Directive 2010/40/EU
Progress Report 2020
Czech Republic

20 November 2020

1 Introduction

This ITS national report updates the previous ones, based mainly on the progress communicated to the transport organisations under founding and establishing authority of the Ministry of Transport (implementing bodies) like Roads and Motorways Directorate of the Czech Republic, Czech Railway Infrastructure Manager, Directorate of Waterways of the Czech Republic and other relevant contributors. The report is elaborated according to a defined structure.

This report provides information about the adoption of relevant strategies as well as the implementation of specific projects over the period 2018-2020.

The current national ITS strategy "*Action Plan for the Development of Intelligent Transport Systems in the Czech Republic by 2020 (with an outlook to 2050)*" expire on 31 December 2020. In 2019, preparation for the development of the new ITS strategy officially began. KPI were defined for the impact evaluation improvement of the road-based ITS implementation, and not just in the territory of TEN-T network. One of the first steps was to carry out an inventory of available data from ITS road-side devices. Not for single use but for continuous monitoring of the whole road network, resp. road sections equipped with adequate devices or covered with relevant technology. This work has not been completed yet. For this reason, certain information does not fully reflect the real-life situation. In parallel with this activity, a software tool has been continuously developed to assess and evaluate KPIs. It is assumed that this tool will also be used for the Directive 2010/40/EU progress monitoring. At present, the inter-ministerial and inter-agency consultation is organised for the forthcoming ITS strategy "*Strategic Plan for the Development of Intelligent Transport Systems in the Czech Republic 2021-2027 with an outlook to 2050*".

1.1 General overview of the national activities and projects

Including national ITS legislations and/or strategies

Activities have concentrated on the following main issues:

- to develop a strategic framework
- to participate in the EU activities and projects
- to implement national ITS and C-ITS projects
- to gradually build and develop unified traffic information system / National-wide Traffic Information Centre

- to continue to fulfil obligations laid down in Delegated Regulation (EU) 2017/1926 through measures identified by the "*Public Transport Strategy for 2020-2025 with an outlook to 2030*" under the Government Resolution No. 1008 of 12 October 2020.

The Government of the Czech Republic adopted the Government Resolution No. 268 of 15 April 2015, which tasked the Ministry of Transport to submit to the Czech government the ITS strategy until 31 December 2020. In this context, the Inter-ministerial and Inter-agency Transport Minister Coordination Council for ITS adopted in December 2019 a schedule of preparation procedures with the purpose to identify expert and technical opinions and to produce contributions from established task forces to the ITS strategy now being developed. In accordance with the methodology for the development of public sector strategies, the ITS strategy original name "*Action Plan for the Development of Intelligent Transport*" was changed to "*Strategic Plan for the Development of Intelligent Transport Systems*". Transport Minister ITS Coordination Council´s role had been strengthened in the area of proposing, assessing and approval ITS projects, which is one of substantial changes proposed to the new ITS strategy. Two-stage ITS and C-ITS project preparation procedure will be introduced in order to facilitate more transparency in the approval process of submitted project proposals. Project ideas recommended and agreed by Coordination Council will be further developed and extended into concrete project plans containing information about detailed description of the technical specifications, a timetable for implementation and investment and operating costs. Project plans will define KPIs and target values to be achieved as a result of implementing the ITS or C-ITS project (i.e. reducing traffic accident rate etc.).

Directive 2010/40/EU on ITS was transposed into the Czech national law, specifically to the Road infrastructure act (No. 13/1997 Coll. as amended). According to the EU ITS directive as well as the mentioned Road infrastructure act, it is assumed that the conformity assessment will be applied for products and for services. Procedures of ITS services conformity assessment constitutes a completely new condition which is not further elaborated in detail neither by EU ITS Directive and related delegated acts nor by Czech national laws. Czech legislation does not allow to classify the ITS conformity assessment on mentioned interpretation into the scope of the Act on Technical Requirements for Products. This gave rise to a lack of a clear framework and methodology for applying the commitments of the EU ITS legislation. The Ministry of Transport of the Czech Republic temporarily carries out the duty of the ITS conformity assessment nominated body. This situation is in the long run unsustainable. Therefore the Ministry of Transport of the Czech Republic currently undertakes to seek more appropriate solution for setting up the organisational model of conformity assessment procedures required by relevant European Commission ITS Delegated Regulations (as well as to those who will be preparing under the EC working programme on the implementation of Directive 2010/40/EU). Where non-compliance is found in random inspection made by the Ministry of Transport the offence has been committed. Act No. 13/1997 Coll., On the Road Infrastructure, as subsequently amended, Section nine Professional government supervision, Paragraph 42b Offences of legal entities and individual entrepreneurs, Article 5: "*(5) Legal entity or individual entrepreneur as ITS service provider will commit an administrative offence if he/she uses ITS component which does not comply with the specification (*that means ITS Delegated Regulations*) according to Paragraph 39a, Article 2 or if he/she provides ITS service in a manner which does not correspond to these specifications.* The same paragraph, Article 7: *"Administrative offences shall be punishable by a fine up to a maximum of 500 000 CZK (about 19 000 EUR)."*

1.2 General progress since 2017

1.2.1 Implementation of projects in the field of ITS and C-ITS in compliance with government approved Implementation Plan for the "*Action Plan to implement the Action Plan for the Development of Intelligent Transport Systems in the Czech Republic by 2020 (with an outlook to 2050)*", implementing document of current national ITS strategy

Implementation Plan (project implementation) for the ITS Action Plan (strategy) is a living document which has been updated several times. The last update of the ITS Implementation Plan (update no. 3) was carried out in April 2019. This document contains 97 project plans and project ideas for all modes of transport. Out of that total, 20 projects were completed before 2020. ITS and C-ITS projects are considered for all modes of transport. Not only in the road-based context.

In 2020, 38 road-based project plans and project ideas were registered in the ITS Implementation Plan. These projects are implemented mainly via the Roads and Motorways Directorate of the Czech Republic.

Czech Republic is building and intending to build also conventional ITS. Conventional ITS roadside elements (such as inductive loops, automatic traffic counters, video-detection systems, weather stations, traffic information devices, variable message signs) mainly cover existing and/or will cover future high-capacity sections with heavy traffic which are situated on backbone road network (especially TEN-T) and on urban arterial roads. In the implementation of conventional ITS roadside elements the priority will be given for the locations associated with traffic accident black spots and the risk factors of traffic congestion, frequent periods of road surface icing, reduced visibility etc. Preference is also given to projects which will meet the obligations laid down in delegated acts under Directive 2010/40/EU (ITS). The objective for the conventional ITS on existing and planned motorways is to achieve the level of standard ITS equipment which includes ITS roadside devices, traffic management centre coordinating real-time road traffic operations (for example, travel and traffic information, incident management and traffic rerouting), telecommunications infrastructure (wired, wireless).

In preparation for the deployment of connected, co-operative and fully automated vehicles the Czech Republic has launched a C-Roads project. This project is building on other projects such as "BaSIC" and "C-ITS Mirošovice - Rudná Corridor" along the Prague motorway, which was completed in summer 2017 and upgraded in 2020. This project deployed along 50 km of motorway and includes an ITS-G5 RSU every 2 km. These projects can be viewed as phase zero for C-Roads Czech Republic. The C-Roads Czech Republic project had also moved towards adopting the C-Roads Platform specifications, which are crucial for any deployment.

Most ITS projects are being financed by the State Fund for Transport Infrastructure (SFDI), which mainly finances construction, modernisation and repair of roads and motorways, inland waterways used for transport and national and regional railways. Apart from financing construction and maintenance, the SFDI Fund also contributes to feasibility studies, project documentation and relevant expert activities connected with transport infrastructure. Before any decision to start projects being financed by the SFDI Fund is taken, the Project Plan documentation must be prepared in compliance with the principle of ministerial rules governing the procedure for the preparation and implementation of non-investment actions and investment projects related to the transport

infrastructure. One of the required information to be used for the project plan documentation is a description of the project, its overall design and structure as well as an explanation whether the project is consistent with national ITS strategy objectives and showing its compliance with the ITS Directive and its supplementing Delegated Regulations. Abovementioned ministerial rules have binding force for the Ministry of Transport, Roads and Motorways Directorate of the Czech Republic, Czech Railway Infrastructure Manager, Directorate of Waterways of the Czech Republic and SFDI Fund.

EU Operational Programme Transport 2014-2020 (also referred to as OPT 2) represents the most important financial source, both for the building of the physical transport infrastructure and for the implementation of ITS and recently also C-ITS. OPT 2 programme provides financial support for activities related not only to the ITS deployment at national level but also to the urban ITS development (*through the Specific objective 2.3 "Improving traffic management and traffic safety, part: ITS in cities"*), building of Urban Traffic Management Centres and implementing a DATEX II in significant urban agglomerations situated along TEN-T corridors and C-ITS implementations in city areas.

Both, national and Urban ITS projects supported from OPT 2 must ensure compliance with the ITS Directive and its supplementing Delegated Regulations. In the case that the C-ITS project is submitted within the framework of OPT 2, compliance with the C-Roads Platform specifications is required in order to ensure the realisation of European harmonised C-ITS interoperable services. OPT2 project costs will be considered as eligible only if C-ITS systems deployed in the Czech Republic will follow the specifications and standards referred in "C-Roads Czech Republic" EU project website: https://c-roads.cz/systemy-cits/technicke-normy-a-standardy/.

The Connecting Europe Facility (CEF) EU funding instrument is used when the European cross-border co-operation in the field ITS or C-ITS is needed.

Conventional ITS and C-ITS development activities proposed by the Operational Programme Transport 2021-2027 are aimed at improving Bohemian, Moravian and Silesian transport system as well as at achieving the common European objectives in current or near-future relevant EU strategies.

The Government of the Czech Republic adopted its Resolution of 27th January 2020, No. 86 on requested assessment and evaluation process dealing with public sector financial expenditures related to ICT. Consequently, it was decided that all ITS and C-ITS projects must follow mentioned governmental resolution and all running ITS projects were stopped. Necessary documentation is under preparation to be sent to the Office of the Chief eGovernment Architect for appraisal and approval from ICT point of view. This is a reason why many ITS and C-ITS projects are delayed in 2020.

1.3 Contact information

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2 Projects, activities and initiatives

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

2.1.1 Description of the national activities and projects

Description of the relevant initiatives, their objective, timescale, milestones, resources, lead stakeholder(s) and status:

In 2005 the project titled "Integrated (harmonised) Traffic Information System (known respectively by the Czech language abbreviation JSDI) / National-wide Traffic Information Centre (known respectively by the Czech language abbreviation NDIC)" was launched. The main project objective was to create a comprehensive system for the collection, processing, sharing, distribution and publication of traffic information and traffic data. This step was considered as the beginning of the systematic development of ITS in the Czech Republic. It is therefore essential to pay attention to the constant development National-wide Traffic Information Centre (NDIC) located in the City of Ostrava with the main focus on measures for improving the existing traffic information collection and exchange.

