Assessment of setting up National Access Points and National Body in Regional Partners

Final Report

PS/SRV/NAP/011/2024

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Abbreviations

Abbreviation	Meaning
APIs	Application Programming Interface
CAPEX	Capital Expenditure
C-ITS	Cooperative ITS
CCTV	Closed-Circuit Television
EC	European Commission
ERTMS	European Rail Traffic Management System
EU	European Union
GIS	Geographic Information System
IT	Information Technology
ICT	Information and Communication Technology
ITS	Intelligent Transport Systems
MTIS	Multimodal Travel Information Service
NAP	National Access Point
NAPCORE	National Access Point Coordination Organisation for Europe
NB	National Bodies
NTS	National Transport Strategy
RTTI	Real Time Traffic Information
RP	Regional Partners
SRTI	Safety Related Traffic Information
TCT	Permanent Secretariat of the Transport Community
ToR	Terms of Reference
OPEX	Operating Expenditure
WB	Western Balkans

Executive Summary

This Final Report presents the findings of the assignment "Assessment of Setting Up National Access Points (NAPs) and National Bodies (NBs) in Regional Partners", that is undertaken to support the Western Balkan partners in aligning with Directive (EU) 2023/2661 and the broader EU digital mobility agenda. The study for each Regional Partner (RP) assesses the existing transport data ecosystems, proposes the suitable NAP and NB models, prioritises data NAP categories, and develops budgeted Roadmap for the period 2026–2030.

Across all six Regional Partners (Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia, Serbia) the establishment of NAPs and NBs emerges as a critical prerequisite for supporting interoperability for data exchange and digitisation of transport data based on use of standards as well as harmonisation RPs legislation in accordance to EU acquis. The NAP initiatives support safe and seamless cross-border mobility and demonstrate the WB strong policy commitment to proceed on the required adaptation for the transport and digitisation sector. The study is prepared by taking into account the current readiness and preparedness of each RP in terms of technical, institutional and legal context.

While each RP operates within distinct institutional and technical contexts, a common pattern emerges: transport data is being collected, sometimes extensively, but is not standardised, not machine-readable, and not published through interoperable interfaces. This gap limits the region's ability to integrate with the wider EU mobility data space.

Key Findings

1. Hybrid NAP model recommended for all RPs

A detailed assessment of institutional structures, ICT capacities, and legal frameworks shows that a Hybrid NAP offers the necessary flexibility to accommodate decentralised data ownership, fragmented systems, and differing levels of digital maturity. This model also enables gradual onboarding of datasets as systems evolve without requiring immediate full centralisation.

2. Data maturity varies, but availability is not the main barrier

Several RPs already collect high-priority datasets—particularly safety-related traffic information (SRTI), roadworks/incident data (RTTI), and traffic flow information. However, these datasets often lack harmonised metadata, EU-compliant schemas (e.g., DATEX II, NeTEx, SIRI), and automated publication mechanisms. The main constraint is therefore data governance, not data availability.

3. Institutional roles require clarification and strengthening

Most RPs need clearer legal mandates for the National Body, including its authority to ensure compliance, define dataset ownership, verify quality, and oversee publication processes. Institutional fragmentation remains a significant obstacle.

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence

4. Prioritisation confirms a phased onboarding approach

Tier 1 datasets (SRTI, RTTI, traffic flow data) provide the highest strategic value and maturity level and should be introduced first to demonstrate early NAP functionality. Infrastructure datasets and multimodal categories fall within Tiers 2 and 3 and will require preparatory measures before proceeding.

5. Roadmaps demonstrate that full NAP/NB establishment by 2030 is achievable

All RPs could reach alignment with the EU acquis by 2030 provided that they undertake legal adjustments, strengthen institutional capacity, introduce harmonised data standards, and invest in ICT infrastructure. The roadmaps include cost estimates, capacity-building needs, and sequenced actions covering legal, institutional, and technical dimensions. Four cross-cutting conclusions emerge:

1. Institutional fragmentation remains the primary barrier to data governance, necessitating clear legal mandates for dataset ownership, publication responsibilities, and NB oversight.
2. Data availability is not the main constraint. Several RPs collect relevant datasets, but lack standardisation, metadata, and automated exchange mechanisms.
3. Capacity building and skills development are essential, particularly in EU data standards (DATEX II, SIRI, NeTEx), metadata governance, and API-based data publication.
4. Sequenced implementation reduces risk. The initiation of Tier 1 datasets enables early compliance while building a scalable foundation for multimodal integration.

These conclusions identify the systemic issues that must be addressed across all RPs to ensure successful regional integration.

General Recommendations

To ensure coordinated, sustainable, and EU-aligned NAP and NB implementation across the Western Balkans, the following overarching recommendations are proposed:

Establish clear, legally mandated National Bodies responsible for compliance oversight, dataset governance, and stakeholder coordination. Each RP should formalise the NB role through legislation that defines:

- authority for dataset compliance checks;
- responsibility for metadata governance;
- mandate to coordinate national stakeholders;
- rights to require data publication in EU-standard formats.

Adopt harmonised, EU-standardised data models and metadata frameworks. RPs should progressively implement:

- DATEX II for road and traffic datasets,
- NeTEx and SIRI for public transport and multimodal data,
- NAPCORE dictionaries and interoperability specifications.

Introduce automated data-exchange and publication mechanisms. RPs should shift from manual reporting to structured, automated workflows enabling:

- real-time or near-real-time updates,
- machine-readable formats,
- stable and secure API-based access layers.

Strengthen institutional capacity and skills within ministries and road authorities. Capacity-building programmes should focus on:

- data governance frameworks,
- compliance assessment and monitoring,
- technical application of standards,
- ICT system integration and metadata validation,
- stakeholder coordination and related processes.

Implement the national roadmaps in phased, risk-managed sequences. Early stages should focus on establishing governance frameworks and Tier 1 datasets, followed by structured integration of Tier 2 and Tier 3 categories. This reduces risks, spreads financial and institutional burdens, and ensures predictable progress.

Strengthen regional cooperation, building on TCT frameworks and NAPCORE participation to ensure alignment with broader EU data-space developments. RPs should strengthen engagement with:

- Transport Community Treaty Secretariat (TCT),
- NAPCORE working groups,
- EU digital mobility initiatives,
- cross-border interoperability pilots.

Overall Conclusion

The assessment confirms that Western Balkan Regional Partners are well-positioned to establish interoperable, future-proof National Access Points and National Bodies within the proposed timeframe. Although institutional fragmentation, inconsistent data governance, and limited standardisation remain challenges, these can be overcome through targeted legal reforms, sustained ICT investment, strong capacity-building measures, and adoption of EU-aligned interoperability frameworks. The RP-specific recommendations and implementation roadmaps contained in this report offer a realistic and structured path for the region to advance toward full participation in the European mobility data ecosystem and to accelerate its digital transport transformation.

Acknowledgements

We wish to express our sincere appreciation to the Transport Community Permanent Secretariat, and in particular to the Task Manager, Ms. Nerejda Hoxha, for her pivotal role in guiding, monitoring, and reviewing the deliverables of this project. The contributions of the Transport Community experts have been instrumental not only in achieving the project's objectives but also in further strengthening our cooperation and partnership.

We also extend our gratitude to all Regional Partners (RPs) for their strong support and constructive collaboration—especially the focal points from the line ministries responsible for road transport and the representatives of Public Road Enterprises and Authorities. Their commitment to meetings, interviews, data provision, and review of interim and final outputs has been invaluable.

Finally, we gratefully acknowledge the dedication and expertise of our team of key experts, whose professionalism and sustained efforts have been essential to the successful completion of this assignment.

1.Introduction

This Chapter provides the conceptual and policy foundation for the assignment, outlining the broader European and regional drivers behind the establishment of National Access Points (NAPs) and National Bodies (NBs) in the Western Balkans. It introduces the legislative, institutional, and strategic context within which the project is implemented, positioning the assignment as part of the wider process of transport sector digitalisation and integration with the European Union transport acquis.

1.1 Background and Context

Intelligent Transport Systems (ITS) have become a fundamental component of modern mobility policy in Europe, enabling more efficient, safe, and sustainable transport through the use of digital technologies and real-time data exchange. The Western Balkan Regional Partners (RPs), through their commitments under the Transport Community Treaty, are progressively aligning with the EU's transport legislation and digital transformation agenda. In this context, the establishment of interoperable NAPs and NBs represents a key step toward harmonising transport-related data governance, supporting multimodal mobility services, and strengthening regional connectivity with the European transport network.

1.1.1 Brief Recap of the Transport Community Treaty

The Transport Community Treaty (TCT) establishes a permanent framework for cooperation between the European Union and the South East European Parties, aimed at progressively integrating their transport markets with that of the European Union. The Treaty builds upon earlier cooperation established through the 2004 Memorandum of Understanding on the South East Europe Core Regional Transport Network, which it supersedes. Recognising the integrated nature of international transport and its importance for economic growth, connectivity, and market integration, the TCT provides the legal and institutional foundation for harmonising rules, standards, and procedures across road, rail, maritime and inland waterways transport modes, while aviation remains governed by separate EU instruments.

The overarching objective of the TCT is the gradual alignment and integration of the transport systems of the Western Balkans into the EU transport market through the adoption and implementation of the relevant EU acquis. By creating a predictable, rule-based environment, the Treaty serves as a cornerstone of the region's EU connectivity agenda.

Within this framework, the deployment of Intelligent Transport Systems (ITS) and the establishment of interoperable, data-driven mobility services have emerged as strategic regional priorities. The TCT therefore provides not only the mandate but also the institutional basis for harmonised ITS deployment and governance, including the establishment of National Access Points and National Bodies as key enablers for compliant and interoperable transport data ecosystems.

1.1.2 Relevance of ITS Directive (EU) 2023/2661 and the Need for NAPs and NBs in the Western Balkans

The ITS Directive (EU) 2023/2661, which amends Directive 2010/40/EU, provides the updated legal and operational framework for the coordinated deployment of

Intelligent Transport Systems (ITS) in road transport and their interfaces with other transport modes. A core element of this revised directive is the obligation for Member States to ensure the harmonised collection, management, and exchange of transport-related data through National Access Points (NAPs). These platforms must make specific datasets—such as real-time traffic and travel information, road safety data, and information on alternative fuel infrastructure—available in machine-readable and interoperable formats, thereby enabling the provision of EU-wide ITS services.

To ensure compliance, the Directive also foresees the designation of National Bodies (NBs), entrusted with monitoring, verifying, and safeguarding the quality and accessibility of data provided via NAPs. Together, NAPs and NBs constitute the structural foundation for Europe's emerging digital mobility architecture, enabling more efficient traffic management, safer and more sustainable road transport, and seamless multimodal mobility solutions across borders.

Although the Western Balkan Regional Partners (RPs) are not yet EU Member States, they are legally committed under the Transport Community Treaty to progressively align their transport policies, legislation, and institutional frameworks with the EU acquis. As such, the requirements introduced by the ITS Directive (EU) 2023/2661 carry direct strategic relevance for the region. The establishment of NAPs and NBs becomes a necessary step for ensuring interoperability with European transport systems, avoiding digital fragmentation, and supporting long-term policy convergence with the Union.

Moreover, the region's transport digitalisation efforts currently vary in maturity, resulting in uneven data availability, limited standardisation, and fragmented ITS deployments. Without NAPs and NBs, the Western Balkans risk developing parallel, incompatible systems, hindering data exchange and undermining cross-border mobility. By contrast, the deployment of NAPs provides a single interface through which national datasets can be accessed, shared, or linked, while NBs ensure that those datasets meet the legal, technical, and quality criteria established by the EU.

Beyond regulatory alignment, these structures also serve broader strategic objectives:

- Facilitating regional and EU connectivity through interoperable data systems;
- Supporting data-driven decision-making for transport planning, safety initiatives, and multimodal passenger services;
- Preparing the institutional environment required for digital mobility technologies, such as real-time traffic management, automated driving, and alternative fuel networks; and
- Increasing access to EU financial instruments, as future infrastructure and digitalisation investments increasingly depend on the existence of robust, compliant governance and data-sharing mechanisms.
- For these reasons, the establishment of NAPs and NBs is not just a formal requirement but a pre-condition for enabling of modern, integrated, and innovation-ready transport systems in the Western Balkans. Their deployment represents a commitment to the region's digital transformation and its progressive integration into the wider European transport market.

1.2 Objectives of the Assignment

Against this backdrop, the assignment was launched to support the Western Balkan Regional Partners (RPs) in addressing these emerging obligations and to define the concrete steps required to establish National Access Points and National Bodies in line with EU requirements, as outlined in the following section.

1.2.1 General Objective

The overall objective of the assignment is to support the establishment of effective and interoperable National Access Points (NAPs) and National Bodies (NBs) within each Western Balkan Regional Partners (RPs), ensuring alignment with EU ITS legislation and facilitating seamless transport data exchange across the region.

1.2.2 Specific Objectives

The specific objectives are to:

- Identify the most suitable NAP and NB models tailored to the institutional, legal, and technical context of each Regional Partner (RP);
- Prioritise the data categories required to meet current and future data-sharing obligations under the ITS Directive and delegated regulations;
- Prepare detailed, partner-specific roadmaps outlining institutional, legal, technical and human resource requirements needed to establish operational NAPs and NBs by the end of the project timeline.

1.3 Scope of Works

The assignment has been implemented through three sequential phases—Inception, Implementation, and Finalisation—with deliverables submitted throughout the contract period in accordance with the Terms of Reference.

Inception Phase

The Inception Phase established the methodological, organisational, and analytical foundation for the assignment. During this phase, the project team refined the work plan, clarified stakeholder roles, and developed the operational framework necessary for subsequent activities. The phase included the kick-off meetings with the TCT Secretariat and Regional Partners (RPs), an extensive collection and review of existing ITS-related documentation, and the development of a comprehensive stakeholder mapping exercise to identify the key institutions, data owners, and relevant actors in each RP. It also involved designing the initial data collection instruments, including a structured questionnaire, to assess the availability, management, and interoperability of transport-related data across the Western Balkans. The Inception Report summarised the findings of this phase and confirmed the plan for executing the assignment.

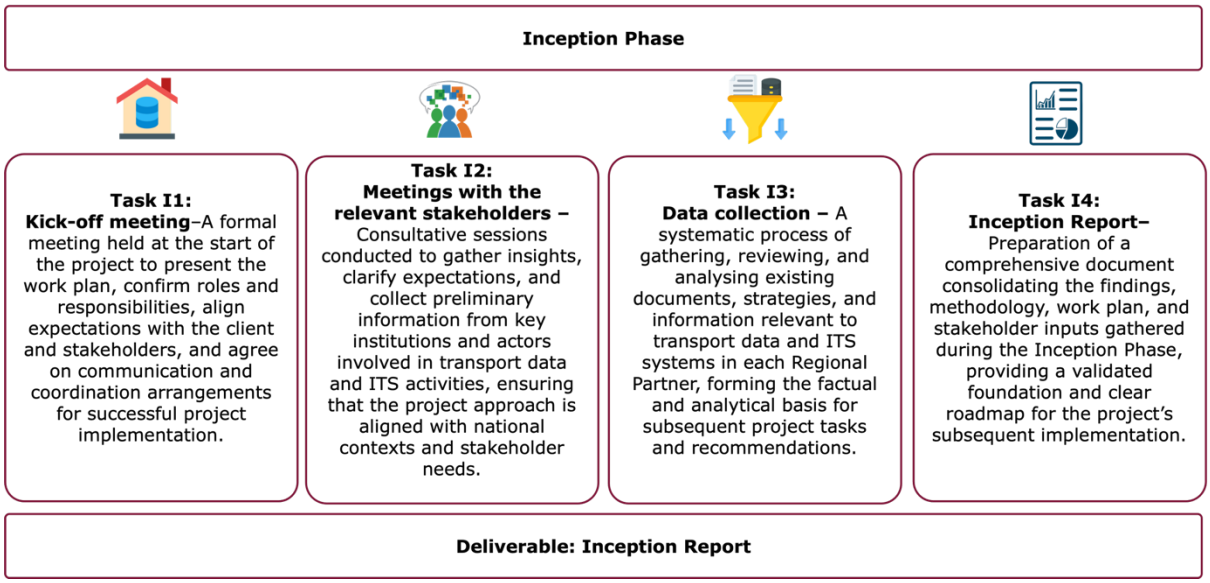

Figure 1 Inception phase overview

Implementation Phase

The Implementation Phase focused on the delivery of the assignment's three core tasks, each designed to address a critical dimension of the establishment of National Access Points and National Bodies in the Western Balkans. Building on the analytical foundations laid during the Inception Phase, this phase comprised:

Task 1: Defining the most suitable NAP and NB types for each RP, including institutional arrangements, governance structures, and cost estimates;

Task 2: Identifying and prioritising data categories in accordance with Annex III of Directive (EU) 2023/2661, reflecting each partner's data maturity and strategic needs and

Task 3: Preparing a roadmap for establishing NAPs and NBs, including capacity-building measures, milestones, costed implementation plans, and risk mitigation measures.

Each task was implemented through an iterative process of analysis, validation, and targeted consultation with regional authorities and stakeholders, ensuring that the proposed solutions were technically sound, context-specific, and aligned with EU requirements.

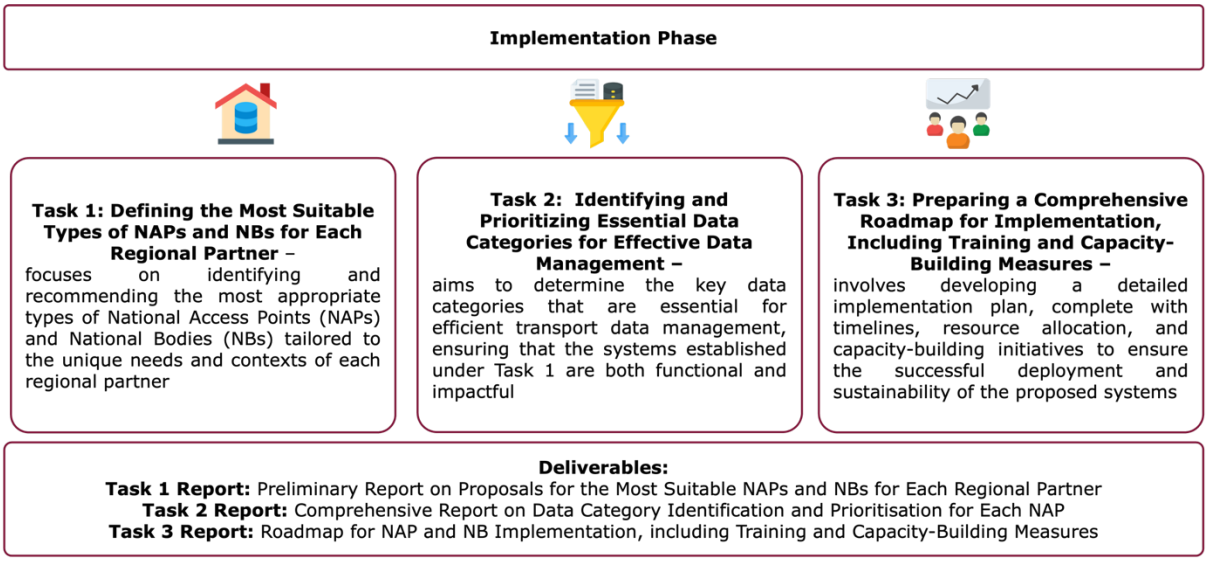

Figure 2 Implementation phase overview

Finalisation Phase

The Finalisation Phase concluded the assignment by consolidating all findings, validating the results of the three core tasks, and preparing the Final Report (this report). This phase involved integrating RP-specific outputs into a coherent regional narrative, formulating cross-cutting conclusions, and developing strategic recommendations to support the deployment of NAPs and NBs across the Western Balkans. Feedback from the TCT Secretariat and RPs incorporated to ensure accuracy, ownership, and alignment with ongoing regional transport digitalisation initiatives. The Final Report represents the conclusion of the assignment and serves as a reference document to guide future implementation efforts.

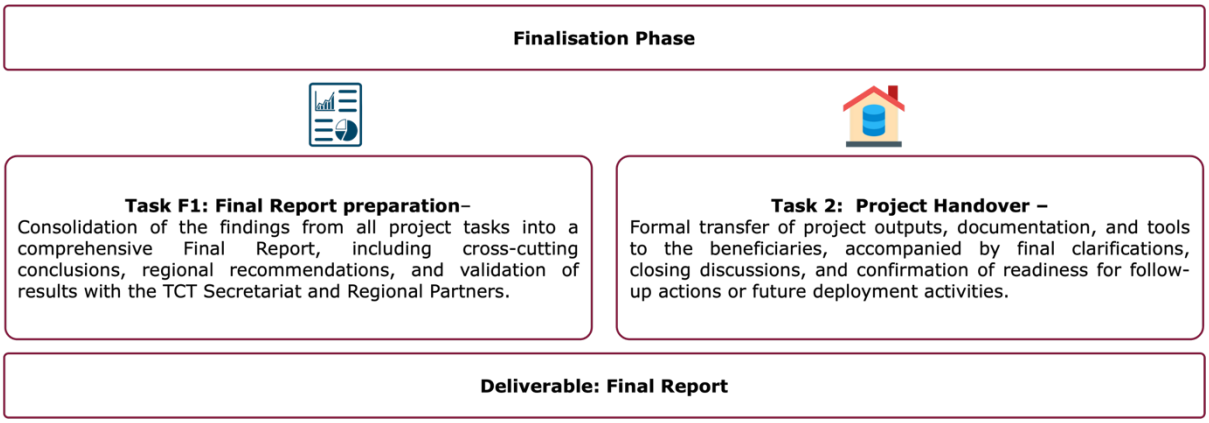

Figure 3 Finalisation phase overview

1.4 Institutional, Governance and Project Methodology

This Chapter presents the institutional and methodological framework applied for the delivery of the assignment, outlining the project's governance structure, data collection and analytical approaches, stakeholder engagement mechanisms, and the integration of EU best practices that collectively informed the preparation of the project deliverables.

