

TA to Connectivity in the Western Balkans

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Strategic Framework for implementation of ITS on TEN-T Core/Comprehensive Network on the WB6

Final Report

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List of Abbreviations

AIS	Automatic Identification System
ALB/AL	Albania
AO	Administrative Order
AVL	Automatic Vehicle Location
BIH	Bosnia and Herzegovina
BHRPC	BIH Railways Public Corporation
CA	Contracting Authority
СВА	Cost Benefit Analysis
CCS	Control Command and Signaling
CCTV	Closed-Circuit Television
CEN	European Committee for Standardization
CfP	Call for Proposals
CNC	Core Network Corridor
СО	Country Office
CONNECTA	Technical Assistance to Connectivity in the Western Balkans
CONNECTA	The MMD led Consortium implementing CONNECTA
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 Display and Information System
EMR	Emergency Medical Response
EUAR/ERA	European Union Agency for Railways (the Agency)
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
EU	European Union
EUD	EU Delegation
EURct/km	Euro cent per kilometre
FB	Fire Brigade
FBIH	Federation of BIH (entity of BIH)
FR	Final Report
FRAME	FRamework Architecture Made for Europe
GSM-R	Global System for Mobile Communications - Rail
IFI	International Financing Institution
IM	Infrastructure Manager (refers to railways)
IMO	International Maritime Organization
IPA	Instrument for Pre-accession Assistance
ISM	International Safety Management
ISPS	International Ship & Port Security
IT/ ICT	Information Technologies
ITS	Intelligent Transport Systems
IWW	Inland Waterways
IR	Inception Report
KE	Key Expert

KfW	Kreditanstalt fur Wiederaufbau (Bank)
KoM	Kick-off-Meeting
KOS	Kosovo* (hereinafter referred to as Kosovo)
LRIT	Long Range Identification & Tracking
MED	Mediterranean (corridor)
MKD/MK/MAC	the former Yugoslav Republic of Macedonia
MIS	Management Information System
MNE/MON	Montenegro
MoM	Minutes of Meeting
MoTC/Mol/MoCTI	Ministry related to Transport and Infrastructure
NIPAC	National IPA Coordinator
NKE	Non-Key Expert
NTCIP	National Transport Communication for ITS Protocol
NCTS	New Computerised Transit System (Customs related)
OEM	Orient East Mediterranean (corridor)
OHVD	Over-height vehicle detection
PM	Project Manager
QA	Quality Assurance
RFA	Request for Approval
RIS	River Information Services
RS	Republic of Srpska (entity of BIH)
RU	Railway Undertaking (refers to rail operators)
SC	Steering Committee
SEE	South East Europe
SEETO	South East Europe Transport Observatory
SNKE	Senior Non-Key Expert
SRB/SER	Serbia
ТА	Technical Assistance
TAF - TAP	Telematic Applications for Freight/Passenger services (railways)
TBD	to be defined
TCC	Traffic Control Centre
тст	Transport Community Treaty
TEN-T	Trans-European Network – Transport
TETRA	Terrestrial Trunked Radio
TL	Team Leader
TM	Task Manager
ToR	Terms of Reference
TSI	Technical Specifications for Interoperability
UIC	Union Internationale des Chemins de Fer
V2I – I2V	Vehicle to Infrastructure (and vice versa)
VDR	Visual Data Recorder
VMS	Variable Message Sign
VTMIS	Vessels Traffic Management and Information System
WB6	Western Balkans 6 Regional Participants
WB (G)	World Bank (Group)
WIM	Weight-in-Motion

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

SYNOPSIS

Project (sub-project) Title:	Strategic Framework for implementation of ITS on the TEN-T Core/Comprehensive Networks in WB6 (CONNECTA-TRA-CRM-REG- 03)
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Consultant:	CONNECTA Consortium (led by Mott MacDonald)
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Responsible Transport KE:	Kostas Georgiou

Executive Summary

The purpose of this TA was to develop a Regional ITS Strategic Framework for the extension of the Core and Comprehensive Trans-European Transport Networks in the Western Balkans region. This consists of numerous Road and Rail Corridors and Routes, the inland waterways of Danube, Sava and Tisa Rivers, IWW- and Sea-ports and airports. The transport sectors covered by this subproject are Roads, Railways, Inland Waterways and Maritime/ Sea-Ports, and consequently their networks, links and nodes: 5,470km of Roads, 4,017km of Railways, 1,345km of inland waterways, four IWW-ports and four seaports.

Using data/ information/ documents made available; questionnaire surveys for user needs assessment; missions for meetings with stakeholders in all Regional Participants; desktop research and in-house analysis, the subproject concluded the following:

Current state of play of ITS deployment and user needs assessment

ITS implementation in the region is limited to road sections and tunnels newly constructed or currently under construction, to railway upgrade/ modernisation projects underway, to River Information Services established on the Danube and partly on the Sava River, and to Vessel Traffic Monitoring Information System, also partly implemented. It is uncoordinated at regional level and also at RP level. ITS are developed separately for every mode, usually with insufficient collaboration and coordination.

ITS application deployment is still in its infancy. This can be considered as advantage because WB6 Regional Participants can avoid the friction of legacy systems and easily build a state of the art ITS Architecture at RP level, based on a regional one, providing specifications that enable compatibility of information delivered to end users through different media. In addition, the following can be achieved: compatibility of equipment with infrastructures, thus enabling seamless travel across Europe; a basis for national and/or regional authorities to produce master plans and recommendations to facilitate ITS deployment; an open market for services and equipment where compatible subsystems are offered (no more ad-hoc solutions); and a known marketplace into which producers can supply products with reduced financial risk.

A prerequisite for the above is the dissemination and raising of awareness of ITS benefits to the stakeholders and wider public. The latter has been identified as one of the regional barriers hampering ITS implementation, together with a lack of relevant legislation and scarcity of funds. Additionally, WB6 Regional Participants are facing two main challenges: the necessary changes at institutional level to abolish different and contradictory legislation by adopting the EU's ITS guidelines and standards and the promotion of best practices.

Legal framework and technical standards

A series of actions have to be taken in order to proceed with ITS and IT deployment, concerning transposition of the EU acquis, as well as mandatory use of the relevant standards. Interoperability is an imperative of an ITS EU-wide system and the application of CEN/ CENELEC related standards is crucial for its effectiveness and efficiency. For implementation of obligatory standards, article 8 of the 2010/40/EU Directive highlights that interoperability should be strongly supported by the provision of standards by the relevant standardisation bodies. Standards are needed to address interoperability at different layers in the ITS architecture and issues of data compatibility across ITS applications and services.

The application of standards ensures a coherent national ITS system and enables integration of its components into European and international systems. CEN/TC278 standards have been and are being

adopted by the corresponding national standardization body. What is common practice in all WB6 beneficiaries is that following the standards is on a voluntary basis and so stakeholders responsible for the ITS adoption and implementation are not aware of the existence of these standards.

General recommendations for all Regional Participants are to:

- Transpose the EU ITS Directive 2010/40/EU and Delegated Acts;
- Adopt all CEN/TC 278 standards;
- Make the above two obligatory to follow by adopting ITS Strategy and Action plans as well as through implementation of provisions of related EU directives (supplementing 2010/40/EU);
- For all transport modes to transpose the relevant Regulations and Directives and respective technical standards and specifications (ERTMS/ TSI/ TAP/ TAF for railways, RIS Directive for Inland Waterways, VTMIS/ IMO SOLAS for maritime);
- For the ICT domain, to transpose the relevant EU legislative and regulatory framework (cybersecurity, personal data protection, electronic communications, liability, cross-border ticket sales and passenger rights, e-Document, e-Customs and Integrated Border Management) and promote implementation of the WB Digital Agenda.

It is essential for all RPs to establish communication and cooperation between different ministries with expertise in different fields of application of ITS (Ministries competent for Infrastructure, Transport, Communications, Environment, Regional Affairs, Interior Affairs, Innovation, Economy, Economic Development and Research). This communication and cooperation should be more than declarative and be obligatory. Considering that end-users of ITS are participants in traffic, road maintenance companies, traffic safety competent authorities and transport operators, the lead should be given to a competent ministry for transport. In order to reach effectiveness and boost ITS deployment, it is recommended to use positive political will and existing regional and national frameworks and legal acts. In this regard, commitments should be made through ratifying and applying the Transport Community Treaty (TCT), referring to Annex I.3 Rules Applicable to Road Transport – Regulatory Area: Intelligent Transport Systems. Moreover, it is recommended to establish a national ITS body, which will gather and enforce the mentioned interdisciplinary cooperation, coordinate legislative acts, projects and other ITS-related activities of competent authorities and other stakeholders.

Impact assessment and costs - benefits calculation

A variety of positive effects (impacts) have been identified, illustrating a wide range of benefits expected from ITS deployment in the region. Given the constraints of data unavailability, but also considering the strategic nature of the project, it was not possible to quantify many of the expected benefits and assess them in more detail. This requires a section-by-section approach (with regard to roads and railways) and project-specific analysis (applies for all transport modes), which was beyond the scope of the exercise.

Nevertheless, from the rough estimations made for costs, it is inevitable that, given the low starting point of the WB6, a significant volume of implementation costs is needed:

- Roads (regional level): c. € 248 million implementation cost, plus € 18.6 million annual operation and maintenance costs (including the respective costs for control centres).
- Railways (regional level, ETCS L2): c. € 512 million implementation cost (without costs for on-board units included), plus € 6 million for annual trackside maintenance costs.
- RIS (BIH, SRB): c. € 7.6 million for new RIS on Sava and Tisa Rivers, plus € 0.22 million annual operation and maintenance costs of RIS on the entire IWW network.
- VTMIS (ALB, MNE): € 5-7million for each system (depending on the starting point of VTMIS implementation, coverage of VTMIS and the number of repeaters), plus 10% of implementation cost for annual operation and maintenance costs.

Even from the few benefits that have been quantified for the case of Road ITS and ERTMS, it is obvious that the return on investment is expected to be considerably high and this is a safe estimate without considering the qualitative benefits described for all transport modes:

- Roads (regional level): c. € 185 million annually from times savings (without considering traffic growth) and c. € 4 million annually from accident cost reduction.
- Railways (regional level): c. € 38 million annually from time savings (without considering traffic growth).
- RIS (BIH): no benefits quantified. However, these would emerge from reduced fuel consumption (2.7% on average on annual basis), reduced pollutants emissions of € 2 per vessel-km, improved vessel utilisation, reduced delays and waiting times, avoidance of accidents and collisions and higher safety performance, improved logistics planning for shippers, increased efficiency of customs and law enforcement procedures, lock and bridge operation, waterway maintenance, etc.
- VTMIS (ALB): no benefits quantified. However, these are expected from higher safety and security at sea and at ports, better protection of the environment, increased efficiency of port operators and coastal states and reduction of operational costs of ports and port facilities. It is noted that prevention of a sea accident could save anywhere from thousands up to a few billions of euros.

Overall, ITS deployment, in combination with large infrastructural projects that are either on-going or underway, will entail substantial benefits for RPs and at regional level, enhancing safety and security, boosting the economies and increasing the overall attractiveness of the WB transport network for both mobility of persons and transport of goods.

Regional vision, Strategic Framework and Roadmap

Understanding the needs, as well as the existing (or perceived) barriers, was the first step towards the definition of a common vision and strategy for the region. Common problems produce common needs that require a common approach. The EU provides all the necessary tools to achieve common regional ITS Architecture and goals. Building a common regional ITS Strategy anticipates helping WB6 countries to build their own harmonized ITS Architecture. For WB6, having an ITS Architecture per RP is recommended, which shall provide specifications that enable:

- Compatibility of information delivered to end users through different media;
- Compatibility of equipment with infrastructures, thus enabling seamless travel across Europe;
- A basis for national and/or regional authorities to produce master plans and recommendations to facilitate ITS deployment;
- An open market for services and equipment where compatible subsystems are offered (no more adhoc solutions);
- A known marketplace into which producers can supply products with reduced financial risk.

The following vision has been formulated to reflect the aspirations towards the Strategic Framework definition: Intelligent Transport Systems development in the entire SEETO area will contribute significantly to the creation of an integrated, safe and efficient transport network and will be a policy axis for ensuring sustainable mobility of people and transport of goods, development, employability and social cohesion in the Western Balkans region.

The challenges related to the specific characteristics of the economy, geography, employability and competitiveness of each WB6 RP, form the basis of the regional strategic planning. The strategic objectives must be structurally and dynamically interconnected among each WB6 RP because of their multiplier effects at regional and RP level.

A prerequisite for a common regional ITS strategy as part of the TEN-T network, is the adoption of EU directives, laws and standards for each RP and the creation of a national strategy for ITS development in each RP should be based on the regional strategy, the European transport policy and the wider

economic-business environment in the WB6 region aiming at the best possible integrated and structured policy.

Given that the technical and legal ITS framework in WB6 is either non-existent or still at an early stage of development, a series of administrative and legislative actions are required that will ensure the smooth operation and deployment of ITS across the region. All proposed actions of the Roadmap serve the Strategic Objectives horizontally, considering that the overall vision is ITS development, which contributes simultaneously to the objectives.

The table below summarizes the required actions included in the Strategic Framework that should form an integral part of each ITS National Strategy and Action Plan to enable the development and creation of an integrated framework for the operation of ITS in a coordinated and consistent way, upon consultation with stakeholders. The table provides the required actions, the objectives - in terms of expected outcomes – and the target year of achievement. Furthermore, it is noted that each national operational framework should be aligned with the European framework, as formed by EU institutions.

S/N	Action	Sub-actions	Goal	Target Year
1	Transposition of EU	Transposition of EU Directives	Completion of Institutional Framework	2019 - 2020
	Legislation	Developing a legal framework, where required	Policy Making	2019 - 2020
2	Adoption and implementation of EU Standards	Ensuring the use of European standards and specifications for all new projects and upgrading old ones (if the case)	Completion of Institutional Framework Policy Making	2020
3	Adoption and implementation	Creating a framework for each RP's ITS architecture and ITS systems	Creation of ITS Framework	2019 - 2020
	of EU ITS Framework Architecture	Adopting the European framework and adapting to each RP's needs and objectives	Creation of ITS Framework	2019 - 2020
		Active involvement of RPs in ERTICO and other transport related bodies.	Capacity building Policy Making	2019 - 2020
4	Adoption of EU Interoperability and Data Exchange Framework	Adopting the EU interoperability framework and a mechanism for the exchange of ITS data at regional level (DATEX II, ERTMS, C-ITS, EETS)	Development of common standards and interoperability requirements at RP level, for integrating traffic management systems and other traffic data sources	2019 - 2020
5	Development of ITS Strategies and Action Plans at	Creating a Strategy and a General Development Framework for ITS at RP level	Ensure alignment with the common regional Vision and Strategic Objectives	2019 - 2020
RP level		Signing of a Memorandum of Understanding between WB6 RPs, committing to the common ITS Vision and its strategic objectives	Establishment of a common regional understanding on ITS and its benefits	2019
Deplo and p	yment of ITS in e rogress made for	each RP, depending on the starting point the other actions	Gradual and coordinated implementation of ITS	2020 - 2025 - 2030

 Table 1 Required actions of Strategic ITS Framework

This general Roadmap is further specialised in the following series of tables, per mode of transport:

Table 2 Roads/ Cross-modal and ICT Regional Roadmap

Field of	Action	Objective	Sub-actions/ Details	Target	year pe	r Region	nal Partio	cipant	
intervention				ALB	BIH	MKD	MNE	SRB	KOS
Institutional – Legal/ Cross-	Developing a clear Strategy and Action Plan for ITS deployment	Policy Making	Elaboration of an ITS Strategy and Action Plan according to the user needs and aligned with the Regional ITS Strategic Framework	2020	2020	2020	2020	2020	2020
modal and ICT	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	Directive 2010/40/EU - Framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes Directive 98/34/EC - Establishment of a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services Directive 2007/2/EC - Establishment of spatial information infrastructure for integrated access to travel data Directive 2016/1148/EU - Network Information Security with mandatory implementation for operators of essential services in the transport areas Directive 2016/1148/EU - Network Information Security with mandatory implementation 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	2020	2020	2020	2020	2020	2020
Institutional/ Road	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	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	2020	2020	2020	2020	2020	2020
Organizational/ Cross-modal	Signing of a Memorandum of Understanding between public and private entities, which shall specify the actions under the RP's strategy.	Policy Making	Upon signing of the MoU by ITS stakeholders, a well-defined group of agencies shall be created to undertake the promotion and implementation of projects required for the deployment of ITS.	2019	2019	2019	2019	2019	2019
	Establishment of a performance monitoring framework	Performance Monitoring	Set up of national framework for performance reporting and monitoring as part of national ITS Strategy and Action Plan and within TEN-T reporting guidelines under Directive 2010/40/EU	2019	2019	2019	2019	2019	2019
	Supporting research and technological development. Make promotions and publicity activities.	Promotion of ITS at RP and regional level	Adopt a framework for developing innovative applications and products for ITS and promoting their use. This can be achieved by creating actions focused on research between research institutions, organizations and companies. Inform stakeholders and wider public about new ITS applications.	2025	2025	2025	2025	2025	2025
Technical/ Cross-modal	Adoption and mandatory application of standards	Legal & Technical framework	Mandatory application of DATEX II (CEN/TS) and CEN/TC 278 Standards	2019	2019	2019	2019	2019	2019
and ICT	Implementation of ITS Services Bundle* 1	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2020	2020	2020	2020	2020	2020
	Implementation of ITS Services Bundle 2	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2025	2025	2025	2025	2025	2025
	Implementation of ITS Services Bundle 3	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2030	2030	2030	2030	2030	2030

* ITS Services have been classified in three bundles, according to the current state of play and the users' needs assessment.

Table 3 Railways Regional Roadmap

Field of	Action	Objective	Sub-actions/ Details	Targe	t year pe	r Region	al Partic	cipant	
intervention				ALB	BIH	MKD	MNE	SRB	KOS
Institutional – Legal	Implementation of EU Interoperability Directive (2008/57/EC) as main legal basis	Completion of Institutional Framework Policy Making -legal basis	 Adoption of relevant EU Interoperability Directives Acceptance and adoption by standardisation authorities as national ITS standards Preparation of necessary bylaws 	2020	2022	2019	2020	2019	2020
	Implementation of Technical Specifications of Interoperability for Control Command and Signalling (TSI CCS) as main technical standards basis	Completion of Institutional Framework Policy Making -technical and standards basis	-Adoption of relevant EU Regulations and TSIs -Acceptance and adoption by standardisation authorities as national ITS standards -Preparation or adaptation of national standards, if necessary	2021	2023	2020	2021	2020	2022
	Implementation of TSI for TAF ITS applications	Institutional basis for further ITS adoption	Adoption of Regulation No 1305/2014	2030	2030	2030	2030	2030	2030
Organizational	Preparation of National Implementation Strategy for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Appoint technical team (in-house or consultant) to develop/ update ITS Strategy Develop stakeholder group and assess user requirements Define and prioritize ERTMS goals, they should provide (safety, reliability, compliance with EU, lower maintenance costs) Define priority directions, alignment and sections to be implemented with ERTMS Define long term goals (cross border interoperability, high traffic, high speeds) Develop and validate ITS Action Plan and assess cost-benefit of proposed projects Finalise ITS Strategy and Action Plan 	2022	2024	2021	2022	2020	2023
Organizational – Technical	Preparation of Technical Requirements for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Define national standards within TSI (balise alphabet, standard HMI interface, frequencies used by GSM-R, minimum trackside bandwidth etc.) develop signalling implementation and maintenance manual for the network encompassing both current legacy system and ERTMS as defined in previous steps 	2023	2025	2022	2025	2022	2024
	Preparation of Technical Requirements for implementation of Secondary ITS (bundle* 2) (TAF/TAP, CIP, PCS, TIS, CIS, CCS TAF, ORFEUS, ISR, CoReDa, WMI)	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Establish an ITS Coordination Team Define the requirements needed for implementation (input data from existing signalling systems, safety protocols, level of access to internal railway network) Join relevant data and international providers networks (such as RNE) 	2030	2030	2030	2030	2030	2030

* ITS Services have been classified in two bundles, according to the current state of play and the users' needs assessment. ERTMS is bundle 1 and all other Rail ITS applications are in bundle 2.

Field of	Action	Objective	Sub-actions/ Details	Target	year pe	r Region	al Partic	ipant		
intervention				ALB	BIH	MKD	MNE	SRB	KOS	
Technical	Development of necessary project documentation	Justification of investment	 Develop detailed CBA and Feasibility studies Develop Preliminary and Main design Prepare the tender documentation¹ 					ecurring		
	Pilot implementation of ERTMS, with the assumption that most of the relevant short-term goals have been achieved (Implementation of ITS systems on the highest priority reconstructed or newly built alignments)	Deployment first phase – a pilot deployment	Implementation and commissioning	2025	2026	2023	2026	2023	2025	
	Evaluation of ERTMS implemented in the previous step; Whether goals are achieved and in what degree, insight into possible unexpected side benefits, cross correlation with new technology developments and international trade routes developments	Evaluation of first phase implementation	Evaluation of feasibility study results and expected outcomes; Possible adaptation of National Implementation Strategy according to results	2028	2029	2025	2029	2025	2026	
	Wide scale deployment of ERTMS	Deployment second phase; a wider deployment of a proven system Possible upgrade of existing implementations with newly developed technology if deemed worthwhile in previous step	Tendering, Design, Implementation and Commissioning in line with proven features, updated strategy and international agreements	2030	2030	2030	2030	2030	2030	
	Implementation of secondary ITS (bundle 2) - TAF/TAP, CIP, PCS, TIS, CIS, CCS ORFEUS, ISR, CoReDa, WMI	Deployment	Tendering and Production of Preliminary and Main Design, implementation and commissioning	2030	2030	2030	2030	2030	2030	

¹ First for selected project to be piloted and then for the rest of the network according to selection in national strategy.

Table 4 Inland Waterways Regional Roadmap

Field of intervention	Action	Objective	Sub-actions/ Details	Target year Regional Pa	per articipant
				BIH	SRB
Institutional – Legal	Table of Concordance between all relevant EU Directives and BIH legislation (96/75/EC, 87/540/EEC, 96/50/EC)	Completion of Institutional Framework Policy Making	Gap analysis/ evaluation for transposition of EU legal framework	2018	-
	Strategy on IWW development and Draft Law on navigation (and Inland Ports)	Completion of Institutional Framework Policy Making		2019	-
	Law on navigation and Inland Ports	Completion of Institutional Framework Policy Making		2019	-
	Implementation of Directive 2005/44/EC of the European Parliament and of the Council of 7 September 2005 on harmonized RIS on IWW in the Community	Completion of Institutional Framework Policy Making		2020	-
	Review of the existing legislation: requirement for compliance with Directives in AA, adjustment of national legislation – Mandatory use of RIS on all IWW	Completion of Institutional Framework Policy Making	Legislation adjustment	2025	-
Organizational	Establishment of authorized institution with jurisdiction over all aspects of IWW development (including RIS activities)	Promotion at RP level (institutional building)	Based on existing agency-models in EU and as such, recognized in the national legislation related to IWW, with clear separation of regulatory from executive powers in IWW-subsectors	2020	-
	Capacity building – training	Promotion at RP level (institutional building)	Regular training of institutional staff (management and employees)	Recurring	-
Technical	ToR for the Technical documentation for RIS implementation	Preparation for deployment		2018	-
	Technical documentation for the RIS implementation on Sava River: procurement procedure for consultancy service	Preparation for deployment		2019	-
	Preparation of technical documentation for RIS implementation on Sava River	Preparation for deployment	Full documentation preparation Financing	2019	-
	Implementation of the RIS on Sava River, basic scenario	Deployment		2020	-
	Implementation of additional services, accordingly with legal regulation adjustments	Deployment	Full documentation preparation Financing	2025	-
	Implementation of additional RIS services, AtoNs (Adds to Navigation)	Deployment	Full documentation preparation Financing	2030	-
	Technical documentation and specification for RIS implementation on Tisa River	Preparation for deployment	Full documentation preparation Financing	-	2019
	Development and installation of the navigation monitoring and electronic fairway marking system on the Danube River (AtoNs)	Deployment	On-going	-	2019
	Implementation of a system of modern hydro- meteorological stations	Deployment		-	2021
	Implementation of the RIS on Tisa River	Deployment		-	2020
	Establishing of VTS and VHF radio-telephone system along IWW	Deployment		-	2021
	RIS implementation on entire Canal –system Danube- Tisa-Danube	Deployment		-	2025
	RIS support to the ship waste disposal operations	Deployment		-	2030

Table 5 Ports/ Maritime Regional Roadmap

Field of intervention	Action	Objective	Sub-actions/ Details	Target year per Regional Participant	
				ALB	MNE
Institutional – Legal	Evaluation of current harmonization status and prioritization of the most urgent EU Regulations and Directives to be transposed	Completion of Institutional Framework Policy Making	Prioritization and transposition of EU Directives and implementation of EU/IMO requirements. VTMIS regulatory regime preparation.	High→2020 Medium→ 2 Low→2025	022
Organizational	Establishment a "Coordination team for VTMIS"	Policy making Coordination and monitoring	Coordination team to act as focal point between the Administration and EU/IMO	2018	2018
Technical	Technical documentation and specifications for VTMIS implementation on the Core Ports and other ports	Deployment preparation	VTMIS system for the Core and other ports has to be established and be compatible with any existing VTMIS system and EU/IMO requirements Full documentation preparation Tender preparation Financing	2020	2020
	Evaluation of the existing VTMIS system data input/output in relation of the stakeholders needs and expectations and establish a common software input/output	Deployment preparation	The whole data input/output procedure has to be decided based on EU specific guidance	-	2021
	Implementation of the unified software including data input/output to all VTMIS systems	Full VTMIS System in operation	Includes training of personnel	2022	2022
	Technical documentation and specifications for SafeSeaNet implementation	Deployment preparation	Full documentation preparation Tender preparation Financing	2023	2023
	Implementation of the unified software including data input/output to all SafeSeaNet systems	Full Operation of SafeseaNet	Includes training of personnel	2025	2025
	Technical documentation and specifications for CleanSeaNet implementation	Deployment preparation	Full documentation preparation Tender preparation Financing	2025	2025
	Implementation of the unified software including data input/output to all CleanSeaNet systems	Full Operation of CleanseaNet	Includes training of personnel	2028	2028
	Examination of technical aspects for optional EU Pilot Projects	Participation in EU pilot projects and initiatives	Establishment an Expert team to decide the technical aspects for participation in EU Pilot Projects Preparation of Feasibility & cost-effective plan	2030	2030

Using the previous work done by SEETO as basis and building on the available knowledge and the updated information provided on progress during recent years in each Regional Participant and in the EU concerning legislative and technological improvements, and in line with the Connectivity Reform Measures, the provisions of the Transport Community Treaty and its respective emerging obligations, the Strategic Framework and Roadmaps constitutes a reference for the Regional Participants.