A number of technical expertise and technical implementations have been carried out in preparation of the Czech Republic for traffic data exchange ensuring compliance with the ITS Directive and its supplementing Delegated Regulations. One aim was to extend the interfaces handling the distribution of road traffic information and data to be compatible with DATEX II required data format. Further work was carried out to create a design of the conversion and to implement it for traffic flow status service to change the original version using ALERT-C for the version using DATEX II.

DATEX II profiles for various traffic information were developed and its provision launched. The main focus was on planning real international (cross-border) exchange, mainly on matching real demand for different sorts of data with data really provided for given region (in the first place, neighbouring counties plus Hungary, Slovenia, Croatia and Italy). Secondly, work was carried out to prioritise the items to be exchanged, gather further technical details and efforts on contracting.

At the same time the functionalities of NAPs – such as the NDIC distribution module (Data Distribution Interface) in the Czech Republic (http://registr.dopravniinfo.cz/en/) – were extended for the new information format DATEX II. An important point was the modernisation of the national-

wide public information web portal providing current status-oriented information about the traffic situation in the Czech Republic https://portal.dopravniinfo.cz/en/drivers-service/websites. The mobile application for road traffic information provision was successfully introduced (http://portal.dopravniinfo.cz/en/drivers-service/mobile-applications). The related mobile phone app has been developed to provide the travel information for motorists. The intention of the mobile phone app development was in particular to create of harmonised application covering all practical traffic related information collected under the Integrated Traffic Information System of the Czech Republic. In addition to the fact that the traffic information must be up-to-date and complete the basic requirement is the interactivity and the clarity for end-users. It is desirable to provide users of traffic information a service in the car-delivery format. The mobile phone app provides clear and well-structured information which constitutes a user-friendly service. The main objective of the project was to extend the distribution channels portfolio in order to ensure the more accessible and optimal use of traffic information in favour of public sector bodies, crisis management authorities, road users, media, hauliers, customers and other users including cross-border traffic information exchange with neighbouring countries and/or with EU relevant systems.

In addition, the geo-information portal for the support of efficient data sharing across the designated stakeholders as well as the development of unified National Spatial Data Infrastructure for compatible ITS services was implemented. The aim of harmonisation is to create, maintain, use in an efficient and effective way and develop the infrastructure for spatial information INSPIRE for the purpose of EU environment policies and policies and/or activities over which it can be expected to have an influence or can have significant impacts on the environment.

Work was also undertaken on relevant strategy. "JSDI/NDIC Strategy Development Plan for the next 10 years" was finalised. This strategy plan clearly indicates roles of National-wide Traffic Information Centre (NDIC) and Integrated Traffic Information System of the Czech Republic (JSDI) and clearly indicates the areas that should be developed as well as laid down guidelines for further developing actions. This gave rise to the clearly defined functional scope of NDIC and JSDI which defines its links with other systems providing similar or complementary functions and which are operated by public or private economic operator at regional, national or European level. Evaluation of the current status of road traffic management system in the Czech Republic and a proposal for its further development was part of the strategy plan. Secondly, the strategy plan considered the issue of other transport modes overlap, revision of the JSDI/NDIC legal and regulatory framework and assessment of the quality and performance of existing services provided by NDIC. The plan contains concrete actions and a timetable which will help to make the plan a reality. Road traffic professionals contributed to the establishment of this strategy plan. The strategy plan for further developments of the National-wide Traffic Information Centre looking ahead to the next ten years was also discussed at the meeting of the Transport Minister Coordinating Council for Intelligent Transport Systems.

Work was also undertaken on multimodal information. In the Czech Republic the provision of multimodal public transport data started in 2000 and this historical context cannot be ignored. The Czech Republic recognizes obligations arising from the Delegated Regulation (EU) 2017/1926 on the provision of EU-wide multimodal travel information services. This has given rise to the need of the current system transformation through gradually replacement important technical elements as well changing related organisational procedures covering not only the national level, but also the regional and local levels. "*Public Transport Strategy for 2020-2025 with an outlook to 2030*" was adopted by the Government of the Czech Republic through Government Resolution No. 1008 of

12 October 2020. One of the objectives of this strategy is to fulfil obligations laid down in Delegated Regulation (EU) 2017/1926 through the measures laid down in this document. The abovementioned Government Resolution tasked the Ministry of Transport to ensure the provision of public passenger transport services accordance with the timetable specified in the strategy. The timetable also contains the implementing measure relates to Delegated Regulation (EU) 2017/1926 obligations. The government resolution in question recommends to Presidents of Regions and the Mayor of Prague to act in accordance with the mutual agreement when providing public passenger transport services accordance with the abovementioned strategy.

2.1.2 Progress since 2017

Description of the progress in the area since 2017:

The system titled "Monitoring System of Traffic Flows on Czech Republic's Road Network" (based on FCD) started operation in 2018. This system allows users to see the real-time and historical traffic flows characteristics of surveyed motorway and road network sections, including city areas.

In 2019, this new traffic data source became publicly accessible. On the basis of application by interested party it has been possible to conclude free-of-charge traffic data collection agreement with the Roads and Motorways Directorate of the Czech Republic. Individual requirements concerning the area location, road classification, degree of traffic density or traffic jam detection may be specified through the web application interface. For data exchange DATEX II or native format can be used. Selected data are transmitted directly to the subscribers systems (*note: It is not a traditional form of data acquisition where subscribers download data from specified IP address*).

On 6 November 2019, Directorate of Roads and Motorways of the Czech Republic and the Ministry of Transport, in cooperation with the Czech & Slovak Intelligent Transport Systems & Services Association, held a workshop and at the same time a kick-off meeting of Dynamic Traffic Data User Forum (https://forum.rsd.cz). This user forum constitutes a platform involving all relevant stakeholders for the exchange of experiences, user feedback on quality and to retrieve user´s ideas and suggestions to improve the system in operation. Further user forum workshops were held on 24 June 2020 and 26 August 2020.

Faculty of Transportation Sciences, Czech Technical University in Prague is the independent supervisor of the system named "*Monitoring System of Traffic Flows on Czech Republic's Road Network*". The supervisor assesses FCD data quality from various criteria.

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

Measures undertaken, if any, to set up a national access point and on the modalities of its functioning: (including information on the weblink to the NAP and discovery services available to users)

Provision of multimodal public transport data in the Czech Republic started in 2000. The National-wide Information System on Public Transport Timetables Information (known respectively by the Czech language abbreviation CIS JŘ) provides based on state-guaranteed data multimodal public transport information for the public, for authorities responsible for the conclusion of public passenger transport service contracts and for public passenger transport operators. Public passenger

transport operators are responsible for providing the timetable data in defined format and structure for the system of CIS JŘ.

Machine access and personal access is covered by the CIS JŘ System - (https://www.mdcr.cz/Dokumenty/Verejna-doprava/Jizdni-rady,-kalendare-pro-jizdni-rady,-metodi-(1)/Jizdni-rady-verejne-dopravy?lang=cs-CZ) in Czech language version only and idos.cz (search engine).

The CIS JŘ data conversion to required formats (Transmodel, NeTEx) is under preparation. It seems appropriate to implement and integrate MTTI NAP into the existing structure of NAP for RTTI / SRTI. The definitive solution regarding NAP is still not decided.

See also the chapter 2.1.1 Description of the national activities and projects.

Information on the progress made since 1 December 2019:

Static public passenger travel data are published in the National Catalogue of Open Data (referred to as "NKOD"). NKOD is administered by the Ministry of the Interior. Multimodal travel data can be found at https://data.gov.cz/english/.

See also chapter 2.1.1 Description of the national activities and projects.

Additional information (e.g. which data types are being provided? Have metadata catalogues been implemented? Are quality requirements being checked?):

Data is however temporarily available in a proprietary format at https://portal.cisjr.cz/pub/seznamy/ in Czech language version only and described at the following link: https://www.mdcr.cz/Dokumenty/Verejna-doprava/Jizdni-rady,-kalendare-pro-jizdni-rady,-metodi-(1)/Jizdni-rady-verejne-dopravy?lang=cs-CZ.

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

(see guidance provided in Member States experts follow up meetings)

Measures undertaken, if any, to set up a national access point and on the modalities of its functioning:

National Access Point (NAP) for the provision of EU-wide real-time traffic information services is operational since 2015. NAP is implemented as a distributed system (registry and distribution interfaces).

The registry (operational since 2015)**:** Metadata and discovery information for traffic sources available from different providers are published in the registry of traffic information while data. Registry is a simple static web page including service metadata, allowing service discovery. In this context it deals with the NAP of 2nd level. This registry is undergoing changes to cover all metadata

required by Coordinated Metadata Catalogue (rev2019) and to allow for other providers to register. It maintains its specifics while enhancing the metadata compatibility.

Distribution interfaces: Services could be consumed through distribution interfaces of individual providers. The NDIC is the sole biggest provider of all (road) traffic information from the Czech Republic. The distribution interface of NDIC is undergoing a major change to allow for seamless subscription to traffic information sources.

Concerning the NAP Website, conceptually, consists of two services types. The registry: http://registr.dopravniinfo.cz/en/ (with traffic information metadata). Distribution interfaces: the data distribution interfaces, provided by separate traffic information providers, for the NDIC it is https://datex.rsd.cz/ and https://fcd.rsd.cz. With the revision of the interface, the new (united) address will be used, more suitable for the service.

Where relevant, the list of motorways not included in the comprehensive trans-European road network and identified priority zones:

NDIC covers entire road network in the Czech Republic. Generally, the ALERT-C location table creates a good reference as to where most of the traffic data is being provided. Real time status data are provided by sensor network and by FCD (from 2019) so they are available also for the complete Czech road network.

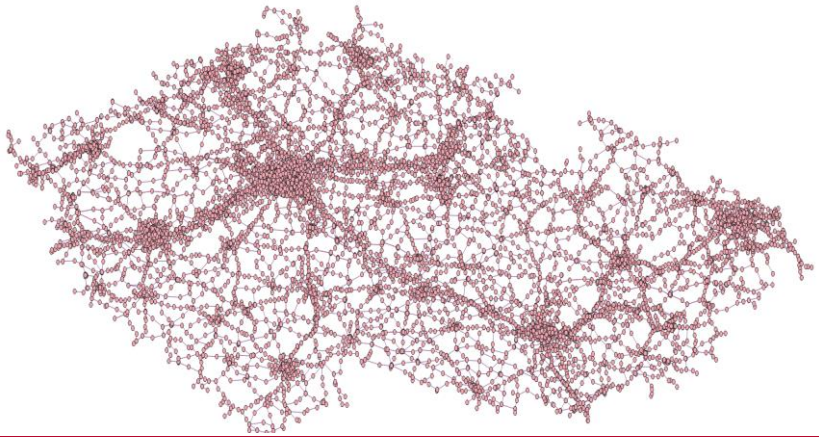


Figure 1 ALERT-C location table coverage in Czechia

Additional information (e.g. which data types are being provided? Have metadata catalogues been implemented? Are quality requirements being checked?):

Several data sources - data required by the delegated regulation - are listed in the registry (only from one provider the NDIC), out of these data sources, the dynamic RTTI related information is covered in these publications:

- DATEX II Situation Publication – Common
- DATEX II Situation Publication – Restrictions
- DATEX II Situation Publication – Weather
- DATEX II Elaborated Data Publication – Traffic Status
- DATEX II Elaborated Data – Travel Time

- DATEX II Elaborated Data – FCD (new, 2019)

Static RTTI related information is covered in these publications:

- DATEX II Predefined Location Publication - Predefined Location Set (containing individual publications per dynamic elaborated data source)
- DATEX II Rest areas Publication
- ALERT-C location table

Distribution interface: By the NDIC the dynamic RTTI content has been available, free of charge, since its start of operation in 2005 to the public. From 2015 in DATEX II, and from 2019 FCD in DATEX II.