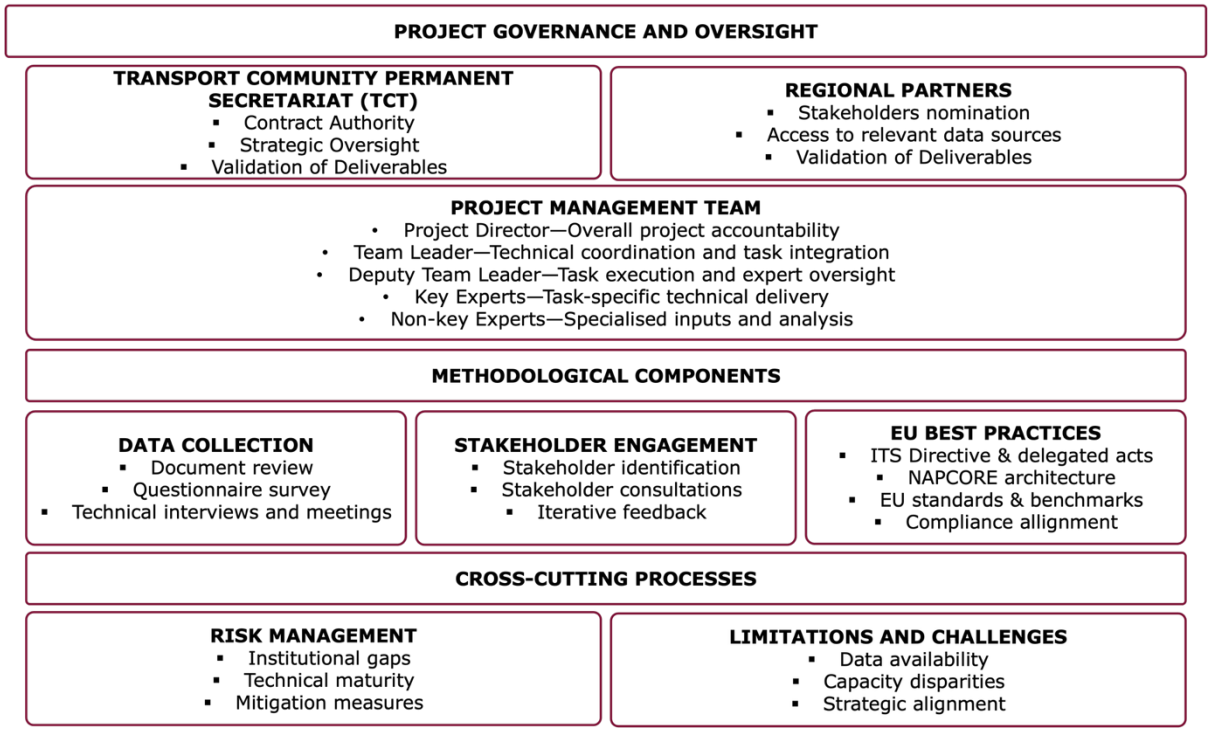

Figure 4 Institutional and methodological framework applied for the delivery of the assignment.

1.4.1 Institutional and Governance Setup

The project was delivered under a structured governance framework designed to ensure alignment with the Terms of Reference, coordinated engagement with the Regional Partners (RPs), and consistent quality control across the three technical tasks.

The Consultant operated under the supervision of the Permanent Secretariat of the Transport Community (TCT), which acted as the Contracting Authority, provided strategic oversight, and ensured coherence with broader regional policy priorities and reform processes. Coordination with the TCT Secretariat ensured that project outputs were aligned with regional transport policy priorities and the sequencing of reforms under the Next Generation Action Plans and the EU Growth Plan for the Western Balkans.

The RPs played a central role in the governance structure, acting as both beneficiaries and contributors to the assignment. Their responsibilities included nominating the relevant national institutions and experts to participate in data collection activities, facilitating access to national ITS and transport-data documentation, coordinating inter-agency communication where mandates overlapped, and validating the national-level findings and recommendations produced under each task. Through regular consultations, RPs provided critical

insights into institutional realities, regulatory frameworks, and operational constraints, ensuring that the proposed National Access Point (NAP) and National Body (NB) configurations reflected RP-specific needs and capacities rather than theoretical design assumptions.

The project team consisted of a Project Director, Team Leader, Deputy Team Leader, Key Experts, and Non-Key Experts, whose roles were defined for each technical task and deliverable. The Team Leader was responsible for overall direction, the Deputy Team Leader supervised technical development, and thematic experts contributed to stakeholder engagement, data analysis, and roadmap preparation. Clear reporting lines and a structured consultation process—including bilateral meetings, technical workshops, and iterative document reviews—ensured accountability and facilitated continuous validation of project outputs with both the TCT Secretariat and the RPs.

1.4.2 Approach to Data Collection and Analysis

The data collection methodology adopted for the project combined desk research, structured stakeholder engagement, and iterative validation. The process began during the Inception Phase, where national strategies, ITS action plans, reform agendas and relevant transport policy documents were compiled and analysed.

This was followed by a region-wide data collection effort implemented through an online questionnaire and targeted technical meetings with relevant authorities nominated by the RPs.

The questionnaire was designed to assess the current practices, legal obligations, data exchange mechanisms, ICT capabilities, and readiness levels related to data management and ITS service deployment.

The analytical framework combined quantitative indicators—such as data formats used, B2B system availability, and ICT infrastructure readiness—with qualitative insights obtained through bilateral consultations. Validation steps were carried out to address incomplete survey responses and clarify technical aspects, ensuring data reliability and consistency across the six RPs.

The validated datasets were subsequently classified into implementation tiers, enabling a phased rollout that aligns maturity levels with strategic importance across all RPs.

1.4.3 Stakeholder Engagement Strategy

The stakeholder engagement strategy was iterative, evidence-based, and embedded throughout all project phases. Stakeholder identification was initiated through a desk-based mapping exercise conducted during the Inception Phase, categorising actors according to their mandate, influence, and data-related roles within the transport ecosystem.

This process led to the development of stakeholder profiles for ministries, road operators, rail infrastructure managers, public transport authorities, ICT entities, and data users.

Engagement activities were organised through technical meetings, targeted consultations, and survey-based interaction, hosted at both national and regional levels for each RP

This iterative approach ensured alignment between EU-level obligations and national priorities while facilitating ownership of the emerging NAP/NB institutional models and roadmap actions. The feedback obtained directly shaped the final recommendations, including data category prioritisation and institutional setup options.

1.4.4 Use of EU Best Practices and NAPCORE Materials

The methodological framework applied by the Consultant was grounded in EU best practices to ensure regulatory, technical, and operational alignment with Directive (EU) 2023/2661 and the evolving ITS acquis. Existing EU documentation, legislative frameworks, European standards, and NAPCORE reference architecture were systematically reviewed and integrated into task deliverables.

Specific NAPCORE elements—such as the data dictionary and interoperability models—were used to benchmark the proposed NAP models and data category lists

This approach ensured that recommendations for metadata standards, data formats and communication protocols remained consistent with EU-wide practices, thereby enabling future cross-border interoperability and facilitating the integration of Western Balkan transport data ecosystems into the EU mobility data space.

To ensure that National Access Points in the Western Balkans are interoperable with EU mobility data ecosystems, the assignment applied a standards-based approach fully aligned with Directive (EU) 2023/2661, NAPCORE guidance and DG MOVE delegated legislation. The standards listed in Table below define how transport datasets are structured, described, exchanged, and interpreted, and constitute the technical backbone for NAP implementation across all RPs.

Table 1 Overview of Standardised formats and protocols

Standard	Focus area	Key specifications	Relevance to NAP's
MobilityDCAP-AP	Metadata, Semantics	API formats, unified terminology	Core compliance with Directive (EU) 2023/2661; ensures consistent dataset descriptions across NAPs
ISO 14817-1:2017	Data Definitions	Transport concept harmonisation	Enables cross-border alignment of concepts and data fields
ETSI TS 103 389	Real-Time V2I Communication	Event encoding, timestamp protocols	Live incident data transmission
INSPIRE	Geospatial Interoperability	WMS/WFS, coordinate systems	Static road network mapping
TN-ITS	Road data changes	Static road attributes	Exchange on modifications in static road attributes between authorities and data users
DG MOVE Delegated Regulations	Dynamic Data Formats	JSON-LD, GTFS-RT	Compliance with EU data-sharing mandates
DATEX II CEN/TS 16157	RealTime Traffic Information, Safety Related Traffic Information, Safe and Secure Truck Parking	Data models, API Exchange formats based on XML and JSON	Data exchange for RealTime Traffic Information, Safety Related Traffic Information, Safe and Secure Truck Parking Places,

Standard	Focus area	Key specifications	Relevance to NAP's
	Places, IDACS - Alternative fuel, EU-EIP Recommended services		IDACS - Alternative fuel, EU-EIP recommended services
TPEG ISO 21219	Traffic events, Traffic flow, Weather	Data models, API Exchange format, XML and binary format, adapted for DAB	Data exchange for Traffic events, Traffic flow, Weather
NeTEx CEN/TS 16614	Exchanging Public Transport schedules and related data	Public Transport Network topology, Scheduled Timetables, Fare information, XML based format	Exchange of public transport focused data
SIRI CEN/TS 15531	Exchanging real-time public transport related data	Data model and XML exchange format	Exchange of real-time public transport focused data

In line with NAPCORE reference architecture and the requirements set out in Directive (EU) 2023/2661, National Access Points may be implemented using different underlying models. The selection of the appropriate model depends on national institutional capacities, data availability, ICT infrastructure maturity, and the expected scope of data services to be supported. Table below provides an overview of the three principal NAP models considered under this assignment.

Table 2 Overview of NAP models

NAP Model	Description
Data Platform	A Data Platform NAP provides both metadata (descriptions of datasets) and the actual datasets or data services. Users can access information about the data and retrieve the data itself through downloads, APIs, or other machine-to-machine interfaces.
Metadata Directory	A Metadata Directory NAP provides only metadata about datasets. It functions as an index or catalogue, enabling users to identify, discover, and understand available datasets, while the data remains accessible solely through the original providers.
Hybrid	A combination of Data Platform and a Metadata Directory NAP that provides both the actual datasets, data services and it acts also as a catalog or index that allowing users to discover and understand available datasets.

1.4.5 Capacity Building and Institutional Strengthening of Regional Partners

The successful establishment, operation, and long-term sustainability of National Access Points (NAPs) and National Bodies (NBs) in the Western Balkans require not only technical deployment and legal harmonisation but also targeted capacity building and institutional strengthening across RPs. While the technical aspects of the Roadmap define the infrastructure and procedural steps for NAP/NB implementation, it is the organisational readiness, availability of skilled personnel, and ability to adopt, manage, and maintain evolving ITS standards that ultimately determine the effectiveness of these systems.

Capacity building has been identified as a horizontal, cross-cutting measure essential at multiple stages of the Roadmap — from the early design and legislative alignment phases, through deployment and operationalisation, to ongoing system upgrades and compliance with the evolving EU ITS Acquis. The Training Needs Assessment confirmed that RPs exhibit varying levels of technical maturity, differing institutional mandates, and uneven human resource capacities, particularly in areas related to data governance, interoperability standards, and cyber-secure ITS operations.

Capacity-building measures are therefore designed to:

- Enhance institutional competencies of governing and operational bodies responsible for NAP and NB implementation.
- Develop technical knowledge and skills for system design, API development, data quality assurance, and interoperability with EU-level platforms.
- Support alignment with EU ITS Directive 2023/2661 and delegated regulations, ensuring national legislation and operational procedures remain compliant.
- Strengthen stakeholder cooperation frameworks and promote a shared understanding of roles, obligations, and data exchange protocols among public and private sector actors.

To achieve these objectives, the Roadmap integrates structured capacity-building actions, including:

- Participation in NAPCORE initiatives, enabling RPs to exchange best practices and gain hands-on understanding of EU-wide NAP implementation models.
- Delivery of formal training sessions tied to NAP design, deployment, and operational phases.
- Development of institutional procedures and reporting mechanisms supporting long-term governance, system upgrades, and inter-agency coordination.

This structured approach ensures that capacity-building efforts are not conducted in isolation but embedded within the strategic and operational framework of each RP.

1.4.6 Roadmap Development Methodology

A harmonised methodology was applied to develop National Access Point (NAP) and National Body (NB) Roadmaps for each RP for the period 2026–2030. While the Roadmaps share a common structure, their content has been tailored to reflect the institutional, technical, and regulatory circumstances of each RP identified throughout the assignment.

Roadmap development was guided by four core structural components:

- a sequenced list of technical, institutional, legal, and capacity building measures;
- designation of responsible stakeholders;
- indicative cost estimates for capital and operational expenditures; and
- a time horizon consisting of quarterly milestones for the establishment phase (2026–2028) and annual periods for operation and enhancement (2029–2030).

In addition to these structural elements, the formulation of measures for each Roadmap was informed by a set of analytical considerations, ensuring that recommendations were realistic, technically feasible, and institutionally anchored:

Existing infrastructure – the current condition of ICT systems, the degree of digitalisation in the transport sector, available hosting capacity, and existing mechanisms for data collection and exchange.

Legal and regulatory frameworks – alignment of domestic legislation with Directive (EU) 2023/2661, delegated regulations, data protection requirements, and existing governance arrangements relevant to NAP/NB mandates.

Existing data ecosystem – maturity, formats, interoperability, quality, and accessibility of datasets across transport modes, including any ongoing initiatives for data publication, standardisation, or bilateral data exchange.

Administrative context – organisational structures, inter-institutional coordination, competencies of stakeholder bodies, and the level of endorsement for NAP/NB establishment within policy and strategic planning processes.

International commitments – obligations arising from participation in regional transport programmes, cross-border agreements, and cooperation frameworks influencing data exchange and ITS deployment.

No	Measure
1	**Establishment of National Access Point (NAP)**
1.1	Technical Preparation
1.2	Legal and Institutional Framework
1.3	Technical Deployment
1.4	Appointment of NAP personnel
2	**NAP Operation / Maintenance and System Upgrades**
2.1	NAP Operation and Maintenance
2.2	System Upgrading and development of APIs
3	**Collaboration between stakeholders for data exchange**
4	**Establishment of National Body (NB)**
4.1	Legal and Institutional Framework
4.2	Allocation of space for NB hosting
4.3	Appointment of NB personnel
5	**National Body Operation**

No	Measure
6	**Capacity Building**
6.1	Participation on NAPCORE Initiatives
6.2	Training sessions for NAP operation and maintenance
7	**Regular alignment with updates to the EU ITS Acquis**
8	**Introduction and Updating of EU Standards into ITS project's lifecycle***
8.1	Standard protocols for NAP authorisation and authentication
8.2	EU Standards for Traffic Management (DATEX II, TPEG, ALERT-C, Open LR)
8.3	EU Standards for Public Transport Management (NeTEx, SIRI)
8.4	INSPIRE directive protocols (GML language, OGC standards)
8.5	C-ITS (ETSI Standards)
8.6	TN-ITS Directive (CEN-17268) for the exchange of road-related spatial data

Figure 5 Formulation of measures

This contextual assessment enabled the prioritisation and sequencing of measures according to institutional readiness, data maturity, and strategic relevance. By directly linking institutional mapping findings and data prioritisation and maturity scoring to the design of the Roadmaps, the methodology ensured that recommendations were aligned with each RP's actual implementation capacity rather than theoretical compliance requirements.

1.4.7 Risk Management Approach

Risk management was an embedded methodological component used to identify potential obstacles affecting institutional setup, data readiness, stakeholder engagement, and implementation sequencing. The risks observed across the region include data fragmentation, varying levels of digital maturity, absence of NAP-related provisions in several ITS strategies, and insufficient operational infrastructure in some jurisdictions.

Mitigation measures were formulated by linking roadmap activities to the priorities of each RP, progressively sequencing implementation measures, and strengthening governance and capacity-building requirements. This approach reduced institutional and operational risks by ensuring that NAP and NB establishment remained realistically paced and aligned with available human, technical, and legal capacities.

1.4.8 Limitations and Challenges Encountered

The project encountered several limitations, mainly stemming from institutional and infrastructural heterogeneity among RPs. Challenges included incomplete survey responses, limited availability of harmonised transport data, and discrepancies in the maturity of ICT systems and procedures for data collection and exchange.

Differences in administrative mandates and organisational structures also generated variability in stakeholder coordination, necessitating additional clarification efforts during data analysis.

Furthermore, in certain RPs, existing ITS strategies do not explicitly reference NAP establishment, constraining the readiness assessment and requiring supplementary assumptions based on national transport development plans.

These constraints did not impede project delivery but informed the calibration of recommendations and the prioritisation logic applied to the roadmap.

2.Results by Regional Partner

Chapter 4 presents the consolidated results of the assignment for each Western Balkan Regional Partner (RP). The analysis is structured alphabetically and reflects the comprehensive, multi-stage assessment undertaken across Tasks 1, 2, and 3 of this Technical Assistance. The chapter provides an evidence-based overview of the current situation in each RP and outlines practical steps required for the establishment of a fully compliant National Access Point (NAP) and a designated National Body (NB) in accordance with Directive (EU) 2023/2661 and the associated delegated regulations.

For each RP, the chapter examines the maturity of the existing Intelligent Transport Systems (ITS) ecosystem and associated transport data landscape, including data availability, governance structures, interoperability constraints, and alignment with EU-standard metadata and data-exchange specifications. Institutional readiness is evaluated through an assessment of mandates, legal frameworks, organisational capacities, and existing ICT infrastructure, with a view to determining the most feasible hosting and governance arrangements for both the NAP and the NB.

The chapter further identifies priority data categories and provides a detailed readiness and maturity assessment, enabling a sequenced onboarding of datasets based on strategic importance and technical feasibility. Each RP section includes a costed implementation roadmap outlining phased deployment activities, indicative investment requirements, and key milestones needed to operationalise the NAP and ensure sustained compliance.

Finally, RP-specific recommendations are provided to guide legislative, technical, and organisational actions tailored to each RP’s current capabilities, institutional context, and strategic transport objectives. Taken together, the results present a harmonised yet differentiated approach that supports gradual NAP and NB establishment, as well as ITS integration across the region while respecting national priorities, administrative arrangements, and levels of digital maturity.

2.1 Albania

2.1.1 Current ITS and Transport Data Landscape

Albania is a Contracting Party to the Transport Community Treaty (TCT) and, under that framework, is committed to aligning its transport systems with the European Union acquis. Recent national transport sector reforms and infrastructure investments reflect this commitment. According to the regional NAP/NB assessment, Albania's existing transport-data environment includes partial data collection mechanisms (e.g., for road infrastructure, traffic monitoring at selected sites) and scattered ITS pilot deployments such as traffic monitoring and some smart-infrastructure elements.

At the same time, comprehensive governance of transport data—particularly structured, interoperable data sharing according to EU standards—is not yet in place. Data sources are fragmented across different agencies (road authorities, municipal transport bodies, ITS/traffic control centres), and there is no centralised mechanism for data publication, metadata standardisation, or data access for third parties. This results in limited reuse of data for real-time travel information, multimodal mobility services, or regional transport planning.

These conditions confirm that while Albania has a foundational transport infrastructure and some elements of digital/ITS deployment, its transport-data ecosystem is emerging, however further consolidation is required to meet the objectives of the forthcoming NAP/NB implementation.

2.1.2 Institutional Readiness and Gaps

Strengths

Albania's commitment to TCT implies political and institutional willingness to harmonise with EU transport and data governance standards. This provides strong legitimacy for the NAP/NB initiative.

Some ITS-related infrastructure and initiatives are already underway (e.g., traffic control systems, road infrastructure planning), indicating that technical capacity and institutional familiarity with data and transport management exist at least partially.

Gaps and Challenges

- Institutional fragmentation: multiple agencies manage different transport sub-sectors (roads, traffic control, municipalities), but there is no unified entity currently mandated to collect, manage, and publish transport-related data centrally.
- Lack of regulatory and governance framework for data sharing, metadata standardisation, and compliance assessment. Without clear legal or institutional mandate, ad-hoc data sharing is common but structured data governance is missing.
- Resource constraints: limited ICT infrastructure capacity for hosting and maintaining a robust, secure data platform; insufficient human resources with expertise in data management, interoperability standards, and compliance monitoring.
- Data availability: while basic static data (road network, infrastructure) may exist, dynamic data (real-time traffic flows, incidents, safety events) are only

partially collected and often not digitised in structured formats, impeding readiness for full compliance.

