improve ITS services with mobility data, and achieving successful results contributing to improve traffic safety, traffic flow, and minimize the environmental impact (e.g. reduce emissions) of the transportation system.

The resulting opportunities and benefits coming from ITS and its use of mobility data, as well as upcoming European laws, such as the revisions of ITS Directive and related Delegated Regulations, led to the necessity to work towards a more future-proof approach to safeguard mobility data. Therefore, in the coming years, the Ministry, in collaboration with all relevant stakeholders, will focus on developing a Digital System for Mobility data (DSM) to ensure that:

- Travellers can move more quickly, sustainably, and safely from point A to point B.
- The mobility system can be optimally utilized.
- We can maintain control over our traffic management.
- Multimodal travel becomes more accessible.

1.3 General overview of the national activities and projects

A general overview of the most relevant activities in the reporting period, related to the European ITS Directive, is provided below.

1. Digital System for Mobility data

The envisioned DSM ensures an organized and coherent system of national and local digital facilities, standards, data, data sources, and agreements regarding (the use of) mobility data.

An initial step was the launch of the **National Access Point for Mobility Data** (NTM) in 2022, which plays a facilitating role in the DSM, both in facilitating the structural collaboration amongst various government bodies and in facilitating collaboration between government and market to provide reliable travel, route, and policy information. The recently renewed NTM Mobility Data Registry website allows data providers and data consumers to find and use various types of mobility data – from bicycle data to data regarding roads and charging stations – for the first time, all in one place.[2] Currently, the registry contains over 50 datasets, including various road traffic datasets, as well as 20 sets of multimodal data and data on alternative fuels. The ambition is to expand this number of datasets in the upcoming period to hundreds, from various data owners.

With these features and service scope, the NTM fulfils and exceeds the European ITS Directive 2010/40 obligation of Member States to establish a National Access Point (NAP), to organise the access to and reuse of transport related data to help support the provision of EU-wide interoperable travel and traffic ITS services to end users.

Joint activities being done by the Ministry and relevant stakeholders in the context of NTM include:

- Continuous improvement of NTM to make mobility data increasingly easy to access and to make agreements between public and private parties regarding the (re)use of mobility data in line with European frameworks.
- Agreements between municipalities, provinces, and market parties on how the availability of mobility data will be addressed in the future in line with European regulatory frameworks.
- A joint sector registration of road networks to provide road users with better information on traffic rules, such as speed limits and zero emission zones, through navigation services.

2. Mobility as a Service

Mobility as a Service (MaaS), allows travellers to plan, book, and pay for all available transportation options in one integrated app, based on personal preferences. In the Netherlands, MaaS was developed in a public-private program (2017-2022) with seven national scalable pilots, each with a different focus or target group: employer-oriented, distribution and substitution of

[2] Nationaal toegangspunt mobiliteitsdata

transportation, better alignment of specialized transport and public transport, and facilitating cross-border public transport.

Eight MaaS applications have been developed by market parties and are available in app stores. The objective of the program was to practically assess whether MaaS induces changes in user behaviour and how these alterations impact the mobility system. Additionally, it empowers the providers' market (public transport, taxis, shared mobility) to better tailor their offerings to match transportation demands. The ultimate goal was to derive conclusions regarding the potential of MaaS and its potential integration into policies, laws, and regulations on a structural basis, such as data accessibility, standardization, and public transport policies.

The program was concluded in this reporting period. Based on the lessons learned a set of follow-up measures were implemented in order to facilitate the scale up of MaaS services. The standards developed within the program for setting up agreements and data exchange are brought under the management of a strategic committee, also supported by NTM. These standards and related lessons learned are currently being introduced to other European Member States through the NAPCORE initiative.

3. Futureproof infrastructure and management

The deployment of smart infrastructure is progressing steadily. In 2023, approximately 20% of the Traffic Light Controllers (TLCs) throughout the Netherlands, managed by municipalities, provinces, and the central government, have been converted into intelligent Traffic Light Controllers (iTLCs). Additionally, in 2021, the deployment of intelligent Road-Side Units (iRSU) began on the main road network. These stations by the roadside contain computers that communicate with traffic control centres and control the motorway signalling system, displaying speeds, arrows, and crosses above the road.

4. Public-private partnerships

In the reporting period of 2020-2023, various projects and programs based on public-private partnership have provided useful results on using mobility data, aiming at increasing road safety and travellers' convenience. The results underline the opportunities offered by using market driven technological applications for keeping our mobility system future-proof.

The **ROMO (Road Monitor)** initiative from the Ministry together with Mercedes, is an example of the added value of vehicle data and information to support road authorities in several tasks such as road maintenance, traffic safety and winter management.

Thanks to collaboration with private parties in the **Safety Priority Services (SPS)** project, approximately 10% of all kilometres driven in the Netherlands can, for instance, receive warnings about approaching traffic jam tails or arriving emergency services via a navigation app on their phone or in-car.

In 2023 new functionalities will become available, for example warnings regarding the accurate location of road inspector's vehicle along the road so that drivers can adjust their driving behaviour accordingly.

In 2021, the final report of the **Talking Traffic public private partnership** was published, providing a description of the positive effects on mobility of the deployed Talking Traffic applications by market parties. With the completion of the program, a new phase is entered where road authorities and market parties further develop the services.

5. Monitor Smart Mobility 2023

On February 24th of 2023 the Monitor Smart Mobility was published, reporting on the progress (in terms of development, usage and effects) of vehicle automation, traffic management & information services and mobility services.[3] The contents have been used as input for the rest of this report, therefore no summary is given here.

[3] Monitor Smart Mobility 2023 (Rijksoverheid.nl)

The Monitor Smart Mobility will be updated and published annually in order to track national progress on the aforementioned topics. Additionally, the reported results will be used in a structural manner to implement data-driven policy measures.

1.4 Contact information

For further inquiries, please contact vdi@minienw.nl.

2 Projects, activities and initiatives

2.1 Introduction

This chapter presents a selection of relevant projects, activities and initiatives in the field of ITS that have been launched or completed in the Netherlands since 2020. As previously mentioned, the Netherlands has shifted its focus from ITS pilots towards deployment. Therefore, the number of projects initiated in the last three years has decreased, though projects are larger in scale. The current projects focus more on the implementation of ITS services, which result in a higher impact on the Dutch mobility system.

For each priority area outlined in the European ITS Action Plan, developments that can currently be observed are described. This is done by analysing ongoing and completed projects, activities and initiatives. The progress made by the Netherlands is described for each of the projects.

The following priority areas are covered in this chapter:

- Priority area 1: Optimal use of road, traffic and travel data.
- Priority area 2: Continuity of traffic and freight management ITS services.
- Priority area 3: ITS road safety and security applications.
- Priority area 4: Linking the vehicle with the transport infrastructure.

2.2 Priority area I. Optimal use of road, traffic and travel data

2.2.1 Description of the national activities and projects

Road Monitor (ROMO)	
Stakeholders	the Ministry (funding), National Traffic Data Portal (NDW) (contracting authority), Rijkswaterstaat (project manager), Mercedes Urban Mobility Solutions, Royal Netherlands Meteorological Institute, all Dutch provinces, 50 municipalities
Status	In progress
Timescale	2022 – 2024 (Q4)
Resources	Public funding

Objectives:

The project Road Monitor (ROMO) was initiated in 2022, with a focus on vehicle information related to road maintenance, winter management and traffic safety. Mercedes Urban Mobility Solutions has secured the contract to provide this information: the company will supply comprehensive data on the entire Dutch road network for two years. The project works towards daily operations in Q3 2023 and the duration is extended to April 2024. The goal is to continue with a similar project with more Original Equipment Manufacturers (OEMs) after 2024. The objectives of ROMO are:

- Providing Probe Vehicle Data to Road Authorities for asset management, adverse weather induced situations such as slippery roads (winter management) and traffic safety (near accidents).
- Establish expert teams to determine the information required for daily management, which can simplify and/or enhance their tasks.
- Find varying needs of road authorities.

Milestones:

- Matching data with ground truth, gaining insights into which data is useful and which is not.
- Ensuring (digital) dashboard information aligns with the road environment (e.g., road signs) to gain user trust.
- Deriving road surface temperature from multiple sources of data (RWS slippery road notification system, car's heater setting, car temperature, cloud cover, etc.).

