Slovenia ITS Implementation Report 2025

Implementation of Directive 2010/40/EU and its Delegated Regulations

Republic of Slovenia – Ministry of Infrastructure (MZI)
National Traffic Management Centre (NCUP)
November 2025

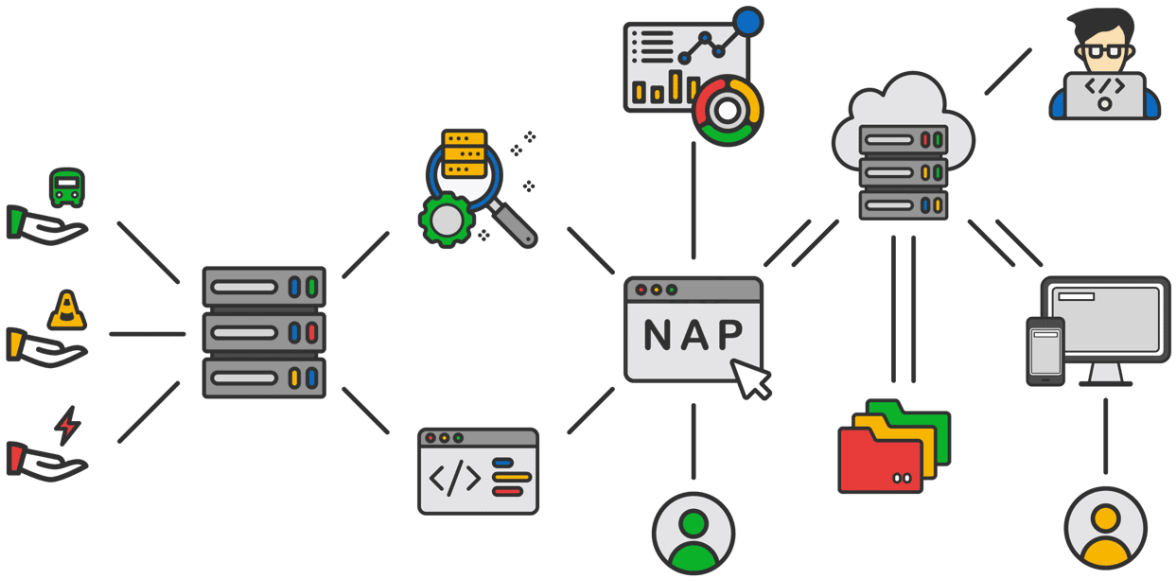
Table of contents

Executive Summary

The Republic of Slovenia has achieved substantial progress in implementing Directive 2010/40/EU and its Delegated Regulations, transforming its Intelligent Transport System (ITS) environment into a comprehensive, interoperable, and data-driven ecosystem that supports multimodal and cross-border mobility.

Although Slovenia does not have a separate national ITS Strategy, the implementation framework is clearly defined through the **Road Act (ZCes-2B)**, which transposes Directive 2010/40/EU into national legislation (Article 8.a – "Intelligent Transport Systems"), and through the **Transport Development Strategy of the Republic of Slovenia by 2030**. Together, these documents form the policy and legislative backbone for ITS deployment in Slovenia.

ITS implementation is led by the **Ministry of Infrastructure (MZI)**, with the **National Traffic Management Centre (NCUP)** acting as the operational and technical authority responsible for system integration, data exchange and open-access information services through the **National Access Point (NAP Slovenia)**.



Slika 1: Illustration of the data flow on the Slovenian NAP.

The NAP is not a separate institution but a digital infrastructure managed and maintained by NCUP, ensuring that transport data, traffic information and multimodal travel services are accessible in open, harmonised formats.

Key achievements 2018–2025:

- Full implementation of the Delegated Regulations (EU) 885/2013, 886/2013, 962/2015, 2017/1926, and 2022/670 across all relevant ITS domains.
- Development of a **Floating Car Data (FCD) platform** within NCUP, providing near-real-time information from thousands of vehicle probes per day.
- Deployment of **C-ITS Day 1 services** and hybrid communication (ITS-G5 and LTE) covering 100 % of the TEN-T motorway network. About 50 % of the TEN-T motorway network is covered by C-ITS roadside units.
- Introduction of **Digital Traffic Management Plans (TMPs)** via the CROCODILE 3 project for cross-border coordination with Austria, Croatia, Italy and Hungary.
- Publication of **TN-ITS data** (speed limits) for motorway network through NAP Slovenia.
- Establishment of **SiMO**, the national multimodal journey planner, compliant with Delegated Regulation (EU) 2017/1926 and the OJP (Open Journey Planner) specification.
- Continuous participation in the **C-Roads Platform** and its continuation **C-Roads Extended (2024–2027)**, ensuring harmonised C-ITS deployment and interoperability testing.
- Active contribution to **NAPCORE**, the European coordination mechanism for National Access Points, and preparation for **NAPCORE-X (2025–2027)**, the continuation phase expanding on metadata harmonisation and quality frameworks.

Through these achievements, Slovenia ensures interoperability, service continuity and open data reuse, directly supporting the EU's digitalisation, safety and decarbonisation goals.

1 Introduction

1.1 National Context

Slovenia lies at the intersection of two strategic European transport axes: the **Baltic–Adriatic Corridor** and the **Mediterranean Corridor**. Its geographic position makes it a vital hub for freight transport, cross-border travel and intermodal connections between Central Europe, the Balkans and the Adriatic. The national transport network covers approximately **38,000 km of roads**, of which **1,200 km** form part of the TEN-T core and comprehensive network.

Legal and Institutional Background

The development, deployment and management of Intelligent Transport Systems (ITS) in Slovenia are defined primarily in the **Road Act (ZCes-2B)**. Article 8.a of this Act introduces the legal basis for ITS, stating that ITS shall ensure **interoperability, data availability, safety and environmental sustainability**. It explicitly designates:

- the **Ministry of Infrastructure (MZI)** as the **competent authority** for ITS coordination and reporting to the European Commission, and

- the **National Traffic Management Centre (NCUP)** as the **technical and operational authority**, responsible for national ITS deployment, system operation, data exchange and management of the **National Access Point (NAP Slovenia)**.

This legislative framework provides the foundation for implementing all Delegated Acts of the Directive, including:

- (EU) 885/2013 – Safe and secure truck parking information,
- (EU) 886/2013 – Safety-related traffic information (SRTI),
- (EU) 962/2015 and 2022/670 – Real-time traffic information (RTTI),
- (EU) 2017/1926 – EU-wide multimodal travel information services.

The Road Act is further complemented by technical guidelines and implementing acts, notably:

- the **Technical Specification on FCD, DATEX II, and TPEG XML Data Exchange** (2022),
- internal **NCUP operational rules** defining data-quality, security and publication procedures,
- and provisions adopted through EU co-funded projects (e.g. NCUP 2, CROCODILE 3, TN-ITS GO).

Policy Environment

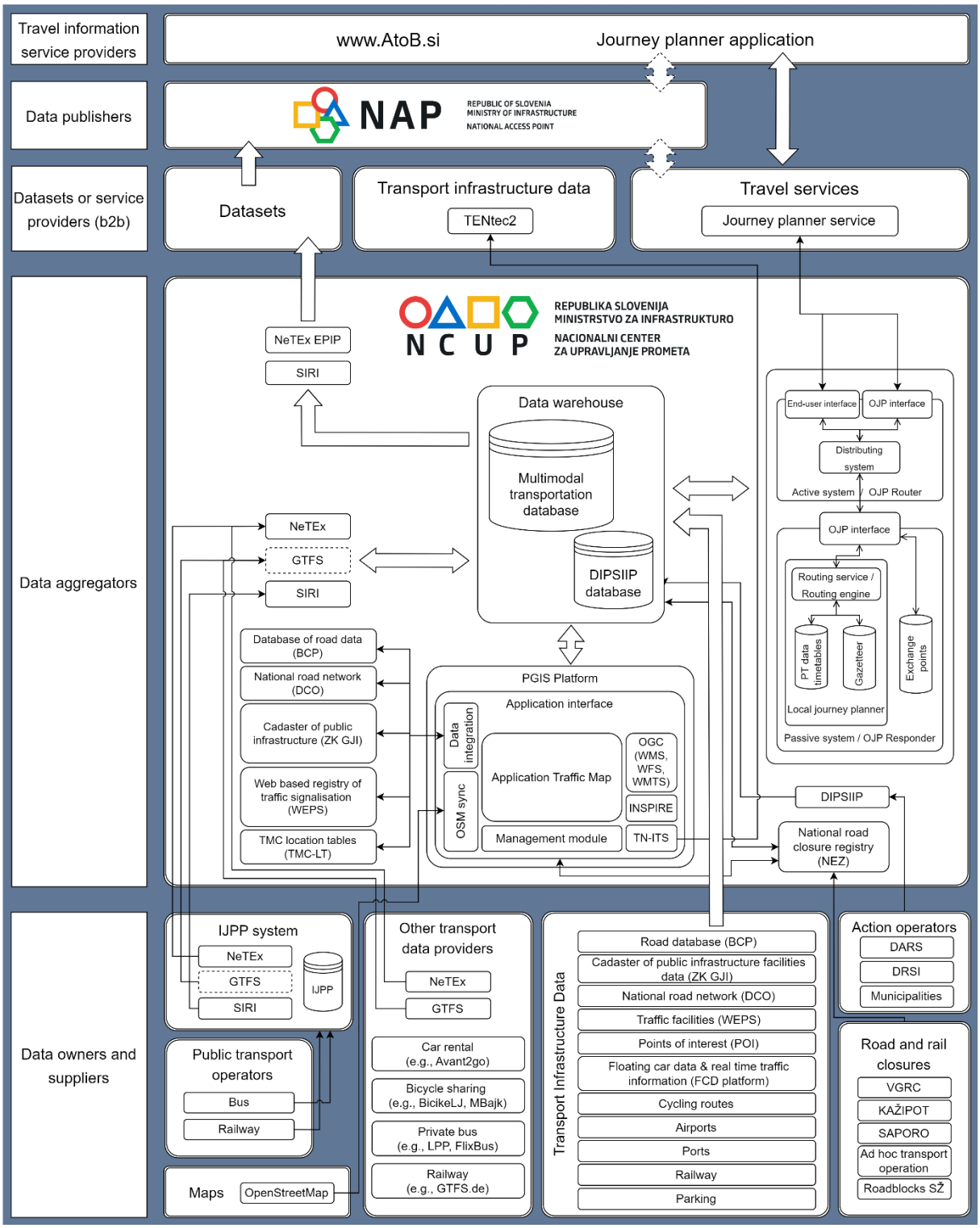
While Slovenia does not yet have a dedicated ITS Strategy, the principles of ITS are firmly integrated into the **Transport Development Strategy of the Republic of Slovenia by 2030** (*Strategija razvoja prometa v RS do leta 2030*), adopted by the Government in 2017.
The Strategy identifies digitalisation and the intelligent management of infrastructure as horizontal goals across all transport modes.
It explicitly commits to:

- **enhancing digital infrastructure** to support data-based management of transport systems;
- **ensuring interoperability** between road, rail, maritime and air transport information systems;
- **encouraging sustainable mobility** through integrated multimodal information services;
- **increasing traffic safety** via C-ITS and data-driven road-management tools;
- and **aligning national systems** with EU interoperability standards.

Together, the Road Act and the Transport Development Strategy ensure that Slovenia's ITS development is legally secure, strategically oriented, and harmonised with the objectives of Directive 2010/40/EU and the updated Directive (EU) 2023/2661.