Static data

There are some static data available only to **NDIC**, data available to public for free and payed services. Next figure summarizes internally and externally available data, DATEX II and LT (location table) data (columns) are available to the public free of charge through the NAP.

static data types	LT	ISSDS/GN	INSPIRE	DATEX II
1. road network links and their physical attributes, such as:				
1. Geometry;	yes	yes	yes	no
2. road width;	no	yes	yes	no
3. number of lanes;	no	yes	yes	no
4. Gradients;	no	yes	yes	no
5. Junctions;	yes	yes	yes	no
2. road classification;	yes	yes	yes	no
3. traffic signs reflecting traffic regulations and identifying dangers, as:				
1. access conditions for tunnels;	no	yes	no	no
2. access conditions for bridges;	no	yes	no	no
3. permanent access restrictions;	no	yes	yes	no
4. other traffic regulations;	no	yes	no	no
4. speed limits;	no	yes	yes	no
5. traffic circulation plans;	no	partially	no	no
6. freight delivery regulations;	no	partially	no	no
7. location of tolling stations;	yes	yes	no	no
8. identification of tolled roads, road user charges and payment methods;	no	partially	partially	no
9. location of parking places and service areas;	yes	yes	yes	yes
10. location of charging points for EV and the conditions for their use;	no	no	no	no
11. location of CNG, liquefied natural gas and petroleum gas stations;	no	no	no	no
12. location of public transport stops and interchange points;	no	no	no	no
13. location of delivery areas.	no	no	no	no

Figure 2 Static data availability with regards to its format (ISSDS/GN is the primary source)

Dynamic data

Next figure summarizes dynamic data available from **NDIC:**

Priority Action b data categories (see Annex, parts 2 and 3)			Available
Annex Parts	Category	Definition	
Part 2.) Dynamic road status Data	(a)	road closures	yes
	(b)	lane closures	yes
	(c)	bridge closures	yes
	(d)	overtaking bans on heavy goods vehicles	no
	(e)	roadworks	yes
	(f)	accidents and incidents	yes
	(g)	dynamic speed limits	no
	(h)	direction of travel on reversible lanes	no
	(i)	poor road conditions	no
	(j)	temporary traffic management measures	yes
	(k)	variable road user charges and available payment methods	no
	(l)	availability of parking places	yes
	(m)	availability of delivery areas	partialy
	(n)	cost of parking	no
	(o)	availability of charging points for electric vehicles	no
	(p)	weather conditions affecting road surface and visibility	yes
Part 3.) Traffic Data	(a)	traffic volume	yes
	(b)	speed	yes
	(c)	location and lenght of traffic queues	yes
	(d)	travel times	partialy
	(e)	waiting time at border crossings to non-EU MS	no

Figure 3 Priority action b) dynamic data availability

Travel times data source from FCD data source was implemented in 2019.

Concerning the quality requirements within the registry, there are just simple formal quality checks in place, concerning a structure and content of metadata available at the registry. Self-certification document for RTTI data is available at the registry.

In accordance with Article 11 of Commission Delegated Regulation 962/2015 on Real-Time Traffic Information, the National-wide Traffic Information Centre (NDIC) and the TomTom company submitted the Assessment of Compliance Form using the harmonized template defined within the ITS Directive WG of TISA. Regular technical quality checks as the next stage.

As regards the distribution interface, the sole source for the NAP the NDIC publishes only verified and checked information. Internal processes require the NDIC operator to crosscheck any message coming from unverified sources before its release to public.

Only traffic information metadata and discovery are available in the NAP registry. Through distribution interface separate traffic information providers (the data owners) manage data distribution interfaces, in the NDIC example it is https://datex.rsd.cz/ and https://fcd.rsd.cz (subscription details setup for machine-to-machine data exchange). Static data and dynamic data are provided free of charge by NDIC at distribution interface.

Metadata are partially aligned with coordinated metadata catalogue; these metadata are available:

- unique identification of the data and provider with contact information
- description of intent and concept
- format of data including description, schema and samples
- distribution protocol description
- licence information (including licence conditions for download)
- subscription process description
- beginning of availability
- linked data sources identification
- etc.

The NAP registry is undergoing changes to cover all metadata required by Coordinated Metadata Catalogue (rev2019).

The dynamic data and some static data (ALERT-C location tables, DATEX II Predefined location set publications) is provided free of charge. The road geometry data (and attributes), is not available to public, its licence terms needs to be defined.

The use of NAP distribution interface is monitored. At the NDIC each subscriber is identified and "monitored", the usage is known. Concerning the registry, no registration process and no monitoring is necessary.

Following diagram showing the architecture of the NAP. The Registry (in the red circle) describes services available from other sources. Distribution interface is indicated in the grey bounding box.

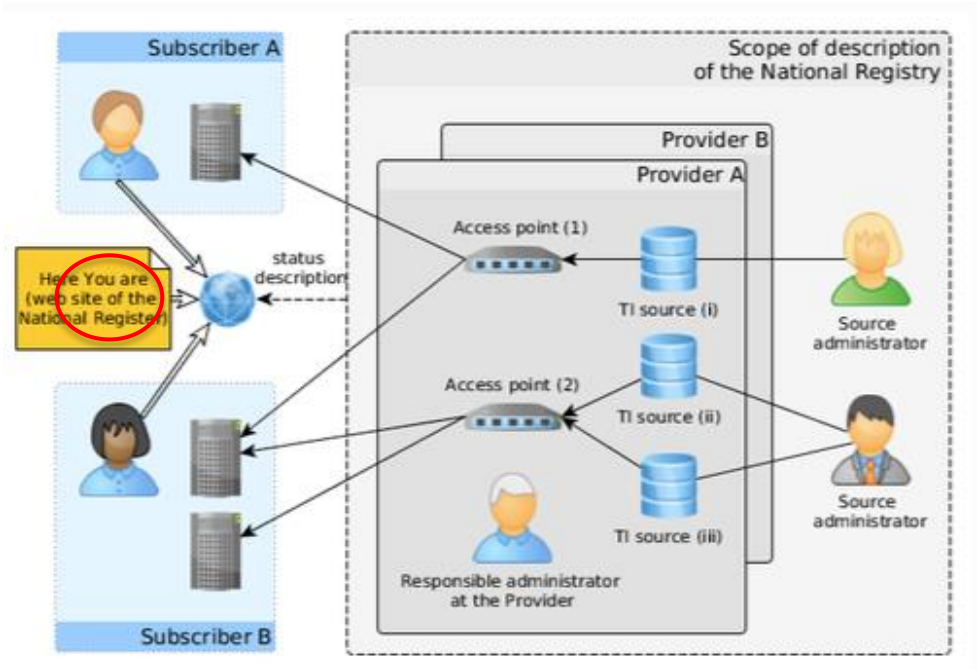


Figure 4 Architecture of Czechia NAP

The NDIC plays an important role in the NAP context. The NDIC integrates data from all Czech Republic´s public bodies according to Section 1 of the regulation 3/2007 Coll. on the national traffic information system. Their ITS data as well as traffic information (manually created).

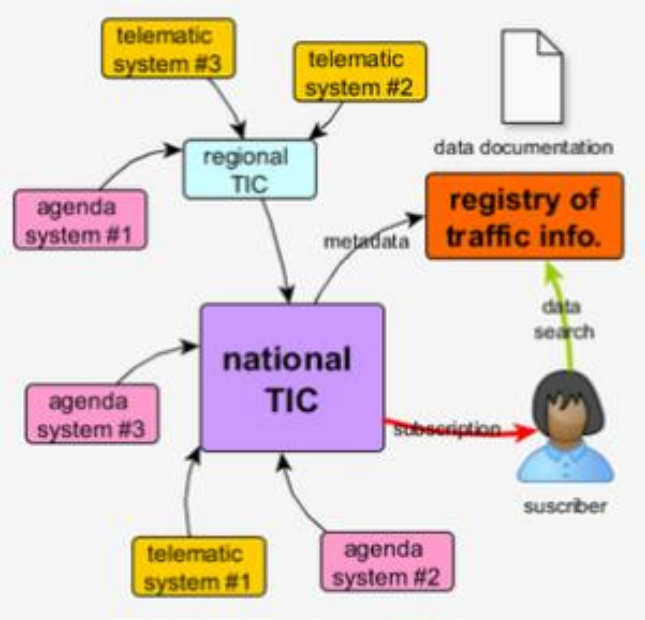


Figure 5 Actors in NDIC and NAP architecture

NAP registry is available in Czech and in English. Distribution interface is available in Czech, English version is under preparation.

The NAP registry of traffic information contains “just” discovery service and metadata of traffic data available from distribution interfaces. Data are available through distribution interface in proprietary xml format DDR (since 2005) and in DATEX II format (since 2015, for FCD since 2019). DATEX II v2.3 version is using.

Following data are provided by NDIC in HTTP PUSH protocol:
- DDR XML – Common traffic information;
- DDR XML – Traffic statuses;
- DDR XML – Winter driving conditions;
- DATEX II Situation Publication – Common;
- DATEX II Situation Publication – Restrictions;
- DATEX II Situation Publication – Weather;
- DATEX II Elaborated Data Publication – Traffic Status;
- DATEX II Elaborated Data – Travel Time;
- DATEX II Elaborated Data – FCD.

Following data are provided by NDIC in HTTP PULL protocol:
- DATEX II Predefined Location Publication – Predefined Location Sets;
- ALERT-C Location table.

Only NDIC data is described at the NAP (registry). The NDIC (red rectangle on next figure) however integrates road related information, their telematics data as well as traffic information (manually created), from all Czech Republic´s public bodies according to Section 1 of the regulation 3/2007 Coll. on the national traffic information system.

NDIC reports to have more than 200 subscribers. FCD is a source of vast amount of periodically updated status data; there are only few registered users so far.

The NAP Registry will be upgraded to have a "back office" for registering new providers that are required by law to publish traffic information. The scope of the Registry will be also broadened to cover Traveller information. Possible integration with subscriber management is foreseen for the registry.

Concerning the quality requirements within the registry, there are just simple formal quality checks in place, concerning a structure and content of metadata available at the registry. Self-certification document for RTTI data is available at the registry.