Partnership Talking Traffic	
Stakeholders	The Partnership Talking Traffic is a collaboration between the Ministry, 60 regional and local authorities and national and international private parties. Amongst the private parties are: Be-Mobile, Sweco, Ericsson, Flitsmeister, Ko Hartog, KPN, Locatienet, Monotch, Roadeo, Royal Haskoning DHV, Siemens (now: Yunex Traffic NL), Simacan, Swarco, Dynniq (now part of Swarco), T-Systems, Vialis, V-Tron, Ziut, Flir, Vinotion.
Status	In progress, ongoing
Timescale	Started in 2016 with 5 year long innovation contracts. Regular roll-out since 2020.
Resources	Public parties invest €55mln and private parties €45mln

Objectives:

The partners active in the Partnership Talking Traffic are working together to accelerate development and deployment of the exchange of data between vehicles and intelligent roadside infrastructure, using regular cellular data communication. This enables, for instance, traffic lights to optimize traffic control to approaching connected traffic, inform them on the time to green and to facilitate priority to specific groups of road users (like public transport, trucks, emergency vehicles or cyclists). Such data from intelligent Traffic Light Controllers (iTLCs), in addition to a wide variety of other traffic data, is converted by service providers into real-time and tailor-made data sets and information and is provided to road users on their smart phones, personal navigation devices, fleet management systems and in-car systems. In this way, the safety and sustainability of traffic and transport can be enhanced, e.g. by reducing travel times for specific road users that are important in terms of local public policy and therefore, eventually, lower public expenditure. Mixing global and local entities in this Partnership speeds up development and deployment of new services to both road users and governments.

Concrete types of data that became available to road users via in-vehicle information services:

- In-vehicle signage and speed advice.
- Individual real-time data on potentially dangerous situations and road work warnings.
- Prioritisation (conditioned and general) of certain types of road users at iTLCs.
- Provide road users with real-time data from iTLCs (currently app. 25% of all Dutch iTLCs).
- Optimising traffic flows at intersections with real-time vehicle data.
- Real-time in-car parking data.

Deployment makes it possible to not only improve traffic flow, but to improve traffic safety as well. Road users will be able to anticipate changing conditions during their trip. Travel times will be reduced. Emissions will be lowered. In short, mobility, accessibility and liveability will improve, and the number of traffic accidents will be strongly reduced.

Milestones:

The following effects were found during evaluation:

- Road users are positive on received data.
- An increase in driving comfort and alertness was reported.
- Driving behaviour was adjusted in response to received information on maximum speeds (60% reported adjusted behaviour) and dynamic lane information (90% reported adjusted behaviour).
- Multiple target groups, such as emergency vehicles and public transport, successfully request priority at iTLCs, resulting in:
    - Potential reduction of truck stops at intersections by 26%.
    - A 30% reduction in travel time over intersections for road inspectors.
    - Reduced travel time for emergency vehicles.
    - Reduction of accidents with emergency vehicles.

Furthermore, the developed ecosystem is able to facilitate many more new ITS use cases to increase road safety, such as Emergency Vehicle Approaching or informing trucks and fleet managers about the condition of their tyres. The Talking Traffic information services are being used by more than 2.5 million road users on a regular basis.

Traffic Management Information for Route Advice (VM-IVRA)	
Stakeholders	Rijkswaterstaat, National Traffic Data Portal (NDW), The Metropolitan Region Rotterdam-The Hague (MRDH), The Amsterdam Metropolitan Area (AMA), Regions of North and East Netherlands, Service providers: Be-Mobile (Flitsmeister), TripService, Locatienet and ANWB
Status	In progress
Timescale	2019 – on going
Resources	• Co-funding EC Connecting Europe Facility (CEF) • Rijkswaterstaat • The Ministry

Objectives:

The goal of VM-IVRA is to share traffic management data elements from traffic control centres with service providers through NDW and NTM; to examine the conditions under which service providers can incorporate this traffic management data into their information services; to determine what this means for road authorities and their traffic management activities. This way, there is added value for road authorities, service providers, road users, and society.

Milestones:

Completed:

- Traffic manager (TM) and service provider (SP) collaboration model descriptions and best practices.
- TM information service and use case descriptions in collaboration with SPs.
- TM information open data feeds service operational at NDW.
- Operational service requests from Traffic Management Centres (TMCs) for in-car VM (Variable Message) services.
- Proven DatexII standard model and message definitions ("Open data feeds" and "Service requests").
- "Digital Information Beacon (DIB)" tool for TMC request to SPs.
- "Diego" digitization tool for TM scenarios and DIB configurations (text and locations).

Planned:

- Embedding a new approach by road authorities/traffic control centres.
- Developing collaboration and transaction model with service providers.
- Ensuring management by road authorities and NDW.
- Scaling up usage.
- Consolidating and advancing the toolkit.
- Integration of further TM services digitalisation with Diego.

NTM (National Access Point for Mobility Data)	
Stakeholders	The Ministry, National Traffic Data Portal (NDW)
Status	In progress
Timescale	2022 – on going
Resources	• The Ministry • Rijkswaterstaat

Objectives:

The main goal of NTM is to make mobility data known, available, usable, and reliable.

NTM cooperates with market parties and co-governments to create a single access point that provides a consistent overview of available (multimodal) mobility data. In dialogue with all stakeholders, the application of this data will be improved in line with European obligations. This information should be easily accessible and transparent for everyone, enabling development of better policies, ensure well-informed citizens, and facilitate safe and convenient travel according to individual preferences.

NTM develops and manages the registry for multimodal mobility data providing an overview of data from various data hubs and existing registrations. This includes road network data from the National Road Database (NWB), public transport data from Collaboration of Decentralized Public Transport Authorities (DOVA), road traffic data collected by the National Traffic Data Portal (NDW), as well as private data on parking and charging stations. NTM works on developing standards for multimodal travel and ensuring interoperability between standards striving to improve the quality and coherence of existing registrations.

NTM coordinates collaboration with other European member states to facilitate international data exchange and scalability of smart mobility applications at the European level. This is done through the NAPCORE program (National Access Point Coordination Organization for Europe). The program aims to promote coordination amongst the NTMs of European member states and the national authorities responsible for compliance with European legislation. This makes it easier for market parties to offer the same services in different member states, thereby enhancing the quality and availability of mobility services.

NTM plays a facilitating role in the dialogue between market parties, such as navigation services, vehicle manufacturers, and shared mobility providers. The ambition is to make public and private mobility data, as described in the European guidelines, accessible to everyone through the NTM.

Milestones:

Completed:

- NTM was launched on July 4 in 2022 by the Dutch minister of Infrastructure and Water Management.
- Hosting data exchange standards for Multimodal Travelling (MaaS, TOMP-API).
- Start public private dialogue with stakeholders.

Planned:

- New version of the NAP-register online including access to all NAP related mobility data from one access point.

NAPCORE (National Access Point Coordination Organisation for Europe)	
Stakeholders	From the Netherlands: NDW and the Ministry. 36 participants of which: 33 beneficiaries covering 26 EU Member States and 3 associated partners. In addition, there are 37 Implementing Bodies.
Status	In progress
Timescale	2021-2024
Resources	• Co-funded EU CEF • Co-funded by partners from 26 European countries

Objectives:

NAPCORE has been launched as the coordination mechanism to improve interoperability of the European NAPs as backbone of European mobility data exchange. The ITS Directive 2010/40/EU and its Delegated Regulations require that each European Member State must establish an NAP for mobility data. By now, there are more than 30 operational NAPs in virtually all EU Member States (and beyond), where mobility related data is published and made available for use in travel information services. The Netherlands aims to seize such European cooperation by initiating dialogue and collaborating on pertinent issues with other Member States. A recent example of this commitment is the initiative to collaborate with NAPCORE partners in creating a dialogue between public authorities and data navigation service providers. This initiative seeks to address the challenges related to data quality and usage requirements stemming from the recent update of the Real-Time Traffic Information (RTTI) Delegated Regulation.

NAPCORE improves the interoperability of mobility data in Europe with mobility data standard harmonisation and alignment. Also, NAPCORE increases access and expands availability to mobility related data by coordinated data access and better harmonisation of the European NAPs.