The development of tailor-made ITS Multimodal Strategies and Action Plans should be a first priority for the Regional Participants. This will be as per the expectations of the European Commission a) for accelerating and making decisive steps in the necessary reforms and adoption of the EU acquis and b) for establishing and ensuring an interoperable transport network in the region with standards equal to TEN-T, including ITS architecture, applications and services.

By the end of this subproject, advanced discussions had been entered into with most of the RPs for potential elaboration of ITS Multimodal Strategies and Action Plans in the CONNECTA framework. CONNECTA remains available to support the RPs through additional sub-projects in the field of ITS development, provided that they are aligned with the Strategic ITS Framework and recommendations made, the RPs overall Transport Strategies and, above all, in the direction of harmonization with the EU Legislation and Standards and serving the scope of the Connectivity Agenda.

1 Introduction and background

1.1 Background

1.1.1 Comprehensive and Core TEN-T and Core Network Corridors

The TEN-T Regulation 1315/2013 forms the current legal basis for the development of the Trans-European Networks $(TEN-T)^2$. The European Commission has concluded that the TEN-T network would best be developed through a dual-layer approach, consisting of a Comprehensive Network and a Core Network.

- The Comprehensive Network constitutes the basic layer of the TEN-T. It consists of all existing and planned infrastructure meeting the requirements of the TEN-T Guidelines. The Comprehensive Network is to be in place by 31 December 2050.
- The Core Network is a focused sub-set of the Comprehensive Network, overlaying it, to connect the strategically most important nodes, hubs, and links/routes of the Comprehensive Network.

Therefore, only parts of the Comprehensive network are selected for the Core Network, which are essentially the components of TEN-T with the highest European added value in terms of addressing cross-border missing links, key bottlenecks, and multi-modal nodes. The Core Network is to be in place by 31 December 2030.

In a future EU enlargement, the transport networks of future Member States would be required to be integrated into the EU TEN-T Network at any given time. Coherence between the network development and compliance with EU regulations would undeniably enhance the integration process.

The Western Balkans Comprehensive Network is strategically located with regard to the European Transport system. It constitutes a physical transport corridor that enables the continuity of different parts of the TEN-T Network, providing connections for the Central European Countries to the Black Sea and further beyond to Asia. In June 2015, the transport infrastructure related Ministries of the WB6 and the European Commission (DG NEAR and DG MOVE) indicatively identified the main transport axes that will be connected to the existing TEN-T Core Network Corridors³. This was carried out in accordance with the application of the *"Planning methodology for the trans-European transport network (TEN-T)*4)", which sets out many of the specific criteria to identify the network's Core nodes and subsequently, Core links in terms of connecting Core nodes.

The WB6 agreed on the alignment of their core transport networks, which shall be developed in line with EU recommendations. Independently from their anticipated future membership of the EU, these countries are already moving towards improving their transport systems in terms of both infrastructure and operational measures.

² Recently amended (Commission Delegated Regulation (EU) 2016/758 of 04.02.2016).

³ as considered by Article 8 of the Regulation (EU) 1315/2013. The indicative extension of the TEN-T Network to the Western Balkans Region is articulated in EC Regulation 2016/758, which amended the TEN-T Regulation.

⁴ Building the Transport Core Network: Core Network Corridors and Connecting Europe Facility {COM (2013) 940 final}.

Furthermore, in June 2015, during the TEN-T Days in Riga, three of the nine identified Core Network Corridors (CNC) were provisionally extended for the Western Balkans. The three identified CNCs are:

- the Orient-East Mediterranean (OEM) Corridor which connects central Europe with the maritime interfaces of the North, Baltic, Black and Mediterranean seas;
- the Mediterranean (MED) Corridor which links the Iberian Peninsula with the Hungarian-Ukrainian border,
- the Rhine/Danube Corridor which provides the main east-west link between continental European countries, connecting France and Germany, Austria, the Czech Republic, Slovakia, Hungary, Romania, and Bulgaria all along the Main and Danube Rivers to the Black Sea.

1.1.2 ITS in the regional institutional transport context

The development of the Comprehensive and Core Network, up to the TEN-T standards with the aim of attracting international traffic flows and increasing the regional mobility along the Network, remains a prevailing goal of the regional transport cooperation conducted under the umbrella of SEETO. Recent development confirmed the Comprehensive and Core Network in Western Balkans based on the networks established under SEETO MoU. In addition, transport infrastructure should also be supported by efficient integrated traffic management systems. Therefore, further integration of the SEE transport system in the European remains a priority for the region over the long term. Enforcement of market rules in transport, removal of transport non-physical barriers, as well as enhancing the ICT services in transport, are important issues for transport facilitation.

The Berlin Process and the Vienna Summit provided a real opportunity to improve connectivity within the Western Balkan region as well as with the EU. At the Vienna Summit both infrastructure and soft investment priorities were agreed. One of the soft measures identified is the deployment of Intelligent Transport Systems (for all modes) on the Core Network. Furthermore, deployment of ITS (all modes) is one of the infrastructure requirements stated in the new TEN-T guidelines.

Previously, Regional Participants agreed on the Core Network for the region, extending the European Core Network to the Western Balkans, allowing speeding up policy and regulatory reforms and concentrate investments on key corridors and interconnectors. Among these soft measures, deployment of various information systems in transport (and wider) up to 2020 is envisaged. This project addresses a soft measure, which is needed, alongside infrastructure investments, to create an efficient and smooth functioning transport system in the SEE.

Currently, the Regional Participants are at different stages of introducing ITS systems, without a coherent introduction of the ITS on even a national level (different transport modes), usually without the necessary interconnection between modes and between different systems at national and international level. Since deployment of the ITS is a requirement according to several EU legislative acts, one regional strategy showing the gaps, costs and impact of the introduction of the IT systems is required. Next to this, impact of the introduction of e-document IT systems should be thoroughly assessed and analysed.

Furthermore, since the WB6 Connectivity initiative expects results and concrete implementation by 2020, one regional deployment plan of IT systems would facilitate introduction and ensure interoperability of the systems in the Western Balkan region.

1.2 Project purpose and objectives

Intelligent Transport Systems (ITS) can significantly contribute to a cleaner, safer and more efficient transport system. They can make transport safer, more efficient and more sustainable by applying various information and communication technologies to all modes of passenger and freight transport. Moreover, the integration of existing technologies can create new services. ITS systems are key to supporting jobs and growth in the transport sector. In order to be effective, the roll-out of ITS needs to be coherent and properly coordinated across the sector, covering the different modes and all the countries of the region. The cumulative impact of low utilisation rates of available infrastructure and low conversion efficiency and sub-optimal resources has resulted in uncompetitive transport costs (in many cases cross-subsidised by inadequate environmental protection) and transport interconnections that are insufficient to support the free flow of goods and people.

Advanced information and communication technologies (ICT) can greatly contribute towards comodality by improving infrastructure, traffic and fleet management, facilitating a better tracking and tracing of goods across the transport networks and better connections between businesses and administrations. However, a number of obstacles to a more widespread and seamless use of ICT in freight logistics need to be overcome, including the insufficient standardisation of the respective information exchanges and market actors' disparate capabilities to use ICT. Legal requirements may also hamper the use of ICT. In addition, data security and privacy issues must be taken into account.

In the current SEE economic environment, industrial operation depends on the availability of transport, new innovative solutions and improved utilisation rates of the transport infrastructure. There is thus a need for the improvement in the quality of the available information for the transport stakeholders (ITS, ERTMS, RIS, tracking and tracing systems, e-documents, etc.), which would tremendously improve the capacity of the existing infrastructure and increase reliability and punctuality of transport.

The aim of this CONNECTA sub-project was to provide a strategic framework for the ITS (ERTMS, ITS, RIS, VTMIS, e-freight) and IT system (e-documents, interfaces etc.) deployment in the SEE through targeted action plans for each mode and their interfaces and a portfolio for enhancement of transport flows in the SEE region and integration of all transport modes together with the other public systems (customs, border police etc.). Most of the existing telematics applications in the region have been developed and implemented according to national norms and standards. This hampers the continuity of information services across borders, a key factor for ensuring the quality of international transport services, notably in the fast-growing segment of international freight services.

Implementation of the ITS in the region is not coordinated on a regional level and in most cases not even on a national level. Currently, in every Regional Participant ITS and IT systems are developed for every mode separately, usually with insufficient coordination. The project addresses this issue and proposes the framework for ITS and IT system deployment for all transport modes and their interfaces on a regional level as well as the introduction of e-documents, based on the guidelines of the European Union's Directives dealing with ITS ("ITS directive"-road, TAP/TAF-rail, RIS-river, VTMIS and e-Maritime-sea, e-Freight, White Paper on multimodal transport of goods, etc.) EU legislation and standards, latest electronic data exchange initiatives and the WB6 process.

Furthermore, it delivers the regional and national roadmaps for future implementation of the ITS and corresponding IT systems in the region according to EU rules and taking into account the current implemented systems. The main potential of introducing ITS and telematics solutions in South East Europe is in the reduction of transport times, improved safety and capacity.

1.3 Activities carried out

The project activities were initially codified as follows:

- (i) Identify user needs and specific objectives at national level for all transport modes;
- (ii) Assess the ITS (ERTMS, ITS, RIS, VTMIS, e-freight etc.) and IT (tracking and tracing, interfaces modes, border authorities etc.) system needs, requirements and priority ITS services in WB region (especially the connection between the needs and requirements set by the TEN-T Guidelines, more specifically Core Network standards);
- Legal approximation of regional ITS legislative acts and further recommendation for what still needs to be achieved to be in line with the EU acquis This includes draft proposal of legislative acts which would need to be adopted by RPs;
- (iv) Assess the EU standards and specifications and propose equal standards and technical specifications relevant for ITS implementation in Western Balkans;
- Undertake cost and benefit calculation of the introduction of ITS (ERTMS, ITS, RIS, VTMIS etc.) and IT systems in WB, which includes rough cost and benefit estimates for infrastructure, operational and institutional establishment;
- (vi) Carry out impact assessment of the introduction of ITS (ERTMS, ITS, RIS, VTMIS etc.) and IT systems in WB;
- (vii) Develop regional ITS vision and key strategic directions to ensure harmonized regional ITS development;
- (viii) Develop the regional strategic framework together with road maps and deployment plans for each Regional Participant per transport mode in line with the national strategies;
- (ix) Guidance and assistance to the Regional Participants in the preparation of national ITS strategies (e.g. capacity building minimum 30 days for the preparation of national strategies).

For the scope of the entire project, multiple data, information and documents were obtained from different sources, but mainly from the RPs. Their type and description were discussed during the sub-project's Kick-off Meeting and in the Inception Report per type of mode and horizontally for the field of IT regarding intermodal interfaces.

Further to their initial definition, the data, information and documents requirements were particularised to address all components relevant to ITS (institutional, legal, financial, technical, barriers and potential impacts) and points of discussion with stakeholders, in view of performance of missions to the RPs.

More specifically, a series of tools were developed, in the form of questionnaires, points of discussion and request for data – documents – information provision:

- Questionnaire-Points of discussion about Roads, ITS Directive and Key Performance Indicators (relevant for all modes);
- Questionnaire-Points of discussion about Railways;
- Questionnaire-Points of discussion about Maritime transport Ports;
- Questionnaire-Points of discussion about Inland Waterways;
- Questionnaire-Points of discussion about ICT (relevant for all modes); and
- Questionnaire Economics (relevant for all modes).

Additionally, for the scope of user needs assessment, an on-line surveying tool was developed, aiming to expand the outreach of the survey, i.e. to cover as much as possible a wider range of the targeted groups of stakeholders (business, industry, academia, operators, users' associations, etc.). The on-line questionnaire was initially developed in English, but after consultations with the RPs, it was translated into all languages used in the region. It was sent to the Focal Contact Persons and forwarded to the stakeholders and, in many cases, published on the Ministries' websites.

The foreseen project outputs according to the deliverables described in the ToR included seven reports in total that follow the project progress, i.e. correspond to the milestones of the project and are used for monitoring and evaluation purposes.

Additionally, for monitoring and coordination purposes, as well as for reporting purposes at regular periods at CONNECTA project level, monthly progress reports were submitted both to SEETO and internally to the CONNECTA TL. The list of deliverables and their submission dates are presented in the table below:

Deliverable	Description	Activities covered	Delivery date (first submission)	Delivery date (resubmissions)
1. Inception Report	Assignment methodology, staffing and time schedule. review of existing studies and stock taking	(all, at inception level)	03 July 2017	02 August 2017
2. Report 2	Scoping and needs Assessment	i, ii	20 December 2017	28 December 2017
3. Report 3	Assessment of standards and specifications - Approximation of National ITS Legislations	iii, iv	09 February 2018	-
4. Report 4	Cost estimations and impacts assessment	v, vi	25 April 2018	27 June 2018
5. Report 5	Regional Vision and Strategic framework for ITS and Roadmaps per RP	vii, viii, ix	30 June 2018	24 September 2018 31 October 2018
 Draft Final Report 	Consolidation of key-findings from all activities-reports	(all)	09 November 2018	-
7. Final Report	Finalised version, taking into account comments of stakeholders	(all)	-	10 December 2018

Table 1.3-1 Deliverables

Especially regarding activity (ix), guidance and assistance was provided to the Regional Participants in making the necessary steps towards ITS inclusion in their Transport Strategies and the preparation of national ITS strategies, as per their requests for support. Details about the discussions and meetings held and activities carried out are provided in Appendix A.

1.4 The Team of Non-Key Experts (NKEs)

The Core Team of the project, consisting of nine (9) Senior Experts, was established in such a way that an expert was assigned per mode of transport covered by the project, an IT expert covering all modes, as well as two institutional experts for Road and Rail and a transport economist.

The team was coordinated by a Project Manager, Marios Miltiadou, in collaboration with the CONNECTA Transport Key-Expert 2 and Deputy Team Leader, Kostas Georgiou.

A supplementary-supporting team was also mobilised, consisting of four (4) Senior Experts covering the six Regional Participants separately, to support the Project Manager and the entire Core Team through provision of documents, assistance in terminology translation of technical or legal documents, contacts with Stakeholders, arrangements of meetings, etc.

The same team has been also acting as CONNECTA focal points in each WB6 country for all three parallel Connectivity Reform sub-projects (ITS, Maintenance Plans and Road Safety).

Table 1.4-1 Team of NKEs

Positior	n in ToR	Name	Category in Financial Proposal
1.	Project Manager	Marios Miltiadou	SNKE
2.	Roads ITS expert	Marios Domoxoudis	SNKE
3.	Railway ITS/ERTMS expert	Uros Marjanovic	SNKE
4.	Ports-Maritime ITS/VTMIS expert	Efthimios Liberopoulos	SNKE
5.	IWW ITS/RIS expert	Zaneta Ostojic	SNKE
6.	ICT expert	Miroslav Petrovic	SNKE
7.	Transport Economist	Ales Pavsek	SNKE
8.	Institutional Rail expert	Bozica Rados	SNKE
9.	Institutional Roads expert	Dusan Mladenovic	SNKE
10.	Local support expert, covering ALB & KOS	Emiljano Zhuleku	SNKE
11.	Local support expert, covering MKD	Jovan Hristoski	SNKE
12.	Local support expert, covering BIH	Amna Redzepagic	SNKE
13.	Local support expert, covering SRB & MNE	Dusan Savkovic	SNKE

The project team was organized as shown below:



Figure 1-1 Project Team organization

1.5 Report structure

Following this introductory chapter, Chapter 2 summarises the EU ITS framework, relevant legislation and standards and Chapter 3 presents the current state of play in the region, the user needs assessment and aspirations for the definition of the Common Vision and the Regional ITS Strategic Framework. Chapter 4 presents the impacts assessment and estimations of costs and quantified benefits anticipated from the ITS deployment in the region. The Strategic Framework and Roadmaps per transport mode are presented in Chapter 5. Finally, Chapter 6 concludes this Final Report with main conclusions, recommendations and perspectives.

Moreover, in the Appendices are presented: a) a summary of activities undertaken to support Regional Participants in the framework of the subproject; b) short summary on the e-tolling EU framework; c) detailed results of the quantified costs and benefits per Regional Participant and Corridor/ Route; and d) the detailed Roadmaps per Regional Participant and per transport mode.

2 The EU ITS framework, legislation and standards

2.1 Roads

As a significant actor in the Global Supply Chain, road transport plays one of the most important roles in terms of sustainable development, strongly influencing all of its three aspects (environmental, social and economic). Increased volume of road transport associated with the growth of the European economy and mobility requirements has resulted in increased congestion of road infrastructure and raised energy consumption, as well as being a source of environmental and social problems.

Unlike rail transport system, road transport is not fully dependent on the technical compatibility between the infrastructure and vehicles using it, but it does encounter problems of congestions, lack of efficiency, road safety and environmental issues, thus creating the need for safer and more efficient operation of road transport and higher level of standardisation of infrastructure, vehicle safety systems, signalling systems and communication systems.

Recognizing that infrastructure development is not the only way to build a more efficient and safer road transport system, the European Union recognized ITS as a tool for more efficient transport demand management, better utilization of transport capacities, improvement of traffic safety resulting in lower CO2 emission and a safer, more efficient and economical road transport system.

Regional Participants expressed their willingness to follow the path to a more efficient and safer road transport through a process of accession to EU and by signing and ratifying of Transport Community Treaty.

2.1.1 Legislative Framework

One of the most important transport strategic documents of the EU is the most recent White Paper "Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system 2011-2020". Innovation for more efficiency and sustainability is a main objective of the Transport White Paper and the use of ITS a means to that end. ITS is one of the main parts of the strategy coming under what needs to be done, within "Innovating for the future – technology and behaviour".

Road transport infrastructure shall comprise, in particular, amongst others, telematics applications including ITS. Deployment of ITS systems has been strongly supported by Trans-European Transport Network (TEN-T) Guidelines. These provisions are related to both developments of Comprehensive and Core Network. Specifically, as a part of the Comprehensive Network requirements Member States shall - among others - ensure that the safety of road transport infrastructure is assured, monitored and, where necessary, improved in accordance with the procedures provided by Directive 2008/96/EC (road infrastructure safety management). Road tunnels over 500m must comply with Directive 2004/54/EC, the interoperability of toll collection systems must be ensured in accordance with Directive 2004/52/EC and with Commission Decision 2009/750/EC and, in particular, any intelligent transport system deployed by a public authority on road transport infrastructure should comply with Directive 2010/40/EU and deployed in a manner consistent with delegated acts adopted under the Directive.

The Road Safety Programme "Towards a European road safety area: policy orientations on road safety 2011-2020" was published in 2010 by the European Commission. Seven strategy objectives have been worked out:

- 1. Improve education and training of road users
- 2. Increase enforcement of road rules
- 3. Safer road infrastructure
- 4. Safer vehicles
- 5. Promote the use of modern technology to increase road safety (ITS)
 - Evaluate the feasibility of retrofitting commercial vehicles and private cars with Advanced Driver Assistance Systems,
 - Accelerate the deployment of e-Call and examine its extension to other vehicles
- 6. Improve emergency and post-injury services
- 7. Protect vulnerable road users

ITS Deployment Action plan - Action Plan for the Deployment of Intelligent Transport Systems in Europe, COM(2008) 886 is the document initiating stronger and focused ITS development in Road Transport across the EU. Although there was relatively high compatibility within strategic research supported by the technological platforms ERTRAC and ERTICO-ITS, there was a lack of a single framework structure that would allow harmonized ITS development in EU road traffic.

The Action Plan provides 24 main activities divided into a set of six main areas of activity:

1. Optimal use of road and traffic data

- Real-time traffic information across the EU
- Collecting and providing road data
- Precise public data for digital maps
- Free basic information services
- Promotion of multimodal travel planners
- 2. The Continuity of services for traffic and freight management along European Corridors and in cities
 - Continuity of ITS services
 - Services related to freight transport and logistics (e-Freight)
 - European framework ITS architecture
 - Interoperability of the toll collection systems
- 3. Road Safety
 - Promotion of safety systems in vehicles
 - Introducing eCall services throughout the EU
 - Legislative framework for human machine interface
 - Guidelines: Impact on vulnerable groups in road traffic
 - Secure Parking Places
- 4. Connecting vehicles and transport infrastructure
 - Open in-vehicle platform architecture
 - Development and evaluation of cooperative systems
 - Specifications for V2I, V2T and I2I communication (Vehicle and Infrastructure communication with other systems and to each other)
 - Who is responsible for European standardization for harmonised ITS development standards

5. Data security and reliability

- Security and data protection
- Establish reliability especially in security systems inside the vehicle
- 6. European coordination and cooperation in the field of ITS
 - Legislative framework for cooperation in the field of ITS
 - Tools for making investment decisions in the ITS area
 - Guidelines for ITS Financing
 - Co-operation in the area of ITS in cities

The first step towards harmonized development is the adoption of specifications for the prescribed priority areas. Specifications are delivered gradually, and may include:

- 1. Functional features description of the role of stakeholders and the flow of information between them,
- 2. Technical features technology of achieving functional characteristics,
- 3. Organizational features description of procedures or obligations for certain stakeholders,
- 4. Service provider features description of Service Levels for ITS Applications

One of the most important issues is to develop specifications necessary to ensure the compatibility, interoperability and continuity for the deployment and operational use of ITS for priority actions.

Regarding ITS and its deployment, the most important legislation of the EU, as a result of the ITS Deployment Action Plan is Directive 2010/40/EU of the European Parliament and of the Council on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport.

According to the Directive, ITS priority areas are:

- Optimal Use of Road, Traffic and Travel Data
- Road Safety and Security
- Continuity of Traffic and Freight Management
- Linking Vehicle and Transport Infrastructure

Within the priority areas, the following shall constitute priority actions for the development and use of specifications and standards, as set out in Annex I:

- the provision of EU-wide multimodal travel information services;
- the provision of EU-wide real-time traffic information services;
- data and procedures for the provision, where possible, of road safety related minimum universal traffic information free of charge to users;
- the harmonised provision for an interoperable EU-wide eCall;
- the provision of information services for safe and secure parking places for trucks and commercial vehicles;
- the provision of reservation services for safe and secure parking places for trucks and commercial vehicles.

Following the ITS Action plan and mentioned transport strategies and in accordance with defined priority actions within priority areas, the following Delegated Regulations and decisions supporting and supplementing Directive 2010/40/EU were adopted:

- Commission Delegated Regulation (EU) No 886/2013 of 15 May 2013 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to data and procedures for the provision, where possible, of road safety-related minimum universal traffic information free of charge to users
- Commission Delegated Regulation (EU) No 305/2013 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the harmonised provision for an interoperable EU-wide eCall
- Decision No 585/2014/EU of the European Parliament and of the Council on the deployment of the interoperable EU-wide eCall service
- Commission Delegated Regulation (EU) No 885/2013 of 15 May 2013 supplementing ITS Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of information services for safe and secure parking places for trucks and commercial vehicles
- Commission Delegated Regulation (EU) No 962/2015 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide real-time traffic information services
- Commission Delegated Regulation (EU) 2017/1926 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide multimodal travel information services

Two major potential constraints can be identified within the ITS deployment into the EU on introducing a system of personal data protection and national security. Several regulations should be taken into consideration for transposition in order to overcome the above-mentioned issues.

Importantly, each Regional Participant should be aware that the EU is pushing for further development of ITS through the enhancement of cooperative, connected and automated mobility known as C-ITS.



Cooperative Intelligent Transport Systems (C-ITS) is composed of 4 main components:

C-ITS Strategy - in late 2016, the European Commission adopted a European Strategy on Cooperative Intelligent Transport Systems (C-ITS), a milestone initiative towards cooperative, connected and automated mobility. The objective of the C-ITS Strategy is to facilitate the convergence of investments and regulatory frameworks across the EU, in order to see deployment of mature C-ITS services in 2019 and beyond.

C-ROADS - in 2016, Member States and the Commission launched the C-Roads Platform to link C-ITS deployment activities, jointly develop and share technical specifications and verify interoperability through cross-site testing (https://www.c-roads.eu/platform.html).

C-ITS Platform - the platform will address the main barriers and enablers identified for the deployment of C-ITS in the EU, in relation to the services likely to be introduce in the first stage (Day 1 applications) with a view to provide policy recommendations to the European Commission for the development of a Communication on the Deployment of C-ITS in the EU.

2.1.2 Technical Standards and Specifications

CEN/TC 278 is responsible for managing the preparation of standards in the field of Intelligent Transport Systems (ITS) in Europe. It serves as a platform for European stakeholders to exchange knowledge, information, best practices and experiences in ITS.

Until now, CEN/TC 278, working on the basis of the relevant Directives, Decisions and Mandates, has published 153 standards and another 53 standards are being drafted or awaiting approval. Detailed information can be found at the CEN/TC 278 portal, where ITS application areas and Working Groups of the CEN/TC 278 are available and where an overview of standards is presented. It should be also noted that at global level, ITS corresponding standardization is subject of the ISO/ TC204, and the working groups of the two (CEN and ISO) are presented in the figure below.

cen	ISO
WG1 EFC	WG 5 Fee and Toll Collection
WG 2 Freight and logistics	WG 7 Freight Operations
WG 3 Public transport	WG 8 Public transport
WG4 Traffic and traveller information	WG 10 Traveller information systems
WG 7 ITS spatial data	
WG 8 Road traffic data / DATEX	WG 9 Transport Information and Control
WG 9 DSRC	
WG 10 Human machine interfacing	
	WG 3 ITS Database technology
	WG 14 Vehicle/roadway warning systems
	WG 16 Communications
	WG 17 Nomadic devices
WG 12 Vehicle identification	WG 4 Vehicle identification
WG 13 ITS architecture	WG1 ITS architecture
WG 14 Recovery of stolen vehicles	
WG 15 eSafety/eCall	
WG 16 Cooperative ITS	WG 18 Cooperative ITS
WG 17 Urban ITS	

Figure 2-1 CEN and ISO Working Groups (source: http://www.itsstandards.eu)

WB6 beneficiaries should harmonize their ITS standards with CEN/TC 278 as soon as possible, making their adoption and implementation mandatory.

Furthermore, DG MOVE is currently promoting C-ITS Platform⁵ and Member States have agreed on the list of Day 1 ITS services for C-ITS. These services are:

- 1. Hazardous location notifications:
 - Slow or stationary vehicle(s) and Traffic ahead warning
 - Road works warning

⁵ C-ITS Platform Final Report.

