MINISTRY OF ENVIRONMENT SPATIAL PLANNING

AND INFRASTRUCTURE

Intelligent Transport System (ITS) Strategy for Kosovo

2024 - 2030

Content

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Lista e shkurtesave dhe akronimeve

RRA	Railway Regulatory Authority
AIS	Automatic Identification System
AI	Administrative Instruction
ATIS	Advanced Traveler Information Systems
BS	Base Station
CA	Contracting Authority
CBA	Cost Benefit Analysis
CCS	Command Control and Signalling
CEN	European Committee for Standardization
CER	Community of European Railway and Infrastructure Companies
CFP	Call for Proposals
CNC	Core Network Corridors
RPO	Regional Partner Office
CRM	Connectivity Reform Measures
DG (MOVE)	Directorate-General for Mobility and Transport
DG (NEAR)	Directorate-General for Neighborhood and Enlargement Negotiations
DTL	Deputy Team Leader
EC	European Commission
ECDIS	Electronic Chart and Information Display System
EMSA	European Maritime Safety Agency
EMSWE	European Maritime Single Window Environment
EUAR/ERA	European Union Agency for Railways (Agency)
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
EU	European Union
EUD EU	EUD EU Delegation
FR	Final Report
FRAMEWORK	Framework Architecture made for Europe The European ITS Framework Architecture
GMDSS	Global Maritime Risk and Safety System

GSM-R	Global System for Mobile Communications - Rail
IFN	International Financial Institution
MIN	MIN Infrastructure Manager (refers to railways)
IMO	International Maritime Organization
IMS	Incident Management Systems
IMSAS	Member State Audit Scheme
IPA	Instrument for Pre-Accession Assistance
ISM	International Security Management
ISPS	International Ship and Port Security
IT/ICT	Information Technology/Information Communication Technology
ITS	Intelligent Transport Systems
IWW	Inland Waterways
ME	Main Expert
KfW	Kreditanstalt für Wiederaufbau (Bank)
LRIT	Long Range Identification and Tracking
MASA	MASA Autonomous Maritime Surface Vessel
MED	Mediterranean (Corridor)
MK/MKD	Republic of North Macedonia
IMS	Information Management System
MNE/MON	Montenegro
NIPAC	National IPA Coordinator
NMSW	National Maritime Single Window
OEM	Orient/East-Mediterranean Corridor
PIU	Project Implementation Unit
PM	Project Manager
QA	Quality Assurance
RAMS	Road Asset Management System
RFA	Request for Approval
RIS	River Information Services
RRA	Railway Regulatory Authority
RU	Railway Undertaking (refers to railway operators)

SC	Steering Committee
SEE	South-East Europe
SEETO	South-East Europe Transport Observatory
SSM	Smart and Stable Mobility
TA	Technical Assistance
TAF - TAP	Telematic Applications for Freight/Passenger Services (Railway)
TCPS	Permanent Secretariat of the Transport Community
TEN-T	Trans European Network-Transport
TM	Task Manager
TMC	Traffic Management Centre
TMS	Traffic Management Systems
ToR	Terms of Reference
TSI	Technical Specifications for Interoperability
UIC	International Union of Railways
V2I – I2V	Vehicle-to-Infrastructure (and vice versa)
VDR	Visual Data Recorder
VTMIS	Vehicle Traffic Management and Information System
WB6	Western Balkans 6 Regional Partners
WB (G)	World Bank (Group)

1 EXECUTIVE SUMMARY

The deployment of the Intelligent Transport System (ITS) is of essential importance for improving safety, mobility and increasing efficiency in the transport system, which affects the economic development of Kosovo, the social well-being of its citizens, and the improvement of the environment. The Government of the Republic of Kosovo is committed to the implementation of ITS as a new planning approach to solve current challenges and lay the foundations for the future of the country's transport sector that will increasingly provide safety, mobility and efficiency. Kosovo's ITS also aims to integrate into regional and European transport systems.

The first most important step in this direction will be the transposition of the EU Acquis into local legislation as a prerequisite for the introduction of ITS based on EU standards.

The second step will be the construction of the Traffic Management Centre, namely the deployment of the ITS infrastructure in the road and rail network of the TEN-T.

Currently, Kosovo has not developed the ITS infrastructure at the National or Local level. The legislative base of Kosovo related to transport is partially harmonized, the transposition of intelligent transport systems is in the initial phase. The infrastructure in Kosovo does not have ITS/ERTMS, including the Traffic Management Centre, but there is a border management system.

The 2024-2030 Intelligent Transport System Strategy is guided by the following vision:

Creating a safer, smarter and more efficient transport ecosystem by deploying innovative ITS Services to significantly reduce traffic accidents and fatalities, improve emergency response capabilities, reduce traffic pollution and minimize safety risks for a smooth and stable mobility experience for all users.

Based on this long-term vision, and considering the current situation and challenges, two strategic goals together with their specific objectives constitute the core of the ITS strategy:

Strategic objective 1: Building an advanced technological infrastructure to increase road safety, improve mobility and reduce environmental impact

This strategic objective is addressed through three (3) specific objectives:

1. Developing the comprehensive and integrated framework of the Intelligent System in Railway Transport;

2. Adapting and effectively using Intelligent Transport Systems;

3. Improving safety, capacities and rail traffic management in the main TEN-T rail network.

4. Specific Objective, Improving efficiency, safety, and cross-border trade through advanced Intelligent Transport (ITS) systems

The main goals for this objective are:

- The transposition of the entire EU Acquis, addressing the technical gaps and encouraging collaboration between institutions, with the aim of increasing the efficiency, safety and sustainability of transport within the next three (3) years;

- Ensuring the reliability and resilience of the transport network in Kosovo by including ITS technologies that enable proactive maintenance and rapid adjustment from outages or incidents with a 20% reduction in the frequency and duration of transport outages, and a reduction of the average incident response and adjustment time by 25% within three (3) years after the implementation of ITS Services.

- The main road network TEN-T will include ITS within the next seven (7) years.

- Reducing the average waiting time at border points by 20% within three (3) years, increasing the volume of cross-border trade by 15% within three (3) years, deploying at least three (3) ITS solutions in border points within five (5) years and reducing security incidents related to cross-border transport by 10% within two (2) years after the implementation of ITS Services.

Strategic objective 2:. Building an advanced technological infrastructure to increase railway safety, improve mobility and reduce the impact on the environment.

This strategic objective is addressed through three (3) specific objectives:

1. Developing the comprehensive and integrated framework of the Intelligent System in Railway Transport;
2. Adapting and effectively using Intelligent Transport Systems;
3. Improving safety, capacities and rail traffic management in the main TEN-T rail network.
4. Specific Objective, Improving efficiency, competitiveness, and quality of railway transport services

The main goals for this objective are:

- Full harmonization with the EU Acquis for ITS by fostering collaboration through inter-institutional agreements with key partner organizations within the next three (3) years.
- Increasing the capacities through comprehensive training programs and distribution of informational materials to targeted state institutions and railway management entities, with the aim of achieving 60% participation in seminars / trainings, and an average knowledge rating of 60% or more high within the next three (3) years.
- The TEN-T railway network under construction will include ERTMS within the next six (6) years.

2 INTRODUCTION

The Republic of Kosovo is located in Southeastern Europe, namely in the Western Balkans. It has an area of 10,905 km and 1,739,825 inhabitants. Considering the geographical position of the Republic of Kosovo, the road and railway network plays an important role in the socio-economic development of the country. Kosovo has an advanced road network with a length of 2446.95 km of paved roads, of which 137 km are highways, 755.19 km - national roads, 1486.31 km - regional roads, while the other 46.88 km are connecting roads. It is worth noting that this road network is characterized by the quality connections of different regions of the country with the road segments of Europe, especially with corridor VIII and X through R6 and R7.

The Intelligent Transport System (ITS) is an innovative and strategic infrastructure used to improve the efficiency, safety and sustainability of transport in a period of rapid technological development. This advanced infrastructure integrates information and communication technologies to monitor, manage and optimize the movement of vehicles on the road, providing a safer and more efficient experience for users. In this strategic document, the main goals and priorities of ITS will be reviewed, addressing a wide range of challenges and opportunities for sustainable development.

For this purpose, the Republic of Kosovo has set the ITS deployment as a priority of the Government.

This Strategy will serve as a strategic plan for the institutions of the Republic of Kosovo, as well as other institutions as stakeholders, which will be involved in the deployment, operation and use of intelligent transport systems in Kosovo.

Furthemore, this Strategy takes into consideration the "Strategic Framework for the Implementation of ITS in TEN-T Networks (Trans-European Transport Network) in the Western Balkans", developed with EU funding and completed at the beginning of the year 2019, aimed at the anticipated deployment of the future ITS in the planned extension of the core (main) and comprehensive Trans-European Transport Networks (TEN-T Networks) in the Western Balkans region; all connecting corridors such as railways, roads, seaports, some waterways within the country, as well as their interconnections. The strategic framework includes recommended action plans for each of the countries of the Western Balkans (WB6), to serve as a basis for a coordinated development of ITS in the region.

The Republic of Kosovo, as a potential country for membership in the EU, has taken as an obligation the achievement of the goals set forth by the Transport Treaty Community within the Road and Railway Action Plan.

The goals of ITS 2030 are also in line with the objectives of the Government Program 2021-2025, point 2.13 "Infrastructure" and 2.13.1 "Integrated Road Infrastructure" which foresees the improvement of traffic safety, road maintenance and improvement of services by revising the legal framework as well as the deployment of the Intelligent Transport System. Point 2.13.2 "Railway Infrastructure for Economic Development" which foresees the harmonization of the legal framework with EU acquis, the railway market and the projects for the rehabilitation and modernization of line 10 including the ITS systems.

The ITS strategy also contributes to the realization of the priorities in the National Development Strategy, the first pillar of sustainable economic development, namely in sustainable and integrated high-quality infrastructure that envisages the improvement of transport infrastructure and services, the creation of barrier-free connections in international multimodal transport and the enhancement of transport safety.

The ITS strategy derives from the 2030 Multimodal Transport Strategy, which foresees the digitization of road and rail transport, namely point 6.2.3.1 "digitalization and innovative services" which aims to establish intelligent transport systems - ITS/ERMTS.

As for the Green Agenda for the Western Balkans, as part of the Berlin process, Kosovo has received obligations for the implementation of actions within five main areas, where in the first

area "Climate, Energy, Mobility" foresees the deployment of intelligent transport systems, developing intelligent infrastructure, promoting innovative technologies and strengthening collaboration within the region by creating wide corridor lanes.

The ITS strategy derives from the Transport Community Treaty (TCT), signed in July 2017 between the EU and the six countries of the Western Balkans (WB6), including Kosovo. The Treaty supports the deepening of the European Integration of the WB6 countries in the area of transport and includes mutual commitments for specific actions to be taken. Article 10 of the TCT, ratified by Law No. 06/L-109, dated 26.11.2018, "On the ratification of the treaty establishing the Transport Community", stipulates that the South-East European Parties will develop efficient traffic management systems, including intermodal and ITS systems.

3 METHODOLOGY

The first was the consultancy work engaged and supported by the Secretariat of TKT, which drafted the initial Strategy of ITS for Kosovo and BiH (for all types of transport) and the Report for the Development of the Traffic Management Centre (TCM), while for Albania and Montenegro for Water Transport.

For the purpose of the project, numerous data, information and documents have been obtained from various sources. Their type and description were discussed during the initial meeting of the sub-project and in the initial report. Following their initial definition, data, information and document requirements have been adapted in order to address all components related to ITS (institutional, legal, financial, technical, barriers and potential impacts) and in relation to the needs and TCM requirements. In the meantime, points of discussion with stakeholders have been identified, in function of the performance of the missions.

More specifically, a number of methods were used, in the form of questionnaires, discussion points and requests for the provision of data - documents - information:

- Questionnaire - Discussion points on routes and key performance indicators (relevant for all modes of transport);
- Questionnaire - Discussion points on Railways;
- Questionnaire - Discussion point on Inland Waterways;

It is noted that these questionnaires followed the same approach already introduced and approved through the previous project, "Strategic framework for the implementation of ITS in the TEN-T Core/Comprehensive Network in WB6", also focusing on receiving all updates and/ or modifications to the terms of both the Regional Partners (RP) and the ITS environment.

The questionnaires were presented and discussed during the missions in all institutions, in order to obtain maximum information and to achieve the acceptance of the Project.

Anticipated results of the project according to the results described in the ToR included a total of eight reports that follow the progress of the project, as follows: Initial report, Assessment of the current situation, strategic vision and objectives, development measures and scenarios, TNC needs and requirements, TMC-Cost Breakdown, Draft Final Report and Final Report available.

In order to draft the ITS strategy for Kosovo, MESPI has established the Working Group composed of representatives from responsible institutions and other participants of the transport sector, who provided and verified all the available information. Before and throughout the strategy drafting process, meetings were held with CONNECTA experts where the initial draft was discussed and presented to MESPI representatives (directors of departments and the office of the minister). Meetings of the working group were held, the initial draft was reviewed and suggestions were given that the draft should be adapted according to the legal guidelines for the preparation of the strategy. A four (4) day workshop was also held for the adaptation and finalization of the strategy in question.

The strategic document has passed the stage of preliminary discussions from 26.10.2023 to 03.11.2023 where the document has been sent to all institutions for comment. After the preliminary consultation phase, the document was published on the public consultation platform from 14.11.2023 to 04.12.2023.

The ITS Strategy is based on the models and standards recommended by TKT and also on the findings of CONNECTA experts, in the comprehensive ITS strategy for the Western Balkans countries.

The ITS Strategy was approved by the Government of the Republic of Kosovo on the date: 14.02.2024 and Decision No. 16/188.

4 CURRENT SITUATION

At the request of the Government of the Republic of Kosovo, the Secretariat of the Transport Community (STC) has engaged Technical Assistance which has drawn up a full assessment of the current situation in terms of the policy framework, the legal approximation according to Annex I of the Treaty of the Transport Community, institutional and technological framework for the Intelligent Transport System (ITS) which includes all types of transport (road, rail and water).

This assessment of transport modes is summarized below with a focus on the gaps that need to be filled. Considering that the findings related to the current situation are the basis for the Strategic Objectives and the short, medium and long-term measures to be proposed, these gaps are summarized in three specific categories related to actions:

- Operation;
- Maintenance;
- New infrastructure to be provided.

By following this approach, the findings regarding the current situation led to Strategic Objectives and Measures to be proposed below.

4.1 ROADS

4.1.1 General Description

One of the initial activities in the preparation of the national ITS strategy for Kosovo and the deployment of a road traffic management centre is the evaluation of the current level of development of the ITS infrastructure in the country. A desk study was conducted to analyse publicly available data and identify the main stakeholders in the country. The desk study showed that in the current situation there are no publicly available documents that would suggest any concrete plans for the development of the ITS infrastructure in the country.

According to the publicly available data, there has hardly been any progress in Kosovo regarding strategic and legal documents for ITS. There is no development of ITS infrastructure on the national or local (city) level.

The constitutional and legislative structure of Kosovo related to transport is straightforward with the main stakeholder being the Ministry of Infrastructure. Within the Ministry, there are departments in charge of specific tasks including the Department of Road Infrastructure and the Department of Road Management.

The road network under the jurisdiction of the Ministry of Infrastructure is as follows: 137 km of constructed highways and an additional 22 km of highways that are under construction. In addition, there are around 753 km of national roads and 1495 km of regional roads. There are several tunnels on those routes and there are several bridges and viaducts, with 5.6 km being the longest one.

4.1.2 Legistation

As for the legislation, Kosovo still does not have any progress for the approximation of the EU legislation, namely the Directive 2010/40/EU for the deployment of ITS(s), even though it is foreseen to be included in the new Draft Law on Roads. It is anticipated that ITS will be divided per mode of transport and within each of them ITS related functions will be introduced. Kosovo Standardisation Agency (KSA) has adopted all CEN ITS standards.

Apart from the Law on Roads, other Laws in place, which are related to road transport sector, are:

- Law on Road Traffic Provisions;
- Law on Vehicles;
- Law on Road Transport;
- Law on Transport of Dangerous Goods.

At the strategic level, the Multimodal Transport Strategy 2023 - 2030 defines some of the important elements for the development of ITS in the transport of passengers and goods, the National Development Strategy 2030, the first pillar of sustainable economic development, namely in high-quality infrastructure sustainable and integrated that envisages the improvement of transport infrastructure and services, the creation of barrier-free connections in international multimodal transport and the enhancement of transport safety. The Government Program 2021-2025 envisages a review of the legal framework, as well as the deployment of ITS and the Green Agenda for the Western Balkans that foresees ITS.

4.1.3 Findings

4.1.3.1 Operation

⇒ A feasibility study for ITS and Tolling was prepared and plans were made for the implementation of the system in the near future.

⇒ Legislation covering the area of Road Transport in its content is based on a significant amount of provisions from the EU Acquis. On the other hand, in the area of ITS, the harmonization of the mentioned laws has not started, while the interoperability standards are planned to be determined at a later stage.

4.1.3.2 Maintenance

⇒ Operation and Maintenance of ITS is planned to be financed through the Kosovo Budget.

4.1.3.3 New Infrastructure

⇒ There is no ITS deployment infrastructure on the road network.