Furthermore, NAPCORE empowers NAPs and National Bodies (NBs) by defining and implementing common procedures and strategy, strengthening the position and the role of NAPs,

supporting steps towards the creation of European-wide solutions to better facilitate the use of EU-wide data.

The Netherlands leads NAPCORE tasks working on the enhancement of NAP level of service harmonisation as well as the DATEX II standardisation activities. The Netherlands is also an active partner in the development of the European NAP Architecture reference and is exploring the concept of an NAP Marketplace through a demonstrator.

Milestones:

Working groups subjects, main milestones with active or leading participation of the Netherlands include:

- WG 1 NAP & NBs platform strategy and governance
  a. Strategy towards EU policies and developments
  b. Strategy towards stakeholders and activities (non-EU policy related)
  c. Future and sustainable governance structure of the NAP/NB platform
- WG 2 NAP interoperability and level of service of NAPs
  a. Levels of service of NAPs – led by the Netherlands
  b. Data standards, reference profiles and metadata and support tools
  c. NAP architecture
  d. NAP service interoperability demonstrators – Marketplace demonstration led by the Netherlands
- WG 3 NAP content and accessibility
  a. Data content requirements
  b. European NAPs data quality
  c. Data access and reuse
  d. Data Exchange Vision
- WG 4 Data Exchange Standards
  a. Roadmap for harmonisation
  b. DATEX II & TN-ITS – led by the Netherlands
  c. Multimodal data
  d. Metadata
- WG 5 NB and compliance assessment

Intelligent Data Exchange Alliance (IDEA)	
Stakeholders	NDW, municipality of Amsterdam, municipality of The Hague, province of North Holland and Rijkswaterstaat
Status	In progress
Timescale	2020-2023
Resources	Public funding

Objectives:

IDEA validates data of planned roadworks and road closures with (near) real-time Floating Car Data (FCD) and potentially other data sources. It can determine whether the road segments are actually closed, delayed or simply open, in real-time.

In the Netherlands, both data sources are currently available: road authorities generally provide data regarding planned roadworks/road closures to NDW, who publishes the data through NTM. Additionally, NDW publishes FCD for all roads on a national scale through NTM.

To solve the issue of falsely reported roadworks (due to for example changed planning or the weather, planned roadworks are rescheduled, though the new information is not relayed), IDEA merges the planned roadworks data with real-time traffic flow and creates additional value from available data. Roadworks that are falsely reported according to the IDEA solution (with a 99.9% certainty) will be filtered out of the live feed. This will drastically improve roadworks/road closures data for all parties using this information, most notably navigation service providers. IDEA leads to several key benefits:

- High quality, validated and real-time data for service providers, for more accurate routing solutions, and efficient traffic patterns.
- Discrepancies between planned and actual roadworks are accessible for road authorities.

- A dashboard for road authorities to track data quality.
- Feedback from service providers on how the data is used, motivating road authorities to improve the quality of their data.

Milestones:

Completed

- Setting up a validation model using the planned data and traffic pattern/flow information.
- Validating published roadworks information in real-time through the model and making the results available in a separate feed.

In progress

- Implement a feedback interface for near-real-time feedback from service providers on the validated data.
- Upscaling the system to cover all Dutch roads.

Planned

- Integrating the process within the NDW core architecture and use the validation results to filter the active roadworks feed to have one feed with real-time accurate information.

2.2.2 Progress since 2020

Since the previous reporting period of 2017-2020, there have been many more projects initiated in the Netherlands related to sharing data. The highlight of these activities is the launch of the National Access Point for Mobility Data (NTM). Cooperation and contracts between public and private parties result in widely available information for road authorities and market parties, which they can use to improve existing services as well as set up and offer new ones.

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

In December 2019, the NAP was extended to include multimodal information as well. A national profile for Network Timetable Exchange (NeTEx) has been developed. For road traffic DATEX II is used. Further harmonization is an ongoing and necessary process, with an ever-growing number of (multimodal) data suppliers. Each data supplier describes the quality of the data in the current NTM. More data sources are being added to the NTM register regarding action A,NTM is working together with relevant parties in order to accomplish this. One of these parties is DOVA[4], a collection point and conduit of supplied source data. While suppliers (government and carriers) are responsible for the quality of source data, the NTM/DOVA are responsible for the timely and correct transmission of source data.

Additionally, the available information from MaaS projects concerning Dutch transport operators, MaaS service providers and other additional related data is published on the NTM register. This contributes to the amount of available multimodal data at the NTM. The NTM offers access to information on the following data types:

- Schedules
- Vehicle characteristics
- Flex transport
- Dynamic platform assignment
- Current punctuality of rides
- Planned and up-to-date travel information at stop level
- Stop-related announcements
- Current passage time per stop
- Physical stop structure and accessibility
- Passenger Stop Assignment

[4] DOVA does not perform operations on source data, but receives source data based on agreements between government and carriers. These agreements have their origins in concessions and the Passenger Transport Act, article 14, and the Passenger Transport Degree 2000, Article 10. DOVA is working on uniform delivery conditions which ultimately form the basis for the data hub. DOVA must make source data available to customers on the basis of a uniform license or user agreement.

- Products, prices and rates
- MaaS service providers
- MaaS transport operators
- Types of modalities
- MaaS dictionary of travellers' characteristics

The geographical scope includes the Netherlands, as well as cross border Dutch public transport services (for a part of the data types). Private data is available at the NTM, but most of the data has been acquired by the (central) government and afterwards has been registered at the NTM. The NTM aims to add more privately owned datasets. This is, however, a challenge since private parties are not obliged to register their data in the NTM, whereas public parties are. At the European level the Netherlands remains active in improving harmonization and guaranteeing the data quality, e.g., as lead of the sub-working group DATEX II within NAPCORE and convenor of CEN TC/278.[5]

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

The data regarding Delegated Act 2015/962 has been operational in the Dutch NAP since the end of 2014. All Dutch motorways are included and, in many cases, real-time traffic information for other types of roads are available as well, which goes beyond the requirements which the Delegated Regulation prescribes in terms of geographical scope. For most datasets a description (metadata) is often available, including publication location, application area, quality, data exchange and contact information of the data provider.

Public data sources that cover real-time information include: road network and road characteristics, roadworks, road and lane closures, accidents, parking data, hydrogen refuelling stations and locations of electric charging stations. It contains public data (NDW, Rijkswaterstaat) and private data (TomTom, Here Technologies). The current situation has not changed substantially over the last few years, except for the fact that the content is updated constantly, and new sources are added.

Improvements of the data are made by:

- Ongoing cooperation between public and private parties (e.g. Safety Priority Services, Data Task Force).
- TN-ITS Go project (the project was officially completed on December 31, 2021). The intended goals (obtaining, storing and sharing the most recent and reliable, uniform, static data for digital road maps, available for service providers and mapmakers) have been achieved and Rijkswaterstaat has made TN-ITS Go data available. The data comes from existing sources and is made available through a data chain via the NTM.
- Data fusion (combining information from detection loops with floating car data).
- Use of feedback loops (jam tail warning, incident information).
- Supervision of the terms of use of the NAP by NDW.
- Development of the NTM.
- NDW has purchased a large amount of real-time traffic data in the form of floating car data for the entire Dutch road network.
- Since 2018, speed data collected by roadside systems has been available at segment level for the entire road network, which can be used for traffic analysis based on historical data, but also for use in real-time traffic information.

During the reporting period of 2017-2020, the accessibility of (real-time) traffic information under the Delegated Regulation 2015/962 was almost complete. The following activities were discussed in the current reporting period:

- In addition to consolidating the existing data flow, more emphasis has been placed on further improving the data quality. More attention is also being paid to non-roadside related data collection (including floating car data).

[5] https://www.itsstandards.eu/aboutus/

- Preparations have been made for the implementation of SPS (Safety Priority Services), which will provide road users with better warnings on their dashboard and in their navigation system during their trip. This brings RTTI and Safety Related Traffic Information (SRTI) services closer together.
- Agreements have been made that service providers offer e.g. incident information, mandatory and prohibition signs. Traffic jam tail warning is being prepared for roads without signalling systems.
- In 2020 Multi Modal Travel Data were added to the NAP.
- The first phase of digitization of traffic control scenarios (Diego) has been completed.
- Work was done on the development of the NTM. In addition to ITS data, other data hubs are also placed under one architecture.