In accordance with Article 11 of Commission Delegated Regulation 962/2015 on Real-Time Traffic Information, NDIC and the TomTom company submitted the Assessment of Compliance Form using the harmonized template defined within the ITS Directive WG of TISA. Regular technical quality checks as the next stage.

As regards the distribution interface, the sole source for the NAP the NDIC publishes only verified and checked information. Internal processes require the NDIC operator to crosscheck any message coming from unverified sources before its release to public.

2.1.5 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)

(see guidance provided in Member States experts follow up meetings)

Progress made in implementing the information service, including the criteria used to define its level of quality and the means used to monitor its quality:

NAP is implemented as a distributed system (registry and distribution interfaces). The Registry: Several data sources are listed (only from one provider the NDIC), out of these data sources, the SRTI related information is in [DATEX II Situation Publication - Common] data source (http://registr.dopravniinfo.cz/en/sources/cz-ndic_d2-common/).

The SRTI covered by the data source:

- temporary slippery road;
- animal, people, obstacles, debris on the road;
- unprotected accident area;
- short-term road works;
- reduced visibility;
- wrong-way driver;
- unmanaged blockage of a road;

- exceptional weather conditions.

Distribution interface: At the NDIC, the SRTI content has been available, free of charge, since its start of operation in 2005 to the public in proprietary XML, since 2015 also in DATEX II.

The Registry: there are just simple formal quality checks in place, concerning a structure and content of metadata available at the registry. Self-certification document for SRTI data is available at the Registry.

Detailed quality document has been created in 2019, available privately and to Nominated body as part of declaration of compliance. Regular technical quality checks as the next stage.

Distribution interface: Regarding the sole source for the NAP the NDIC, it publishes only verified and checked information. Internal processes require the NDIC operator to crosscheck any message coming from unverified sources before its release to public. This has of course negative impact on timelines of provisioning of some SRTI information types:

- temporary slippery road;
- animal, people, obstacles, debris on the road;
- unprotected accident area;
- wrong-way driver;
- unmanaged blockage of a road.

Data distribution interfaces are managed by separate traffic information providers (the data owners) in the NDIC example it is https://datex.rsd.cz/ (subscription details setup for machine to machine data exchange).

Within the registry metadata are partially aligned with coordinated metadata catalogue, these metadata are available:

- unique identification of the data and provider with contact information
- description of intent and concept
- format of data including description, schema and samples
- distribution protocol description
- licence information (including licence conditions for download)
- subscription process description
- beginning of availability
- linked data sources identification
- etc.

The NAP registry is undergoing changes to cover all metadata required by Coordinated Metadata Catalogue (rev2019). Distribution interface is referenced to the registry.

Results of the assessment of compliance with the requirements set out in Articles 3 to 8 of Delegated Regulation (EU) No 886/2013:

Through the EU project CROCODILE 2 the Czech Republic tested its traffic information services in order to verify whether this information comply with the quality requirements and whether the Self-Certification can be performed.

Czech Republic initiated in 2018 actions leading to the future implementation of cross-border data exchange. The cross-border data exchange was not intended for the Czech NAP only but also for NAPs (and data) from other member states involved in this project. At the first CROCODILE 2 technical meeting taking place in Ostrava (Czech Republic) on 15 and 16 February 2018 participants from seven Member States discussed the current status and further plans for working towards increased cross-border exchange of traffic data while ensuring compliance with the ITS Directive and its supplementing Delegated Regulations.

These discussions led to following conclusions:

- To test legal, administrative and technical conditions in which that NAPs of listed project partners will carry out traffic information subscription. A relevant document was created to simplify a subscription process.
- To test real subscription and compliance in accordance with the traffic information documentation in force. For purposes of the test, in a few weeks data were gathered from different sources.

Following table summarizes providers and feeds in above mentioned test with “messages per day” statistics:

Country	**Provider**	**Messages**
Austria	Asfinag	240/day
Czechia	NDIC	2 880/day
Germany	MDM	1 440/day
Hungary	Kozut	288/day
Italy	Autovie	45/day
Poland	GDDKIA	288/day
Slovenia	Promet	720/day

In accordance with Articles 3 to 8 of Commission Delegated Regulation 886/2013 on road safety-related minimum universal traffic information, the National-wide Traffic Information Centre (NDIC) submitted the Assessment of Compliance Form using the harmonized template defined within the ITS Directive compliance WG of EU-EIP project.

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

In 2019 in the framework of the road traffic information provision a new version of the web and mobile application "Traffic Info" was put into operation: https://nove.dopravniinfo.cz/en/:

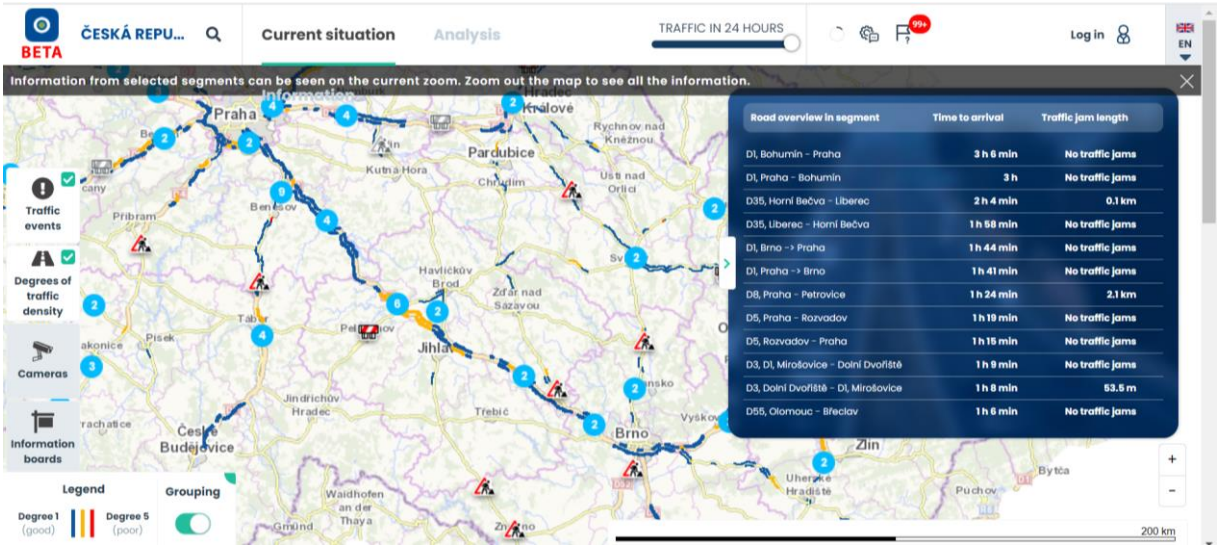


Figure 6 screenshot of NDIC traffic information web application

Additional information (e.g. sources of data used for the provision of safety related traffic information):

Regional Traffic Information Centres (DIC) are being built up in the Czech Republic (especially in the larger urban agglomerations). An appropriate level of data interconnection is ensured between National-wide Traffic Information Centre (NDIC) and Regional Traffic Information Centres (DIC) so that both sides may profit from the traffic information available.

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

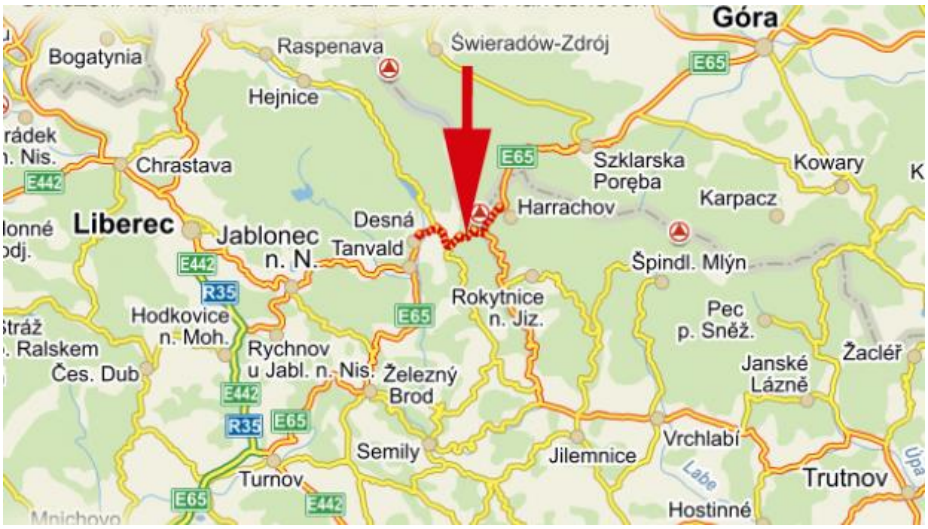
2.2.1 Description of the national activities and projects

Description of the relevant initiatives, their objective, timescale, milestones, resources, lead stakeholder(s) and status:

Public investments in conventional ITS as well as in C-ITS are made in projects that are of public interest, i.e. projects that will contribute to improve traffic control and the traffic flow, will contribute to better transport safety, to improve incidents management and further to improve public transport safety and its accessibility as well as to improve logistic processes for consignments which required a special surveillance (e.g. transport monitoring of heavy and oversized loads).

An example of one ITS project in public interest (from several others) relating to the freight management ITS services is remote control of heavy freight traffic within Tanvald - Harrachov mountain road section (European route E65). VMS were installed on the roadside of this eighteen kilometres section which will be remotely closed to heavy freight traffic in case of heavy snowfall. In

such cases, trucks are diverted through first-class road no. 35 to Hrádek nad Nisou (Grottau in German, Gródek nad Nysą in Polish) in the direction of Poland, while car traffic and busses can continue their journey. Activation of VMS must be approved by the Traffic Police.



This road section may be closed due to ice and snow. | Picture: Český rozhlas

2.2.2 Progress since 2017

Description of the progress in the area since 2017:

See the chapter 2.2.1 Description of the national activities and projects.

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

2.3.1 Description of the national activities and projects

Description of the relevant initiatives, their objective, timescale, milestones, resources, lead stakeholder(s) and status:

In 2017, Roads and Motorways Directorate of the Czech Republic implemented a pilot project located on motorways D1 (Prague – Brno – Ostrava – Poland) and D2 (Brno – Břeclav – Slovakia) which concerned with traffic incidents fast response vehicle. This vehicle was equipped with variable message sign and was ready for deployment for traffic incidents response missions. There are following areas in which the mentioned vehicle was deployed to inform/warn drivers about potential collision risks:

- before the beginning of the road section being upgraded or renewed
- before the beginning of long-term or short-term closures
- at the traffic accident or incident
- at the lane reduction point.

A traffic incidents fast response vehicle is sent on operations by the motorway maintenance centre operator based on the NDIC or Traffic Police instructions. A methodology for activation process of this fast response vehicle, its placing and monitoring rules is currently being developed.

2.3.2 Progress since 2017

Description of the progress in the area since 2017:

See the chapter 2.3.1 Description of the national activities and projects.