Given these gaps, establishing a dedicated institutional arrangement (NAP + NB) is necessary to consolidate responsibilities, ensure data governance, and support phased upgrade of data collection and sharing practices.

2.1.3 Proposed NAP Type and Justification

Recommended NAP Model: Hybrid NAP

Following the assignment findings and the multi-criteria assessment of NAP models conducted for all RPs, the Hybrid NAP emerges as the most suitable solution for Albania

The assessment demonstrated that the Hybrid model achieved the highest overall rating, outperforming both the metadata directory and full data platform models in terms of technical compatibility, scalability, interoperability, and legal-institutional alignment. The recommendation is based on the following key elements:

Alignment with Albania's current data ecosystem

Albania is characterised by a fragmented transport data landscape, where different organisations already collect partial ITS datasets but without uniform standards or a common access framework. The hybrid model permits progressive onboarding of data while building upon existing infrastructure— notably the Road Traffic Monitoring and Control Centre—without requiring wholesale replacement of legacy systems.

Supports incremental maturity upgrades

The Hybrid NAP allows Albania to start with metadata-driven discovery services, while selectively ingesting and hosting actual datasets in cases where providers lack APIs or when regulatory or interoperability requirements require centralised storage. This approach fits Albania's present maturity level and enables compliance improvements over time.

Interoperability and cross-border readiness

The Hybrid NAP aligns with the EU ITS Directive (2023/2661) and related delegated regulations, and is technically compatible with NAPCORE reference architecture, allowing Albania to integrate seamlessly with the evolving EU mobility data ecosystem.

Balanced cost and complexity

Compared to a full data platform, the Hybrid model minimizes initial capital expenditure while reducing institutional burden, enabling Albania to allocate resources gradually toward the most strategically important datasets—notably safety-related and real-time traffic information.

Therefore, the Hybrid NAP represents the optimal balance between Albania's current institutional capacity, technical infrastructure, and legislative trajectory. It offers a pragmatic implementation pathway toward full NAP functionality and ensures that investments made now remain future-proof and fully compliant with EU and NAPCORE expectations.

2.1.4 Proposed NB Set-up and Functions

Consistent with the EU legislative framework and the functional boundaries identified throughout the assignment, establishment of a National Body (NB) is proposed as an essential counterpart to the NAP

Albania has proposed the designation of the Albanian Institute of Transport (AIT) as the competent institution to perform NB functions, operating under the strategic oversight of the Ministry of Infrastructure and Energy. This placement ensures that the NB:

- Operates with an independent mandate but benefits from ministerial oversight and policy continuity.
- Has a clear role in validating compliance with EU Delegated Regulations through standardised methodologies.
- Maintains operational proximity to the national institutional structures responsible for ITS development and NAP data flows.

Core NB Functions

The NB in Albania will assume the following legally and functionally mandated tasks, in line with EU practice and NAPCORE recommendations

- Data compliance & quality assurance: Verify that data providers conform to the formats, completeness, timeliness, and procedural standards required under the ITS legal framework.
- Metadata and governance oversight: Maintain authoritative metadata records, including update frequency, origin, validation status, access policies, and dataset version history.
- Data-sharing governance: Issue and monitor data-sharing agreements, define access rules (open/restricted), and ensure coherence between datasets, NAP protocols, and ICT capabilities at provider level.
- User support and stakeholder liaison: Act as the primary contact point for data providers, mobility service developers, and other NAP stakeholders, facilitating onboarding and operational problem resolution.
- Monitoring and reporting: Prepare periodic compliance reports for national authorities and enable traceability of datasets and their providers.

Resource Requirements

To fulfil its mandate, the NB will require:

Dedicated staff covering metadata governance, data quality, compliance control, and ICT integration.

Support systems including database services, secure hosting, access management layers, and compliance assessment tools, aligned with EU best practice.

Institutional Responsibilities

In line with the institutional arrangements proposed, the authorities that are expected to assume the governance, coordination, and operational roles required for the establishment and functioning of the National Access Point (NAP) and the National Body (NB) have been identified. The allocation of institutional responsibilities is presented in Table below.

Table 3 Institutional responsibilities - Albania

Governing Body/Coordinating Committee/	Operational Unit	National Body
Ministry of Infrastructure and Energy	Albanian Road Authority (ARA)	Albanian Institute of Transport (AIT)

This allocation ensures that the NB is institutionally positioned to perform quality assurance, metadata governance, and compliance functions, while maintaining operational links with the entities responsible for data production and ITS deployment.

2.1.5 Priority Data Categories and Readiness Assessment

A comprehensive assessment of Albania's transport-related datasets was undertaken to determine their maturity, availability, and readiness for publishing through the National Access Point (NAP). The evaluation examined digitalisation levels, metadata quality, interoperability potential, clarity of data ownership, and alignment with Directive (EU) 2023/2661 and NAPCORE interoperability specifications.

The findings confirm that while Albania collects several NAP-relevant datasets, most are maintained in non-standardised formats and lack harmonised metadata or automated publication mechanisms. As a result, preparatory actions are required before onboarding can take place. To establish a phased implementation sequence, datasets were identified, categorised, and assessed against maturity and availability criteria. The results are presented in the table below.

Table 4 Albania – data category identification and availability

Data Category	Maturity level	Data availability
Safety related traffic information (SRTI)	Intermediate	Available, non-standardised formats
Road closures, roadworks, incidents (RTTI)	Intermediate	Available, non-standardised formats
Road traffic flow data (RTTI)	Intermediate	Available, non-standardised formats
Static road infrastructure data	Basic	Toll data
Dynamic road infrastructure data	Basic	*No data available*
Multimodal LOS1 (MTIS)	Basic	Passing times
Multimodal LOS2 (MTIS)	Basic	*No data available*
Multimodal LOS3 (MTIS)	Basic	Trip fares
Multimodal LOS4 (MTIS)	Basic	*No data available*

To define a structured onboarding path, each dataset was evaluated using two weighted criteria:

- Maturity – readiness of systems and organisations to provide the dataset, and

- Strategic importance – relevance for EU compliance, cross-border services, and user needs.

These scores were combined into a composite value, resulting in the prioritisation presented below.

Table 5 Albania - prioritisation of data categories

Data category	Maturity	Strategic importance	Score
Safety related traffic information (SRTI)	5	9	7,4
Road closures, roadworks, incidents (RTTI)	5	9	7,4
Road traffic flow data (RTTI)	5	7	6,2
Static road infrastructure data	1	6	4
Dynamic road infrastructure data	1	6	4
Multimodal LOS1 (MTIS)	1	6	4
Multimodal LOS2 (MTIS)	1	4	2,8
Multimodal LOS3 (MTIS)	1	3	2,2
Multimodal LOS4 (MTIS)	1	1	1

The prioritisation clearly identifies three datasets—Safety-Related Traffic Information (SRTI), Road Closures / Roadworks / Incidents (RTTI), and Road Traffic Flow Data (RTTI)—as Tier 1 datasets. These form the initial core package for NAP publication, offering the highest strategic relevance and regulatory alignment.

Static and dynamic road infrastructure data and Multimodal LOS1 represent Tier 2 datasets, requiring preparatory consolidation of data sources, metadata development, and the definition of update responsibilities before onboarding.

The remaining multimodal datasets fall into Tier 3, characterised by minimal maturity and limited immediate feasibility. These datasets require medium-term investment before integration becomes viable.

Table 6 Albania - prioritisation profile

Data category	Tier
Safety related traffic information (SRTI)	1
Road closures, roadworks, incidents (RTTI)	1
Road traffic flow data (RTTI)	1
Static road infrastructure data	2
Dynamic road infrastructure data	2
Multimodal LOS1 (MTIS)	2

Data category	Tier
Multimodal LOS2 (MTIS)	3
Multimodal LOS3 (MTIS)	3
Multimodal LOS4 (MTIS)	3

This tier-based sequencing allows Albania to establish the NAP with datasets that provide immediate value and demonstrable compliance, while gradually expanding technical capability, institutional readiness, and multimodal integration.

2.1.6 Roadmap and Indicative Implementation Timeline

In accordance with the harmonised Roadmap Development Methodology, a phased implementation roadmap has been prepared for Albania, covering the period 2026–2030. The roadmap translates the assignment findings into a sequenced set of actionable measures required for the establishment, operationalisation, and sustained functioning of the National Access Point (NAP) and the National Body (NB).

The roadmap reflects Albania's institutional configuration, current level of data maturity, and strategic priorities regarding transport digitalisation. It is structured into three implementation phases, each corresponding to the progressive build-up of capabilities and systems required under Directive (EU) 2023/2661:

Phase 1 (Months 0–12)

Legal and institutional preparation including the establishment of the NB, definition of mandates, and formalisation of governance roles. Initiation of the NAP technical concept, procurement activities, metadata catalogue development, and preparation of static datasets.

Phase 2 (Months 12–24)

Onboarding and publication of static datasets, operationalisation of the NAP platform, and delivery of capacity-building activities. Pilot deployment of dynamic datasets covering traffic, road status, and selected corridors or urban zones.

Phase 3 (Months 24–36)

Expansion of dynamic datasets and onboarding of additional data categories such as alternative fuel infrastructure and multimodal public transport information. Full operation of the NAP and NB, including regular updates, service improvement, and user support.

The detailed measures, responsible institutions, indicative costs, and implementation timelines are presented in Table below.

Table 7 Albania Roadmap 2026 - 2030

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
1	**Establishment of National Access Point (NAP)**																
1.1	**Technical Preparation**	- Ministry of Infrastructure and Energy - Albanian Road Authority (ARA)	--														
1.1.1	Technical Assistance Support (Planning, Design, Procurement)		30,000 EUR														
1.1.2	NAP design review		3,600 EUR														
1.1.3	Tender process and selection of awarded system provider		7,200 EUR														
1.2	**Legal and Institutional Framework**	Ministry of Infrastructure and Energy supported by Albanian Road Authority (ARA)	-														
1.2.1	Legislative framework for NAP (preparation and adoption)		25,200 EUR														
1.2.2	Institutional responsibilities and relationships		n.a.														
1.2.3	Coherent data governance framework		n.a.														
1.2.4	Reporting framework for the NAP		n.a.														
1.3	**Technical Deployment**	Albanian Road Authority (ARA)	-														
1.3.1	Allocation of space of NAP hosting		n.a.														
1.3.2	Hardware acquisition and configuration		625,000 EUR														
1.3.3	Software acquisition and configuration																
1.3.4	Custom APIs for integration with existing systems																
1.3.5	NAP system testing and commissioning																
1.4	**Appointment of NAP personnel**	Albanian Road Authority (ARA)	43,200 EUR per year														
2	**NAP Operation / Maintenance, Data and System Upgrades**	Albanian Road Authority (ARA)	-														

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
2.1	NAP Operation and Maintenance		95,000 per year														
2.2	System Upgrading and development of APIs																
3	**Collaboration between stakeholders for data exchange**	Ministry of Infrastructure and Energy, All	n.a.														
4	**Establishment of National Body (NB)**																
4.1	**Legal and Institutional Framework**	Ministry of Infrastructure and Energy supported by Albanian Institute of Transport (AIT)	-														
4.1.1	Legislative framework for NB (preparation and adoption)		n.a.														
4.1.2	Institutional responsibilities and relationships		n.a.														
4.2	**Allocation of space for NB hosting**	Albanian Institute of Transport (AIT)	n.a.														
4.3	**Appointment of NB personnel**	Albanian Institute of Transport (AIT)	21,600 EUR per year														
5	**National Body Operation**	Albanian Institute of Transport (AIT)	25,200 EUR per year														
6	**Capacity Building**																
6.1	Participation on NAPCORE Initiatives	- Ministry of Infrastructure and Energy - Albanian Road Authority (ARA) - Albanian Institute of Transport (AIT)	26,400 EUR per year														
6.2	Training sessions for NAP operation and maintenance		13,800 EUR per year														
7	**Regular alignment with EU Acquis**	Ministry of Infrastructure	n.a.														
8	**Introduction and Updating of EU Standards into ITS projects lifecycle***																

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
8.1	Standard protocols for NAP authorisation and authentication	- Albanian Institute of Transport - Albanian Road Authority (ARA)	n.a.														
8.2	EU Standards for Traffic Management (DATEX II, TPEG, ALERT-C, Open LR)		n.a.														
8.3	EU Standards for Public Transport Management (NeTEx, SIRI)		n.a.														
8.4	INSPIRE directive protocols (GML language, OGC standards)		n.a.														
8.5	C-ITS (ETSI Standards)		n.a.														
8.6	TN-ITS Directive (CEN-17268) for the exchange of road-related spatial data		n.a.														
**** Compulsory introduction after adopting EU Legislation Acts into domestic law - previous introduction is recommended (such as DATEX II, NeTEx, SIRI)***																	

2.1.7 Estimated Costs and Capacity-building Needs

Estimated Costs

The establishment and operation of the National Access Point (NAP) and National Body (NB) in Albania requires a mix of capital expenditure (CAPEX) for system deployment and operational expenditure (OPEX) for maintenance, staffing, and compliance activities.

Table 8 Albania - estimated CAPEX and OPEX

Initial Investment (EUR)	Annual Opex for first 3 years Years 1–3 (approx. 15–20%)	Annual OPEX for Year 4 onwards -40% compared to previous years	Remarks
625 000	≈ 95 000	≈ 57 000	Existing ITS centre and MoIE coordination

Cost estimates developed identify financial requirements across three dimensions: ICT infrastructure, software development and integration, and institutional capacity-building. These investments are essential to ensure that the NAP delivers interoperable, EU-compliant services and can evolve in line with the ITS acquis and delegated acts.

Cost Structure

The estimated overall cost of the NAP software package—covering design, development, integration, testing and commissioning—is approximately EUR 500,000. This includes the implementation of several key subsystems required for full compliance with EU standards:

G2B/B2B API subsystem supporting push/pull and GET/POST interfaces, enabling machine-readable data exchange with national stakeholders and third-party service providers using formats such as DATEX II, NeTEx, SIRI, GTFS, TPEG and GeoJSON, including performance metrics and the development of national DATEX II profiles.

MobilityDCAT-compatible Metadata subsystem, implementing a metadata registry aligned with NAPCORE and INSPIRE specifications to ensure dataset discoverability and harmonised catalogue services.

Public NAP User and Role Management subsystem supporting secure authentication, authorisation and account management for public and administrative users.

GIS subsystem providing spatial visualisation, map layers and browsing of location-based datasets.

Routing Engine subsystem enabling routing and network analysis based on national or open-source data sets.

Web Portal and Content Management subsystem serving as the public interface for dataset discovery, documentation, and user support.

Overview of additional costs required is presented in the table below.

Table 9 Additional costs overview

Category	Description
ICT infrastructure	Hardware procurement, hosting environment, data storage, redundancy and cybersecurity controls
Software licensing and development	Configuration of NAP platform components, APIs, metadata catalogue, and integration tools
Human resources	Recruitment and training of NB officers, data stewards, IT support and compliance specialists
Operations and maintenance	Hosting fees, software updates, dataset refresh cycles, support desk, and periodic compliance audits
Institutional strengthening	Procedural development, documentation and reporting protocols enabling NB oversight

The emphasis on interoperability and compliance under the ITS Directive necessitates not only system investment but also sustained operational support.

Capacity-Building Needs

Capacity-building is a critical enabler for Albania's NAP and NB implementation and remains a recurring requirement throughout the roadmap period. The institutional analysis highlighted gaps in specialised skills related to:

- data governance and semantic interoperability,
- metadata structuring and quality control,
- implementation of EU standards and delegated acts, and
- operation and maintenance of API-based exchange services.

Accordingly, priority capacity-building measures include:

- Training on EU mobility data standards and metadata profiles (NAPCORE, MobilityDCAT-AP, DATEX II), enabling Albanian institutions to apply harmonised specifications and maintain future compliance;
- Workshops for data providers to align mandates, data-sharing agreements and operational procedures across ministries, road authorities and public transport bodies;
- Technical upskilling of IT personnel responsible for NAP deployment and maintenance, API configuration, testing, and performance monitoring; and
- Participation in NAPCORE initiatives and working groups, providing exposure to EU peer practices and enabling Albania to adopt evolving standards in real time.

These measures ensure that the financial investment in the NAP infrastructure is matched by institutional maturity, reducing long-term implementation risks and supporting Albania's transition toward a sustainable, interoperable transport data ecosystem.

Taken together, these cost and capacity-building measures provide Albania with the financial and organisational foundation required to operationalise the NAP and NB in line with EU expectations and regional interoperability targets.

2.1.8 Key Recommendations

Implement the Hybrid NAP model, allowing Albania to combine centralised hosting and federated data access, and enabling progressive onboarding of datasets in line with its current digital maturity.

Operationalise the institutional allocation, with the Ministry of Infrastructure and Energy providing strategic oversight, the Albanian Road Authority (ARA) managing NAP technical deployment, and the Albanian Institute of Transport (AIT) acting as the National Body responsible for compliance, metadata governance, and reporting.

Initiate NAP implementation with high-priority, higher-maturity datasets, beginning with static road network and safety-related traffic information, and expand toward dynamic traffic and multimodal datasets as infrastructure, data quality, and institutional capacity improve.

Develop and maintain a metadata catalogue aligned with NAPCORE and MobilityDCAT-AP requirements, supported by formal, standardised data-sharing agreements that regulate dataset accessibility, update frequency, and provider obligations.

Allocate sufficient financial, human, and technical resources to support NAP establishment, including ICT platform deployment, metadata management roles, NB monitoring functions, and sustained operation and maintenance beyond 2028.

Follow the phased implementation roadmap for 2026–2030, ensuring that milestones, deliverables, and responsibilities are monitored and adjusted as needed to maintain compliance with Directive (EU) 2023/2661 and evolving delegated acts.

Strengthen institutional capacity through structured training programmes and participation in NAPCORE working groups, focusing on data governance, EU data standards (DATEX II, NeTEx, SIRI, GTFS-RT), metadata registration, and interoperability practices.

2.2 Bosnia and Herzegovina

2.2.1 Current ITS and Transport Data Landscape

Bosnia and Herzegovina (BiH) exhibits a complex and heterogeneous ITS environment shaped by its highly decentralised governance structure. Competences relevant to transport policy, digital infrastructure, and data management are divided among multiple administrative levels—the State, the Federation of Bosnia and Herzegovina (FBiH), Republic of Srpska (RS), and the Brčko District—each operating independent legal, institutional, and ICT frameworks. This decentralisation results in fragmented approaches to ITS deployment, data collection, and interoperability.

At the State level, the Ministry of Communications and Transport (MoCT BiH) provides overarching strategic direction and represents BiH in EU transport and ITS-related dialogues. However, practical responsibilities for road network management, public transport systems, and traffic-related data collection lie primarily with entity-level institutions such as PE Ceste Federacije BiH (FBiH) and PE Putevi RS (RS), as well as transport and ICT departments within the Brčko District.

Existing ITS capabilities vary across jurisdictions. While certain datasets—such as static road network information and selected safety or incident records—are maintained at the entity level, these are characterised by non-standardised formats, inconsistent update mechanisms, and limited digital interoperability. Dynamic datasets, including real-time traffic information, multimodal transport data, and road status conditions, are either unavailable, collected for operational use only, or maintained in standalone systems without defined data-sharing protocols. No single institution currently consolidates, governs, or publishes transport-related datasets at the State level.

This fragmented landscape creates both a challenge and an opportunity for the establishment of a National Access Point (NAP). The absence of unified data models, metadata standards, and cross-entity exchange mechanisms underscores the need for a coordinated national solution, while the presence of existing datasets at entity level provides a foundation for incremental onboarding once common standards and governance structures are introduced.

2.2.2 Institutional Readiness and Gaps

Bosnia and Herzegovina’s institutional landscape for ITS deployment and transport data governance is characterised by a multi-layered administrative structure, where mandates for infrastructure management, ICT systems, and transport data are distributed across several authorities. While individual institutions retain operational responsibilities within their jurisdictions, no single entity currently holds an overarching mandate for national-level data integration, standardisation, or publication—functions that are essential for a compliant National Access Point (NAP) and National Body (NB) establishment. This fragmented administrative architecture requires a tailored approach to governance, standardisation, and data integration.

Strengths

Existing transport datasets at entity level: Both PE Ceste Federacije BiH and PE Putevi RS maintain digitised road infrastructure datasets, providing a tangible starting point for NAP onboarding.

Operational technical capacities within road agencies: Entity Road authorities possess ICT systems and traffic-related data collection processes that can be upgraded to support metadata harmonisation and NAP interfacing.

State-level coordination potential: The Ministry of Communications and Transport of BiH provides a legitimate institutional anchor for hosting the NB and representing BiH in EU ITS policy alignment processes.

Growing awareness of ITS relevance: Participation in regional ITS initiatives, TCT processes, and preliminary data coordination activities demonstrates institutional willingness to engage in structured data governance reforms.

Gaps

Lack of unified national transport data governance: No institution currently consolidates datasets or enforces common metadata models, data-sharing procedures, or interoperability standards across jurisdictions.

Uneven data maturity and standardisation: Static road data exists in both entities but lacks harmonised formats; dynamic datasets—such as traffic conditions, multimodal transport, or real-time reporting—are limited or unavailable.