In the Netherlands, RDW (Netherlands Vehicle Authority) has been appointed as the national supervisory authority that acts as the national body of compliance to verify whether the required road authorities, road operators and service providers provide the agreed (updates of) road and traffic data to the National Access Point ITS set up for this purpose.

No active testing, assessment and/or enforcement activities took place between 2020 and 2023. ITS data service providers have previously been contacted following an assessment in 2016. These parties did not react at all, or felt the ITS Directive did not apply to them. This was reported to the EC by the Ministry in a previous progress report.[6] The Ministry has decided to work closely together with road authorities, service providers and data suppliers in order to improve ITS services through increasing the number of categories and quality of data publications on the NTM. Implementing the supervision activities by the appointed national body of compliance is the last step of the process. If the collaboration shows that there are no technical obstacles to sharing data and there are still parties that do not share data, enforcement is a logical next step. It is worthwhile to explore how to achieve a common EU-approach.

The existing information item Road and Traffic Data was expanded with information about: hydrogen refuelling stations, locations for alternative fuels, TN-ITS GO, real-time parking data and Vattenfall charging locations. There is also increasing interest from owners of charging station to share their data in the NTM.

Since July 2022, the NTM hosts the Dutch NAPs. NTM's range of tasks is broader than being merely a NAP. In addition to hosting the NAP, NTM is also responsible for standardization and data quality. The technical platform that uses the NAP function was also rebuilt in 2022 and is now given a new look. A significant increase in the number of available data sets is achieved in 2023. Additionally, improving applicability is a point of attention.

As a result of the earlier work in the European ITS Platform, a proposal for a harmonised set of metadata applicable for priority actions B, C and E has been developed. The result was a joint effort of Austria, Germany and the Netherlands, called the "Coordinated Metadata Catalogue", where a 'minimum set of metadata' was proposed. Moreover, in the Partnership Talking Traffic (see 2.2.1) a great deal of effort has been put into objectifying data quality and improving it (both public and private data). Information on all Variable Message Signs (VMS) for lane signalling of Rijkswaterstaat has thus been arranged. Lastly, several data purchase contracts (bicycle data, logistics data, traffic sign data) have been signed, contributing to data quality and availability.

In the further development of the NAPs, the ambition is to further harmonise the metadata at a European level. Within NAPCORE, the Netherlands has contributed to the work that has been done on setting up a new data catalogue according to the DCAT-AP structure. This is expected to be completed by the end of 2023.

On February 2, 2022, the revision of the EU delegated regulation on RTTI Services was published and the ITS Delegated Regulation (EU) 2022/670 RTTI became effective. An impact assessment

[6] "Progress report 2022 on the implementation of ITS delegated regulations (EU) 2015/962 in the Netherlands", Dutch Ministry of Infrastructure and Water Management

has been conducted, providing an overview of the obligations the revised delegated regulation prescribes, whether the Netherlands currently meets these obligations, as well as several scenarios for implementation. The assessment provides insights regarding the feasibility of the regulation and to develop scenarios for implementation of the RTTI:

1. Further definition of data types as stated in the regulation.
2. Specification of quality requirements based on consultation with service providers and government usage.
3. For each data type, to determine what actions are required to comply with the RTTI regulation.
4. Development of viable implementation scenarios for delivering the requirements in RTTI regulation.

2.2.5 Reporting obligation under Delegated Regulation (EU) No 886/2013 on data and procedures for the provision, where possible, of road safety-related minimum universal traffic information free of charge to users (priority action c)

European legislation and regulations (ITS Directive 2010/40/ EU and Delegated Regulation 2013/886 Action C) requires Rijkswaterstaat to relay safety-related messages to service providers. The information (data) that Rijkswaterstaat shares with service providers covers:

- Current traffic information, such as the nature, cause and residual duration of disruptions.
- Data resulting from the work processes of the measures mentioned, such as the status of traffic measures implemented (local speed limits, lane closures, diversions and green phases of traffic lights) and safety-related messages (detected slipperiness, ghost drivers, traffic tailbacks, obstacles on the road).

In turn, service providers ensure that the information reaches the road user via radio, web pages, navigation systems, apps and/or social media. The Netherlands chaired the Data Task Force between 2017 and 2020 and has, based on the Memorandum of Understanding, started a proof of concept: 'Data for Road Safety'.[7] During this proof of concept, the partners test their common understanding of implementing the Delegated Act 886/2013. The discussions went beyond the scope of the Delegated Regulation, by setting up an agreement in which not only the end-user receives these services free-of-charge, but a whole system is built around free-of-charge data exchange on the basis of reciprocity. The aim is to increase the availability and the reach of safety-related traffic information and to commoditize it.

Regarding SRTI, many new initiatives to further open up these types of data have been initiated. For example, within the SPS project. This project has implemented in-car "Emergency Vehicle Approaching" notifications.

To go from traffic data to smart route advice, road authorities, service providers and car manufacturers cooperate in the field of digital traffic management. Data is shared amongst the involved parties, and smart in-car services are developed that allow motorists to reach their destination faster and more safely, taking into account the safety and quality of life in the area. Finally, there have been projects within Rijkswaterstaat to digitize the various control scenarios within the traffic control centres (DRS, Diego). The project's datasets are not yet publicly available, and therefore not yet included in NTM.

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

2.3.1 Description of the national activities and projects

MERIDIAN	
Stakeholders	24 partners, amongst which: ministries, road authorities, road operators, urban and port authorities, a federal highway research institute and hub operators from Belgium, Germany, Ireland, Italy, Latvia and the Netherlands
Status	In progress

[7] MoU Data for Road Safety (www.dataforroadsafety.eu)

Timescale	01-2021 until 12-2025
Resources	Co-funded EU CEF Co-funded by partners

Objectives:

MERIDIAN is based on collaboration of road administrators and authorities in URSA MAJOR neo, which has now been expanded to include administrators of urban junctions, ports, and other logistics hubs.[8] MERIDIAN continues the implementation of Intelligent Transport System (ITS) services to improve freight traffic on the TEN-T network and enhance flow. Participants come from Ireland, Belgium, Germany, Italy, Latvia and the Netherlands. Switzerland and Austria participate as "interested partners." The project aims to:

- Improve mobility in the European Union, with particular attention to cross-border routes and urban junctions.
- Enhance the harmonisation of ITS services from the end-user perspective, both within the corridor and more broadly through knowledge sharing.
- Improve operational activities.

The Netherlands' contribution will consist of 5 projects from Rijkswaterstaat and one project from the municipality of Amsterdam. In total, the Netherlands will invest €20,000,000 in these projects:

- Data Turbo Pipeline (Rijkswaterstaat)
- Digitisation of traffic management scenarios (Rijkswaterstaat)
- CHARM (Rijkswaterstaat)
- Real-time Information on road closures (Municipality of Amsterdam)
- Safety Priority Services (the Ministry)
- Data-Driven Working (NDW)

These projects contribute to European objectives for digitalisation and improving traffic management efficiency, as well as fostering closer collaboration with service providers. The knowledge gained through these projects will be shared with partners within the project and beyond, facilitated by the communication work package (led by Rijkswaterstaat).

Milestones:

- Meeting between Die Autobahn and several Rijkswaterstaat delegates in 2021 to share knowledge and increase collaboration.
- The first three newsletter were sent (February, April, July).
- A dashboard framework was developed to show quality indicators for several data streams from the NAP.
- The initial dashboard platform has been completed.
- AI is used to assign road inspectors and towing companies to incidents, which is also digitally communicated to both of these parties.