2.3.3 112 eCall (priority action d)

Information on any changes regarding the national eCall PSAPs Infrastructure and the authorities that are competent for assessing the conformity of the operations of the eCall PSAPs:

The Ministry of Interior – Fire Brigade Service of the Czech Republic as responsible authority for eCall 122 operation, has received the report „eCall PSAP Conformance testing report" version 1.1 of 13 December 2017 from the contractor that has realized the procurement „Implementation of the eCall service into the TCTV 112" in the Czech Republic. The report declares that the contractor has executed functional test of the technologies operated in not specified PSAP in compliance with testing procedures defined in the ČSN EN 16454:2015. Testing was finished on 8 October 2017 and covered all evaluated scenarios (conformance testing point) and all evaluated scenarios has resulted in compliance of the PSAP technology behaviour with procedural requirements.

In accordance with:

- Article 4 of Commission Delegated Regulation 305/2013 on harmonised provision for an interoperable EU-wide eCall
- Article 1 to the Decision No 585/2014/EU of the European Parliament and of the Council on the deployment of the interoperable EU-wide eCall service

the Ministry of Interior – Fire Brigade Service of the Czech Republic sent a letter to the Ministry of Transport which was a formal notice of fulfilment of compliance obligations regarding the harmonised provision for an interoperable EU-wide eCall.

Additional information:

eCall data set is forwarded from PSAP (112 emergency call centre operated by Fire Rescue Services of the Czech Republic) to the National-wide Traffic Information Centre (NDIC) via communication profile created for this purpose. Within NAP (established in NDIC) a traffic information is generated which are subsequently distributed via different channels (and to relevant working places of Traffic Police and Emergency Medical Service) that means:

- to display of accident symbol on VMS or to display of short message about the accident on Traffic Information Device near the location of a major emergency event
- to publish the traffic event information (accident information generated by eCall) at TrafficInfo.cz web page (https://nove.dopravniinfo.cz/)
- to publish the traffic event information at TrafficInfo.cz via mobile app
- to provide traffic information and data to all subscribers (about 200) incl. navigation and traffic information providers like Google, Waze etc.

Concerning the (road) traffic control, we must respect the accreditation of competencies. Traffic is directly managed (regulated) by the police. National Traffic Information Centre influencing the behaviour of drivers, guiding (re-routing) the traffic flow, but not in the form of command. This is the

reason why the prohibitions or commands variable message traffic signs are not located on the Czech Motorway Network – of course with exemptions:

- Tunnels on motorways (note: in the case of stationary vehicles different sensor systems are used – video detection)
- Dynamic Lane Management System on the South Prague bypass (46 km length).

Statistics of eCalls routed to NDIC (also including false and testing calls – not differentiated):

	2019	2020
January	28	124
February	151	32
March	265	58
April	176	73
May	43	98
June	54	92
July	27	93
August	99	84
September	222	109
October	89	78
November	23	n.a.
December	14	n.a.

Print screen of the incoming test eCall 112 message presented on a NDIC operator display:

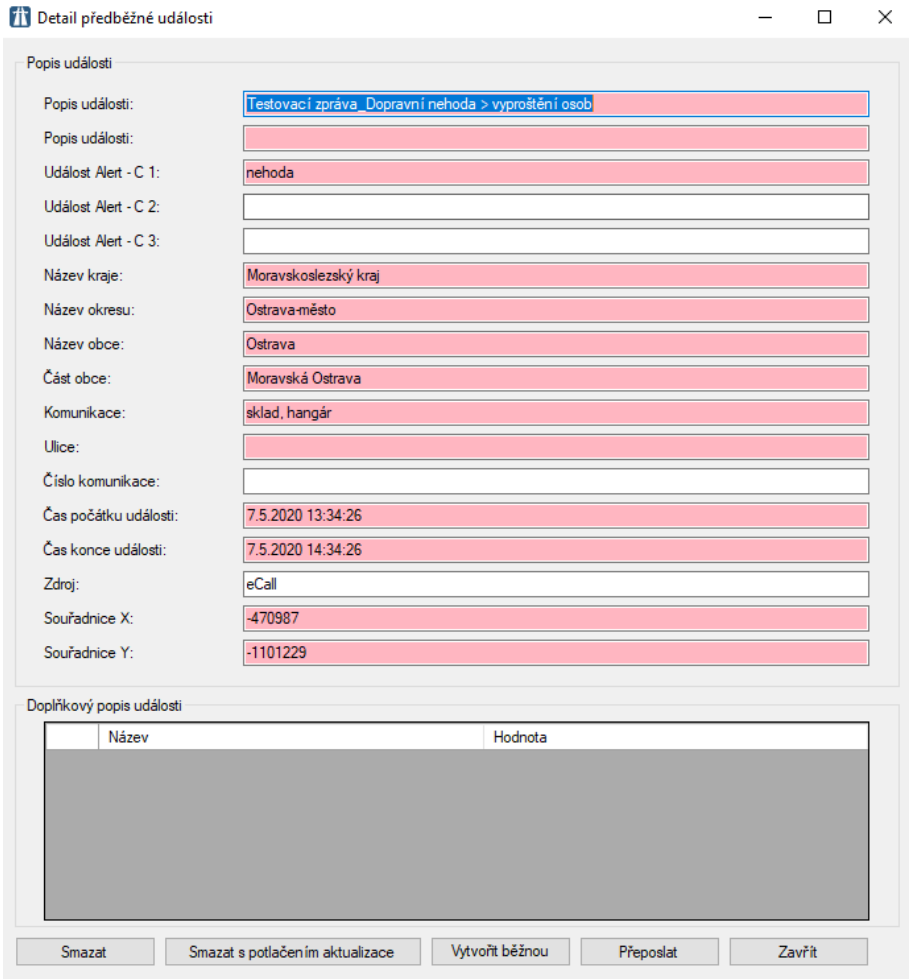


Figure 7 eCall message GUI of the NDIC operator

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

Number of different parking places and parking spaces on their territory:

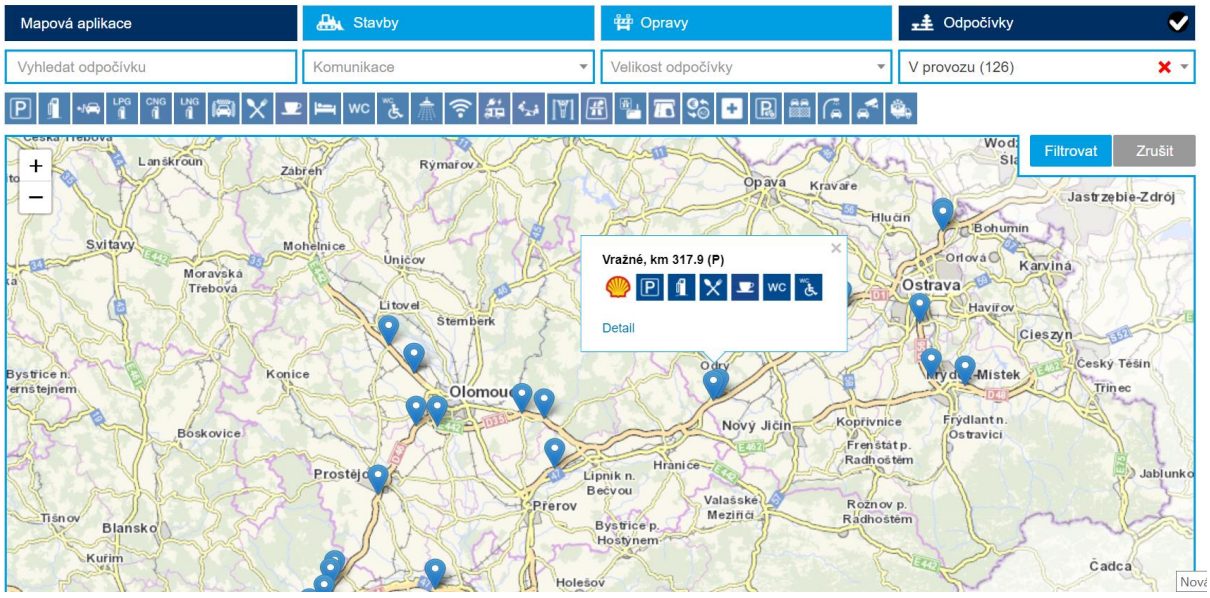
There are 132 parking places (2018) located in the Czech motorway network. All the places are visible in the map, available on https://www.rsd.cz/wps/wcm/connect/90ef5d90-835f-47a8-ad03-8cea0fb51ca4/rsd-mapa-odpocivky-A3-2018.pdf?MOD=AJPERES (map legend: in blue – parking places in operation, in orange – planned parking facilities of all types).

Within the CEF Transport several projects on Czech motorway rest areas upgrade and extension are financed in order to increase capacity and ensure safe and secure parking conditions on the Core Road Network. After the work completion, the busiest Czech D1 motorway (Prague – Brno – Ostrava – Poland) will ensure appropriate capacity for safe and secure parking on the D1 motorway, represented by 337 new or modernised parking places (141 for passenger cars, 170 for trucks, 16 for cars with a trailer or motorhomes, and 10 parallel bus parking places).

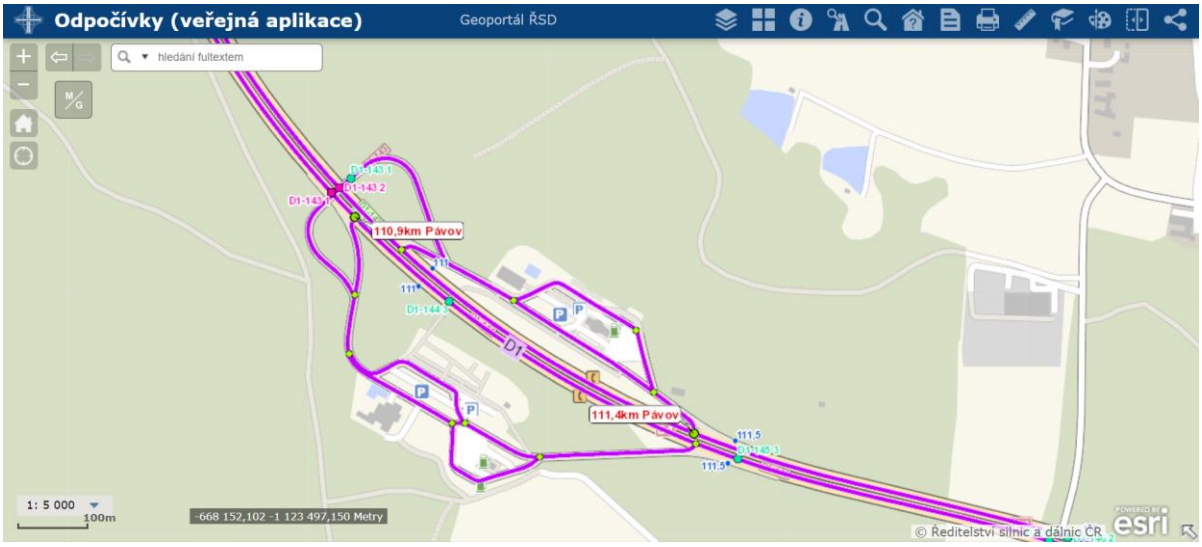
Percentage of parking places registered in the information service:

Static information on all parking places for Heavy Goods Vehicles (HGVs) located on motorways operated by the Roads and Motorways Directorate of the Czech Republic are provided in DATEX II format via the European Access Point on the European Open Data Portal https://opendata.europa.eu/en/data/.