- Weather conditions
- Emergency brake light
- Emergency vehicle approaching
- Other hazardous notifications
- 2. Signage applications:
 - In-vehicle signage
 - In-vehicle speed limits
 - Signal violation/ Intersection Safety
 - Traffic signal priority request by designated vehicles
 - Green Light Optimal Speed Advisory (GLOSA)
 - Probe vehicle data
 - Shockwave Damping (falls under ETSI Category "local hazard warning")

Additionally, the C-ITS Platform also agreed on a list of "Day 1'5 services", considered as mature and highly desired by the market, though, for which specifications or standards might not be completely ready. These "DAY 1'5 services" are the following:

- 1. Information on fuelling and charging stations for alternative fuel vehicles
- 2. Vulnerable Road user protection
- 3. On street parking management and information
- 4. Off street parking information
- 5. Park & Ride information
- 6. Connected and cooperative navigation into and out of the city (first and last mile)
- 7. Parking, route advice, coordinated traffic lights
- 8. Traffic information and smart routing

WB6 beneficiaries should grasp the momentum, setting the goal of C-ITS compliance, since faster deployment may lead to earlier initial investments, but also to break even sooner and recoup higher overall benefits. WB6 beneficiaries should adopt common EU standards enthusiastically in order to capitalize on all ITS benefits as soon as possible.

2.2 Railways

2.2.1 Legislative Framework

Interoperability in the EU is understood to mean 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 a railway undertaking 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 Europe.

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, clearance spaces, the axle weight of track and 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 also make for 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 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 has been introduced by the 4th Railway Package concerning the pre-approval of the ERA of trackside implementations. 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 area⁶. By removing these barriers, the creation of a more competitive rail sector can be achieved, which will 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:

⁶ http://www.consilium.europa.eu/hr/policies/4th-railway-package/



Figure 2-2 Goals for ERTMS implementation (source: Study of implementing ERTMS in Croatia, 2016)

Regarding decision making, some important points have to be taken into the consideration: the situation of neighbouring countries regarding connection, sources of financing (EU funds prioritised for the Core/Comprehensive networks), development plans, on-going projects, connection with important nodes (sea- and river- ports), etc. Also, 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. ETCS and GSM-R is given in the figure below:



Figure 2-3 Example of decision process for ERTMS implementation

2.2.2 Technical Standards and Specifications

Baseline 3 is considered functionally complete and that should remain stable 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 in order to meet the essential requirements and to ensure the interoperability of the European Community's high speed and conventional rail systems. The main changes in this Regulation are the following:

- Adequate legal instrument: CCS TSI is no longer a Decision but a 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 authorization, 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 in order to increase transparency of testing processes and prepare for further harmonization 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, in order 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 a standardized compliant on-board unit to be produced 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 detection⁷.

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

⁷ Also, EN 50159, although significant in implementation, is not mentioned, being of more general nature not directly pertaining to ERTMS.

National rules are allowed under certain conditions only, as defined in the Interoperability Directive (EU) 2016/797 and in the Safety Directive (EU) 2016/798, and they apply in addition to the European Rules. In order to achieve the objectives of the European Railway legislation, 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 CENELEC and 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 systems⁸ 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.

2.3 Inland Waterways

2.3.1 Legislative Framework

The EU legislative framework related to the River Information Services (RIS) is based on the European transport policy that defines and supports RIS development on European waterways.

The EU RIS Directive (2005/44/EC) applies to the implementation and operation of RIS on all inland waterways of Member States of class IV and above⁹, and on those linked by a waterway of class IV or above to a waterway of class IV or above of another Member State, including ports on such waterways as referred to in Decision No 1346/2001/EC of the European Parliament and of the Council of 22 May 2001 amending Decision No 1692/96/EC as regards seaports, inland ports and intermodal terminals.

Additional support to implementation of the RIS Directive comes from the EU Transport Council, which in June 2006, urged EU Member States "to provide adequate infrastructure by improving the multi-modal network and by implementing River Information Services on those inland waterways within the scope of EU RIS Directive (2005/44/EC)".

EU RIS Framework Directive (EC/2005/44) is the main document in the IWW sector that provides minimum requirements for RIS implementation and agreed RIS standards to enable cross-border compatibility of national systems. Comprehensive and international guidelines for RIS are continuously developed to harmonise the existing standards for particular river information systems and services within a common framework defining the content of common requirements and technical specifications in the interest of pan-European harmonisation of the services.

⁸ Telematics applications for Freight services (TAF); Telematics Applications for Passenger services (TAP).

⁹ Classification of European Inland Waterways was set out in UNECE Resolution No 30 of 12 November 1992.

The European Commission has published the RIS Guidelines, but also Commission Regulations regarding all RIS key technologies (Vessel Tracking and Tracing (VTT), Notices to Skippers (NtS), Electronic Reporting International (ERI) and Inland Electronic Chart Display and Information System (Inland ECDIS).

The European Commission established a procedure to monitor the implementation of legislation and to prevent anything that could lead to an infringement in the case of EU Member States not fulfilling the requirements of the EU RIS legislation.

In addition to the RIS Directive, European legislation related to RIS is as follows:

- Directive (EU) 2016/1629 of the European Parliament and of the Council of 14 September 2016 laying down technical requirements for inland waterway vessels, amending Directive 2009/100/EC and repealing Directive 2006/87/EC
- Commission Regulation (EC) No 414/2007 of 13 March 2007 concerning the technical guidelines for the planning, implementation and operational use of River Information Services (OJL L 105, 23/04/2007)
- Commission Regulation (EC) No 415/2007 of 13 March 2007 concerning the technical specifications for vessel tracking and tracing systems (OJ L 105/35, 23/02/2007)
- Commission Regulation (EC) No 416/2007 of 22 March 2007 concerning the technical specifications for Notices to Skippers (OJ L 105/35, 23/02/2007)
- Commission Regulation (EU) No 164/2010 of 25 January 2010 on the technical specifications for Electronic Reporting in inland navigation (OJ L057, 06/03/2010)
- Commission Regulation (EC) No 689/2012 of 27 July 2012 on Vessel Tracking and Tracing (OJ L202 of 28.07.2012)
- Commission Implementing Regulation (EU) No 909/2013 of 10 September 2013 on the technical specifications for electronic chart display and information system for inland navigation (Inland ECDIS) referred to in Directive 2005/44/EC of the European Parliament and of the Council
- Commission Directive 2013/49/EU of 11 October 2013 amending Annex II to Directive 2006/87/EC of the European Parliament and of the Council laying down technical requirements for inland waterway vessels

EU RIS Directive (2005/44/EC) and RIS guidelines specify the applicability of the legislation, responsibilities of Member States, minimum requirements for RIS, services to be provided and technical specifications to be applied while the Regulations 415/2007, 416/2007, 164/2010 and 909/2013 provide specific information on how the technologies are to be implemented (notices to skippers, tracking and tracing and electronic reporting).

2.3.2 Technical Standards and Specifications

The EU RIS Directive provides the basis for the development of Implementing Regulations related to technical specifications for the four RIS key technologies, namely the Inland ECDIS, NtS, ERI and Vessel Tracking and Tracing systems.

Integral parts of the Directive are two Annexes: Annex I- Minimum Data requirements and Annex II-Principles for RIS guidelines and technical specifications, containing: RIS guidelines, Inland ECDIS, Electronic ship reporting, Notices to skippers and Vessel tracking and tracing systems.
2.4 Ports/ Maritime

2.4.1 Legislative Framework

The 2011 Transport White Paper "Roadmap for a single European transport" stressed anew the importance of the Motorways of Sea (MoS). The 2013 TEN-T Guidelines redefined the MoS as the maritime dimension of the trans-European transport network, which shall contribute towards the achievement of a European maritime space without barriers and shall include:

- Maritime links between maritime ports of the comprehensive network or between a port of the comprehensive network and a third-country port where such links are of strategic importance to the Union;
- Port facilities, freight terminals, logistics platforms and freight villages located outside the port area but associated with the port operations, information and communication technologies (ICT) such as electronic logistics management systems and safety and security and administrative and customs procedures in at least one Member State;
- Infrastructure for direct land and sea access.

While the Commission defines the policy aspects of the MoS from which the eligibility criteria for funding derive, the Innovation and Networks Executive Agency (INEA) as the successor of the TEN-T Executive Agency (TEN-TEA), manages the technical and financial implementation of the programme. As regards specifically the maritime safety issues (VTMIS related), EMSA is in charge to ensure a high, uniform and effective level of maritime safety, maritime security, prevention of, and response to, pollution caused by ships as well as response to marine pollution caused by oil and gas installations.

In this regard, the EU has issued several relevant directives for AIS, ECDIS, VDR, sVDR, VTMIS, LRIT, ISPS and many others that focus on providing information for safety, security, protection of the environment and any related human element. It is noted that the ITS Directive does not have specific provisions for the maritime sector; Nevertheless, the establishment of the VTMIS is a requirement of International Maritime Organization (IMO in resolution (A.857(20), ref. 4) and the EU legal framework (Directive 2010/65/EU and Directive 2002/59/EC).

Upon application for EU membership, Regional Participants can become part of EMSA. It is therefore recommended as a minimum to transpose all EMSA related directives and regulations, namely:

- Directive 2002/59/EC (Consolidated Version 16/03/2011)
- Directive 2011/15/EC
- Directive 2009/17/EC
- Directive 2010/65/EC (National Single Window)

together with any other related VTS/ VTMIS Directive or Regulation emerging as obligatory requirements of EU and IMO (as presented in detail in Report 5).

2.4.2 Technical Standards and Specifications

EMSA operates and manages a suite of systems, which receive, process and distribute information on vessel traffic reports (VTMIS, LRIT, AIS, SafeSeaNet), satellite monitoring (CleanSeaNet), and Port State Control (Thetis).



Figure 2-4 IMDatE Concept and Components – Architecture (source: EMSA, 2012)

The services produced by these systems are shared with Member States and the Commission to supplement and enhance national capacity for vessel traffic monitoring, Port State Control and maritime pollution preparedness and response. EMSA has developed a platform to ensure the performance, availability and reliability of all the maritime information systems it hosts. This platform can also integrate and combine different types of data, including data provided by the end user, to produce customized services tailored to user requirements. These services are used by European authorities to obtain a clearer picture of a broad range of activities in the maritime domain, building a common picture across EU maritime interests. Enabling governmental and institutional organizations to make use of EMSA's systems avoids duplication of effort, overlapping infrastructures and unnecessary expenditure¹⁰.

Services are offered directly to EU Member States and organizations, sparing them the cost and complexity of buying and managing the underlying hardware and software, and hosting separate data integration systems. Users have full operational support, 24 hours a day, 7 days a week, through EMSA's Maritime Support Services (MSS).

Regarding ITS systems, EMSA has already established a central SafeSeaNet system that enables data exchange and supports:

- Automatic Identification System (AIS) based on near-real-time ship positions (i.e. one every 6 minutes)
- Archived historical ship positions (over several years)

¹⁰ http://www.emsa.europa.eu/

- Additional information from AIS-based ship reports (e.g. identification name/numbers, flag, dimensions, course, speed, dimensions, destination and ship type)
- Estimated/actual times of arrival/departure
- Details of hazardous goods carried on board
- Information on safety-related incidents affecting ships
- Information on pollution-related incidents affecting ships
- Details of waste carried on board/ to be offloaded (from June 2015)
- Ship security-related information (from June 2015)
- Information on the location of remaining single hulled tankers
- Information on the location of ships that have been banned from EU ports
- Digital map layers (containing information on depths, navigation aids, traffic separation schemes, anchorages, AIS station locations, etc.)

The above service is operated by EMSA and provided to Member States authorities.

It is noted that, as of May 2018 and for two years (April 2020), EMSA provides technical assistance to the beneficiary RPs (Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro and Serbia), including provision of supporting tools and organization of training activities as regards relevant EU legislation acts.

2.5 ICT - multimodal

2.5.1 Legislative Framework

Since ICT technologies provide the main tool for implementation of ITS, there are a number of elements from ICT EU strategy, legislations and standards which must be, directly or indirectly, taken into account throughout the processes of preparation of the legal environment, introduction of ITS, regulatory harmonization and strategic alignment with the EU approach in all modes of transport, for each of the RPs and across the whole WB6 region.

Digital Agenda

The Digital Agenda is the second of the seven pillars of the Europe 2020 Strategy, which sets the key goals for the growth of the EU by 2020. The main target of the European Commission's Digital Agenda is to develop a digital single market, which will result in the generation of smart, sustainable and inclusive growth in Europe. By creating a connected digital single market, we can generate up to EUR 250 billion of additional growth in Europe in the course of the mandate of the next Commission. Outside of this goal, there are six additional elements, which should be taken into account, again forming seven pillars, but this time for the Digital Agenda:

- Achieving the digital single market;
- ICT-enabled benefits for EU society;
- Strengthening online trust and security;
- Enhancing interoperability and standards;
- Promoting fast and ultrafast internet access for all;
- Investing in research and innovation; and
- Promoting digital literacy, skills and inclusion.

Moreover, the most recent (February 2018) Strategy for the Western Balkans contains the Initiative for a Digital Agenda for the Western Balkans as the one of the 6 flagship initiatives of the EU. These

initiatives target specific areas of interest for both the EU and the Western Balkans countries to support the transformation of the Western Balkans towards EU accession.

The European Commission's e-Government action plan (COM(2016) 179) is derived from the Digital Single Market Strategy for Europe and aims to remove existing digital barriers to the Digital Single Market and to prevent further fragmentation arising in the context of the modernisation of public administrations. By 2020, public administrations and public institutions in the European Union should provide borderless, personalised, user-friendly, end-to-end digital public services to all citizens and businesses in the EU.

Key aspects of the strategy stress the need to accelerate the adoption of electronic identification and trust services for electronic transactions in the internal market (e-IDAS Regulation 2014/910/EU) and to accelerate the cross-border and cross-sector usage of electronic identification (e-ID), including mobile ID, and trust services (in particular, eSignature, website authentication and online registered delivery service). This regulation resulted in a set of implementing Decisions and Regulations:

(On electronic identification)

- 2015/296/EU
- 2015/1501/EU
- 2015/1502/EU
- 2015/1984/EU

(On electronic trust services)

- 2015/806/EU
- 2015/1505/EU
- 2015/1506/EU
- 2016/650/EU.

e-Freight

According to the logistic performance index prepared by the World Bank, Western Balkan participants record low scores in transport operations, showing the necessity of improvement. Introduction of edocument IT systems ensures transnational paperless operations which serves to improve trade and transport and there are several EU initiated initiatives and legal frameworks which support this approach.

In 2018, the Commission planned to establish a European single window addressing a once-only principle for reporting purposes in maritime transport. In a wider context, the Commission is working on the digitalisation of transport documents for all modes and the promotion of their acceptance by public authorities. This is in accordance with the White Paper COM (2011) 144, where the need for an e-Freight concept is expressed:

- Create the appropriate framework to allow tracing goods in real time, ensure intermodal liability and promote clean freight transport;
- Put in practice the concepts of 'single window' and 'one-stop administrative shop' by creating and deploying a single transport document in electronic form (electronic waybill), and creating the appropriate framework for the deployment of tracking and tracing technologies;
- Ensure that liability regimes promote rail, waterborne and intermodal transport.

e-Customs

Customs operations is an integral part of cross-border transport and logistic chain. The electronic customs project initiated by the European Commission aims to replace paper format customs

procedures with EU wide electronic ones, thus creating a more efficient and modern customs environment. The project's dual objective is to enhance security at the EU's external borders and facilitate trade.

An important element of efficient customs operations is the concept of Integrated Border Management (IBM), applied initially in the context of the EU's support activities in the Western Balkans region during the period 2002-2006. IBM introduces national and international coordination and cooperation among all the relevant authorities and agencies involved in border security and trade facilitation thus establishing effective, efficient and coordinated border management with the ultimate goal of keeping open, but well-controlled and secure borders.

The first step to the EU-wide electronic exchange of customs declarations was established with the New Computerised Transit System (NCTS) initiated in 1997. As a contribution to the e-Government programme, in July 2003, the Commission published COM/2003/452 on a paperless environment for customs and trade, which provided a vision of a modern customs service which communicates electronically with trade business. This vision was endorsed by the Council Resolution of December 5, 2003, which called for a Multi-Annual Strategic Plan (MASP) for the creation of a European electronic environment, consistent with the operational and legislative projects and developments already scheduled or underway in the areas of customs and indirect taxation. The MASP is also intended to provide interested parties with a short overview and background information on projects and key issues related to the evolution of the electronic customs initiative and the present state of play.

The electronic customs initiative is essentially based on the following two pieces of legislation:

- The Decision on a paperless environment for customs and trade (Electronic Customs Decision) which sets the basic framework and major deadlines for the electronic customs projects;
- The Union Customs Code (UCC), which provides the legal basis for the completion of the computerisation of customs and repeals the Community Customs Code (Modernised Customs Code) Regulation.

Strengthening online trust and security

In 2013, the Commission presented measures on network and information security to fight against cyberattacks and breaches of privacy and personal data security, focused on strengthening its policy in this area. The goal is to establish a systematic approach, which will enable all relevant parties to be aware of what happens to personal data and to know that the rules are the same in all countries across the EU and, in some cases, even further afield.

In parallel, Member States are advised to take measures to establish a well-functioning network at national level, carry out large-scale cyberattack simulations, with the adaptation of national alert platforms to the Europol cybercrime platform.

As a next step in this process, Directive 2016/1148/EU entered into force in August 2016, concerning measures for a high common level of security of network and information systems across the EU. This NIS Directive gives Member States 21 months to transpose the Directive into their national laws and a further 6 months to identify operators of essential services.

The Directive aims to achieve a high common level of network and information systems security across the European Union in three ways:

- improving cybersecurity capabilities at national level
- increasing cooperation on cyber security among EU Member States
- introducing security measures and incident reporting obligations for operators of essential services in critical national infrastructure and digital service providers.

This directive identifies operators of essential services (OES) as a public or private entity which meet the following criteria:

- an entity providing a service which is essential for the maintenance of critical societal and/or economic activities
- the provision of such service depends on network and information systems
- an incident would have significant disruptive effects on the provision of that service.

Furthermore, Annex II of the directive clearly identifies OES in all transport areas and the following are relevant to the scope of this project (since air transport is excluded):

- Road transport
 - Road authorities as defined in point (12) of Article 2 of Commission Delegated Regulation (EU) 2015/962 responsible for traffic management control
 - Operators of Intelligent Transport Systems as defined in point (1) of Article 4 of Directive 2010/40/EU of the European Parliament and of the Council
- Rail transport
 - Infrastructure managers as defined in point (2) of Article 3 of Directive 2012/34/EU of the European Parliament and of the Council
 - Railway undertakings as defined in point (1) of Article 3 of Directive 2012/34/EU, including operators of service facilities as defined in point (12) of Article 3 of Directive 2012/34/EU
- Water transport
 - Inland, sea and coastal passenger and freight water transport companies, as defined for maritime transport in Annex I to Regulation (EC) No 725/2004 of the European Parliament and of the Council, not including individual vessels operated by such companies
 - Managing bodies of ports as defined in point (1) of Article 3 of Directive 2005/65/EC of the European Parliament and of the Council, including their port facilities as defined in point (11) of Article 2 of Regulation (EC) No 725/2004, and entities operating works and equipment contained within ports
 - Operators of vessel traffic services as defined in point (o) of Article 3 of Directive 2002/59/EC of the European Parliament and of the Council

The NIS Directive requires operators of essential services to:

- take appropriate technical and organizational measures to secure their network and information systems;
- take into account the latest developments and consider the potential risks facing the systems;
- take appropriate measures to prevent and minimise the impact of security incidents to ensure service continuity
- notify the relevant supervisory authority of any security incident having a significant impact on service continuity without undue delay.

As a final legal step in this area, the General Data Protection Regulation (GDPR) was approved by the EU Parliament in April 2016, with an enforcement date of 25th May 2018. GDPR replaces the Data Protection Directive 95/46/EC. The purpose of GDPR is to harmonize data privacy laws across Europe, to reshape the way organizations approach data privacy in order to properly protect all EU citizens' data privacy. GDPR responds to the current and foreseen trends in this area and revises definition of personal data to any data which allows identification of an individual, directly or indirectly. Hence, a variety of factors that can identify a person – IP address or location data, for example – are now covered as a means to ensure personal data protection.

Any ITS service, which deals with personal data in this new, wider sense, must take GDPR articles into account. Below are the most relevant issues being introduced through GDPR:

Increased Territorial Scope (extra-territorial applicability)

GDPR extends jurisdiction in the sense that it is applied to processing of personal data of EU citizens, regardless of whether the processing takes place in the EU or not.

Penalties

As for NIS, huge penalties are imposed for a breach of GDPR - up to 4% of annual global turnover or €20 Million (whichever is greater).

Consent

The conditions for consent have been strengthened, where consent must be clear, distinguishable from other matters and provided in an intelligible and easily accessible form and it must be as easy to withdraw consent as it is to give it.

Breach Notification

Breach notification will become mandatory in all Member States where a data breach is likely to "result in a risk for the rights and freedoms of individuals". This must be done within 72 hours of first having become aware of the breach "without undue delay".

Right to Access

Right for data subjects to obtain from the data controller confirmation as to whether or not personal data concerning them is being processed, where and for what purpose, with a copy of the personal data provided on request, free of charge, in electronic format.

Right to be Forgotten

The right to be forgotten entitles the data subject to have the data controller erase his/her personal data, cease further dissemination of the data and potentially have third parties halt processing of the data.

Data Portability

The right for a data subject to receive personal data concerning them, which they have previously provided in a 'commonly used and machine-readable format' and have the right to transmit that data to another controller.

Privacy by Design

Privacy by design calls for the inclusion of data protection from the onset of the designing of systems, rather than an addition and calls for controllers to hold and process only data absolutely necessary for the completion of its duties (data minimisation), as well as limiting the access to personal data to those needing to act out the processing.

Data Protection Officers

It will not be necessary to submit notifications / registrations to each local DPA of data processing activities.

2.5.2 Technical Standards and Specifications

Enhancing interoperability and standards

Information and Communication Technology is a very broad category, including wide spectrum of innovative and rapidly changing technologies and devices with increasing importance in daily lives and for all kinds of activities. It is especially important that products and services are mutually compatible and interoperable, so that information can be shared and communication can be established and performed using different devices. Relevant standards help to ensure that products made by different companies are able to work together seamlessly.

European Standards (EN) are documents that have been ratified by one of the three European Standardization Organizations: CEN, CENELEC or ETSI, recognized as competent in the area of voluntary technical standardization according to EU Regulation 1025/2012. Standards are voluntary

which means that there is no automatic legal obligation to apply them. However, laws and regulations may refer to standards and even make compliance with them compulsory.

Although they deal with different fields of activity, CEN, CENELEC and ETSI cooperate in a number of areas of common interest such as ICT. Participation in the European Commission's ICT Multistakeholder Platform (MSP), based on Decision EC/2011/349 is of relevance here. The MSP is composed of representatives of national authorities from EU Member States & EFTA countries, by the European and international ICT standardisation bodies, and by stakeholder organisations that represent industry, small and medium-sized enterprises and consumers. The mission of MSP is to advise on matters related to the implementation of ICT standardisation policies, covering:

- Potential future ICT standardisation needs in support of European legislation, policies and public procurement;
- Technical specifications for public procurements, developed by global ICT standards developing organisations;
- Cooperation between ICT standards-setting organisations;
- The Rolling Plan, which provides a multi-annual overview of the needs for preliminary or complementary ICT standardisation activities in support of EU policy activities.

Apart from joint work, there are also topics covered separately by each of these organizations and which are, directly and indirectly, relevant to this project. A list of the most important ICT areas covered, which are relevant for the project, has been provided in Report 3 (Chapter 3.5.2).

Finally, standards originating from other relevant international standardization organization may be applicable to the ICT areas that this project covers.

Promoting fast and ultrafast internet access for all

Electronic communications EU law covers fixed and wireless telecoms, internet and broadcasting and transmission services. The legal framework currently consists of the following Directives and Regulations:

- Framework Directive 2002/21/EC, Access Directive 2002/19/EC and Authorisation Directive 2002/20/EC (together with the Better Regulation Directive 2009/140/EC);
- Universal Service Directive 2002/22/EC, Directive on Privacy and Electronic Communications 2002/58/EC and Amending Directive 2006/24/EC (together with the Citizens' Rights Directive 2009/136/EC);
- The Regulation on Body of European Regulators for Electronic Communications (BEREC) and the Regulation on roaming on public mobile communications networks.

In the area of network access, this legal framework puts emphasis on a more predictable investment environment for all network investors, with varying business models and regulation focused on promoting infrastructure competition wherever possible. It encourages market-driven solutions leading to infrastructure deployment re-using existing civil engineering wherever possible, and encouraging commercial agreements, including co-investment or access agreements, between operators, where these have a positive effect on competition.

In terms of wireless spectrum usage, regulations are preparing a path for introduction of 5th generation wireless communications (5G) networks and services, which will exploit these networks. New spectrum management methods are emerging and demand for spectrum is still growing significantly due to the increase in wireless traffic driven by existing and new services and applications.

3 Current state of play, user needs and aspirations

3.1 Current state of play

3.1.1 Roads

The current status with regard to the most important documents referring to Road ITS including the national Transport Strategies, Action Plans for ITS and relevant national laws containing elements required for ITS deployment is described through common positions – elements which are the same status in all RPs and by relevant existing specific achievements or issues in each of the Regional Participants.

In general, ITS deployment in the region is mostly visible through separate and fragmented efforts, which are mostly not harmonised or synchronised with the EU ITS legal framework.

None of the Regional Participants has fully implemented Directive 2010/40/EU and none of them has officially adopted national ITS Strategy.

All Regional Participants have a national Transport Strategy where ITS is mentioned to some extent (or not at all), but not sufficiently to be considered as implementation of Directive 2010/40/EU or any of its parts. In terms of an Action Plan, none of the RPs have officially adopted the ITS Action Plan, except Albania where Action Plan of sorts exists within the Guidelines on rules for ITS implementation.

All Regional Participants have national regulations dedicated to Road Transport, Roads and Road Traffic safety, while only Serbia has adopted a new law on roads and a law on road safety containing provisions defining ITS, ITS Architecture, Tunnel management, electronic toll collection, eCall etc. creating a legal framework for ITS deployment harmonized with EU ITS regulations.

All RPs except Kosovo have a fully implemented system of digital tachograph and EU harmonised rules on driving, working and rest time for professional drivers.

Even though the current status of the ITS legal framework and harmonised legislation in terms of transposition of the EU ITS Directive is uncertain, all Regional Participants expressed a strong political will and commitment to the Transport Community Treaty, creating a legal framework and obligation to ITS deployment and transposition of all relevant EU regulations and directives.

Furthermore, even though there is no clear legal framework or strict rules, most RPs have implemented partial ITS solutions and applications on almost all recently completed infrastructure projects, particularly new tunnels and highways. Generally, implemented solutions are still not fully aligned to EU ITS requirements and will probably have to be upgraded in order to achieve full interoperability.