⇒ Although there is no ITS equipment on the Highway, measures are foressen to enable easy and efficient installation of the equipment.

4.2 RAILWAY

4.2.1 General Description

The length of the public railway infrastructure in the territory of Kosovo is 335 km, there are also around 103 km of industrial railway line. All railway lines in Kosovo are single-track and non-electrified, characterized by poor condition (some non-functional lines) and lack of maintenance. Practically, all railway lines operate at speeds between 30 and 70 km/h. Since 2011, the railway infrastructure has been entrusted to the “INFRAKOS” JSC, which is 100% owned by the Government. The management function is performed by the Ministry of Economy.

In addition to the infrastructure manager, there is also the national transport company for goods and passengers – “TRAINKOS” JSC, also 100% owned by the Government.

The TEN-T railway lines in Kosovo are shown on the map below:

Figura 1: Rrjeti hekurudhor i Kosovës (burimi: Infrakos)

The Government, through the Ministry of Environment, Spatial Planning and Infrastructure (formerly: Ministry of Infrastructure), and the Ministry of Economy, controls and supervises the work of "INFRAKOS" , and "TRAINKOS".

The Railway Regulatory Authority (RRA) is an independent body established by the Assembly of the Republic of Kosovo, and operates on the basis of the Law on Railways of Kosovo No. 04/L-063 charged with the responsibilities for the regulation and supervision of the railway sector in Kosovo through the following professional bodies: the Railway Safety Authority, the Interoperability Authority, the Licencing Authority and the Railway Market Regulatory Authority.

Upon request, the RRA reports to the Assembly of Kosovo, and at least once a year, on the scope of the departments that are within it.

Pursuant to Law 04 / L-063 on Kosovo Railways, the Body for Investigation of Railway Accidents and Incidents has been established within the Commission for Investigation of Aeronautical Accidents and Incidents (CIAAI).

CIAAI is responsible for the investigation of accidents and incidents in the railway sector of the territory of the Republic of Kosovo.

Access to the public railway infrastructure is enabled by the Law on Railways of the Republic of Kosovo No. 04/L – 063, adopted on 14.11.2011, and currently the private railway operator operates in the railway network: "RAILTRANS", which holds about 40% of the rail freight market.

Since 2006, a centralized traffic control and management system has been implemented on the Hani i Elezit – Fushë Kosovë – Leshak railway line, with a length of 149,311 km (which includes 15 railway stations), now it is completely out of order and demolished due to the rehabilitation of the railway line 10. The connections of the telephone system with optical cables and radio networks are used for railway communication.

The main railway line from Han i Elezit to Mitrovica and Leshak is currently being rehabilitated through three subsections, and for segment 1 and 2 (Han i Elezit – Fushë Kosovë – Mitrovica) the installation of the Signalling and Telecommunication System is expected to be completed in the second quarter 2027, and phase 3 that includes Civil Works, Signalling and Telecommunications is expected to be completed in the fourth quarter of 2028. Electrification begins in coordination with neighboring countries. The total value of the project is 366.118 million euros, and the planned completion date is the end of 2028.

The rehabilitation of railway line 10, Hani i Elezit – Fushë Kosovë – Leshak, is envisaged to be equipped with European Train Control System (ETCS) level 1 full survelliance including Balise charging function. The electronic interlock system will enable the introduction of ERTMS/ETCS level 2 technology in the future.

As for other projects, the rehabilitation and modernization of railway line 7, Fushë Kosovë – Podujevë, Conceptual Design and EIA have been completed, now it is expected to find funds for the execution of works and the preliminary feasibility study for the railway line Prishtina – International Airport "Adem Jashari" has been completed.

The financing of "INFRAKOS" operations remains an unresolved issue, given that the difference between direct operating costs and income from fees is around 2.5 million euros.

Another unresolved and quite obvious issue is the lack of railway staff and the training of current employees. There is the Multimodal Transport Strategy 2023-2030, which aims at intelligent and sustainable transport, including ERTMS traffic management.

Findings

4.2.2 Operation

⇒ Directives 2004/49/EC, 2008/57/EC and 2007/59/EC have been transposed into the legal framework of Kosovo, with the current Law on Railways 04/L-063. The TSIs are in the 19roces of being approved by the RRA.

⇒ So far, TSI INF, TSI OPE, TSI CCS, TSI LOC & PAS, TSI WAG have been approved, while TSI PRM, TSI TAP and TSI TAF are in the 19roces of adaptation, while it is planned for 2024 for the adoption of TSI SRT.

⇒ The Concept Document on Railways has been approved and foresees the 19roces19ent of the current Law on Railways and the preparation of the new Law on Safety and Interoperability. The new law foresees harmonization with the Safety Directive 2016/978 of the fourth railway package and the Interoperability Directive 2016/979.

⇒ Regarding the implementation of railway EN standards (included in TSI), collaboration has been established between RRA and the Kosovo Standardization Agency.

⇒ Preparations of the National Plan for the Implementation of TSI INF have begun. The final draft has already been prepared, but in the absence of the RRA Supervisory Board, this activity has not yet been finalized. There is a plan to develop action plans for all other TSIs as well.

⇒ ERA on June 21, 2023 has decided that Kosovo will be able to temporarily use the two-digit numerical code “00” for “all other states/territories”, until a final solution is found. This solution has the advantage that Kosovo can have 19roces to the EVR and the existing registers may not need to be changed. RRA is in the 19roces of amending/supplementing the Regulation on the National Register of Motor Vehicles (NVR) and adaptation for transposition of Decision (EU) 2018/1614 that determines the specifications for the registers of motor vehicles referred to in Article 47 of Directive (EU) 2016/ 797.

4.2.3 Maintenance

⇒ There is a need for improvement in the knowledge and professional skills necessary for the implementation (operation and maintenance) of ERTMS and other ITS in railways, for both state institutions and railway companies, as well as managing and operational staff.

4.2.4 New railway infrastructure

⇒ Railway infrastructure is in poor condition, hindering safety and quality of the rail service.
⇒ There is no implemented of ITS infrastructure in rail mode.

4.3 INLAND WATERWAYS

4.3.1 Legislation

In the territory of Kosovo, there are no waterways of local or international significance and with the international regime of navigation.

There is no traffic in the rivers of Kosovo. In addition, some waterways and small lakes that have touristic activities, including sports - non-motorized sailing, are less developed.

Consequently, in the "2023-2030 Multimodal Transport Strategy and Action Plan for three years", there is no hint of planning activities or investments in the infrastructure of inland waterways.

4.3.2 Findings

4.3.2.1 Operation

⇒ The Authority managing water resources on the national level is not in charge of transport issues.
(i) The Ministry of Environment, namely River Basin Dictrict Authority (RBDA) is currently drafting the River Basin Management Plans as strategic planning documents for water resource management on the basin level.
⇒ There is no plan for the development of water transport, since the rivers of Kosovo do not have the capacity to be navigable rivers.
⇒ In the context of transboundary water management, a memorandum of understanding has been reached at the level of the Drin river basin together with Albania, Montenegro, North Macedonia and Greece. In addition, a memorandum of understanding was recently signed between ARPL and the Albanian Water Resources Management Agency, as well as an interstate agreement on transboundary water management with Albania and North Macedonia is being worked on.
⇒ ITS in IWW does not apply since there is no possibility of water transport.

4.3.2.2 New infrastructure

⇒ There is no established IWW-type ITS infrastructure.

5 VISION

Creating a safer, smarter and more efficient transport ecosystem by deploying innovative ITS Services to significantly reduce traffic accidents and fatalities, improve emergency response capabilities, reduce traffic pollution and minimize safety risks for a smooth and stable mobility experience for all users.

In order to achieve the above Vision, it is necessary to rely on the principles:

1. ITS services are developed and deployed in a coordinated, systematic and cost- effective manner.
2. All ITS applications are seamlessly integrated, compatible with systems in neighbouring countries and meet with EU ITS architecture standards.
3. ITS are fully integrated into the planning, design, construction, and maintenance of the transportation infrastructure.
4. Sustainable development and deployment of ITS.

6 STRATEGIC OBJECTIVES

In order for the Strategic Objectives to be articulated, factors to be considered include the comprehensive EU transport policies, the international obligations and rights of the Republic of Kosovo, efficiency improvement means, such as the digitisation, and the European principles and norms regarding their transparency and accountability.

The factors that have influenced the formation of Strategic Objectives such as: the Regional Action Plans for Road Safety, Roads[1], and Railways[2], as well as the Smart and Sustainable Strategy for the Western Balkans[3] were analysed.

In addition, for the formulation of the Strategic Objectives, the recent developments in the Western Balkans [4] and the Acquis implementation [5] were analysed.

The above Vision and Principles apply to all modes of transport, Roads, Railways and Inland Waterways, forming their strategic objectives that being set out in the following sub chapters.

Kosovo is currently drafting the plan of implementing ITS for the various transport modes.

This presents a great opportunity to apply all lessons learned from any previous efforts.

***Strategic Objective 1*:** Building an advanced technological infrastructure to increase road safety, improve mobility and reduce environmental impact

The road network under the jurisdiction of the Ministry is as follows: 137 km of constructed highways and 22 km of other highways under construction. In addition, there are around 753 km of national roads and 1495 km of regional roads. There are several tunnels, bridges and viaducts on these roads, the longest of which is 5.6 km. Of the entire above-mentioned network, 395 km are main and comprehensive roads that are part of the TEN-T road network.

The road legal framework for ITS in Kosovo is still in the development stage and its formation is the first step towards the ITS implementation. Kosovo should overcome this gap by transposing and implementing the Directives and Regulations covering the area of ITS.

Development and establishment of the Traffic Management Center, preparations for the start of the ITS deployment on the main and comprehensive road network.

Strategic objective 1 defines a clear direction for the implementation of ITS in Kosovo with a focus on achieving EU standards by transposing all EU directives and regulations covering the area of ITS, increasing the reliability and resilience of the transport network in Kosovo, including the deployment of ITS technologies, increasing public and private investment in the development and deployment of ITS, and reducing the duration and increasing security of trade in cross-border transport.

[1] https://www.transport-community.org/action-plans/
[2] https://www.transport-community.org/reports/five-year-rolling-ëork-plan-for-development-of-the-indicative-ten-t-extension/
[3] https://www.transport-community.org/strategy-for-sustainable-and-smart-mobility-in-the-ëestern-balkans-2/
[4] https://www.transport-community.org/reports/ten-t-annual-reports/
[5] https://www.transport-community.org/reports/progress-reports-on-action-plans-and-acquis-implementation/

Specific Objective 1.1: Developing of the comprehensive and integrated framework of the Intelligent Transport System (ITS) in road transport

The transposition of all EU directives and regulations, addressing technical gaps and promoting collaboration between institutions, with the aim of increasing the efficiency, safety and sustainability of transport within the next three (3) years.

Specific Objective 1.2: Increasing the reliability and resilience of the system

Ensuring the reliability and resilience of the transport network in Kosovo including ITS technologies that enable proactive maintenance and rapid adjustment from outages or incidents that achieves a 20% reduction in the frequency and duration of transport outages and a reduction in average response of the incident and the adjustment time by 25% within three (3) years after the implementation of the ITS Services.

Specific Objective 1.3: Improving the transport infrastructure and innovation in Kosovo

The main TEN-T road network will include ITS within the next seven (7) years.

Specific Objective 1.4: Improving efficiency, safety, and cross-border trade through advanced Intelligent Transport (ITS) systems

Reducing the average waiting time at border points by 20% within three (3) years, increasing the volume of cross-border trade by 15% within three (3) years, deploying at least three (3) ITS solutions at border points within five (5) years and reducing security incidents related to cross-border transportation by 10% within two (2) years after implementation of the ITS Services.

Strategic Objective 2: Building an advanced technological infrastructure to increase railway safety, improve mobility and reduce the impact on the environment

Geographical position and competitiveness for rail transport flows on Line X and the connection with the Port of Durres are the most important factors for the implementation of the ITS rail systems. Also, the lack of human resources is pronounced at both levels: in the state administration and in the railway companies.

In railways, the most important ITS systems are those recognized by EU regulations and strategic documents: European Rail Traffic Management System (ERTMS), Telematic Applications for Freight (TAF-TSI) and Telematic Applications for Passengers (TAP) -TSI). The ITS railway legal framework in Kosovo is still in the development phase and its deployment is the first step towards its implementation in the railway infrastructure. Kosovo should overcome this gap by transposing and implementing the Interoperability Directive and TSI of the 4th railway package (TSI CCS, OPE and INF already published, TAP and TAF remain to be transposed).

Regarding the access to the railway networks of the Western Balkans countries and the EU, Kosovo has institutional barriers (legal, technical and organizational) to overcome.

Specific Objective 2.1: Developing the Comprehensive and Integrated Framework of the Intelligent Systems in Railway Transport

Full harmonization with the EU Acquis on ITS by fostering cooperation through inter-institutional agreements with key partner organizations within the next three (3) years

Specific Objective 2.2: Adaptating and effectively using of Intelligent Transport Systems

Increasing the capacities through comprehensive training programs and dissemination of information materials to targeted state institutions and railway management entities, with the aim of achieving 60% participation in seminars /trainings and an average knowledge rating of 60% or higher within the next three (3) years

Specific Objective 2.3: Improving safety, capacities, and rail traffic management in the main TEN-T rail network

The TEN-T Rail Network that will be under construction will include ERTMS within the next six (6) years.

Specific Objective 2.4: Improving efficiency, competitiveness, and quality of railway transport services

The TEN-T Railway Network that will be under construction will include TSI TAP and TAF within the next six (6) years.

7 ANTICIPATED MEASURES FOR THE IMPLEMENTATION OF THE INTELLIGENT TRANSPORT SYSTEM STRATEGY

For each of the identified measures, all relevant factors such as the entity responsible for implementation, the method of implementation including relevant cost parameters, possible funding sources and appropriate monitoring indicators have been analysed. This process led to the proposal of the appropriate time frame for the implementation of the measure (short-term, medium-term and long-term). Moreover, relevant monitoring indicators are provided so that the implementation progress can be easily assessed.

Measure 1 – Transposition of the EU Acquis

As one of the first actions to be taken towards the successful ITS implementation in the road transport is the transposition of the following directives:

- Directive 2010/40/EU on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport.
- Directive 2004/54/EC on minimum safety requirements for tunnels in the Trans-European Road Network.
- Directive 98/34/EC laying down a procedure for the provision of information in the field of standards and technical regulations and of rules on Information Society services.
- Directive 2007/2/EC establishing an Infrastructure for Spatial Information for integrated access to travel data.
- Directive 2016/1148/EU - Network Information Security with mandatory application for operators of essential services in the transport areas.
- General Data Protection Regulation (GDPR) 2016/679/EU.
- e-IDAS Regulation 2014/910/EU accompanying implementing acts.
- Directive 2004/52/EC - Interoperability of electronic road toll systems.
- Directive 2008/96/EC - Road Infrastructure Safety Management.
- Delegated acts (305/2013, 886/2013, 885/2013, 962/2015, 2017/1926, 2017/2380) under Directive 2010/40/EU.
- Mandatory application of DATEX II (CEN/TS) and CEN/TC 278 standards.

The cost of implementation is small and there is no necessity for identifying sources of funding, while the benefits are essential since this will set the basis for further implementing ITS on roads.

This measure should be implemented in the short term (2025).

The Monitoring Indicator for the implementation of this measure will be: **Number of transposed directives.**

Measure 2 – Establishing and commissioning the Traffic Management Centre

The Traffic Management Centre (TMC) will play a vital role in traffic management by performing traffic monitoring and control functions. These functions help optimize traffic flow, reduce congestion, increase road safety and improve overall transport efficiency.

The cost of such a measure is high and can be financed from national funds or other funding sources.

This measure should be implemented in the medium term (2027).

The Monitoring Indicator for the implementation of this measure will be: **Functional TMC.**

Measure 3 – Deploying ITS in the TEN-T network and increasing technical/professional skills

Establishing infrastructure, implementing the latest technologies, developing human resources and fostering a culture of innovation and continuous improvement.

1. Establishing the Technical Infrastructure - The technical infrastructure for ITS includes both physical and digital components. Physical infrastructure consists of roads, traffic lights, signage and other elements that are integrated with intelligent devices. These devices, such as sensors and cameras, collect real-time data about traffic flow, vehicle speed, road conditions and other factors.

Digital infrastructure, on the other hand, includes the systems and platforms that process and analyze the collected data. This includes data centres, computer network-based servers, and advanced software systems that use artificial intelligence to interpret data and provide actionable insights.

2. Use of the latest technologies - The use of the latest technologies is essential for maximizing the benefits of ITS. The use of Internet of Things (IoT) devices that enables real-time monitoring of traffic conditions and vehicle performance. 5G can provide high-speed, low-latency communication between vehicles and infrastructure, while V2X enables vehicles to communicate with each other and with infrastructure elements, improving safety and efficiency.

Cyber security is another key technical capability in SIT. As SIT systems become more interconnected and data-driven, they become potential targets for cyberattacks. Therefore, the implementation of strong cyber security measures is essential to protect the integrity and confidentiality of data and to ensure the reliability of SIT services.

3. Human resource skills development - A successful implementation of ITS relies heavily on the skills and expertise of the work-force. This includes professionals with knowledge in various areas such as transport engineering, computer science, data science and cyber security. To build these capabilities, organizations can invest in training and development programs, collaborate with academic institutions to develop specialized ITS curricula, and foster a culture of lifelong learning among their employees. Attracting and retaining professionals in these areas is also a strategic priority.