Information about motorway rest areas to the general public is also be available through a Roads and Motorways Directorate of the Czech Republic website: https://www.rsd.cz/wps/portal/web/mapa-projektu/#/odpocivky?stav=V%20provozu



The Road and Motorway Geoportal website contains the rest areas on the Czech motorway network item with descriptive attributes at https://geoportal.rsd.cz/webappbuilder/apps/10/



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

Dynamic information on the availability of parking spaces are not currently provided.

The State Fund for Transport Infrastructure (SFDI) funded a project "Providing real-time traffic information on the TEN-T network – Trucks parking places on motorway network of the Czech Republic" in its programme "New technologies" which was used to the creation of a database for all parking places at rest areas on Czech motorway network in DATEX II format (static data). Furthermore this project established a hierarchy of motorway rest areas and recommended the scale of fitting these rest areas with appropriate detection technologies for providing real-time information about rest areas occupancy (dynamic data).

In the context of this project, system architecture, mandatory and optional data elements in accordance with DATEX II and estimation of necessary investment costs for the period 2017-2022 have been delivered.

The motorway rest area of Vražné (motorway D1, 317.9 km, in the direction of Ostrava) was selected for pilot deploying of relevant technologies at parking spaces in order to validate the proposal proven in real service.

Figure 8 Installation of dynamic information equipment at Rest Area – pilot project

Figure 9 Installation of dynamic information equipment at Rest Area – pilot project

Abovementioned project had started in July 2016 and was to be completed in 2017.

The Czech Republic participated in the European project "URSA MAJOR NEO" through the national project "URSA Czech Republic" which was selected for co-financing by the CEF Transport. The aim of the project was to equip 4 parking places for intelligent truck parking (ITP) for the D1 motorway near Ostrava City and the road border crossing to Poland (TEN-T Baltic-Adriatic Corridor) and to implement ITS traffic and travel information services (TTI) for ITSP. Technical requirements and specifications were published. The project was completed in 2019.

Additional information: (e.g. has a national access point been set up to provide truck parking data? Does it include dynamic data? What is the source of data (public / private)? Is data published on the European Access Point for Truck Parking hosted by DG MOVE? If not, is there any intention to do it in the future?)

There is no change of Czech NAP as regards the provision of truck parking information.

The NAP architecture is as interface for data distribution and traffic information registry. Traffic information is available at the technical interface of the NDIC and contains a description incl. profile, scheme and registry patterns (available online: http://registr.dopravniinfo.cz/cs/index.html).

Based on the experience with the exchange of cross-border traffic data, carried out by the EU CROCODILE project, NDIC simplified the license conditions in regards of the model user agreement (originally published in 2006) for the free provision of traffic information (data accessible to third parties).

2.4 Priority area IV. *Linking the vehicle with the transport infrastructure*

2.4.1 Description of the national activities and projects

Description of the relevant initiatives, their objective, timescale, milestones, resources, lead stakeholder(s) and status: in particular, provide information on the C-ITS deployment initiatives and their technical specifications.

C-Roads Czech Republic will deploy C-ITS services across motorways, urban nodes and a unique pilot site focused on verifying the use of C-ITS for enhancing railway crossing safety, aiming to prevent collisions between trains and road vehicles. A hybrid communication approach using ITS-G5 and 4G mobile networks will be used to provide the services.

The deployment of Cooperative ITS through the BaSIC project allowed the road operators to prepare for the new technologies and related installations on roadside. 2 year national real demonstration project for C-ITS, focussed on V2I and V2V. Two applications were selected for the trial on a section of Prague Ring Road between motorways D1 (Prague-Brno-Ostrava), D5 (Prague-Pilsen), and D8 (Prague-Dresden). The trial used VMS (Variable Message Signs), which were displayed to the driver on a screen in the vehicle. The first application (reduced speed limit) informed drivers of a speed reduction from 130km/h to 120km/h and warned of road works and maintenance vehicles travelling slowly ahead. The second application (emergency vehicle approaching) informed drivers about emergency vehicles on a mission. For V2I and V2V communications, the project used 802.11p and 802.11g networks and the standardised protocols DENM, CAM and FSAP.

C-Roads Czech Republic is made up of five Deployment & Tests pilot sites, split based on their geographical location and responsible implementation bodies. The project coordinator is the Ministry of Transport of the Czech Republic. Following project partners are responsible for realization of this project:

a) Deployment of C-ITS services via ITS G5:
    - Roads and Motorways Directorate of the Czech Republic (ŘSD)
    - City of Brno (via Brněnské komunikace)
    - Czech Railway Infrastructure Manager (Správa železnic, state organization)
    - City of Ostrava and Plzeň (via. their public transport companies)
    - AŽD Praha (railway level crossings)
b) Deployment of hybrid C-ITS system based on ITS G5 and current LTE technologies:
    - O2 Czech Republic
    - INTENS Corporation
    - T-Mobile Czech Republic
    - Škoda Auto
c) Deployment of new cellular technologies (LTE-V):
    - T-Mobile Czech Republic
d) Evaluation and Assessment of implemented systems:
    - Czech Technical University in Prague, Faculty of Transportation Sciences (CTU)

The deployment of C-ITS system and services will be carried out at least on the following parts of the Czech road network split into individual DT´s:

DT1 Brno agglomeration covers the southern sector of the city of Brno, in particular the following roads / motorways:

- Part of motorway D1 (E50/E65) in approx. length of 28 km between km 182 and km 210
- Part of motorway D2

DT2 Brno city, this pilot covers 1st class radial roads connecting the city centre and outer ring road of Brno (motorway D1), as well as on the southern part of the Brno inner ring road. This DT will be closely coordinated with DT1 in order to supplement RSU installations on the major city roads. Concerning the lower class roads, RSU were installed on the Vídeňská street (due to its role as expressway out of Brno to Wien and significant traffic density) which create an important alternative route to the major roads.

DT3 – Motorways D1, D5, D11 and Class I/52 / D52 C-ITS equipment and services were deployed on the D1 motorway between Prague and Brno, D5 motorway between Prague and Rozvadov (German border), on the D11 motorway between Prague and Hradec Králové, and on the D52/I52 connection road between Brno and the Austrian border. Total length amounts to more than 360 km. This pilot site includes both cross-border locations – on the D5 motorway with Germany, and on the D52/I52 motorway/road with Austria.

- Motorway D1 (E50/E65) between Prague and Brno, where ITS-G5 technology is being deployed around the Brno agglomeration and cellular technology is being used for CITS services coverage on the remaining part of the motorway.

- Motorway D5 (E50) between Prague and the German border, where ITS-G5 technology is being deployed on the section between Prague and Plzeň (km 6 – km 90) and cellular technology is being used for C-ITS services coverage on remaining part of the motorway.
- Motorway D11 (E67) between Prague and Hradec Králové (km 0 – km 90), where ITS-G5 technology covers the whole motorway section and cellular technology is being used as a secondary communication tool for C-ITS service provision.
- Combined motorway D52 and 1st class road I52 (E461) from Brno to the Austrian border is covered by cellular technology to provide C-ITS services.

DT4 – Public transport deployment in cities of Plzen and Ostrava is implemented in existing city streets/roads and intersections with tram rail infrastructure. Suitable junctions equipped with traffic lights were selected for public transport priority use case as well as "dangerous" locations for passengers or critical collision points between public and individual transports will be identified for deployment of safety related applications.

DT5 – Railway crossing pilot - Railway network operator (Správa železnic) together with project partner AŽD are responsible for ITS G5 deployment, and LTE-based services are being offered by mobile phone operators O2 and T-Mobile. C-ITS services are available via hybrid ITS G5 / LTE system and the pilot is deployed on 2 level railway crossings. Both locations are equipped with security systems where one is equipped with barriers and one is without barriers. Another 2 level crossings have been identified and selected for enlargement of the pilot testing in the Czech Republic on the line no. 113 in the Ústí nad Labem region for deployment in the 1st half of 2020.

DT6 – Cross border testing, is situated mainly on the D5-A6 motorway (Czech – German border) and the I/57 – E59 road (Czech - Austrian border), but other C-Roads Czech Republic test sites may be selected as well. Cross-testing with other C-Roads Platform members on their pilot sites is also part of this activity. All C-Roads Platform partners are invited to the testing.

2.4.2 Progress since 2017

Description of the progress in the area since 2017:

As regards deployment of C-ITS system and services on defined C-Roads Czech pilot sites, following implementation was successfully completed in 2019 and the C-ITS system was put into operation. That allowed the project to proceed to the next step of starting C-ITS field-testing, cross border testing and evaluation. As for each Czech pilot sites:

DT1 – Brno road/motorway pilot site – On Brno road/motorway are installed 24 Roadside units (RSU). 57 Road-vehicle units (RVU) to lorries and movable trailers and 5 On-board units (OBU) to personal vehicles were installed to vehicles of Motorway Administration and Maintenance Centre Chrlice. The part of the project was also development of HMI application that is key interface for using and controlling information from C-ITS units.

DT2 – Brno urban pilot site – After completion of the preparatory works and selection of the supplier, the deployment was successfully completed. The C-ITS system (OBU and RVU units were installed in 11 vehicles - 1 company passenger car, 3 traffic lights service vehicles, 3 towing services vehicles, 3 salt spreaders trucks, 1 fire rescue response vehicle, RSU units were implemented in 31 locations - at 25 intersections and at 6 public lighting masts - and a C-ITS back office that can create

events for several use cases was put into operation in August 2019. In addition, the use-case of Public Transport preference was tested in the co-operation with an associated partner Public Transport Operator of Brno (DPMB). The fleet consisted of the following vehicles: 276 trams, 142 trolley-buses, 328 city-buses, in total 746 public transport vehicles.

DT3 – D1/D5/D11/D52 motorway pilot site – C-ITS system on this site was put into operation in October 2019. In total, on D5 road/motorway are installed 25 Roadside units (RSU). On D11 road/motorway are installed 24 Roadside units (RSU). Besides RSU were in the project DT3 installed C-ITS units to vehicles of five Motorway Administration and Maintenance Centres. The supplier installed 57 Road-vehicle units (RVU) to lorries, 16 Road-vehicle units (RVU) to movable trailers and 8 On-board units (OBU) to personal vehicles. One part of the project was also the development of HMI application.