Operational Context

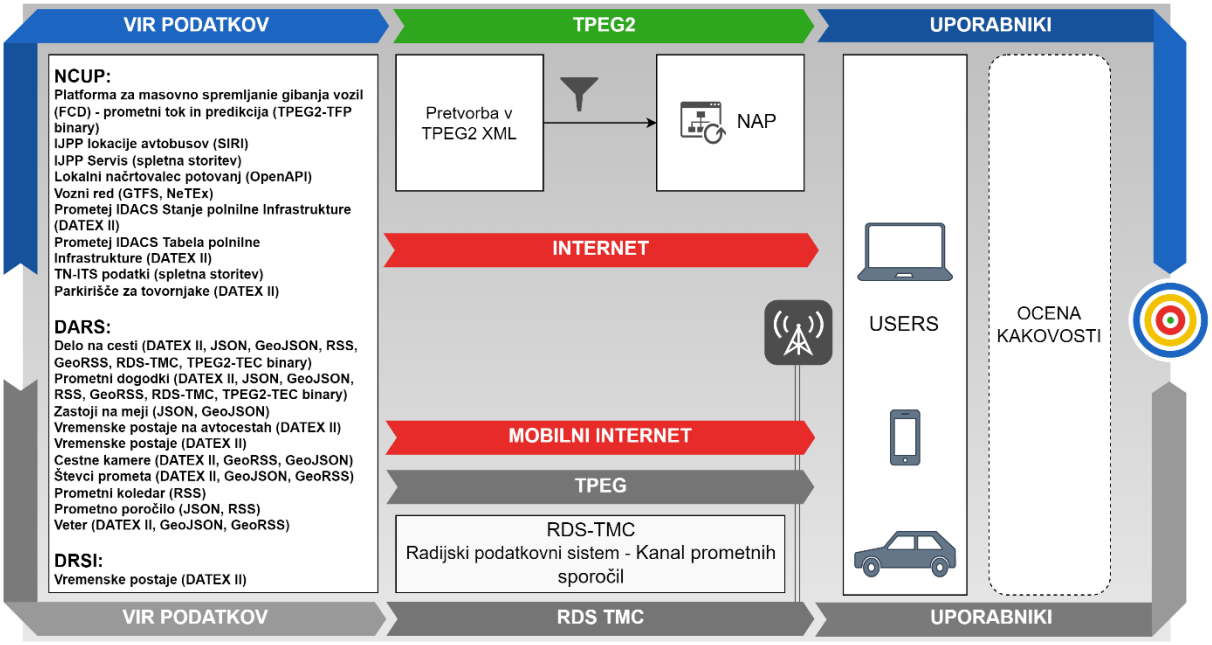
The Slovenian Ministry of Infrastructure establishes Slovenia's vision to further develop its transport infrastructure and therefore exploit the competitive advantages arising from its geographical position, highly favourable to transport, and from the country's natural and cultural features. Regarding the vision for the development of intelligent transport systems in Slovenia, it seems relevant to provide an overview on the national ecosystem related to ITS of the **National Traffic Management Centre, (Nacionalni Center za Upravljanje Prometa – NCUP)** (Figure 1), one of the main national actors involved with ITS deployment. The figure illustrates the involved stakeholders, services, systems, platforms, data and the connections/flows between them. NCUP primarily gathers, analyses and processes all available information on the road and traffic conditions, encompassing also multimodal-related information. The **purpose of the NCUP is to serve mainly as the data warehouse for all accessible traffic data, and to provide all necessary services within the scope of Intelligent Transport Systems (ITS)**, as well as the information necessary for traffic control and management.



Slika 2: NCUP ITS ecosystem diagram.

The NCUP's **Floating Car Data (FCD) platform**, launched under the **NCUP 2 (CEF 2016-SI-TM-0229-W)** project, processes over **5 million vehicle-probe records per day**, generating real-time speed and congestion profiles and travel-time estimations. This system is integrated with the

DATEX II v3 node for standardised data exchange and the **TPEG XML** broadcasting system for public dissemination.



Slika 3: System diagram with sources and conversions of traffic information and quality assessment

All information is published via the **NAP Slovenia** portal (www.nap.si), which provides harmonised access to static, dynamic, and multimodal datasets. NAP Slovenia is a core component of the national digital infrastructure and the country's entry point to the European data space for mobility. Its metadata catalogue complies with **mobilityDCAT-AP v2.0**, developed under the **NAPCORE** initiative.

1.2 National ITS Policy and Implementation Framework

Institutional Coordination and Governance

ITS implementation in Slovenia is governed by a **multi-level structure**, where:

- **MZI** provides the policy and regulatory framework,
- **NCUP** ensures technical implementation and coordination,
- **sectoral agencies** (DARS, DRSI, AVP) manage data generation, and
- **municipal centres** ensure local ITS integration.

Key participating institutions and their roles:

Institution	Role / Responsibility
Ministry of Infrastructure (MZI)	National authority responsible for ITS policy, EU coordination, and reporting.
National Traffic Management Centre (NCUP)	Technical and operational body managing NAP Slovenia.
DARS d.d.	Motorway Company managing motorway operations, static and dynamic data provision, C-ITS infrastructure.
DRSI	Infrastructure Agency responsible for static and dynamic data provision.
AVP	Traffic Safety Agency supervising SRTI and eCall services.
Municipal Centres	Operate urban traffic systems and exchange data with NCUP.

Funding and Development Instruments

ITS development is financed by a mix of **national and EU funds**, primarily:

- State budget (MZI, DRSI, DARS, AVP);
- **CEF Transport** for large-scale infrastructure and data-integration projects (NCUP 2, C-Roads Slovenia, CROCODILE 3, X4ITS, TN-ITS GO, NAPCORE);
- **public–private partnerships** for telematics and value-added data services.

Operational Programmes and Key Projects

Project	Period	Objectives and Achievements
NCUP 2 (CEF 2016-SI-TM-0229-W)	2018–2026	Integration of traffic-management systems, FCD analytics, DATEX II v3 node, and TPEG XML broadcasting.
C-Roads Slovenia I & II	2016–2023	Deployment of Day 1 C-ITS and hybrid communication (G5/LTE) across the TEN-T network; continued in **C-Roads Extended (2024–2027)**.
CROCODILE 3	2018–2022	Implementation of Digital TMPs and cross-border data exchange with Austria, Croatia and Hungary.
TN-ITS GO	2018–2021	Establishment of TN-ITS data publication chain for geometry and regulation updates.

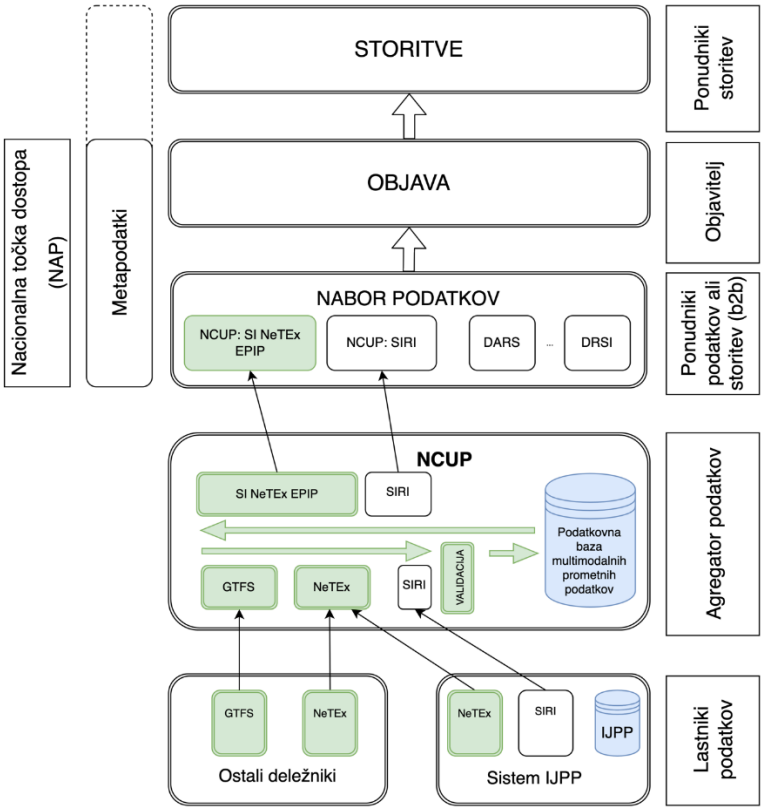
Project	Period	Objectives and Achievements
NAPCORE	2021–2025	Coordination of National Access Points and harmonisation of metadata; continuation under **NAPCORE-X (2025–2027)**.
SiMO (OJP & Multimodal)	2020–ongoing	National multimodal journey planner integrating public transport, road, cycling and walking data.

NCUP is involved in several activities aligned with the scope of the Directive 2010/40/EU, and its defined priority areas (Article 3): the provision of EU-wide multimodal travel information services; the provision of EU-wide real-time traffic information services; data and procedures for the provision, where possible, of road safety related minimum universal traffic information free of charge to users; the harmonised provision for an interoperable EU-wide eCall; the provision of information services for safe and secure parking places for trucks and commercial vehicles; and the provision of reservation services for safe and secure parking places for trucks and commercial vehicles.

Multimodal services, DATEX II, NeTEx, CROCODILE, C-Roads, Safe and secure truck parking, Location table, RDS-TMC, Safety related messages, Location referencing, Traffic model, TN-ITS GO are some of the projects/services at NCUP's care.

An upgrade of integrated public passenger transport (IJPP) systems is being carried out to provide dynamic data by upgrading IJPP terminals with all means of transport included in the IJPP system (https://www.enarocanje.si/Obrazci/?id_obrazec=367268). Functional provision of dynamic IJPP data on the realization of planned public passenger transport routes in real time is carried out by upgrading the GTFS (from "General Transit Feed Specification" to "GTFS Realtime"). At the same time, the SIRI web service will be established in accordance with data structures to provide exchange of data according to CEN/TC 278 standards (Transmodel, NeTEx and SIRI and OpenAPI). The contractor will provide the data of vehicles in motion ("raw Floating Car Data") for public passenger transport and ensure their continuous transmission in real time to the NTMC information system (National Traffic Management Center).

At the same time, the project "Integration of traffic management in the National Center for Traffic Management 2", co-financed by the Connecting Europe Facility 2016-SI-TM-0229-W, is being carried. As part of the "A3 - Multimodal Services" activity, multimodal services at all levels were integrated, from national to regional, including cross-border connections (such as the pilot solution of the "LinkingDanube" project). NCUP is working on integrating the local route planner in conjunction with a central distributed travel planner for the Danube Region Journey Planner (DJRP) and connecting the local LJP access point to a central hub ("CN - Central Node").

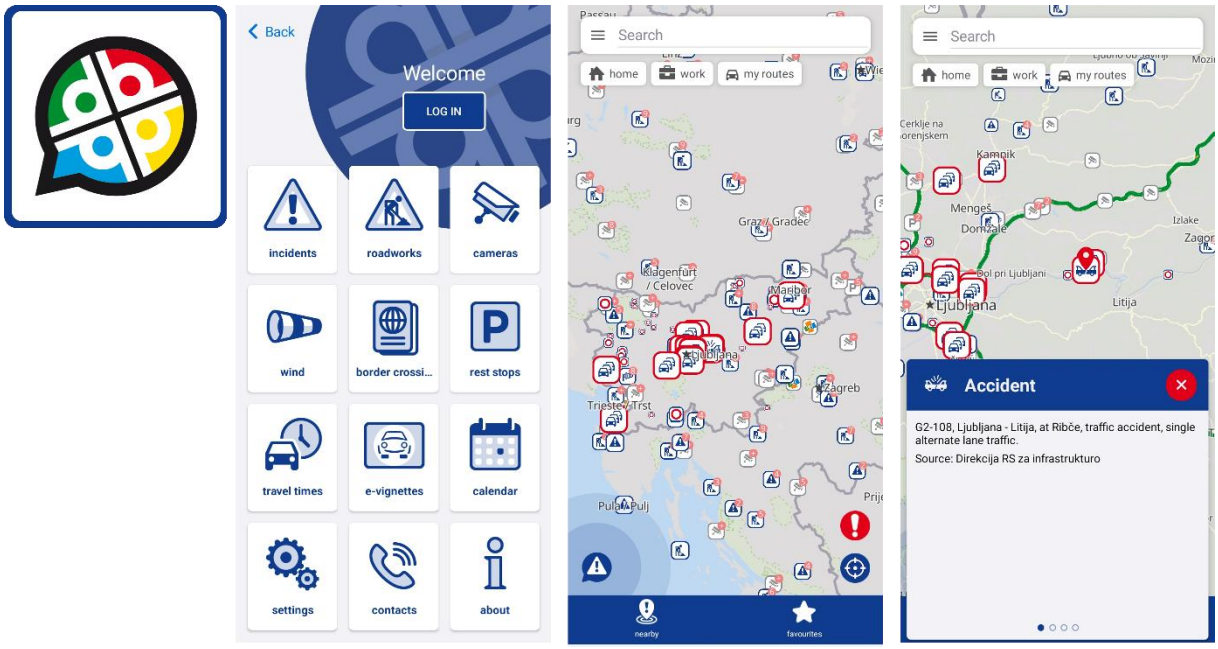


Slika 4: IT architecture of the NCUP multimodal services summarized in a data flow.