4. Fostering a culture of innovation and continuous improvement - Building ITS technical capabilities requires a culture of innovation and continuous improvement. Regular performance reviews and system audits can help identify areas for improvement and track progress towards defined objectives. Building ITS technical capabilities involves a multi-pronged approach, including infrastructure development, technology implementation, human resource development and fostering a culture of innovation. By adapting such an approach, organizations can create a flexible and far-sighted ITS that provides superior transport services and contributes to sustainable urban development.

The cost of such a measure is high and it should be financed by IPA and national funds. The benefits are substantial as this will set the stage for further implementation of ITS on the road.

This measure should be implemented in the long term (2030).

The Monitoring Indicator for the implementation of this measure will be:

1. **Physical and digital functional infrastructure.**
2. **V2X Implementation.**
3. **Development of programs for staff training and development.**
4. **Audit procedure and performance system established.**

Measure 4 – Functionalization of the traffic management system, the passenger information system and the accident/incident management system to increase the efficiency and safety of the road network

Traffic Management Systems (TMSs) are the main pillars of ITS. They monitor, control and manage road traffic to optimize traffic flow and ensure transport efficiency. TMSs include several technologies as traffic tracking sensors, traffic signal control systems, traffic control centres and variable message signs. These technologies work interconnected to monitor real-time traffic conditions, analyze traffic data and implement appropriate traffic management strategies.

Traffic sensors installed across the road network provide real-time data on traffic flow, speed, and density. This data is relayed to traffic control centres where it is analyzed to identify congestion, traffic jams, or any abnormal traffic conditions. Based on the analysis, traffic control strategies such as signal timing adjustments, speed limit changes, or lane control are implemented. Variable message signs display real-time traffic information, advisories, and warnings to drivers, guiding them to take alternative routes in case of congestion or incidents, thereby enhancing the overall network efficiency.

Advanced Passenger Information Systems (APISs) are another significant component of ITS. ATIS provide real-time, personalized, and multimodal travel information to travellers, enabling them to make informed travel decisions. ATIS include technologies such as navigation systems, real-time traffic information services, and mobile applications.

Navigation systems installed in vehicles or accessed via smartphones, provide route guidance to drivers based on real-time traffic conditions. Real-time traffic information services provide up-to-the-minute information on traffic conditions, travel times, and incidents, enabling travellers to plan their routes and departure times effectively. Mobile applications allow travellers to access a wide range of travel information on-the-go, including public transportation schedules, ride-sharing services, parking information, and bicycle or pedestrian routes.

Incident Management Systems (IMSs) play an important role in enhancing the safety and efficiency of transportation networks. They provide a coordinated response to incidents such as accidents, breakdowns, or roadworks, minimizing their impact on traffic flow and safety. IMSs involve several technologies and processes, including incident detection and verification

systems, decision support systems, and incident response and recovery systems. Incident detection and verification systems, typically using traffic sensors and CCTV cameras, identify and verify incidents quickly and accurately. Decision support systems analyse incident data and suggest optimal response strategies. Incident response and recovery systems, including emergency vehicles and road service teams, carry out the response strategies, managing the incident scene, rerouting traffic, and restoring normal traffic conditions as quickly as possible.

In conclusion, the integration of ITS technologies such as TMS, ATIS, and IMS into our transportation networks can significantly enhance their efficiency and safety. By providing real-time, data-driven solutions to traffic management, traveller information, and incident management, ITS technologies can transform roads, highways, and urban areas into smart, interconnected networks. As we continue to face growing traffic congestion and environmental challenges, the role of ITS technologies in the future of transportation cannot be underestimated. The promise of ITS is a future where transportation is not just about getting from point A to point B, but about doing so in the most efficient, safe, and sustainable way possible.

The cost of such a measure is high and it should be financed from the IPA and national funds.

This measure should start to be implemented in the medium term (2028).

The Monitoring Indicator for the implementation of this measure will be: **TMS, APIS, IMSs, Functional TMC.**

Measure 5 – Use predictive analytics and machine learning to anticipate and proactively address maintenance issues

Predictive analytics is a branch of advanced analytics that uses both new and historical data to forecast future activity, behaviour, and trends. It involves applying statistical algorithms and machine learning techniques to data to predict future outcomes. For infrastructure maintenance, this could involve analysing data from past repairs and maintenance activities to predict when and where future maintenance will be needed.

Machine learning, a subset of artificial intelligence, involves the use of algorithms that improve their performance at a task over time through exposure to data. Machine learning algorithms can identify patterns in data and make predictions or decisions without being explicitly programmed to do so. In the context of infrastructure maintenance, machine learning could be used to analyse data from sensors monitoring road conditions and infrastructure health, and then make predictions about when maintenance will be required.

Sensor technology plays a crucial role in this predictive maintenance approach. Sensors can be used to monitor various aspects of road conditions, such as surface wear, temperature changes, and vibration levels. These sensors generate large volumes of data that can be analysed to identify patterns and trends. For example, an increase in road surface vibration levels might indicate that the road is deteriorating and needs to be repaired. Similarly, sensors can be used to monitor the health of infrastructure such as bridges and tunnels. Sensors could monitor variables such as structural strain, temperature, and moisture levels, with the data used to predict when maintenance will be required.

The application of machine learning to this sensor data allows for the development of predictive models. These models can identify patterns in the data that might not be apparent to human analysts. For example, a machine learning model might identify a particular combination of sensor readings that typically precedes a road failure, allowing for preventive maintenance to be performed before the road fails.

Connected vehicle technologies and data sharing are other important tools for improving infrastructure maintenance. Connected vehicles generate a wealth of data about road conditions and traffic patterns. This data can be shared with infrastructure managers and used to inform maintenance decisions. For example, if multiple vehicles report hitting a pothole at a certain location, this information could be used to prioritize repair of that pothole.

Furthermore, connected vehicles can also share data with each other to improve traffic flow and reduce the impact of disruptions. For example, if a vehicle is involved in an accident, it could share this information with other vehicles in the area, allowing them to adjust their routes to avoid the accident site. This could significantly reduce the impact of the accident on traffic flow.

In conclusion, predictive analytics, and machine learning, combined with sensor technology and connected vehicle technologies, provide a powerful toolkit for improving infrastructure maintenance. By enabling proactive maintenance and improving the flow of traffic, these technologies can significantly enhance the safety and efficiency of our transportation systems.

The cost of such workshops/training may vary, and relevant funding might be provided by IPA funds.

This measure should be implemented in long term (2030).

The Monitoring Indicator for the implementation of this measure will be:

Percentage of road network that predictive analytics and machine learning is used for proactive maintenance.

Predictive analytics and machine learning are powerful tools that are increasingly being used to anticipate and proactively address maintenance issues. This is particularly applicable to infrastructure maintenance, where these technologies can be used to monitor road conditions and the health of infrastructure. Additionally, connected vehicle technologies and data sharing can be leveraged to improve traffic flow and reduce the impact of disruptions. In this discussion, we'll delve into these concepts in detail.

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The cost of such workshops/training may vary, and relevant funding might be provided by IPA funds.

This measure should be implemented in long term (2030).

The Monitoring Indicator for the implementation of this measure will be: **Percentage of road network that predictive analytics and machine learning is used for proactive maintenance.**

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The cost of such workshops/training may vary, and relevant funding might be provided by IPA funds.

This measure should be implemented in long term (2030).

The Monitoring Indicator for the implementation of this measure will be: **The percentage of the road network that predictive analytics and machine learning are used for proactive maintenance.**

Measure 6 – Collaboration with local level and stakeholders to ensure that the ITS technologies being used meet their needs and expectations

The local level and stakeholders are those who will be directly affected by the deployment of ITS technologies. They are the users of the transport system who are in the best position to articulate their needs and expectations. Their insights can provide valuable direction for the development and implementation of ITS solutions. For example, one community may prioritize reducing traffic congestion, while another may be more focused on improving pedestrian safety or improving public transport services. Understanding these unique needs and expectations is the first step towards ensuring that the ITS technologies being used meet them.

Engaging local communities and stakeholders from the outset is also important to ensure their acceptance and support for the project. Their involvement can help mitigate any potential resistance or fear of change that can often accompany the introduction of new technologies. It can also help build trust, which is essential for the successful adoption and use of SIT technologies. For example, some community members may have concerns about data privacy issues related to ITS. Involving them in the decision-making process and addressing their concerns can help alleviate fear and foster a sense of ownership and acceptance of the new system.

Collaboration with stakeholders, such as local government institutions, transport operators and businesses, is equally important. These stakeholders often have a particular interest in the successful deployment of ITS technologies.

The deployment of Intelligent Transport Systems is not only a technical effort, but also a social one. It requires the active collaboration of all parties involved to ensure that technologies meet the needs and expectations of local communities and stakeholders. This collaborative approach not only increases the possibility of successful adaptation and use of ITS technologies, but also contributes to building a more connected, flexible and sustainable transport system that truly serves its users.

The cost is small and there is no necessity for identifying sources of funding. The benefits are substantial as this will lay the groundwork for collaboration between stakeholders for the further implementation of ITS on the road.

This measure should be implemented in the short term (2025).

The Monitoring Indicator for the implementation of this measure will be:

1. **Public workshops and online surveys**
2. **Memorandum signed between the parties of interest**

Measure 7 – Approval of the ITS interoperability standards

Interoperability plays a crucial role in the successful deployment of cross-border Intelligent Transport Systems (ITS) in Kosovo. It refers to the ability of different ITS systems and components to exchange and use information effectively, regardless of their origin or technology. In the context of cross-border deployment, interoperability becomes even more critical as it enables uninterrupted communication and cooperation between transport networks and systems beyond national borders.

Interoperability ensures the flow of information between different ITS systems operating in Kosovo and neighboring countries. This data exchange may include traffic conditions, road incidents, weather updates and other relevant information. By establishing Interoperability standards, Kosovo can integrate its transportation systems with those of neighboring countries, enabling real-time information exchange and fostering better coordination and decision-making.

Cross-border interoperability in ITS can significantly increase security measures. By sharing information on road conditions, traffic incidents and emergencies, relevant authorities can respond more effectively and coordinate their efforts. For example, if there is a major accident or dangerous situation on a road leading to or from Kosovo, interactive systems can provide real-time alerts to both local and neighboring authorities, enabling them to take the appropriate actions immediately.

Interoperability allows optimization of traffic flow and efficiency across borders. By harmonizing traffic management strategies and systems, transportation institutions can implement coordinated traffic control measures, such as intelligent traffic signal synchronization, dynamic lane management, and traffic congestion management. These measures can ease congestion, reduce travel time and increase the overall efficiency of transport on cross-border corridors.

Supporting cross-border travel and trade: Interoperable ITS systems can facilitate cross-border travel and trade by providing seamless and consistent services to travelers and freight operators. For example, interoperable electronic toll collection systems can enable seamless payment and passage through toll plazas, minimizing delays and administrative burdens for cross-border travelers and freight operators.

The cost of this measure can be financed from both national and IPA funds.

This measure should be implemented in the long term (2030).

The Monitoring Indicator for the implementation of this measure will be: **Number of approved Interoperability standards.**

Measure 8 – Transposition and implementation of EU Directive 2016/797

The measure aims to transpose the 4th package Directive (EU) 2016/797 on the Interoperability of the railway system.

Therefore, the cost of implementation is small and there is no necessity for identifying sources of funding. The benefits are substantial as this will lay the groundwork for further implementation of SIT in railways.

This measure should be implemented in the short term (2025).

The Monitoring Indicator for the implementation of this measure will be: **The legal framework harmonized with EU Directive 2016/797.**

Measure 9 – Transposition and implementation of TSIs

In parallel with measure 8, the TSIs should be transposed, in the first line the TSIs: CSS, OPE, TAP and TAF, to establish the technical aspect of the legal framework. Therefore, the relevant

cost is small and there is no necessity for identifying sources of funding. The benefits are substantial as this will be the second step for further implementation of ITS in railways.

This measure should be implemented in the short term (2025).

The Monitoring Indicator for the implementation of this measure will be: **Number of TSIs transposed (by 2024) and implemented (by 2025).**

Measure 10 – Increasing the capacities in the ITS area of the institutions

Since the functional railway institutions (Regulatory Body, Licencing Body, NSA, NIB, DB) have been formed in the structure of RRA, now their capacities in terms of decision-making, independence, financing and human resources should be increased.

Also, competition should be introduced in the railway market and mutual recognition of documentation should be enabled at the regional level (actions from the TCT Railway Action Plan).

The relevant cost is low and there is no necessity for identifying sources of funding.The benefits are essential as this will set the final step for Kosovo to be ready to implement ITS on railways.

This measure should be implemented in the short term (2025).

The Monitoring Indicator for the implementation of this measure will be: **Implementation of the provisions of the TKT Railway Action Plan.**

Measure 11 – Increasing the capacities for the operation and maintenance of the ITS railway systems

To enable the smooth deployment, operation and maintenance of ITS systems, railway employees must be trained including the knowledge and skills for the operation and maintenance of ERTMS. The possibilty of involvement and assistance from the transport community should be considered.

The cost of such workshops/trainings may vary and relevant funding may be provided by IPA.

This measure should be implemented in the medium term (2026).

The Monitoring Indicator for the implementation of this measure will be: **Trainings related to the operation and maintenance of ERTMS, including attendance lists and completed questionnaires, as well as other relevant activities implemented.**

Measure 12 – ERTMS involvement from the early stage of infrastructure projects

The benefits should be assessed and ERTMS included from the early planning stage of infrastructure projects. This measure has no actual cost, a process should be implemented to ensure that all Documents will be reviewed in order to ensure that ERTMS issues will be included in the Design requirements.

This measure should be implemented in the short term (2024/2025).

The Monitoring Indicator for the implementation of this measure will be: **Documents prepared to include ERTMS requirements.**

Measure 13 – ERTMS Implementation

ITS - ERTMS should be deployed on the TEN-T rail network. Before the full implementation, a pilot project for ERTMS is established. The entity responsible for this measure is the Ministry responsible for transport and other competent institutions.

Potential funds for implementation include national funds, IPA and other donations.

This measure should be implemented in the long term (2029).

The Monitoring Indicator for the implementation of this measure will be: **Percentage of the basic railway network equipped with ERTMS.**

Measure 14 – Preparation of technical solutions

The benefits should be assessed and technical solutions prepared for the future implementation of TAF and TAP. The entity responsible for this measure is the Ministry responsible for transport and other competent institutions in collaboration with the infrastructure manager and railway operators.

As these issues are mainly related to design, national funds, IPA and other funding sources can be used.

This measure should be implemented in the medium term (2026).

The Monitoring Indicator for the implementation of this measure will be: **The number of projects including TAF and TAP provisions.**

Measure 15 – TSI – TAF systems installation

The TSI -TAF implementation in the railway network supported by the Ministry responsible for transport and other competent institutions, the Infrastructure Manager and the railway freight operators.

As these issues are mainly related to Software Solutions, national funds and IPA can be used as possible funding sources.

This measure should be implemented in the long term (2029).

The Monitoring Indicator for the implementation of this measure will be: **Number of projects including TSI - TAF provisions.**

Measure 16 – TSI – TAP systems installation

TSI - TAP implementation in the railway network supported by the Ministry responsible for transport and other competent institutions, the Infrastructure Manager and the passenger railway operator.

As these issues are mainly related to Software Solutions, national funds and IPA can be used as potential funding sources.

This measure should be implemented in the long term (2029).

The Monitoring Indicator for the implementation of this measure will be: **Number of projects including TSI - TAP provisions.**

8 IMPLEMENTATION, MONITORING AND REPORTING ARRANGEMENTS

The Ministry in charge for Transport is responsible for the implementation, monitoring and reporting of the ITS Strategy. The Ministry, through the Department of Road Management, will coordinate these activities in close collaboration with other relevant ministries and state institutions through the establishment of a Working Group for the Implementation of the ITS Strategy. This includes the institutions that participated in the working group for the drafting of the ITS Strategy, as well as the parties of interest, consisting of the following members:

Table 1: Composition of the working group for the implementation, monitoring and reporting of the ITS Strategy (2024-2030)

No.	Institution	Role
1	Department of Road management (DRM)/ MESPI	Chairman
2	Department of Road Infrastructure (DRI)/ MESPI	Member
3	Department of Land Transport (DLT)/ MESPI	Member
4	Office for Strategic Planning (OSP)/OPM	Member
5	Office for European Integration (OEI)/OPM	Member
6	Legal Office (LO)/OPM	Member
7	Legal Department (LD)/MESPI	Member
8	Department for European Integration and Policy Coordination (DEIPC)/MESPI	Member
9	Budget and Finance Division (BFD)/MESPI	Member
10	Ministry of Finance Labour and Transfers (MFLT)	Member
11	Ministry of Internal Affairs (MIA)	Member
12	Infrakos JSC	Member
13	Trainkos JSC	Member
14	Railway Regulatory Authority (RRA)	Member

The group is led by the Ministry responsible for transport which organizes the functioning of the group, determines the work plan and convenes group meetings. The group may also organize sub-groups for specific tasks and have reporting responsibilities to the main group.