Fragmented mandates and regulatory misalignment: Entity-level legislation does not explicitly require participation in a national NAP, creating uncertainty regarding data submission obligations and long-term compliance with EU Directive (EU) 2023/2661.

Absence of formalised inter-entity cooperation mechanisms: Current coordination relies on ad-hoc arrangements without legally defined roles or reporting responsibilities.

Challenges

Constitutional and administrative decentralisation: The distribution of transport competence across the national and entity levels complicates the definition of a single operational and governance pathway for NAP implementation.

ICT interoperability barriers: Existing systems employ different data formats, collection methods, and ICT architectures, making integration costly without prior standardisation and metadata alignment.

Capacity-building needs: Technical, legal, and organisational skills in EU ITS standards (DATEX II, NeTEx, SIRI, GTFS-RT), metadata governance, and real-time data management must be significantly enhanced before dynamic datasets can be reliably integrated.

Risk of parallel systems and duplication: Without a centralised governance mandate, entities may continue investing in isolated data solutions, undermining NAP cohesion and inflating long-term operational costs.

2.2.3 Proposed NAP Type and Justification

Recommended NAP Model: Hybrid NAP

BiH's fragmented administrative framework, absence of a unified national data portal, and differing levels of digitalisation across the entities necessitate a Hybrid NAP model. This model allows:

Federated data contributions from entity and district authorities, while ensuring State-level visibility and coordination.

Incremental onboarding of datasets without requiring prior full harmonisation of ICT systems.

EU alignment capability, ensuring that, once operational, the NAP can interface with European mobility data standards and exchange protocols promoted by NAPCORE.

The hybrid option was deemed the only viable solution given the constitutional setup and the fact that no single institution currently holds comprehensive jurisdiction over transport-related data.

2.2.4 Proposed NB Set-up and Functions

Given Bosnia and Herzegovina's constitutional setup and decentralised administrative arrangements, a coordinated National Body (NB) model under State-level leadership, supported by entity-level operational structures, is proposed as the most viable and compliant approach for implementing Directive (EU) 2023/2661.

The Ministry of Communications and Transport of Bosnia and Herzegovina (MoCT BiH) should be formally designated as the National Body. Its mandate, legal status, and recognised role in representing BiH in EU transport processes position it as the one institution capable of:

- ensuring harmonised alignment with the ITS Directive,
- performing state-level reporting obligations, and
- coordinating policy coherence across entities and the Brčko District.

To operationalise this mandate, the NB should function within a dual-entity governance framework:

- Federal Ministry of Transport and Communications (FBiH) and
- Ministry of Transport and Communications of Republic of Srpska (RS)

jointly support ITS-related policies, regulatory development, and enforcement at entity level, ensuring vertical coherence between national commitments and subnational execution.

The technical implementation of NAP functions should be decentralised and performed by the existing road infrastructure companies:

- PE Ceste and
- PE Putevi.

which already manage transport infrastructure datasets and possess the ICT interfaces required for data provisioning. These entities constitute the practical operational nodes of the NAP framework.

Where appropriate, additional operational partners may be integrated, including Brčko District authorities and rail/public transport operators, subject to future data availability and ITS policy expansion.

The NB will be responsible for:

- Data quality and compliance verification across entity-level providers
- Metadata and interoperability governance adopting EU/NAPCORE-aligned data dictionaries
- Regulation of data access and authorisation mechanisms, including data-sharing agreements
- Structured inter-entity coordination, facilitated through legally binding cooperation instruments and/or working groups
- Performance monitoring, reporting, and oversight towards the TCT Secretariat and the European Commission

To ensure the NB is fully operational, the following reforms are recommended:

- Establishment of a dedicated ITS/NAP coordination unit within MoCT BiH
- Introduction of legal and procedural instruments (MoUs, protocols, or delegated legislation) mandating structured data exchange between the State and the entities
- Capacity-building initiatives focused on ITS regulation, metadata management, and interoperability standards
- Technical assistance to support the deployment of NAP-compliant ICT infrastructure

Table 10 Institutional responsibilities - Bosnia and Herzegovina

Governing Body/Coordinating Committee/	Operational Unit	National Body
Ministry of Communications and Transport of Bosnia and Herzegovina Federal Ministry of Transport and Communications Ministry of Transport and Communications of Republic of Srpska	Public enterprises for roads on entity level: - PE Ceste and - PE Putevi.	Ministry of Communications and Transport of Bosnia and Herzegovina

This model ensures that the NB possesses state-level authority and EU-facing legitimacy, while practical data provisioning and system operation remain decentralised and entity-driven. It reflects Bosnia and Herzegovina's unique governance architecture and provides a sustainable path towards full compliance with the ITS Directive and interoperability across RPs.

2.2.5 Priority Data Categories and Readiness Assessment

A structured assessment of Bosnia and Herzegovina's transport datasets was conducted to determine their maturity, availability, and suitability for onboarding into the National Access Point (NAP). The analysis examined dataset digitalisation levels, governance arrangements, interoperability readiness, and the degree of alignment with Directive (EU) 2023/2661 and NAPCORE interoperability specifications.

The results confirm that Bosnia and Herzegovina maintains several datasets relevant to NAP implementation. However, unlike other Western Balkan partners with fully centralised transport governance, dataset ownership and ITS responsibilities in Bosnia and Herzegovina are distributed across entity-level administrations (FBiH, RS, BD). While this provides a strong operational foundation, it also results in fragmented data architectures, heterogeneous formats, and differing levels of digital readiness—none of which currently enable unified publication or automated exchange.

To determine onboarding sequencing, datasets were identified and categorised according to maturity (technical readiness and governance clarity) and availability. These results are summarised below.

Table 11 Bosnia and Herzegovina – data category identification and availability

Data Category	Maturity level	Data availability
Safety related traffic information (SRTI)	Intermediate	DATEX II (only partially)
Road closures, roadworks, incidents (RTTI)	Intermediate	DATEX II (only partially)
Road traffic flow data (RTTI)	Intermediate	DATEX II (only partially)
Static road infrastructure data	Basic	Toll data
Dynamic road infrastructure data	Basic	*No data available*
Multimodal LOS1 (MTIS)	Basic	*No data available*
Multimodal LOS2 (MTIS)	Basic	*No data available*
Multimodal LOS3 (MTIS)	Basic	*No data available*
Multimodal LOS4 (MTIS)	Basic	*No data available*

To support phased NAP deployment, each dataset was assessed using the prioritisation framework applied across all RPs. This framework evaluates:

- Data maturity – degree of digitalisation, metadata completeness, frequency of updates, API readiness, and custodianship, and
- Strategic importance – contribution to ITS services, cross-border continuity, safety objectives, and compliance obligations.

Each data category received a composite score. The results are presented below.

Table 12 Bosnia and Herzegovina – prioritisation of data categories

Data category	Maturity	Strategic importance	Score
Safety related traffic information (SRTI)	5	9	7,4
Road closures, roadworks, incidents (RTTI)	5	9	7,4
Road traffic flow data (RTTI)	5	7	6,2
Static road infrastructure data	1	6	4

Data category	Maturity	Strategic importance	Score
Dynamic road infrastructure data	1	6	4
Multimodal LOS1 (MTIS)	1	6	4
Multimodal LOS2 (MTIS)	1	4	2,8
Multimodal LOS3 (MTIS)	1	3	2,2
Multimodal LOS4 (MTIS)	1	1	1

The prioritisation confirms that Bosnia and Herzegovina should initiate NAP implementation with three Tier 1 datasets:

- Safety related traffic information (SRTI)
- Road closures, roadworks, incidents (RTTI)
- Road traffic flow data (RTTI)

These datasets demonstrate the highest maturity and strategic relevance and already exist—albeit in partially DATEX II–compatible formats—making them the most efficient entry point for Phase 1 NAP deployment. However, onboarding requires:

- Harmonisation of entity-level schemas,
- Adoption of a single metadata framework, and
- Establishment of automated publication workflows.

Tier 2 datasets—static road infrastructure and dynamic infrastructure data—require preparatory actions, including:

- Consolidation of infrastructure inventories,
- Clear allocation of update responsibilities across entities, and
- Alignment with EU metadata models prior to publication.

Tier 3 multimodal datasets are currently unavailable and require significant digitalisation efforts, institutional coordination, and investment before onboarding can occur.

Table 13 Bosnia and Herzegovina - prioritisation profile

Data category	Tier
Safety related traffic information (SRTI)	1
Road closures, roadworks, incidents (RTTI)	1
Road traffic flow data (RTTI)	1
Static road infrastructure data	2
Dynamic road infrastructure data	2
Multimodal LOS1 (MTIS)	2
Multimodal LOS2 (MTIS)	3
Multimodal LOS3 (MTIS)	3

Data category	Tier
Multimodal LOS4 (MTIS)	3

This sequenced approach enables Bosnia and Herzegovina to demonstrate early NAP functionality using existing datasets while progressively addressing structural issues stemming from decentralised data custodianship. By prioritising Tier 1 datasets and gradually developing Tier 2 and Tier 3 categories, Bosnia and Herzegovina can build a scalable, interoperable ecosystem that aligns with EU requirements and supports future multimodal mobility services.

2.2.6 Roadmap and Indicative Implementation Timeline

A National Access Point (NAP) implementation roadmap has been prepared for Bosnia and Herzegovina, outlining the sequential steps required to establish the National Body (NB), operationalise NAP functions, and progressively onboard transport-related datasets in line with Directive (EU) 2023/2661. The roadmap recognises multi-layered governance structure and therefore prioritises measures that first secure institutional commitments, coordination mechanisms, and minimum compliance conditions before advancing towards more complex data integration tasks.

The implementation strategy is organised into phased milestones, enabling Bosnia and Herzegovina to demonstrate early progress through the publication of priority datasets while building the technical, legal, and organisational foundations needed for long-term interoperability and multimodal service deployment.

Phase 1 — Institutional Foundations and System Preparation (Months 0–12)

Designation of the National Body at State level, establishment of inter-entity cooperation arrangements, assessment and selection of the NAP hosting model, adoption of initial legal instruments, and initiation of metadata catalogue development.

Phase 2 — Core NAP Deployment and Initial Data Onboarding (Months 12–24)

Publication of Tier 1 and selected Tier 2 datasets, capacity-building for data providers, implementation of data quality and metadata validation processes, and first interoperability testing cycles.

Phase 3 — System Expansion and Multimodal Integration (Months 24–36)

Progressive onboarding of dynamic and multimodal datasets, alignment with EU standards for public transport and real-time data services, regular compliance monitoring, reporting, and refinement of operational procedures.

The detailed measures, responsible institutions, indicative costs, and implementation timelines are presented in Table below.

Table 14 Bosnia and Herzegovina Roadmap 2026 - 2030

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
1	**Establishment of National Access Point (NAP)**																
1.1	**Technical Preparation**	- **Ministry of Communications and Transport of Bosnia and Herzegovina** - Federal Ministry of Transport and Communications - Ministry of Transport and Communications of Republic of Srpska	-														
1.1.1	Technical Assistance Support (Planning, Design, Procurement)		30,000 EUR														
1.1.2	NAP design review		3,600 EUR														
1.1.3	Tender process and selection of awarded system provider		7,200 EUR														
1.2	**Legal Framework**	**Ministry of Communications and Transport of Bosnia and Herzegovina** supported by - Federal Ministry of Transport and Communications - Ministry of Transport and Communications of Republic of Srpska	-														
1.2.1	Legislative framework for NAP (preparation and adoption)		25,200 EUR														
1.2.2	Institutional responsibilities and relationships		n.a.														
1.2.3	Coherent data governance framework		n.a.														
1.2.4	Reporting framework for the NAP		n.a.														
1.3	**Technical Deployment**	- PE Ceste - PE Putevi	-														
1.3.1	Allocation of space of NAP hosting		n.a.														
1.3.2	Hardware acquisition and configuration		1,294,000 EUR														
1.3.3	Software acquisition and configuration																
1.3.4	Custom APIs for integration with existing systems																
1.3.5	NAP system testing and commissioning																
1.4	**Appointment of NAP personnel**	- PE Ceste - PE Putevi	86,400 EUR per year														
2	**NAP Operation / Maintenance, Data and System Upgrades**	- PE Ceste - PE Putevi	-														

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
2.1	NAP Operation and Maintenance		200,000 EUR per year														
2.2	System Upgrading and development of APIs																
3	**Collaboration between stakeholders for data exchange**	- Ministry of Communications and Transport of Bosnia and Herzegovina, all	n.a.														
4	**Establishment of National Body (NB)**																
4.1	**Legal and Institutional Framework**	Ministry of Communications and Transport of Bosnia and Herzegovina supported by - Federal Ministry of Transport and Communications - Ministry of Transport and Communications of Republic of Srpska	-														
4.1.1	Legislative framework for NB (preparation and adoption)		n.a.														
4.1.2	Institutional responsibilities and relationships		n.a.														
4.2	**Allocation of space for NB hosting**	Ministry of Communications and Transport of Bosnia and Herzegovina	n.a.														
4.3	**Appointment of NB personnel**	Ministry of Communications and Transport of Bosnia and Herzegovina	21,600 EUR per year														
5	**National Body Operation**	Ministry of Communications and Transport of Bosnia and Herzegovina	25,200 EUR per year														
6	**Capacity Building**																
6.1	Participation on NAPCORE Initiatives	Ministry of Communications and Transport of Bosnia and Herzegovina, Federal Ministry of Transport and Communications, Ministry of Transport and Communications of	26,400 EUR per year														
6.2	Training sessions for NAP operation and maintenance		13,800 EUR per year														

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
		Republic of Srpska, PE Ceste. PE Putevi															
7	**Regular alignment with EU Acquis**	Ministry of Communications and Transport of Bosnia and Herzegovina	-														
8	**Introduction and Updating of EU Standards into ITS projects lifecycle***																
8.1	Standard protocols for NAP authorisation and authentication	- Federal Ministry of Transport and Communications - Ministry of Transport and Communications of Republic of Srpska - PE Ceste - PE Putevi	n.a.														
8.2	EU Standards for Traffic Management (DATEX II, TPEG, ALERT-C, Open LR)		n.a.														
8.3	EU Standards for Public Transport Management (NeTEx, SIRI)		n.a.														
8.4	INSPIRE directive protocols (GML language, OGC standards)		n.a.														
8.5	C-ITS (ETSI Standards)		n.a.														
8.6	TN-ITS Directive (CEN-17268) for the exchange of road-related spatial data		n.a.														
**** Compulsory introduction after adopting EU Legislation Acts into domestic law - previous introduction is recommended (such as DATEX II, NeTEx, SIRI)***																	

2.2.7 Estimated Costs and Capacity-building Needs

Estimated Costs

A preliminary cost assessment was conducted to determine the financial and human resource requirements associated with the establishment and operation of the National Access Point (NAP) and the National Body (NB) in Bosnia and Herzegovina. The assessment considers unique multi-entity institutional framework, which necessitates parallel coordination, data harmonisation, and compliance oversight mechanisms at State and entity levels. As a result, Bosnia and Herzegovina is expected to incur comparatively higher institutional and capacity-building expenditures than other RPs.

Table 15 Bosnia and Herzegovina - estimated CAPEX and OPEX

Initial Investment (EUR)	**Annual Opex for first 3 years** **Years 1–3 (approx. 15–20%)**	**Annual OPEX for Year 4 onwards** **-40% compared to previous years**	**Remarks**
1 294 000	≈ 200 000	≈ 120 000	Reflects dual-entity operational structure and decentralised data governance requirements

These estimates indicate that Bosnia and Herzegovina's NAP deployment will require sustained financial commitment beyond the initial investment phase to ensure that data governance, interoperability, and compliance mechanisms are maintained across jurisdictions. The reduction in operational expenditures after Year 4 reflects the stabilisation phase, once core systems and workflows are in place.

Capacity-Building Needs

Given the institutional fragmentation and differing levels of ITS maturity across jurisdictions, capacity strengthening is essential to ensure a harmonised and sustainable implementation. Priority areas include:

- ITS data governance and metadata management – establishing procedures to ensure consistent dataset descriptions and update cycles across all entities
- Standardisation and alignment with NAPCORE reference materials and EU delegated regulations – ensuring interoperability and harmonised technical specifications
- Training on interoperability frameworks and technical data exchange mechanisms for entity-level custodians (e.g., PE Ceste, PE Putevi, Brčko District authorities)
- Cross-entity coordination and data-sharing governance – developing operational protocols, memoranda of understanding, and structured reporting pathways
- These interventions are critical to enabling Bosnia and Herzegovina to transition from isolated dataset management practices toward a unified, EU-aligned digital mobility ecosystem.

2.2.8 Key Recommendations

Establish a Entity-level NB at MoCT BiH to ensure formal authority and coherence.

Adopt a Hybrid NAP enabling decentralised data contributions.

Align entity-level ICT strategies with EU ITS standards (NeTEx, SIRI, DATEX II, INSPIRE).

Prioritise onboarding static datasets followed by dynamic datasets once governance mechanisms mature.

Create permanent inter-entity coordination mechanisms for data-sharing and metadata governance.

Introduce formal legal provisions mandating NAP participation by subnational authorities.

Invest in capacity-building to mitigate institutional fragmentation and differing maturity levels.

2.3 Kosovo

2.3.1 Current ITS and Transport Data Landscape

Kosovo's ITS and transport data landscape is characterised by a growing institutional commitment to digital mobility, supported by an increasingly structured governance model centred around the Ministry of Infrastructure (MoI). The Ministry holds a comprehensive mandate for transport policy, infrastructure planning, regulatory alignment, and coordination with regional and EU integration frameworks. This centralised model provides a solid foundation for the design and establishment of the National Access Point (NAP).

At the operational level, data collection and management responsibilities are distributed across several public entities, most notably the Department for Road Management (DRM), the Department for General Transport (DGT), municipal authorities, law enforcement structures, and Kosovo Railways JSC Infrastructure (INFRAKOS). The DRM currently maintains Kosovo's national road asset database through GIS and RAMS systems and supports ITS-related initiatives such as electronic traffic monitoring and digital traffic services. However, these functions and associated personnel are expected to be transferred to the newly established Kosovo Road Agency, consolidating road management capacities under a single institution.

Static datasets (e.g., road network inventories and infrastructure features) are partially digitised and represent the most mature category of transport-related information. By contrast, dynamic datasets—such as road traffic flow, incident reporting, and multimodal transport data—are collected inconsistently, stored in heterogeneous formats or proprietary systems, and lack harmonised metadata. While multiple institutions hold relevant datasets, these assets have not yet been integrated into a common governance or interoperability framework.

No national mechanism currently exists for validating dataset quality, ensuring compliance with EU Delegated Regulations, or publishing transport-related data in a structured, public-facing environment. Kosovo therefore lacks the necessary architectural and procedural components of a fully functional NAP, despite possessing several institutional assets and data sources that can be incrementally leveraged.

In summary, Kosovo is at an early but promising stage of ITS development. Existing databases, ongoing digital initiatives and centralised policy coordination enable a strong starting position, while the absence of a formalised data governance structure, metadata standards and interoperability frameworks constitutes the primary bottleneck to NAP deployment.

2.3.2 Institutional Readiness and Gaps

Kosovo exhibits strong institutional positioning for NAP development, but requires formal governance structures, dedicated ITS capacity, and standardised data management practices before full NAP and NB functionality can be realised. Main identified strengths and gaps and challenges are presented further below.

Strengths

Centralised mandate: The Ministry of Infrastructure is the single state authority responsible for national transport policy, infrastructure governance, regulatory

alignment and stakeholder coordination, reducing fragmentation risks common in other RPs.

Institutional restructuring underway: The transition of road management functions from the DRM to the Kosovo Road Agency creates a long-term institutional home for operational responsibilities linked to ITS and NAP deployment.

Ongoing digitalisation initiatives: GIS-based road asset management, RAMS integration, and emerging electronic traffic monitoring systems provide a technical foundation for digitised data flows.

EU and donor partnerships: Active cooperation with TCT, IPA, and development banks supports institutional strengthening, policy alignment, and potential NAP infrastructure funding.

Gaps and Challenges

Absence of ITS-specific governance structures: Kosovo does not yet have a designated ITS coordination unit or National Body capable of ensuring data standardisation, compliance monitoring, and interoperability management.

Fragmented operational responsibilities: Data holders operate independently, using non-standardised formats and procedures, with no defined mechanisms for data aggregation, metadata governance, or automated publishing.

Limited technical capacity: MoI lacks in-house ITS experts and relies on project-driven capabilities, constraining its ability to manage delegated regulation requirements, API governance, and conformity assessment.

Dynamic data scarcity: Real-time traffic, road status and multimodal datasets remain underdeveloped and not yet integrated into digital platforms.

2.3.3 Proposed NAP Type and Justification

Recommended NAP Model: Hybrid NAP

Based on the multi-criteria assessment undertaken for all RPs, the Hybrid NAP model emerges as the most appropriate option for Kosovo. This model balances Kosovo's current data maturity with its strategic ambition to align with the EU ITS acquis. The proposed Hybrid NAP provides Kosovo with a measured, future-proof path toward full NAP functionality, enabling compliance with EU ITS requirements while leveraging domestic digitalisation investments and institutional consolidation.