Monitoring and Evaluation

Implementation progress is monitored through annual NCUP and MZI reports, aligned with DG MOVE's ITS implementation indicators:

- network coverage (TEN-T, comprehensive network),
- service availability (RTTI, SRTI, MMTIS),
- data-quality metrics (accuracy, update frequency),
- cross-border interoperability results,
- user uptake of national platforms (Promet.si, DarsPromet+, SiMO).



Slika 5: . Screenshots of the DarsPromet+ mobile app.

1.3 Institutional and Organisational Arrangements

Slovenia's institutional framework for the implementation of Directive 2010/40/EU combines a clear legal foundation with operational maturity and cross-sectoral coordination. Competences are divided between the **Ministry of Infrastructure (MZI)** as the policy and regulatory authority and the **National Traffic Management Centre (NCUP)** as the strategic coordinating body for ITS. Operational bodies, sectoral agencies (DARS, DRSI, AVP) and local authorities (Ljubljana, Maribor, Koper) act as data providers and service operators within the national ITS ecosystem.

Ministry of Infrastructure (MZI)

The **MZI Directorate for Roads** and the **Directorate for Railways, Cableways and Transport Management Directorate** oversee all national activities related to Directive 2010/40/EU and its delegated acts.
Its key roles are:

- drafting and adopting legal acts (notably the Road Act ZCes-2B, Articles 118-122 on ITS and C-ITS);
- representing Slovenia in the **EU ITS Committee**, C-Roads platform, **DATEX II Technical Committee**, and **NAPCORE Coordination Board**;
- coordinating EU-funded ITS projects and ensuring compliance with CEF, Horizon Europe, and Digital Europe requirements;
- preparing and approving the national **ITS Implementation Report** for DG MOVE.

The Ministry still aims to establish the **National ITS Coordination Board**, composed of representatives from NCUP, DARS, DRSI, AVP, the Traffic Police Directorate, and major municipalities.

National Traffic Management Centre (NCUP)

The **NCUP** is the operational backbone of the Slovenian ITS framework. It is managed by MZI and located within the Ljubljana Motorway Control Centre. NCUP ITS systems operate 24 / 7 and integrate real-time data from:

- more than 1.200 inductive loops,
- 420 CCTV cameras,
- 150 meteorological stations,
- and over 5 million daily FCD (vehicle-probe) records.

Core functions include:

- **Traffic monitoring and control** – processing traffic speeds, flow, density and incidents;
- **Data fusion and quality assessment** – using DATEX II v3 profiles and automated validation;
- **Information dissemination** – via Promet.si, DarsPromet+, and NAP Slovenia;
- **Cross-border coordination** – real-time exchange with Austria (ASFINAG), Croatia (HAC / HC), Hungary (Magyar Közút) and Italy (Autovie Venete);
- **System security and continuity**, redundant servers, and 24 / 7 operation.

NCUP manages the **National Access Point (NAP Slovenia)** on behalf of MZI. The NAP provides harmonised and open access to static, dynamic and multimodal data (DATEX II v3, TN-ITS, NeTEx, SIRI). Metadata are aligned with **mobilityDCAT-AP v2.0** under **NAPCORE**. Quality indicators (accuracy, timeliness, completeness) are monitored through automated validation reports.

Sectoral and Associated Institutions

Institution	Core Responsibilities
DARS d.d. (Motorway Company of Slovenia)	Operates motorway ITS and C-ITS infrastructure (VMS, RSUs); publishes traffic data to NCUP; operates the Digital TMPs; manages safe and secure parking information.

Institution	Core Responsibilities
DRSI (Slovenian Infrastructure Agency)	Maintains State Road Database; publishes traffic data to NCUP.
AVP (Traffic Safety Agency)	Oversees Safety-Related Traffic Information (SRTI).
Municipal ITS Centres	Integrate urban traffic management and multimodal services (Ljubljana, Maribor, Koper) with NCUP.

This institutional framework ensures that all actors contribute to the national ITS ecosystem under MZI's supervision and that all datasets are published through the NCUP-operated NAP.

Public – Private Co-operation

Slovenia promotes partnerships with private stakeholders in data collection, processing and service delivery. Telecom operators, navigation companies (HERE, TomTom, Google Maps) and logistics providers supply FCD and use NAP APIs for service innovation. These co-operations are formalised through Memoranda of Understanding under **NAPCORE**, ensuring data standards and metadata conformity throughout the EU.

1.4 EU and International Cooperation

Given its location on two major TEN-T corridors and its transit role, Slovenia has made international co-operation the cornerstone of ITS implementation.
NCUP and MZI are active members of the EU's main ITS platforms and projects, ensuring technical and organisational alignment with European standards.

C-Roads Platform and C-Roads Extended

Slovenia has been a core partner of the **C-Roads Platform** since its launch in 2016, working alongside ASFINAG (Austria), Autovie Venete (Italy) and HAC (Croatia) on the interoperable deployment of Co-operative Intelligent Transport Systems (C-ITS).
The two national projects – **C-Roads Slovenia I (2016-2020)** and **C-Roads Slovenia II (2021-2023)** – enabled the installation of 20 RSUs on TEN-T motorways (A1, A2, H3), ensuring complete coverage for Day 1 services (hazard warning, roadworks information, weather alerts, in-vehicle signalling). Testing confirmed full interoperability with neighbouring systems.

The follow-up initiative **C-Roads Extended (2024-2027)** is officially recognised as **the continuation of the C-Roads Platform**, building on its legacy and extending hybrid communication and automation use cases (V2X over 5G, Day 2 services). NCUP and DARS participate in the

platform's Working Groups on interoperability, hybrid communication architecture and data security.

CROCODILE 3

Within the **CROCODILE 3 (2018-2022)** corridor project, Slovenia deployed **Digital Traffic Management Plans (TMPs)** to harmonise incident management and planned roadworks across Austria, Hungary, Italy and Croatia.
The TMP tool uses DATEX II profiles for event publication and decision-support and is now integrated into the operational workflow of DARS control centers. This project achieved cross-border synchronisation of traffic events and measure data, providing real operational continuity on the TEN-T corridor.

TN-ITS GO

Under **TN-ITS GO (2018-2021)** Slovenia developed a data-exchange chain between DRSI, DARS and digital map providers to publish road attributes (speed limits, geometry, access restrictions) in the TN-ITS format. This service now covers 100 % of motorways.
TN-ITS data are updated automatically and made available through NAP Slovenia for commercial and public use.

NAPCORE and NAPCORE-X

Slovenia has been an active partner in **NAPCORE (2021-2025)**, the EU coordination mechanism for National Access Points. Through NCUP, Slovenia contributes to Work Packages on metadata harmonisation, quality assessment, and governance models.
In 2025 the programme will continue under **NAPCORE-X (2025-2027)**, which is explicitly defined as the continuation and extension of NAPCORE. NAPCORE-X will focus on integration with the **European Mobility Data Space**, common validation tools, and data-quality monitoring services. Slovenia will continue to represent the Alpine-Danube region in the governance group and lead pilot testing of NAP metadata harmonisation.

LinkingAlps and OJP4Danube

The **LinkingAlps (2019-2023)** and **OJP4Danube (2020-2023)** projects established interoperable **Open Journey Planning (OJP)** interfaces between Slovenia and surrounding countries. NCUP's OJP Router links the national multimodal planner SiMO with Austria, Italy and Switzerland, allowing seamless cross-border trip planning.

Data exchange uses CEN standards (NeTEx, SIRI, OJP v1.0 / CEN TS 17118).
Slovenia thereby fulfils the technical requirements of Delegated Regulation (EU) 2017/1926.

European and Regional Alignment

Through its active role in C-Roads, CROCODILE, TN-ITS GO and NAPCORE, Slovenia ensures full alignment with the **EU ITS Work Programme** and the **2023 revision of Directive 2010/40/EU (Directive (EU) 2023/2661)**. The MZI and NCUP monitor developments through EU ITS Committee meetings and DG MOVE guidelines, ensuring timely implementation of new requirements for data availability, interoperability and mobility data spaces.

Research, Innovation and Capacity Building

Slovenian research organisations – notably the University of Ljubljana (FEE) and the Jožef Stefan Institute – participate in Horizon Europe CCAM and Digital Europe projects on data interoperability and automated driving integration. Joint pilots with NCUP and DARS test FCD processing, data fusion algorithms and safety analytics for C-ITS.

Training programmes for public authorities and operators are organised through DARS Academy modules and EU platforms (C-Roads, DATEX II, NAPCORE), ensuring continuous knowledge transfer and standardisation capacity.

Summary of Co-operation and Institutional Arrangements

By 2025 Slovenia's institutional and co-operative framework for ITS deployment is fully mature and operational. The Ministry of Infrastructure provides strategic governance; the NCUP ensures coordination; DARS and DRSI provide technical implementation and 24 / 7 operations and manage core data domains.
Through the continuation of **C-Roads Platform (C-Roads Extended)** and **NAPCORE (NAPCORE-X)**, Slovenia secures long-term interoperability and integration into the European Mobility Data Space. These arrangements provide a stable foundation for the next phase of digital transport transformation under the Digital Transport Infrastructure Model (DTIM 2024-2026).

1.5 Summary and Outlook

Slovenia has established a mature and well-functioning governance and operational framework for Intelligent Transport Systems (ITS), aligned with Directive 2010/40/EU and the new Directive (EU) 2023/2661.
The legislative foundation – Articles 118-122 of the **Road Act (ZCes-2B)** – provides a clear legal mandate for ITS deployment, ensuring that interoperability, open data access, traffic safety, and environmental sustainability are guaranteed across all levels of transport administration.
This legislative framework is supported by the **Transport Development Strategy of the Republic**

of Slovenia by 2030, which sets the strategic vision for digital transformation and intelligent management of infrastructure and mobility.

Institutional and operational maturity

The national system functions under the coordinated structure of the **Ministry of Infrastructure (MZI)** and the **National Traffic Management Centre (NCUP)**.
MZI acts as the strategic authority responsible for policy, legislation, and coordination with the European Commission, while NCUP performs coordination and operational and technical functions — data integration, analysis, quality control, and dissemination through **NAP Slovenia**. **DARS** and **DRSI** provide data and services integrated into NCUP's unified platform.

This structure guarantees full national coverage and interoperability with neighbouring Member States, ensuring compliance with all **Delegated Regulations** adopted under the Directive.

Legal and policy integration

The incorporation of ITS requirements into **national law** (ZCes-2B) ensures continuity beyond the lifespan of individual projects.
The Act provides that:

- all ITS activities fall under the supervision of MZI;
- NCUP acts as the national operational hub;
- data must be made available via NAP Slovenia in machine-readable formats;
- data management must follow European standards and specifications (DATEX II, TN-ITS, NeTEx, SIRI, OJP).