DT4 – Public transport deployment in cities of Plzen and Ostrava – Installations of C-ITS equipment in public transportation system in Plzeň and Ostrava were finished in April 2019. Delivery consists of four primary components: Roadside units (RSU, 7pcs), Onboard units (OBU, 9 pcs), C-ITS back office and Mobile application. After the installations, extensive pilot tests have been performed in cooperation with both public transport companies. C-ITS complex tests were organized both in Plzen and Ostrava. These tests were primarily focused on the verification of C-ITS services in the public transport environment. Representatives of Public Transport Companies had a chance to create events defined by the standard via GUI of C-ITS back office. These events were then displayed on the test mobile application as the vehicle passed through the defined location. In addition, there were successfully tested also C-ITS services, which are currently uniquely tested only in the Czech Republic, however, specifications of these services were submitted to the C-Roads Czech Republic Project Steering Committee in December 2019 for approval and inclusion to the next release of the international C-Roads Specifications. The testing fully proved the functionality of the entire C-ITS system built within pilot area DT4 of C-Roads Czech Republic project. All scheduled test scenarios were successfully fulfilled. Within DT4 pilot area 9 pcs. on-board units were installed to trams, bus and trolleybus and 7 pcs. roadside units were installed to crossroads and tram crossings.

Comment: The C-ITS OBU units were installed by Transport Operator of Ostrava (DPO). Fleet consisted of the following vehicles: 242 trams, 68 trolley-buses, 300 city-buses, in total 617 public transport vehicles + 7 DPO company 7 service vehicles. Another 21 trams and 2 crossroads with traffic lights and 2 crossroads with railway switches were equipped by C-ITS units in Prague where further pilot testing took place. The implemented C-ITS system complies with the C-Roads Standards, although this implementation does not belong to the C-Roads Czech Republic project.

DT5 – Railway crossings pilot – Implementation and deployment of the RSU and Backoffice system was completed and the tailored C-ITS, RSU-RLX category equipment (type ITX10) for the RLX Use case was installed on two railway level crossings in September 2019. The pilot was started on the 2 railway level crossings in the Pardubice region: 1. on the Chrudim – Moravany railway line – the crossing no. P5013 only with warning lights without barriers, and the Pardubice - Havlíčkův Brod line at Horka – the crossing no. P5238 with warning lights and barriers. The ITS-G5 RSU units were deployed at both crossings. One solution uses G5 transmitters on both sides of the railway line and the second solution uses a high pole on side of the crossing but capable to transmit radio signal to both directions of the road coming to the crossing. The passing train shall not prevent the

transmitted signal access the cars coming from both sides of the line. The transmitted messages comply with the Specifications of RLX Use case. The additional 2 crossings in the Ústí n. L. region were deployed in the 1st half of 2020.

DT6 – Cross border testing – Both localities (Czech - German border and Czech - Austrian border) were originally planned for field testing in May 2020. Cross-border testing is postponed due to coronavirus epidemic situation.

Other activities related to the pilot project:

T-Mobile Czech Republic a.s. as a partner of C-Roads project in the Czech Republic focused in 2019 to build up the necessary infrastructure for C-ITS solution composed of the back office connected to the integration platform, hybrid mobile application communicating via G5 with other G5 components as well as communicating with the back office via standard LTE internet. In order to validate the full value chain of Traffic Jam Ahead messages under the conditions of the "low coverage" C-ITS systems (C-ITS with low penetration of G5 OBUs and G5 RSU), T-Mobile set-up a combined Floating Car Data service using both cellular as well as GPS data sources to generate valid traffic jam content for the Czech roads, so that the TJA messages could be tested in the entire C-Roads infrastructure of all project partners in realistic situations. Also, this created an opportunity for realistic user experience test which have proved the functionality of the full TJA message value chain from the content creation in proper C-ITS format of TJA messages according to specifications, distribution into integration platform, and, further to road operator back office and to its RSUs, and thereafter to OBUs and related HMI in testing cars. The same validation and user experience testing approach was used with primary meteodata as a source to create live (dynamic) and valid Weather Condition Warning messages. The last primary source for testing Other Hazardous Location Notices use case was a static hazard location database.

All the components and contributions were tested within T-Mobile continuous internal testing and validation and was a part of the Czech consortium field tests in Q1 2020.

In the next part of the project, T-Mobile tests also LTE-V technology for C-ITS systems. The LTE-V system is still under implementation, which started in the autumn 2019 and was finished in Q1 2020.

In 2019, following main outputs were implemented by C-Roads Czech Republic project partner O2 Czech Republic a.s.:

- Security - PKI for C-Roads – complete migration to the new security standard according to TS 103 097 1.3.1 has been completed; practically all processes from registration, through enrolment to authorization have been verified in the test environment. The solution was deployed in the operational environment in early 2020 by all project partners.
- Hybrid unit – complete delivery of hybrid C-ITS units has been completed according to the approved schedule. The delivered units were validated by certification laboratories for operation in automotive and railway vehicles (trams, trolleybuses …). The unit is ready for operational environment deployment, which was planned for 2020 after completion of field tests to confirm the compatibility of individual system elements.
- Integration Platform – All project partners have been connected to the production environment of the Integration Platform, which is a prerequisite for field tests and the launch

of C-Roads operational tests. At the same time, a filtering module was implemented on the platform, allowing each of the partners to manage the flow of messages they want to receive at their back office. Another important output was the commissioning of the central transformation of messages from the National Transport Information Centre (NDIC) from the Datex II standard to the C-ITS standard.

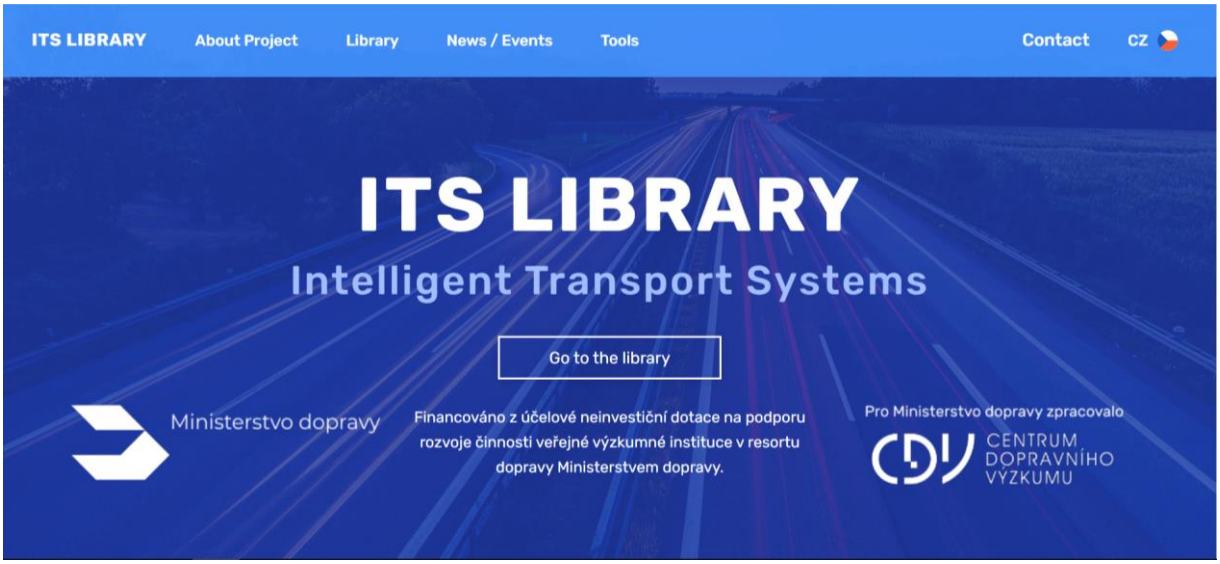
- Back office – all essential elements for managing the flow of messages from / to units, their processing, evaluation and display have been completed. BO was connected to the Integration Platform - testing and production. A module for visualization of all messages in the map background was put into operation, the module also allows entering and creating all types of C-ITS messages.
- Data privacy – the impact of privacy standards to the C-Roads project was analysed. Based on this analysis we have created a contractual document between the partners of the project dealing with the management and processing of the personal data.

2.5 Other initiatives / highlights

2.5.1 Description of other national initiatives / highlights and projects not covered in priority areas 1-4:

Description of the relevant initiatives, their objective, timescale, milestones, resources, lead stakeholder(s) and status:

Web platform "ITS Library" was custom-made by Transport Research Centre (known respectively by the Czech language abbreviation CDV) for the Ministry of Transport. Online web platform is available at this link: https://www.its-knihovna.cz/en (not yet complete, still in construction).



ITS Library aims to establish an ITS and C-ITS knowledge-base for professionals as well as for general public. Web platform is comprised of number of information and links to internet-based information as well as invitations to conferences and other training actions relevant to ITS and C-ITS, grouped under appropriate headings. Another aim is to support planning, approval and subsequent progress monitoring process of ITS and C-ITS projects that are contained in the national strategy. Data about

ITS and C-ITS project plans and implementation projects are collected by entering a required information in the specific section of the ITS Library website. An additional aim is to support the continual monitoring of key performance indicators of implemented ITS projects (TEN-T KPI) through a dedicated SW tool.

In 2019, the project named "*Use of the Czech Republic Geographic Data Fundamental Base* (ZABAGED) *for designing precise navigation applications for visually impaired or disabled passengers in public transport*" was realised. Project under its code TIRSMD704 was financed under the Beta 2 programme of the Technology Agency of the Czech Republic (TA CR) on the basis of terms of reference created by the Ministry of Transport of the Czech Republic. The initial idea was to create conditions to continuous use of mobile application which will enable mobility more independent and easier for disabled people in public transport and in the publicly accessible areas. The aim of the project was to verify the feasibility of using ZABAGED state's map work for the navigation software adaptation, specifically for navigation of visually impaired or disabled passengers in public transport. In order to increase the position accuracy in the provided information for visually impaired users another aim was to verify the feasibility of position sensors integration. Through the integration of positioning data from different GNSS systems (GPS, Glonass a Galileo) and position sensors (odometer, accelerometer) the accuracy and reliability of position determination was verified. An integral part of the project was testing the solution in real service with volunteer's blind users.

The result of the project is a walking navigation which uses the footpaths, pavements and zebra crossings and it is specifically tailored to the needs of visually impaired and/or disabled people. ZABAGED state's map work and digital technical map of the Capital City of Prague were converted to enable the navigation use for visually impaired or disabled people. Currently the coverage across the Czech Republic is ensured. Project results are available free of charge and can be utilised by other cities. In case of interest the request can be communicated to info@navics.cz.

The DPMBinfo app, launched by the Brno Public Transport Company (DPMB), allows users to search for connections and access up-to-the-minute information about delays and changes to the service. Following upgrades to the mobile app, it can also be used to purchase tickets and view live departure boards for any stop. Most popular is a DPMBinfo app feature that shows the current location of trams, city buses and trolleybuses and current departures.

The Prague Public Transport Company (DPP) plans to purchase multi-frequency receivers with an antenna for all its entire fleet of trams (more than 800 units). This will enable them to receive signals from the European navigation system Galileo, as well as GPS, Glonass and BeiDou.

Real-time information about the position of city and suburban buses of Prague Integrated Public Transport System (PID) are available through the mobile application mapa.pid.cz**.** This application offers information about more that thousand operating bus services regarding bus positions and routing, delays, barrier-free accessibility to a particular bus connection and other additional information. So far, tram and trains monitoring are missing.