None of the RPs have fully transposed any of the main directives into their national legislation, such as Directive 2010/40/EU - Framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes; 2004/52/EC - Interoperability of electronic road toll systems; 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. Moreover, none of RPs the has completed a policy or institutional framework for the creation of ITS architecture, ensuring interoperability according to European standards and requirements.

In terms of organizational status, all Regional Participants need to establish a well-defined group of bodies and/or agencies aiming to promote and implement projects for ITS development, monitor future

performance of the Action Plans, deal with technical requirements, support scientific research and technological development etc.

Regarding capacity building, all RPs should concentrate their efforts in two directions:

- Institutional and organizational capacity building in terms of establishing dedicated bodies, agencies and departments with well-defined responsibilities aiming to create functional coordination of ITS deployment through all identified aspects
- Capacity building in terms of knowledge and skills enhancement and creating a base of personnel, especially within government functions

Most Regional Participants have some personnel with a solid ITS background, but mostly at a technical and operational level engaged with road management institutions (e.g. Public Roads Companies) or at a scientific level within universities. There is an obvious need to create dialogue through ITS dedicated bodies, aiming to share knowledge and experience at national and international level, to involve and initiate cooperation between competent authorities, public, governing bodies, private sector, associations, universities etc.

The current state of play per Regional Participant is presented below.

3.1.1.1 Albania

Albania partially approached transposition of Directive 2010/40/EU, through Guidelines of the Minister responsible for Infrastructure and Transport on "Rules for the Implementation of Intelligent Systems in the field of Road Transport and for Interfaces with other modes of transport".

The Transport Sector Strategy 2016-2020 approved in November 2016 includes priority actions, which are dedicated to ITS deployment. Strategic priority number 8 is to increase the use of ITS in the transport sector.

Albania is not officially a full member of CEN, but is a member of ISO and has already transposed and published 93 CEN/ISO ITS standards.

3.1.1.2 Bosnia and Herzegovina

There has hardly been any progress in Bosnia and Herzegovina regarding strategic and legal documents for ITS. However, deployment of ITS in some tunnels and tolling systems follows the provisions of relevant Directives on the level of safety and electronic road tolls. Furthermore, ITS has been mentioned in the following legislative acts: Law on Road Safety in Bosnia and Herzegovina; Rulebook on traffic signalization and signalisation on roads, signalling of works, obstacles on roads, and signalling that official authorities give to traffic users.

Bosnia and Herzegovina is not officially a full member of CEN, but is a member of ISO and has already transposed and published 76 CEN/ISO ITS standards.

3.1.1.3 the former Yugoslav Republic of Macedonia

A new Transport Strategy has been drafted with a section dedicated to ITS. With regard to freight transport and customs procedures on common crossings points on Core and Comprehensive network, the country is one of three non-EU countries (beside Serbia and Turkey) who have implemented The New Computerised Transit System (NCTS).

The Standardization Institute of the former Yugoslav Republic of Macedonia (ISRM) is a full member of CEN and ISO and has already transposed and published all CEN/ISO ITS standards.

3.1.1.4 Montenegro

The new Transport Development Strategy Report for Montenegro (November 2017) defines ITS as one of its priority areas. ITS is identified as one of the four priority areas for infrastructure, where the expected outcomes are upgraded services to users, advanced monitoring and management of network operations and performance and safety improvement with infrastructural measures, such as installation of ITS equipment (VMS, dynamic signage, WIM stations), installation of integrated system for monitoring and information provision of interurban public transport.

A recently introduced new law on roads includes a legal basis for ITS implementation, which will further pave the way for transposition of Directive 2010/40/EU.

The Institute for Standardization of Montenegro (ISME) has published a number of CEN ITS standards and application for the status of CENELEC affiliate member is currently under way.

3.1.1.5 Serbia

Serbia completed a draft version of "ITS Strategy for Serbia" in 2017, which was discussed to some extent but not officially adopted. However, the document contains all elements in accordance with Directive 2010/40 and the European ITS action plan.

There is a national strategy for the development of rail, road inland waterways, air and intermodal transport 2008-2015 recognizing and defining ITS by dedicated chapter, including the need for a dedicated ITS Strategy which will define competent authority, action plan and funding sources. This strategy has to be updated.

Existing laws (on Road Traffic Safety, on Working time of vehicle crew in road transport and tachograph) have some elements relevant for the deployment of ITS in the road sector (tachograph system, accident data collection system, vehicle safety system and eCall system). Some by-law acts still need to be adopted for full harmonisation.

With regard to freight transport and customs procedures on common crossings points on the Core and Comprehensive network, Serbia is one of three non-EU countries (besides the former Yugoslav Republic of Macedonia and Turkey) who have implemented the New Computerised Transit System (NCTS).

The latest achievement regarding ITS in Serbia is the adoption of a new law on roads (May 2018), where a definition of ITS system and interoperability is given, together with priority areas and actions. The law also defines tunnel safety advisor, toll collection and European Electronic Toll Collection and European Electronic Toll Service Provider. ETC and EETC systems have been introduced. Main elements from Directive 2010/40 have been adopted and this law establishes a legal framework for transposition of ITS Directive. A number of by-laws still needs to be drafted and adopted in order to achieve functional implementation.

The Institute for Standardization of Serbia is a full member of CEN/CENELEC and ISO and, as a result, all CEN/ISO ITS related standards have been published.

3.1.1.6 Kosovo

The Multimodal Transport Sectorial Strategy 2015-2025 defines some of the important elements for the development of ITS in freight transport. There are no other strategic or legal documents defining or mentioning ITS.

Kosovo Standardization Agency (KSA) has adopted all CEN ITS standards.

3.1.2 Railways

ERTMS is a completely new concept in railways systems. In order 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 Interoperability Railways Directives. Currently, institutional (technical, organizational and operational) barriers prevent freedom of access to the rail networks of the European member states and other countries, which are on corridors.

In WB6, the situation regarding ERTMS deployment is not satisfactory, from institutional point of view as well. Deployment of ITS is a requirement according to EU legislative acts, and analysis of current on-going projects and situations in the WB6 region reveals a major insufficiency in terms of legislation, without coherent planning.

There is a huge gap between the development of ERTMS in EU countries and WB6. Without an institutional framework, which is basic foundation for deployment of any ITS system, the WB6 region is a "bottleneck" and "missing links" for an integrated network and development of interoperability.

Regional Participant	Current situation/ institutional framework	Connection between institutional/ legislative framework and layouts for deployment of ITS/ ERTMS
Albania	There are plans for institutional framework (New Law on Railways in 2017 -based on EU Directive, but without By-law acts and Operating rules)	No ERTMS strategy
Bosnia and Herzegovina	Institutional framework exists (Law on Railways -based on EU Directive, but without By-law acts and Operating rules)	Partially, through projects
the former Yugoslav Republic of Macedonia	Institutional framework prepared (Law on Railways -based on EU Directive, By-law acts, but no Operating rules)	Some, but with no influence on institutional framework
Montenegro	There is no institutional framework (no Law on Railways -based on EU Directive, without By-law acts and Operating rules)	No ERTMS strategy
Serbia	There is institutional framework (Law on Railways adopted in 2018 based on EU Directive and By-law acts, but without Operating rules)	Some through projects
Kosovo	There is no institutional framework (Law on Railways planned -based on EU Directive, but without By-law acts and Operating rules)	Some, but with no influence on institutional framework

The situation regarding ERTMS/ ITS in the WB6 region is presented below:

Details are provided below per Regional Participant:

3.1.2.1 Albania

In the field of rail transport sector, the new railway code in Albania No. 142/2016 entered into force within one year of its publication in Official Journal Series No. 265-2016 and it aligned the SERA directive 2012/34/EU, recent Safety Directive aiming to establishing EU standards and the latest Directive for Interoperability in the EU, as well as several European regulations in the field of public services in rail transport for passengers and their rights in PSOs (Public Service Obligations).

No ERTMS technical standards have been officially adopted; only the relevant EN standards, preconditions to ERTMS.

Albania is currently cooperating with the European Union Agency for Railways EUAR in the field of clean up rules in the field of railway safety and transposition of the TSIs (technical specifications of interoperability) for railways through IPA project 2016-2017. The Transport Sector Strategy and its Action Plan 2016-2020 has been also approved (November 2016), which includes priority actions, which are rail transport policies for deployment of ITS/ERTMS in rail transport projects in all preparation studies and investment projects.

There is no legal act enforcing the use of particular frequency bands for GSM-R or the process to assign particular frequencies to base stations. The bands usually used for GSM-R are currently owned by a private mobile telephony provider, with the condition from the government that said frequency bands can be reassigned to GSM-R should it be determined that the system is needed.

Albania has no ERTMS/ ITS services at the moment. The railway network is completely operated by manual signalling and telecommunications services are limited to AM radio (subsequently supplanted by mobile telephony, as is the case in countries where public available technology gets implemented faster than system-specific technology). At this point, Albania is in direct need of local basic knowledge and experience to start building a signalling system of its own on its rail network.

There are a number of designs, mostly feasibility studies and preliminary designs (one of which has been completed and three are under elaboration) for existing alignments as well as future alignments that would complete the western arm of Corridor VIII, and all entail the use of ERTMS Level 1. This is the only signalling system planned in Albania at the moment, and no other systems were considered.

Currently there is no fibre optics network, and no General Design or strategy for implementing it.

There is a GSM-R feasibility study, but no GSM-R network, and the frequency band that GSM-R should use is currently the private property of the mobile provider, and - according to the information provided - with an option to be reassigned to GSM-R.

3.1.2.2 Bosnia and Herzegovina

The following table provides a summary of the main issues and needs related to rail infrastructure regulation.¹¹

¹¹ Framework Transport Strategy of Bosnia and Herzegovina Document status: Draft for submission Date of document submission: 13 July 2016 (Document adopted as final, according to information provided by BIH Ministry during the mission in Sarajevo).

Administrative level	Description
BIH	Institution of an independent Rail Safety Investigation Authority Investigate new ways to finance railway maintenance Adoption of UIC high speed railway standard Adoption of the EU Directives on interoperability and safety
FBIH	 The process of harmonization of rail transport regulation in FBIH with EU standards needs to achieve specific objectives such as: Restructuring of the railway company in accordance with EU Directive 2012/34 Ensuring the technical improvement and integration of ZFBIH into the single European railway system Enabling a single European railway system, in accordance with EU directives, through facilitating the access of other railway undertakings in the medium term and preparing to railway market opening after BIH joins the EU. Creating a sustainable funding system for the maintenance of railway infrastructure. Such objectives have to be achieved by the following specific actions in the medium term: Financing railway maintenance Full application of the Law on the financing of the rail infrastructure, by allocating the total costs of maintenance from the budget Adoption of the EU Directives on interoperability and safety Defining a scenario of alignment of existing FBIH legislation with EU Directives and legislation on rail market access Defining long term scenarios for rail market opening
Republika Srpska	Regulation in the field of rail transport is partially compliant with regulations, standards and practices of the EU, but needs further harmonization with by-laws. The goals to prepare the railway sector for the joint EU market and establishing a sustainable funding system for railway will be achieved by the following actions: - Definition of the model for financing railway infrastructure - Finalisation of the separation of rail infrastructure and transport operation - Alignment of RS legislation with EU legislation e.g. implementation of EU Directive 2012/34 and, in general, integrating ZRS in the Single European railway system
Brcko District	Rail network in Brcko District is subject to the State jurisdiction of the Railway Regulatory Board BIH, and rail services are operated both by ZRS and ZFBIH. Hence, Brcko District shares with the two entities of BIH the same objectives and actions to be undertaken in the field of rail sector regulation.

Bosnia and Herzegovina has no legal act enforcing the use of particular frequency bands for GSM-R or the process to assign particular frequencies to base stations.

The railway network in Bosnia and Herzegovina is equipped with a partial legacy signalling system, left over from ex-Yugoslavia, done as a patchwork with every area covered by a system from a different manufacturer (according to the information obtained during the meetings, some sections have no block detection). Current ITS is limited to optic fibre links (a section is being equipped with optic fibre and there is a General Design on Telecommunications). ERTMS was discussed several times over the years, but low understanding of the matter and severe limitations on the network (railways is considered a "loser", a negative profit state company, and as such, prohibited to take on debt; Also, as per Official Gazette 19/17, article 12, par. 2, opening up of the railways will be done after BIH joins EU) and this resulted in dismissal of the idea every time it was considered.

No ERTMS technical standards have been officially adopted; only the relevant EN standards, preconditions for ERTMS.

3.1.2.3 the former Yugoslav Republic of Macedonia

ERTMS as part of rail safety is foreseen within the National Transport Strategy 2007-2017. The project is also foreseen in the programme of the Government 2014-2018. Each year the Ministry of Transport and Communications prepare the Annual Programme, where the projects, which will be implemented are presented.

There is no legal act enforcing the use of particular frequency bands for GSM-R or the process to assign particular frequencies to base stations.

No ERTMS technical standards have been officially adopted, whilst the relevant EN standards, preconditions for ERTMS have been adopted.

Regarding deployment:

- There is an existing optical fibre network.
- Need for ERTMS is established, a prefeasibility study on ERTMS and GSM-R has been assigned and was expected to be finalized within 2018.
- There are ERTMS Designs on some sections of the network (Bitola-Kremenica) and others underway (Skopje – Kicevo).
- There is GSM-R legislation and relevant frequency bands are reserved for GSM-R use.
- Self-service ticketing machines are being installed and entering service.

3.1.2.4 Montenegro

Montenegro has transposed EU's Interoperability Directive in its legislation. However, currently, a dedicated ERTMS strategy or plan for implementation does not exist. TSIs have been mentioned within the interoperability Directive; however, they have not been transposed into national legislation.

There is no legal act enforcing the use of particular frequency bands for GSM-R or the process to assign particular frequencies to base stations. There are no plans for GSM-R installation.

ERTMS technical standards have not been officially adopted; only the relevant EN standards, preconditions for ERTMS.

Regarding infrastructure, Montenegro has a functional optic fibre network with no ring architecture/ redundancy, 60 fibres per cable and with more than 90% capacity unused due to low demand for current ITS services. Excess capacity is rented out.

Infrastructure is relatively old, with latest upgrades dating from the '80s, ex-Yugoslavia. All the railway alignments are single track. Signalling systems are a challenge to maintain, given that they are outdated, there is a lack of funds, unqualified personnel and they are frequent targets of theft.

There is a plan for interstate alignment Podgorica – Vlore; the Montenegrin side of the section will be equipped with ERTMS Level 1, so Montenegro is also inconsistent, in the sense that one of its primary needs is cross border compatibility.

3.1.2.5 Serbia

Serbia does not have a National Strategy for ERTMS development. The National Assembly of the Republic of Serbia has adopted a legal Decision on the National Program of Public Railway Infrastructure for the period 2017-2021 ("Official Gazette of the Republic of Serbia", no. 53/17), which states that ERTMS will be applied on all railway lines on Corridor X.

One of the goals is "Deployment of transport management systems (ERTMS)". In this regard, the ERTMS is the future goal of Serbian railway traffic management system and Serbian railways will tender signalling systems to be ERTMS/ ETCS ready. This document is under development.

Article 9 of the Rules on the manner of using radio stations on domestic and foreign aircraft, locomotives, ships and other vessels of RATEL has defined the frequency range 876-880 / 921-925 MHz for the needs of the GSM-R system of the railway.

The Directorate for Railways has published the technical specification for interoperability (TSI) in accordance with Directive 2008/57/EC (TSI for subsystems for control-command and signalling, as well

as translation of the following Decisions of the EU: Commission Decision No 2012/88/EU of 25 January 2012 on the technical specification for interoperability relating to the control-command and signalling subsystems of the trans-European rail system, and its amendments). With this TSI full alignment has been achieved with the Directive 2008/57/EC.

In Serbia, the frequency bandwidth reserved for GSM-R is regulated by the act from Official Gazette 8/11 and plan of intended use, Official Gazette 99/12. There are no laws or by-laws detailing the process of assigning individual frequencies to base stations.

Serbia has no ERTMS technical standards officially adopted; only the relevant EN standards, preconditions for ERTMS. Need for ERTMS is established, there is a number of Designs made involving ERTMS on some parts of Corridor X.

Regarding infrastructure, there is a trackside optical fibre network being installed on some parts of the railway. There is a General Design on Optical Networks, though obsolete, from 2007, with cabling executed only on one side of the tracks, with no possibility for redundancy or ring architecture. Current designs ignore these General Design guidelines.

There is GSM-R legislation and relevant frequency bands are reserved for GSM-R use.

A recent tender on new loco acquisition states that said locos will come equipped with ERTMS, so this will be the first rolling stock in the region to have ERTMS capabilities.

3.1.2.6 Kosovo

Access in the Kosovo Railway Infrastructure is regulated by the Law on Railways No. 04/L - 063 approved on 14.11.2011, and legal sub-acts supported by this law and other acts. The Interoperability Directive has been transposed providing a legal basis for deployment of the ERTMS, as cited in the Law on Railways.

The Railway Regulatory Authority Kosovo (RRA), who is responsible for the area of interoperability, is obliged to ensure the fulfilment of its obligations vested by the law. In September 2016 it began preparation of the TSI for the Infrastructure subsystem, which will be based on EU Regulation No. 1299/2014 TSI INF. Since the procedures for assessing conformity and suitability for the use of the interoperability constituents as well as the procedures for the verification assessment of railway subsystems with TSI regulations are carried out by the Notifying Bodies (in EU countries), RRA initially analysed the two possible transposition alternatives (amendment of the Regulation on TSI for the Infrastructure Subsystem, adapted to the conditions of the railway sector, or adoption of the Regulation no. 1299/2014 on TSI for the EU Infrastructure).

At the end of 2016, the preparation of the TSI for the subsystem Operation and Traffic Management (OPE) began. This sub-legal act is envisaged to be based on the EU's TSI Regulation no. 2015/995 for this subsystem. The transposition manner will be the same as the TSI Regulation for the Infrastructure subsystem.

Kosovo has no ERTMS technical standards officially adopted and there are no ITS systems at this time. The Kosovo Network statement states that the network is equipped with fibre optics. However, it does not detail the type of fibre optics and it is only used for telephony, so confirmation is needed in order to claim it as part of ITS.

3.1.3 Inland Waterways

The main characteristics of the current status of the RIS in RPs were obtained from the questionnaires, from direct contact with stakeholders and as a result of desk investigation and are presented below for Bosnia and Herzegovina and for Serbia, respectively.

3.1.3.1 Bosnia and Herzegovina

The problem imposing difficulties on inland waterways governance and administration in general is the organization and structure of the governments in the country. This organizational setup influences process of RIS development on the Sava River.

At the moment, within this scheme of governmental structure there is neither a single RIS authority nor an authorized agency/ directorate in charge of inland waterways and navigation across the entire BIH territory.

Although a reply received from stakeholders states that all vessels navigating on Sava River on Bosnia and Herzegovina's territory are obliged to be equipped by appropriate equipment, including RIS equipment, when the available documents were analyzed, it was not possible to find any provision regarding the level of obligation nor the time frame (or the date) by when the possession of specific RIS would be mandatory on inland waters in BIH, as well as possible sanctions for non-compliance with this provision.

The EU Directive related to the IWW transport and other relevant documents/ standards have not been ratified or applied. The precise status of the ongoing process of legal amendment of documents and/ or procedures to EU/ UNECE is not available at the moment. Familiarity with this subject as well as with EU legislation is very basic.

After the pilot project, "Detailed design and prototype installation for the RIS on the Sava River" completed in 2010, no further development/ implementation activities related to RIS were performed on the BIH stretch of Sava River.

An inland ECDIS viewer was installed in Brcko District HM Office as a part of a pilot project. The viewer is still in function. Also, as part of the pilot project, one vessel ("Enver Šiljak") was equipped with RIS equipment. In the meantime, the water-management company "Sava", owner of the vessel, was sold together with all the equipment, including the vessel and mounted devices. There is no evidence of the current status of this equipment.

Maintenance of existing equipment is not secured by financial and technical support from any of responsible level of government.

There is no official way and/or regular procedure to exchange data relevant for different modes of transport between the institutions responsible.

There is no evidence of the level of exchanged data nor of possible analysis of such exchanged/ crossed data that would lead to any system improvement.

Some cooperation with Serbia and Croatia related to common strategic interest exists, but the level and all elements of that process are not defined by rules or procedures. International cooperation with similar governmental/ public institutions should be better organized and information should be made more publicly available.

There is need for a wide range of training/ education of operators as well as of users in order to promote services and prepare stakeholders for the next stage of process development.

A bilateral agreement is in force between Bosnia and Herzegovina and Croatia for marking the waterway of Sava River, defining the responsibilities of both countries, as well as an agreement on navigation on inland waterways and its maintenance, which refers to the common sector of Sava River with Serbia. There is no publicly available record regarding the maintenance of the fairway and on a survey of waterway as a result of these agreements.

Although RIS is recognized as a part of the infrastructure in a few important documents at entity level, precise rules and procedures on all aspects of RIS implementation (deployment, maintenance, minimal architecture, mandatory usage) do not exist.

There is room for better cooperation with neighbouring countries, particularly with Croatia on the common sector of Sava River.

3.1.3.2 Serbia

Implementation of RIS in Serbia was synchronized with existing European standards (EU RIS Directive, recommendations of the UN Economic Commission for Europe). Full deployment of RIS and the EU RIS Directive (2005/44/EC) was completed in a harmonized way with the Danube riparian countries, especially in terms of fulfilling the EU RIS Directive requirements, including the border regulations ensuring compatibility with neighbouring countries.

The RIS system in Serbia is considered a significant part of the transport infrastructure and their obligatory use is in force.

The RIS network consists of:

- 15 AIS Base-stations for Tracking and Tracing subsystem for the Danube River and of 3 additional AIS Base-stations for Sava River (from January 1st 2014, the usage of AIS transponders on vessels is required and the publication of Notices to Skippers is mandatory).
- One dGPS reference station for improved positioning of vessels and two monitoring stations
- System for electronic voyage reporting (ERI) according to EU RIS Directive
- System for electronic provision of Notices to Skippers according to EU RIS Directive
- System for electronic ship Hull Database according to EU RIS Directive
- Lock Management System installed and operating of two locks on the Serbian Danube
- Authority Segment consisting of 47 workplaces in different locations in Serbia, installed in the premises of Ministry of Interior (Border Police, River Police, Gendarmerie), Serbian Customs, Ministry of Transport – now MoCTI (Captaincies-Harbour Master Offices responsible for traffic management and safety of navigation)
- RIS central segment consisting of central control system, data gateway for exchange of information with other countries and integrity monitoring system

Currently, on the Sava and Danube Rivers, the following services are available: AIS (coverage 100%), VTT, ENCS, NtS, ERI, Electronic Lock Management System, Hull Database, RIS Index in ERDMS. There are no AIS base-stations installed on the Tisa River; due to coverage of BSs along the Danube River and flat terrain, parts of the Tisa River are covered by the AIS signal.

The user community of the RIS system in Serbia includes ship users (all governmental and commercial ships which are obliged to use RIS services in accordance with the legislation) and shore users (Ministry of Construction, Transport and Infrastructure: Harbour Master Offices, Waterway Transport Inspection, Authority for Determination of Seaworthiness, Department for Transportation of Dangerous Goods), Port Governance Agency, Ministry of Interior (Water police, Border Police, Sector for Emergency

Situations), Ministry of Finance (Customs Offices), Public Water Management Companies, Electric Power company of Serbia (Lock Operators at the Iron Gate I Navigational lock and Iron Gate II Navigational Lock), ports, agents and ship owners.

Users who are not governmental institutions have user accounts with privileges limited to vessels which they owe or represent, and do not have access to data from other vessels. The total number of individual shore user accounts with different privileges for the usage of different RIS services within the RIS Serbia system is 238 (status on 07.12.2017).

Concluding this IWW subchapter, it is evident that considerable differences exist between the two RPs (Serbia and Bosnia and Herzegovina) regarding the progress of RIS implementation. While in Serbia implementation has reached a high level and RIS have been functioning at full capacity since 2013, in Bosnia and Herzegovina the process is still less advanced and there is no indication of significant development progress.

These differences between the two RPs concern:

- the legislation,
- the level of implementation,
- the technologies implemented as such and
- the level of quality of available services.

Differences between the RPs regarding the pace of the implementation process arose because of:

- Different timing of the process, e.g. depending on EU accession process,
- Differences in governmental structure, in the size of the industry and the way infrastructure management is organized, e.g. the role of IWW transport, regions, inland ports,
- Differences in the availability of resources.

In Serbia, additional institutional/ regulatory actions, amendments or regulations, as well as adoption of any additional EU legislation into existing legislation are not necessary at the moment.

The Strategy on Waterborne Transport Development for the period 2015-2025, with corresponding Action Plan for the period 2015-2020, covers the general plan and indicative budget for further development of RIS. Although RIS is not part of a specific (separate) strategy for ITS development, the existing strategy forms a sufficient base for proper further development of services. The strategy covers the period to 2025, but further development should already be the subject of timely planning.

Actions to be taken are of a technical nature and concern the preparation and deployment of RIS on the entire IWW system Danube – Tisa – Danube.

Serious efforts regarding the creation of the necessary institutional/ regulatory framework are therefore needed in Bosnia and Herzegovina as a prerequisite for RIS implementation on Sava River, in combination with other activities such as capacity building and technical documentation preparation.

3.1.4 Ports/ Maritime

3.1.4.1 Albania

In Albania, VTMIS has not yet been implemented. While steps have been taken towards harmonisation with the relevant IMO/ EU regulatory framework, efforts are still needed for the completion of the institutional and legislative framework.

The required interventions concern institutional/ legal, organizational and technical aspects that would lead to proper implementation of VTMIS and of other systems in the future. As regards the VTMIS legislation, it is drafted and will be completed and approved once the funding for the set-up of the system becomes available. This is stated clearly in the monitoring report on the National Transport Strategy and Action Plan, published in June 2018 and the Ministry and General Maritime Directory are committed to this task.

VTMIS is also an IMO's SOLAS – Safety of Life at Sea – Convention (1974) requirement, which in its successive forms is generally considered to be the most important of all the international treaties regarding safety of merchant ships. Albania is a signatory to the SOLAS Convention and is committed to ratify and endorse the most recent forms of IMO regulations and EC rules on maritime safety, security, environmental protection and coastal management as per the Priority Actions of the National Transport Strategy. This will be done with Technical Assistance provided by IMO (already approved).

Previous Technical Assistance (IPA 2012 – EuropeAid/134513/C/SER/AL) produced a Gap Analysis report for the level of Acquis of Albanian Maritime legislation and gave recommendations on future acts. Following these recommendations, Directive 2009/16/EC on port state control and Regulation (EC) 336/2006 on the implementation of the International Safety Management Code have been transposed. IMO Technical Assistance will further enhance the ratification and amendments necessary for legislation approximation with the EU/IMO regulatory framework.