The recommendation is supported by the following considerations:

Proposed NAP model aligns well with Kosovo's evolving institutional model: The Hybrid NAP enables initial onboarding of static datasets managed by the DRM and municipalities, while offering a controlled pathway to incorporate dynamic and multimodal datasets once the Kosovo Road Agency becomes fully operational.

Supports progressive maturity building: The model accommodates existing digital capabilities—particularly GIS and RAMS road inventories—while enabling future deployment of APIs, real-time services and metadata structures aligned with EU delegated regulations.

Ensures interoperability: Compatibility with Directive (EU) 2023/2661 and NAPCORE reference architecture allows Kosovo to progressively join regional and EU-level mobility ecosystems without full platform redesign.

Cost-efficient scalability: The Hybrid approach avoids a high-cost full data platform in early phases and instead allows Kosovo to expand dataset hosting and publication functions in line with institutional capacity, operational readiness and funding opportunities.

2.3.4 Proposed NB Set-up and Functions

Consistent with the governance model prescribed in Directive (EU) 2023/2661 and the implementation logic adopted under this assignment, Kosovo must designate a National Body (NB) to ensure oversight, metadata governance, and compliance monitoring for the NAP.

The recommended institutional configuration places the NB under the Ministry of Infrastructure. The Ministry holds the legal mandate, administrative authority, and stakeholder coordination capacity required to supervise NAP implementation and ensure conformity with ITS-related delegated regulations.

The NB shall perform the following functions in line with European practice and NAPCORE guidance:

Data compliance and quality assurance: Validate that all datasets published through the NAP conform to prescribed technical formats, metadata rules, update frequency requirements, and accessibility provisions.

Metadata governance and custodianship: Maintain authoritative metadata, dataset descriptors, provenance records, access parameters, and interoperability attributes, ensuring traceability across data providers.

Data-sharing governance: Develop and enforce data-sharing agreements and authorisation procedures, defining access conditions, responsibilities of providers, and rules for open or restricted data publication.

Stakeholder coordination and support: Serve as a central liaison to data providers, municipalities, ICT operators, and potential commercial data users, facilitating onboarding, resolving operational issues, and supporting interoperability adoption.

Monitoring and reporting: Prepare periodic reports on compliance and data provision status for national authorities and regional bodies, progressively supporting integration with EU reporting mechanisms.

Resource Requirements

To fulfil this mandate, the NB will need:

Dedicated personnel specialising in metadata governance, ITS compliance, ICT integration, and stakeholder coordination.

Supporting ICT systems, including secure hosting, metadata catalogues, access management layers, and verification tools aligned with EU requirements.

Standardised templates and legal instruments for data-sharing, interoperability checks, and compliance reporting.

Institutional Responsibilities

The allocation of responsibilities expected to support NAP/NB establishment is summarised below:

Table 16 Institutional responsibilities - Kosovo

Governing Body/Coordinating Committee/	Operational Unit	National Body
Ministry of Infrastructure	Department for Road Management (DRM)	Ministry of Infrastructure

2.3.5 Priority Data Categories and Readiness Assessment

A detailed assessment of Kosovo's transport-related datasets was undertaken to determine their readiness for onboarding into the National Access Point (NAP) and to evaluate their alignment with the metadata, interoperability, and publication requirements established under Directive (EU) 2023/2661 and NAPCORE reference specifications. The assessment examined dataset existence, level of digitalisation, custodianship clarity, and their strategic relevance for phased NAP deployment.

The results confirm that Kosovo maintains several datasets of high relevance for NAP implementation, predominantly within the Ministry of Infrastructure, which acts as the primary custodian of road-related data. Additional datasets are held by INFRAKOS, the City of Pristina, and Limak Kosovo International Airport, reflecting sectoral responsibilities across different transport modes. However, although datasets exist, standardisation, metadata harmonisation, and automated publication mechanisms are largely absent.

The outcomes of the data assessment are summarised below.

Table 17 Kosovo – data category identification and availability

Data Category	Maturity level	Data availability
Safety related traffic information (SRTI)	Intermediate	Available, non-standardised formats
Road closures, roadworks, incidents (RTTI)	Intermediate	Available, non-standardised formats
Road traffic flow data (RTTI)	Basic	*No data available*
Static road infrastructure data	Basic	*No data available*
Dynamic road infrastructure data	Basic	*No data available*
Multimodal LOS1 (MTIS)	Basic	Passing times
Multimodal LOS2 (MTIS)	Basic	*No data available*
Multimodal LOS3 (MTIS)	Basic	Trip fares, occupancy per vehicle
Multimodal LOS4 (MTIS)	Basic	*No data available*

The assessment indicates intermediate maturity in two road-traffic-related data categories—SRTI and Road closures/roadworks/incidents (RTTI)—collected by the Ministry of Infrastructure and the City of Pristina, yet stored in heterogeneous formats without harmonised metadata, quality control, or DATEX II/NeTEx-compliant schemas. These datasets provide a solid starting point for Phase 1

onboarding, provided that standardisation procedures and automated publication workflows are introduced.

By contrast, road traffic flow data and infrastructure and multimodal datasets remain at basic maturity, characterised by fragmented or absent digital records, inconsistent custodianship, and a lack of interoperability frameworks.

To support structured and cost-efficient NAP deployment, each dataset was prioritised based on maturity and strategic importance. The prioritisation results are presented below.

Table 18 Kosovo - prioritisation of data categories

Data category	Maturity	Strategic importance	Score
Safety related traffic information (SRTI)	5	9	7,4
Road closures, roadworks, incidents (RTTI)	5	9	7,4
Road traffic flow data (RTTI)	1	7	4,6
Static road infrastructure data	1	6	4
Dynamic road infrastructure data	1	6	4
Multimodal LOS1 (MTIS)	1	6	4
Multimodal LOS2 (MTIS)	1	4	2,8
Multimodal LOS3 (MTIS)	1	3	2,2
Multimodal LOS4 (MTIS)	1	1	1

The prioritisation confirms that Kosovo should initiate NAP implementation with three Tier 1 datasets demonstrating the highest maturity and strategic relevance:

- Safety-related traffic information (SRTI)
- Road closures, roadworks, incidents (RTTI)

These datasets form the initial publication package and can be onboarded once Kosovo introduces harmonised metadata models, compliance mechanisms, and automated publication pipelines.

Tier 2 datasets— road traffic flow data, static and dynamic road infrastructure data, and Multimodal LOS1—require preparatory actions, including:

- consolidation of source systems at the Ministry of Infrastructure,
- metadata harmonisation in accordance with Directive (EU) 2023/2661, and
- definition of institutional responsibilities for updates and publication.

Tier 3 datasets—advanced multimodal LOS categories—will require targeted investments, improved coordination across transport operators, and the introduction of interoperable data collection frameworks before onboarding is feasible.

Table 19 Kosovo - prioritisation profile

Data category	Tier
Safety related traffic information (SRTI)	1
Road closures, roadworks, incidents (RTTI)	1
Road traffic flow data (RTTI)	2
Static road infrastructure data	2
Dynamic road infrastructure data	2
Multimodal LOS1 (MTIS)	2
Multimodal LOS2 (MTIS)	3
Multimodal LOS3 (MTIS)	3
Multimodal LOS4 (MTIS)	3

This tier-based sequencing ensures that Kosovo demonstrates early NAP functionality while progressively developing the institutional and technical capacity required for more complex datasets, ultimately supporting convergence with EU practices and regional interoperability targets.

2.3.6 Roadmap and Indicative Implementation Timeline

A phased National Access Point (NAP) implementation roadmap has been prepared for Kosovo, setting out the institutional, technical, and operational steps required to establish the National Body (NB), operationalise NAP functions, and progressively onboard transport-related datasets in accordance with Directive (EU) 2023/2661. Unlike other RPs (RPs) with layered governance arrangements, Kosovo benefits from a centralised transport administration structure, enabling a more streamlined institutional workflow. However, the absence of existing digital infrastructure for ITS operations means that Kosovo must undertake more foundational preparatory activities before full-scale NAP deployment can commence. The roadmap recognises Kosovo's early-stage ITS maturity and prioritises the establishment of:

- minimum institutional and legal preconditions for NB designation,
- the development of core hosting and ICT capabilities needed for NAP operation, and
- the structured onboarding of priority datasets—initially static and safety-related information, followed by real-time traffic data and multimodal datasets.

The implementation strategy is organised into phased milestones, ensuring that Kosovo demonstrates visible progress in system development while gradually building the technical capacity required for real-time, multimodal data integration.

Phase 1 — Institutional Foundations and Infrastructure Preparation (Months 0–12) aiming to establishment of governance, hosting prerequisites, and data governance rules with the following key activities:

- Formal designation of the Ministry of Infrastructure (MoI) as the National Body (NB) responsible for regulatory oversight, metadata governance, and compliance monitoring.
- Operational assignment of the Department for Road Management (DRM) as the future operator of the NAP, pending its eventual transition to the newly established Kosovo Road Agency.
- Development of foundational legal instruments governing data-sharing responsibilities, metadata models, and alignment with delegated EU regulations.
- Initiation of NAP system architecture design, including hosting requirements, network specifications, and ICT procurement planning.
- Definition of responsibilities for priority data categories (SRTI, road closures, RTTI, road traffic flow data).
- Planning activities for the future national Traffic Management and Control Centre, which will eventually support real-time data capture and system integration.

Phase 2 — Core NAP Deployment and Initial Data Onboarding (Months 12–24) aiming at deployment of operational components, onboard Tier 1 datasets, and enable initial system use with the following key activities:

- Procurement and configuration of ICT hardware and software to host the NAP platform on ministry premises due to the absence of an operational control centre.
- Launch of the metadata catalogue and first publication interface.
- Standardisation of the Safety Related Traffic Information (SRTI) and Road Closures / Roadworks / Incidents (RTTI) datasets, and preparation of automatic publication mechanisms.
- Commencement of Road traffic flow data (RTTI) collection through traffic counters, Floating Car Data (FCD) and other sensors—identified as a critical readiness gap.
- Capacity-building activities for municipal authorities, rail infrastructure operators, airport providers, and other data custodians.
- Initial interoperability testing exercises with the Transport Community Secretariat and peer RPs.

Phase 3 — System Expansion and Multimodal Integration (Months 24–36) aiming at extending system capabilities, broaden dataset coverage, and institutionalise governance with the following key activities:

- Gradual transition of NAP operating functions from DRM to the Kosovo Road Agency once operational capacity is formally established.
- Introduction of Tier 2 datasets, including static and dynamic road infrastructure data, following the establishment of consistent update workflows.
- Preparatory work for multimodal datasets (MTIS) in collaboration with INFRAKOS, Pristina Municipality, and Limak Kosovo International Airport.
- Advanced interoperability testing aligned with NAPCORE reference architecture, including cross-border services where feasible.
- Integration of the emerging Traffic Management and Control Centre functions once commissioned.
- Regular compliance reporting, data quality audits, and refinement of governance procedures.

Based on the current ITS baseline and the preconditions required for full system deployment, Kosovo is projected to complete and commission its NAP during Q1/Q2 of 2028.

Table 20 Kosovo Roadmap 2026–2030

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
1	**Establishment of National Access Point (NAP)**																
1.1	**Technical Preparation**	- Kosovo Ministry of Infrastructure - Department for Road Management	-														
1.1.1	Technical Assistance Support (Planning, Design, Procurement)		30,000 EUR														
1.1.2	NAP design review		3,600 EUR														
1.1.3	Tender process and selection of awarded system provider		7,200 EUR														
1.2	**Legal Framework**	Kosovo Ministry of Infrastructure	-														
1.2.1	Legislative framework for NAP (preparation and adoption)		25,200 EUR														
1.2.2	Institutional responsibilities and relationships		n.a.														
1.2.3	Coherent data governance framework		n.a.														
1.2.4	Reporting framework for the NAP		n.a.														
1.3	**Technical Deployment**	Department for Road Management of the Ministry of Infrastructure															
1.3.1	Allocation of space of NAP hosting		n.a.														
1.3.2	Hardware acquisition and configuration		678,000 EUR														
1.3.3	Software acquisition and configuration																
1.3.4	Custom APIs for integration with existing systems																
1.3.5	NAP system testing and commissioning																
1.4	**Appointment of NAP personnel**	Department for Road Management of the Ministry of Infrastructure	43,200 EUR per year														
2	**NAP Operation / Maintenance, Data and System Upgrades**	Department for Road Management of the	-														
2.1	NAP Operation and Maintenance																

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
2.2	System Upgrading and development of APIs	Ministry of Infrastructure	100,000 EUR per year														
3	**Collaboration between stakeholders for data exchange**	Kosovo Ministry of Infrastructure, All	n.a.														
4	**Establishment of National Body (NB)**																
4.1	**Legal and Institutional Framework**	Kosovo Ministry of Infrastructure															
4.1.1	Legislative framework for NB (preparation and adoption)		n.a.														
4.1.2	Institutional responsibilities and relationships		n.a.														
4.2	**Allocation of space for NB hosting**	Kosovo Ministry of Infrastructure	n.a.														
4.3	**Appointment of NB personnel**	Kosovo Ministry of Infrastructure	21,600 EUR per year														
5	**National Body Operation**	Kosovo Ministry of Infrastructure	25,200 EUR per year														

2.3.7 Estimated Costs and Capacity-building Needs

Estimated Costs

The financial and institutional effort required for establishing the National Access Point (NAP) and National Body (NB) in Kosovo is shaped by its comparatively low baseline of ITS infrastructure. Unlike other RPs that can leverage existing control centres or partial digital architectures, Kosovo must build most system components from the ground up, including hosting infrastructure, system interfaces, and data collection mechanisms for priority datasets.

The cost structure is therefore dominated by initial capital investments in ICT infrastructure, procurement of platform software and APIs, and the operationalisation of data collection systems—particularly for Road Traffic Flow Data (RTTI), which currently represents a major institutional gap. Operating expenditures reflect the need for maintaining the NAP and gradually expanding technical capacity as new datasets are incorporated.

The table below summarises the indicative cost profile proposed for Kosovo.

Table 21 Kosovo - estimated CAPEX and OPEX

Initial Investment (EUR)	**Annual Opex for first 3 years** **Years 1–3 (approx. 15–20%)**	**Annual OPEX for Year 4 onwards** **-40% compared to previous years**	**Remarks**
678 000	≈ 100 000	≈ 60 000	New system establishment phase

These values reflect Kosovo's need to establish a dedicated NAP infrastructure rather than integrate into an existing control centre, as is the case in other RPs. Once the hosting environment and data interfaces are operational, annual operating costs decrease significantly, reflecting reduced infrastructure ramp-up and stabilised technical routines.

Capacity-Building Needs

Given Kosovo's institutional context, the establishment of the NAP and NB requires targeted investment in human resources, skills development, and operational procedures to ensure compliance with Directive (EU) 2023/2661, NAPCORE specifications, and regional interoperability requirements. Priority capacity-building themes include:

ITS data governance and metadata management: Strengthen capacities within the Ministry of Infrastructure (MoI), Department for Road Management (DRM), and subsequently the Kosovo Road Agency to apply metadata catalogues, update cycles, and compliance checks.

Standardisation of priority datasets: Training to support the adoption of EU-aligned data models and formats for Safety-related traffic information (SRTI), Road closures and incidents (RTTI), and Road traffic flow data, including FCD and sensor-based acquisition.

ITS interoperability frameworks: Familiarisation with NAPCORE reference architecture, delegated regulations, and standards such as DATEX II, NeTEx, and CEN-based MTIS taxonomies.

Institutional role clarification and coordinated workflows: Development of internal guidelines defining responsibilities between the MoI, DRM, municipalities, INFRAKOS, and the Kosovo Road Agency for data collection, transmission, and quality assurance.

Technical competencies for system operation and maintenance: Skills development for ICT personnel to support hosting, system monitoring, cybersecurity, and NAP API management.

2.3.8 Key Recommendations

Based on the institutional assessment, data readiness evaluation, and the phased implementation roadmap, the following recommendations are proposed to support Kosovo in establishing a compliant and sustainable National Access Point (NAP) and National Body (NB) in line with Directive (EU) 2023/2661 and regional interoperability objectives.

Formally designate the Ministry of Infrastructure (MoI) as the National Body (NB): MoI holds the legal mandate for national transport policy, EU alignment, and cross-sector coordination. It is institutionally best placed to oversee NAP governance, compliance monitoring, metadata standardisation, and reporting obligations. However, this designation should be supported by the establishment of a small ITS/NAP coordination unit within MoI to ensure long-term technical and administrative capacity.

Assign the Department for Road Management (DRM) – and later the Kosovo Road Agency – as the NAP operator: Given the current administrative arrangements and planned institutional reforms, the DRM is best positioned to serve as the technical operator of the NAP during initial phases.

As Kosovo Road Agency becomes operational, responsibilities for data hosting, system maintenance, and interfacing with providers should transition accordingly to ensure continuity and operational strengthening.

Adopt the Hybrid NAP model as the recommended architecture: Kosovo's data landscape, characterised by partial digitalisation and the absence of interoperable APIs, favours a Hybrid NAP that can combine metadata-based discovery with selective dataset hosting.

Prioritise three Tier 1 datasets for initial onboarding: Kosovo should begin implementation by focusing on datasets with the highest maturity and strategic importance (Safety related traffic information (SRTI), Road closures, roadworks, incidents (RTTI), Road traffic flow data (RTTI)).

Develop missing data categories through targeted actions: To support medium-term NAP expansion, Kosovo should prioritise creation of a consistent static road infrastructure dataset (topology, attributes, asset inventory); dgitalisation of dynamic road data (traffic status, temporary restrictions), and structured development of multimodal transport data, including NeTEx and SIRI-based specifications (especially for rail and airport-related datasets).

Establish a formal ITS coordination mechanism within MoI: A standing interdepartmental/agency working group should be created to ensure systematic collaboration between relevant stakeholders.

Strengthen institutional capacity through structured training and technical assistance: Priority capacity-building themes include: ITS data governance and

metadata standards; NAP/NB operational procedures; EU delegated regulations and interoperability frameworks; Management of real-time data and traffic monitoring systems; NAPCORE-compliant formats (DATEX II, NeTEx, SIRI, INSPIRE, C-ITS protocols).

Develop the technical hosting environment as a stand-alone national infrastructure: As Kosovo lacks an existing Traffic Management Centre, initial hosting should be arranged within MoI or DRM premises, with the medium-term goal of integrating the NAP into the future national Traffic Management Centre once operational.

Align the roadmap with planned organisational reforms: Kosovo should synchronise NAP development with the establishment of the Kosovo Road Agency to avoid fragmentation and ensure consistent operational arrangements.

Establish data-sharing agreements and a unified metadata catalogue early in the process: Clear procedures should be formalised for metadata definitions, update frequency, validation workflows, and access rules to ensure reliable and harmonised data flows from all providers.

2.4 Montenegro

2.4.1 Current ITS and Transport data landscape

Montenegro's ITS environment is evolving, shaped by ongoing digitalisation initiatives and supported by a comparatively centralised governance model. Core transport and data management responsibilities lie with the Ministry of Transport, supported by subordinate agencies responsible for road infrastructure, traffic operations, and initial ITS deployments. Decision-making powers are concentrated at the national level, which simplifies future NAP governance and data standardisation.

Montenegro has already made progress in modernising road infrastructure information systems and enhancing traffic management capabilities. Montenegro operates a Traffic Management Control Centre (TMCC) that collects selected traffic data and supports road operation processes. However, this capability is not yet aligned to NAPCORE interoperability requirements, and current datasets are not published in standardised formats such as DATEX II, NeTEx, or other EU-recommended schemas.

While static road infrastructure information exists and is partially digitised, other datasets—such as safety-related traffic information (SRTI) and road traffic flow data (RTTI)—remain incomplete, unstructured, or not systematically collected. Multimodal datasets, although referenced in various planning documents, are not operationalised and do not exist in machine-readable formats. No institution currently provides open data services suitable for integration into a future NAP.

The National ITS Strategy for 2022–2026 provides a strategic foundation for digital transport development, but does not include provisions for establishing a National Access Point (NAP). ITS developments remain fragmented and focused on operational ITS applications rather than integrated data governance.

Taken together, Montenegro exhibits a promising—but not yet compliant—ITS ecosystem. Foundational elements, including a functional traffic management centre and operational road data systems, provide a solid basis for NAP deployment. However, significant work is required to standardise datasets, introduce metadata governance, and establish a legal and institutional anchor for a National Body (NB) capable of overseeing interoperability and compliance obligations.

2.4.2 Institutional Readiness and Gaps

Montenegro possesses the institutional structure to support NAP implementation but requires targeted legal designation of roles, capacity-building measures, and alignment of existing data systems with EU standards. Establishing a National Body with clear mandates and authority is essential for enabling long-term compliance and interoperability. Main identified strengths and gaps and challenges are presented further below.

Strengths

A centralised governance structure enables clear allocation of responsibilities and decision-making authority at national level.

A formal National ITS Strategy (2022–2026) shows political recognition of ITS priorities.

Transport-related databases and digital platforms already exist in selected domains, providing an institutional entry point for data standardisation.

Transport Authority of Montenegro already operates ICT systems that can be upgraded for NAP functions, reducing the cost and complexity of initial deployment.

Existence of a Traffic Management Control Centre provides a technical anchor and operational environment for initial NAP deployment.

Ongoing cooperation with EU and international partners through IPA, WBIF and bilateral initiatives provides access to funding and technical support for ITS digitalisation.