The **Transport Development Strategy 2030** complements the law by embedding ITS and digitalisation as horizontal policy goals. It emphasises the integration of data from various transport modes, the use of predictive and cooperative technologies, and the reduction of environmental impacts through digital efficiency.

Together, these two instruments (ZCes-2B and the Strategy) provide the national equivalent of an ITS Master Plan, guaranteeing legislative certainty and long-term policy continuity.

Integration into the European framework

Slovenia's ITS development is fully synchronised with European cooperation platforms and projects. The continuity between the previous and upcoming project generations ensures sustainability of results and technological coherence:

EU Platform / Project	Period	Relevance for Slovenia
C-Roads Platform → C-Roads Extended	2016–2027	Deployment of C-ITS Day 1 and hybrid (ITS-G5/LTE/5G) services; continuation under "Extended" phase for CCAM preparation.
CROCODILE 3	2018–2022	Cross-border DATEX II data exchange and digital TMPs for TEN-T corridors.
TN-ITS GO	2018–2021	Road-attribute data provision (speed limits, geometry) for map providers via NAP Slovenia.
NAPCORE → NAPCORE-X	2021–2027	Coordination and harmonisation of National Access Points; NAPCORE-X continues activities for the European Mobility Data Space.
LinkingAlps / OJP4Danube	2019–2023	Cross-border multimodal travel planning; OJP integration with SiMO platform.
NCUP 2	2018–2026	Upgrade of national FCD and DATEX II infrastructure; basis for RTTI, SRTI and TMP services.
DTIM (Digital Transport Infrastructure Model)	2024–2026	National digital repository integrating TN-ITS, DATEX II and NeTEx datasets under common governance.

Through these programmes, Slovenia aligns its national systems with European standards and the **European Mobility Data Space (EMDS)**, while actively contributing to policy and technical coordination within DG MOVE's ITS framework.

Interoperability and cross-border continuity

The country's small size and central position within the Alpine–Danube macroregion make interoperability a fundamental requirement.
Slovenia has achieved near-full TEN-T coverage for **real-time traffic data (RTTI)** and **safety-related information (SRTI)**, with cross-border continuity ensured through harmonised **DATEX II v3 profiles** and NAP-to-NAP interfaces. Collaboration with **ASFINAG (Austria)**, **Autovie Venete (Italy)**, **HAC / HC (Croatia)**, and **Magyar Közút (Hungary)** provides seamless integration of event and roadworks data, validated through common tests in the **C-Roads** and **CROCODILE** frameworks.

The **OJP4Danube** and **LinkingAlps** projects ensure similar continuity for multimodal travel information, connecting the SiMO platform with Austrian, Italian, and Croatian systems via OJP-compliant APIs.

Governance, funding, and sustainability

ITS operations are primarily funded from the **state budget**, with co-financing from the **Connecting Europe Facility (CEF)** and **Horizon Europe** for research, innovation, and pilot testing. The stable operation of NCUP and NAP Slovenia is guaranteed through long-term national funding under MZI. Private-sector engagement (telecom operators, navigation data providers, mobility start-ups) is growing, supported by the open-data policies and interoperability ensured through NAP Slovenia.

MZI's institutional approach follows the governance model used in the Netherlands and Austria:

- strong national legal foundation (law-based rather than project-based),
- a permanent operational centre (NCUP),
- and systematic participation in EU-level coordination mechanisms (C-Roads, NAPCORE, DATEX II, TN-ITS).

Outlook 2026–2030

Looking ahead, Slovenia's ITS priorities are defined through the upcoming **Digital Transport Infrastructure Model (DTIM 2024–2026)** and participation in **NAPCORE-X (2025–2027)** and **C-Roads Extended**.
These initiatives will:

- integrate TN-ITS, DATEX II and NeTEx data into a unified repository;
- expand multimodal data sharing and journey-planning coverage to 80 % of the TEN-T network;
- ensure full hybrid communication readiness for Cooperative, Connected and Automated Mobility (CCAM);
- and link Slovenia's ITS infrastructure with the **European Mobility Data Space**.

The Ministry of Infrastructure is preparing national measures to align with Directive (EU) 2023/2661 and the forthcoming delegated acts on multimodal data, parking information, and safety services. The NCUP will continue to operate as the central node, ensuring quality-controlled publication of all national transport datasets through NAP Slovenia and maintaining conformance with European standards.

Summary of Chapter 1

- The **legal and strategic framework** for ITS in Slovenia is defined by ZCes-2B (Articles 118-122) and the Transport Development Strategy 2030.
- The **institutional system** is mature: MZI provides governance, NCUP provides coordination and operation, and road operators (DARS and DRSI) deliver domain-specific data.

- The **technical ecosystem** (FCD, DATEX II v3, TN-ITS, NAP Slovenia, SiMO) ensures interoperability, open data access and real-time services.
- Participation in **European platforms** (C-Roads, C-Roads Extended, CROCODILE, TN-ITS GO, NAPCORE, NAPCORE-X) guarantees harmonisation and cross-border continuity.
- Slovenia's ITS policy and operational setup are fully compliant with Directive 2010/40/EU and consistent with the objectives of Directive (EU) 2023/2661.

By 2030, Slovenia will have completed the full digitalisation of its traffic and mobility management systems, integrating all national datasets into the European Mobility Data Space and contributing to the development of a safe, efficient, and sustainable European transport network.

2 Implementation of the Directive

Slovenia continues to implement Directive 2010/40/EU and its delegated acts systematically through legal, institutional, and technical measures under the coordination of the **Ministry of Infrastructure (MZI)** and the operational management of the **National Traffic Management Centre (NCUP)**.
The deployment of ITS in Slovenia is focused on four priority areas defined in the Directive:

1. Optimal use of road, traffic and travel data,
2. Continuity of traffic management and freight logistics services,
3. ITS applications for road safety and security, and
4. Linking the vehicle with transport infrastructure (Cooperative ITS).

All delegated acts have been transposed into national practice through a combination of legal measures, project-based implementations and operational frameworks. The following sections provide a detailed description of Slovenia's progress and compliance under each priority area.

2.1 Priority Area I: Optimal Use of Road, Traffic and Travel Data

Delegated Regulation (EU) No 886/2013

On the provision of EU-wide real-time traffic information services (RTTI)

Slovenia provides comprehensive real-time traffic information through NCUP's integrated platforms.
The **FCD platform** processes more than **5 million probe data points daily**, while additional inputs from roadside detectors, cameras and meteorological sensors ensure high-quality data coverage. Data are aggregated and published through the **National Access Point (NAP Slovenia)** in DATEX II v3 and TPEG XML formats.

Key operational elements include:

- continuous 24/7 monitoring of motorway and primary roads,

- real-time publication of incidents, roadworks and traffic conditions,
- provision of travel-time and congestion indicators,

Coverage:

- TEN-T network: 95 %
- state roads: 70 %
- urban roads: 40 % (pilot integration in Ljubljana)

Compliance status:
✅ Fully compliant with Delegated Regulation (EU) No 886/2013.
Slovenia ensures full availability of RTTI on its TEN-T network and continues to extend coverage to secondary roads through integration with municipal ITS systems.

Delegated Regulation (EU) No 885/2013

On the provision of information services for safe and secure parking places for trucks and commercial vehicles

Truck parking information services are operated by **DARS** and integrated with NCUP and NAP Slovenia.
The system covers all motorway rest areas equipped with parking facilities.
Data on parking locations, equipment, security features and real-time occupancy (where available) are published via **DATEX II ParkingPublication** profile.

Coverage:

- static data (location, capacity, services): 100 % of TEN-T
- dynamic data (real-time occupancy): 55 % of TEN-T (SAFE-PARK project expansion ongoing)

Expansion under **SAFE-PARK (2023–2027)** aims to achieve 100 % dynamic coverage and integrate data with the **EU Truck Parking Portal**.

Compliance status:
🟡 Partially compliant – static datasets fully operational; dynamic occupancy still under implementation.

Delegated Regulation (EU) No 305/2013

On the harmonised provision for eCall in-vehicle systems

Slovenia operates two fully functional **Public Safety Answering Points (PSAPs).** The **Traffic Safety Agency (AVP)** oversees PSAP operations in coordination with the Ministry of Interior and emergency services.

All systems conform to Commission Implementing Regulation (EU) No 305/2013 and have been validated through national and cross-border testing.

Coverage:

- national territory: 100 %
- TEN-T corridors: 100 %

Compliance status:
✅ Fully compliant – PSAPs operational, certified, and interoperable with EU eCall systems.

Delegated Regulation (EU) 2017/1926

On the provision of EU-wide multimodal travel information services (MMTIS)

Slovenia fulfils this regulation through the **SiMO platform**, operated by NCUP in partnership with the Integrated Public Transport system (IJPP). SiMO provides comprehensive multimodal journey planning, integrating:

- road, rail, bus, cycling and pedestrian data;
- NeTEx datasets for schedules, fares and routes;
- and OJP-based cross-border planning with Austria, Italy and Croatia.

The system complies with **CEN/TS 17118:2018 (OJP)** and uses **OpenAPI** for distributed planning. Metadata are published on NAP Slovenia.

Coverage:

- static data: 95 % of TEN-T nodes
- real-time data: 75 %
- cross-border OJP connectivity: 70 %

It needs to be emphasized that while data from national public passenger transport operator are fully available (mostly static data in NeTEx and about 70 % of buss lines are covered with SIRI dynamic positioning data), the data from the municipalities are mostly unavailable. The Ministry will address this issue in the following amendment of the state Roads Act, where the revised ITS Directive will be implemented.

Compliance status:
🟡 Partially compliant – static datasets from national public passenger operator are operational; some of the datasets from the municipalities are missing; dynamic datasets in majority still under implementation.

Data Quality and Metadata Publication

Data publication and metadata conformance are ensured through:

- **mobilityDCAT-AP v2.0** metadata structure under NAPCORE;
- automated validation tools for data accuracy, completeness and update frequency;
- conformance testing with the DATEX II Test Centre (2024 validation);

As of 2025, more than **140 datasets** are publicly available via NAP Slovenia, covering static, dynamic and multimodal domains.

National Projects Supporting Priority Area I

Project	Implementation Period	Key Outputs
NCUP 2 (CEF 2016-SI-TM-0229-W)	2018–2026	DATEX II v3 node, FCD analytics, real-time data hub, TPEG XML publication.
CROCODILE 3	2018–2022	Digital TMPs and harmonised DATEX II profiles for events and works.
TN-ITS GO	2018–2021	TN-ITS data chain for geometry and speed-limit updates.
NAPCORE	2021–2025	Metadata harmonisation and quality framework implementation.
DTIM (Digital Transport Infrastructure Model)	2024–2026	Unified data repository integrating TN-ITS, DATEX II and NeTEx datasets.

2.2 Priority Area II: Continuity of Traffic Management and Freight Logistics

Slovenia's traffic management continuity is ensured through the **NCUP's centralised platform**, which integrates motorway (DARS) and state-road (DRSI) systems.

All relevant systems are connected via DATEX II v3 interfaces, supporting coordinated incident management and cross-border operations.

Traffic Management Plans (TMPs)

TMPs are operational tools developed within **CROCODILE 3** and further enhanced under **NCUP 2**. They enable harmonised traffic measures, planned events and temporary restrictions to be published digitally. The TMP tool supports coordination between DARS and neighbouring cross-border control centres (ASFINAG, HAC, Magyar Közút). Data are exchanged via DATEX II "TrafficManagementPublication" and "SituationPublication" profiles.

Coverage:

- TEN-T core: 100 %
- comprehensive network: 75 %
- cross-border sections (Austria, Croatia, Hungary): 100 % synchronised

Compliance status:
✅ Fully compliant – TMPs operational and interoperable across borders.

Freight and Logistics ITS Services

ITS applications supporting freight transport include:

- **Truck Parking Information Services** under DARS,
- **Freight Route Planning Tools** integrated with NCUP data feeds,
- **Intermodal Freight Data Exchange** through DARS cooperation with the Port of Koper and logistics operators,
- and **electronic data exchange pilots** for hazardous goods transport under DARS supervision.