5G Blueprint	
Stakeholders	The Ministry (project coordinator), HAN University of Applied Sciences, TNO, North Sea Port, KPN, Eurofiber NL, V-tron, Locatienet, Swarco Netherlands, Impuls Zeeland, HZ University of Applied Sciences, Imec, Port of Antwerp-Bruges, Telenet Group, Toyota Motor Europe, Roboauto, Seafar, Sentors, Room 40, Be-Mobile, Verbrugge International, Roosens, Kloosterboer, Martel Innovate, Flemish Ministry of Mobility and Public Works
Status	In progress
Timescale	2020-2024
Resources	• 10 million euros EU funding • 3.9 million euros contribution through the consortium

Objectives:

Although automation is very mature from a technology perspective, there are still challenging situations where automated vehicles or vessels need support to overcome unexpected or tricky situations (referred to as edge cases and corner cases). There are two schools of thought to address these gaps, tele operation and remote support, where respectively a remote driver takes over the dynamic driving task and controls the vehicle or vessel or a remote supervisor gives the

[8] https://meridian-corridors.eu/

vehicle or vessel instructions on how to manoeuvre in a certain situation. Both approaches require wireless connectivity, but have different requirements for latency. Currently, most deployments use remote support to overcome the gaps in their operations, for example Waymo and Cruise in the US.

5G Blueprint aims to design and validate technical architecture and business and governance models for uninterrupted cross-border teleoperated transport based on 5G connectivity. As such, the project will explore and define:

- The economics of 5G tools in cross–border transport and logistics, as well as in passenger transport: bringing capital expenditure and operational expenditure into view, both on the supply (telecom) side and the demand (transport and logistics) side, leading to the transformation of current business practices as well as new value propositions.
- The governance issues and solutions pertaining to responsibilities and accountability within the value chain dependent on cross-border connectivity and seamless services related to the Dutch and Belgian regulatory frameworks (telecommunications, traffic and Connected and Automated Mobility (CAM) experimentation laws, contracts, value chain management).
- Tactical and operational (pre)conditions that need to be in place to get the full value of 5G tooled transport and logistics. This includes implementing use cases that increase cooperative awareness to guarantee safe and responsible teleoperated transport.
- Preparing and piloting teleoperated and telemonitored transport on roadways and waterways to alleviate the increasing shortage of manpower and bring transport and logistics to a higher level of efficiency through data sharing in the supply chain and the use of AI.
- Exploring the possibilities of increasing the volume of freight transported during the night where excess physical infrastructure capacity is abundant – lowering of personnel costs would make this feasible on a cost-effective basis.
- Teleoperation will be enabled by 5G qualities, such as low latency, reliable connectivity, and high bandwidth.

The project's outcome will be the blueprint for operational pan-European deployment of teleoperated transport solutions in the logistics sector and beyond.
5G Blueprint will specifically look at these use cases:
Use Case 1 - Automated Barge Control.
Use Case 2 - Automated docking.
Use Case 3 - Cooperative Adaptive Cruise Control (CACC) based platooning.
Use Case 4 - Remote takeover.

The project is coordinated by the Ministry, they also lead WP1 (ethics). Furthermore, WP4 (teleoperated transport) is led by V-TRON and WP5 (5G network) is led by KPN.

Milestones:

2020 - Description enabling functions and requirements
2021 - Functional architecture and enabling functions architecture
2023 - Showcases; Automotive week 2023 (April 2023, Helmond) & upcoming final showcase event (21 November 2023, Sas van Gent)

2.3.2 Progress since 2020

Traffic Management

Rijkswaterstaat continues to fulfil their traffic management responsibilities by seven network services: Object Control, Incident Management, Roadworks, De-icing, Enforcement, Network Optimization, and Travel and Route Information. In addition, they are looking to enhance and adapt by adding as much societal value as possible to traffic management in the future. According to RWS, the future scenario for road traffic management is driven by the following transitions:

- Public and private road traffic data become increasingly accessible, of higher quality, and is used in traffic management and information applications. RWS' processes are becoming more data driven.

- In-car navigation information and Advanced Driver Assistance Systems (ADAS) are further deployed in the vehicle fleet, accepted, and used by road users.
- Dialogue between the public and private sector, initiated with the SPS initiative and the NTM, results in concrete collaboration agreements driven by positive business cases for all parties involved.
- The "Digital traffic management" approach, initiated by the VM-IVRA initiative, and based on trusted public-private collaboration, is further expanded for new use cases focused on traffic flow, safety and sustainability objectives.
- Connected Cooperative Automated Mobility (CCAM) applications are further developed and increasingly introduced for specific user groups.

These transitions are fueled by a growing need for connectivity and data exchange between stakeholders, their services and systems. The approach and objectives of initiatives such as MERIDIAN, 5G BluePrint, VM-IVRA, SPS, MODI and C4Safety are both exploring the impact and benefits of these transitions as well as aiming at structural implementation of their results in the current traffic management services and operation.

Freight Management

In addition to its traffic management efforts, the Netherlands also aims to improve freight management and associated ITS services. To that extent, the Ministry organized an international market consultation on 5G in the mobility sector in the reporting period of 2017-2020, which led to the (participation in) the Horizon2020 project 5G Blueprint (started in June 2020). The project's outcome will be the blueprint for operational pan-European deployment of teleoperated transport solutions in the logistics sector and beyond.

2.4 Priority area III. ITS road safety and security applications

2.4.1 Description of the national activities and projects

Safety Priority Services	
Stakeholders	The Ministry, ANWB, Be-Mobile, Hyundai, Inrix, Kia, TomTom.
Status	In progress
Timescale	2022 – 2025
Resources	Public funding, 12 million euro
Objectives:	
In this project, the Ministry works together with six private parties (car manufacturers, navigation service providers and mapmakers) to provide road users with more and improved in-car safety warnings, either via the car's dashboard, or through a navigation service. A large number of other car manufacturers and navigation service providers are involved through these companies as well. Government data is used to alert drivers in case of potentially dangerous situations, taking into account limiting driver distraction. The aim is to improve and expand the information for road users and make it more widely available. This collaboration will make traffic on all roads in the Netherlands not only safer, but also more efficient and sustainable for all road users. Five services will be or are deployed during this project: **Traffic jam tail warnings** In the event of a large difference in speed between your own vehicle and the last vehicle in a traffic jam further down the road, you will be warned to reduce speed. Unlike, for example, the variable message signs above the road, not every road user receives a warning at that location and at that time: only if it threatens to become dangerous in view of the difference in speed. The warning can be given on all roads: on the motorway, but also on provincial or municipal roads. **Emergency services warnings** You will receive a warning if an emergency service vehicle approaches. You will see the direction from which the emergency service is approaching, so that you will not be surprised, and you can prepare for possible swerving or adjusting your speed.	

Other warnings

- Temporary slippery road
- Animals, people, obstacles and debris on the road
- Unsecured accident location
- Short-term roadworks
- Poor visibility
- Wrong-way drivers
- Unattended roadblock
- Extreme weather conditions

The provision of relevant information on these eight situations is regulated within the EU. Certain data comes from companies, while other data comes from governments. Together, the complete picture can be provided.

Information on traffic rules

- Applicable maximum speeds, including dynamic maximum speeds on the VMSs above the road
- Lane advice through VMSs above the road
- Other information useful to road users (environmental zones and route information)

Smart routing

The SPS partners can also offer 'smart routing' in due course, in addition to the various road safety warnings. A route will then be suggested to help you will avoid potentially unsafe traffic situations, such as school zones during certain periods on school days, or zero-emission zones for fuel cars.

Milestones:

2022 Implementation of jam tail warning
2023 Implementation of emergency services warnings

C4Safety	
Stakeholders	Initiative from Rijkswaterstaat in commission of the board of directors Smart Mobility Contractors: This includes both the contractors responsible for carrying out the roadworks (e.g., Heijmans, etc.) and the (sub)contractors specializing in roadwork safety measures. Other road authorities, mainly provinces.
Status	In progress
Timescale	2021-2025
Resources	• Funded by RWS/NDW/the Ministry • Possible contributions from market parties in the form of providing data on roadworks

Objectives:

C4Safety investigates how to best provide trusted safety related in-car warnings. The following services were selected: (1) safety warnings for roadworks and (2) safety warnings for emergency vehicles approaching or securing incidents. These services will be used as input for the requirements on the RWS service platform, for which more services are envisioned in the future.

In addition, the following applies:

- Utilize and implement the developed information chain.
- Introduce prerequisites for accurate and trusted message delivery (trust domain), following European standards.
- Lay the foundation for future communication with vehicles.

The above objectives were aligned in the board of directors Smart Mobility.