3.1.4.2 Montenegro

In Montenegro, VTMIS has been partially implemented. An evaluation of the level of compliance with the EU/IMO regulatory framework is needed in order to ensure full harmonisation (according to the New Transport Development Strategy, 70% of harmonisation has been achieved).

Required interventions concern institutional/legal, organizational and technical aspects that would lead to proper implementation of VTMIS and of other systems in the future.

3.1.5 ICT - multimodal

The state of play regarding ICT legislations and standards per Regional Participant are presented in the following series of tables.

Area	STRATEGIC DOCUMENTS	Laws	REGULATORY / COORDINATION BODY
GENERAL ICT	available, until 2020	exists (electronic communication)	exists
SECURITY OF NETWORK AND INFORMATION SYSTEMS	partially available until 2020	exists	exists
PERSONAL DATA PROTECTION	not available	not aligned with GDPR	exists
E-DOCUMENT, E-FREIGHT, TRACKING AND TRACING	e-Document is in the IT strategy	e-Document related laws adopted recently	exists for e- Document
E-CUSTOMS, IBM	available, until 2020	not available	exists

Table 3.1-1	Current status of ICT	legislation and	standards il	n Albania

Table 3.1-2	Current status of ICT	legislation and standards	in	Bosnia and	Hercegovina
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Area	STRATEGIC DOCUMENTS	Laws	REGULATORY / COORDINATION BODY
GENERAL ICT	available, until 2021	exists (electronic communication)	exists
SECURITY OF NETWORK AND INFORMATION SYSTEMS	available, until 2022	not available	exists
PERSONAL DATA PROTECTION	not available	obsolete, not aligned with GDPR	exists
E-DOCUMENT, E-FREIGHT, TRACKING AND TRACING	e-Document is in the IT strategy	e-Signature is not yet operational	no
E-CUSTOMS, IBM	available, until 2018	not available	exists

Table 3.1-3 Current status of ICT legislation and standards in the former Yugoslav Republic of Macedonia

Area	STRATEGIC DOCUMENTS	Laws	REGULATORY / COORDINATION BODY
GENERAL ICT	expired (until 2017), long- term (until 2020) in preparation	exists (electronic communication)	exists
SECURITY OF NETWORK AND INFORMATION SYSTEMS	not available	in preparation	no
PERSONAL DATA PROTECTION	not available	not aligned with GDPR	exists
E-DOCUMENT, E-FREIGHT, TRACKING AND TRACING	e-Document is in the expired IT strategy	exists (for e-Document)	no
E-CUSTOMS, IBM	available, until 2019	not available	exists

Table 3.1-4 Current status of ICT legislation and standards in Montene	gro
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Area	STRATEGIC DOCUMENTS	Laws	REGULATORY / COORDINATION BODY
GENERAL ICT	available, until 2020	exists (electronic communication)	exists
SECURITY OF NETWORK AND INFORMATION SYSTEMS	available, until 2021	exists	exists
PERSONAL DATA PROTECTION	unavailable	not aligned with GDPR	exists
E-DOCUMENT, E-FREIGHT, TRACKING AND TRACING	e-Document is in the IT strategy	e-ID law adopted, no other laws	no
E-CUSTOMS, IBM	available, until 2018	not available	exists

Area	STRATEGIC DOCUMENTS	Laws	REGULATORY / COORDINATION BODY
GENERAL ICT	available, until 2020	exists (electronic communication)	exists
SECURITY OF NETWORK AND INFORMATION SYSTEMS	available, until 2020	exists	exists
PERSONAL DATA PROTECTION	obsolete	not aligned with GDPR	exists
E-DOCUMENT, E-FREIGHT, TRACKING AND TRACING	e-Document is in the IT strategy	e-Document law adopted, bylaw for tracking and tracing in Customs-related bylaws	partially
E-CUSTOMS, IBM	available, until 2020	not available	yes

Table 3.1-5 Current status of ICT legislation and standards in Se	erbia
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Table 3.1-6 Current status of ICT legisla	ation and standards in Kosovo
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Area	STRATEGIC DOCUMENTS	Laws	REGULATORY / COORDINATION BODY
GENERAL ICT	available, until 2020	exists (electronic communication)	exists
SECURITY OF NETWORK AND INFORMATION SYSTEMS	available, until 2019	exists	no
PERSONAL DATA PROTECTION	not available	not aligned with GDPR	exists
E-DOCUMENT, E-FREIGHT, TRACKING AND TRACING	e-Document is in the IT strategy	not available	no
E-CUSTOMS, IBM	available, until 2018	exists for IBM	no

With the exception of the Ministry of Communications and Transport BIH, hardly any Ministries responsible for Transport within the RPs have ICT in their areas of responsibility. As a consequence, the main stakeholders of this project do not have direct jurisdiction over national ICT policies, legislations and standards.

However, this fact cannot be used as a reason for neglecting the impact of ICT on ITS implementation. Clearly, introduction of ITS in any transport mode (or in several of in the case of multimodal) requires both intensive and extensive involvement of ICT technologies. This raises the importance of compliance and harmonization with the EU ICT acquis, standards and policies relevant for ITS.

General recommendation for all RPs is to raise awareness of the interdisciplinary nature of ITS. Hence, capacity building should include various stakeholders, which will set wide and solid grounds for proper ITS deployment. By reaching not only institutional but also wider society and industry participants throughout the region, foundations for regionally interoperable Intelligent Transport Systems and services applicable for RPs will be achieved.

3.2 Needs assessment

For the scope of user needs assessment, missions to all RPs were performed, meeting each beneficiary's key stakeholders. Missions were organized in Belgrade (26-27 September 2017); Skopje (04-05 October 2017); Tirana (13 October 2017); Podgorica (19-20 October 2017); Pristina (15 November 2017); and Sarajevo (24 November 2017). Meetings with representatives of the following stakeholders were held:

Regional Participant	Stakeholders met during the missions
Albania	Ministry of Infrastructure and Energy; Road Transport Directorate; Albanian Road Authority; Albanian Institute of Transport; Chamber of Commerce and Industry; Italian Trade Agency (ICE) Railway Transport Directorate; Albanian Railways; Railway Inspection Directorate (under MoIE); Betonplus (private rail operator); AlbRail Ltd Tirana; Durres Port Authority; Port of Vlora S.A.
Bosnia and Herzegovina	Ministry of Communication and Transport BIH; Directorate for Roads of Republika Srpska; Public Enterprise for Roads of Republika Srpska; Public Enterprise for Highways of Republika Srpska; Indirect Taxation Authority; Foreign Trade Chamber; Association of Transporters Directorates for Railways; Public Enterprises for Railways; Infrastructure Managers; Operators.
the former Yugoslav Republic of Macedonia	Ministry of Transport and Communications; Directorate for Roads; Public Enterprise State Roads; Ministry of Interior – Sector for Border Affairs & Migration/ Traffic Department; Ministry of Finance – Customs Administration; Truck Drivers Association AMERIT; Truck Drivers Association MAKAMTRANS; Chamber of Commerce; Transport Terminal Operator SCT; Transport Terminal Operator SCT; Transport Terminal Operator ARGOLOGISTIC; FERSPED AD; Directorate for Railways; Public Enterprise Railway Infrastructure; Macedonian Railway Transport JSC.
Montenegro	Ministry of Transport and Maritime Affairs; Traffic Directorate; Ministry of Interior – Integrated Border Management and Customs Administration; Chamber of Commerce – Transport Association; Chamber of Commerce – Freight Forwarders Association; Railway Directorate; Railway Infrastructure JSC; Railway Transport JSC; JSC Maintenance of railway rolling stock; Rail Cargo Operator; Maritime Safety Directorate and Port Authority; Port Operator Port of Bar.
Serbia	Ministry of Construction, Transport and Infrastructure; Directorate for Roads; Public Enterprise Roads of Serbia; Koridori Srbije Ltd; Chamber of Commerce; City of Belgrade – Secretariat for traffic; Directorate for Railways; Infrastructure Serbian Railways JSC; Serbia Cargo JSC; Serbia Train JSC; Department for Water Transport and Safety of Navigation; Directorate for Inland Waterways – Plovput; Port Governance Agency (AUL).
Kosovo	Ministry of Infrastructure; Directorate of Roads; Department of Road Management; Ministry of Interior/ Border Police; Kosovo Customs; Transport Terminal Operators; Truck Drivers Association; Chamber of Commerce of Kosovo; Passenger and Freight Transport; Safety Agency.

Moreover, an on-line surveying tool has been developed, aiming to expand the outreach of the survey, i.e. to cover, as much as possible, a wider range of the targeted groups of stakeholders (business, industry, academia, operators, users' associations, etc.). The questionnaire, which was also made available in the languages used in the region, was structured according to the European ITS Framework (FRAME) and the EU's ITS priority areas. Thus, high-level ITS user needs as defined in the European ITS Framework were presented in the following 8 distinct groups:

- Traffic Management and Operation Services
- Emergency Services
- Road Transport Personal Safety and Security
- Intelligent Vehicle Services
- Freight and Logistics
- Transport related Electronic Payment services
- Public Transport ITS services
- Information Services

The respondents were also given the ability to add their own input regarding their needs under the above grouping and regarding their perception of ITS within their own country and region. Moreover, at the end of the questionnaire, they were asked to define the perceived barriers to ITS implementation. The vast majority of the respondents (71 in total) operate or are interested in ITS deployment not solely in their country of residence, but at regional level. Moreover, out of the total responses, 28% responded as individuals and 72% on behalf of an organization/ company.

From the analysis of responses of the online questionnaire, the following services per functional area have been identified as the most crucial by the respondents.

Functional Area	Most crucial ITS needs identified (ranked)
Traffic Management and	Traffic Management & Control
Operation Services	Incident Management
	Transport Infrastructure Maintenance Management
Emergency Services	Emergency Notification and Personal Security
	Hazardous Materials and Incident Management
	Emergency Vehicle Management
Road Transport Personal Safety	Emergency Notification (accidents, eCall)
and Security	Road condition and weather notification
	Ghost Driver Management
Intelligent Vehicle Services	Advance Driver Assistance Systems
	Automated Vehicle Operation
	Cooperative Systems (V2V, V2I)
Freight and Logistics	Positioning and Freight Tracking Services
	Cross Border Services
	Dangerous/Abnormal Freight Management
Transport-related Electronic	Electronic Road Tolling
Payment Services	Integration of Payment Systems
	Public Transport Electronic Payment
Public Transport ITS Services	Public Transport Management
	Demand Responsive Public Transport
Information Services	Road Safety related information / incident warning
	Real time traffic information services
	Pre-trip travel information

Table 3.2-1 Most crucial needs identified in WB6, per ITS functional area (regional level)

Based on missions performed, meetings with stakeholders, collection of relevant information as well as on the update and validation of the existing situation related to ITS implementation and the identification of the needs and scoping, it became quite clear that ITS applications deployment in the region is in its infancy. This can be considered an advantage, because WB6 Regional Participants can avoid the friction of legacy systems and easily build a state of the art National ITS Architecture, based on a regional one. A prerequisite for the above is the dissemination and awareness raising regarding ITS benefits to the stakeholders and wider public. This was identified as one of the regional barriers to ITS implementation.

The three most significant barriers identified are: unavailability of financing, lack of relevant legislation and unclear anticipated benefits. Thus, the most crucial step is to overcome those barriers. The two main challenges that the WB6 Regional Participants must face, towards a regional ITS implementation are changes needed at institutional level to abolish different and contradicting legislation, by adopting EU's ITS guidelines and standards and the promotion of best practices.

3.3 Towards a regional ITS vision

Understanding the needs, as well as the existing (or perceived) barriers, was the first step towards the definition of a common vision and strategy for the region. Common problems produce common needs that require a common approach. This is obvious from the missions performed and the questionnaire responses¹², where there is mostly homogeneity in the ITS needs per Regional Participant. The EU provides all the necessary tools to achieve the WB6 countries' common regional ITS Architecture and goals.

The EU has already developed a European ITS Framework Architecture (FRAME). FRAME provides a reference for the terminology, a decomposition of an ITS system and a methodology to build new ITS architectures. These aspects are used to allow harmonization with national ITS architectures. FRAME does not define technology, thus enabling the freedom to apply it in order to implement different ITS systems that use different technological solutions. Its distinctive characteristic is that it contains more than one way of performing a service, thus it enables the user to select the most appropriate set of functionalities.

Building a common regional ITS Strategy will help WB6 countries to build their own harmonized National ITS Architecture. For WB6 countries, having a National ITS Architecture provides specifications that enable:

- Compatibility of information delivered to end users through different media;
- Compatibility of equipment with infrastructures, thus enabling seamless travel across Europe;
- A basis for national and/or regional authorities to produce master plans and recommendations to facilitate ITS deployment;
- An open market for services and equipment where compatible subsystems are offered (no more adhoc solutions);
- A known marketplace into which producers can supply products with reduced financial risk.

While for VTMIS and RIS there is imbalance of progress between the two pairs of RPs concerned, in Road ITS there is gradual deployment on a project basis (new motorway sections and tunnels). Regarding ERTMS, the level of development is still in its infancy, however but with no irreversible deployment made yet and the main issues to confront being financing, the low priority given and the low level of expertise and understanding of the systems, the latter comprising the risk of different interpretations of the ERTMS specifications during the rollout of projects that may lead to errors and incompatibilities between ETCS subsystems. Therefore, continuous cooperation within the region is

¹² See Report 2 "Needs Assessment and Scoping".

required, to timely avoid uncoordinated ERTMS deployment, and to this end, stakeholders should look beyond their immediate needs.

A series of actions have to be taken in order to proceed with ITS and IT deployment, concerning transposition of EU acquis, as well as mandatory use of the relevant standards. Regarding the way of transposing EU legislation into RPs legal framework, a series of laws, acts and presidential decrees were obtained from Member States and evaluated. A common practice (e.g. in Greece) is the adoption of Directives as they are, by one Law/ Presidential Decree/ Joint Ministerial Decision. In such cases, each article of a Directive is transferred as one article in the legal document to be adopted. In this way, there is no need for provision of official translation of the legal document before its approval. However, Report 3 (Appendix C) provides a few examples of transposition Directives: a general template for transposition through a Presidential Decree (as mentioned above), the Slovenian example for transposition of the Interoperability Directive (in English) and the Serbian example of IWW Law (in English), containing provisions for RIS and VTS.

4 Impact assessment, costs and benefits

With the available data (as submitted to CONNECTA) but also as per approved ToR, CBA could be performed only in a more macroscopic way, separately per mode of transport and separately per SEETO Corridor/ Route; not in detail per section nor per RP. However, it was feasible to provide rough estimations per RP, considering that the initial approach allows extrapolations based on network length (relevant for roads and railways). For IWW and Ports/ Maritime estimations are provided per RP, as needs substantially differ.

Costs and benefits have been estimated, where possible, showing annual expenses and monetized benefits on an annual basis, i.e. traffic increase has not been considered. Thus, benefits estimation has been kept moderate, and for this reason it must be said that they are anticipated to be higher than the values provided.

Recognizing the difficulties in making sound estimates of costs and benefits, a series of estimated indicators and values of important parameters found in international literature are provided, which could prove very useful for the RPs when preparing detailed Cost-Benefits Analyses for specific projects.

4.1 Impact assessment

4.1.1 Roads and ICT

The basic reasons for introducing ITS are similar everywhere in the world. ITS provides society-wide benefits, which include reducing accidents, overall levels of congestion, and emissions. Benefits of ITS deployment can be:

- Improved mobility for people and freight
- Less traffic congestion
- A better managed transportation infrastructure
- Reduced environmental impact of surface transportation
- Reduced fatalities and crash severity

Systems for traffic management, and demand management could be classified as ITS, providing society-wide benefits. These benefits are potentially very large and they are an important reason why governments adopt and promote ITS.

The second important reason for adopting and using ITS relates to benefits that may not provide significant effects in solving conventional traffic issues but help increase the quality of services which individual travellers or transportation operators can see, understand and appreciate, as follows:

- Reducing travel uncertainty
- Increasing security for freight movement and personal travel
- Increasing efficiency for operators
- Increasing efficiency for users

These benefits include also increased reliability and less uncertainty in travel, which makes travel more comfortable and more productive, provides greater efficiency in operating and using the transportation system and is also more safe and secure.

Road users and other travellers benefit from ITS. Particularly:

- car users, truck and delivery drivers may experience greater safety, more certainty in their journeys, shorter journey times, more direct routes and easier access to parking
- pedestrians and other vulnerable road users may experience greater safety and benefit from a balancing of traffic priorities in their favour
- public transport users may experience shorter journey times and have better access to reliable travel information

Everyone benefits from ITS applications that:

- reduce the vulnerability of the transport infrastructure to extreme events. ITS can help prevent incidents and speed up recovery when things go wrong (severe weather and flooding, security alerts, serious accidents and incidents)
- better integrate services. ITS can help support improved response and efficiency for law enforcement, emergency services and other agencies. For example, accurate location information for emergency calls can reduce the time taken to respond to incidents, which in turn reduces disruption to the network.

These benefits are briefly described in the following paragraphs.

Road Network Operator

Some examples of key Road Network Operator objectives – to which ITS can contribute – and which can be informed by monitoring and evaluation that are suitably planned, include:

- improving efficiency
- improving safety
- protecting and enhancing the environment
- maximising use of existing networks
- postponing investment in new capacity
- reducing the amount of new capacity which needs to be added
- reducing operational costs
- reallocating space to prime users at different times of day or year
- helping modal shift from traditional car use to more sustainable modes
- making public transport easier to use
- making public transport more reliable
- improving satisfaction among end users

ITS is applied in many different ways and different contexts, including:

- traffic control
- improving information provision to travellers
- electronic payment and ticketing, which reduces the travel time linked to toll collection
- improving fleet management and logistics for freight and public transport
- promoting road safety
- improving environmental conditions

Improved vehicle control systems (crash avoidance systems) will increase throughput by reducing the headway required between vehicles. They can also help reduce the number of collisions, which means fewer traffic hold-ups. It has been estimated that a three-fold increase in throughput is possible with platooned vehicle operation. A less sophisticated automated highway system might increase throughput:

- by 30% (with rear-end collision warning in vehicles with similar performance characteristics)
- by 60% (with collision avoidance in vehicles differing in braking capacity)

Freight transport

In freight transport, there are two separate streams of benefits available from ITS:

- benefits to the supply chain as a whole (the operation of supply chains using data and information linked with communication technologies). Methods include control systems, vehicle tracking and load monitoring to:
 - facilitate back-loads, port and customs pre-clearance and communication with the customer about the progress of a shipment
 - monitor drivers' hours, alertness and driving performance
 - bring access cost reductions to hauliers through traffic management measures in urban areas though some access policies that are enabled by ITS can impose constraints
- operating costs (reducing the costs of transport operators by providing productivity improvements):
 - many ITS applications are designed to mainstream business or regulatory processes (for example, some ITS applications related to Commercial Vehicles Operations)
 - other ITS applications may help in the collection and analysis of data that can eventually result in cost saving to the agency.

The primary measure of productivity is typically cost savings as a result of an ITS implementation.

4.1.2 Railways

Being compatible throughout Europe, ERTMS provides the European Union with a unique opportunity to create a seamless railway system, where trains may run from Point A to Point B without facing technical problems related to signalling. However, interoperability is far from being the only advantage brought by ERTMS. Indeed, ERTMS has also been designed to be the best performing train control system in the world¹³. It therefore brings considerable benefits in addition to interoperability, if all requirements are met. The following impacts have been taken from ERTMS website and are commented as per the situation in the WB6:

- Increased capacity on existing lines and a greater ability to respond to growing transport demands: as a continuous communication-based signalling system, ERTMS reduces the headway between trains enabling up to 40% more capacity on currently existing infrastructure; ERTMS implementation can postpone new infrastructure construction. It is proven to be one of the biggest benefits in ERTMS implementation. Note: As all lines in WB6 are currently below capacity, this feature is mostly ignored by the stakeholders at this time. However, projected increases in railway traffic in the near future along with future interoperability, enabling out-of-state trains to operate on domestic lines, will show this feature to be essential to full operation in WB6. Besides construction of new or additional track(s), which could be very costly, the best results for increasing railway capacity are achieved on double tracked lines under Level 2 ERTMS.
- Higher speeds: ERTMS allows higher speeds and thus reduction of travel times; Note: Only Level 2 allows above 160 km/h limit, if all other requirements are met as well. Level 1 is still limited to visual signalling, deemed ineffective over 160 km/h. Even declaratively planning a line for speeds over 160 km/h means that all level crossings need to be replaced with underpasses or overpasses, increasing the safety performance of the lines.
- Higher reliability rates: ERTMS may significantly increase reliability and punctuality, which are crucial for both passenger and freight transport; Note: again, Level 2 offers a much greater benefit in this feature than Level 1. Flexibility in handling rail traffic means that delays from one train can be

¹³ http://www.ertms.net/?page_id=44.

mitigated in real time so that it minimises effects on other trains on the network, as opposed to legacy systems where one delay usually means propagating that delay throughout the network.

- Lower production costs: one proven harmonised system is easier to install, maintain and manufacture making railway systems more competitive due to economy of scale; Note: this feature is especially notable in Level 2 systems, as the implementing costs are expected to decrease significantly in the following 5-year period.
- Reduced maintenance costs: With ERTMS level 2, trackside signalling is no longer required, which considerably reduces maintenance costs; Note: as above, the maintenance costs are also expected to go down significantly in the following 5-year period. Legacy systems in WB6 are expected to increase maintenance costs, as most of the parts are no longer produced serially, which results in higher costs and higher waiting times.
- An opened supply market: customers will be able to purchase equipment for installation anywhere in Europe and all suppliers will be able to bid for any opportunity. Trackside and on-board equipment may be made by any of the six ERTMS suppliers, which makes the supply market more competitive; Note: This conflates with the two items above, resulting in the noted benefits. Also, the Client will not be bound to a single supplier, giving more flexibility in maintenance operations and further planning.
- Reduced contract lead time due to the significant reduction of process engineering;
- Simplified approval process in Europe and greatly reduced certification costs traditionally associated with the introduction of new systems;
- Improved safety for passengers; Note: This feature stems from forming a predictable route, evened out speeds en-route with minimal accelerations and decelerations, and with Level 2 offering a better benefit on this feature.
- Single signalling system (ERTMS without existing systems B) means reduction of maintenance costs (maintenance of single system is cheaper than maintenance of dual system) and as such a benefit to Infrastructure Manager;
- ERTMS will remove one of the interoperability barriers on the railway network in Europe. It will allow
 railway undertakings to optimize their operations, for instance on cross-border sections (no need to
 change the locomotive¹⁴ after the border and higher utilization of assets).
- Energy benefits: due to more constant speed and less acceleration and deceleration the energy consumption will decrease;
- CO2 reduction: consequent to energy reduction.

ERTMS also has the following advantages:

- Uninterrupted cross-border transport of passengers and freight (cross-border railway interoperability)
- Ability to use different manufacturers parts on the same system (manufacturers interoperability)
- Change in modal split
- Gives possibility for:
 - Implementation of integrated timetables
 - Technological unification of infrastructure
- More effective traffic organization and management (also centralisation)
- Increase of capacity of existing infrastructure
- Decrease of maintenance costs (unification of SS system on railway would decrease unit cost due to economy of scale)
- Increase of traffic management efficiency on stations
- No maintenance of outdated B-systems
- In line with EU legislation and TSI
- Possible EU co-financing of implementation (up to 50% from CEF for all Member States/ up to 85% from Cohesion Fund, for Member States eligible for this)

¹⁴ Depends on type of locomotive.

- Innovative technologies
- Time savings for different trip purposes (work, commuting, other), based on average speeds and traffic forecasts and assumptions for savings from smooth passage at common crossing stations
- Travel time reduction for freight (incl. delays in delivery), based on average speeds, traffic forecasts and average load and assumptions for savings from smooth passage at common crossing stations
- Accident reduction of different types of severity, based on anticipated safety improvement from similar projects abroad and on actual accident statistics
- Avoidance of capital expenses for capacity increase, based on estimation of cost of upgrading project

As an incidental feature, ERTMS infrastructure may be used for other means, its optical backbone excess capacity rented out for profit or to other ITS systems (railways are naturally positioned on optimal directions for traffic exchange), and GSM-R systems too (in ports where railway and maritime infrastructure overlap).

4.1.3 Inland Waterways

The impact of RIS implementation is linked to the following factors:

- Investments and operational costs of RIS equipment and services
- Fuel consumption due to fleet operations
- Service level of IWT
- Shift between transport modes
- Safety on IWW
- Emission of air pollutants due to fleet operations
- Climate change due to fleet operations

The figure below shows the various effects, how they interrelate and the stakeholders that experience the impact.



Figure 4-1 Relation between impacts for various stakeholders in IWW (source: Panteia)

Impact on fuel consumption

RIS provide information that can be used to improve the voyage planning and anticipate traffic situations. In addition, information on draught and Inland ECDIS informs skippers more precisely about the geographic location of shallow and deep stretches of waterway. This will allow skippers to better stabilize cruising speeds and optimize the fuel consumption of engines.

Impact on level of service

RIS services allow skippers and barge operators to offer clients a faster and more reliable transport service. They are able to improve the planning of lock passages and synchronize activities with lock management. Therefore, RIS is expected to result in a reduction of waiting times for terminals and locks (or bridges).

Impact on emissions and climate change

Fuel savings reduce environmental damage due to the emission of harmful pollutants and greenhouse gases. External costs due to emission of pollutants amounts about 2 euro per vessel-km¹⁵. For climate change this is 0.25 euro per vessel-km¹⁶. Since no methodology and data are available regarding climate change from emissions, the basis for the calculation (including transition of tonne kilometres to vessel kilometres) could be the study "Evaluation of RIS Implementation for the period 2006-2011", Annex 8, PANTEIA, July 2014.

Impact on safety

The implementation of RIS may contribute to the reduction of the accident rate on waterways. In addition to this, RIS may contribute to an adequate emergency response once an accident has occurred. Damage can then be avoided or mitigated. In this way, increased safety, due to the implementation of RIS, contributes to the overall benefits. With the implementation of RIS, skippers have a more up-to-date and complete overview of the traffic on waterways. The combination of RIS applications (AIS, ECDIS and also NtS) can significantly improve the performance of radar systems. This will contribute to a safer situation and consequently, the number of accidents will be reduced. Unfortunately, even in EU Member States, the availability of accident statistics in IWW transport is very limited. The most precise data can be found for the Rhine River¹⁷, although these figures are not representative for our project due to huge differences in the level of development and volume of traffic on Rhine River and Sava River.