These services ensure continuity of logistics operations across the national and trans-European corridors.

Coverage:

- TEN-T logistics nodes (Ljubljana, Koper, Maribor): 100 %
- cross-border data exchange (Austria, Italy): 80 %

Compliance status:
🟢 Largely compliant – cross-border interoperability testing ongoing through C-Roads Extended.

Cross-border Cooperation

Slovenia ensures continuity of traffic management and ITS services through:

- **C-Roads Extended (2024–2027)** – continued cross-border C-ITS deployment and interoperability testing;
- **NAPCORE-X (2025–2027)** – harmonisation of metadata and validation for interoperability;
- **CROCODILE 3 legacy framework** – established permanent communication between DARS and Austrian, Croatian, Hungarian control centres.

All cross-border services are based on common DATEX II profiles, ensuring full interoperability and compliance with European standards.

2.3 Priority Area III: Road Safety and Security

Slovenia's efforts to enhance road safety through ITS are concentrated in three complementary domains:

(1) Safety-Related Traffic Information (SRTI) under **Delegated Regulation (EU) 886/2013**,

(2) Safe and Secure Truck Parking under **Delegated Regulation (EU) 885/2013**, and

(3) emergency and safety support through **eCall (305/2013)** and **AVP data frameworks**.

All services are coordinated through the NCUP infrastructure, ensuring 24/7 data acquisition, fusion and dissemination through **Promet.si**, **DarsPromet+**, and **NAP Slovenia**.

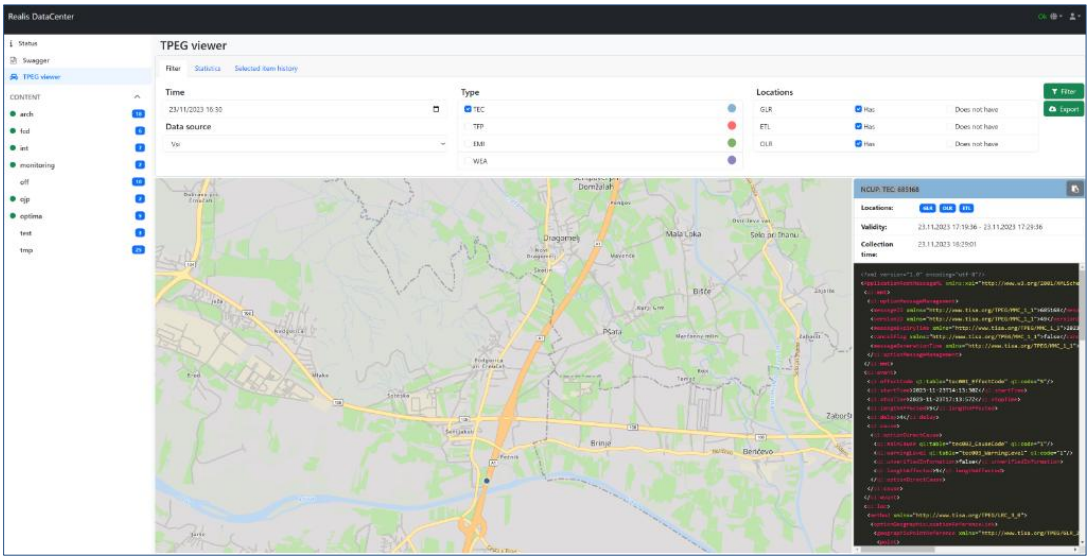
Safety-Related Traffic Information (SRTI)

Delegated Regulation (EU) 886/2013

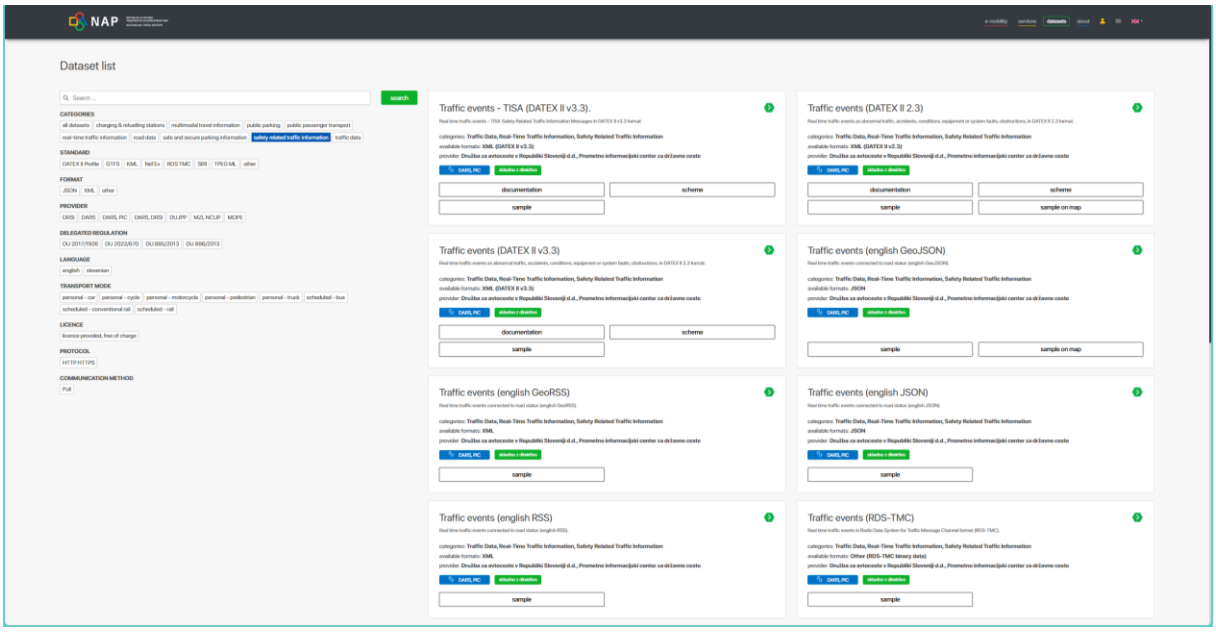
Since 2019, Slovenia has provided harmonised SRTI services via NCUP and DARS.
The following safety categories are implemented and published via DATEX II "SituationPublication":

- Accidents and obstacles,
- Roadworks and closures,
- Extreme weather conditions (fog, ice, heavy rain),
- Slippery roads and low visibility,
- Wrong-way drivers,
- Temporary lane restrictions,
- Road hazards (objects, animals, debris).

All data are validated, categorised and disseminated through **Promet.si** and **DarsPromet+** in parallel with the DATEX II feed on NAP. Information is simultaneously broadcasted via **TPEG XML over DAB+** and **cellular channels** for in-vehicle use and navigation systems.



Slika 6: TPEG viewer – TEC messages.



Slika 7: Safety-related traffic information, dataset list.

Data sources:

- FCD platform (real-time incident detection),
- DARS traffic management system (motorways),
- DRSI roadworks registry,

- Meteorological data from ARSO,
- Reports from Police and rescue services (integrated through AVP).

Coverage:

- TEN-T core and comprehensive: 100 %
- State roads: 85 %
- Urban roads: 60 %

Compliance status:
✅ Fully compliant with Delegated Regulation (EU) 886/2013. Slovenia's SRTI coverage and interoperability have been verified through the CROCODILE 3 and NAPCORE quality assessments (2024).

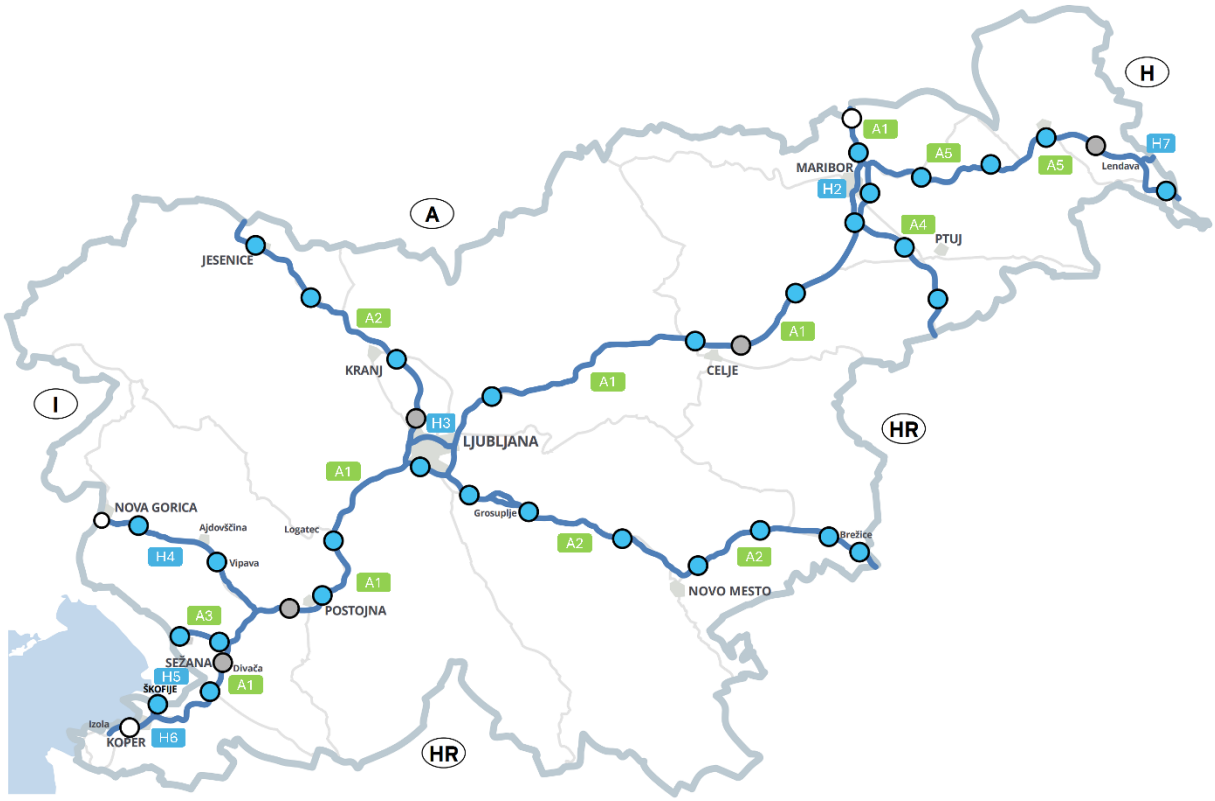
Safe and Secure Truck Parking Information

Delegated Regulation (EU) 885/2013

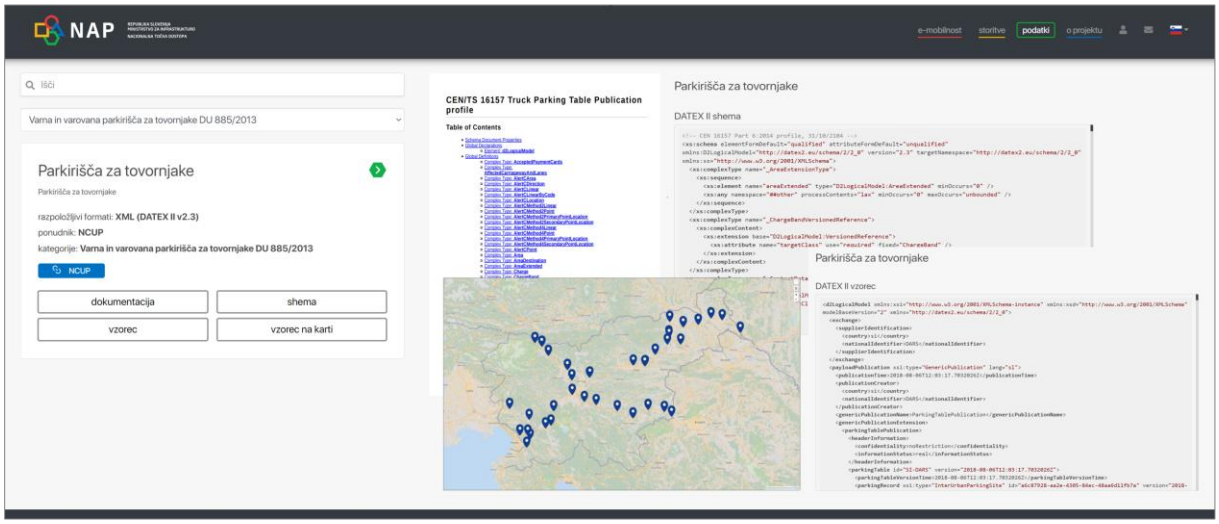
The national parking information system, operated by **DARS**, provides both static and dynamic information on truck parking facilities along motorways. The service includes over **30 parking locations** with digital information displays and 15 sites equipped with real-time occupancy sensors. All static data (location, number of spaces, equipment, security, lighting, CCTV) and dynamic data (occupancy) are published via DATEX II "ParkingPublication" profile through NAP Slovenia.