2.5.2 Progress since 2017

Description of the progress in the area since 2017:

See the chapter 2.5.1 Description of other national initiatives / highlights and projects not covered in priority areas 1-4.

3 Key Performance Indicators (KPIs)

*Note: **The EC document on "ITS KPIs for the EU" is to be used for comprehensive definitions of the KPIs and further guidance. The EU EIP Activity 5 report on "ITS Deployment and Benefit KPIs definitions" is a complementary document providing in particular estimation methods.***

KPI will be reported separately by type of road network / priority zone / transport network and nodes (when appropriate).

The Government of the Czech Republic adopted the Government Resolution No. 684 of 30 September 2019, which tasked the Ministry of Transport to lay down specific actions to implement the proposals included in the position of Ministry of Transport on the Audit Report of the Supreme Audit Office under number 18/34 titled "Implementation of intelligent transport systems (ITS) in the road infrastructure of the Czech Republic".

One of the proposals was to implement measures in order to ensure the monitoring of the implementation and operation of individual ITS projects' impact through key performance indicators concerning changes in travel time (in both the smooth traffic flow and congestion), changes in accident rates and impacts on public health and environment.

Until today, however, no sufficient tool has become available due to inadequately prepared ŘSD internal methodologies for data collection from different sources, data storage and related evaluation process. In addition to the software tools design and development, systematic activities have been carried out for setting harmonised in relation to work with data including historical data.

The overview below lists for activities performed in the period 2017-2020 by the Ministry of Transport in order to create a sufficient KPI tool - **software "TEN-T KPI" for automatic monitoring of defined ITS indicators on TEN-T network on the territory of the Czech Republic**.

The main purpose of this tool is to user-friendly and continuously evaluate selected key performance indicators (KPIs) through data integration using principles of Big data. This work took into account the European Commission's document "Intelligent transport systems Key performance indicators for the EU" which was adjusted to the conditions of the Czech Republic.

Following steps have been taken:

a) Implementation in the period 2017-2018:

1. Drawing up document relating to ensure interoperability and continuity for the deployment and operational use of ITS in compliance with Delegated Regulations supplemented ITS Directive

2. Drawing up methodology for the calculation procedure using the information system for individual KPI down to a single use-cases adapted for the Czech Republic environment

3. Software architecture design of a tool which by using digital evidence will enable to enter data of individual implemented ITS projects into the database and by using the integrated data sources to automatically evaluate KPIs

4. Detailed design of data collection methods, data aggregation, intermediate storage and a set algorithm to data fusion based on mutual information for KPI evaluation

5. Definition of data sources and provision of data acquisition from individual integrated systems

6. Software tool development

7. Drawing up requirements for data sources consistency

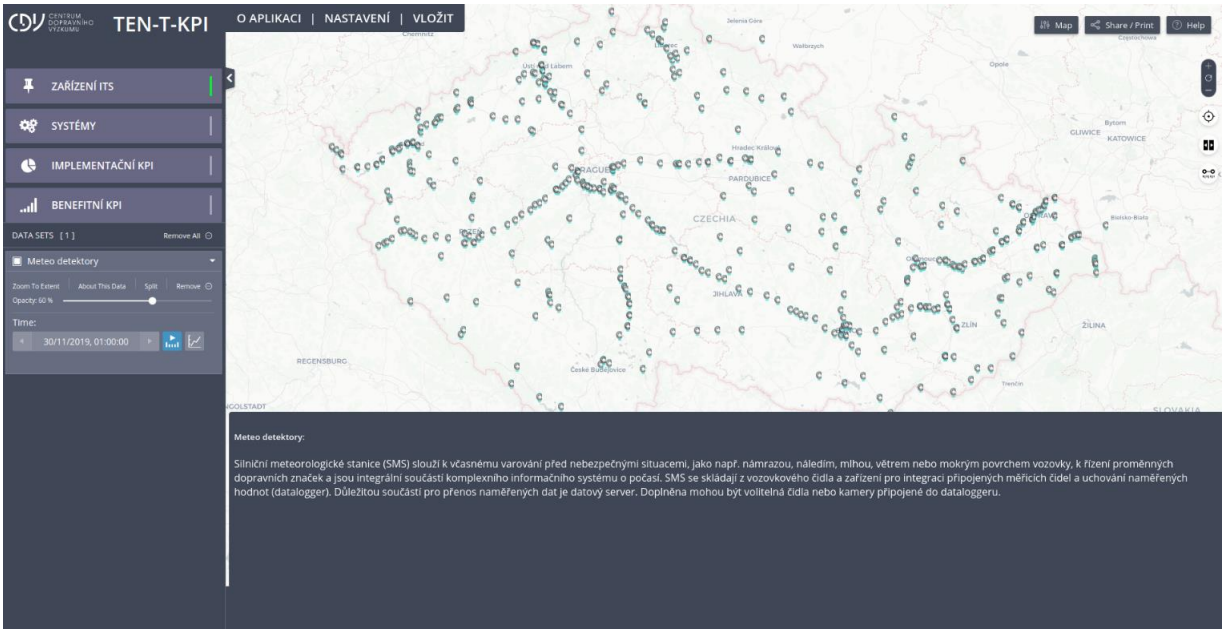
8. Drawing up methodology for audit procedure of data sources consistency

9. Preparatory works for testing of KPI tool and an examination of the operational phase

b) <u>Implementation in the period 2018-2020</u>:

10. Data sources for software tool:

- Data from all available traffic detectors (ASIM, strategic detectors, ESVZ, portable detectors before the beginning of closures, CSD)
- Static and semi-static data (GIS, map layers, portable elements – installation etc.)
- Data from the electronic toll collection system
- Floating Car Data
- Data from accident database
- Data from a network of meteorological detectors
- Data on ITS actuators location
- Digital map data



Evidence base and data model design for detailed documentation of the motorway network (passportization as it is called) analysis study is being carried out.

The study on harmonised systematization of ITS devices data operated by ŘSD is under preparation.

Another important factor for the start of KPI data evaluation is to enable a direct data export from passportization software to KPI software tool. Immediately when the data export will be put into operation it will be possible to use results from "TEN-T KPI" tool.

In 2020, preparatory work was undertaken on designing a tool for KPIs monitoring on the road infrastructure operated by the Roads and Motorways Directorate of the Czech Republic (ŘSD). That work has not yet been completed. For this reason, **no KPI information** below is **provided**.

It is assumed that since 2021 the automatic monitoring of KPIs becomes operational.

3.1 Deployment KPIs

3.1.1 Information gathering infrastructures / equipment (road KPI)

Figures to be provided by type of network / zone.

Figures to distinguish fixed and mobile equipment.

KPI to be calculated by type of network / zone (when relevant).

- Length of road network type / road sections (in km) equipped with information gathering infrastructures & Total length of this same road network type (in km):

- KPI = (kilometres of road network type equipped with information gathering infrastructures / total kilometres of same road network type) x 100

3.1.2 Incident detection (road KPI)

Figures to be provided by type of network / zone.

KPI to be calculated by type of network / zone (when relevant).

- Length of road network type / road sections (in km) equipped with ITS to detect incident & Total length of this same road network type (in km):

- KPI = (kilometres of road network type equipped with ITS to detect incident / total kilometres of same road network type) x 100

3.1.3 Traffic management and traffic control measures (road KPI)

Figures to be provided by type of network / zone.

KPI to be calculated by type of network / zone (when relevant).

- Length of road network type / road sections (in km) covered by traffic management and traffic control measures & Total length of this same road network type (in km):

- KPI = (kilometres of road network type covered by traffic management and traffic control measures / total kilometres of same road network type) x 100

3.1.4 Cooperative-ITS services and applications (road KPI)

Figures to be provided by type of network / zone.

KPI to be calculated by type of network / zone (when relevant).

- Length of road network type / road sections (in km) covered by C-ITS services or applications & Total length of this same road network type (in km):

- KPI = (kilometres of road network type covered by C-ITS services or applications / total kilometres of same road network type) x 100

3.1.5 Real-time traffic information (road KPI)

Figures to be provided by type of network / zone / node.

KPI to be calculated by type of network / zone / node (when relevant), and if relevant indicate the proportion of services accessible to passengers with reduced mobility, orientation and/or communication.

- Length of road network type / road sections (in km) with provision of real-time traffic information services & Total length of this same road network type (in km):

- KPI = (kilometres of road network type with provision of real-time traffic information services / total kilometres of same road network type) x 100

3.1.6 Dynamic travel information (multimodal KPI)

Figures to be provided by type of network / zone / node.

KPI to be calculated by type of network / zone / node (when relevant), and if relevant indicate the proportion of services accessible to passengers with reduced mobility, orientation and/or communication.

- Length of transport network type (in km) with provision of dynamic travel information services & Total length of this same transport network type (in km):

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

- KPI = (kilometres of transport network type with provision of dynamic travel information services / total kilometres of same transport network type) x 100

- KPI = (number of transport nodes with provision of dynamic travel information services / total number of same transport nodes) x 100

3.1.7 Freight information (multimodal if possible or road KPI)

Figures to be provided by type of network / zone / node.

KPI to be calculated by type of network / zone / node (when relevant), and if relevant indicate the proportion of services accessible to passengers with reduced mobility, orientation and/or communication.

- Length of road network type / road sections (in km) with provision of freight information services & Total length of this same road network type (in km):

- Number of freight nodes (e.g. ports, logistics platforms) covered by freight information services & Total number of the same freight nodes:

- KPI = (kilometres of road network type with provision of freight information services / total kilometres of same road network type) x 100

- KPI = (number of freight nodes with provision of freight information services / total number of same freight nodes) x 100

3.1.8 112 eCalls (road KPI)

N.a. – will be provided through the COCOM 112 questionnaire

3.2 Benefits KPIs

3.2.1 Change in travel time (road KPI)

Figures to be provided also include vehicle.km for the route / area considered

KPI = ((travel time before ITS implementation or improvement – travel time after ITS implementation or improvement) / travel time before ITS implementation or improvement) x 100

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

Results shall be provided / aggregated at national level to be representative enough. If possible, distinction can be made between accidents resulting in deaths, serious injuries or slight injuries.

Figures to be provided also include vehicle.km for the route / area considered.

- Number of road accident resulting in death or injuries before ITS implementation or improvement:

- Number of road accident resulting in death or injuries after ITS implementation or improvement:

3.2.3 Change in traffic-CO2 emissions (road KPI)

Routes / areas where ITS has been implemented or improved should be specified. Length along / area within which the change in CO2 emissions is calculated should be long / wide enough to be representative.

KPI = ((traffic CO2 emissions before ITS implementation or improvement – traffic CO2 emissions after implementation or improvement) / traffic CO2 emissions before ITS implementation or improvement) x 100

3.3 Financial KPIs

ITS includes any types of systems and services altogether.

Annual investment in road ITS (as a % of total transport infrastructure investments):

Annual operating & maintenance costs of road ITS (in euros per kilometre of network covered):