Reductions of collisions and accidents is linked to AIS deployment, but other RIS related factors, e.g. inland ECDIS and NtS, could have contributed (integrated with AIS) to the improvement of safety as well. Furthermore, additional factors should be included in the analysis, such as changes in the fleet, vessel technology or the waterway infrastructure improvement and/or network extension – which will be the case in the Sava River example due to planned rehabilitation and improvements to the condition of the fairway on the entire stretch of Sava River. These data are in any case important in the sense of

¹⁵ Handbook on estimation of external costs in the transport sector, produced within the study

Internalisation Measures and Policies for All external Cost of Transport (IMPACT), Version 1.1, CE Delft, et al, 2008.

¹⁶ "Contribution to impact assessment of measures for reducing emissions of inland navigation" PANTEIA, via donau, SPB, June 2013.

¹⁷ Source: Federal Ministry of Transport, Building and Urban Development (BMVBS) of Germany.

apparent increase of safety of navigation as a result of introduction of modern technologies in the navigation sector.

Impact due to modal shift

In Europe, inland waterway transport is a viable alternative with potential benefits in terms of cost savings, reduced pollution and increased transport safety when considering shifting traffic from road to more environmentally friendly transport modes. However, the elimination of infrastructure bottlenecks is obligatory for the development of inland navigation everywhere.

Several studies at EU level have dealt with this subject, but dominantly analysing pollution reduction (from all sources) and the relation between possible cost reduction and time savings. Direct impact of RIS implementation to the modal shift and consequently to the entire policy in the transport sector is not found. This is why only a few conclusions will be drawn here, while in the part of the study that deals with defining strategic directions for development of RIS and IWW generally, this issue was explained in more detail.

The main emphasis in analysis of modal shift in literature is placed on price-elasticities, which are generally low for IWT services, causing a relatively low modal shift effect in the case of changes in transport prices¹⁸. Benefits due to cost reduction will induce a very modest modal shift compared to the effects that benefit the existing fleet. If skippers and transport operators pass on benefits in the transport chain to the shippers, this could lead to a shift from other transport modes to IWT. However, this effect is expected to be very modest, even in cases where costs would lower by as much as 10% and the study¹⁹ provides support for this.

4.1.4 Ports/ Maritime

The purpose of the VTMIS Directive is to establish in the Community a vessel traffic monitoring and information system with a view to enhancing the safety and efficiency of maritime traffic, improving the response of authorities to incidents, accidents or potentially dangerous situations at sea, including search and rescue operations, and contributing to a better prevention and detection of pollution by ships.

In addition to VTMIS, the SafeSeaNet system is a vessel traffic monitoring and information system, established in order to enhance:

- Maritime safety
- Port and maritime security
- Marine environment protection
- Efficiency of maritime traffic and maritime transport

Also, the integration of new equipment in WB6 coastal states can enhance the availability of real-time information about safe navigation conditions, pollution incidents, security and traffic control in given areas, necessary to foresee accidents and minimise their impact.

¹⁸ Reviewing Directive 97/68/EC Emissions from non-road mobile machinery, ARCADIS and

Transport & Mobility Leuven (TML), 2009.

¹⁹ Sys, C. and T. Vanelslander (eds.) (2011), Future Challenges for Inland Navigation: A Scientific Appraisal of the Consequences of Possible Strategic and Economic Developments up to 2030, University Press Antwerp.

Progressively, more and more information from and on ships is being centralised in the SafeSeaNet system. This means that, now and in the future, a growing number of different types of users are being given the opportunity to access the information they need from a **single source**, instead of using many different sources, making their work easier, and more efficient. SEETO's Assessment of ITS deployment in WB (2016) provided the following list of benefits:

- Port state control: Under the New Inspection Regime for Port State Control, those involved in inspecting ships need to look at specific vessels when they enter their ports. This is progressively enabling port state control officers to improve their planning.
- Pollution preparedness and response: By combining information on ship positions obtained in Automatic Identification System (AIS) signals via SafeSeaNet with pollution images generated by the CleanSeaNet system (using Synthetic Aperture Radar - SAR), polluters are being identified and convicted.
- Port authorities: estimated and actual arrival times of ships, enables port authorities to have greater control over such things as: efficient and safe use of anchorages; management of ship queues; traffic control for entry, manoeuvring, berthing and departure; cargo/passenger planning, loading and unloading, and handling of dangerous goods, avoidance or collision etc.
- Coastal monitoring: Staff involved in monitoring the coastlines, such as those in coastal and port VTSs (Vessel Traffic Services) have access to the full suite of information in SafeSeaNet in order to carry out their work. For example, they can see exactly where ships are, their destination (plus all their associated information) on the map long before they enter their waters.
- Risk analysis and control: SafeSeaNet provides those entrusted with ensuring that shipping operates safely in and around EU waters with improved information for managing risk.
- Customs control: Customs officers need different types of information on ships and cargoes that they wish to inspect. SafeSeaNet provides information on unexpected vessel behaviour, such as deviation from route, speed variations, unexpected stops, at-sea encounters. SafeSeaNet is based on Solas, Marpol regulations rather than a financial/ commercial regulatory regime.
- Waste/Garbage control: Such notifications sent by ships to port/coastal authorities identify the types and quantities of waste and cargo residues that they are carrying, and this enables more efficient disposal when ships are in port and better management of pollutants, should they have accidents. It also provides useful information on pollutants that could potentially be illegally discharged, and thus acts as an additional pollution deterrent.
- Security monitoring: The security of European Community shipping, and of citizens using it, and of the environment, in the face of threats of intentional unlawful acts such as acts of terrorism, acts of piracy or similar, should be ensured at all times.

According to the Reporting Formalities Directive (RFD), the SafeSeaNet system should be used for additional exchange of information to reduce the administrative burdens for maritime transport and for the facilitation of maritime transport.

4.2 Costs and benefits

All data used in the calculations (section lengths, volume and composition of traffic, average speeds etc.) have been extracted from SEETIS. The table below presents the entire road network of TEN-T extension used in the costs/ benefits estimation exercise. Separate tables on the Core and Comprehensive network are presented in Appendix C.

Section	Road length (km)								
	ALB	BIH	MKD	MNE	SER	KOS	Total		
Corridor Vc	0	400	0	0	0	0	400		
Corridor VIII	359	0	312	0	0	0	671		
Corridor X	0	0	195	0	531	0	726		
Corridor Xb	0	0	0	0	185	0	185		
Corridor Xc	0	0	0	0	110	0	110		
Corridor Xd	0	0	117	0	0	0	117		
Route 1	13	7	0	86	0	0	106		
Route 2a	0	228	0	0	0	0	228		
Route 2b	173	104	0	160	0	0	437		
Route 2c	125	0	0	0	0	0	125		
Route 3	0	131	0	0	54	0	185		
Route 4	0	0	0	180	421	0	601		
Route 5	0	0	0	0	213	0	213		
Route 6a	0	0	20	79	25	135	259		
Route 6b	0	0	0	101	0	104	205		
Route 7	114	0	0	0	85	107	306		
Route 8	0	0	78	0	0	0	78		
Route 9a	0	214	0	0	134	0	348		
Route 10	0	0	170	0	0	0	170		
Total	784	1,084	892	606	1,758	346	5,470		
Percentage	14%	20%	16%	11%	32%	6%	100%		

Section	Rail length (km)						
	ALB	BIH	MKD	MNE	SER	KOS	Total
Corridor Vc	0	428	0	0	0	0	428
Corridor VIII	357	0	244	0	0	0	601
Corridor X	0	0	215	0	515	0	730
Corridor Xb	0	0	0	0	151	0	151
Corridor Xc	0	0	0	0	104	0	104
Corridor Xd	0	0	146	0	0	0	146
Route 2	119	0	0	25	0	0	144
Route 4	0	0	0	159	421	0	580
Route 7	0	0	0	0	84	50	134
Route 9a	0	383	0	0	108	0	491
Route 10	0	0	17	0	174	151	342
Route 11	0	0	0	0	138	0	138
Route 13	0	0	0	0	28	0	28
Total	476	811	622	184	1,723	201	4,017
Percentage	12%	20%	15%	5%	43%	5%	100%

4.2.1 Roads and ICT

4.2.1.1 Costs

For implementation of road ITS the following cost estimations are suggested:

	Roadside equipment:	
	 implementation costs per kilometre of infrastructure/direction 	EUR 20,000
	- annual maintenance costs per kilometre of infrastructure/direction	EUR 600
-	Control centre:	
	 implementation cost of software 	EUR 5,000,000
	 annual maintenance of software 	EUR 550,000
	 annual operation personnel cost 	EUR 1,500,000

The implementation costs of road ITS, together with one control centre per RP, are as follows. The calculation is performed for every RP and for every Corridor/Route of the Core and Comprehensive network.

Section	Implementation costs with control centres (EUR)						
	ALB	BIH	MKD	MNE	SER	KOS	total
Corridor Vc	0	17,845,018	0	0	0	0	17,845,018
Corridor VIII	16,649,541	0	14,228,879	0	0	0	30,878,420
Corridor X	0	0	8,893,049	0	22,750,239	0	31,643,288
Corridor Xb	0	0	0	0	7,926,166	0	7,926,166
Corridor Xc	0	0	0	0	4,712,856	0	4,712,856
Corridor Xd	0	0	5,335,830	0	0	0	5,335,830
Route 1	602,908	312,288	0	4,149,571	0	0	5,064,767
Route 2a	0	10,171,661	0	0	0	0	10,171,661
Route 2b	8,023,316	4,639,705	0	7,720,132	0	0	20,383,153
Route 2c	5,797,194	0	0	0	0	0	5,797,194
Route 3	0	5,844,244	0	0	2,313,584	0	8,157,827
Route 4	0	0	0	8,685,149	18,037,383	0	26,722,532
Route 5	0	0	0	0	9,125,802	0	9,125,802
Route 6a	0	0	112,108	3,811,815	1,071,104	7,350,867	12,345,893
Route 6b	0	0	0	4,873,333	0	5,662,890	10,536,224
Route 7	5,287,041	0	0	0	3,641,752	5,826,243	14,755,036
Route 8	0	0	3,557,220	0	0	0	3,557,220
Route 9a	0	9,547,085	0	0	5,741,115	0	15,288,200
Route 10	0	0	7,752,915	0	0	0	7,752,915
Total	36,360,000	48,360,000	39,880,000	29,240,000	75,320,000	18,840,000	248,000,000

Table 4.2-1 ITS implementation cost

Total implementation costs amount to EUR 248 million, out of which EUR 159.1 million is for the Core network.

Annual operation and maintenance costs amount to EUR 1,200 per kilometre of road (both directions) and EUR 2.05 million for each control centre (EUR 12.3 million in total). The calculation is performed for every RP and for each Corridor/ Route of the Core and Comprehensive network.
Section	O&M costs with traffic control centres (EUR)									
	ALB	BIH	MKD	MNE	SER	KOS	total			
Corridor Vc	0	1,360,000	0	0	0	0	1,360,000			
Corridor VIII	1,220,600	0	1,060,800	0	0	0	2,281,400			
Corridor X	0	0	663,000	0	1,805,400	0	2,468,400			
Corridor Xb	0	0	0	0	629,000	0	629,000			
Corridor Xc	0	0	0	0	374,000	0	374,000			
Corridor Xd	0	0	397,800	0	0	0	397,800			
Route 1	44,200	23,800	0	292,400	0	0	360,400			
Route 2a	0	775,200	0	0	0	0	775,200			
Route 2b	588,200	353,600	0	544,000	0	0	1,485,800			
Route 2c	425,000	0	0	0	0	0	425,000			
Route 3	0	445,400	0	0	183,600	0	629,000			
Route 4	0	0	0	612,000	1,431,400	0	2,043,400			
Route 5	0	0	0	0	724,200	0	724,200			
Route 6a	0	0	68,000	268,600	85,000	459,000	880,600			
Route 6b	0	0	0	343,400	0	353,600	697,000			
Route 7	387,600	0	0	0	289,000	363,800	1,040,400			
Route 8	0	0	265,200	0	0	0	265,200			
Route 9a	0	727,600	0	0	455,600	0	1,183,200			
Route 10	0	0	578,000	0	0	0	578,000			
Total	2,665,600	3,685,600	3,032,800	2,060,400	5,977,200	1,176,400	18,598,000			

Table 4.2-2 ITS annual operational and maintenance costs

Total annual operation and maintenance costs amount to EUR 18.598 million, out of which EUR 12 million is for the Core network.

4.2.1.2 Benefits

In the benefits calculation, the following types were taken into account:

- Time savings for passengers,
- Time savings for freight,
- Accident reductions for different types of severity, based on anticipated safety improvement from similar projects abroad and on actual accident statistics.

The increase in travel speed means a decrease in travel times and thus a time benefit. In the literature studied, the decrease in travel times due to ITS measures amounts to 10%. The unit values of time were taken from the REBIS Update study²⁰. The value of time for car passengers was considered to be $3.3 \notin$ /hour for car passengers, and a car occupancy rate of 2.25 passengers per car was assumed. The value of time for a professional driver on the road network was estimated at 10.40 \notin per hour. It should be noted that the same unit values were applied for all RPs (as REBIS Update).

Reduction of fatalities and heavy injuries were calculated for each Corridor/ Route for each RP for the Core and Comprehensive network. In order to get unit accident reduction per kilometre of road per year in each RP, the accidents per Corridor/ Route were weighted by length. The accident unit costs were taken from the REBIS Update and amount to:

۰.	fatality	EUR 600,000
•	heavy injury	EUR 78,261

light injury
 EUR 6,000

The total time savings and accident reduction per RP and Corridor/ Route of the Core and Comprehensive network are presented below.

²⁰ The Regional Balkans Infrastructure Study (REBIS) Update, IBRD, September 2015.

Section	Time savings/year + accident reduction/year								
	ALB	BIH	MKD	MNE	SER	KOS	Total		
Corridor Vc	0	49,406,909	0	0	0	0	49,406,909		
Corridor VIII	24,934,901	0	5,915,864	0	0	0	30,850,765		
Corridor X	0	0	4,254,635	0	27,693,618	0	31,948,253		
Corridor Xb	0	0	0	0	8,204,911	0	8,204,911		
Corridor Xc	0	0	0	0	2,329,183	0	2,329,183		
Corridor Xd	0	0	103,601	0	0	0	103,601		
Route 1	103,773	132,675	0	4,492,347	0	0	4,728,795		
Route 2a	0	13,564,645	0	0	0	0	13,564,645		
Route 2b	11,662,577	21,931	0	83,046	0	0	11,767,553		
Route 2c	1,753,264	0	0	0	0	0	1,753,264		
Route 3	0	28,168	0	0	54,350	0	82,518		
Route 4	0	0	0	9,715,745	10,987,281	0	20,703,026		
Route 5	0	0	0	0	211,570	0	211,570		
Route 6a	0	0	17,076	40,238	24,117	5,064,696	5,146,127		
Route 6b	0	0	0	49,057	0	93,849	142,906		
Route 7	2,296,935	0	0	0	695,621	4,017,579	7,010,135		
Route 8	0	0	68,670	0	0	0	68,670		
Route 9a	0	67,906	0	0	135,454	0	203,360		
Route 10	0	0	150,295	0	0	0	150,295		
Total	40,751,450	63,222,233	10,510,142	14,380,433	50,336,104	9,176,123	188,376,486		

 Table 4.2-3 Annual time savings and accidents costs reduction

The annual benefit from accidents reduction is estimated at EUR 3.9 million. However, this benefit is marginal if compared to the annual benefit from time-savings, which is estimated to be more than EUR 185 million annually, without considering traffic growth. These figures, combined with the non-quantified benefits (emissions, time savings at borders, etc.), demonstrate the effectiveness of investing in ITS deployment in the region.

4.2.2 Railways

4.2.2.1 Costs

The implementation costs for ERTMS L2 is estimated at EUR 144,500 per kilometre of track. The cost of retrofitting the rolling stock with an on-board unit is split between:

- ERTMS 2 equipment and installation costs
- Testing and authorization
- Unavailability of the vehicle

The unit cost for an on-board unit depends on various factors so it is very hard to set the general unit cost per item of on-board equipment. The cost of an on-board unit also varies between different sources. In order to indicate the magnitude, the cost could go from EUR 100,000 for new equipment to EUR 200,000 to 300,000 if existing equipment has to be adapted²¹, or even EUR 375,000²².

The implementation and annual maintenance costs for ERTMS are given in the table below. It should be noted that retrofitting the rolling stock with on-board unit has not been considered, since it depends

²¹ ERTMS in 10 questions, MEMO/05/235, Brussels, 4 July 2005.

²² ERTMS Business case on the 9 core network corridors, July 2016.

on the rolling stock structure. The calculation is performed for every RP and for every Corridor/ Route of the Core and Comprehensive network.

Section			Implementati	on costs in El	JR - track-side		
	ALB	BIH	MKD	MNE	SER	KOS	Total
Corridor Vc	0	61,846,000	0	0	0	0	61,846,000
Corridor VIII	51,586,500	0	35,258,000	0	0	0	35,258,000
Corridor X	0	0	31,067,500	0	74,417,500	0	105,485,000
Corridor Xb	0	0	0	0	21,819,500	0	21,819,500
Corridor Xc	0	0	0	0	15,028,000	0	15,028,000
Corridor Xd	0	0	21,097,000	0	0	0	21,097,000
Route 2	17,195,500	0	0	3,612,500	0	0	3,612,500
Route 4	0	0	0	22,975,500	60,834,500	0	83,810,000
Route 7	0	0	0	0	12,138,000	7,225,000	19,363,000
Route 9a	0	55,343,500	0	0	15,606,000	0	70,949,500
Route 10	0	0	2,456,500	0	25,143,000	21,819,500	49,419,000
Route 11	0	0	0	0	19,941,000	0	19,941,000
Route 13	0	0	0	0	4,046,000	0	4,046,000
Total	68,782,000	117,189,500	89,879,000	26,588,000	248,973,500	29,044,500	511,674,500

Table 4.2-4 ERTMS implementation cost

Table 4 2-5	FRMTS annual	operational and	maintenance costs
10010 4.2 0		operational and	

Section			Annual mai	ntenance cos	ts in EUR		
	ALB	BIH	MKD	MNE	SER	KOS	Total
Corridor Vc	0	719,040	0	0	0	0	719,040
Corridor VIII	599,760	0	409,920	0	0	0	409,920
Corridor X	0	0	361,200	0	865,200	0	1,226,400
Corridor Xb	0	0	0	0	253,680	0	253,680
Corridor Xc	0	0	0	0	174,720	0	174,720
Corridor Xd	0	0	245,280	0	0	0	245,280
Route 2	199,920	0	0	42,000	0	0	42,000
Route 4	0	0	0	267,120	707,280	0	974,400
Route 7	0	0	0	0	141,120	84,000	225,120
Route 9a	0	643,440	0	0	181,440	0	824,880
Route 10	0	0	28,560	0	292,320	253,680	574,560
Route 11	0	0	0	0	231,840	0	231,840
Route 13	0	0	0	0	47,040	0	47,040
Total	799,680	1,362,480	1,044,960	309,120	2,894,640	337,680	5,948,880

Therefore, the implementation cost is estimated at approx. EUR 512 million and the annual maintenance cost at EUR 6 million.

4.2.2.2 Benefits

In the benefits calculation, the following types were taken into account:

- Time savings for passengers,
- Time savings for freight.

The increase in travel speed means a decrease in travel times and thus a time benefit. Based on the available literature, ERTMS measures could decrease travel times by up to 20% ²³. The unit values of time were taken from the REBIS Update²⁴. The value of time was considered $3 \in$ /hour for passengers, and 2.13 \in /ton-hour for freight. It should be noted that the same unit values were applied for all RPs (as REBIS Update).

The total time-savings per RP and Corridor/ Route for Core and Comprehensive network are presented below.

Section		E	Benefits from t	ime savings re	eduction in EUR		
	ALB	BIH	MKD	MNE	SER	KOS	Total
Corridor Vc	0	12,180,839	0	0	0	0	12,180,839
Corridor VIII	30,253	0	51,854	0	0	0	82,107
Corridor X	0	0	596,896	0	4,013,257	0	4,610,152
Corridor Xb	0	0	0	0	4,635,614	0	4,635,614
Corridor Xc	0	0	0	0	4,477,172	0	4,477,172
Corridor Xd	0	0	410,410	0	0	0	410,410
Route 2	231,534	0	0	42,111	0	0	273,644
Route 4	0	0	0	1,081,086	2,404,278	0	3,485,364
Route 7	0	0	0	0	68,946	704,360	773,306
Route 9a	0	5,328,707	0	0	332,212	0	5,660,919
Route 10	0	0	188,932	0	207,884	695,186	1,092,001
Route 11	0	0	0	0	556,932	0	556,932
Route 13	0	0	0	0	592	0	592
Total	261,787	17,509,546	1,248,091	1,123,197	16,696,887	1,399,546	38,239,054

Table 4.2-6 Annual time savings due to ERTMS implementation

The annual benefit from time savings is estimated at EUR 38 million annually, without considering the traffic growth.

4.2.3 Inland Waterways

4.2.3.1 Costs

Below the implementation costs from Serbia are used for Bosnia and Herzegovina. This model does not include administrative costs that should be taken into account in the case of BIH waterways:

- establishing new institution/agency authorized for RIS implementation, maintenance and development; this could be the institution in charge of maintenance and development of IWW in BIH at the same time, depending on the provisions of the law regulating the competences in the IWT sector;
- training of staff responsible for RIS operation and users of RIS

²³ Decrease in travel times is compounded over multiple features, including allowing higher speeds, breaking curve control (Introduction to ETCS Braking curves, ERA_ERTMS_040026, 14/06/16), eliminating propagation of delays, better reliability of the signalling system, overview of multiple block vacancies by the driver etc. (see details in Report 4).

²⁴ The Regional Balkans Infrastructure Study (REBIS) Update, IBRD, September 2015.

For the estimation of the RIS implementation costs, the following figures represent the Serbian case:

Cost Category	Amount (€)
Technical and tender documentation for implementation	800,000
Implementation of RIS	6,400,000
Supply of equipment	2,404,982
Supervision of the Implementation	1,488,200
Total costs	11,093,182

Table 4.2-7 RIS implementation budget in Serbia

The waterways network covered by RIS comprise 588km of the Danube River and 211km of the Sava River and the above-mentioned budget are related to a total length of 799km. When the total costs of implementation in Serbia are divided by the total length of waterways with RIS implemented, the unit cost of implementation per kilometre is calculated. Implementation costs per kilometre amounts to EUR 14,000. Therefore, it is estimated that the total investment cost for RIS implementation on the rest of the IWW network in Bosnia and Herzegovina and Serbia could reach EUR 7.6 million.

Additional costs are related to the RIS operation and regular maintenance of the entire system. The cost of RIS operation and maintenance includes different features, such as renting of facilities, internet connection, hosting services, acquisition of different software and licences, acquisition of equipment and their components, installation of equipment and their components, external services, salaries of staff, overheads, etc. Annual operations and maintenance costs of RIS on Serbian rivers Sava and Danube varies in the range of 100,000 and 150,000 EUR²⁵. When dividing O&M costs on the total length of waterways with RIS, the unit cost of O&M per kilometre amounts to between EUR 125 and EUR 190, with the average of EUR 160. O&M costs for the entire IWW network could be EUR 0.22 million annually.

4.2.3.2 Benefits

RIS can lead to the following benefits:

- Improved vessel utilization
- Homogeneous cruising speeds
- Reduced delays and waiting times
- Higher safety performance
- Improved logistics planning for shippers
- Positive effects of RIS on the efficiency of authorities, such as more efficient custom and law enforcement procedures, more efficient lock and bridge operation, more effective waterway maintenance, more efficient statistical data collection, improved efficiency at terminals, and improved security.

According to SPIN-TN Strategies to Promote Inland Navigation the implementation of RIS will lead to a 2% reduction of fuel consumption.

²⁵ Data provided by Directorate for IWW "Plovput", Serbia (Questionnaire).

4.2.4 Ports/ Maritime

4.2.4.1 Costs

Taking into account the strategic level of assessment and the unit costs received, the following costs and benefits would be quantified:

- Costs:
 - Project Initial investment value.
 - Implementation costs for works to be decided
 - Training cost of the persons involved
 - Cost of maintenance and operation.
 - Communication and security control costs

The VTMIS implementation is obligatory, but also proved to be very cost efficient. Usually the implementation costs of VTMIS vary from EUR 5 to 7 million. An initial estimation of costs breakdown is as follows:

- Study for the installation of a VTMIS system EUR 500,000 1.000,000, depending on the coverage of the VTMIS). This study covers also training and communication aspects.
- Total investment costs of VTMIS implementation amount to between EUR 5,000,000 and 7,000,000
 ²⁶ (depending on the coverage and the number of repeaters²⁷)
- Technical Support for the implementation/evaluation of the installation, etc. (third party other than the provider): EUR 600,000
- Initial Training: estimated at 5-10% of the initial implementation cost (depending on the number of persons and the location). For Montenegro the cost is:
 - Stage 1: Levelling programme, EUR 72,000
 - Stage 2: VTS operator course, EUR 79,750
- Maintenance cost is estimated at 10% of total investment costs, i.e. EUR 500,000 700,000
- Communication and security control costs are estimated at 10%, i.e. EUR 500,000 700,000

4.2.4.2 Benefits

Briefly, the following benefits are anticipated, which, however, cannot be quantified within the current exercise and specific ports, due in particular to lack of data and the unknown level of the specific contribution of VTMIS to each of these benefits:

- Safety at sea and ports
- Security at sea and ports
- Protection of the Environment
- Increased efficiency of port operators and coastal states (KPIs)
- Reduced operational costs of ports and port facilities

VTMIS could be very beneficial for safety and accident prevention.

²⁶ The value of implementation cost refers to the case of Albania, as per recent estimation made by the World Bank.

 $^{^{27}}$ Unit cost of a repeater ranges between EUR 100,000 – 500,000 (typically 5-10% of initial cost of the central installation).

Accidents may have the following consequences:

- 1. Human loss or injury of any type
- 2. Damage to the vessel(s) only (starting from simple hull damage until total loss of the vessel(s))
- 3. Damage to vessel(s) and Pollution of the environment (sea and ashore)
- 4. Any combination of the above and cargo loss (partial or total)
- 5. Any combination of the above plus human injury or death

The cost could range from some thousand EUR up to a few billion in the worst-case scenarios²⁸. Any combination can occur depending on the vessel(s), the cargo, the number of passengers and crew involved and the conditions of an accident. It cannot be said that a worst-case scenario occurs every day, but the example merely indicates why measures are needed to prevent accidents. From different accident scenarios, even by choosing only "crew liabilities" for the tanker vessel, the cost could reach approx. USD 25 million, while the cost of a VTMIS system depending on the coverage would be much less. Briefly, VTMIS is a system that could contribute to minimising accidents especially:

- in areas of significant risk (Internal Waters Port areas/ Coastal waters <= 12 nm/ Internal Waters -Channel, river) and
- where a vessel is operating under conditions like Departure/ Arrival/ Alongside/ Anchorage

In conclusion, the costs of an accident may vary from a few million to a few billion euros, while the implementation costs of VTMIS ranges between EUR 5 and 7 million. The implementation costs of VTMIS is just a portion of a single accident cost and from this point of view is considered a worthwhile investment.