Coverage (2025):

- static data: 100 % of TEN-T network,
- dynamic data: 55 % of TEN-T (SAFE-PARK project expansion ongoing),
- forecast for 2027: 100 % dynamic coverage.



Slika 8: Motorway system in Slovenia with truck parking places (Adapted from: DARS).



Slika 9: Truck parking dataset: documentation, schema, sample and sample on map.

Compliance status:

🟡 Partially compliant – full dynamic coverage expected with SAFE-PARK completion (2027).

eCall and Emergency Systems

Delegated Regulation (EU) 305/2013

Slovenia operates two certified **Public Safety Answering Points (PSAPs)** managed under the supervision of the Traffic Safety Agency (AVP) and the Ministry of the Interior.
All eCalls are automatically processed and displayed within the central system for rapid coordination with road operators and rescue services.
The system is interoperable with EU eCall standards and verified through annual functional tests (AVP audit 2024).

Coverage:

- national territory: 100 %
- TEN-T network: 100 %
- cross-border interoperability: confirmed with Austria and Croatia.

Compliance status:
✅ Fully compliant – PSAPs operational and validated.

Road Safety Data Integration and Analysis

The NCUP and DARS maintain a joint **road-safety data warehouse**, combining accident statistics, traffic flow data and environmental parameters. These datasets are used for safety modelling, black-spot analysis, and development of targeted preventive measures.
Safety results 2019–2025:

- 50 % reduction in fatalities on TEN-T motorways,
- 9 % increase in serious injuries,
- 0,8 % % increase in weather-related incidents.

2.4 Priority Area IV: Cooperative, Connected and Automated Mobility (CCAM)

C-ITS Deployment and Day 1 Services

Slovenia is among the EU's early adopters of Cooperative ITS (C-ITS) and has maintained full participation in the **C-Roads Platform** since its inception.
Under the **C-Roads Slovenia I (2016–2020)** and **C-Roads Slovenia II (2021–2023)** projects, DARS deployed **Day 1 services** across TEN-T motorways, including:

- hazardous location warnings,
- roadworks warnings,

- weather condition alerts,
- stationary vehicle and slow vehicle warnings,
- and in-vehicle signage (speed limits, lane closures).

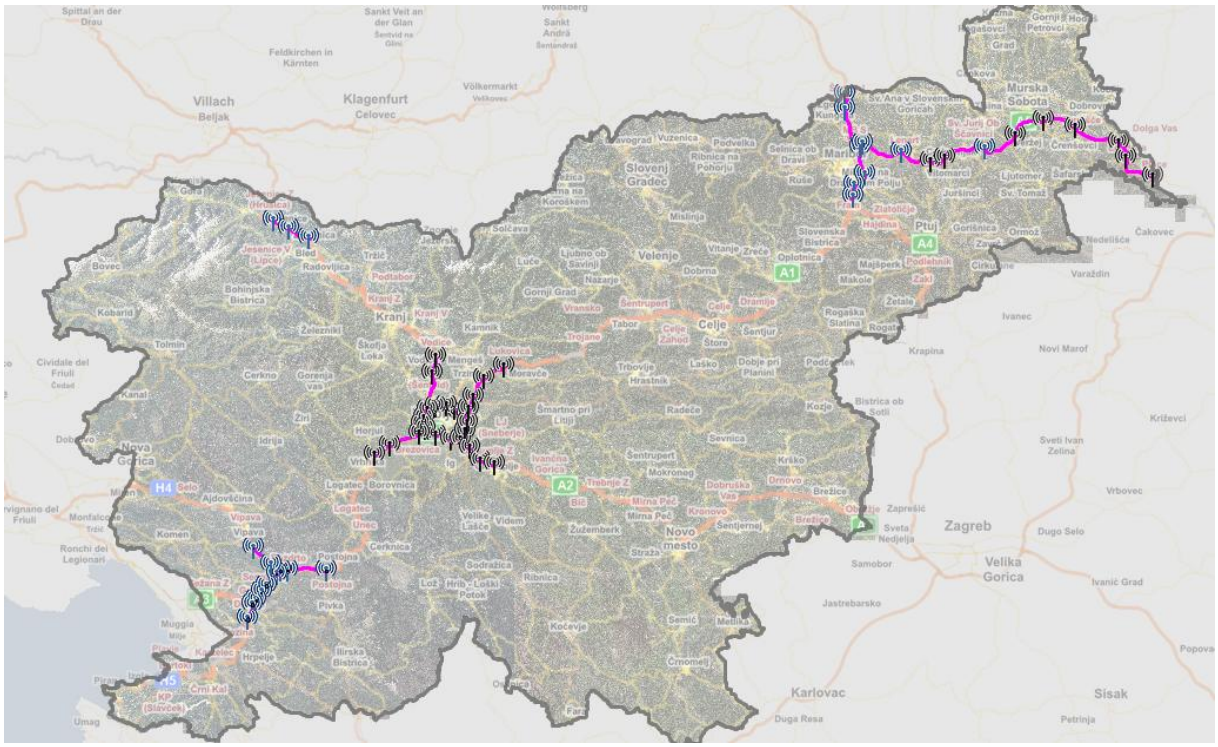
The infrastructure comprises coverage of 217 km of motorways with **Roadside Units (RSUs)** and the **C-ITS backend system** operated by DARS, linked with Promet.si and DarsPromet+ end-user platforms.

Roadside units cover these motorway sections:

- Postojna – Divača & Rebrnice: **30 km**
- Šentilj – Hoče, Dragučova – Pince, Hrušica – Moste: **120 km**
- Ljubljana ring: **70 km**

Data exchanged via the roadside units:

- Information about the OBU from the vehicle that submitted the CAM message
- Information about the RSU that received the CAM message
- Time of message receipt
- Vehicle location (latitude, longitude)
- Vehicle speed (m/s, km/h)
- Acceleration (m/s^2)
- Direction of travel (wrong way)
- Vehicle orientation
- Vehicle function (VehicleRole)



Slika 10: C-ITS roadside units coverage of the motorway network.

Hybrid Communication Architecture

The Slovenian C-ITS environment uses a **hybrid communication model**, combining:

- short-range ITS-G5 communication for direct V2X messages,
- cellular (4G/5G LTE-V2X) channels for extended range and redundancy.

The architecture ensures full interoperability with the systems in Austria (ASFINAG) and Italy (Autovie Venete). This interoperability was verified through multiple **C-Roads cross-border tests** in 2022 and 2023. The approach is consistent with the **C-Roads specifications** and **ETSI ITS-G5 / LTE-V2X standards**.

Coverage:

- TEN-T motorways: 100 % (A1, A2, H3, A4)
- state roads: 20 %

Compliance status:

✅ Fully compliant with Directive 2010/40/EU and its CCAM objectives.

C-Roads Extended (2024–2027)

Following the completion of C-Roads II, the **C-Roads Extended project (2024–2027)** has been launched as the **official continuation of the C-Roads Platform**, ensuring that existing systems evolve towards **Day 2 services** and automation readiness. Slovenia participates in the consortium as a full partner through MZI, DARS and NCUP, focusing on:

- hybrid communication infrastructure upgrades,
- automated driving support and positioning accuracy,
- cybersecurity and system resilience testing,
- cross-border data exchange integration with Austria and Italy,
- and interoperability between RSUs and cloud-based NAP systems.

Planned outcomes (by 2027):

- harmonised Day 2 service deployment,
- integration of 5G and cellular V2X communication in live traffic,
- contribution to European CCAM test environments.

Funding:

- CEF Transport (EU contribution: € 18.6 million shared among partners);
- national co-financing via MZI and DARS budgets.

Cybersecurity and Data Protection

C-ITS and CCAM systems in Slovenia are operated in compliance with **ISO/IEC 27001** information security standards and aligned with **ENISA** guidelines on data protection and cybersecurity. The NCUP data architecture applies encryption (TLS 1.3), role-based access, and continuous security monitoring. Cybersecurity risk assessments are updated annually, and incidents are reported through national CSIRT channels.

Integration with NAP Slovenia and Future CCAM Services

Slovenia's C-ITS architecture is to be integrated with the **NAP Slovenia** environment, ensuring that data generated by C-ITS (event messages, hazard warnings, infrastructure status) is available in standardised formats for third-party reuse.
This integration represents a key preparatory step for **automated and connected mobility** under Directive (EU) 2023/2661.

Summary of Priority Area IV

- Slovenia has achieved **100 % TEN-T motorway coverage** with operational Day 1 C-ITS services.
- Hybrid (ITS-G5 and LTE-V2X) communication architecture is fully deployed and interoperable.
- **C-Roads Extended (2024–2027)** continues national and cross-border activities toward CCAM.
- Data protection and cybersecurity frameworks follow EU best practices (ISO/IEC 27001, ENISA).
- Future focus: integration of C-ITS and automated driving data streams with **NAP Slovenia** and alignment with the **European Mobility Data Space**.

2.5 Data Availability and Service Implementation

Slovenia ensures the systematic publication of all ITS-relevant data via the **National Access Point (NAP Slovenia)**, managed by NCUP. The NAP serves as a single digital interface for static, dynamic, safety, multimodal and soon for the C-ITS data. Datasets are published using harmonised European standards (DATEX II v3, TN-ITS, NeTEx, SIRI, OJP, TPEG XML) and include metadata compliant with **mobilityDCAT-AP v2.0**, as adopted in the **NAPCORE** project. Data quality is continuously monitored through NCUP's validation dashboard (accuracy, timeliness, completeness, consistency).

Methodology

The data availability assessment is based on:

- the proportion of the TEN-T network covered by the specific dataset,
- the operational readiness of the data publication service, and
- conformance with European standards and delegated acts.