Monitoring procedures - The Ministry responsible for transport has the task of drafting an Annual Progress Report. The report is intended to monitor the annual achievements of the various actions, and the performance of the objectives over time. In elaborating the report, the Chairman relies on the information received from the Group members. The report will be sent

to the Office of the Prime Minister by the end of the first quarter of the following year. The monitoring report will cover all strategic and specific objectives, with their indicators assessed according to the timeline. The report should also reflect the achievement of the impact indicators of the National Development Strategy, the Multimodal Transport Strategy, the Government Program, The NIPSAA (National Implementation Plan of the Stabilization and Association Agreement). The executive summary of the annual report with the main achievements will be made public.

Mid-Term Review of the Action Plan and Final Assessment - As needed, the strategy can be reviewed to re-examine the target achievements and make the necessary adjustments. The review process will elaborate on the areas in which the ITS Strategy has set the main direction. After that, the assessment of the Action Plan will continue. Mid-term reviews will assess all strategic and specific objectives, together with their indicators. Any deviation will be assessed, as well as measures and corrective actions will be determined to enable the achievement of the goals.

9 BUDGET IMPACT OF ITS STRATEGY IMPLEMENTATION

Considering the lack of investments in the area of ITS, there is an imperative need for the planning of funds in order to implement the ITS Strategy that will require a considerable budget. In addition to financing from public funds (whether from the Government's budget or public enterprises), it is expected that the implementation of the strategy will benefit from donor grants, as well as mobilize private investments.

The table summarizes an approximate assessment for the components of the ITS Strategy during the period 2024-2030 (7 years)

Component	**Cost (million euros)**	**Funding Sources**
Traffic Management Centre	13	Public, IPA, IFN
ITS Deployment in the TEN-T Road Network	15	Public, IPA, IFN
ERTMS Deployment in the TEN-T Railway Network	21	Public, IPA, IFN

10 ANNEX 1: TRAFFIC MANAGEMENT CENTRE (TMC)

Needs assessment

Current Situation

According to the publicly available data, there has hardly been any progress in Kosovo regarding strategic and legal documents for ITS. Furthermore, there is no development of ITS infrastructure on the national or local (city) level.

The constitutional and legislative structure of Kosovo is straightforward with the main stakeholder being the Ministry of Infrastructure. Within the Ministry, there are departments in charge of specific tasks including the Department of road infrastructure and the Department of Road Management.

Kosovo has approximately 150km of constructed highways and an additional 50 km of highways that are under construction. In addition, there are around 400km of the national road network under the jurisdiction of the Ministry. There are no tunnels on those routes and there are several bridges and viaducts, with 5.6 km being the longest one.

All maintenance of the road network is outsourced and monitored by the respective department within the Ministry. It is also planned to outsource the maintenance and operation of the ITS equipment in the future. The plan is to implement ITS equipment through the PPP scheme together with e-tolling.

The sharing of information between modes and other institutions is not automated. For instance, the police department collects all the data on traffic collisions, but this data is shared per request. The interoperability with the Rail system at this point is not in focus as the rail network is in poor condition. The planned ITS system will not be connected to customs as customs control.

There is a unique emergency number “112” in place but there is no information on reaction time to traffic collisions. As there is no exchange of data there is no one place where drivers can be informed of current road conditions (works, collisions, road closures, bans for certain types of vehicles etc.).

Needs to be addressed

The deployment of a Traffic Management Centre (TMC) in Kosovo is governed by the following needs:

1. ***Growing Traffic Demand***: As urban populations and traffic congestion increase, there is a need to manage transportation networks more effectively. The TMC can optimize traffic flow, minimize delays, and improve overall network efficiency, addressing the challenges posed by growing traffic demand.
2. ***Safety Concerns***: The need to enhance road safety, reduce accident rates, and minimize the impact of incidents on traffic flow is a key factor driving the establishment of the TMC. The TMC can coordinate incident management and response, ensuring timely assistance and appropriate traffic control measures.

3. ***Environmental Impact***: Reducing the environmental impact of transportation by lowering emissions and fuel consumption is another critical need. The TMC can help achieve this by implementing traffic management strategies that optimize traffic flow, promote eco-friendly transportation options, and encourage more efficient travel choices.
4. ***Infrastructure and Budget Constraints***: Limited budgets for infrastructure expansion and maintenance necessitate more efficient use of existing resources. Establishing the TMC can help optimize the existing transportation infrastructure without requiring significant investments in new physical infrastructure.
5. ***Increase employment***: To effectively operate the TMC, it's essential to have a skilled workforce trained in traffic management, data analysis and incident response. Establishing the TMC requires hiring and training personnel to ensure the centre functions effectively.
6. ***Real-Time Traffic Information***: The demand for real-time traffic information from road users and the widespread use of smartphones and other communication devices create a need for TMCs that can provide accurate and timely information to the public.
7. ***Connected and Automated Vehicles***: The emergence of connected and automated vehicles requires advanced traffic management systems capable of integrating these vehicles into the transportation network. This need drives the development and implementation of traffic monitoring and control functions that can communicate and coordinate with connected and automated vehicles.

   Addressing these needs can guide the process of establishing the TMC, ensuring that it meets the demands of modern transportation networks and contributes to safer, more efficient, and environmentally friendly travel.

Corridors and Routes

Consistent with its Economic Development Vision and Action Plan, the Government of Kosovo (GoK) has focused its motorway development on European Route 7. Route 7 in Kosovo is operational to north of Pristina in total length of approximately 78 km. Route 7 is divided in 9 sections, of which Section 6 from crossing with M9 to Sllatine is on existing road with two traffic lanes. Other sections are designed and constructed as a motorway with 2 traffic lanes and emergency lane in each direction. The last Section 10 of Route 7 from north of Prishtina to Merdare in Serbian border is in plans at length of approximately 26,8 km.

The Government of Kosovo also developed the motorway corridor Route 6 from Pristina (connection to M2) to the border with North Macedonia, 65.5 kms. The construction of Route 6 contributes to improved access to the Adriatic Sea for northern Macedonia and Bulgaria by linking to Route 7 and the Albanian highway towards the port of Durres.

The following map shows major roads linking Kosovo with neighbouring countries.

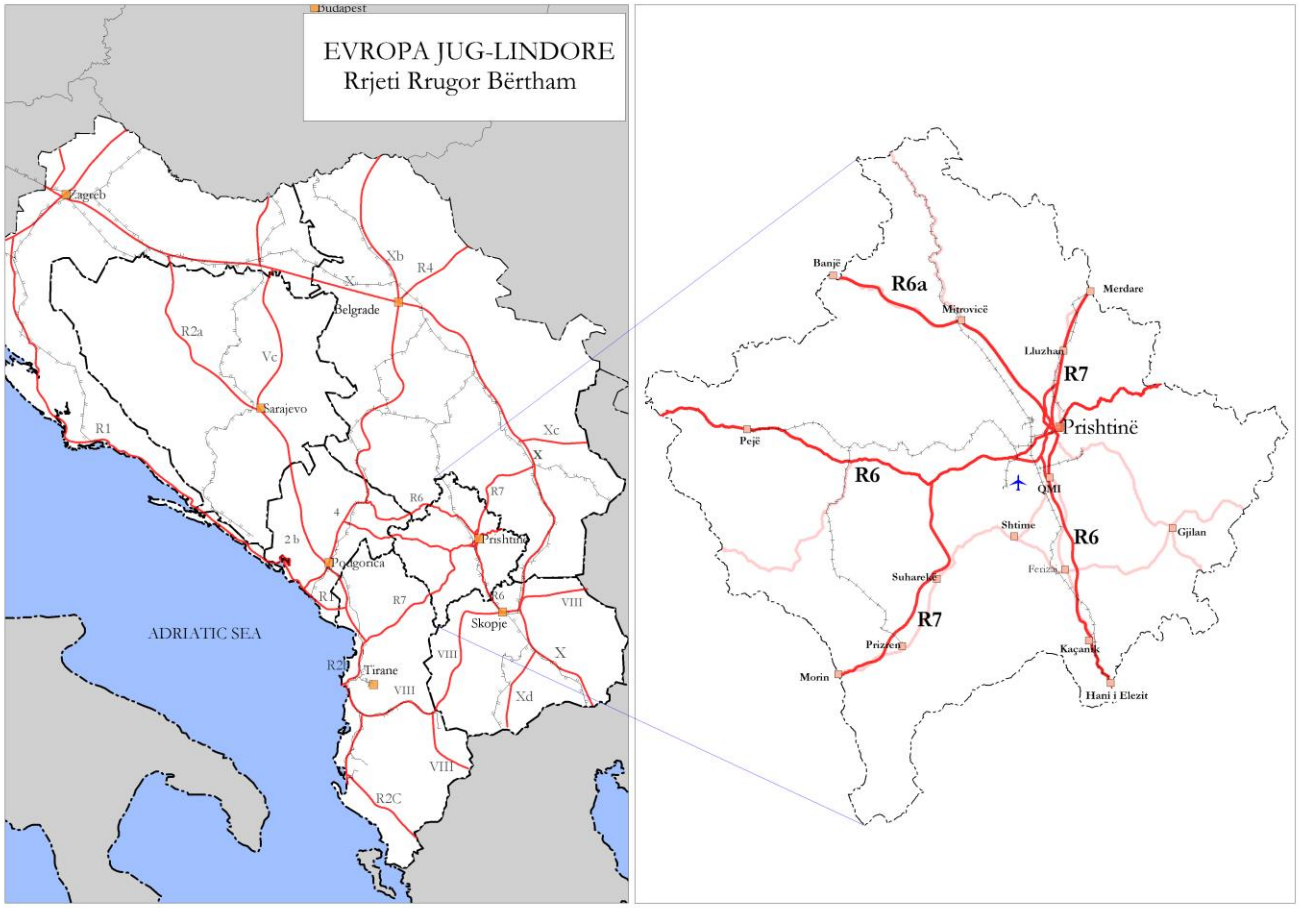

Figure 2: Kosovo Road links

Traffic Monitoring and Control

The Traffic Management Center (TMC) shall play a vital role in managing traffic by performing traffic monitoring and control functions. These functions help optimize traffic flow, reduce congestion, enhance road safety, and improve overall transportation efficiency.

A brief description of these functions is presented below.

- ***Traffic Monitoring:***

1. Data Collection: Traffic monitoring involves collecting real-time data on traffic conditions using various sensing technologies like cameras, loop detectors, radar, and GPS-based probes. This information will include vehicle counts, speeds, travel times, and occupancy rates. This includes connection with:

a) Roadside sensors: The TMC shall utilize various roadside sensors, such as inductive loops, radar, or infrared detectors, to gather real-time traffic data, including vehicle counts, speeds, and occupancy levels.

b) Video surveillance: Cameras mounted at strategic locations shall allow the TMC to monitor traffic conditions visually, providing valuable information on congestion, incidents, and

roadwork. This can be enhanced with automatic incident detection using AI powered video post processing techniques, such as Tensorflow.

c) Connected vehicles: The TMC shall also obtain traffic data from connected vehicles through Vehicle-to-Infrastructure (V2I) communication, offering insights into travel times, route choices, and traffic patterns.

d) Third-party data sources: The TMC shall leverage data from third-party providers, such as satellite navigation systems, mobile apps, or social media platforms such as Waze, to enrich their understanding of the traffic situation.

2. Data Analysis: The collected data are analyzed to identify traffic patterns, trends, and potential issues. This is essential in order to make informed decisions on traffic management strategies, detecting incidents, and predicting future traffic conditions. This can be achieved by:

a) Real-time data processing: The TMC, shall process and analyze real-time traffic data to identify trends, detect incidents, and assess network performance.

b) Traffic modelling and simulation: The TMC shall use traffic modelling and simulation tools to forecast traffic conditions, evaluate alternative traffic management strategies, and optimize the transportation network.

c) Performance measurement and reporting: The TMC shall monitor key performance indicators, such as travel times, congestion levels, and incident response times, to evaluate the effectiveness of their traffic management strategies and inform decision-making.

3. Visualization and Dissemination: The traffic monitoring subsystem shall include a graphical representation of the road network, displaying real-time traffic conditions and allowing operators to visualize the current state of the network. The data could also be shared with other stakeholders, such as travelers, through variable message signs, mobile applications, and websites.

- ***Traffic Control:***

1. Signal Timing and Coordination: This subsystem/function shall optimize traffic signal timings and coordination to minimize delays and improve traffic flow, in TEN-T parts under the TMC's jurisdiction that traffic signals exist. This can involve adjusting signal timings based on real-time traffic conditions, implementing traffic signal priority for emergency vehicles and public transit, and coordinating signals along a corridor to create green waves.

2. Ramp Metering: Ramp metering controls the flow of vehicles entering freeways from on-ramps to minimize disruptions and maintain smooth traffic flow on the mainline. This can be achieved by:

a) Traffic sensors: The TMC shall utilize various traffic sensors, such as inductive loops, radar, or infrared detectors, on both the freeway mainline and the on-ramps to gather real-time traffic data, including vehicle counts, speeds, occupancy levels, and queue lengths.

b) Connected vehicles: TMCs can obtain traffic data from connected vehicles through Vehicle-to-Infrastructure (V2I) communication, providing additional insights into traffic conditions.

c) Adaptive algorithms: Adaptive ramp metering shall employ advanced algorithms that process real-time traffic data to determine the optimal metering rate (i.e., the rate at which vehicles are allowed to enter the freeway). These algorithms consider factors such as mainline congestion, on-ramp queue lengths, and prevailing traffic conditions to make real-time adjustments to the metering rate.

d) Traffic signal control: Based on the calculated optimal metering rate, the TMC shall adjust the timing of traffic signals at the on-ramps, controlling the flow of vehicles entering the freeway. The metering rate may vary depending on time of day, day of the week, or the presence of incidents or road maintenance activities.

3. Dynamic Lane Management: The TMC shall dynamically allocate lanes based on traffic conditions, such as providing additional lanes for high-occupancy vehicles (HOV) during peak hours or reversing the direction of lanes to accommodate changing traffic patterns.

4. Incident Management (IM): The TMC shall detect incidents like accidents, breakdowns, or congestion and automatically implement appropriate response strategies. This can include dispatching emergency services, providing real-time information to drivers through variable message signs or smartphone apps, and adjusting traffic signals to reroute traffic around the incident.

a) Incident detection: The TMC shall use advanced technologies, such as video analytics and machine learning algorithms, to identify incidents quickly, enabling rapid response.

b) Traffic diversion: The TMC shall implement traffic diversion strategies, such as rerouting vehicles onto alternative routes, according to its operational manual, to minimize the impact of incidents on the transportation network.

c) On-scene coordination: The TMC shall work closely with emergency responders and other agencies to manage incidents effectively and restore normal traffic conditions as quickly as possible.

This function focuses on the detection, response, and resolution of incidents that impact the transportation network. The subsystem supporting this, aims to minimize the impact of incidents on traffic flow, reduce secondary incidents, and restore normal traffic conditions as quickly as possible. This is achieved by the TMC IM subsystem supporting:

d) Incident Detection:

1. Traffic sensors: IM subsystem shall utilize various traffic sensors, such as inductive loops, radar, or infrared detectors, to monitor traffic conditions and identify irregularities that may indicate an incident.

2. Video analytics: IM subsystem shall employ video surveillance cameras and advanced video analytics to automatically detect incidents, such as accidents, stalled vehicles, or debris on the roadway.

3. Connected vehicles: IM subsystem shall leverage data from connected vehicles through Vehicle-to-Infrastructure (V2I) communication, providing real-time insights into incidents and traffic conditions.