Gaps and Challenges

No institution currently has a formal mandate to collect, govern, verify, and publish ITS-related datasets in alignment with Directive (EU) 2023/2661.

Existing datasets lack metadata, harmonisation, and automated publication mechanisms, preventing integration with future NAP services.

Data systems are not standardised, datasets exist but are not harmonised with Directive (EU) 2023/2661 metadata requirements.

SRTI and RTTI datasets are insufficiently available, and need structured collection and standardised publication pipelines.

Multimodal datasets are either unavailable or exist only at conceptual level, requiring strategic development and phased onboarding.

Institutional capacity for data governance, compliance management, and interoperability oversight is limited and requires targeted personnel strengthening.

2.4.3 Proposed NAP Type and Justification

Recommended NAP Model: Hybrid NAP

Based on the multi-criteria assessment performed during the assignment, the Hybrid NAP is identified as the optimal solution for Montenegro, allowing the Transport Authority to host core datasets while enabling distributed contributions from other entities as maturity increases. The model aligns with incremental ITS deployment and forthcoming ERTMS-based rail digitalisation.

The recommendation is supported by the following considerations:

Alignment with current architecture: Montenegro already operates a Traffic Management Control Centre and digital systems capable of hosting structured datasets. The hybrid model allows these to be upgraded rather than replaced, reducing initial capital burden.

Progressive onboarding: The hybrid model supports staged implementation—starting with metadata-based publication for early datasets and expanding to full data ingestion as systems mature.

Compliance with EU frameworks: The model aligns with the EU ITS Directive, the Delegated Regulations, and NAPCORE interoperability specifications, ensuring forward compatibility.

Balanced investment strategy: Full platform establishment is unnecessary at the outset. Montenegro can build upon existing systems, focusing resources on priority datasets and required upgrades rather than wholesale redevelopment.

Supports phased expansion toward multimodal integration: Montenegro's ITS Strategy (2022–2026) focuses primarily on road transport, with plans for future digitalisation of railway systems through ERTMS deployment. The Hybrid NAP accommodates such phased evolution, enabling Montenegro to start with road data and later expand towards multimodal datasets without architectural redesign.

The Hybrid NAP provides a scalable and cost-effective path toward interoperability and phased expansion into multimodal mobility services, making it the most appropriate choice for Montenegro.

2.4.4 Proposed NB Set-up and Functions

To comply with Directive (EU) 2023/2661 and ensure structured governance of transport-related datasets, Montenegro must establish a National Body (NB) with clearly defined regulatory, supervisory, and coordination responsibilities. Based on the institutional assessment, the Transport Authority of Montenegro is the most suitable institution to perform NB functions, operating under the policy oversight of the Ministry of Transport. This placement reflects the Authority's emerging role in transport system modernisation and its capacity to interface with Monteput d.o.o., which will act as the operational unit responsible for NAP deployment and technical activities.

Core NB functions

Data validation and compliance assurance: Carry out checks on datasets provided by Monteput and other stakeholders to verify their quality, completeness, and conformity with the EU ITS delegated regulations. Since Montenegro currently lacks structured datasets for SRTI and incident reporting, this function will initially focus on establishing minimum compliance conditions and progressively integrating validation criteria as datasets mature.

Metadata governance and catalogue administration: Develop and maintain Montenegro's national transport metadata catalogue, including dataset descriptions, update frequency, and provider responsibilities. Given the absence of national metadata frameworks, the NB must adopt NAPCORE dictionaries and ensure that Montenegro transitions from ad-hoc data collection to harmonised, machine-readable metadata structures.

Data-sharing and access governance: Define access policies for transport datasets, manage data-sharing agreements with public bodies (e.g., Monteput, municipalities, rail operators), and ensure transparent user access through the NAP. The NB must also introduce formal procedures for granting and monitoring access rights, which currently do not exist in Montenegro's legal framework.

Stakeholder coordination and onboarding support: Lead the onboarding of data providers — particularly Monteput, future multimodal operators, and local authorities — and provide continued support for technical and procedural questions. Montenegro will require structured engagement mechanisms, as stakeholder communication is currently informal and without standardised roles or responsibilities.

Monitoring, reporting, and regional integration: Prepare periodic compliance reports, ensure traceability of datasets, and act as Montenegro's liaison point with the European Commission.

Institutional Responsibilities

The allocation of responsibilities expected to support NAP/NB establishment is summarised below:

Table 22 Institutional responsibilities - Montenegro

Governing Body/Coordinating Committee/	Operational Unit	National Body
Ministry of Transport	Monteput d.o.o	Transport Authority of Montenegro

2.4.5 Priority Data Categories and Readiness Assessment

A detailed review of Montenegro's transport datasets was undertaken to evaluate their maturity, availability, and readiness for NAP onboarding. The assessment considered data existence, digitalisation status, metadata completeness, and alignment with EU data exchange standards and Directive (EU) 2023/2661 requirements.

The results confirm significant gaps in overall data maturity, primarily due to the absence of Safety Related Traffic Information (SRTI) and the limited scope of Road Closures / Roadworks / Incidents (RTTI)—both mandatory dataset categories for NAP compliance. Existing datasets are fragmented, lack harmonised metadata, and are not published in machine-readable formats suitable for automated integration into a National Access Point.

Montenegro does, however, possess a foundation in road traffic flow data, supported by operational monitoring systems, though publication formats remain proprietary and non-DATEX II compliant. Static infrastructure datasets are partially available through tolling records, while dynamic infrastructure and multimodal datasets exist only in isolated environments maintained by railway, airport, and port authorities, without interoperability architectures or update responsibilities.

Table 23 Montenegro – data category identification and availability

Data Category	Maturity level	Data availability
Safety related traffic information (SRTI)	Basic	*No data available*
Road closures, roadworks, incidents (RTTI)	Basic	Planned events information only, non-standardised formats
Road traffic flow data (RTTI)	Intermediate	Available, non-standardised formats
Static road infrastructure data	Basic	Toll data
Dynamic road infrastructure data	Basic	*No data available*
Multimodal LOS1 (MTIS)	Basic	Passing times

Data Category	Maturity level	Data availability
Multimodal LOS2 (MTIS)	Basic	Parking availability (multi-modal terminals)
Multimodal LOS3 (MTIS)	Basic	Trip fares, occupancy per vehicle, SIRI CEN/TS 15531
Multimodal LOS4 (MTIS)	Basic	*No data available*

To ensure a sequenced and resource-efficient NAP deployment, each dataset category was prioritised based on its maturity and strategic importance. The results clearly indicate that Montenegro must first establish SRTI and RTTI datasets, as these are obligatory under Directive (EU) 2023/2661 and represent the minimum functional baseline for NAP establishment.

Road traffic flow data, while more mature, cannot be onboarded before publication formats are harmonised and metadata responsibilities defined.

Table 24 Montenegro - prioritisation of data categories

Data category	Maturity	Strategic importance	Score
Safety related traffic information (SRTI)	1	9	5,8
Road closures, roadworks, incidents (RTTI)	1	9	5,8
Road traffic flow data (RTTI)	5	7	6,2
Static road infrastructure data	1	6	4
Dynamic road infrastructure data	1	6	4
Multimodal LOS1 (MTIS)	1	6	4
Multimodal LOS2 (MTIS)	1	4	2,8
Multimodal LOS3 (MTIS)	1	3	2,2
Multimodal LOS4 (MTIS)	1	1	1

The tier assignment presented in Table below translates the prioritisation scores into a phased implementation structure, enabling Montenegro to sequence NAP onboarding in accordance with dataset readiness and regulatory urgency. Tier 1 represents the mandatory and most time-critical datasets required to establish the initial operational baseline of the NAP. Tier 2 includes datasets with moderate maturity that will require preparatory actions before publication, while Tier 3 captures long-term multimodal datasets that depend on future investments, institutional coordination, and digitalisation efforts. The resulting tier profile for Montenegro is shown below.

Table 25 Montenegro - prioritisation profile

Data category	Tier
Safety related traffic information (SRTI)	1

Data category	Tier
Road closures, roadworks, incidents (RTTI)	1
Road traffic flow data (RTTI)	1
Static road infrastructure data	2
Dynamic road infrastructure data	2
Multimodal LOS1 (MTIS)	2
Multimodal LOS2 (MTIS)	3
Multimodal LOS3 (MTIS)	3
Multimodal LOS4 (MTIS)	3

2.4.6 Roadmap and Indicative Implementation Timeline

A phased National Access Point (NAP) implementation roadmap has been developed for Montenegro, structured to reflect the its emerging ITS environment, moderate institutional readiness, and the need to progressively introduce EU-aligned dataset governance, metadata frameworks, and interoperability mechanisms. The roadmap builds upon existing operational capabilities in Monteput d.o.o. while strengthening the regulatory and supervisory functions of the Transport Authority of Montenegro as the designated National Body (NB).

The roadmap is organised into three sequential phases, enabling early publication of foundational datasets while Montenegro establishes the core systems, procedures, and institutional capacity required for long-term NAP operation and EU integration.

Phase 1 — Institutional and Technical Foundations (Months 0–12)

- Formal designation of the National Body within the Transport Authority of Montenegro
- Establishment of a legal and procedural framework for NAP governance and dataset onboarding
- Initial setup of NAP ICT infrastructure within Monteput d.o.o. and definition of hosting requirements
- Development of Montenegro’s transport metadata catalogue and adoption of NAPCORE data dictionaries
- Identification of priority datasets and definition of data provider responsibilities
- Initiation of capacity-building activities targeting Monteput and NB technical staff.

Phase 2 — Core NAP Deployment and Initial Data Publication (Months 12–24)

- Onboarding and publication of Tier 1 datasets (SRTI and RTTI-related data categories)
- Implementation of dataset quality assurance processes and metadata validation mechanisms
- Introduction of user access layers for public and authorised data consumers

- Onboarding of selected Tier 2 datasets, including static road infrastructure data
- First interoperability tests against EU specifications and NAPCORE reference architectures
- Institutionalisation of stakeholder coordination mechanisms and provider onboarding procedures

Phase 3 — System Expansion and Multimodal Integration (Months 24–36)

- Gradual onboarding of dynamic road infrastructure datasets and multimodal LOS categories
- Alignment with future railway digitalisation efforts (ERTMS and related systems)
- Expansion of NAP services to support multimodal journey information, transport operations data, and advanced ITS services
- Institutional reporting to the Transport Community Treaty Secretariat and European Commission
- Continuous refinement of compliance monitoring, user-interface functionality, and support services

The detailed measures, institutional responsibilities, technical dependencies, and indicative costs supporting this roadmap are presented in Table XX Montenegro Roadmap 2026–2030.

Table 26 Montenegro Roadmap 2026–2030

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
1	**Establishment of National Access Point (NAP)**																
1.1	**Technical Preparation**	- Ministry of Transport - Monteput d.o.o.	-														
1.1.1	Technical Assistance Support (Planning, Design, Procurement)		30,000 EUR														
1.1.2	NAP design review		3,600 EUR														
1.1.3	Tender process and selection of awarded system provider		7,200 EUR														
1.2	**Legal Framework**	Ministry of Transport supported by Monteput d.o.o.	-														
1.2.1	Legislative framework for NAP (preparation and adoption)		25,200 EUR														
1.2.2	Institutional responsibilities and relationships		n.a.														
1.2.3	Coherent data governance framework		n.a.														
1.2.4	Reporting framework for the NAP		n.a.														
1.3	**Technical Deployment**	Monteput d.o.o.	-														
1.3.1	Allocation of space of NAP hosting		n.a.														
1.3.2	Hardware acquisition and configuration		623,000 EUR														
1.3.3	Software acquisition and configuration																
1.3.4	Custom APIs for integration with existing systems																
1.3.5	NAP system testing and commissioning																
1.4	**Appointment of NAP personnel**	Monteput d.o.o.	43,200 EUR per year														
2	**NAP Operation / Maintenance, Data and System Upgrades**	Monteput d.o.o.	-														
2.1	NAP Operation and Maintenance		90,000 EUR per year														
2.2	System Upgrading and development of APIs																
3	**Collaboration between stakeholders for data exchange**	Ministry of Transport, All	n.a.														

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
4	**Establishment of National Body (NB)**																
4.1	**Legal and Institutional Framework**	Ministry of Transport supported by Transport Authority of Montenegro	-														
4.1.1	Legislative framework for NB (preparation and adoption)		n.a.														
4.1.2	Institutional responsibilities and relationships		n.a.														
4.2	**Allocation of space for NB hosting**	Transport Authority of Montenegro	n.a.														
4.3	**Appointment of NB personnel**	Transport Authority of Montenegro	21,600 EUR per year														
5	**National Body Operation**	Transport Authority of Montenegro	25,200 EUR per year														
6	**Capacity Building**																
6.1	Participation on NAPCORE Initiatives	- Ministry of Transport - Monteput d.o.o.	26,400 EUR per year														
6.2	Training sessions for NAP operation and maintenance		13,800 EUR per year														
7	**Regular alignment with EU Acquis**	Ministry of Transport supported by Monteput d.o.o.	-														
8	**Introduction and Updating of EU Standards into ITS projects lifecycle***																
8.1	Standard protocols for NAP authorisation and authentication	- Ministry of Transport - Monteput d.o.o.	n.a.														
8.2	EU Standards for Traffic Management (DATEX II, TPEG, ALERT-C, Open LR)		n.a.														
8.3	EU Standards for Public Transport Management (NeTEx, SIRI)		n.a.														
8.4	INSPIRE directive protocols (GML language, OGC standards)		n.a.														
8.5	C-ITS (ETSI Standards)		n.a.														
8.6	TN-ITS Directive (CEN-17268) for the exchange of road-related spatial data		n.a.														

**** Compulsory introduction after adopting EU Legislation Acts into domestic law - previous introduction is recommended (such as DATEX II, NeTEx, SIRI)***

2.4.7 Estimated Costs and Capacity-building Needs

Montenegro's financial and institutional requirements for establishing the National Access Point (NAP) and National Body (NB) reflect its intermediate ITS maturity and the presence of limited but functional digital infrastructure within Monteput d.o.o. Unlike RPs that must initiate system deployment from a near-zero baseline, Montenegro benefits from existing ICT elements associated with road management systems and traffic monitoring platforms, reducing the volume of required foundational investments.

However, Montenegro still lacks standardised data-exchange interfaces, metadata governance structures, and automated data publication mechanisms. These gaps drive the need for targeted investments in system integration, dataset harmonisation, and institutional capacity building. The Transport Authority of Montenegro, as the designated NB, will require additional competencies in compliance assessment, metadata management, and monitoring processes aligned with Directive (EU) 2023/2661.

The cost structure for Montenegro is therefore characterised by moderate upfront ICT investments followed by sustained operational expenditures associated with system maintenance, data quality assurance, and incremental onboarding of dynamic and multimodal datasets.

Table 27 Montenegro - estimated CAPEX and OPEX

Initial Investment (EUR)	**Annual Opex for first 3 years** **Years 1–3 (approx. 15–20%)**	**Annual OPEX for Year 4 onwards** **-40% compared to previous years**	**Remarks**
623 000	≈ 90 000	≈ 54 000	Compact network and existing systems

Capacity-Building Needs

To ensure full operationalisation of the NAP and effectiveness of the NB, Montenegro must address several staffing and skills prerequisites. Capacity-building activities should prioritise:

ITS data governance and metadata standardisation: training Monteput and NB staff to apply NAPCORE dictionaries, metadata schemas, and interoperability rules.

Compliance assessment and reporting: strengthening institutional capabilities for evaluating dataset quality, timeliness, completeness, and adherence to delegated regulations.

Public and private stakeholder coordination: developing procedural and technical competencies to manage onboarding processes for road operators, municipalities, and emerging mobility service providers.

API architecture and secure data-exchange protocols: training ICT personnel to configure access layers, authentication mechanisms, and publication workflows.

Multimodal data readiness: preparing Montenegro for future integration of public transport, rail, and airport datasets as ERTMS and other digitalisation initiatives mature.

Taken together, these capacity-building measures ensure that the Transport Authority of Montenegro can transition from a monitoring-based organisation to a fully compliant NB capable of sustaining long-term NAP operations.

2.4.8 Key Recommendations

The assessment confirms that Montenegro has foundational ITS capabilities and institutional clarity necessary for NAP implementation, but must prioritise consolidation, standardisation, and future-proofing of data governance arrangements. The following recommendations outline the necessary steps for successful deployment:

Adopt the Hybrid NAP model as a pragmatic approach aligned with Montenegro's current infrastructure and moderate ITS readiness, enabling phased integration of datasets without extensive redevelopment of legacy systems.

Formally designate the Transport Authority of Montenegro as the National Body (NB) and ensure that supporting legal acts define its compliance, monitoring, and metadata governance responsibilities.

Leverage Monteput d.o.o. as the operational NAP hosting entity, expanding its existing ICT environment to support secure hosting, data publication services, and integration with future traffic management control centres.

Prioritise onboarding of road-related datasets—notably SRTI and RTTI categories—to demonstrate early functionality and satisfy mandatory EU reporting obligations.

Develop structured cooperation frameworks with public transport operators, rail infrastructure managers, and local authorities to support gradual expansion toward multimodal datasets.

Embed ITS competence within institutional structures through targeted training, dedicated staffing, and engagement with NAPCORE working groups, ensuring operational independence and knowledge transfer.

Implement a phased roadmap with defined milestones, responsibilities, and data-readiness requirements, enabling Montenegro to align investment cycles, institutional planning, and compliance reporting.

2.5 North Macedonia

2.5.1 Current ITS and Transport data landscape

North Macedonia's transport data ecosystem is characterised by several sectoral competent institutions operating in parallel, without a unified ITS governance or NAP-compliant data-sharing framework. The Ministry of Transport and Communications (MoT) holds the primary mandate for transport policy and digital transformation, while the Public Enterprise for State Roads (PESR) manages national road infrastructure and has begun deploying ITS components through recent projects. Other entities such as the Ministry of Interior and the Ministry of Information Society and Administration maintain their own transport-relevant datasets but lack integration mechanisms or metadata harmonisation protocols. Although individual systems collect operational data, the absence of shared standards and an interoperability framework prevents structured exchange or publication via a National Access Point (NAP).

2.5.2 Institutional Readiness and Gaps

North Macedonia possesses a well-defined institutional architecture for transport governance, yet ITS-specific responsibilities, data management functions, and National Access Point (NAP) governance have not been formally designated. While it benefits from a centralised policy framework anchored in the Ministry of Transport and Communications (MoT), the absence of legally assigned roles, structured coordination mechanisms, and dedicated ITS capacity constrains its readiness for full NAP implementation. Establishing a National Body (NB) with a clear mandate, supported by targeted capacity-building and operational interfaces with the Public Enterprise for State Roads (PESR), is a critical precondition for ensuring long-term compliance with Directive (EU) 2023/2661 and future interoperability requirements.

Strengths

Centralised sector governance enables clear ministerial authority over transport policy, decision-making, and European alignment processes.

MoT holds the legal mandate to assume NB responsibilities, act as the national interlocutor with the European Commission and Transport Community, and adopt regulatory instruments required for NAP implementation.

Existing technical capabilities within PESR provide a functional entry point for ITS deployment, including road asset management systems, digital infrastructure initiatives, and experience with public road network operations.

Institutional structures for EU approximation are already in place, allowing the MoT to integrate ITS governance into ongoing legislative reforms and transport digitalisation programmes.

Access to donor and EU funding mechanisms (IPA, WBIF, bilateral assistance) offers opportunities to finance ITS capacity development, data system upgrades, and NAP operationalisation.

Gaps and Challenges

No institution currently holds a formal mandate to collect, govern, validate, and publish ITS-related datasets in accordance with Directive (EU) 2023/2661 and its supplementing Delegated Regulations.

Lack of a dedicated ITS coordination unit within MoT results in fragmented responsibility for ITS policy oversight, hindering continuity and structured implementation.

PESR's competencies are operational rather than regulatory, limiting its ability to act as a National Body without legislative amendments or delegated powers.

Data management practices remain decentralised, with limited interoperability, heterogeneous formats, and no systematic metadata governance.

Absence of automated publication mechanisms prevents the transition from isolated datasets to NAP-compliant machine-readable services.

Institutional capacity remains limited in areas such as compliance monitoring, data harmonisation, metadata standards, and cross-modal ITS integration, requiring targeted staff strengthening and structured knowledge transfer.

Multimodal datasets are insufficiently developed and rail-related digitalisation lags behind road-sector systems, delaying future integration of multimodal travel services.

2.5.3 Proposed NAP Type and Justification

Recommended NAP Model: Hybrid NAP

Based on the institutional assessment conducted under this assignment, a Hybrid NAP is identified as the optimal solution for North Macedonia. This model combines a central governance authority hosted within the Ministry of Transport and Communications (MoT) with distributed data contributions from Public Enterprise for State Roads (PESR) and other sectoral entities as their maturity progresses. The recommendation is supported by the following considerations:

Alignment with current institutional and technical architecture: North Macedonia's transport governance system is centralised, but data ownership is distributed across several agencies. MoT holds the legal mandate for ITS policy alignment and NAP governance, whereas PESR and other operators retain operational control of road, traffic, and public transport datasets. A Hybrid NAP respects this structure by hosting core services centrally while allowing authorised institutions to publish or expose datasets through harmonised interfaces.