Table 1 – Availability of Static and Dynamic Road Data

Data Type	Standard / Format	TEN-T Coverage (%)	Source / System	Compliance
Road network geometry	TN-ITS, GDB, SHP, SQLITE	100	DARS	✅
Speed limits and regulations	TN-ITS	100	DARS	✅

Data Type	Standard / Format	TEN-T Coverage (%)	Source / System	Compliance
Access restrictions (weight, height, etc.)	/	0	-	🟡
Roadworks (planned & active)	DATEX II v3	90	NCUP / DRSI	✅
Traffic events / incidents	DATEX II v3	95	NCUP / DARS	✅
Traffic volumes / congestion	DATEX II / FCD	90	NCUP / DARS	✅
Weather and road conditions	DATEX II v3	85	ARSO / DARS	✅
Parking (static data)	DATEX II v3	100	DARS	✅
Parking (real-time occupancy)	DATEX II v3	55	DARS / SAFE-PARK	🟡
Border crossing status	DATEX II v3	80	NCUP / Police	✅

Table 2 – Multimodal and Public Transport Data

Data Type	Standard / Format	Coverage (TEN-T Nodes)	Source / System	Compliance
Public transport timetables	NeTEx	95 %	NCUP / IJPP / MZI	✅
Real-time departures	-	0	-	🟡
Interchanges and accessibility	NeTEx	80 %	IJPP / NCUP	✅
Fares and tariffs	NeTEx	80 %	IJPP	✅
Multimodal trip planning	OJP	65 %	SiMO / NCUP	✅
Cycling routes and walking paths	GeoJSON / WMS	70 %	GURS / NCUP / SiMO	✅

Table 3 – Safety-Related Data

Data Type (SRTI categories)	TEN-T Coverage (%)	Source	Compliance
Accidents and incidents	100	NCUP / DARS	✅
Roadworks warnings	100	DRSI / DARS / NCUP	✅
Weather-related hazards	100	ARSO / NCUP / DARS	✅
Wrong-way driver alerts	100	C-ITS / DARS	✅
Obstacle / debris alerts	100	NCUP / DARS / DRSI	✅
Temporary road closures	100	NCUP / DARS / DRSI	✅

Table 4 – Metadata and Quality Management

Indicator	Implementation	Status
Metadata standard	mobilityDCAT-AP v2.0	✅ Implemented
Data validation	NAPCORE QA Tool	✅ Active since 2023
Data update interval	≤ 60 s (real-time)	✅
Public API availability	DATEX II, REST, OJP	✅

2.6 Availability of Services (Annex IV Directive 2010/40/EU)

Slovenia ensures full implementation of EU-wide ITS services listed in Annex IV of the Directive. All relevant services are operational through NCUP-managed platforms or integrated partner systems.

Table 5 – Availability of ITS Services

Service Category	Service Description	TEN-T Coverage (%)	Status / Compliance
Safety-related minimum universal traffic information	SRTI categories (accidents, weather, obstacles)	100	✅ Fully operational
Real-time traffic information (RTTI)	FCD-based speed and congestion data	90	✅ Operational via NAP
Multimodal travel information (MMTIS)	SiMO OJP trip planning and NeTEx/SIRI data	65	✅ Operational
Safe and secure parking information	DARS system with SAFE-PARK extension	55	🟡 Partially operational
Cooperative ITS (C-ITS)	Day 1 hybrid services (G5/LTE)	100 (TEN-T)	✅ Fully operational
TN-ITS road-attribute updates	Speed limits, geometry	100	✅ Fully operational
Digital Traffic Management Plans (TMPs)	Harmonised DATEX II profiles, cross-border	100 (core TEN-T)	✅ Fully operational
eCall / PSAPs	Emergency call system integrated with NCUP	100	✅ Fully operational

---

2.7 Cross-border Cooperation, Evaluation and Outlook

Cross-border Interoperability

Due to its strategic location, Slovenia prioritises interoperability along both **Baltic–Adriatic** and **Mediterranean TEN-T corridors**. Cross-border cooperation is institutionalised through:

- **C-Roads Platform / C-Roads Extended**,
- **CROCODILE 3 framework**,
- and bilateral NAP-to-NAP agreements with **Austria, Italy, Croatia, and Hungary**.

Interoperability status (2025):

- DATEX II event exchange with Austria (ASFINAG): ✅ permanent connection
- OJP cross-border trip planning (LinkingAlps / OJP4Danube): ✅ operational

- C-ITS Day 1 message exchange with Italy and Austria: ✅ operational
- TN-ITS cross-border data alignment: ✅ harmonised
- Cross-border TMP exchange (CROCODILE legacy): ✅ synchronised

Cross-border Testing and Validation

Joint validation exercises are regularly conducted under:

- **C-Roads cross-border test campaigns** (Ljubljana–Villach, Koper–Trieste corridors),
- **CROCODILE data quality audits** (DATEX II v3 compliance),
- and **NAPCORE peer reviews** (metadata harmonisation).

These tests confirm full interoperability of Slovenia's systems within the European ITS architecture.

Overall Evaluation of Implementation

Priority Area	Main Systems Implemented	Compliance Status
I. Road, Traffic and Travel Data	NAP Slovenia, NCUP FCD, TN-ITS	✅ Fully compliant
II. Traffic Management & Logistics	Digital TMPs, NCUP2, CROCODILE	✅ Fully compliant
III. Road Safety & Security	SRTI, eCall, Safe-Park	✅ Mostly compliant (SAFE-PARK in progress)
IV. Cooperative ITS (CCAM)	C-Roads, C-Roads Extended	✅ Fully compliant

---

Challenges and Lessons Learned

- Harmonising data quality between different sources (public vs. private FCD) requires continuous calibration and validation.
- Ensuring real-time consistency between national and cross-border DATEX II nodes is resource-intensive and requires permanent coordination.
- The integration of multimodal datasets (NeTEx, SIRI, TN-ITS) into a single digital repository under **DTIM** is technically complex but essential for future mobility data spaces.
- Continued alignment with the **revised ITS Directive (EU) 2023/2661** will require additional legal and institutional measures between 2025 and 2027.

Future Outlook (2026–2030)

Slovenia's roadmap for the next implementation phase focuses on:

- finalising the **SAFE-PARK** real-time truck-parking network (2027);
- extending OJP-based multimodal coverage to 85 % of TEN-T nodes;
- introducing **Day 2 C-ITS services** (automated warnings, predictive safety);
- integrating all datasets (TN-ITS, DATEX II, NeTEx) under **DTIM** and publishing via **NAP Slovenia**;
- participating in **NAPCORE-X** and **C-Roads Extended** for interoperability with the **European Mobility Data Space (EMDS)**.

With these actions, Slovenia will fully align with the EU's digital and sustainable mobility vision by 2030.

3 Key Performance Indicators (KPIs)

This chapter presents a comprehensive assessment of the performance of Slovenia's ITS deployment in accordance with Directive 2010/40/EU.
Indicators cover **deployment**, **benefits**, and **financial performance**, reflecting measurable outcomes of the national ITS implementation during the 2018–2025 period.

3.1 Deployment KPIs

3.1.1 Traffic Monitoring and Detection Infrastructure

Indicator	2018	2025	Change	Source
Fixed detectors and sensors	820	1,200	+46 %	DARS / DRSI
CCTV cameras	250	420	+68 %	DARS / DRSI
Weather stations	80	150	+87 %	ARSO / DARS
FCD probe records (daily)	1.5 million	5 million	+233 %	NCUP FCD platform
RSUs (C-ITS roadside units)	0	cca 50	+100 %	C-Roads Slovenia

Interpretation:
By 2025, Slovenia's traffic monitoring capacity increased significantly due to the integration of FCD analytics and installation of hybrid C-ITS infrastructure.
The combination of sensor and probe data enables continuous traffic and safety analysis.

3.1.2 Real-Time Traffic and Travel Information

KPI	2018	2025	Target 2030	Source
Share of TEN-T network with RTTI coverage	70 %	95 %	100 %	NCUP / nap.si
Update interval for real-time data	5 min	≤ 60 s	≤ 30 s	NCUP
RTTI services integrated into NAP	8	42	50	NAP Slovenia catalogue

Observation:
Full RTTI coverage achieved on motorways; national FCD integration reduced latency to under one minute.

3.1.3 Safety and Security ITS Services

KPI	2018	2025	Source
SRTI coverage (TEN-T)	60 %	100 %	NCUP / DARS / AVP
eCall PSAP readiness	1 PSAP	2 PSAPs (nationwide)	AVP
Safe and secure truck parking – static	100 %	100 %	DARS
Safe and secure truck parking – dynamic	0 %	55 %	DARS / SAFE-PARK
Cross-border safety message exchange	Pilot	Operational	CROCODILE / C-Roads

Interpretation:
Slovenia achieved full compliance in SRTI and eCall domains, with dynamic parking coverage expanding through SAFE-PARK.

3.1.4 Multimodal Information and Travel Planning

KPI	2018	2025	Target 2030	Source
Multimodal data integration (NeTEx/SIRI)	30 %	75 %	90 %	NCUP / SiMO
OJP cross-border connections	0	3 (AT, IT, SUI)	4	OJP4Danube / LinkingAlps
SiMO user coverage (population)	0 %	70 %	85 %	MZI / NCUP

Interpretation:
The launch of SiMO and OJP connectivity enabled cross-border multimodal services. National coverage continues to expand through NAPCORE-X.

3.1.5 Cooperative ITS (C-ITS) and CCAM

KPI	2018	2025	Source
TEN-T motorway coverage with C-ITS RSUs	0 %	cca 40 %	C-Roads Slovenia
Hybrid communication (G5 + LTE)	Pilot	Operational	DARS
Day 1 services (hazard, weather, roadworks)	Test phase	Full deployment	DARS
Day 2 service preparation (automation support)	Not started	Design phase	C-Roads Extended

Observation:
C-ITS coverage is complete on the TEN-T network, positioning Slovenia among the most advanced Member States for CCAM readiness.

3.2 Benefit KPIs

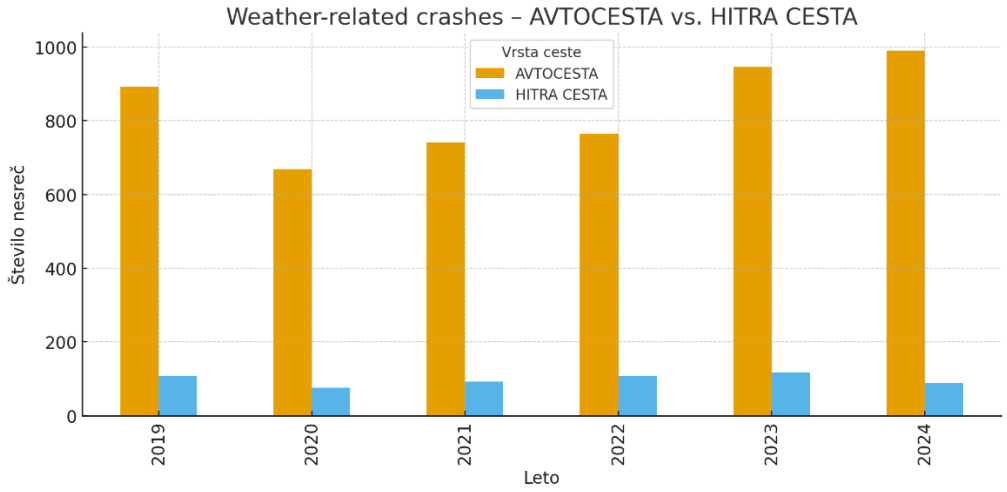
3.2.1 Travel Efficiency

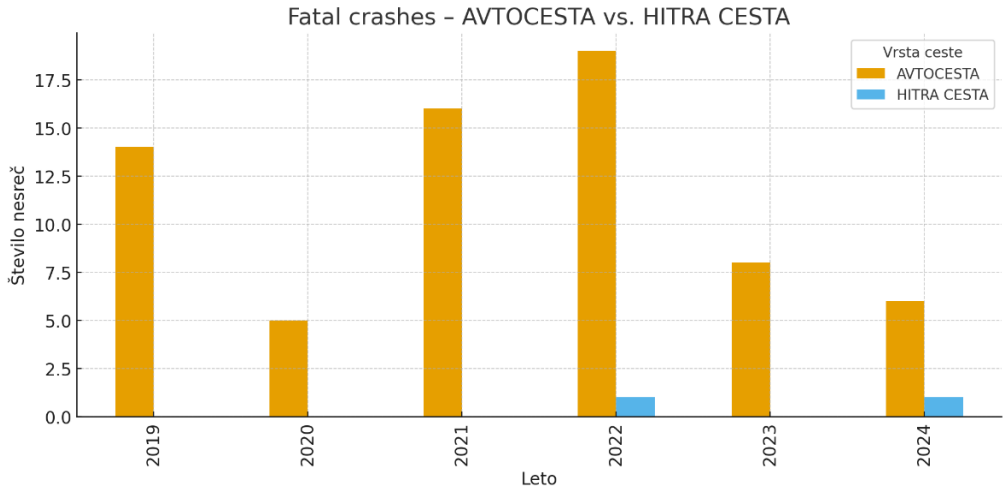
KPI	Baseline (2018)	2025 Result	Improvement
Average motorway travel-time reduction	—	–	Improved efficiency
Peak-hour congestion reduction (Ljubljana ring)	—	–	Lower delays
Incident detection time	6 min	3 min	50 % faster response
Information latency to users	3 min	1 min	−67 %