4. Public reports: IM subsystem shall be able to receive incident reports from the public through dedicated phone lines, mobile apps, or social media platforms.

e) Incident Verification:

1. Traffic management center (TMC) operators: Upon detecting a potential incident, TMC operators, if possible, shall use video feeds or other data sources to verify the incident's existence, location, and severity.
2. Field personnel: TMCs shall dispatch field personnel, such as traffic officers or maintenance crews, to verify and assess incidents on-site.

f) Incident Response:

1. Emergency services coordination: TMC operators shall work closely with emergency services, such as police, fire brigade, and ambulance, to ensure a rapid and coordinated response to incidents.
2. Traffic control strategies: IM subsystem shall propose and TMC operators shall implement traffic control measures, such as adjusting traffic signal timings, changing lane configurations, or implementing detours, to manage traffic flow around the incident.
3. Information dissemination: IM subsystem shall utilize traveler information systems to notify road users of incidents, providing real-time updates on travel times, alternative routes, and expected delays.

g) Incident Clearance and Recovery:

1. On-scene coordination: IM subsystem shall facilitate TMC operators to coordinate with on-scene responders, tow trucks, and maintenance crews to ensure a swift clearance of incidents and minimize the impact on the transportation network.
2. Post-incident analysis: After an incident is resolved, IM subsystem shall analyze the event's handling to identify areas for improvement and inform future incident management strategies.

h) Incident Prevention:

1. Data analysis and pattern recognition: IM subsystem shall use historical incident data and advanced analytics to identify patterns or trends that may indicate potential problem areas or recurring issues, informing preventive measures.
2. Infrastructure improvements: Based on incident analysis, IM subsystem shall provide insights and analytics in order for TMC engineers to recommend infrastructure improvements, such as better signage, lighting, or roadway design, to reduce the likelihood of future incidents.
3. Public education and outreach: IM subsystem shall facilitate TMC engineers to engage in public education and outreach efforts to promote safe driving behaviors and raise awareness about incident prevention.
5. Traveler Information System (TIS): The TMC shall disseminate real-time traffic information to road users through various channels, such as variable message signs, radio broadcasts, websites, and mobile applications. This helps travelers make informed decisions about their routes and travel times, reducing congestion and improving overall network efficiency. This

subsystem plays a crucial role in improving overall traffic flow, reducing congestion, and enhancing safety. Below is a detailed description of Traveler Information Systems:

a) Types of Information:

1. Traffic conditions: TIS shall provide real-time information on traffic congestion, delays, and travel times to help drivers plan their routes and avoid congested areas.
2. Incidents and roadwork: TIS shall notify road users of incidents, such as accidents or roadwork, allowing them to make informed decisions on whether to seek alternate routes or adjust their travel schedules.
3. Weather and road conditions: TIS shall deliver information on weather conditions and their impact on the road network, such as road closures, flooding, or icy conditions, so drivers can take necessary precautions.
4. Public transportation: TIS shall offer real-time updates on public transit schedules, delays, or service disruptions, encouraging the use of more sustainable transportation modes and improving overall network efficiency.
5. Parking availability: TIS shall provide real-time parking availability data, guiding drivers to available parking spaces and reducing congestion caused by vehicles searching for parking.

b) Information Delivery Channels:

1. Variable Message Signs (VMS): TIS shall use VMS, which are electronic traffic signs, to display real-time traffic information, such as travel times, incidents, or detours, directly to drivers on the road.
2. Highway Advisory Radio (HAR): TIS shall broadcast traffic updates and other relevant information via HAR or RDS, a low-power AM or FM radio service that drivers can tune into while traveling.
3. Websites and mobile applications: TIS shall provide real-time traffic information through dedicated websites or mobile apps, allowing users to access this information on their smartphones or other devices.
4. Social media platforms: TIS shall leverage social media platforms, such as Twitter or Facebook, to disseminate traffic information and engage with road users.
5. Navigation devices and systems: TIS shall integrate with in-vehicle navigation systems or GPS devices, providing real-time traffic updates and route guidance directly to drivers.

c) Advanced Technologies and Data Sources:

1. Connected vehicles: TIS shall leverage data from connected vehicles through Vehicle-to-Infrastructure (V2I) communication, offering insights into travel times, route choices, and traffic patterns.
2. Third-party data providers: TIS shall utilize data from third-party sources, such as satellite navigation systems, mobile apps, or crowdsourced platforms (e.g. Waze), to enrich their traffic information offerings.

3. Artificial Intelligence (AI) and machine learning: TIS shall employ AI and machine learning algorithms to process large volumes of traffic data, identify patterns and trends, and generate more accurate and timely traffic information.

d) Challenges and Considerations:

1. Data accuracy and timeliness: The effectiveness of TIS depends on the accuracy and timeliness of the information provided. To maintain credibility and user trust, TIS must ensure that data is regularly updated and verified.
2. Integration and interoperability: TIS should also rely on data from various sources and agencies, making integration and interoperability critical for seamless information exchange and collaboration.
3. User engagement and adoption: For TIS to be successful, road users need to be aware of and actively use the available information. Public outreach, education, and user-friendly interfaces can help increase engagement and adoption.

By combining the above traffic monitoring and control functions, the TMC shall create a more efficient, safe, and environmentally friendly transportation system, ultimately improving the overall travel experience for all road users.

Data Management and Analysis

Data management and analysis are crucial functions of the Traffic Management Center (TMC) to ensure efficient traffic monitoring and control. These functions help the TMC to make informed decisions, identify traffic patterns, predict future traffic conditions, and optimize traffic management strategies. A description of the data management and analysis functions in a TMC is presented hereafter.

Data Management:

1. Data Collection: The TMC shall collect real-time traffic data from:

a) Traffic sensors: The TMC shall employ various traffic sensors, such as inductive loops, radar, or infrared detectors, to collect real-time traffic data, including vehicle counts, speeds, occupancy levels, and queue lengths.

b) Video surveillance: The TMC shall use video cameras to monitor traffic conditions and gather visual data for incident detection, verification, and response.

c) Connected vehicles: The TMC shall obtain data from connected vehicles through Vehicle-to-Infrastructure (V2I) communication, providing additional insights into traffic conditions, travel times, and route choices.

d) Third-party data sources: The TMC shall integrate data from third-party providers, such as satellite navigation systems, mobile apps, or crowdsourced platforms, to enrich its traffic data.

2. Data Storage: Collected data is stored in a centralized database, ensuring easy access and retrieval. The TMC shall use data storage solutions that can handle large volumes of data, accommodate different data formats, and maintain data integrity.

3. Data Integration: The TMC shall integrate normalized data from multiple sources and formats, such as traffic sensors, weather stations, and incident reports, to create a comprehensive view of the transportation network and enable seamless information exchange, analysis, and collaboration between different systems and agencies. Data integration will help the TMC to identify correlations between various data sources and better understand the factors affecting traffic conditions.
4. Data Quality Assurance: The TMC shall implement data quality assurance processes to ensure the accuracy, completeness, and reliability of the collected data. This may involve data validation, cleaning, and error correction to maintain a high level of data quality.
5. Data security and privacy: The TMC shall implement robust data security measures and adhere to privacy regulations to protect sensitive traffic data from unauthorized access, tampering, or misuse.

Data Analysis:

1. Descriptive Analysis: The TMC shall perform descriptive analysis to understand the current state of the transportation network. This includes analyzing traffic volumes, speeds, travel times, and congestion levels to identify patterns and trends in the data.
2. Predictive Analysis: The TMC shall use advanced analytical techniques and machine learning algorithms to predict future traffic conditions based on historical data and real-time information. This helps the TMC operators to anticipate and prepare for potential issues, such as congestion or incidents, and implement proactive traffic management strategies.
3. Prescriptive Analysis: The TMC shall perform prescriptive analysis to identify the best course of action for specific traffic situations. This involves evaluating various traffic management strategies and determining their impact on traffic flow, safety, and efficiency. Prescriptive analysis helps TMC operators and engineers to make data-driven decisions and optimize traffic control measures.
4. Incident Detection and Analysis: The TMC shall analyze real-time data to detect incidents, such as accidents, breakdowns, or congestion. It shall use data analysis tools and algorithms to identify the cause, location, and severity of incidents, enabling a swift response and minimizing the impact on traffic flow.
5. Performance Metrics and Evaluation: The TMC shall establish performance metrics to evaluate the effectiveness of traffic management strategies and monitor the performance of the transportation network. Regular analysis of these metrics will help TMC operators to identify areas for improvement and guide future traffic management initiatives.

By effectively managing and analyzing traffic data, TMCs can optimize traffic flow, enhance road safety, and improve overall transportation efficiency, ultimately benefiting all road users.

Communication and Information Management

Communication and information management are vital functions of the Traffic Management Center (TMC) that ensure the efficient exchange of information between the TMC, various stakeholders, and road users. These functions enable real-time collaboration, coordination, and

dissemination of traffic-related information. Below is a description of the communication and information management functions in a TMC:

Communication

1. Internal Communication: TMCs establish reliable communication channels among their internal teams, such as traffic monitoring, control, data analysis, and incident management, to ensure seamless coordination and information sharing. It can be distinguished into:

a) Centralized data exchange: The TMC must facilitate the exchange of data between different internal systems, such as traffic sensors, video surveillance, incident management systems, and traveler information systems, ensuring a seamless flow of information for decision-making and traffic management operations.

b) Operator communication: The TMC must enable communication between operators and staff within the centre, fostering collaboration and coordination in incident response, traffic control, and other traffic management activities.

2. External Communication: TMCs communicate with external stakeholders, such as emergency services, law enforcement, transportation agencies, and utility companies, to coordinate responses to incidents and share relevant information. This can be split into:

a) Emergency services coordination: The TMC must establish communication channels with emergency services, such as police, fire brigade, and ambulance, to ensure a rapid and coordinated response to traffic incidents.

b) Collaboration with neighbouring jurisdictions: The TMC must communicate with neighbouring traffic management centres, sharing traffic data, analysis, and resources to manage regional traffic effectively.

c) Public transit and transportation agencies: The TMC must collaborate with public transit agencies, sharing information on traffic conditions, incidents, or disruptions to coordinate transit operations and improve overall network performance.

3. Vehicle-to-Infrastructure (V2I) Communication: The TMC shall facilitate communication between connected vehicles and transportation infrastructure to exchange real-time traffic information, coordinate traffic control measures, and enhance road safety.

4. Road User Communication:

a) Traveler information systems: The TMC must utilize traveler information systems to disseminate real-time traffic information to road users through various channels, such as variable message signs, websites, mobile apps, or social media platforms.

b) Public reporting: The TMC must be able to receive incident reports, feedback, or inquiries from the public through dedicated phone lines, mobile apps, or social media platforms, enhancing their situational awareness and ability to respond to incidents.

Information Management:

1. Real-time Information Dissemination: The TMC must collect, process, and disseminate real-time traffic information to road users through various channels, such as variable message signs,

radio broadcasts, websites, and mobile applications. This helps travelers make informed decisions about their routes and travel times, reducing congestion and improving overall network efficiency.

2. Incident Notification: The TMC must provide timely notifications of incidents, such as accidents, road closures, and adverse weather conditions, to affected road users and relevant stakeholders to minimize disruptions and ensure a coordinated response.
3. Traffic Management Strategies: The TMC must develop and communicate traffic management strategies, such as signal timing adjustments, lane closures, or traffic diversion plans, to optimize traffic flow and improve network performance.
4. Public Outreach: The TMC must engage with the public to provide updates on traffic conditions, planned events, and transportation projects. This can involve using social media, websites, and press releases to inform the community and gather feedback.
5. Data Sharing and Collaboration: The TMC must share traffic data and insights with other organizations, such as research institutions, private companies, and government agencies, to support the development of innovative transportation solutions and inform policy decisions.

   By effectively managing communication and information, the TMC can enhance the efficiency, safety, and overall performance of transportation networks, benefiting all road users and stakeholders.

Collaboration and Coordination

Collaboration and coordination are essential functions of the Traffic Management Center (TMC) that ensure smooth and efficient operation of the transportation network. These functions involve working with various internal teams, external stakeholders, and other organizations to optimize traffic flow, enhance road safety, and improve overall transportation efficiency. The TMC systems and internal procedures must facilitate the following collaboration and coordination functions:

1. Internal Coordination: The TMC shall facilitate seamless coordination among its internal teams, such as traffic monitoring, control, data analysis, and incident management. This ensures that all teams have access to relevant information and can work together effectively to implement traffic management strategies and respond to incidents.
2. External Stakeholder Collaboration: The TMC must collaborate with external stakeholders, such as emergency services, law enforcement, transportation agencies, and utility companies, to coordinate responses to incidents, share relevant information, and develop traffic management plans. This collaboration helps to ensure a unified approach to traffic management and incident response.
3. Interagency Coordination: The TMC should establish coordination mechanisms with other TMCs, regional transportation agencies, and relevant organizations to share information, resources, and best practices. This enables more efficient traffic management across jurisdictions, particularly during large-scale incidents or events that impact multiple regions.

4. Public-Private Partnerships: The TMC, in some cases should collaborate with private companies, such as technology providers, data analytics firms, and infrastructure developers, to leverage their expertise and resources for implementing advanced traffic management solutions and improving transportation infrastructure.
5. Traffic Management Plan Development: The TMC should work with local and regional planning agencies to develop traffic management plans, taking into account factors such as population growth, land use, and transportation demand. These plans guide the implementation of traffic management strategies and infrastructure projects to ensure efficient use of resources and optimize the transportation network's performance.
6. Emergency Management Coordination: The TMC must collaborate with emergency management agencies to develop and implement emergency response plans for transportation-related incidents, such as natural disasters, hazardous material spills, or terrorist attacks. This coordination helps to ensure a swift and effective response to emergencies, minimizing disruptions and enhancing public safety.
7. Public Engagement: The TMC should engage with the public to gather feedback, provide updates on traffic conditions, planned events, and transportation projects, and raise awareness about traffic management initiatives. This involves using various communication channels, such as social media, websites, and public meetings, to facilitate dialogue and build trust with the community.

   By fostering collaboration and coordination among various stakeholders, this planned TMC can create a more efficient, safe, and sustainable transportation system that benefits all road users and contributes to the overall well-being of the community.

Security and Safety

The security and safety functions of the Traffic Management Center (TMC) play a crucial role in ensuring the protection of transportation infrastructure, road users, and the TMC's own operational assets. These functions involve implementing measures to prevent and respond to safety and security incidents, as well as monitoring and managing risks. Here's a description of the security and safety functions in a TMC:

1. Road Safety: The TMC should continuously monitor traffic conditions and implement traffic management strategies to enhance road safety of the road network under its jurisdiction. This includes optimizing traffic signal timings, coordinating traffic signals, managing incidents, and providing real-time information to road users to help prevent accidents and reduce the risk of injury.
2. Incident Management: The TMC must play a key role in detecting, responding to, and managing incidents such as accidents, breakdowns, or hazardous material spills. As already discussed, it must coordinate with emergency services, law enforcement, and other relevant stakeholders to ensure a swift and effective response, minimize the impact on traffic flow, and protect public safety.
3. Infrastructure Security: The TMC must be responsible for securing the transportation infrastructure under its jurisdiction, such as bridges, tunnels, and traffic control devices. This

involves implementing access control measures, surveillance systems, and intrusion detection technologies to prevent unauthorized access, vandalism, or other security threats.

4. Cybersecurity: The TMC must protect their communication networks, data storage systems, and control systems from cyber threats. This involves implementing robust cybersecurity measures, such as firewalls, encryption, intrusion detection systems, and regular security audits, to safeguard sensitive information and ensure the continued operation of critical traffic management systems.
5. Emergency Preparedness: The TMC must collaborate with emergency management agencies to develop and implement emergency response plans for transportation-related incidents, such as natural disasters, hazardous material spills, or terrorist attacks. It must also conduct regular drills and exercises to test their preparedness and ensure a swift and effective response to emergencies.
6. Data Privacy and Security: The TMC shall collect and process large volumes of traffic data, some of which may be sensitive or personally identifiable. It must implement data privacy and security measures, such as anonymizing data, limiting data access, and securely storing data, to protect the privacy of road users and comply with relevant EU data protection regulations.
7. Staff Training and Awareness: The TMC is responsible for providing their personnel with appropriate safety and security training, ensuring that they are well-equipped to identify, prevent, and respond to potential threats. This includes training on incident management, emergency response, and cybersecurity best practices. Thus, its systems must support simulated training on real events.

   By effectively implementing security and safety functions, the TMC will be able to protect transportation infrastructure, road users, and its own operational assets from potential threats, ultimately contributing to a safer and more resilient transportation system.

Training and Development

The training and development function of the Traffic Management Center (TMC) is essential for maintaining a skilled and knowledgeable workforce capable of effectively managing traffic and responding to incidents. This function involves providing TMC personnel with the necessary training, resources, and opportunities to improve their skills, stay up to date with industry advancements, and enhance their overall performance. Below is a description of the training and development functions that the TMC systems must facilitate:

1. Onboarding and Orientation: The TMC must provide new employees with comprehensive onboarding and orientation programs to familiarize them with the organization, its policies, procedures, and systems. This helps ensure that new staff members can quickly become productive members of the team.
2. Technical Training: The TMC should offer technical training to their personnel to ensure they are proficient in using the various tools, software, and equipment required for their roles. This can include training on traffic monitoring systems, control devices, data analysis tools, and communication systems.

3. Incident Management Training: TMC personnel must receive training on incident detection, response, and management procedures to ensure they can effectively handle incidents such as accidents, breakdowns, or hazardous material spills. This training may cover topics such as emergency dispatch, incident command systems, and coordination with external stakeholders.
4. Emergency Preparedness and Response: The TMC must provide training on emergency preparedness and response procedures, enabling its staff to effectively manage transportation-related emergencies, such as natural disasters or terrorist attacks. This training includes developing and implementing emergency response plans, coordinating with emergency management agencies, and participating in drills and exercises.
5. Safety and Security Training: TMC personnel must receive training on safety and security best practices, ensuring they are well-equipped to identify, prevent, and respond to potential threats. This includes training on infrastructure security, cybersecurity, data privacy, and road safety measures.
6. Professional Development: The TMC should offer opportunities for staff members to further develop their skills and advance their careers through professional development programs, such as workshops, conferences, and certification courses. This helps employees stay up to date with industry advancements, enhance their expertise, and contribute to the organization's growth and success.
7. Performance Evaluation and Feedback: The TMC should regularly evaluate employee performance, providing feedback and identifying areas for improvement. This helps employees understand their strengths and weaknesses, set goals for professional growth, and continuously improve their performance.
8. Cross-Functional Training: The TMC should provide cross-functional training to their personnel, allowing them to gain a broader understanding of the organization and develop skills in multiple areas. This can help promote collaboration, foster a deeper understanding of the interconnectedness of the TMC's functions, and enable employees to contribute more effectively to the overall mission.