²⁸ Source: Allianz Insurance-Safety and Shipping Review 2017, see Report 4.

5 Regional vision, Strategic Framework and Roadmap

5.1 Vision and regional strategic objectives

The concise vision defined below comprises a regional aspiration for ITS development and the base to define strategic objectives and actions towards the integration and the improvement of safety and efficiency of the transport network in the region.

Intelligent Transport Systems development in the entire SEETO area will contribute significantly to the creation of an integrated, safe and efficient transport network and will be a policy axis for ensuring sustainable mobility of people and transport of goods, development, employability and social cohesion in the Western Balkans region.

The challenges related to the specific characteristics of the economy, geography, employability, competitiveness, of each WB6 RP form the basis of regional strategic planning. The strategic objectives must be structurally and dynamically interconnected among each WB6 RP because of their multiplier effects at regional and RP level.

The creation of an ITS development strategy for each RP should be based on the regional strategy, the European transport policy and the wider economic-business environment in the WB6 region aiming at the best possible integrated and structured policy. <u>A prerequisite for a common regional ITS strategy</u> as part of the TEN-T network, is the adoption of EU legislative framework and standards by all RPs.

Development of transport networks, transport safety, sustainable mobility and economic and social cohesion are key principles embodied in a transport policy, in general, and in the area of ITS, in particular. The specific geographical and economic characteristics of the WB6 region, as well as uncertainty caused by the low ITS penetration, the analysed data from the RPs and key stakeholders, lead to the regional strategic objectives presented in the following figure:



Figure 5-1 Regional Strategic Objectives

5.2 Strategic Framework, Roadmap and deployment plan

Given that the technical and legal ITS framework in WB6 is either non-existent or still at an early stage of development, a series of administrative and legislative actions are required that will ensure the smooth operation and deployment of ITS across the region.

The diagram below provides the correlation of those actions with the Regional ITS Vision and its Strategic Objectives. All proposed actions of the Roadmap serve the Strategic Objectives horizontally, considering that the overall vision is ITS development, which is contributing simultaneously to the achievement of the objectives.



Figure 5-2 Vision - Strategic Objectives and Actions

The table below summarizes the required actions included in this Strategic Framework that should form an integral part of each ITS Strategy and Action Plan of RPs, to enable the development and creation of an integrated framework for the operation of ITS in a coordinated and consistent way, upon consultation with stakeholders.

The table provides the required actions, the objectives - in terms of expected outcomes – and the target year of achievement. Furthermore, it is noted that each national operational framework should be aligned with the European framework, as formed by EU institutions.

S/N	Action	Sub-actions	Goal	Target Year	
1	Transposition of EU Legislation	Transposition of EU Directives	Completion of Institutional Framework	2019 - 2020	
		FrameDeveloping a legal framework, where requiredPolicyDeveloping a legal framework, where requiredPolicyEnsuring the use of European standards and specifications for all new projects and upgrading old ones (if the case)Comp 	Policy Making	2019 - 2020	
2	Adoption and implementation of EU Standards	Ensuring the use of European standards and specifications for all new projects and upgrading old ones (if the case)	Completion of Institutional Framework Policy Making	2020	
3	Adoption and implementation of EU ITS Framework	Adoption and implementation of EU ITS Framework Arshitecture		2019 - 2020	
	Adopting the European framework and adapting to each RP's needs and objectives		Creation of ITS Framework	2019 - 2020	
		Active involvement of RPs in ERTICO and other transport related bodies.	Capacity building Policy Making	2019 - 2020	
4	Adoption of EU Interoperability and Data Exchange Framework	Adopting the EU interoperability framework and a mechanism for the exchange of ITS data at regional level (DATEX II, ERTMS, C-ITS, EETS ²⁹)	Development of common standards and interoperability requirements at RP level, for integrating traffic management systems and other traffic data sources	2019 - 2020	
5	Development of ITS Strategies and Action Plans at RP level	Creating a Strategy and a General Development Framework for ITS at RP level	Ensure alignment with the common regional Vision and Strategic Objectives	2019 - 2020	
		Signing of a Memorandum of Understanding between WB6 RPs, committing to the common ITS Vision and its strategic objectives	Establishment of a common regional understanding on ITS and its benefits	2019	
Deplo point	yment of ITS in each R and progress made for	P, depending on the starting the other actions	Gradual and coordinated implementation of ITS	2020 - 2025 - 2030	

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Table 5.2-	п кеци	meu action	5 01 3110	аедіс п	SFIA	niework

The Strategic Framework is presented in detail in Report 5. It comprises actions per transport mode, which could be summarised as follows:

²⁹ See Appendix B for e-tolling.

Roads and Cross-modal/ ICT:

- Developing a clear Strategy and Action Plan for ITS deployment
- Transposition of EU relevant legislation
- Signing of a Memorandum of Understanding between public and private entities, which shall specify the actions under the RP's strategy
- Establishment of a performance monitoring framework
- Supporting research and technological development
- Make promotions and publicity activities
- Adoption and mandatory application of standards
- Implementation of ITS Services

Railways:

- Implementation of EU Interoperability Directive (2008/57/EC) as main legal basis
- Implementation of Technical Specifications of Interoperability for Control Command and Signalling (TSI CCS) as main technical standards basis
- Implementation of TSI for TAF ITS applications
- Preparation of National Implementation Strategy for development of European Rail Traffic Management System (ERTMS) on the railway network
- Preparation of Technical Requirements for development of European Rail Traffic Management System (ERTMS) on the railway network
- Preparation of Technical Requirements for implementation of Secondary ITS (TAF/TAP, CIP, PCS, TIS, CIS, CCS TAF, ORFEUS, ISR, CoReDa, WMI)
- Development of necessary project documentation
- Pilot implementation of ERTMS, with the assumption that most of the relevant short-term goals have been achieved (Implementation of ITS systems on the highest priority reconstructed or newly built alignments)
- Evaluation of ERTMS implemented in the previous step; Whether goals are achieved and in what degree, insight into possible unexpected side benefits, cross correlation with new technology developments and international trade routes developments
- Wide scale deployment of ERTMS
- Implementation of secondary ITS (TAF/TAP, CIP, PCS, TIS, CIS, CCS ORFEUS, ISR, CoReDa, WMI)

Inland Waterways:

Bosnia and Herzegovina

- Table of Concordance between all relevant EU Directives and BIH legislation (96/75/EC, 87/540/EEC, 96/50/EC)
- Strategy on IWW development and Draft Law on navigation (and Inland Ports)
- Law on navigation and Inland Ports
- Implementation of Directive 2005/44/EC of the European Parliament and of the Council of 7 September 2005 on harmonized river information services on IWW in the Community
- Review of the existing legislation: requirement for compliance with Directives in AA, adjustment of national legislation – Mandatory use of RIS on all IWW
- Establishment of an authorized institution with jurisdiction over all aspects of IWW development (including RIS activities)
- Capacity building training
- ToR for the technical documentation for RIS implementation
- Technical documentation for the RIS implementation on Sava River: procurement procedure for consultancy service
- Preparation of technical documentation for the RIS implementation on Sava River
- Implementation of the RIS on Sava River, basic scenario

- Implementation of additional services, accordingly with legal regulation adjustments
- Implementation of additional RIS services, AtoNs (Adds to Navigation)

Serbia

- Technical documentation and specification for RIS implementation on Tisa River
- Development and installation of the navigation monitoring and electronic fairway marking system on the Danube River (AtoNs)
- Implementation of a system of modern hydro-meteorological stations
- Implementation of the RIS on Tisa River
- Establishing of VTS and VHF radio-telephone system along IWW
- RIS implementation on entire Canal system Danube-Tisa-Danube
- RIS support to the ship waste disposal operations

Ports/ Maritime:

- Evaluation of current harmonization status and prioritization of the most urgent EU Regulations and Directives to be transposed
- Establishment of a "Coordination team for VTMIS"
- Technical documentation and specifications for VTMIS implementation on the Core Ports and other ports
- Evaluation of the existing VTMIS system data input/output in relation to stakeholder needs and expectations and establish a common software input/output
- Implementation of the unified software including data input/output to all VTMIS systems
- Technical documentation and specifications for SafeSeaNet implementation
- Implementation of the unified software including data input/output to all SafeSeaNet systems
- Technical documentation and specifications for CleanSeaNet implementation
- Implementation of the unified software including data input/output to all CleanSeaNet systems
- Examination of technical aspects for optional participation in EU Pilot Projects

In the following paragraphs, the Roadmaps per mode of transport are presented in an aggregated way. Detailed presentation of Roadmaps per Regional Participant and mode of transport are attached to this Report, in Appendix D.

5.2.1 Roads/ Cross-modal and ICT

Field of	Action	Objective	Sub-actions/ Details	Target	year pe	r Regior	nal Parti	cipant	
intervention				ALB	BIH	MKD	MNE	SRB	KOS
Institutional – Legal/ Cross- modal and ICT	Developing a clear Strategy and Action Plan for ITS deployment	Policy Making	Elaboration of an ITS Strategy and Action Plan according to the user needs and aligned with the Regional ITS Strategic Framework	2020	2020	2020	2020	2020	2020
	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	Directive 2010/40/EU - Framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes Directive 98/34/EC - Establishment of a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services Directive 2007/2/EC - Establishment of spatial information infrastructure for integrated access to travel data Directive 2016/1148/EU - Network Information Security with mandatory implementation for operators of essential services in the transport areas Directive 2016/1148/EU - Network Information Security with mandatory implementation 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	2020	2020	2020	2020	2020	2020
Institutional/ Road	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	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	2020	2020	2020	2020	2020	2020
Organizational/ Cross-modal	Signing of a Memorandum of Understanding between public and private entities, which shall specify the actions under the RP's strategy.	Policy Making	Upon signing of the MoU by ITS stakeholders, a well-defined group of agencies shall be created to undertake the promotion and implementation of projects required for the deployment of ITS.	2019	2019	2019	2019	2019	2019
	Establishment of a performance monitoring framework	Performance Monitoring	Set up of national framework for performance reporting and monitoring as part of national ITS Strategy and Action Plan and within TEN-T reporting guidelines under Directive 2010/40/EU	2019	2019	2019	2019	2019	2019
	Supporting research and technological development Make promotions and publicity activities	Promotion of ITS at RP and regional level	Adopt a framework for developing innovative applications and products for ITS and promoting their use. This can be achieved by creating actions focused on research between research institutions, organizations and companies. Inform the public about new ITS applications.	2025	2025	2025	2025	2025	2025
Technical/ Cross-modal	Adoption and mandatory application of standards	Legal & Technical framework	Mandatory application of DATEX II (CEN/TS) and CEN/TC 278 Standards	2019	2019	2019	2019	2019	2019
and ICT	Implementation of ITS Services Bundle* 1 (see Chapter 5.3)	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2020	2020	2020	2020	2020	2020
	Implementation of ITS Services Bundle 2 (see Chapter 5.3)	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2025	2025	2025	2025	2025	2025
	Implementation of ITS Services Bundle 3 (see Chapter 5.3)	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2030	2030	2030	2030	2030	2030

* ITS Services have been classified in three bundles, according to the current state of play and the users' needs assessment.

5.2.2 Railways

Field of	Action	Objective	Sub-actions/ Details	Target	t year pe	r Regio	nal Parti	cipant	
intervention				ALB	BIH	MKD	MNE	SRB	KOS
Institutional – Legal	Implementation of EU Interoperability Directive (2008/57/EC) as main legal basis	Completion of Institutional Framework Policy Making -legal basis	 Adoption of relevant EU Interoperability Directives Acceptance and adoption by standardisation authorities as national ITS standards Preparation of necessary bylaws 	2020	2022	2019	2020	2019	2020
	Implementation of Technical Specifications of Interoperability for Control Command and Signalling (TSI CCS) as main technical standards basis	Completion of Institutional Framework Policy Making - technical and standards basis	-Adoption of relevant EU Regulations and TSIs -Acceptance and adoption by standardisation authorities as national ITS standards -Preparation or adaptation of national standards, if necessary	2021	2023	2020	2021	2020	2022
	Implementation of TSI for TAF ITS applications	Institutional basis for further ITS adoption	Adoption of Regulation No 1305/2014	2030	2030	2030	2030	2030	2030
Organizational	Preparation of National Implementation Strategy for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Appoint technical team (in-house or consultant) to develop/ update ITS Strategy Develop stakeholder group and assess user requirements Define and prioritize ERTMS goals, they should provide (safety, reliability, compliance with EU, lower maintenance costs) Define priority directions, alignment and sections to be implemented with ERTMS Define long term goals (cross border interoperability, high traffic, high speeds) Develop and validate ITS Action Plan and assess cost-benefit of proposed projects Finalise ITS Strategy and Action Plan 	2022	2024	2021	2022	2021	2023
Organizational – Technical	Preparation of Technical Requirements for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Define national standards within TSI (balise alphabet, standard HMI interface, frequencies used by GSM-R, minimum trackside bandwidth etc.) develop signalling implementation and maintenance manual for the network encompassing both current legacy system and ERTMS as defined in previous steps 	2023	2025	2022	2025	2022	2024
	Preparation of Technical Requirements for implementation of Secondary ITS (bundle* 2 in Chapter 5.3) (TAF/TAP, CIP, PCS, TIS, CIS, CCS TAF, ORFEUS, ISR, CoReDa, WMI)	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Establish an ITS Coordination Team Define the requirements needed for implementation (input data from existing signalling systems, safety protocols, level of access to internal railway network) Join relevant data and international providers networks (such as RNE) 	2030	2030	2030	2030	2030	2030

* ITS Services have been classified in two bundles, according to the current state of play and the users' needs assessment. ERTMS is bundle 1 and all other Rail ITS applications are in bundle 2.

Field of	Action	Objective	Sub-actions/ Details	Targe	t year pe	er Regio	nal Parti	cipant		
intervention				ALB	BIH	MKD	MNE	SRB	KOS	
Technical	Development of necessary project documentation	Justification of investment	 Develop detailed CBA and Feasibility studies Develop Preliminary and Main design Prepare the tender documentation³⁰ 	recurring						
	Pilot implementation of ERTMS, with the assumption that most of the relevant short-term goals have been achieved (Implementation of ITS systems on the highest priority reconstructed or newly built alignments)	Deployment first phase – a pilot deployment	Implementation and commissioning	2025	2026	2023	2026	2023	2025	
	Evaluation of ERTMS implemented in the previous step; Whether goals are achieved and in what degree, insight into possible unexpected side benefits, cross correlation with new technology developments and international trade routes developments	Evaluation of first phase implementation	Evaluation of feasibility study results and expected outcomes; Possible adaptation of National Implementation Strategy according to results	2028	2029	2025	2029	2025	2026	
	Wide scale deployment of ERTMS	Deployment second phase; a wider deployment of a proven system Possible upgrade of existing implementations with newly developed technology if deemed worthwhile in previous step	Tendering, Design, Implementation and Commissioning in line with proven features, updated strategy and international agreements	2030	2030	2030	2030	2030	2030	
	Implementation of secondary ITS (bundle 2 in Chapter 5.3) - TAF/TAP, CIP, PCS, TIS, CIS, CCS ORFEUS, ISR, CoReDa, WMI	Deployment	Tendering and Production of Preliminary and Main Design, implementation and commissioning	2030	2030	2030	2030	2030	2030	

 $[\]frac{1}{30}$ First for selected project to be piloted and then for the rest of the network according to selection in national strategy.

5.2.3 Inland Waterways

Field of intervention	Action	Objective	Sub-actions/ Details	Target year Regional Pa	per rticipant
				BIH	SRB
Institutional – Legal	Table of Concordance between all relevant EU Directives and BIH legislation (96/75/EC, 87/540/EEC, 96/50/EC)	Completion of Institutional Framework Policy Making	Gap analysis/ evaluation for transposition of EU legal framework	2018	-
	Strategy on IWW development and Draft Law on navigation (and Inland Ports)	Completion of Institutional Framework Policy Making		2019	-
	Law on navigation and Inland Ports	Completion of Institutional Framework Policy Making		2019	-
	Implementation of Directive 2005/44/EC of the European Parliament and of the Council of 7 September 2005 on harmonized river information services on IWW in the Community	Completion of Institutional Framework Policy Making		2020	-
	Review of the existing legislation: requirement for compliance with Directives in AA, adjustment of national legislation – Mandatory use of RIS on all IWW	Completion of Institutional Framework Policy Making	Legislation adjustment	2025	-
Organizational	Establishment of authorized institution with jurisdiction over all aspects of IWW development (including RIS activities)	Promotion at RP level (institutional building)	Based on existing agency-models in EU and as such, recognized in the national legislation related to IWW, with clear separation of regulatory from executive powers in IWW-subsectors	2020	-
	Capacity building – training	Promotion at RP level (institutional building)	Regular training of institutional staff (management and employees)	Recurring	-
Technical	ToR for the Technical documentation for RIS implementation	Preparation for deployment		2018	-
	Technical documentation for the RIS implementation on Sava River: procurement procedure for consultancy service	Preparation for deployment		2019	-
	Preparation of technical documentation for RIS implementation on Sava River	Preparation for deployment	Full documentation preparation Financing	2019	-
	Implementation of the RIS on Sava River, basic scenario	Deployment		2020	-
	Implementation of additional services, accordingly with legal regulation adjustments	Deployment	Full documentation preparation Financing	2025	-
	Implementation of additional RIS services, AtoNs (Adds to Navigation)	Deployment	Full documentation preparation Financing	2030	-
	Technical documentation and specification for RIS implementation on Tisa River	Preparation for deployment	Full documentation preparation Financing	-	2019
	Development and installation of the navigation monitoring and electronic fairway marking system on the Danube River (AtoNs)	Deployment	On-going	-	2019
	Implementation of a system of modern hydro-meteorological stations	Deployment		-	2021
	Implementation of the RIS on Tisa River	Deployment		-	2020
	Establishing of VTS and VHF radio-telephone system along IWW	Deployment		-	2021
	RIS implementation on entire Canal system Danube-Tisa-Danube	Deployment		-	2025
	RIS support to the ship waste disposal operations	Deployment		-	2030

5.2.4 Ports/ Maritime

Field of intervention	Action	Objective	Sub-actions/ Details	Target yea Regional F	r per Participant
				ALB	MNE
Institutional – Legal	Evaluation of current harmonization status and prioritization of the most urgent EU Regulations and Directives to be transposed	Completion of Institutional Framework Policy Making	Prioritization and transposition of EU Directives and implementation of EU/IMO requirements. VTMIS regulatory regime preparation.	High→2020 Medium→ Low→2025	0 2022 5
Organizational	Establishment a "Coordination team for VTMIS"	Policy making Coordination and monitoring	Coordination team to act as focal point between the Administration and EU/IMO	2018	2018
Technical	Technical documentation and specifications for VTMIS implementation on the Core Ports and other ports	Deployment preparation	VTMIS system for the Core and other ports has to be established and be compatible with any existing VTMIS system and EU/IMO requirements Full documentation preparation Tender preparation Financing	2020	2020
	Evaluation of the existing VTMIS system data input/output in relation of the stakeholders needs and expectations and establish a common software input/output	Deployment preparation	The whole data input/output procedure has to be decided based on EU specific guidance	-	2021
	Implementation of the unified software including data input/output to all VTMIS systems	Full VTMIS System in operation	Includes training of personnel	2022	2022
	Technical documentation and specifications for SafeSeaNet implementation	Deployment preparation	Full documentation preparation Tender preparation Financing	2023	2023
	Implementation of the unified software including data input/output to all SafeSeaNet systems	Full Operation of SafeseaNet	Includes training of personnel	2025	2025
	Technical documentation and specifications for CleanSeaNet implementation	Deployment preparation	Full documentation preparation Tender preparation Financing	2025	2025
	Implementation of the unified software including data input/output to all CleanSeaNet systems	Full Operation of CleanseaNet	Includes training of personnel	2028	2028
	Examination of technical aspects for optional EU Pilot Projects	Participation in EU pilot projects and initiatives	Establishment an Expert team to decide the technical aspects for participation in EU Pilot Projects Preparation of Feasibility & cost-effective plan	2030	2030

5.3 ITS Services Implementation Strategy

The table below provides a strategy for ITS implementation covering all WB6 participants. Those services were identified duration our consultation process with all stakeholders per RP and grouped into bundles for assessing their impact (Report 4). Each RP should identify specific projects for those services and ensure that each project is interoperable within the WB6 region and EU.

ITS Areas	ITS Services	Bundle 1	Bundle 2	Bundle 3	Implementation Horizon
ent s	Traffic Management & Control	$\sqrt{\sqrt{1}}$			2020 - <mark>2025</mark>
Fraffic nagem Opera ervice	Incident Management	V			2020
Mar and s	Transport Infrastructure Maintenance Management	\checkmark		\checkmark	2025 - 2030
ss cy	Emergency Notification and Personal Security	\checkmark	\checkmark		2020 - 2030
ervice	Hazardous Materials and Incident Management		\checkmark		2025
й Ш	Emergency Vehicle Management		\checkmark		2025
ort afety rity	Emergency Notification (accidents, eCall)	\checkmark	\checkmark		2025
anspoi onal Sa Secur	Infrastructure condition and weather notification	$\sqrt{\sqrt{1}}$			2020 - 2025
Tr Persc and	Ghost Driver Management				2020
vices	Advanced Driver Assistance Systems	√		V	2030
tellige le Ser	Automated Vehicle Operation	\checkmark		\checkmark	2030
Int Vehic	Cooperative Systems (V2V, V2I)			\checkmark	2030
pu s	Positioning and Freight Tracking Services		$\sqrt{\sqrt{1}}$		2025 - 2030
ight a ogistic	Cross Border Services		1	\checkmark	2030
Fre	Dangerous/ Abnormal Freight Management		\checkmark		2025
ᆂᅳᇃᆇᅇ	Electronic Road Tolling		\checkmark		2025
anspo elated ectron aymer ervice	Integration of Payment Systems		$\sqrt{\sqrt{1}}$		2025 - <mark>2030</mark>
Ĩ, Ţ	Public Transport Electronic Payment				2025
olic S ices	Public Transport Management			\checkmark	2030
Put Trans IT Serv	Demand Responsive Public Transport			\checkmark	2030

ITS Areas	ITS Services	Bundle 1	Bundle 2	Bundle 3	Implementation Horizon
s on	Safety related information/ incident warning	$\sqrt{}$			2020 - 2025
ormati ervice	Real time traffic information services	\checkmark	\checkmark		2020 - 2030
lnfe Ø	Pre-trip travel information	\checkmark	\checkmark		2020 - 2030
. <u>0</u>	Next generation rail signalling service	\checkmark			2025
speci	Cross border interoperability	\checkmark			2030
Servi Servi	Common platform for rail data exchange service		V		2030
Ra	Infrastructure data exchange service		\checkmark		2030

ITS services for roads and all modes are marked normally with a $\sqrt{}$ and specific railway services with $\sqrt{}$. When the implementation horizon differs for given services (for railways services, which have been grouped into two bundles <u>independently of the implementation horizon</u>), the years are color coded as well. It is reminded that for Railway systems, ERTMS is Bundle1 by itself (as a prerequisite to all other systems) and all other Rail ITS are grouped in Bundle 2. Detailed description of the services is presented in R5 p.p. 95 – 102).

6 Conclusions, recommendations and perspectives

The aim of this specific CONNECTA subproject has been the formulation of a Regional Strategic Framework for ITS development in the Western Balkans region, with a common vision and Roadmaps developed per Regional Participant and per transport mode.

The subproject comprised a step-by-step process with scoping, missions and needs assessment as the first stage, analysis of the current situation regarding deployment, standards and legislative framework and alignment with EU and international ones, an impact assessment and cost – benefits estimation, and as the final stage, development of the regional strategic framework to serve as the basis for coordinated ITS development in the region. Moreover, the subproject comprised the provision of support to the Regional Participants in planning their next activities in this field and particularly at strategic level, through incorporation of ITS provisions in their ITS Strategies and through the elaboration of RP-specific ITS Strategies and Action Plans³¹.

Understanding the needs, as well as the existing (or perceived) barriers, was the first step towards the definition of a common vision and strategy for the region. Common problems produce common needs. This is obvious from the meetings with stakeholders and the responses to the specific questionnaire used, where there is mostly homogeneity in the ITS needs per Regional Participant. EU provides all the necessary tools to achieve a WB6 Regional Participants' common regional ITS Architecture and goals.

The EU has already developed a European ITS Framework Architecture (FRAME). FRAME provides a reference for the terminology, a decomposition of an ITS system and a methodology to build new ITS architectures. These aspects are used to allow harmonization with national ITS architectures. FRAME does not define technology, thus enabling the freedom to apply it in order to implement different ITS systems that use different technological solutions. Its distinctive characteristic is that it contains more than one way of performing a service, thus it enables the user to select the most appropriate set of functionalities.

So, building a common regional ITS Strategy will help the Regional Participants to build their one harmonized National ITS Architecture. Having a National ITS Architecture provides specifications that enable:

- Compatibility of information delivered to end users through different media;
- Compatibility of equipment with infrastructures, thus enabling seamless travel across Europe;
- A basis for national and/or regional authorities to produce master plans and recommendations to facilitate ITS deployment;
- An open market for services and equipment where compatible subsystems are offered (no more adhoc solutions);
- A known marketplace into which producers can supply products with reduced financial risk.

While for VTMIS and RIS there is an imbalance of progress between the two respective pairs of RPs, in Road ITS there is gradual deployment on a project basis (new motorway sections and tunnels). Regarding ERTMS, the development level is still in its infancy, but with no irreversible deployment made, and the main issues to confront being financing, the low priority given and the low level of expertise and understanding of the systems, the latter comprising the risk of different interpretations of the ERTMS specifications during the rollout of projects that may lead to errors and incompatibilities between ETCS subsystems. Therefore, continuous cooperation within the region is required, to timely avoid uncoordinated ERTMS deployment, and to this end, stakeholders should look beyond their immediate needs.

³¹ Details about the provided supporting activities within this subproject are provided in Appendix A.

A variety of positive effects (impact) have been presented, illustrating a wide range of benefits expected from the ITS deployment in WB6 region. Given the constraints of data unavailability, but also considering the strategic nature of the project, it was not possible to quantify many of the expected benefits and assess them in more detail. This requires a section-by-section approach (speaking about roads and railways) and project-specific analysis (applies to all transport modes), which goes beyond the scope of this exercise.