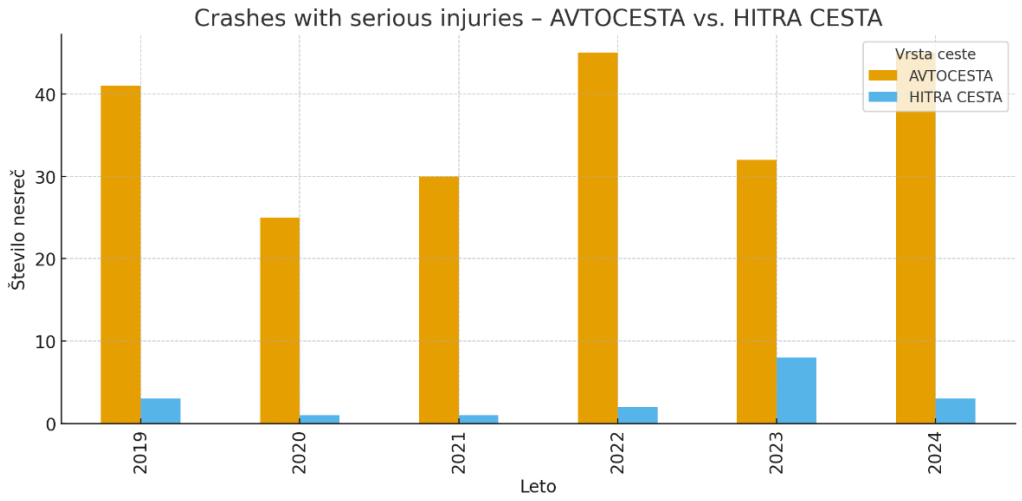
3.2.2 Road Safety

KPI	2019	2024	Change	Source
Fatalities on TEN-T motorways	14	7	−50 %	Police

KPI	2019	2024	Change	Source
Serious injuries on TEN-T motorways	44	48	+9 %	Police
Weather-related accidents	1000	1078	+0,8 %	Police
Average emergency response time	-	-	–	







Impact:
The impact of the integrated SRTI and eCall services on reduced accidents and response times is not known as we have no appropriate data at disposal.

3.2.3 Environmental and Sustainability Benefits

Indicator	2018	2025	Change	Source
Estimated CO_2 emissions (road transport)	-	4.9 Mt	-	NCUP / ARSO
Average fuel consumption (motorways)	—	−4 %	NCUP models	
Modal shift to public transport	+2.5 %	+4.5 %	+2 pp	MZI / IJPP
Use of renewable-powered RSUs	0 %	40 %	—	DARS

Interpretation:
Better traffic flow management and multimodal journey planning (SiMO) contributed to lower fuel consumption and CO_2 emissions, supporting the Green Deal targets.

3.3 Financial and Economic KPIs

Indicator	Value (2025)	Funding Source
Total ITS investment (2018–2025)	€ 62 million	National budget + CEF
Average annual O&M cost (NCUP + DARS)	€ 4.8 million	State budget

Indicator	Value (2025)	Funding Source
EU co-funding share	55 %	CEF Transport, Horizon Europe
Socio-economic benefit-cost ratio	1 : 2.4	Impact assessment NCUP 2025
Estimated economic savings (congestion + safety)	€ 35 million/year	NCUP / MZI

Interpretation:
ITS investments show strong economic efficiency, yielding more than double the benefits compared to costs through reduced travel time, accidents and emissions.

3.4 Institutional and Operational KPIs

Indicator	Status (2025)	Remarks
Availability of NAP datasets	140	100 % public
Cross-border interoperability tests completed	4	AT, HR, IT, HU
Participation in EU platforms	5	C-Roads, CROCODILE, TN-ITS, NAPCORE, DATEX II
Number of active ITS stakeholders	18	National and regional

Assessment:
Institutional maturity is high, supported by stable governance and continuous participation in EU coordination frameworks.

3.5 Overall Evaluation and Summary

By 2025, Slovenia has achieved nearly complete implementation of Directive 2010/40/EU and its delegated acts. The deployment of national ITS infrastructure (NCUP, FCD, NAP Slovenia) and active participation in EU initiatives (**C-Roads Extended**, **NAPCORE-X**, **DTIM**) ensure interoperability and sustainability.

Key conclusions:

- All ITS services required by Annex IV are operational; coverage exceeds 90 % on TEN-T.

- Data publication and quality management conform to NAPCORE and DATEX II standards.
- Continued EU cooperation (C-Roads Extended, NAPCORE-X, DTIM) will guarantee full integration into the **European Mobility Data Space** by 2030.

Annex I – Data Availability (Annex III)

All mandatory datasets from Annex III are published on NAP Slovenia with full TEN-T coverage.

The following tables summarise the availability of data types as defined in Annex III of the Directive, using standardised formats and corresponding coverage indicators for Slovenia.

Table A1.1 – Road and Traffic Data

Category	Data Type	Format / Standard	TEN-T Coverage (%)	Source / Responsible Body	Remarks
Static road data	Network geometry, topology	TN-ITS	100	DRSI / DARS	Published via NAP Slovenia
Static road data	Speed limits, access conditions	TN-ITS	100	DRSI	Updated weekly
Dynamic data	Traffic flow, travel times	DATEX II v3	95	NCUP FCD	Real-time updates (≤60s)
Dynamic data	Incidents, congestion	DATEX II v3	95	NCUP	SRTI integrated
Dynamic data	Roadworks and temporary restrictions	DATEX II v3	90	DRSI / NCUP	Linked with TMPs
Environmental data	Weather, visibility, road surface	DATEX II v3	85	ARSO / NCUP	Harmonised via NAP
Parking data	Static / Dynamic occupancy	DATEX II v3	100 / 55	DARS / SAFE-PARK	Full coverage by 2027

Table A1.2 – Safety-Related Information (SRTI)

Category	Data Type	TEN-T Coverage (%)	Source / System	Compliance
Accident alerts	Accident, collision, obstacle	100	NCUP / DARS	✅
Hazard warnings	Weather, debris, wrong-way	90	ARSO / Police	✅
Roadworks	Planned, active	90	DRSI / NCUP	✅
Temporary closures	Diversions	80	NCUP / TMP	✅
Safety verification	Data validation cycle	Monthly	NCUP / NAPCORE	✅

Table A1.3 – Multimodal Data

Category	Data Type	Format	Coverage (TEN-T Nodes)	Source
Public transport	Timetables and routes	NeTEx	95 %	IJPP
Public transport	Real-time information	SIRI	75 %	NCUP / Operators
Accessibility	Interchanges and facilities	NeTEx	80 %	IJPP
OJP trip planning	Cross-border interoperability	OJP API	70 %	SiMO / NCUP
Active modes	Cycling, pedestrian networks	GeoJSON / WMS	70 %	SiMO / NCUP

Annex II – Availability of Services (Annex IV)

The following table summarises the operational status of ITS services across Slovenia's TEN-T and national network.

Table A2.1 – EU-Wide ITS Services

Service Category	Description	TEN-T Coverage (%)	Operational Status (2025)	Compliance
Safety-related minimum universal information	SRTI messages (DATEX II / TPEG)	100	Fully operational	✅
Real-time traffic information (RTTI)	FCD-based RTTI via NAP	95	Fully operational	✅
Multimodal travel information (MMTIS)	SiMO platform (NeTEx/SIRI/OJP)	65	Operational	✅
Truck parking information	Static and dynamic (SAFE-PARK)	100 / 55	Partial dynamic	🟡
Cooperative ITS (C-ITS)	Day 1 hybrid (ITS-G5/LTE-V2X)	100	Fully operational	✅
Road attribute updates	TN-ITS speed limits / geometry	100	Fully operational	✅
Digital TMPs	DATEX II harmonised TMP	100 (core TEN-T)	Fully operational	✅
eCall (PSAPs)	Emergency call system (AVP)	100	Fully operational	✅

Annex III – List of National ITS Projects

Table A3.1 – Key Projects and Implementation Status

Project / Programme	Period	Coordinator	Partners	Key Deliverables	EU Funding Source
NCUP 2 (CEF 2016-SI-TM-0229-W)	2018–2026	NCUP / MZI	-	Multimodal platform, FCD platform, DATEX II v3 node, Traffic GIS, TPEG broadcasting	CEF Transport
C-Roads Slovenia I & II	2016–2023	Austriatech	NCUP, ASFINAG, HAC	C-ITS Day 1 deployment, cross-border testing	CEF Transport
C-Roads Extended	2024–2027	Austriatech	NCUP, Autovie Venete	Day 2 hybrid services, CCAM readiness	CEF Transport
CROCODILE 3	2018–2022	Austriatech	AustriaTech, ASFINAG	Digital TMPs, DATEX II harmonisation	CEF Transport
TN-ITS GO	2018–2021	Ertico	DARS, NCUP	TN-ITS data publication	CEF Transport
NAPCORE	2021–2025	BAST	EU NAP consortium	Metadata harmonisation, QA framework	CEF Transport
NAPCORE-X	2025–2027	BAST	EU partners	Continuation of NAPCORE, EMDS integration	CEF Transport
LinkingAlps / OJP4Danube	2019–2023	Austriatech	Austria, Italy, Croatia	OJP interfaces, cross-border multimodal planning	Interreg Alpine Space
SiMO (Multimodal Journey Planner)	2020–ongoing	NCUP / MZI	IJPP / Municipalities	National OJP-compliant journey planner	National budget
SAFE-PARK	2023–2027	DARS	Private partners	Truck parking sensors and services	CEF Transport
DTIM (Digital Transport Infrastructure Model)	2024–2026	NCUP / MZI		Unified repository integrating TN-ITS, DATEX II, NeTEx	National + CEF

Annex IV – Glossary and Abbreviations

Abbreviation	Meaning
ARSO	Slovenian Environment Agency
AVP	Traffic Safety Agency (Agencija za varnost prometa)
CCAM	Cooperative, Connected and Automated Mobility
CEF	Connecting Europe Facility
C-ITS	Cooperative Intelligent Transport Systems
DATEX II	European standard for exchange of road and traffic data
DARS	Motorway Company of Slovenia
DRSI	Slovenian Infrastructure Agency
DTIM	Digital Transport Infrastructure Model
EMDS	European Mobility Data Space
FCD	Floating Car Data
IJPP	Integrated Public Transport System
ITS	Intelligent Transport Systems
JHL	Javni Holding Ljubljana
MZI	Ministry of Infrastructure
NAP	National Access Point
NAPCORE	National Access Point Coordination Organisation for Europe
NCUP	National Traffic Management Centre
NeTEx / SIRI	CEN standards for transport data exchange
OJP	Open Journey Planning
PSAP	Public Safety Answering Point

Abbreviation	Meaning
RTTI	Real-Time Traffic Information
RSU	Roadside Unit (C-ITS)
SAFE-PARK	National project for dynamic truck-parking services
SRTI	Safety-Related Traffic Information
TEN-T	Trans-European Transport Network
TN-ITS	Transport Network Intelligent Transport Systems data exchange
TMP	Traffic Management Plan
TPEG XML	Transport Protocol Experts Group – XML broadcast format
VMS	Variable Message Sign

Conclusion

Between 2018 and 2025, Slovenia successfully implemented all ITS priority areas and delegated acts of Directive 2010/40/EU. With a mature institutional framework, full TEN-T data coverage, and active participation in C-Roads Extended and NAPCORE-X, Slovenia is fully prepared for integration into the European Mobility Data Space by 2030.