Milestones:

August 2023: Agreement in board of directors Smart Mobility and start of executing the work plans for the work packages: Data, Security/Trust, Operation and International alignment

SmartwayZ	
Stakeholders	More than 200 partners cooperate in this program, including the Ministry, Rijkswaterstaat, the provincial governments of North Brabant and Limburg, various municipalities, companies and knowledge institutions.
Status	In progress
Timescale	2016 - 2026
Resources	Predominantly public funding

Objectives:

SmartwayZ's main objectives are:

- To promote innovations.
- To improve traffic flow.
- To achieve good operational processes.
- Liveability.
- Traffic safety.

The SmartwayZ.NL mobility program consists of eight related sub-projects in North Brabant and Limburg and focusses on the Breda-Venlo corridor (A58, A2, A67), the A2 Weert-Eindhoven, the N279 Veghel-Asten and the south-east Brabant region. The projects aims to improve accessibility and traffic flow. The project approach ranges from smart mobility solutions to the widening of motorways and the tackling of transport hubs. The program supports companies that want to test, improve and roll-out smart mobility solutions on a larger scale. The following sub-projects relate to ITS:

- Mobility Lab offers start-ups facilities to test their prototype in practice.
- MobilitymoveZ.NL offers facilities to private parties to test mobility concepts on a large scale. Techniques come together around connected and automated driving, electric transport and partial concepts.
- Providing service providers with information on desired usage of a road (i.e., zero emission zones, undesired routes).
- Intelligent Speed Assistance (ISA).
- In-car notifications of detected animals (through a detection system besides the road).

In the field of smart mobility, the ambition is to realise the smartest road network in Europe, which will penetrate to the centre of the cities in the south of the Netherlands. In nine to ten years, 50% of travellers, 10-20% of (mostly international) freight traffic and 30-40% of distribution freight traffic within the geographical scope will use smart mobility services.

Milestones:

The following SmartwayZ projects have concluded:

- Slim Sturen 1, which developed a way to implement the multimodal network vision through connecting navigation providers with traffic management centres.
- GLOSA, a set of requirements for GLOSA was developed. The concept was implemented and evaluated.
- Fabulos AI, an algorithm to support predictive capabilities of autonomous shuttles was developed, the algorithm was applied in a test vehicle.
- Safety Analysis, vehicle data was used to identify unsafe situations in traffic, resulting in insights in where to implement measures to improve traffic safety.
- Smart Asset Management, vehicle data was used to gather information on quality of the infrastructure. Results from this project were taken into the earlier discussed ROMO project.

Others have started: Realising a stable iTLC environment, ISA Retrofit, Social INnovation to FOster iNclusIve cooperatIve, Connected and Automated mobility (SINFONICA), "Slim Sturen vervolg", Animal detection in-car at the N69, Group of cyclist detection for iTLCs, Fabulos phase X.

2.4.2 Progress since 2020

With projects such as SPS and C4Safety, major improvements have been realised regarding road safety. Both projects contributed to improvement of data quality for provision of in-car safety information. By combining public and private data, hazardous locations can be identified and shared with road users. Furthermore, SPS is exploring collaboration with in-car information and navigation service providers, to improve and expand information availability for road users. This collaboration will make traffic on all roads in the Netherlands not only safer, but also more efficient and sustainable for all road users.

2.4.3 112 eCall (priority action d)

"eCall" stands for "Emergency Call." This safety system in vehicles automatically gets in touch with the 112 emergency centre following an accident, conveying information such as the precise location and the number of occupants inside the vehicle. This data helps emergency services to prepare more effectively and reach the scene promptly. The 112 operator intercepts clear obvious cases and then connects the call to the Regional Emergency Centre (Regional Police, Ambulance and Fire Brigade). The position data and minimum set of data (MSD) is transferred to the regional centre.

The Ministry of Justice and Security, specifically the National Police, is responsible for implementing the 112-facility. As of April 1, 2018, eCalls can be received directly by the national 112-control centre. The Dutch Authority for Digital Infrastructure has been designated by the Ministry of Justice and Security as a national body within the framework of the eCall obligations. The Dutch Authority for Digital Infrastructure is a part of the National Public Safety Answering Point (PSAP).

There is no further progress to report for this priority action.

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

Regarding 2013/885, no substantial improvements have taken place since the progress report of 2017-2020. The NTM operates the database with truck parking information from which service providers can search the metadata of all truck parking areas. The database includes information on:

- 326 parking areas with 7.995 freight parking lots.
- 93% are registered in the NAP (100% public parking areas, some private areas are still missing with an unknown amount of parking places).
- 5 parking areas (1.5% of the total) also provide dynamic information. This number is growing, because NDW is working together with the Province of South Holland (as secretary of the Working Group Truck Parking) and Rijkswaterstaat to provide dynamic information about more truck parking sites.

Additionally, due to Brexit, a number of emergency parking areas have been realised near the ports of Rotterdam and Flushing. About half of these parking areas are added to the database. Some large private truck parking areas are not included in the NAP yet.

Moreover, the following developments are worth mentioning in light of the Delegated Regulation:

- Some parking areas are deleted at the request of (truck) restaurants that host parking places, as they only allow truck drivers to use the parking area if they make use of the restaurant’s facilities.
- The following activities have been undertaken to improve quality:
    - Visit of all sites with more than 35 parking lots.
    - Desk research (internet, documents) and detailed checks with recent satellite and 360-degree images (street view).
    - Extra site visits (in case of missing or conflicting data).
    - Yearly check-up with regional Rijkswaterstaat departments for recent amendments.
- An assessment was made for private truck parking areas.

2.5 Priority area IV. Linking the vehicle with the transport infrastructure

2.5.1 *Description of the national activities and projects*

Digital Infrastructure for Futureproof Mobility (DITM)	
Stakeholders	Funded by the Ministry. Project partners are TomTom, VDL Enabling Transport Solutions, VDL Steelweld, Heliox Automotive, TNO, NXP, AIIM, Sioux Technologies, Monotch, Geomaat, Siemens, Eindhoven University of Technology, Scholt Energy, Stichting ElaadNL, RAI Automotive Industry NL, Brainport Development, Infiniot, Nederlands Kennisplatform Laadinfrastructuur
Status	In progress
Timescale	October 2022 – October 2026
Resources	The project involves an investment of 60.7 million euros. The requested contribution from the National Growth Fund (NGF) amounts to 30 million euros. The partners will co-invest the remaining amount, with 19 million euros funded by private partners, 11.5 million euros by knowledge institutes, and 0.2 million euros by public partners.
Objectives:	
The innovation project "Digital Infrastructure for Futureproof Mobility" focuses on developing a system architecture for digital infrastructure, including critical core technologies related to localization, traffic services, digital maps, and charging infrastructure. This initiative aims to accelerate the implementation of scalable CCAM and to establish an essential connection with a reliable and secure energy supply. To validate the scalability of the architecture, several use-cases will be tested and validated in both real and virtual validation environments. DITM adopts a comprehensive public-private approach to achieve interoperability and scalability, bringing together developments from the (international) automotive industry, ICT industry, traffic management, and mobility innovations. By leveraging digitalization and automation, DITM contributes to addressing significant societal challenges concerning safe, reliable, efficient, and sustainable mobility and energy systems. The project facilitates accelerated knowledge and product development, enabling Dutch companies like TomTom, NXP, VDL, and Heliox to strengthen their leading positions in the value chain. The project activities align with the long-term strategies and research and development roadmaps of the involved companies and are crucial for their future competitiveness.	
Milestones:	
2022 – start program	

CCAM Partnership	
Stakeholders	More than 200 European members, Dutch members are: the Ministry, Rijkswaterstaat, RDW, Province of North Brabant, Municipality of Helmond, DAF, MAPtm, Royal HaskoningDHV, SAE group Europe, TNO, Delft University of Technology, Eindhoven University of Technology, University of Groningen
Status	In progress
Timescale	Initiated in 2021, no end date
Resources	Membership fees paid per stakeholder
Objectives:	
Connected, Cooperative, Automated Mobility (CCAM) has a great potential to contribute to key policy goals, like the UN Sustainable Development Goals, Vision Zero, the European Green Deal, Europe fit for the Digital Age and the Smart and Sustainable Mobility Strategy. Addressing deployment challenges for CCAM in a coordinated and concentrated manner requires a shift in the mobility innovation process regarding user involvement, timing and outreach. Making CCAM solutions ready for deployment (Deployment Readiness) requires that research and innovation, standards and regulation advance in a synchronised way. Europe can benefit from a CCAM Partnership, that has clear objectives and promotes effective coordination across research areas.	