Supports progressive onboarding and maturity growth: The Hybrid NAP enables phased implementation in line with North Macedonia's current data landscape. Early onboarding will focus on safety-related and road traffic datasets, while multimodal and dynamic data services can be integrated later as infrastructure and digital systems mature. This avoids creating bottlenecks, reduces transition risks, and complements the planned development of a future National Traffic Management Control Centre.

Compliance with EU frameworks and NAPCORE requirements: The model ensures conformity with: Directive (EU) 2023/2661, Delegated Regulations for SRTI, RTTI, static/dynamic infrastructure, and multimodal information, NAPCORE interoperability layers and Level of Service (LoS) indicators. The Hybrid architecture allows North Macedonia to publish metadata and datasets even when full digitalisation or real-time data pipelines are not yet operational.

Balanced investment and operational approach: The Hybrid NAP enables: incremental capital investments, reuse of existing TMCC infrastructure in Skopje for initial hosting, future migration to the planned national TMCC without

architecture change, reliance on PESR and other technical bodies for data provision rather than duplicating systems. This maximises cost-efficiency while ensuring scalability.

Enables future multimodal evolution: Although multimodal, real-time public transport datasets are currently absent at national level, North Macedonia's long-term strategic plans—including ERTMS deployment and improved public mobility information services—require an architecture capable of adding these functionalities. The Hybrid NAP allows such expansion without restructuring the original platform.

2.5.4 Proposed NB Set-up and Functions

The Ministry of Transport and Communications is proposed as the National Body (NB) for North Macedonia. This designation reflects MoTC's legal mandate for national transport policy, its established intersectoral coordination role, and its responsibility for EU approximation in the transport sector. Under the Hybrid NAP model, MoTC will act as the central authority for governance, compliance, and strategic oversight, while operational functions will be implemented in cooperation with the Public Enterprise for State Roads (PESR) and other data-owning institutions. This arrangement ensures regulatory continuity, supports phased data onboarding, and avoids duplication of competencies across institutions.

Core NB functions

The National Body will be responsible for the following ITS-specific roles, aligned with Directive (EU) 2023/2661, NAPCORE governance principles, and future Delegated Regulations:

Governance and compliance management

- Formally oversee NAP implementation and national ITS alignment.
- Ensure conformity of datasets and metadata with EU standards, including DATEX II, NeTEx, GTFS, and MobilityDCAT-AP.
- Coordinate legislative updates related to ITS, data exchange, and digital mobility.

Metadata and data quality governance

- Maintain authoritative national metadata catalogues and ensure consistency of dataset descriptions.
- Define update frequencies, data quality checks, and validation routines before publication to the NAP.
- Establish audit mechanisms to ensure traceability of data modifications and provider responsibilities.

Data-sharing oversight and access management

- Approve onboarding of new data providers and manage access rights in accordance with national data protection rules.
- Negotiate and formalise data-sharing agreements with public and private operators.
- Create transparent rules for data availability, reuse conditions, and service-level expectations.

Stakeholder coordination and interoperability

- Lead inter-institutional cooperation among MoT, PESR, municipalities, public transport operators, and ICT authorities.
- Support capacity building and onboarding of new stakeholders as datasets mature.
- Ensure interoperability with regional NAPs and EU mobility platforms.

Monitoring, reporting, and strategic integration

- Produce compliance reports and performance metrics aligned with NAPCORE Levels of Service.
- Track readiness of future data categories—particularly multimodal and dynamic infrastructure datasets.
- Facilitate integration with emerging digital transport initiatives, including national TMCC development and forthcoming ERTMS deployment.

The allocation of responsibilities expected to support NAP/NB establishment is summarised below:

Table 28 Institutional responsibilities – North Macedonia

Governing Body/Coordinating Committee/	Operational Unit	National Body
Ministry of Transport and Communications	Public Enterprise for State Roads	Ministry of Transport and Communications

This layered model ensures strong policy leadership by MoT, while PESR and other entities retain responsibility for dataset generation and technical system management, in line with their statutory mandates.

2.5.5 Priority Data Categories and Readiness Assessment

A detailed review of North Macedonia's transport datasets was conducted to evaluate their maturity, availability, and readiness for onboarding into the National Access Point (NAP). The assessment considered the existence of digital datasets, metadata completeness, interoperability potential, data ownership clarity, and alignment with the EU ITS Directive and NAPCORE interoperability specifications.

Table 29 North Macedonia – data category identification and availability

Data Category	Maturity level	Data availability
Safety related traffic information (SRTI)	Intermediate	Available, non-standardised formats
Road closures, roadworks, incidents (RTTI)	Intermediate	Available, non-standardised formats
Road traffic flow data (RTTI)	Intermediate	Available, non-standardised formats
Static road infrastructure data	Basic	Toll data
Dynamic road infrastructure data	Basic	*No data available*
Multimodal LOS1 (MTIS)	Basic	*No data available*
Multimodal LOS2 (MTIS)	Basic	*No data available*

Data Category	Maturity level	Data availability
Multimodal LOS3 (MTIS)	Basic	*No data available*
Multimodal LOS4 (MTIS)	Basic	*No data available*

To determine implementation sequencing, each dataset was assessed using the regional Prioritisation Framework developed under Activity 2.2, which evaluates data categories against two weighted criteria—maturity (40%) and strategic importance (60%)—in line with Directive (EU) 2023/2661 and NAPCORE guidance. The results of this scoring exercise are presented below.

Table 30 Prioritisation scoring results for North Macedonia across NAP-relevant data categories

Data category	Maturity	Strategic importance	Score
Safety related traffic information (SRTI)	5	9	7,4
Road closures, roadworks, incidents (RTTI)	5	9	7,4
Road traffic flow data (RTTI)	5	7	6,2
Static road infrastructure data	1	6	4
Dynamic road infrastructure data	1	6	4
Multimodal LOS1 (MTIS)	1	6	4
Multimodal LOS2 (MTIS)	1	4	2,8
Multimodal LOS3 (MTIS)	1	3	2,2
Multimodal LOS4 (MTIS)	1	1	1

The prioritisation reflects the principle adopted across the Western Balkans: Tier 1 data categories should be introduced first to establish the NAP's operational baseline and demonstrate visible value. North Macedonia must therefore initially focus NAP implementation on Tier 1 datasets—SRTI, RTTI, and traffic flow information—as these provide the regulatory foundation and highest impact. Tier 2 and Tier 3 datasets will follow once data governance, interoperability, and real-time capabilities mature:

Table 31 North Macedonia - prioritisation profile

Partner	Data category	Tier
North Macedonia	Safety related traffic information (SRTI)	1
North Macedonia	Road closures, roadworks, incidents (RTTI)	1
North Macedonia	Road traffic flow data (RTTI)	1
North Macedonia	Static road infrastructure data	2
North Macedonia	Dynamic road infrastructure data	2

Partner	Data category	Tier
North Macedonia	Multimodal LOS1 (MTIS)	2
North Macedonia	Multimodal LOS2 (MTIS)	3
North Macedonia	Multimodal LOS3 (MTIS)	3
North Macedonia	Multimodal LOS4 (MTIS)	3

2.5.6 Roadmap and Indicative Implementation Timeline

A phased National Access Point (NAP) implementation roadmap has been developed for North Macedonia, taking into account its advanced EU approximation progress, the institutional positioning of the Ministry of Transport (MoT) as the recommended National Body (NB), and the operational capabilities of the Public Enterprise for State Roads (PESR) as the main technical entity for dataset provision. The proposed hybrid NAP model reflects the its current ITS landscape—characterised by an established policy framework but limited data governance structures and heterogeneous formats across institutions.

The roadmap is structured into three sequential phases, enabling North Macedonia to launch priority datasets early in the process, while establishing the governance mechanisms, metadata architecture, and interoperability services required for full EU compliance and long-term multimodal digital mobility integration.

Phase 1 — Institutional and Legal Foundations (Months 0–12)

Formal designation of the Ministry of Transport as the National Body (NB), including publication of a Government Decision defining NB competences and scope.

Operationalisation of the hybrid NAP model, assigning PESR technical responsibilities for core road dataset hosting, transformation, and publication.

Adoption of legal and procedural acts defining: dataset onboarding rules, data provider obligations, compliance and reporting requirements.

Establishment of the ITS coordination unit within MoT and initiation of resourcing and capacity-building measures.

Development of a transport metadata catalogue aligned with NAPCORE specifications and Directive (EU) 2023/2661 Annex III requirements.

Definition of institutional interfaces with municipalities, the Ministry of Interior, and MISA (Ministry of Information Society and Administration) to ensure cross-domain digital interoperability.

Phase 2 — Core NAP Deployment and Tier 1 Data Publication (Months 12–24)

Deployment of the NAP platform and hosting architecture, drawing on PESR's existing road ITS environment.

Publication of Tier 1 datasets: Safety Related Traffic Information (SRTI), Road closures, roadworks and incidents (RTTI), and Road traffic flow data.

Integration of data ingestion pipelines, transformation tools, and metadata validation mechanisms.

Testing interoperability with EU services and NAPCORE reference interfaces (including DATEX II / future EU-compliant schemas).

Implementation of access control, user interfaces, and basic data query functions for public and authorised consumers.

Introduction of monitoring tools for dataset completeness, update frequency, and quality assurance.

Phase 3 — NAP Expansion and Multimodal Integration (Months 24–36)

Onboarding of Tier 2 datasets, including: static and dynamic road infrastructure data, and Multimodal LOS1 (public transport vehicle passing times).

Completion of interoperability bridges with urban ITS systems, charging infrastructure, and public transport operators.

Preparation for onboarding Tier 3 multimodal datasets (LOS2–LOS4), aligned with evolving digitalisation initiatives in railway and aviation sectors.

Integration with national digital public services and MISA data interoperability frameworks.

Launch of enhanced NAP services enabling real-time transport information, multimodal journey planning, and cross-border data exchange.

Annual compliance reporting to the European Commission.

Table 32 North Macedonia Roadmap 2026–2030

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
1	**Establishment of National Access Point (NAP)**																
1.1	**Technical Preparation**	- Ministry of Transport and Communications - Public Enterprise for State Roads	-														
1.1.1	Technical Assistance Support (Planning, Design, Procurement)		30,000 EUR														
1.1.2	NAP design review		3,600 EUR														
1.1.3	Tender process and selection of awarded system provider		7,200 EUR														
1.2	**Legal Framework**	Ministry of Transport and Communications supported by Public Enterprise for State Roads	-														
1.2.1	Legislative framework for NAP (preparation and adoption)		16,800 EUR														
1.2.2	Institutional responsibilities and relationships		n.a.														
1.2.3	Coherent data governance framework		n.a.														
1.2.4	Reporting framework for the NAP		n.a.														
1.3	**Technical Deployment**	Public Enterprise for State Roads															
1.3.1	Allocation of space of NAP hosting		n.a.														
1.3.2	Hardware acquisition and configuration		647,000 EUR														
1.3.3	Software acquisition and configuration																
1.3.4	Custom APIs for integration with existing systems																
1.3.5	NAP system testing and commissioning																
1.4	**Appointment of NAP personnel**	Public Enterprise for State Roads	43,200 EUR per year														
2	**NAP Operation / Maintenance, Data and System Upgrades**	Public Enterprise for State Roads	-														
2.1	NAP Operation and Maintenance		95,000 per year														
2.2	System Upgrading and development of APIs																
3	**Collaboration between stakeholders for data exchange**	Ministry of Transport and Communications, All	n.a.														
4	**Establishment of National Body (NB)**																

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
4.1	**Legal and Institutional Framework**	Ministry of Transport and Communications	-														
4.1.1	Legislative framework for NB (preparation and adoption)		n.a.														
4.1.2	Institutional responsibilities and relationships		n.a.														
4.2	**Allocation of space for NB hosting**	Ministry of Transport and Communications	n.a.														
4.3	**Appointment of NB personnel**	Ministry of Transport and Communications	21,600 EUR per year														
5	**National Body Operation**	Ministry of Transport and Communications	25,200 EUR per year														
6	**Capacity Building**																
6.1	Participation on NAPCORE Initiatives	- Ministry of Transport and Communications - Public Enterprise for State Roads	26,400 EUR per year														
6.2	Training sessions for NAP operation and maintenance		13,800 EUR per year														
7	**Regular alignment with EU Acquis**	Ministry of Transport and Communications	**-**														
8	**Introduction and Updating of EU Standards into ITS projects lifecycle***																
8.1	Standard protocols for NAP authorisation and authentication	- Ministry of Transport and Communications - Public Enterprise for State Roads	n.a.														
8.2	EU Standards for Traffic Management (DATEX II, TPEG, ALERT-C, Open LR)		n.a.														
8.3	EU Standards for Public Transport Management (NeTEx, SIRI)		n.a.														
8.4	INSPIRE directive protocols (GML language, OGC standards)		n.a.														
8.5	C-ITS (ETSI Standards)		n.a.														
8.6	TN-ITS Directive (CEN-17268) for the exchange of road-related spatial data		n.a.														

**** Compulsory introduction after adopting EU Legislation Acts into domestic law - previous introduction is recommended (such as DATEX II, NeTEx, SIRI)***

2.5.7 Estimated Costs and Capacity-building Needs

North Macedonia's financial and institutional requirements for establishing the National Access Point (NAP) and operationalising the National Body (NB) are shaped by its favourable institutional positioning, emerging ITS ecosystem, and the need to introduce EU-aligned data governance, metadata structures, and standardised interoperability frameworks. Unlike RPs that lack institutional clarity, North Macedonia benefits from a clearly identifiable NB candidate—the Ministry of Transport and Communications (MoT)—supported by the Public Enterprise for State Roads (PESR) for technical implementation. This reduces institutional fragmentation but still necessitates targeted investments in ITS-related legislation, dataset harmonisation, and operational tooling.

Initial costs will be concentrated on regulatory enabling measures, procurement support, system architecture design, and establishment of dataset publication processes. Operational expenditures will subsequently be driven by system maintenance, metadata governance, dataset quality assurance, and onboarding of multimodal transport datasets in later phases. Estimated costs overview is provided in the table below.

Table 33 North Macedonia - estimated CAPEX and OPEX

Initial Investment (EUR)	**Annual Opex for first 3 years** **Years 1–3 (approx. 15–20%)**	**Annual OPEX for Year 4 onwards** **-40% compared to previous years**	**Remarks**
647 000	≈ 95 000	≈ 57 000	TMCC development under single authority

Additional funds will be required for capacity building in EU standards (DATEX II, SIRI, NeTEx), metadata governance, and NAP operation.

Capacity-Building Needs

To ensure sustainable long-term operation of the NAP and full compliance with Directive (EU) 2023/2661, North Macedonia must strengthen institutional and technical competencies within MoT and PESR. Capacity-building priorities include:

ITS data governance and metadata standardisation: Training MoT and PESR staff to adopt NAPCORE dictionaries, define dataset ownership structures, implement metadata schemas, and apply harmonised update cycles.

Compliance assessment and reporting: Building institutional capability to verify dataset completeness, timeliness, and interoperability, and prepare regulatory submissions to the Transport Community and the European Commission.

Stakeholder coordination: Developing operational workflows for onboarding data providers from national and municipal bodies, infrastructure operators, and future mobility service providers.

Interoperable data-exchange protocols: Strengthening ICT proficiency in implementing access control mechanisms, secure APIs, and EU-standard formats such as DATEX II, SIRI, and NeTEx.

Multimodal dataset readiness: Preparing for integration of rail, public transport, and aviation data as national digitalisation projects mature (e.g., potential alignment with ERTMS deployment and urban transport ITS systems).

2.5.8 Key Recommendations

The assessment confirms that North Macedonia possesses the institutional preconditions necessary for NAP implementation. To convert this advantage into operational readiness, the following steps are recommended:

Formally designate the Ministry of Transport and Communications as the National Body, supported by explicit secondary legislation defining compliance, monitoring, and interoperability responsibilities.

Establish a national data governance framework that specifies dataset custodians, update cycles, metadata requirements, and interoperability standards based on NAPCORE models.

Prioritise the onboarding of Tier 1 datasets—SRTI, RTTI, and traffic flow data—to demonstrate early functionality and fulfil mandatory EU reporting obligations.

Adopt DATEX II, NeTEx, and SIRI standards incrementally, integrating them into existing datasets and avoiding future retrofitting costs.

Develop a structured capacity-building programme for MoT and PESR staff, including participation in NAPCORE working groups to ensure continuity of knowledge and alignment with evolving EU practices.

Define technical delegation mechanisms enabling PESR to support operational NAP functions under MoT's strategic oversight, ensuring cost-efficient implementation and continuity.

Initiate preparatory work for Tier 2 datasets (static and dynamic road infrastructure) to expand NAP services and prepare for multimodal integration in later phases.

2.6 Serbia

2.6.1 Current ITS and Transport data landscape

Serbia's ITS environment is at an advanced stage of development, shaped by sustained investment in road network digitalisation, the introduction of tolling and traffic information systems, and the early deployment of intelligent railway infrastructure. Governance responsibilities are centralised under the Ministry of Construction, Transport and Infrastructure (MCTI), supported by sectoral institutions with clearly defined mandates. This centralised structure provides a favourable foundation for future National Access Point (NAP) implementation, simplifying coordination, policy enforcement, and harmonised data management.

The Public Enterprise "Roads of Serbia" (PERS) operates several digital platforms for tolling, asset management, and traffic data collection. These systems enable the generation of structured datasets and represent Serbia's most mature source of transport-related digital information. However, although selected datasets—especially those related to road network operation—are available in digital form, they are not yet aligned with NAPCORE metadata specifications nor systematically published using compliant EU standards such as DATEX II for road datasets and NeTEx or SIRI for multimodal services.

In the railway sector, Serbian Railways Infrastructure (SRI) has made notable progress through the deployment of ERTMS Level 1 on the Belgrade–Novi Sad corridor, providing a unique basis for future multimodal ITS integration. Nevertheless, interoperability mechanisms, data-exchange protocols, and national transport data catalogues have not been formalised, and datasets remain siloed across operators without a unified interface.

Multimodal datasets—covering public transport schedules, fares, and terminal services—exist in isolated systems operated by municipal transport authorities and airport organisations, particularly in Belgrade and Novi Sad. These datasets lack harmonised metadata, are not shared in machine-readable formats, and do not support real-time publication mechanisms. Consequently, Serbia currently has no open data environment suitable for direct onboarding to a future NAP.

While Serbia has adopted several strategic documents related to digitalisation and infrastructure development, no national ITS strategy or legal framework explicitly defines NAP governance, the role of a National Body (NB), or the responsibilities of transport data providers toward EU interoperability requirements. As a result, ITS deployments remain operationally strong but institutionally fragmented, with no overarching mechanism ensuring EU-aligned dataset publication.

Taken together, Serbia demonstrates a high baseline capability for NAP implementation—particularly due to mature road ICT systems and initial digital railway services—but still requires significant institutional and regulatory enhancements. To progress toward full EU compliance, Serbia must introduce standardised data governance, adopt NAPCORE-aligned metadata frameworks, and establish the legal foundation necessary for a designated National Body capable of overseeing interoperability, dataset publication, and long-term transport data harmonisation.

2.6.2 Institutional Readiness and Gaps

Serbia's institutional landscape provides a solid foundation for the future establishment of a National Access Point (NAP), supported by a centralised governance framework and several technically capable entities operating within the road and rail sectors. The MCTI holds the statutory mandate for transport policy, strategic planning, and regulatory alignment with EU frameworks, positioning it as the most suitable authority to assume the role of National Body (NB). Its cross-sector oversight enables coordination across public transport, road infrastructure, and railway digitalisation initiatives—essential criteria for effective NAP governance.

Operational ITS deployment and road data management are predominantly carried out by the PERS, which maintains digital tolling platforms, traffic monitoring systems, and selected datasets relevant for future NAP publication. Serbia also benefits from advanced railway digitalisation capabilities through Serbian Railways Infrastructure (SRI) and the implementation of ERTMS Level 1 on priority corridors. These assets demonstrate a technical maturity; however, they remain fragmented and lack the data-exchange mechanisms and metadata frameworks required for NAP integration.

Despite this favourable institutional environment, several structural gaps persist:

Strengths

Centralised transport governance enables authoritative decision-making and simplifies future legal designation of a National Body.

MCTI has experience in EU approximation, including adoption of directives applicable to ITS and infrastructure interoperability.

PERS operates digital systems that generate core road datasets and could serve as the operational anchor for NAP hosting and data publication services.

Railway digitalisation leadership through ERTMS deployment offers a strategic advantage for future multimodal integration not present in other RPs.

Growing stakeholder ecosystem, including municipal transport authorities in Belgrade and Novi Sad, provides a basis for future multimodal data expansion.

Gaps and Challenges

No institution currently has a formal mandate to govern, verify, and publish ITS datasets in accordance with Directive (EU) 2023/2661 and related Delegated Regulations.

Data publication remains fragmented, with key road and multimodal datasets held in isolated systems that lack interoperability and metadata alignment.

Absence of a national ITS data governance framework results in unclear dataset ownership, undefined update frequencies, and inconsistent quality assurance processes.

MCTI lacks a dedicated ITS coordination unit, requiring new staffing, technical roles, and procedural instruments to manage NAP oversight responsibilities.