   By implementing a robust training and development program, the TMC can ensure that its personnel is well-equipped to handle the complex challenges of traffic management, ultimately contributing to a safer, more efficient, and sustainable transportation system

   10.1.3.7 Scalability and flexibility are essential functions for the TMC to adapt to a rapidly changing transportation landscape, manage evolving traffic demands, and effectively integrate emerging technologies. These functions will enable the TMC to respond to various challenges and ensure the efficient and resilient operation of the transportation system. The TMC systems must offer:

1. Infrastructure Scalability:

a) Network expansion: The TMC should have the capacity to scale its infrastructure to accommodate growth in the transportation network, such as the addition of new roads, intersections, or transportation modes. Thus, its systems must be designed in a modular way enabling expansion.

b) Data infrastructure: The TMC must be able to handle increasing volumes of data generated by various sources, including connected vehicles, IoT devices, and sensors. Scalable data storage and processing solutions, such as cloud-based storage or distributed databases, can help manage this growth.

2. Technology Integration and Upgradability:

a) Open architecture: By adopting open architecture designs, the TMC can more easily integrate new technologies or replace outdated components without overhauling the entire system. So, it is essential to avoid proprietary protocols and closed systems.

b) Modular systems: The TMC must take advantage of modular hardware and software components, allowing for easy upgrades, replacements, or expansions as needed.

c) Interoperability: Embracing EU ITS interoperability standards and communication protocols ensures that the TMC can integrate with various transportation systems and devices, facilitating data sharing and collaboration among different agencies.

3. Adaptive Traffic Management Strategies:

a) Context-aware strategies: The TMC should develop traffic management strategies that consider various contextual factors, such as weather, time of day, or special events, enabling more targeted and effective interventions.

b) Dynamic traffic management: The TMC shall implement real-time traffic management strategies that respond to changing traffic conditions, such as dynamic traffic signal timings or adaptive ramp metering.

c) Multimodal traffic management: By considering different transportation modes, including public transit, bicycles, and pedestrians, the TMC can optimize the overall transportation network and encourage more sustainable travel choices.

4. Incident Response and Management:

a) Scenario planning: The TM should engage in scenario planning exercises, developing pre-planned response strategies for a wide range of potential incidents, including natural disasters, large-scale emergencies, and infrastructure failures.

b) Real-time incident detection and response: The TMC should adopt advanced incident detection technologies, such as computer vision or machine learning algorithms, to identify and respond to incidents in real-time, minimizing their impact on the transportation network.

c) Multi-agency coordination: Establishing strong relationships and communication channels with other agencies, such as law enforcement, emergency services, or neighboring TMCs, allows for a more coordinated and efficient response to incidents, ensuring public safety and minimizing traffic disruptions.

5. Futureproofing and Technology Adoption:

a) Technology scouting: The TMC engineers should actively monitor and assess emerging technologies, identifying potential opportunities for enhancing their traffic management capabilities or addressing new challenges.

b) Pilot projects and experimentation: The TMC should engage in pilot projects, testbeds, or other experimentation efforts to explore the potential benefits and risks of new technologies before committing to full-scale deployment.

c) Technology roadmap development: The TMC should develop technology roadmaps, outlining their strategic vision for technology adoption, integration, and development, ensuring they remain agile and prepared for future advancements.

6. Work force Development and Training:

a) Continuous training: The TMC should provide its personnel with ongoing training and education opportunities, ensuring they are equipped with the skills and knowledge needed to operate and manage new technologies, systems, and methodologies.

b) Cross-functional collaboration: Encouraging cross-functional collaboration within the TMC can help staff members develop a broader understanding of different aspects of traffic management, fostering a more versatile workforce that can adapt to changing roles and responsibilities.

c) Talent acquisition and retention: The TMC should strive to attract and retain top talent in fields such as data science, engineering, and urban planning, ensuring they have the expertise required to address the complex challenges of modern traffic management.

7. Flexibility in Policy and Regulation:

a) Adaptive policies: The TMC should support the development of flexible transportation policies and regulations that can be adjusted as new technologies or transportation trends emerge, ensuring that the regulatory environment remains conducive to innovation and efficiency.

b) Public-private partnerships: Engaging in partnerships with private sector stakeholders can help the TMC to leverage cutting-edge technologies, expertise, and resources, enhancing their ability to adapt and respond to changing transportation demands and challenges.

In summary, the scalability and flexibility functions of the Traffic Management Center (TMC) are critical to ensuring the efficient and resilient operation of the transportation system. By focusing on these functions, the TMC can adapt to the rapidly changing transportation landscape, effectively manage evolving traffic demands, and integrate emerging technologies to maintain a safe, efficient, and sustainable transportation network.

Roles

The general outline of proposed roles and responsibilities in the TMCs, for both RPs, is presented here after.

- TMC Manager: This individual is responsible for overseeing all TMC operations, ensuring that the TMC meets its objectives and manages traffic efficiently. He coordinates with external agencies and stakeholders and develops strategic plans for the TMC.
- Traffic Engineers: These professionals analyze traffic data, design traffic management strategies, and develop plans for the implementation of traffic control devices, such as traffic signals and signs. They also play a crucial role in optimizing traffic flow and reducing congestion.
- Traffic Operations Specialists: They are responsible for monitoring real-time traffic conditions, operating traffic management systems, and coordinating incident response plans. They also manage Intelligent Transportation Systems (ITS) and utilize technologies such as CCTV cameras, variable message signs, and traffic sensors to manage traffic flow.
- Traffic Incident Management (TIM) Coordinator: This individual coordinate incident response, communicates with emergency services, and manages the deployment of resources to manage traffic incidents such as accidents, roadwork, and special events.
- Data Analysts: They collect, analyze, and interpret traffic data to identify trends, evaluate the effectiveness of traffic management strategies, and provide insights for future planning and improvements.
- GIS Analysts/Technicians: These professionals use Geographic Information Systems (GIS) to create maps and visualize traffic data, helping traffic engineers and planners to both better understand traffic patterns and plan infrastructure improvements.
- Communications Specialists: They are responsible for managing public information and communicating traffic updates, incidents, and planned events to the public through various channels such as social media, websites, and press releases.
- IT Support Staff: These individuals maintain and troubleshoot the TMC's computer systems, networks, and software, ensuring that the TMC’s technology infrastructure runs smoothly and securely.

Administrative Staff: They handle various administrative tasks such as scheduling, budgeting, procurement, and human resources management.

Staffing Requirements

For Kosovo, the TEN-T Core and Comprehensive network is still under development and staffing requirements are expected to change as more parts of the TEN-T network are integrated. Below is a recommendation for staffing requirements for the TMCs operating in a 24/7 basis, having integrated 100% of the TEN-T network and ITS having been deployed in its entirety.

- TMC Manager: 1 Person
  To oversee all TMC operations and manage the team.
- Traffic Engineers: 1-2 Persons

To analyze traffic data, design traffic management strategies, and develop plans for traffic control devices.

- Traffic Operations Specialists: 10 Persons
  Three shifts (morning, evening, and night) with 2-3 specialists per shift to ensure 24/7 coverage.
- Traffic Incident Management (TIM) Coordinator: 5 Persons
  One coordinator per shift to ensure 24/7 coverage and coordination of incident response.
- Data Analysts: 1 Person
  To collect, analyze, and interpret traffic data to evaluate the effectiveness of traffic management strategies.
- GIS Analysts/Technicians: 1 Person
  To create maps and visualize traffic data, supporting traffic engineers and planners.
- Communications Specialists: 5 Persons
  One specialist per shift to ensure 24/7 coverage, managing public information and communicating traffic updates.
- IT Support Staff: 2-3 Persons
  To maintain and troubleshoot the TMC's computer systems, networks, and software.
- Administrative Staff: 2-3 Persons
  To handle various administrative tasks such as scheduling, budgeting, procurement, and human resources management.

In total, approximately 28-31 personnel are needed to staff the 24/7 TMC for Kosovo.

On-site incident responders

On-site incident responders are crucial for managing traffic incidents, providing rapid response, and ensuring safety and smooth traffic flow. For the 24/7 operating TMCs, and for the TEN-T and ITS developed in its entirety, the following on-site incident responder roles are required:

- **Incident Response Team (IRT):** These teams are responsible for on-site management of traffic incidents, including accident clearance, debris removal, and traffic control. They often work closely with emergency services, such as police, fire brigade, and medical personnel. A suggested number would be 1-2 IRTs, each consisting of 2-3 members, for the TMC, to ensure adequate coverage across the TEN-T network in its entirety.
- **Roadside Assistance Technicians**: These technicians provide support for stranded motorists, including flat tire changes, jump starts, and minor mechanical repairs. 5 technicians are needed working in shifts for the TMCs, to provide 24/7 coverage.
- **Tow Truck Operators**: They are responsible for removing disabled or damaged vehicles from the roadway to reduce congestion and restore normal traffic flow. 5 tow truck operators working in shifts for 24/7 coverage are required. This role may be outsourced to a tow truck / road assistance company.
- **Emergency Services**: While not directly employed by the TMC, it's essential to establish close coordination with local police, fire brigade, and medical emergency services for efficient incident response. Thus, their presence is foreseen within the TMC building complex.

In total, the TMC needs around 20-30- on-site incident responders, including IRT members, roadside assistance technicians, and tow truck operators working in 24/7 shifts. However, these numbers should be adjusted based on factors such as the road network's incident frequency, traffic density, and local regulations.

It's crucial to ensure proper communication and coordination between the TMC and on-site incident responders for efficient incident management. This can be achieved using radios, mobile phones, and other communication devices, as well as regular training and debriefing sessions to continually improve response strategies.

Location

The site of the TMC should be strategically located for easy access to major transportation routes and proximity to relevant government agencies, emergency services, and other stakeholders to be ensured. Based on the preliminary assessment of the potential locations for TMC the stakeholder (Ministry of Environment, Spatial Planning, and Infrastructure) proposed, via an email on the 22nd of February 2023, a location near Pristina. Following is the satellite image of proposed location.

Figure 3 Potential location for the TMC (aproximate plot area 22.000 m^2)

The land characteristics of the TMC should be as such to prevent any natural disaster that may occur, and at the same time reduce construction costs. Based on the high-level analysis of proposed location it can be concluded that the location is suitable for further consideration for TMC construction.

Building Programme

- Entrance and Reception (30-50 sqm)
  - Secure access control
  - Reception desk and waiting area.

- Information display and signage
- Control Room (100-150 sqm)
- Large video wall for displaying CCTV feeds, maps, and traffic data.
- Workstations for traffic operations specialists and communications specialists
- Traffic incident management coordinator's station
- Space for necessary equipment, such as computers and communication devices
- Offices and Workstations (150-250 sqm)
- Private offices for TMC manager, traffic engineers, and IT support staff
- Open workspace for data analysts, GIS analysts, and administrative staff
- Storage for files, documents, and equipment
- Police Officer Room (20-30 sqm)
- Workstations for police officers with computers and communication devices
- Storage for files, documents, and equipment
- Direct access or proximity to the control room for seamless coordination with TMC staff

  During the final design process, it is essential to consult with the relevant stakeholders, such as the local law enforcement agency and TMC staff, to determine the specific requirements and design criteria for the police officer room. This will ensure that the room meets the needs of both the TMC and law enforcement personnel and supports effective collaboration between the two entities.

- Meeting and Training Rooms (100-150 sqm)
- Crisis Room
- Conference room for meetings, briefings, and presentations
- Training room for staff development and workshops
- Break Room and Kitchenette (30-50 sqm)
- Seating area with tables and chairs
- Kitchenette with refrigerator, microwave, coffee maker, and sink
- Vending machines or snack area
- Restrooms and Locker Rooms (30-50 sqm)
- Separate male and female restrooms
- Locker rooms for staff to store personal belongings.
- IT and Equipment Rooms (50-70 sqm)
- Secure server room with climate control
- Storage for network equipment, cables, and other IT components
- Circulation and Other Spaces (500-100 sqm)
- Hallways and corridors connecting different areas.
- Emergency exits and fire safety equipment.
- Utility spaces, such as electrical and mechanical rooms

  Factors such as accessibility, sustainability, and security should also be considered during the detailed design process of the TMC facility.

Implementation Scenarios

A staged deployment approach is also recommended for Kosovo's TMC which allows for a more manageable and cost-effective implementation. This staged approach can ensure that

each phase is thoroughly tested and evaluated before moving to the next, allowing for any necessary adjustments or improvements. Below is a suggested staged deployment plan:

Stage 1: Basic Infrastructure and Initial Functionality (6-12 months)

- Procure and install hardware and software.
- Establish connectivity with existing ITS devices.
- Implement basic TMC functionalities (e.g., traffic monitoring, incident detection and management, traffic signal control).
- Train TMC operators and other personnel.
- Deploy dynamic message signs and variable speed limit signs.

Stage 2: Data Management and Analysis (12-18 months)

- Integrate data collection systems (CCTV cameras, vehicle detectors, GPS devices)
- Develop and implement efficient data storage and management systems.
- Establish data analysis capabilities and tools.

Stage 3: Communication and Information Management (18-24 months)

- Implement traveler information systems (dynamic message signs, social media, mobile applications).
- Enhance emergency communication capabilities.
- Train TMC operators on new communication tools.

Stage 4: Collaboration and Coordination (24-30 months)

- Establish coordination mechanisms with emergency services, maintenance teams, and transport operators.
- Develop processes for information sharing and collaborative decision-making.
- Train TMC operators on coordination processes and tools.

Stage 5: Advanced Technologies and System Integration (30-36 months)

- Implement advanced ITS technologies, such as connected vehicle systems, traffic prediction tools, and adaptive traffic signal control.
- Integrate TMC systems with other regional and national transportation management systems (e.g. NAP).
- Train TMC operators on new technologies and system integrations.

Stage 6: Security, Safety, and Training (36-42 months)

- Implement cybersecurity measures.
- Establish physical security protections.
- Develop safety procedures and guidelines.
- Provide ongoing training and development for TMC staff.

Stage 7: Scalability and Flexibility (ongoing)

- Assess system performance and identify areas for improvement.
- Plan and implement system upgrades and expansions.

- Monitor emerging ITS technologies and best practices to ensure the TMC remains adaptable to future needs.

This staged deployment schedule provides a structured approach to implementing a modern TMC for Kosovo, allowing for gradual integration of advanced functions and technologies while ensuring that the system remains flexible and adaptable to changing needs and emerging innovations.

Cost Calculations - CAPEX

It is noted that the total CAPEX will consist of the following elements: a) works, b) facility equipment, c) IT equipment (Software and Hardware), d) Contingency, e) Design, and f) Supervision. Following the previous assumptions, the total CAPEX for the TMCs' implementation is Kosovo is calculated and presented in the table below.

Table 1 CAPEX for the new TMC in Kosovo, 2023 prices

CAPEX	**%**	**EUR**
Building		1,800,000
Road Surfaces		150,000
Total works (A)		1,950,000
Hardware		2,500,000
Software		4,000,000
Total hardware and software (B)		6,500,000
Total cost A+B		**8,450,000**
Contingency	15% of total cost	1,267,500
Total CAPEX		9,717,500
Supervision	8% of total CAPEX	777,400
Design	5% of total CAPEX	485,875
Grand Total (excl. VAT)		**10,980,775**
VAT	18%	**1,976,540**
Grand Total (incl. VAT)		**12,957,315**

Cost Calculations - OPEX

It is noted that the total OPEX consist of: Personnel Costs while the Maintenance Cost consist of Hardware and Software maintenance cost and Facilities Maintenance Cost.

Following the previous assumption, O&M cost for the TMC is calculated and the annual cost is presented in the following table. Finally, it must be noted that the proposal regarding the TMCs along with the Cost Estimations were presented to the RP and no comments were received.

Table 2 Annual OPEX for the new TMC in Kosovo, 2023 prices

OPEX	**%**	**EUR**
Operation		
Staff (incl. all taxes)		1,294,650
Maintenance		
Building	3%	58,500
Hardware	12%	300,000
Software	20%	800,000
Total		**2,453,150**

11 ANNEX 2: EU REQUIREMENTS

General

The identification of the EU ITS Requirements is the most important step to identify the needs of the RPs and correctly approach the state of play for every RP.

It is noted that useful data Regarding the existing Legal Framework per RP, and the progress achieved up to the point of the preparation of this report, were received by the Permanent Secretariat of Transport Community (TCPS) – "Action Plans – First Year Progress Report" (October 2021) and "Action Plans and the EU Acquis Progress Report" (November 2022) [6].

Roads

EU Framework

The most important document on the EU level that regulates the development of the Intelligent Transport System (ITS) is the ***Directive 2010/40/EU***[7] on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport. The Directive 2010/40/EU (ITS Directive) establishes a framework in support of the coordinated and coherent deployment and use of ITS within the EU, across the borders between the Member States, and sets out the general conditions necessary for that purpose. Moreover, the Directive states: "to ensure a coordinated and effective deployment of ITS within the Union as a whole, specifications, including, where appropriate, standards, defining further detailed provisions and procedures should be introduced."

The following 4 priority areas are defined within the 2010/40/EU Directive:

- Optimal use of road, traffic, and travel data,
- Continuity of traffic and freight management ITS services,
- ITS road safety and security applications,
- Linking the vehicle with the transport infrastructure.