The general objectives of the CCAM Partnership are:

- Increasing safety in road transport.
- Ensuring inclusive mobility and proper access for all.
- Strengthening competitiveness of European industries.
- Reducing negative impacts from road transport on the environment.
- Capitalising knowledge to accelerate development and deployment of CCAM solutions.

Milestones:

2021 – Establishment of the CCAM Partnership
2021 – CCAM Strategic Research and Innovation Agenda adopted
2022 – First multi-cluster meeting
2023 – Launch of the public consultation to update the CCAM Strategic Research and Innovation Agenda (SRIA)

From 2021 until now, Rijkswaterstaat, fulfils the role of vice-chair of the CCAM partnership. Furthermore, Eindhoven University of Technology is leader of cluster 5 (key enabling technologies) and TNO is co-leader of cluster 3 (validation).

MODI	
Stakeholders	The consortium includes industrial partners, industrial clusters & networks, terminals and harbours, public partners, knowledge institutes and test sites. Dutch stakeholders are: DAF Trucks, Technolution, TNO, Rijkswaterstaat, the Ministry, Eindhoven University of Technology, HZ University of Applied Sciences
Status	In progress
Timescale	October 2022 – March 2026
Resources	27,992,880.00 euros, including a 23,030,095.00 euro EU-contribution

Objectives:

The EU-funded MODI project aims to accelerate the introduction of highly automated freight vehicles through demonstrations, and by overcoming barriers to the implementation of automated transport systems and solutions in logistics. The logistics corridor from the Netherlands to Norway has been chosen for demonstration activities, since the Netherlands, Germany, Denmark, Sweden, and Norway are expected to be amongst the first movers to implement fully automated vehicles in Europe.

MODI comprises of five use cases, each describing a part of the logistics chain in confined areas and on public roads. It identifies what is already possible for automated driving without human interaction and what has yet to be developed. The MODI objectives are to:

- Implement new CCAM technology.
- Define recommendations for the design of physical and digital infrastructure.
- Demonstrate the local, national and international differences and similarities regarding rules and regulations, as well as infrastructural characteristics related to freight transport with CCAM vehicles, both in confined areas and on public roads.
- Cooperate and co-create with logistics companies, road operators, OEMs, providers of physical and digital infrastructure and other stakeholders to bridge the gap between research and development and market introduction.
- Demonstrate innovative and viable business models for connected and automated logistics.
- Perform technical and socioeconomic impact assessments.
- Develop highly automated driving solutions for long-distance operational design domains (ODD).
- Prove that the technology can soon deliver on promised benefits at relatively high speeds and medium traffic complexity, including a coordinated CCAM system to support smart traffic management.

Major challenges include regulatory aspects and standardisation, border crossings, access control, charging, coordination with automated guided vehicles, loading/unloading and handover from public roads to private roads in confined areas. The ambition of MODI is to take automated driving in Europe to the next level by demonstrating complex real-life CCAM use cases and setting examples of business-wise CCAM integration in logistics.

The main focus of the Dutch partners in this project is aimed at a coordinated CCAM interface and optimal physical and digital infrastructure.

Milestones:

October 2022 – start project
March 2023 – the first newsletter was sent
March 2023 – the first field trips to demo areas and co-creation workshops

2.5.2 Progress since 2020

There is a functional relationship between ADAS equipped vehicles and Automated Driving Systems (ADS) on the one hand and the physical and digital infrastructure on the other hand. Optimal operation of ADAS and ADS cannot be seen in isolation. This means that the functioning of such systems is related to the ODD: the complete set of conditions in which the system is intended to function. For example, Automated Lane Keeping Systems (ALKS) need to be able to recognize lane markings as the lane boundary. ISA systems needs to be able to determine the actual speed limit, either by detecting a physical road sign, digital information, or both. It is the vehicle manufacturer's responsibility to make sure these systems function correctly. This means, amongst others, making sure such systems can cope with current road infrastructure. Regarding the digital infrastructure, Rijkswaterstaat and fellow road operators make increasing amounts of information available, that can support the functioning of various systems. Regarding the physical infrastructure, the goal is to manage and maintain the network according to the agreed upon level of service. It is not foreseen to invest substantially in additional measures to facilitate ADAS or ADS. Research is being conducted however, through various projects and initiatives to gain insights into the effects and associated costs of additional measures to facilitate ADAS and ADS.

3 Key Performance Indicators (KPIs)

3.1 Deployment KPIs

3.1.1 Information gathering infrastructures/equipment (road KPI)

Information collection is available along 100% of the TEN-T road network and along 100% of motorways. Information is gathered through physical infrastructure and through floating car data. Thanks to the availability of floating car data, the coverage rate of most local roads is also 100%. Only for less-travelled roads, data is not always available due to unavailability of a FCD source and privacy concerns.

Fixed information gathering infrastructure

The NDW collects, via roadside systems, real-time traffic data at 37,000 locations, along over 10,000 kilometres of roads, including all TEN-T roads and other motorways:

- 3,000 kilometres of main local roads in cities.
- 4,300 kilometres of provincial roads.
- 3,400 kilometres of motorways and other national roads.

Loop detectors are the primary means for traffic data collection on motorways, in line with the high data quality requirements implied by current legislation (for instance on air quality and noise) and for policy accountability.

Mobile information gathering infrastructure

The NDW procures FCD. Since February 2018, travel times and vehicle speeds have been measured, which is provided as open data. The coverage rate encompasses almost 100% of the road network. Data collection extends to all types of roads. However, coverage is lower on less-travelled roads: a minimum number of cars sharing FCD should be reached within a specific period before data can be reported.

3.1.2 Incident detection (road KPI)

Rijkswaterstaat performs incident management on all motorways in the Netherlands on a 24/7 basis. Over 2,942 cameras are positioned alongside the motorway network, used by traffic operators in the traffic control centre to detect and analyse incidents. On roads equipped with signalling systems (approximately 35% of the Dutch motorway network), incidents are detected automatically by the present Automated Incident Detection (AID) system and reported to the traffic operator in the traffic control centre. In addition, about 300 road inspectors are deployed to monitor the road situation and to provide assistance in case of incidents. Additionally, a set of organizational and financial agreements applies to all stakeholders involved, such as Police, Fire Brigade, insurance companies, salvage crews, etc.. For instance, towing companies receive compensation for being on standby at crucial locations along highways.

3.1.3 Traffic management and traffic control measures (road KPI)

Traffic management is performed on the entire motorway network on a 24/7 basis by traffic operators in five regional centres and one national traffic control centre. For this purpose, traffic operators can deploy a wide variety of traffic control measures. More specifically, the motorways in the Netherlands are equipped with 170 traffic lights, 423 Dynamic Route Information Panels (DRIPs), 6,121 signalling/VMS locations, 93 ramp metering locations and 2,942 cameras. DRIPs are spread out across the Netherlands and are more concentrated around large cities such as Amsterdam, Utrecht and Rotterdam.

In addition, the Netherlands is actively implementing iTLCs. Approximately 1,300 iTLCs are spread across the country.[9] Each newly installed TLC is required to be an iTLC.

3.1.4 Cooperative ITS services and applications (road KPI)

[9] Monitor Smart Mobility 2023 (Rijksoverheid.nl)

The Netherlands focuses on informing road users through long range communication.

3.1.5 Real-time traffic information (road KPI)

All real-time traffic data collected for the motorway network is made available as open data by NDW for both commercial service providers and road authorities. Data is updated on a minute basis and includes intensities, average speed, current and predicted travel time, vehicle type, incident locations, traffic jams, iTLCs data and roadworks.

The NTM includes a dataset with real-time safety related information. The dataset includes information, amongst others, regarding weather conditions, incidents, ghost drivers, obstacles on the road and roadworks.

Dynamic information for travellers is also available for off-street parking locations. Dynamic parking data includes the number of available spaces. This information is available for 86% of off-street parking areas and garages.[10] Additionally, it is available for 25% of the Park&Ride facilities, where an easy transfer from car to train/bus is facilitated.