Multimodal datasets are decentralised and maintained in proprietary formats at municipal level, hindering integration into a national access point.

Existing ITS systems do not support open APIs or standardised publication mechanisms such as DATEX II, NeTEx, or SIRI, limiting Serbia's ability to comply with NAPCORE interoperability layers.

Full operational readiness will depend on:

- Formal designation of MCTI as National Body, supported by enabling legislation defining NAP responsibilities and compliance functions;
- Operational partnership with PERS to leverage existing road data platforms and accelerate initial dataset publication; and
- Structured integration of railway and municipal datasets, ensuring Serbia capitalises on its unique ERTMS deployment advantage.

2.6.3 Proposed NAP Type and Justification

Recommended NAP Model: Hybrid NAP

Based on the institutional analysis, technical system review, and benchmarking against regional deployment pathways, the Hybrid NAP model is identified as the optimal solution for Serbia. This configuration combines centralised governance by the Ministry of Construction, Transport and Infrastructure (MCTI) with distributed data provision from operational entities—primarily the Public Enterprise "Roads of Serbia" (PERS), Serbian Railways Infrastructure (SRI), and selected municipal transport authorities. The Hybrid model aligns with Serbia's existing ITS investments, leverages its advanced railway digitalisation capabilities, and enables gradual onboarding of multimodal datasets without imposing immediate full-platform requirements. The recommendation is supported by the following considerations:

Alignment with existing architecture: Serbia already operates several digital platforms capable of generating relevant datasets, including tolling systems, road traffic monitoring infrastructure, and railway ERTMS deployments. The Hybrid NAP allows Serbia to reuse and integrate these systems rather than replacing them, minimising initial capital expenditure and avoiding redundant development. PERS, in particular, possesses ICT infrastructure that can be progressively upgraded to support NAP hosting functions, metadata catalogues, and secure access layers.

Progressive onboarding and risk mitigation: The Hybrid configuration enables Serbia to start with Tier 1 datasets—Safety Related Traffic Information (SRTI), Road closures/roadworks/incidents (RTTI), and traffic flow information—while preparing secondary datasets over time. This phased approach aligns with Serbia's current readiness levels, allowing capacity-building, governance reforms, and interoperability testing to occur without delaying early NAP demonstrators.

Leverages digital rail advantage: The Hybrid NAP provides a scalable framework for integrating future real-time rail datasets using EU standards such as TAP-TSI, NeTEx, and SIRI, enabling Serbia to expand into multimodal journey information services faster than other partners.

Compliance with EU frameworks and NAPCORE specifications: The Hybrid model fully supports: Directive (EU) 2023/2661 and its Delegated Regulations, NAPCORE interoperability and metadata layers, Standardised publication formats (DATEX II, NeTEx, SIRI), and Long-term expansion into cross-border ITS services.

Balanced investment strategy: The Hybrid model structure reduces initial costs while allowing technical complexity to grow in parallel with institutional maturity.

Supports multimodal evolution: Serbia's ITS focus has historically been road-centric, but strategic plans foresee increasing integration with public transport, railway modernisation, and airport data services. The Hybrid NAP enables this future trajectory by providing an adaptable architecture that can onboard additional data types and operators as digital readiness improves.

The Hybrid NAP model offers Serbia the most cost-effective, future-proof, and institutionally coherent pathway to full compliance with EU ITS requirements. It capitalises on Serbia's existing digital infrastructure, supports early dataset publication, and provides a structured route toward multimodal integration. With MoCTI as the designated National Body and PERS as the primary operational partner, Serbia can establish a NAP that evolves in step with its ITS maturity, positioning itself as a regional leader in transport digitalisation.

2.6.4 Proposed NB Set-up and Functions

Based on Serbia's institutional and technical landscape, Public Enterprise Roads of Serbia (PERS) is identified as the most suitable institution to assume the role of the National Body (NB) for the National Access Point (NAP). PERS possesses the legal authority, regulatory mandate, and technical capacity required to manage ITS data governance, ensure compliance with EU legislation, and represent Serbia in regional and EU-level forums. Operational responsibilities—including data provision, system operation, and dataset integration—should also be delegated to Public Enterprise "Roads of Serbia" (PERS) and complemented by other sectoral operators as multimodal services mature.

Core NB functions:

Regulatory oversight and legislative alignment

- Integrate ITS requirements into Serbian transport legislation.
- Adopt and enforce metadata standards and interoperability rules aligned with Directive (EU) 2023/2661 and related Delegated Regulations.
- Ensure legal clarity on data ownership, update responsibilities, and publication obligations.

Strategic coordination and stakeholder management

- Lead inter-ministerial and public-private engagement (railways, toll concessionaires, municipal ITS operators, and service providers).
- Manage the onboarding of new data owners into the NAP and coordinate compliance reporting.

Supervisory and compliance functions

- Monitor dataset quality, completeness, accessibility, and timeliness.
- Conduct annual compliance checks against NAPCORE interoperability layers and EU monitoring requirements.

Representation at EU and regional levels

- Serve as Serbia's official interlocutor to the European Commission, NAPCORE, and relevant regional ITS bodies.
- Ensure cross-border synchronisation of road and multimodal datasets.

The allocation of responsibilities expected to support NAP/NB establishment is summarised below:

Table 34 Institutional responsibilities – Serbia

Governing Body/Coordinating Committee/	Operational Unit	National Body
Ministry of Construction, Transport and Infrastructure	Public Enterprise Roads of Serbia (PERS)	Public Enterprise Roads of Serbia (PERS)

2.6.5 Priority Data Categories and Readiness Assessment

A detailed assessment of Serbia's transport-related datasets was undertaken to determine their readiness for onboarding into the National Access Point (NAP) and to evaluate the extent to which existing data sources align with the interoperability and metadata requirements established under Directive (EU) 2023/2661 and NAPCORE reference specifications. The analysis covered the existence, maturity, level of digitalisation, and interoperability potential of each dataset, with particular focus on their strategic relevance for early NAP deployment.

Core road traffic datasets—particularly Safety-Related Traffic Information (SRTI), Road Closures / Roadworks / Incidents (RTTI), and Road Traffic Flow Data—are already collected by national road authorities and traffic management systems, in some cases using DATEX II or equivalent structured formats. Static road infrastructure datasets are largely digitised within GIS/RAMS environments, while basic multimodal information (e.g. scheduled services and basic timetable data) is available for selected public transport services. However, despite this relatively higher maturity, data is not yet governed under a coherent metadata framework, publication is not automated, and full compliance with NAPCORE and EU data exchange standards has not been achieved.

Table below summarises the current identification and availability of NAP-relevant data categories in Serbia.

Table 35 Serbia – data category identification and availability

Data Category	Maturity level	Data availability
Safety related traffic information (SRTI)	Intermediate	DATEX II
Road closures, roadworks, incidents (RTTI)	Intermediate	DATEX II
Road traffic flow data (RTTI)	Intermediate	DATEX II
Static road infrastructure data	Intermediate	Road network enabling routing services, Toll data
Dynamic road infrastructure data	Basic	Parking availability
Multimodal LOS1 (MTIS)	Intermediate	Passing times, trip plan computation
Multimodal LOS2 (MTIS)	Basic	*No data available*
Multimodal LOS3 (MTIS)	Basic	Trip fares
Multimodal LOS4 (MTIS)	Basic	*No data available*

Using the common prioritisation framework (maturity and strategic importance, weighted 40% and 60% respectively), each data category was scored to determine its suitability and sequencing for NAP implementation. The results are presented below.

Table 36 - Serbia – prioritisation of data categories

Partner	Data category	Maturity	Strategic importance	Score
Serbia	Safety related traffic information (SRTI)	5	9	7,4
Serbia	Road closures, roadworks, incidents (RTTI)	5	9	7,4
Serbia	Road traffic flow data (RTTI)	5	7	6,2
Serbia	Static road infrastructure data	5	6	5,6
Serbia	Dynamic road infrastructure data	1	6	4
Serbia	Multimodal LOS1 (MTIS)	5	6	5,6
Serbia	Multimodal LOS2 (MTIS)	1	4	2,8
Serbia	Multimodal LOS3 (MTIS)	1	3	2,2
Serbia	Multimodal LOS4 (MTIS)	1	1	1

The prioritisation confirms that Serbia is well positioned to go beyond the minimum "Tier 1 core" common to all RPs. In line with the Western Balkans-wide approach, Serbia should prioritise immediate implementation of the three highest-scoring road-traffic-related datasets: Safety-related traffic information (SRTI); Road closures, roadworks, incidents (RTTI); Road traffic flow data (RTTI).

Given the relatively advanced digitalisation of its asset and basic multimodal data, Serbia can also bring forward additional categories into the first implementation phase. Static road infrastructure data and Multimodal LOS1 (MTIS) already exhibit sufficient maturity and strategic value to be treated as early NAP datasets, provided that metadata, interoperability rules, and publication processes are formalised.

Dynamic road infrastructure data and remaining multimodal levels (LOS2–LOS4) remain at lower readiness and will require further investment in data collection, system integration, and institutional coordination before full onboarding becomes feasible.

Applying the scoring methodology and implementation tiers, the following prioritisation profile is proposed for Serbia:

Table 37 Serbia – prioritisation profile

Partner	Data category	Tier
Serbia	Safety related traffic information (SRTI)	1

Partner	Data category	Tier
Serbia	Road closures, roadworks, incidents (RTTI)	1
Serbia	Road traffic flow data (RTTI)	1
Serbia	Static road infrastructure data	1
Serbia	Dynamic road infrastructure data	2
Serbia	Multimodal LOS1 (MTIS)	1
Serbia	Multimodal LOS2 (MTIS)	3
Serbia	Multimodal LOS3 (MTIS)	3
Serbia	Multimodal LOS4 (MTIS)	3

This tiering allows Serbia to demonstrate early and visible NAP functionality, while leveraging its comparatively higher data maturity to publish a broader initial dataset package. At the same time, it preserves a realistic sequencing for more complex dynamic and multimodal datasets, which will depend on future investments and the gradual strengthening of data governance, standardisation, and institutional cooperation.

2.6.6 Roadmap and Indicative Implementation Timeline

Serbia's National Access Point (NAP) implementation roadmap reflects its comparatively advanced ITS environment, existing digital road management assets, and the strategic opportunity to leverage the ongoing ERTMS deployment on the Belgrade–Novi Sad rail corridor. The roadmap is designed to consolidate Serbia's current ITS capabilities, enable early publication of high-priority datasets, and establish a scalable institutional and technical architecture that supports future multimodal integration and EU compliance.

The roadmap is structured into three sequential phases, enabling Serbia to operationalise a core NAP instance rapidly, while progressively expanding towards dynamic and multimodal data categories and strengthening the legal, institutional, and governance frameworks required for long-term sustainability.

Phase 1 — Institutional designation, governance, and foundational setup (Months 0–12)

Formalise the designation of the PE Roads of Serbia (PERS) as the National Body (NB), including explicit mandates for compliance oversight, metadata governance, and coordination with EU bodies.

Establish a dedicated ITS/NAP coordination unit within MCTI, defining reporting lines and operational interfaces with the Road Traffic Safety Agency, Corridors of Serbia, and Serbian Railways Infrastructure.

Adopt national procedures for dataset onboarding, validation, and publication aligned with Directive (EU) 2023/2661.

Design the NAP system architecture and procurement documentation for hosting, publication services, and interoperability interfaces.

Integrate existing road ITS assets—including traffic counting stations, variable message signs, and tunnel systems—into a unified data governance model.

Develop a national metadata catalogue based on NAPCORE dictionaries and define dataset responsibilities for Tier 1 categories (SRTI, RTTI, traffic flow).

Initial training for NB and operational staff on DATEX II, NeTEx, SIRI, and metadata governance.

Phase 2 — Core NAP deployment and publication of priority datasets (Months 12–24)

Launch the first operational version of the NAP, hosted within the national road authority ICT environment or in an interim facility pending deployment of the national Traffic Management Control Centre.

Onboard and publish Tier 1 datasets: Safety-related traffic information (SRTI); Road closures / roadworks / incidents (RTTI); Road traffic flow data

Introduce dataset quality validation mechanisms and user access layers for authorised data consumers.

Conduct the first interoperability tests against NAPCORE reference specifications and EU data-exchange requirements.

Begin onboarding Tier 1.5 datasets—Static road infrastructure data and Multimodal LOS1—leveraging existing digital repositories and available public transport data.

Phase 3 — System expansion and multimodal integration (Months 24–36)

Introduce dynamic road infrastructure datasets and additional multimodal LOS categories as data collection and institutional readiness improve.

Expand the NAP scope to integrate datasets originating from: Rail digital systems, including ERTMS expansion beyond Belgrade–Novi Sad, Airport and port operators, Local public transport information systems.

Operationalise routine compliance reporting to the European Commission.

Formalise cooperation frameworks that govern long-term onboarding of mobility service providers and municipal ITS operators.

Extend NAP functionality to support journey planning, asset status visibility, and cross-modal datasets aligned with future EU Delegated Regulations.

The Serbia Roadmap for NAP and NB establishment within the period 2026 – 2030 is shown in the Table below.

Table 38 Serbia Roadmap 2026 - 2030

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
1	**Establishment of National Access Point (NAP)**																
1.1	**Technical Preparation**	- Ministry of Construction, Transport and Infrastructure - Public Enterprise Roads of Serbia (PERS)	-														
1.1.1	Technical Assistance Support (Planning, Design, Procurement)		30,000 EUR														
1.1.2	NAP design review		3,600 EUR														
1.1.3	Tender process and selection of awarded system provider		7,200 EUR														
1.2	**Legal Framework**	Ministry of Construction, Transport and Infrastructure supported by Public Enterprise Roads of Serbia (PERS)	-														
1.2.1	Legislative framework for NAP (preparation and adoption)		16,800 EUR														
1.2.2	Institutional responsibilities and relationships		n.a.														
1.2.3	Coherent data governance framework		n.a.														
1.2.4	Reporting framework for the NAP		n.a.														
1.3	**Technical Deployment**	Public Enterprise Roads of Serbia (PERS)															
1.3.1	Allocation of space of NAP hosting		n.a.														
1.3.2	Hardware acquisition and configuration		558,000 EUR														
1.3.3	Software acquisition and configuration																
1.3.4	Custom APIs for integration with existing systems																
1.3.5	NAP system testing and commissioning																
1.4	**Appointment of NAP personnel**	Public Enterprise Roads of Serbia (PERS)	43,200 EUR per year														
2	**NAP Operation / Maintenance, Data and System Upgrades**	Public Enterprise Roads of Serbia (PERS)	-														
2.1	NAP Operation and Maintenance		110K per year														
2.2	System Upgrading and development of APIs																
3	**Collaboration between stakeholders for data exchange**	Ministry of Construction,	n.a.														

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
		Transport and Infrastructure, All															
4	**Establishment of National Body (NB)**																
4.1	**Legal and Institutional Framework**	Ministry of Construction, Transport and Infrastructure supported by 'Public Enterprise Roads of Serbia (PERS)	-														
4.1.1	Legislative framework for NB (preparation and adoption)		n.a.														
4.1.2	Institutional responsibilities and relationships		n.a.														
4.2	**Allocation of space for NB hosting**	Public Enterprise Roads of Serbia (PERS)	n.a.														
4.3	**Appointment of NB personnel**	Public Enterprise Roads of Serbia (PERS)	21,600 EUR per year														
5	**National Body Operation**	Public Enterprise Roads of Serbia (PERS)	25,200 EUR per year														
6	**Capacity Building**																
6.1	Participation on NAPCORE Initiatives	- Ministry of Construction, Transport and Infrastructure - Public Enterprise Roads of Serbia (PERS)	26,400 EUR per year														
6.2	Training sessions for NAP operation and maintenance		13,800 EUR per year														
7	**Regular alignment with EU Acquis**	Ministry of Construction, Transport and Infrastructure	**-**														
8	**Introduction and Updating of EU Standards into ITS projects lifecycle***																
8.1	Standard protocols for NAP authorisation and authentication	- Ministry of Construction, Transport and Infrastructure - Public Enterprise	n.a.														
8.2	EU Standards for Traffic Management (DATEX II, TPEG, ALERT-C, Open LR)		n.a.														
8.3	EU Standards for Public Transport Management (NeTEx, SIRI)		n.a.														

SN	Measure	Responsible Stakeholder	Estimated Budget (whereas applicable)	2026				2027				2028				2029	2030
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
8.4	INSPIRE directive protocols (GML language, OGC standards)	Roads of Serbia (PERS) - National Institute for Standardisation	n.a.														
8.5	C-ITS (ETSI Standards)		n.a.														
8.6	TN-ITS Directive (CEN-17268) for the exchange of road-related spatial data		n.a.														
**** Compulsory introduction after adopting EU Legislation Acts into domestic law - previous introduction is recommended (such as DATEX II, NeTEx, SIRI)***																	

2.6.7 Estimated Costs and Capacity-building Needs

Serbia's financial and institutional requirements for establishing the National Access Point (NAP) and operationalising the National Body (NB) are shaped by its ITS ecosystem, availability of digital road infrastructure assets, and ongoing deployment of ERTMS-based systems on the Belgrade–Novi Sad corridor.

While Serbia already operates multiple ITS subsystems—traffic monitoring stations, tunnel management systems, electronic tolling infrastructure, and digital railway tracking—these systems are not yet governed through a unified data governance architecture nor aligned with Directive (EU) 2023/2661 and NAPCORE interoperability standards. The key cost drivers therefore relate to system integration, metadata governance, and establishing a legal and organisational framework capable of ensuring long-term compliance and coordinated dataset publication.

Table 39 Serbia - estimated CAPEX and OPEX

Initial Investment (EUR)	**Annual Opex for first 3 years** **Years 1–3 (approx. 15–20%)**	**Annual OPEX for Year 4 onwards** **-40% compared to previous years**	**Remarks**
558 000	≈ 110 000	≈ 65 000	Broad ITS and C-ITS integration scope

Capacity-Building Needs

Sustained capacity development is required to ensure that the National Body can assume operational independence and oversee a growing digital mobility ecosystem. Priority areas include:

ITS Data Governance and Metadata Management: Training for NB staff on NAPCORE data dictionaries, metadata schemas, and dataset onboarding procedures.

EU-compliant Data Standards and Protocols: DATEX II for road transport datasets, NeTEx and SIRI for public transport and multimodal services, OGC-based GIS reference models for spatial datasets.

Compliance Monitoring and Reporting: Strengthening competencies for assessing dataset completeness, quality, timeliness, and adherence to delegated regulations.

API-based data access and cybersecurity: Technical training for ICT personnel on secure publication interfaces, authentication layers, and interoperability workflows.

Multimodal Data Integration and ERTMS Synergies: Preparing institutional and technical teams for data exchange models associated with planned railway digitalisation and integration of LOS categories.

Serbia's cost and capacity-building profile reflects a transition from project-based ITS deployments to systemic governance of digital mobility data. The required investments are not primarily infrastructural but organisational and integrative, ensuring that Serbia can transform its advanced ITS components into a unified, compliant, and future-proof NAP ecosystem.

A targeted capacity-building programme will allow Serbia to consolidate responsibilities within the National Body, leverage its existing ITS assets, and progressively expand toward interoperable multimodal data services aligned with EU ITS architecture and forthcoming delegated regulations.

2.6.8 Key Recommendations

The assessment confirms that Serbia possesses strong baseline ITS infrastructure, driven by extensive road telematics, operational tunnel management systems, electronic tolling, and early deployment of ERTMS on the Belgrade–Novi Sad corridor. These assets provide a solid foundation for NAP implementation; however, data standardisation, governance structures, and systematic compliance processes remain underdeveloped. To ensure efficient and future-proof deployment, Serbia should prioritise the following actions:

Enact the legal act designating the Ministry of Construction, Transport and Infrastructure (MCTI) as the National Body responsible for NAP governance, compliance monitoring, and interoperability oversight.

Embed NB responsibilities in sectoral legislation to ensure institutional continuity and prevent fragmentation of data governance roles across road, rail, and municipal systems.

Implement a Hybrid NAP hosted within the existing Traffic Management ecosystem, enabling immediate onboarding of road datasets while providing a scalable architecture for future multimodal and railway data.

Exploit existing ICT environments within road and rail operators to minimise CAPEX and accelerate deployment.

Prioritise onboarding of Tier 1 datasets to demonstrate early compliance

Define dataset custodianship, update responsibilities, and metadata rules consistent with Directive (EU) 2023/2661 and NAPCORE interoperability specifications.

Establish a national metadata catalogue covering all NAP datasets, with clear update cycles and validation processes.

Align NAP evolution with the expansion of ERTMS and digital rail systems, enabling future integration of rail traffic data and multimodal journey information services.

Coordinate with public transport operators and airport authorities to accelerate collection and digital exchange of LOS categories.

Train NB staff in EU ITS standards (DATEX II, NeTEx, SIRI), data validation processes, compliance reporting, and security protocols.

Participate actively in NAPCORE working groups to track evolving requirements and transfer technical know-how to the national ecosystem.

Sequence implementation to align capital investments, public procurement, and regulatory updates with IPA and WBIF funding opportunities.

Use early wins—especially publication of Tier 1 datasets—to strengthen institutional credibility, stakeholder engagement, and EU compliance visibility.