Besides the Directive already mentioned, provisions from the following directives also apply to the development of ITS:

- Directive 2008/96/EC[8] on road infrastructure safety management,
- Directive 2004/54/EC[9] on minimum safety requirements for tunnels in the Trans-European Road Network,

[6] https://www.transport-community.org/reports/progress-reports-on-action-plans-and-acquis-implementation/

[7] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:207:0001:0013:en:PDF

[8] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0096&from=EN

[9] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32004L0054&from=EN

- Directive 2019/520/EC[10] on the interoperability of electronic road toll systems and facilitating cross-border exchange of information on the failure to pay road fees in the Union.

In Europe, CEN/TC 278 is responsible for managing the preparation of standards in the field of Intelligent Transport Systems (ITS).

11.2 Rail

11.2.1 General about Rail ITS

In railways, the most important ITS systems which are those recognised by the EU regulation and strategic documents are:

- European Rail Traffic Management System (ERTMS),
- Telematics Applications for Freight- Technical Specifications for Interoperability (TAF-TSI) and
- Telematics Applications for Passengers- Technical Specifications for Interoperability (TAP-TSI).

Therefore, these are the systems whose implementation should be considered, the relevant benefits and costs should be analysed, and plans for their application should be carefully made.

ERTMS is a relatively new concept in railway systems of the EU, and its level of implementation varies across different countries. Specifically in 2021, 6,713 km of the Core Network was in operation with European Train Control System (ETCS), which is only 43% of the European Deployment Plan target for 2023. The EU deployment goal has encountered some delays in the short-term implementation. Nonetheless, the medium- and long-term outlook for trackside deployment is promising. A total of 47,890 km of the railway network, is considered as Core Network of the 118,037 km-long TEN-T Network and is expected to be fully equipped with ERTMS by 2040[11].

On the other hand, by the end of 2019, around 5,700 vehicles were equipped with ERTMS on board equipment. 40% of these were newly purchased vehicles and 60% were retrofitted vehicles. This number of vehicles represents only 12.5% of the European commercial railway fleet. As stated by the Community of European Railway and Infrastructure Companies (CER)[12], almost 90% of Europe's commercial fleets operating on the Core Network Corridors (CNC) are to be renewed in the upcoming 20 years, more than 20,000 vehicles are expected to be renewed between 2021-2030 and further 11,000 vehicles between 2031-2040.

Nevertheless, ERTMS in the WB6 is still at an early phase of implementation. To implement the ERTMS/ICT system, the first step is to prepare legislation in each of the RPs, and the basis for this new legislation is the implementation of the Interoperability Railways Directives.

[10] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0520&from=EN

[11] 226,726 km is the total length of the EU's railway network

[12] https://www.globalrailwayreview.com/article/135585/what-is-needed-to-accelerate-overall-deployment-ertms/

Regarding the access to the rail networks of the EU, although certain important steps have been made, still, there are institutional (technical, organisational, and operational) barriers that prevent this freedom of access to be fully implemented. This is the final goal of the Treaty Establishing the Transport Community signed by WB6 and the EU[13] and its Action Plans.

An analysis of current on-going projects and of the situation in the WB6 region reveals that, although there are improvements in transposition of the EU acquis, there are still insufficiencies, especially regarding the institutional perspective, while there is no coherent planning.

Another aspect that is usually overlooked is the human resources. This includes the capability of state institutions and railway management to: (1) transpose and implement the EU acquis, including the fourth package of EU Directives and TSI's; (2) update the existing legal framework, standards and procedures, including by-laws and internal railway acts, regarding ITS systems on technical level[14]; (3) capacitate employees for first line, maintenance of ITS railway systems; and (4) create innovative training programs, especially at high-school level, in order to encompass new procedures and new technical aspects brought by ITS systems.

A prerequisite for a functioning regional ITS as part of the TEN-T network, is the adoption of EU directives, laws and standards by each country and the creation of a national strategy for ITS development that should be based on:

1. the Regional Strategy,
2. the European Transport Policy and
3. The wider economic-business environment in the WB6 region aiming at the best possible integrated and structured policy.

Legal aspect of Rail ITS

Interoperability in the EU is perceived as the creation of a "single area" through the harmonisation of European railway technical and operating standards and approval processes. Interoperability has a major contribution to make to transport policy in the single European market. The primary purpose is to improve the way railways can provide services across the borders of EU Member States. In addition, it will create an internal market in the construction, operation and renewal of rail infrastructure and rolling stock. Adopting a single set of technical specifications and pan European product approval will allow railway companies to buy interchangeable equipment from amongst a large pool of competing suppliers both from within and outside the EU.

More than any other transport mode, rail transport depends on technical compatibility between the infrastructure and the vehicles running on it. Safe and efficient operation of railways requires a high level of standardisation of infrastructure, rolling stock, signalling systems,

[13] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A22017A1027%2801%29

[14] For example: rulebooks on signalling, safety systems, construction and electro-technical standards

clearance spaces, the axle weight of track, communication systems, etc. Harmonisation is, therefore, indispensable to enable international rail traffic.

Over the years, national rail networks have developed different technical specifications for infrastructure. Consequently, all these differences led to a different institutional framework. Different gauge widths, electrification standards and safety and signalling systems all make it more difficult and costlier to run a train from one country to another. Specific EU legislation exists to promote interoperability and overcome such differences.

The railway interoperability ***Directive 2008/57/EC*** of 17 June 2008 sets out the conditions to be met to achieve interoperability within the EU's rail system. These conditions concern the design, construction, placing in service, upgrading, renewal, operation and maintenance of the parts of this system, as well as the professional qualifications and health and safety conditions of the staff who contribute to its operation and maintenance. This Directive repeals both Directive 96/48/EC on the interoperability of the European high-speed rail system and Directive 2001/16/EC on the interoperability of the European conventional rail system.

Important changes concerning ERTMS have been introduced by the new technical pillar of the 4th Railway Package. This enhances the role of the European Union Agency for Railways (ERA) as the ERTMS system authority which maintains, monitors and manages the corresponding subsystem requirements, including the technical specifications for the European Train Control System (ETCS) and the Global System of Mobile Communications – Railway (GSM-R). Also, a new process concerning the pre-approval of the ERA of trackside implementations, has been introduced by the 4th Railway Package. All the above-mentioned will lead to enhanced interoperability and compatibility between on-board and trackside subsystems.

The 4th railway package aims to remove the remaining barriers to the creation of a single European rail area. By removing these barriers, the creation of a more competitive rail sector can be achieved, which will consequently ensure better connections between the EU and its neighbouring countries.

A substantial element of ERTMS is the software code used to define the messages between train and infrastructure, and what the train should do in response to those messages. Like all software, this provides the possibility to deal with many scenarios and allows for rapid development – but also introduces the risks of errors and barriers to interoperability. The stability of the specification is frequently mentioned as the most critical element for a wide-scale deployment. Evolution of the specification has been driven by the request of the users to introduce new functionalities and by the need to correct errors.

Regional Participants may decide which ERTMS level is most suitable. However, the basis for implementation is clear regarding the legislative part. During the decision process, it is important to be aware of the goals that can be achieved by implementing ERTMS. These goals are presented in the figure below:

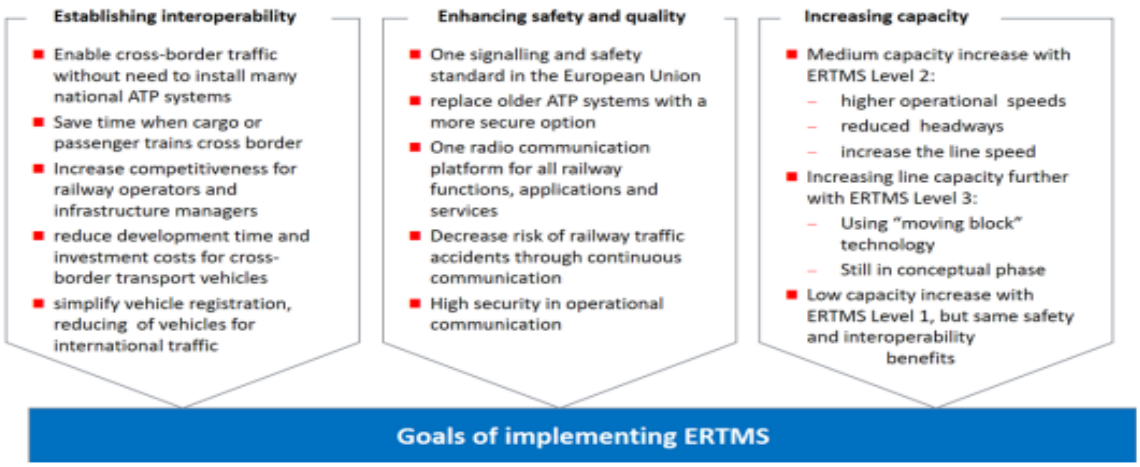

Figure 4: Goals for ERTMS implementation

Regarding decision making, some important points must be taken into the consideration such as the situation of neighbouring countries regarding connection, possible sources of financing (EU funds prioritised for the Core/ Comprehensive TEN-T networks), development plans, on-going projects, connection with important nodes (sea- and river- ports), etc. It is also important to mention that, in order to be able to introduce Level 2 precondition, a GSM-R network must be prepared and ready. A simplified decision tree for introducing ERTMS i.e., European Train Control System (ETCS) and GSM-R is given in the figure below:

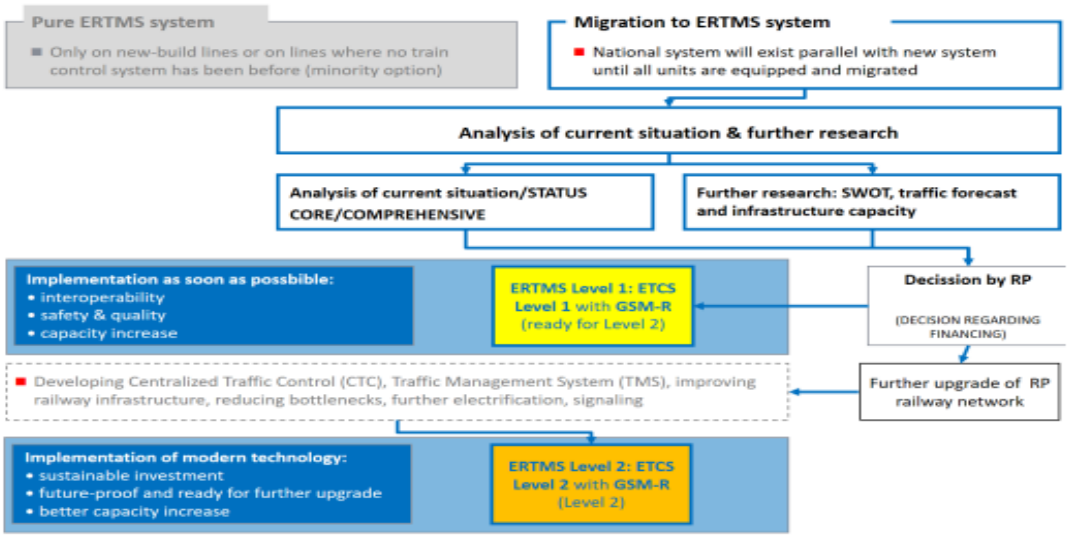

Figure 5: Example of decision process for ERTMS implementation

ETCS specifications Baseline 3, Release 2, is considered functionally complete. Furthermore, it should remain unchanged in the coming years. The adoption of Regulation (EU) 2016/919 was a major milestone in the development of the specification and of the ERTMS breakthrough programme. Technical Specifications for Interoperability (TSIs) are the specifications by which each subsystem or part of subsystem are covered to meet the essential requirements and

to ensure the interoperability of the EU's high speed and conventional rail systems. The main changes in this Regulation are the following:

- Adequate legal instrument: CCS TSI is no longer an EU Decision but an EU Regulation that is not only addressed to the Member States but individually to all actors referred to in the legislation.
- TSI Compliance: Obligation to suppliers, applicants for an authorisation, Notified Bodies and National Safety Authorities (NSAs) to produce/implement TSI compliant products (Article 6).
- Transparency towards Railway Undertakings (RUs): Member States will publish a National Implementation Plan including planned dates for decommissioning of Class B systems. These plans will be publicly available to support RUs in adapting their business plans (Article 6 and Annex point 7.4.4).
- Transparency of trackside testing procedures: Notification of engineering rules and operational test scenarios to increase transparency of testing processes and prepare for further harmonisation of operational rules (Article 5 and Annex point 6.1.2.3).
- Compatibility tests: Possibility to include the results of the compatibility tests, in case they are requested by the applicant, in the technical file to be submitted to the NSA for facilitating compatibility checks (Annex point 6.5).
- Updated ERTMS Specification: Release 2 of Baseline 3 introduces functional aspects agreed by the sector in the 2012 "Memorandum of Understanding". These include GPRS, to address problems of spectrum capacity in areas with a high frequency of trains where the spectrum has limited capacity, a higher level of protection against radio interference, and online key management to protect messages between the infrastructure and the train from cyber-attacks. This specification is incompatible with the currently applicable version of the TSI and will allow for a standardised compliant on-board unit to be produced consequently allowing trains to circulate on any ERTMS line.

The table below lists the current EN standards (European Norms). However, for ERTMS purposes the standard EN 50238 (compatibility between rolling stock and train detection systems) mentioned in the table is not relevant, as ERTMS does not define track detection[15].

[15] Also, EN 50159, although significant in implementation, is not mentioned, being of more general nature not directly pertaining to ERTMS.

A1	EN 50126	Railway applications - The specification and demonstration of reliability, availability, maintainability and safety (RAMS)
A2	EN 50128	Railway applications – Communication, signalling and processing systems – Software for railway control and protection systems
A3	EN 50129	Railway applications – Communication, signalling and processing systems – Safety related electronic systems for signalling
A4	EN 50125-1	Railway applications – Environmental conditions for equipment – Part 1: equipment on board rolling stock
A5	EN 50125-3	Railway applications – Environmental conditions for equipment – Part 3: equipment for signalling and telecommunications
A6	EN 50121-3-2	Railway applications – Electromagnetic compatibility - Part 3-2: Rolling stock – Apparatus
A7	EN 50121-4	Railway applications - Electromagnetic compatibility - Part 4: Emission and immunity of the signalling and telecommunications apparatus
A8	EN 50238	Railway applications – Compatibility between rolling stock and train detection systems

Table 3: Current EN Standards for Railway Applications

National rules are allowed under certain conditions only, as defined in the Interoperability Directive (EU) 2016/797[16] and in the Safety Directive (EU) 2016/798[17], and they apply in addition to the European Rules. To achieve the objectives of the European Railway legislation, which may be summarised as ***interoperability*** and a ***single market for railway products and services***, the number and content of National Rules must be reduced to a minimum and all applicable national rules must be publicly available.

In addition, as a precondition to the listed technical specifications, there are mandatory European Committee for Electrotechnical Standardization (CENELEC) and European Telecommunications Standards Institute (ETSI) Norms relevant for ERTMS, defined by three sub-committees:

- SC9XA: Communication, signalling and processing systems.
- SC9XB: Rolling stock.
- SC9XC: Fixed installations

Among several ITS applications, the TAF and TAP systems for Freight and Passengers respectively will enable a new level of interoperability between European railways. This will bring substantial business and service benefits as a result of cross-industry standardised processes and messaging standards.

Inland Waterways

Framework

Legislative framework on the EU level related to the River Information Services (RIS) is based on the European transport policy that defines and supports RIS development on European

[16] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016L0797&from=EN

[17] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016L0798&from=EN

waterways from Class IV onwards. It supports RIS not only concerning safety and environmental protection but also regarding the efficiency of inland navigation.

River Information Services (RIS) is not only a tool for improving the safety of navigation, but it also has an essential role in the following:

- Transport policy defining and development.
- Improving and harmonisation of corresponding legislation.
  That way RIS is a significant indicator of the implementation of the defined policy.

The main document related to the ITS in the IWWs sector on the EU level is the EU RIS Framework Directive of the European Union (2005/44/EC - OJ L 255,30.09.2005), entered into force on October 20th, 2005. The Directive applies to all interconnected waterways of class IV or higher across the EU. It provides binding rules for the authorities on implementing RIS services according to agreed regulations. The Directive provided minimum requirements for RIS implementation and agreed on RIS standards to enable cross-border compatibility of national systems. It is accepted as required regulation in all non-EU countries, too.

River Information Services (RIS) is an information service designed to enhance the safety and efficiency of inland waterway transport by optimising traffic and transport processes with a focal aspect of a swift demand-oriented electronic data transfer between water and shore through real-time exchange of information. RIS, therefore, aims to streamline the exchange of information between all IWT stakeholders. Comprehensive and international guidelines for RIS are continuously developing to harmonise the existing standards for river information systems and services within a common framework defining the content of standard requirements and technical specifications in the interest of pan-European harmonisation of the services.