In addition, real-time traffic information is available for road users through various online applications and through DRIPs and graphic route information panels (GRIPs). A recent study on the use and usefulness showed that more and more people look for travel information pre-trip (51% in 2018 vs. 61% in 2021) and on-trip (46% in 2018 vs. 57% in 2021)[8]. Digital communication channels grow in popularity.

Use of DRIPs and GRIPs

Dynamic travel information is provided in the Netherlands through DRIPs and GRIPs. Around 96% of the people in the Netherlands have encountered DRIPs on their travels. A little over 72% has seen GRIPs. 83% of people who have seen GRIPs find the information useful and use it regularly. For DRIPs this percentage is higher, around 97%. The majority of the people find the information on the panels on trustworthy, 93% for GRIPs and 97% for DRIPs.[11]

3.1.6 Dynamic travel information (multimodal KPI)

DOVA provides real-time and static (multimodal) travel information as open data for both commercial service providers and road authorities. Provided data includes schedules, real-time status information (estimated arrival times, delays, cancellations) and ticket rates for public transport.

The data is accessible to the public through various privately developed online applications, where real-time departure times and travel routes can be found and planned. Since information is updated in real-time, alternative routes are instantly available in case of delays. In addition, real-time departure times from all bus, tram, metro and train stations and stops are available through online apps.

3.1.7 Freight information (multimodal if possible or road KPI)

The NAP contains static information on 326 truck parking spaces. In addition to general information such as names of truck parking areas and their coordinates, the database contains information about facilities (toilets, water, electricity connections, etc.) as well. Some truck parking areas already provide real-time information about vacant parking spots.

Based on results of a study by Rijkswaterstaat[12], in 2022, most truck drivers in the Netherlands consulted road-related information services on a regular basis before departure. Smart phone apps are most popular, used by 49% of the drivers. 50% of truck drivers always use a navigation

[10] Parkeerdatamonitor.nl (openparking.nl)

[11] RWS. (2022). Monitor wegverkeergerelateerde informatiediensten 2021. Rijkswaterstaat.

[12] Monitoring wegverkeergerelateerde informatiediensten en rijtaakondersteunende systemen vrachtverkeer 2022 - Rijkswaterstaat Publicatie Platform (rws.nl)

system. Traffic information that drivers often have available in their truck are the maximum speed (81%), lane information and lane signing (63%) and information on downstream traffic jams (66%).

The following ADAS are widely available in trucks: standard Cruise Control (CC) (93%), Adaptive Cruise Control (ACC) (55%), Hill Start Assist (HSA) (72%), eco-driving (69%), Autonomous Emergency Braking System (AEBS) (73%), Lane Departure Warning (LDW) (77%), Electronic Stability Control (ESC) (60%) and Forward Collision Warning (FCW) (71%).

3.1.8 112 eCalls (road KPI)

At the 112 level, multiple calls about the same incident will not be transferred (e.g., a fire on the side of the road that already has been reported two times). A possible intervention at the regional level is not automatically reported back. Reporting is limited and hindered by the lack of exact definitions and clear descriptions of the various outcomes of the process. This also has its effect on reporting on EU level and comparing outcomes of member states.

eCall can be initiated automatically and manually. In the full year of 2022, there were 14.187 automatic initiations and 4.053 manual ones. For 2023 (up to the 20th of August) this was 9.890 and 2.450 respectively. For both years, the number of real emergencies is unknown.

3.2 Benefits KPIs

3.2.1 Change in travel time (road KPI)

When comparing 2019 and 2021, loss of travel time on the Dutch main road network was reduced by 62%, while traffic itself was only reduced by 9%.[13] These changes are a result of the measures taken in context of the COVID-19 pandemic.

In 2020, the distance covered on the main road network was 16% lower than in 2019. The year 2021 showed a similar trend (13% lower than 2019). In 2022, the number of kilometres travelled increased to 92% compared to 2019, which is comparable to the year 2015.

The severity of traffic congestion, calculated by multiplying traffic jam length and duration, decreased to 32% of the severity of 2019 during 2020. In 2021, this level was 44%, and in 2022, the severity reached 80% of the level in 2019, which is comparable to the year 2016. The majority of the traffic congestion (75%) consists of regular rush hour traffic. 13% is caused by accidents, and 7% is due to other incidents, such as breakdowns.

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

A publication by SWOV[14], which is released each year, presents data on road casualties and injuries. The number of casualties in traffic in the Netherlands is increasing. In 2022, 737 casualties were reported, whereas 582 casualties were reported in 2021. 9% of these casualties occurred on motorways. Other results from SWOV[15] show that most common accidents involved collisions with roadside obstacles (e.g., trees) (21), rear-end collisions (17) and head-on collisions (6). During 2021, an estimated 6,800 people were seriously injured in traffic, indicating a stagnation of the upwards trend. Most probably, this is a result of measures taken in the context of the COVID-19 pandemic.[16] 71% of injuries were suffered by cyclists, while car drivers accounted for 3% of injuries. There have not been any evaluations regarding safety impacts of ITS services.

3.2.3 Change in traffic-CO2 emissions (road KPI)

While theoretical emission reductions are high (up to 75% NOx and 20% CO2), an evaluation regarding the Green Light Optimized Speed Advisory (GLOSA) shows only marginal benefits in terms of emission reductions.

[13] Kerncijfers Mobiliteit 2022 | Publicatie | Kennisinstituut voor Mobiliteitsbeleid (kimnet.nl)
[14] SWOV (2023). Verkeersdoden in Nederland. SWOV-factsheet, april 2023. SWOV, Den Haag.
[15] SWOV (2023). Dodelijke verkeersongevallen op rijkswegen in 2021. SWOV-publicatie, 2023. SWOV, Den Haag.
[16] SWOV (2022). Ernstig verkeersgewonden in Nederland. SWOV-factsheet, november 2022. SWOV, Den Haag.

In the Netherlands, there has been a remarkable shift towards embracing electric vehicles for various purposes. Vans (1.3%), and personal vehicles (3.7%) are transitioning to electric alternatives. One key factor behind this transformation is the proliferation of charging stations across the country. The Netherlands boasts the highest density of charging stations per 100 kilometres of road in Europe, ensuring convenient access to power up electric vehicles.

3.2.4 Financial KPIs

Annual motorway traffic management expenses by Rijkswaterstaat are fairly constant, averaging around 250 million euros per year, equalling the number reported in 2020. Of these expenses, 80 million euros are related to personnel costs, of which nearly 60% can be related to operational traffic management, i.e. road and traffic control centre operators. Other costs relate to, amongst others, development of information services, organisation of management and maintenance of traffic management assets and related systems.

Other costs relate to projects, half of which concerns the actual management and maintenance or replacement of traffic management assets. Furthermore, 20% consists of projects within the traffic management centres, and 12% relates to systems required to operate traffic management systems.

Appendix 1: List of abbreviations

Abbreviation	In full
ADAS	Advanced Driver Assistance Systems
AID	Automated Incident Detection
ALKS	Automated Lane Keeping Systems
CACC	Cooperative Adaptive Cruise Control
CAM	Connected and Automated Mobility
CCAM	Connected, Cooperative and Automated Mobility
CEF	Connecting Europe Facility
DOVA	Collaboration of Decentralized Public Transport Authorities
DRIPs	Dynamic Route Information Panels
EC	European Commission
EU	European Union
FCD	Floating Car Data
GRIPs	Graphic Route Information Panels
ISA	Intelligent Speed Assist
iTLC	intelligent Traffic Light Controller
ITS	Intelligent Transport Systems
iRSU	intelligent Road Side Unit
MSD	Minimum set of data
NAP	National Access Point ITS
NB	National Body
NDW	National Traffic Data Warehouse
NeTEx	Network Timetable Exchange
NTM	National Access Point for Mobility Data
NWB	National Road Database
ODD	Operational Design Domain
OEM	Original Equipment Manufacturer
PSAP	Public Safety Answering Point
RDW	Netherlands Vehicle Authority
ROMO	The Road Monitor project
RTTI	Real-Time Traffic Information
RWS	Directorate-General for Public Works and Water Management (Rijkswaterstaat)
SPS	Safety Priority Services
SRTI	Safety Related Traffic Information
SWOV	National scientific institute for road safety research in the Netherlands
TEN-T	Trans-European Transport Network
VMS	Variable Message Sign