12 ANNEX 3: EXTERNAL CONTRIBUTION TO "ITS STRATEGY" 2024 - 2030

Remark field section	Comment received	Contributing Stakeholder	Comment status	Comment
General				
Inland Waterways	**ation** In the territory of Kosovo, there are no waterways of local or international significance and with the international regime of navigation. There is no traffic in the rivers of Kosovo. In addition, some waterways and small lakes that have tourist activities including sports - non-motorized sailing are less developed. Consequently, the "Multimodal Transport Strategy 2023 – 20metho0 and Action Plan for three years" does not envisage the development of activities or investments in the infrastructure of internal waterways. **Findings:** Operation	Mr. Baton Begolli, and Mr. Afrim Lajçi – Advisor for Waters Date: 3.12.2023 Email: Afrim.Lajçi@rks-gov.net Institution: Inter - Ministerial Water Commission	Accepted	

	The authority that manages the water resources at the state level is not responsible for the transport issues. The Ministry of Environment, namely the River Basin Regional Authority (RBRA) is currently drafting River Basin Management Plans as strategic planning documents for the management of water resources at the basin level. There is no plan for the development of water transport, as the rivers of Kosovo do not have the capacity to be navigable rivers. In the context of transboundary water management, a memorandum of understanding has been reached at the level of the Drin River basin together with Albania, Montenegro, North Macedonia, and Greece. In addition, a memorandum of understanding was recently signed between RBRA and the Water Resources Management Agency of Albania, as well as an interstate agreement for transboundary water management with Albania and North Macedonia is being worked on.			

	ITS in IWW is not applicable since there is no possibility of water transport.			
Executive Summary	The second step will be the construction of the Road Traffic Management Centre and the Railway Traffic Management Centre, namely the deployment of the ITS infrastructure in the road and railway network TEN-T (TEN-T to be deleted).	Valerie Bojku – Bibaj, Acting Director of the Technical and Communication Department / Kosovo Railways Infrastructure - "INFRAKOS" JCS Date: 5.12.2023 Email: valerie.bojku@kosovorailway.com	Not accepted	Since there is a railway traffic centre, the establishment of such a centre has not been promoted, however, the rehabilitation and modernization of this existing centre will be within the ITS Strategy Action Plan. Regarding the removal of the initials TEN-T, the comment is not accepted since ITS until 2030 will be applied only to the TEN-T railway network.
Executive Summary	At least the core and comprehensive TEN-T rail network will include ERTMS within the next six (6) years.	Valerie Bojku – Bibaj, Acting Director of the Technical and Communication Department / Kosovo Railways Infrastructure - "INFRAKOS" JCS Date: 5.12.2023	Accepted	

		Email: valerie.bojku@kosovorailway.com		
General Description	Railway map to be replaced.	Valerie Bojku – Bibaj, Acting Director of the Technical and Communication Department / Kosovo Railways Infrastructure - "INFRAKOS" JCS Date: 5.12.2023 Email: valerie.bojku@kosovorailway.com	Accepted	
General Description	Since 2006, a centralized traffic control and management system has been implemented on the railway line Hani i Elezit - Fushë Kosovë - Leshak, with a length of 149,311 km (which includes 15 railway stations), which is now completely out of order and demolished due to the rehabilitation of the 10-railway line. Therefore, a new Traffic Management Centre (TMC) should be established in accordance with EU standards. For communication on the railways, the	Valerie Bojku – Bibaj, Acting Director of the Technical and Communication Department / Kosovo Railways Infrastructure - "INFRAKOS" JCS Date: 5.12.2023 Email: valerie.bojku@kosovorailway.com	Accepted	

	connections of the telephone system are used with optical cables and radio networks. The main railway line from Hani i Elezit to Mitrovica and Leshak is currently being rehabilitated through three subsections, and in segment 1 and 2 (Hani i Elezit – Fushë Kosovë – Mitrovica) the installation of the Signaling and Telecommunication System is expected to be completed in the Quarter Second (SQ) 2027. While the third phase, which includes Civil Works, Signaling and Telecommunications, is expected to be completed in the Fourth Quarter (FQ) 2028. As for electrification, it will begin in coordination with neighboring states. The total value of the project is 366,118 million euros, and the planned deadline for completion is the end of 2028. The rehabilitation of the railway line 10, Hani i Elezit – Fushë Kosovë - Leshak - it is envisaged that the line will be equipped with the European Train Control System (ETCS) Level 1 of Full Surveillance including the filling function with the use of Balise. The electronic interlocking system will allow the introduction of			

	ERTMS/ETCS Level 2 technology in the future. As for other projects, for the rehabilitation and modernization of railway line 7 Fushë Kosovë - Podujevë, the Preliminary Design and the EIA for this line have been completed, now funds are expected to be found for the execution of the works, while the pre-feasibility study for the railway line Prishtina - "Adem Jashari" International Airport has been completed.			
General Description	The Railway Regulatory Authority (RRA) is an independent body established by the Assembly of the Republic of Kosovo and operates based on the Law on Railways of Kosovo No. 04/L-063 charged with the responsibilities for the regulation and supervision of the railway sector in Kosovo through the following professional bodies: the Railway Safety Authority, the Interoperability Authority, the Licensing Authority, and the Railway Market Regulation Authority. RRA reports to the Assembly of Kosovo upon request and at least once a year on the scope of the departments that are within it.	Zyrafete Zejnullahu – Krasniqi, Deputy General Director of Railway Regulatory Authority Date: 5.12.2023 Email: Zyrafete.Krasniqi@rks-gov.net	Accepted	

General Description, paragraph 5	Based on the Law on Railways of Kosovo (KR) No. 04 / L - 063: Railway Safety body Article 18 / The Safety Authority is responsible for issuing, renewing, amending, and revoking Safety Authorizations, Safety Certificates as well as the Authorization for putting railway rolling stock into service, etc. Licensing Body Article 22 / The Licencing Body is responsible for issuing, amending, suspending, and revoking railway licences. Railway Market Regulatory Body Article 25 / The Market Regulatory Body is responsible and ensures that the payments set by the infrastructure manager or the payment setting body are not discriminatory, ensuring that access to tracks, stations, depots of operators who meet the necessary conditions is fair, transparent and non-discriminatory, as well as, the same approach also applies to the analysis and monitoring of competition and quality of services in the market of railway services. Interoperability Body.	Zyrafete Zejnullahu - Krasniqi, Deputy General Director of Railway Regulatory Authority Date: 5.12.2023 Email: Zyrafete.Krasniqi@rks-gov.net	Not accepted	As these articles exist in law, it is not necessary to rewrite them in the strategic document.

	Article 28 / The Interoperability Body is responsible for ensuring that the railway sector complies and will comply in the future with the requirements for interoperability defined in EU directives and regulations, and with the Regulation of the European Railway Agency.			
Operational Findings	And the TAS TAF, while planned for 2024 for the adoption of the TSI SRT (TSI for safety in tunnels).		Accepted	
	It will be necessary to harmonize the specific professional terminology according to the legislation in force. The term: 'Interaction' in the Albanian language, which has the same meaning as in the English language, should be replaced by 'Interoperability'.		Accepted	
	All standards within TSIs are simultaneously adopted by AKS.		Accepted	
	ERA on June 21, 2023, has decided that Kosovo will temporarily use the two-digit numerical code "00" for "all other states/territories", until a final solution is found. This solution has the advantage that Kosovo can have access to the EVR, and the existing registers may not need to be changed.		Accepted	

	RRA is in the process of amending / supplementing the Regulation for the National Vehicle Register (NVR) and adaptation for transposition of the Commission Implementing Decision (EU) 2018/1614 that defines the specifications for vehicle registers referred to in Article 47 of the (EU) Directive 2016/797.			
Maintenance	There is a need to increase the professional capacities necessary for the implementation (operation and maintenance) of ERTMS and ITS in railways, both for state institutions and for railway companies, as well as for management and operational staff. But so far this has not been supported by the Government of Kosovo according to the Law on Railways of Kosovo No. 04/L-63 approved on 14.11.2011, namely Article 63 paragraph 3, Article 14, Article 15 paragraph 2, Article 118 paragraph 5 and Article 123 paragraphs 3, 4, 5, 6 and 7, in order to sign financial agreements through which the method and amount of financing of "INFRAKOS" is regulated.		Not accepted	The Strategic Document does not address the issue to which the comment refers.
Strategic Objectives				

Strategic Objective 2	Strategic Objective 2 is essentially comprehensive, but we think that greater commitment is needed to improve the current situation, specifically: The fact that the lack of human resources is pronounced at both levels, in the state administration and in the railway companies, requires dedicated and monitored commitment. At the level of the state administration, specifically in MESPI, which creates and implements policies on railway transport, for years the necessary capacities (in our opinion) have been missing to prepare, develop and monitor development policies in the railway sector. MESPI, as the epicenter for ITS implementation, should have a separate Department for the railway sector to fulfill the obligations / Strategy implementation plan with sufficient and professional staff. Likewise, we consider that there should be greater commitment to the issue of institutional (legal) barriers and membership in European and World institutions/associations. This is because it should be considered that ITS must be in line with the advancements / developments in neighboring countries and beyond in the	Sefedin Sefaj, “TRAINKOS” JSC Date: 30.11.2023 Email: Sefedin.Sefaj@trainkos.com	Partially accepted	The term "Corridor" will be corrected by line. As for the other part, the document in question deals with the deployment of ITS and not with investments in the railway. While the capacities will be envisaged as activities in the ITS Action Plan.

	EU. Furthermore, to align with the EU's goals to create a "Single European Railway Area".			
	Strategic Objective 2 for Railways has specific objectives 2.1; 2.2; 2.3 and 2.4 that are interconnected to achieve the general objectives in the implementation of ITS in Kosovo. The description is very inclusive and if it will not be preceded by a precise action plan, then we must bear in mind that for the realization of specific objectives we must have a clear interconnection with other sectors within the responsible entities. Specifically, for: The plan for the drafting and implementation of the relevant legislation. The implementation of the obligations arising from this legislation by the relevant entities, and, The Government priorities over the years (according to the specifications in the Specific Objectives) and the forms of identification of financial resources for the financing of projects.		Not accepted	This comment is foreseen in the Action Plan that will be drawn up after the approval of the strategy.

	To coordinate the forms of "theoretical" benefits of participation in seminars / trainings and practical implementation.			
	In the ITS Strategy, which is an inseparable part of the pyramidal functioning of the other main strategies approved by the State, there is also the implementation of point 6.3.3.2 (STMM 2023-2030) – Modernization of railway transport to encourage the transition from road to rail is itself a key facilitator of sustainable transport. In addition, new vehicles should be more environmentally friendly as increased safety will minimize dangerous accidents. This shows the importance of the supply and release in function of appropriate vehicles that meet the obligations arising from the Legislation approved in the country and the implementation of the European Directives for the sector.		Not accepted	The strategic document in question is only about ITS deployment.
	Part of the text on page 16 needs to be corrected - the private railway operator "RAILTRANS", which holds about 40% of the rail transport market, because it does not stand. This fact can be proven in the annual reports issued by ESK and "INFRAKOS" JSC and,		Accepted	

	The text of the document has some minor spelling and technical errors that need to be corrected. Attention should also be paid to a part of the document where railway rolling stock is written with "vehicles".			
Objektivi Strategjik 2:	Building an advanced technological infrastructure to increase railway safety, improve mobility and reduce the impact on the environment.	Valerie Bojku – Bibaj, Acting Director of the Technical and Communication Department / Kosovo Railways Infrastructure - "INFRAKOS" JCS Date: 5.12.2023 Email: valerie.bojku@kosovorailway.com	Accepted	
Strategic Objective 2:	Geographical position and competitiveness for railway transport flows in Corridor X and the connection with the Port of Durres are the most important limiting factors for the ITS rail systems implementation.		Accepted	
Strategic Objective 2: Paragraph 2.	The main TSI for ERTMS, which is the TSI for the Control-Command subsystem, and the Signalling TSI CCS should also be included.	Zyrafete Zejnullahu - Krasniqi, Deputy General Director of Railway Regulatory Authority Date: 05.12.2023 Email: Zyrafete.Krasniqi@rks-gov.net	Accepted	

Strategic Objective 3	This strategic objective should be deleted since it does not even exist in the Executive Summary, considering that there is no potential for the development of freight and people transportation in the internal waters of Kosovo.		Accepted	
Anticipated Measures				
Measure no. 18 - 23	The following measures should be deleted: Measure 18 Data collection and creation of a database for Water Streams. Measure 19 – Classification of water courses according to international navigation standards. Measure 20 – Researching the possibility of transporting passengers and goods in the rivers of Kosovo. Measure 21 – Investigating the possibility of improving the navigability status of watercourses	Mr. Baton Begolli, dhe Mr. Afrim Lajçi – Advisor for Waters Date: 3.12.2023 Email: Afrim.Lajçi@rks-gov.net Institution: Inter - Ministerial Water Commission	Accepted	

	to the highest navigability class that will enable the transport of goods and people in the Kosovo rivers. Measure 22 – Establishment of collaboration between different government bodies that deal with rivers. Measure 23 - Promotion of sailing for tourism and sport - TSI CCS has been approved by RRA, while TSI TAP and TAF are in the process of approval. - What does the Special Decision mean? The Law on Railways envisages the approval of TSIs through which the preparation/approval of National Implementation Plans is required. RRA has already started this as a process.			

9 – To Objective 2: TSIs Transposition and implementation		Zyrafete Zejnullahu - Krasniqi, Deputy General Director of Railway Regulatory Authority Date: 5.12.2023 Email: Zyrafete.Krasniqi@rks-gov.net	Accepted	

10 – To Objective 2: Increasing the capacities of the Railway Regulatory Authority (RRA), introducing competition and mutual recognition of railway documents	**<u>This measure shall be amended by:</u>** **<u>Increasing the professional capacities of all responsible state institutions (MESPI and RRA).</u>** **<u>Because:</u>** The increase of professional capacities related to systems. such as ITS/ERTMS, is necessary in all institutions responsible for railways. Starting from MESPI, the RRA and the railway companies dealing with their implementation. Builders/designers of the legal framework, including policy makers and regulators, must have sufficient knowledge capacities on the advanced and innovative systems with which the legal infrastructure is built. Since the functional railway bodies (the Licensing Body, the NSA, the Interoperability Body, and the Market Regulation Body) are formed within the structure of the RRA, the professional capacities for ERTMS and the human resources within the RRA should be built.	Zyrafete Zejnullahu - Krasniqi, Deputy General Director of Railway Regulatory Authority Date: 5.12.2023 Email: Zyrafete.Krasniqi@rks-gov.net	Accepted	Measure 10 will be reformulated in building the ITS capacities.

	RRA has its decision-making and financial independence. Every advanced system, with high standards, challenges employees, therefore professional training is planned and foreseen, so that employees are able and ready to professionally fulfill advanced professional and technological innovations. The existing framework guarantees competition in the field of railways and does not present any legal obstacles in this direction.			

– ERMT Involvement from the early stage of infrastructure projects	It is very important to have an inter-institutional discussion on this point, because with the new EU legislation, Interoperability Directive 2016/797, an approval for ERTMS is required from ERA (European Union Agency for Railways. P.S. The agency is ERA. **For reference:** **Point 48 of the introduction of the Interoperability Directive 2016/797** In order to ensure that European Rail Traffic Management System (ERTMS) equipment complies with the relevant applicable specifications and to prevent additional requirements related to ERTMS from impairing its interoperability, the Agency should act as the ERTMS system authority. For this purpose, the Agency must evaluate the technical solutions envisaged before any call for tenders regarding the launched or published ERTMS trackside	Zyrafete Zejnullahu - Krasniqi, Deputy General Director of Railway Regulatory Authority Date: 5.12.2023 Email: Zyrafete.Krasniqi@rks-gov.net	Not accepted	These comments will be provided within the Action Plan, when we will deal with the harmonization of our legislation with the EU legislation.

	equipment, in order to check whether these technical solutions are compatible with the relevant ITS and are fully interoperable. **Article 18 of Directive (EU) 2016 / 797** (a) in the case of track-side control-command and signalling subsystems involving the European Train Control System (ECTS) and / or the Global System for Mobile Communications - Railway equipment (GSM-R), the positive decision of the Agency issued in accordance with Article 19 of this Directive; and, in case of an amendment to the draft specifications of the tender or to the description of the foreseen technical solutions that occurred after the positive decision, compliance with the result of the procedure referred to in Article 30 (2) of Regulation 2016 / 7963. The applicant shall submit a request for the Agency's approval. The application relating to individual ERTMS projects or for a			

	combination of projects, a line, a group of lines or a network, shall be accompanied by a file where they will be included. **Article 19 of Directive (EU) 2016/979** In the case of control-command and signalling subsystems which include ETCS equipment and/or GSM-R equipment, the Agency will ensure the harmonized implementation of ERTMS in the European Union. 1. 1. In order to ensure the harmonized implementation of ERTMS and interoperability at the level of the European Union, before any call for tenders regarding ERTMS deviating track equipment, the Agency will check that the technical solutions envisaged are in compliance with the relevant TSIs and therefore fully interoperable.			

14 – ERTMS implementation	The RRA, according to the Law of Railways drafts the legislation for ERTMS and issues the Authorization for the Commissioning of ERTMS. Therefore, this is also the reason why the involvement of RRA is required.	Zyrafete Zejnullahu - Krasniqi, Deputy General Director of Railway Regulatory Authority Date: 5.12.2023 Email: Zyrafete.Krasniqi@rks-gov.net	Accepted	
15 – ɒn of technical solutions	The RRA, according to the Law on Railways, draws up the legislation for TSI TAF and TSI TAP, and during the issuance of the Safety Authorization and Safety Certificate it checks whether the provisions of these regulations are being implemented, therefore the involvement of RRA is required.		Accepted	
16 – TSI – TAF systems deployment	And RRA.		Accepted	
17 – TSI – TAP systems	And RRA.		Accepted	