Nevertheless, from the rough estimations provided for implementation costs, it is inevitable that, given the low starting point of the WB6 a significant volume of implementation costs is needed. Even from the few benefits that have been quantified for the case of Road ITS and ERTMS, it is obvious that the return on investment is expected to be considerably high and this in the safe side before considering the benefits described in a qualitative manner, for all transport modes. ITS deployment, in combination with large infrastructural projects that are on-going or underway, will entail substantial benefits at RP and regional level, boosting the economies and increasing the overall attractiveness of the WB transport network for both mobility of persons and transport of goods.

Insights have been provided into the regional costs and benefits from the introduction of ITS. Beyond this general objective, costs elements both at regional and RP level per mode have been provided, and specifically for the Road and Railway Network per Corridor and Route. As its aim was not to focus on the project level of one specific section, the elaboration of more detailed analysis for specific ITS projects and of a proper CBA including streams of costs and benefits over a time period was not possible within the scope of the project, as it presupposes the provision of additional, detailed and more project-specific data.

A series of actions have to be taken in order to proceed with ITS and IT deployment, concerning transposition of EU acquis, as well as mandatory use of the relevant standards. The proposed strategic framework and roadmaps are tools in the service of RPs and the respective – per mode – stakeholders serving as a basis of a mutually recognised framework for further actions, and thus it is a prerequisite for the formulation of fully aligned Roadmaps and Deployment Plans that have been provisionally prepared, taking into account the RPs current status regarding ITS and their capacities and potentials (apart from the weakness of information/ data unavailability). It should be noted that financial and political components for ITS promotion and deployment, which are very often the main arguments for stagnancy, were - at a certain level - disconnected from the process of Roadmap/ Deployment Plans definition.

Using the previous work done by SEETO as a basis and building on the available knowledge and the updated information provided on progress during recent years in each Regional Participant and in the EU concerning legislative and technological improvements, and in line with the Connectivity Reform Measures, the provisions of the Transport Community Treaty and its respective emerging obligations, the Strategic Framework and Roadmaps constitutes a reference for the Regional Participants.

General recommendations for all Regional Participants are to:

- Transpose the EU ITS Directive 2010/40/EU and Delegated Acts;
- Adopt all CEN/TC 278 standards;
- Make the above two obligatory to follow by adopting ITS Strategy and Action Plans as well as through implementation of provisions of related EU directives (supplementing 2010/40/EU);
- Adopt and implement of EU ITS Framework Architecture and actively involved in ERTICO and other transport related bodies;
- Adopt the EU interoperability framework and establish a mechanism for the exchange of ITS data at regional level (DATEX II, ERTMS, C-ITS, EETS);
- For all transport modes, to transpose the relevant Regulations and Directives and respective technical standards and specifications (ERTMS/ TSI/ TAP/ TAF for railways, RIS Directive for Inland Waterways, VTMIS/ IMO SOLAS for maritime);

- For the ICT domain, to transpose the relevant EU legislative and regulatory framework (cybersecurity, personal data protection, electronic communications, liability, cross-border ticket sales and passenger rights, e-Document, e-Customs and Integrated Border Management) and promote implementation of the WB Digital Agenda;
- Establish communication and cooperation between different ministries with expertise in different fields of application of ITS;
- Promote the ITS deployment in a coordinated way, based on ITS Strategy and Action Plan developed at RP level.

The development of tailor-made ITS Multimodal Strategies and Action Plans should be a first priority for the Regional Participants during the immediately following period, as per the expectations of the European Commission for:

a) accelerating and taking decisive steps in the necessary reforms and adoption of the EU acquis; and

b) establishing and ensuring an interoperable transport network in the region with equal to the TEN-T standards, including ITS architecture, applications and services.

By the end of this subproject, there had been advanced discussions with most of the RPs for potential elaboration of ITS Multimodal Strategies and Action Plans in the CONNECTA framework. CONNECTA remains available to support the RPs through additional sub-projects in the field of ITS development, provided that they are aligned with the Strategic ITS Framework and recommendations made and the RPs overall Transport Strategies and, above all, in the direction of harmonization with the EU Legislation and Standards and serving the scope of the Connectivity Agenda.

APPENDICES

APPENDIX A: SUPPORT PROVIDED TO REGIONAL PARTICIPANTS [Activity (ix) of ToR]

Regional Participant	Interactions and provided support	Details		
Albania	Discussions and meetings initiated in July 2018 regarding potential of CONNECTA to elaborate Multimodal ITS Strategy	Confirmation of interest received in October 2018. Draft request submitted to CONNECTA on December 3 rd 2018, with additional request for the preparation of ITS design for 200km of roads. Discussions on-going.		
	Request for CONNECTA to prepare full documentation for VTMIS establishment in Durres	Request received in June 2018 and reviewed. It was resubmitted in October and then enriched by CONNECTA in agreement with beneficiary (submitted end of October 2018). Discussions for coordination with World Bank in November 2018. Finally, VTMIS documentation is to be financed by the World Bank, as part of the financing package for VTMIS implementation.		
Bosnia and Herzegovina	Discussions and meetings initiated in June 2018 regarding potential of CONNECTA to elaborate Multimodal ITS Strategy	Confirmation of interest received in July 2018. Next step is to prepare and officially submit the request to CONNECTA. No response yet.		
the former Yugoslav Republic of	Review of draft National Transport Strategy regarding ITS aspects, within its public consultation period	Technical note with findings of the review submitted to MoTC in July 2018.		
Macedonia	Discussions and meetings initiated in May 2018 regarding potential of CONNECTA to elaborate Multimodal ITS Strategy	NoTC prepared draft CONNECTA request, to be submitted officially after required governmental procedure. Draft request unofficially received (16 Oct) and response with comments sent (24 Oct). Next step is to officially submit the request to CONNECTA and start the screening procedure.		
	Official request submitted to CONNECTA for review of design for ITS implementation on Corridor X	<u>Request approved as separate subproject and its on-going since May 2018</u>		
Montenegro	Discussions initiated in June 2018 regarding potential of CONNECTA to elaborate Multimodal ITS Strategy or organisation of local workshop	Beneficiary expressed interest for ITS Strategy and Action Plan elaboration (still under internal consultation). No response yet.		
Serbia	Discussions and meetings with PE Roads of Serbia and MoCTI regarding potential of CONNECTA to elaborate: a) Multimodal ITS Strategy and 4-year Action Plan b) full documentation for the construction of National Control Center in Belgrade	CONNECTA team prepared draft requests for both potential subprojects (delivered to stakeholders end October 2018), to support the beneficiary in preparing official CONNECTA requests to start screening procedure. Meeting with MoCTI held on November 28 th 2018 and discussions on-going for finalisation of TA requests.		
	Review of provisional Scope of Works on preparation of National ERTMS deployment plan	Request received and fulfilled within August 2018. Draft ToR received (14 Aug) and response with comments submitted (21 Aug).		
Kosovo	Proposal of beneficiary on potential organisation of seminar and site-visit in Greece received in March 2018 Discussions initiated in May 2018 regarding potential of CONNECTA to elaborate Multimodal ITS Strategy or organisation of local workshop	Proposal examined and considered impossible to organise, due to ineligibility of expenses (out of CONNECTA region) No request nor confirmation of interest received so far		

Summary of supporting activities provided to Regional Participants

APPENDIX B: E-TOLLING

EU Framework

Electronic Toll Collection (ETC) systems can offer the possibility of charging road vehicles in a flexible way and allow targeted infrastructure charging policies, for those Member States that are applying toll charging schemes for financing road infrastructure construction and maintenance³², according to the 2010 White Paper. It is essential for such systems to be interoperable, also across national borders, to avoid creating new obstacles to traffic flow in Europe.

Directive 2004/52/EC and related Decision 2009/750/EC aim to achieve the interoperability of all the electronic road toll systems in the European Union, thus any tolling system applied in the WB6 region should be compliant to that. This Directive's revision has been recently approved promoting more efficient pricing of infrastructure, the roll -out of intelligent transport solutions and enhanced energy efficiency. The revision is part of the Commission's 2016 European strategy for low – emission mobility, including the polluter-pays and user-pays principles to be adopted.

Moreover, Commission Decision 2009/750/EC, defines European Electronic Toll Service (EETS) which covers all the road networks and tolled (infra)structures in the Union on which road-usage is declared electronically by means of a single on-board equipment, and defines the allowed technological solutions for carrying out electronic toll transactions, namely 5.8 GHz microwave and satellite positioning coupled with mobile communications. EETS allows any road user to pay easily the tolls incurred on any road or (infra)structure in the Union by means of a single subscription contract with an EETS Provider and a single on-board equipment.

The introduction of EETS does not replace any national tolling systems and schemes, but it operates in parallel, ensuring that the EETS user is not charged twice and by no means is not charged more from a user of the national/local system. This involves:

- 1. technical interoperability: concerning on-board equipment as well as positioning and communication technology
- 2. procedural interoperability: contractual agreements between infrastructure operators and toll payment service providers
- 3. treatment of "non-equipped users": how to handle vehicles with no equipment or equipment which is not compatible
- 4. protection of personal data and system security

Thus, any existing and future tolling charging system in the WB6 countries should adhere to the above according to the approved interoperability standards set.

³² Some Member States, apply "shadow tolling" instead of toll charging the user. "Shadow tolling" is the approach where the government collects indirectly tolls from vehicle taxation.

Legislation³³

Directive 2004/52/EC — which entered into force on 26 June 2004 — has been transposed into national law by all the Member States (Annex 1 lists the references to national transpositions of the directive).

Commission Decision 2009/750/EC of 6 October 2009 lays down the essential requirements which will apply to EETS for the whole of the Union. The decision entered into force on 8 October 2009, upon its notification to the Member States.

Road charging for heavy goods vehicles (including Eurovignette) - Directive 1999/62/EC as modified by Directive 2006/38/EC and by Directive 2011/76/EU sets common rules on distance-related tolls and time-based user charges (vignettes) for heavy goods vehicles (above 3.5 tonnes) for the use of certain infrastructures. These rules stipulate that the cost of constructing, operating and developing infrastructure can be leveraged through tolls and vignettes to road users.

Current state of play in WB6

Transposition of Directive 2004/52/EC: the Directive has not been adopted by Albania, the former Yugoslav Republic of Macedonia and Kosovo. It has been partially adopted by Bosnia and Herzegovina, Montenegro and Serbia.

Deployment: E-toll system has been implemented in Serbia. In Bosnia and Herzegovina contactless payments, but only in prepaid mode and introduction of e-toll system is envisaged, after the completion of an on-going EBRD study. Finally, e-toll system introduction is underway in the former Yugoslav Republic of Macedonia.

³³ https://ec.europa.eu

APPENDIX C: COSTS AND BENEFITS ESTIMATIONS



SEETO Road Core/ Comprehensive TEN-T extension

Source: prepared by Connecta team on SEETO MAP 2018 background map

Section	Road length (km)												
	Total	ALB	BIH	MKD	MNE	SER	KOS						
Corridor Vc	400	0	400	0	0	0	0						
Corridor VIII	671	359	0	312	0	0	0						
Corridor X	726	0	0	195	0	531	0						
Corridor Xb	185	0	0	0	0	185	0						
Corridor Xc	110	0	0	0	0	110	0						
Corridor Xd	117	0	0	117	0	0	0						
Route 1	106	13	7	0	86	0	0						
Route 2a	228	0	228	0	0	0	0						
Route 2b	437	173	104	0	160	0	0						
Route 2c	125	125	0	0	0	0	0						
Route 3	185	0	131	0	0	54	0						
Route 4	601	0	0	0	180	421	0						
Route 5	213	0	0	0	0	213	0						
Route 6a	259	0	0	20	79	25	135						
Route 6b	205	0	0	0	101	0	104						
Route 7	306	114	0	0	0	85	107						
Route 8	78	0	0	78	0	0	0						
Route 9a	348	0	214	0	0	134	0						
Route 10	170	0	0	170	0	0	0						
Total	5,470	784	1,084	892	606	1,758	346						
Percentage	100%	14.3%	19.8%	16.3%	11.1%	32.1%	6.3%						

Core/Comprehensive Network Length

Core Network Length

Section			l	Road length ((m)		
	Total	ALB	BIH	MKD	MNE	SER	KOS
Corridor Vc	400	0	400	0	0	0	0
Corridor VIII	533	221	0	312	0	0	0
Corridor X	726	0	0	195	0	531	0
Corridor Xb	185	0	0	0	0	185	0
Corridor Xc	110	0	0	0	0	110	0
Route 1	106	13	7	0	86	0	0
Route 2a	228	0	228	0	0	0	0
Route 2b	138	138	0	0	0	0	0
Route 2c	125	125	0	0	0	0	0
Route 4	601	0	0	0	180	421	0
Route 6a	84	0	0	20	0	0	64
Route 7	306	114	0	0	0	85	107
Total	3,542	611	635	527	266	1,332	171

(Remaining) Comprehensive Network Length

Section	Road length (km)										
	Total	ALB	BIH	MKD	MNE	SER	KOS				
Corridor VIII	138	138	0	0	0	0	0				
Corridor Xd	117	0	0	117	0	0	0				
Route 2b	299	35	104	0	160	0	0				
Route 3	185	0	131	0	0	54	0				
Route 5	213	0	0	0	0	213	0				
Route 6a	175	0	0	0	79	25	71				
Route 6b	205	0	0	0	101	0	104				
Route 8	78	0	0	78	0	0	0				
Route 9a	348	0	214	0	0	134	0				
Route 10	170	0	0	170	0	0	0				
Total	1,928	173	449	365	340	426	175				

ITS Implementation Costs - Road Core Network

	Implementation costs with control centre (EUR)												
Section	Total	ALB	BIH	MKD	MNE	SER	KOS						
Corridor Vc	17,845,018	0	17,845,018	0	0	0	0						
Corridor VIII	24,478,318	10,249,439	0	14,228,879	0	0	0						
Corridor X	31,643,288	0	0	8,893,049	0	22,750,239	0						
Corridor Xb	7,926,166	0	0	0	0	7,926,166	0						
Corridor Xc	4,712,856	0	0	0	0	4,712,856	0						
Route 1	5,064,767	602,908	312,288	0	4,149,571	0	0						
Route 2a	10,171,661	0	10,171,661	0	0	0	0						
Route 2b	6,400,102	6,400,102	0	0	0	0	0						
Route 2c	5,797,194	5,797,194	0	0	0	0	0						
Route 4	26,722,532	0	0	0	8,685,149	18,037,383	0						
Route 6a	3,596,963	0	0	112,108	0	0	3,484,855						
Route 7	14,755,036	5,287,041	0	0	0	3,641,752	5,826,243						
Total	159,113,900	28,336,684	28,328,967	23,234,036	12,834,719	57,068,396	9,311,098						

ITS Implementation Costs - Road Comprehensive Network

	Implementation costs with control centre (EUR)											
Section	Total	ALB	BIH	MKD	MNE	SER	KOS					
Corridor VIII	6,400,102	6,400,102	0	0	0	0	0					
Corridor Xd	5,335,830	0	0	5,335,830	0	0	0					
Route 2b	13,983,051	1,623,214	4,639,705	0	7,720,132	0	0					
Route 3	8,157,827	0	5,844,244	0	0	2,313,584	0					
Route 5	9,125,802	0	0	0	0	9,125,802	0					
Route 6a	8,748,930	0	0	0	3,811,815	1,071,104	3,866,012					
Route 6b	10,536,224	0	0	0	4,873,333	0	5,662,890					
Route 8	3,557,220	0	0	3,557,220	0	0	0					
Route 9a	15,288,200	0	9,547,085	0	0	5,741,115	0					
Route 10	7,752,915	0	0	7,752,915	0	0	0					
Total	88,886,100	8,023,316	20,031,033	16,645,964	16,405,281	18,251,604	9,528,902					

ITS Annual Operation & Maintenance Costs - Road Core Network

	O&M costs with traffic control centre (EUR)											
Section	Total	ALB	BIH	MKD	MNE	SER	KOS					
Corridor Vc	1,360,000	0	1,360,000	0	0	0	0					
Corridor VIII	1,812,200	751,400	0	1,060,800	0	0	0					
Corridor X	2,468,400	0	0	663,000	0	1,805,400	0					
Corridor Xb	629,000	0	0	0	0	629,000	0					
Corridor Xc	374,000	0	0	0	0	374,000	0					
Route 1	360,400	44,200	23,800	0	292,400	0	0					
Route 2a	775,200	0	775,200	0	0	0	0					
Route 2b	469,200	469,200	0	0	0	0	0					
Route 2c	425,000	425,000	0	0	0	0	0					
Route 4	2,043,400	0	0	0	612,000	1,431,400	0					
Route 6a	285,600	0	0	68,000	0	0	217,600					
Route 7	1,040,400	387,600	0	0	0	289,000	363,800					
Total	12,042,800	2,077,400	2,159,000	1,791,800	904,400	4,528,800	581,400					

ITS Annual Operation & Maintenance Costs - Road Comprehensive Network

			O&M costs wit	h traffic contro	I centre (EUR)		
Section	Total	ALB	BIH	MKD	MNE	SER	KOS
Corridor VIII	469,200	469,200	0	0	0	0	0
Corridor Xd	397,800	0	0	397,800	0	0	0
Route 2b	1,016,600	119,000	353,600	0	544,000	0	0
Route 3	629,000	0	445,400	0	0	183,600	0
Route 5	724,200	0	0	0	0	724,200	0
Route 6a	595,000	0	0	0	268,600	85,000	241,400
Route 6b	697,000	0	0	0	343,400	0	353,600
Route 8	265,200	0	0	265,200	0	0	0
Route 9a	1,183,200	0	727,600	0	0	455,600	0
Route 10	578,000	0	0	578,000	0	0	0
Total	6,555,200	588,200	1,526,600	1,241,000	1,156,000	1,448,400	595,000

		٦	Гime savings/yea	r + accident re	duction/year		
Section	Total	ALB	BIH	MKD	MNE	SER	KOS
Corridor Vc	49,406,909	0	49,406,909	0	0	0	0
Corridor VIII	21,265,761	15,349,897	0	5,915,864	0	0	0
Corridor X	31,948,253	0	0	4,254,635	0	27,693,618	0
Corridor Xb	8,204,911	0	0	0	0	8,204,911	0
Corridor Xc	2,329,183	0	0	0	0	2,329,183	0
Route 1	4,728,795	103,773	132,675	0	4,492,347	0	0
Route 2a	13,564,645	0	13,564,645	0	0	0	0
Route 2b	9,303,096	9,303,096	0	0	0	0	0
Route 2c	1,753,264	1,753,264	0	0	0	0	0
Route 4	20,703,026	0	0	0	9,715,745	10,987,281	0
Route 6a	2,419,005	0	0	17,964	0	0	2,401,041
Route 7	7,010,135	2,296,935	0	0	0	695,621	4,017,579
Total	172,636,983	28,806,965	63,104,229	10,188,463	14,208,092	49,910,614	6,418,620

ITS Annual Benefits - Road Core Network

ITS Annual Benefits - Road Comprehensive Network

		т	ime savings/yea	r + accident re	duction/year		
Section	Total	ALB	BIH	MKD	MNE	SER	KOS
Corridor VIII	9,585,004	9,585,004	0	0	0	0	0
Corridor Xd	103,601	0	0	103,601	0	0	0
Route 2b	2,464,457	2,359,481	21,931	0	83,046	0	0
Route 3	82,518	0	28,168	0	0	54,350	0
Route 5	211,570	0	0	0	0	211,570	0
Route 6a	2,728,010	0	0	0	40,238	24,117	2,663,655
Route 6b	142,906	0	0	0	49,057	0	93,849
Route 8	68,670	0	0	68,670	0	0	0
Route 9a	203,360	0	67,906	0	0	135,454	0
Route 10	150,295	0	0	150,295	0	0	0
Total	15,740,391	11,944,485	118,004	322,567	172,341	425,490	2,757,504



SEETO Rail Core/ Comprehensive TEN-T extension

Source: prepared by Connecta team on SEETO MAP 2018 background map

Core/Comprehensive	Network Length
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Section			F	Rail length (kr	n)		
	Total	ALB	BIH	MKD	MNE	SER	KOS
Corridor Vc	428	0	428	0	0	0	0
Corridor VIII	601	357	0	244	0	0	0
Corridor X	730	0	0	215	0	515	0
Corridor Xb	151	0	0	0	0	151	0
Corridor Xc	104	0	0	0	0	104	0
Corridor Xd	146	0	0	146	0	0	0
Route 2	144	119	0	0	25	0	0
Route 4	580	0	0	0	159	421	0
Route 7	134	0	0	0	0	84	50
Route 9a	491	0	383	0	0	108	0
Route 10	342	0	0	17	0	174	151
Route 11	138	0	0	0	0	138	0
Route 13	28	0	0	0	0	28	0
Total	4,017	476	811	622	184	1,723	201
Percentage	100%	11.8%	20.2%	15.5%	4.6%	42.9%	5.0%

Core Network Length

_				Rail Length (km)		
Section	Total	ALB	BIH	MKD	MNE	SER	KOS
Corridor Vc	428		428				
Corridor VIII	123	37		86			
Corridor X	730			215		515	
Corridor Xb	151					151	
Corridor Xc	104					104	
Route 2	144	119			25		
Route 4	580				159	421	
Route 10	256			17		88	151
Route 11	138					138	
Total	2,654	156	428	318	184	1417	151

(Remaining) Comprehensive Network Length

	Length (km)										
Section	Total	ALB	BIH	MKD	MNE	SER	KOS				
Corridor VIII	478	320		158							
Corridor Xd	146			146							
Route 7	134					84	50				
Route 9a	491		383			108					
Route 10	86					86					
Route 13	28					28					
Total	1,363	320	383	304	0	306	50				

ERTMS Implementation Costs - Rail Core Network

			Implementatio	on costs in EU	R - track-side		
Section	Total	ALB	BIH	MKD	MNE	SER	KOS
Corridor Vc	61,846,000	0	61,846,000	0	0	0	0
Corridor VIII	12,427,000	5,346,500	0	12,427,000	0	0	0
Corridor X	105,485,000	0	0	31,067,500	0	74,417,500	0
Corridor Xb	21,819,500	0	0	0	0	21,819,500	0
Corridor Xc	15,028,000	0	0	0	0	15,028,000	0
Route 2	3,612,500	17,195,500	0	0	3,612,500	0	0
Route 4	83,810,000	0	0	0	22,975,500	60,834,500	0
Route 10	36,992,000	0	0	2,456,500	0	12,716,000	21,819,500
Route 11	19,941,000	0	0	0	0	19,941,000	0
Total	360,961,000	22,542,000	61,846,000	45,951,000	26,588,000	204,756,500	21,819,500

ERTMS Implementation Costs - Rail Comprehensive Network

		Implementation costs in EUR - track-side											
Section	Total	ALB	BIH	MKD	MNE	SER	KOS						
Corridor VIII	22,831,000	46,240,000	0	22,831,000	0	0	0						
Corridor Xd	21,097,000	0	0	21,097,000	0	0	0						
Route 7	19,363,000	0	0	0	0	12,138,000	7,225,000						
Route 9a	70,949,500	0	55,343,500	0	0	15,606,000	0						
Route 10	12,427,000	0	0	0	0	12,427,000	0						
Route 13	4,046,000	0	0	0	0	4,046,000	0						
Total	150,713,500	46,240,000	55,343,500	43,928,000	0	44,217,000	7,225,000						

Continu			Annual r	naintenance c	osts in EUR		
Section	Total	ALB	BIH	MKD	MNE	SER	KOS
Corridor Vc	719,040	0	719,040	0	0	0	0
Corridor VIII	144,480	62,160	0	144,480	0	0	0
Corridor X	1,226,400	0	0	361,200	0	865,200	0
Corridor Xb	253,680	0	0	0	0	253,680	0
Corridor Xc	174,720	0	0	0	0	174,720	0
Route 2	42,000	199,920	0	0	42,000	0	0
Route 4	974,400	0	0	0	267,120	707,280	0
Route 10	430,080	0	0	28,560	0	147,840	253,680
Route 11	231,840	0	0	0	0	231,840	0
Total	4,196,640	262,080	719,040	534,240	309,120	2,380,560	253,680

ERMTS Annual Maintenance Costs - Rail Core Network

ERMTS Annual Maintenance Costs - Rail Comprehensive Network

			Annual m	aintenance co	sts in EUR		
Section	Total	ALB	BIH	MKD	MNE	SER	KOS
Corridor VIII	265,440	537,600	0	265,440	0	0	0
Corridor Xd	245,280	0	0	245,280	0	0	0
Route 7	225,120	0	0	0	0	141,120	84,000
Route 9a	824,880	0	643,440	0	0	181,440	0
Route 10	144,480	0	0	0	0	144,480	0
Route 13	47,040	0	0	0	0	47,040	0
Total	1,752,240	537,600	643,440	510,720	0	514,080	84,000

ERTMS Annual Benefits - Rail Core Network

			Time	savings in l	EUR		
Section	Total	ALB	BIH	MKD	MNE	SER	KOS
Corridor Vc	12,180,839	0	12,180,839	0	0	0	0
Corridor VIII	21,412	3,135	0	18,276	0	0	0
Corridor X	4,610,152	0	0	596,896	0	4,013,257	0
Corridor Xb	4,635,614	0	0	0	0	4,635,614	0
Corridor Xc	4,477,172	0	0	0	0	4,477,172	0
Route 2	273,644	231,534	0	0	42,111	0	0
Route 4	3,485,364	0	0	0	1,081,086	2,404,278	0
Route 10	989,254	0	0	188,932	0	105,137	695,186
Route 11	556,932	0	0	0	0	556,932	0
Total	31,230,383	234,669	12,180,839	804,104	1,123,197	16,192,389	695,186

ERTMS Annual Benefits - Rail Comprehensive Network

	Time savings in EUR						
Section	Total	ALB	BIH	MKD	MNE	SER	KOS
Corridor VIII	60,695	27,118	0	33,578	0	0	0
Corridor Xd	410,410	0	0	410,410	0	0	0
Route 7	773,306	0	0	0	0	68,946	704,360
Route 9a	5,660,919	0	5,328,707	0	0	332,212	0
Route 10	102,747	0	0	0	0	102,747	0
Route 13	592	0	0	0	0	592	0
Total	7,008,670	27,118	5,328,707	443,987	0	504,498	704,360
APPENDIX D: ROADMAPS PER REGIONAL PARTICIPANT AND TRANSPORT MODE

D1. Albania

Roads and ICT (cross-modal)

The National Transport Strategy in force, includes provisions for ITS strategy and development. The ITS Directive has not been transposed, however recently last year, an official instruction for rules for implementation of ITS in road services has been issued.

Regarding deployment, it is foreseen first on roads Tirana-Durres and Tirana-Elbasan (currently under construction). ITS implementation is currently limited to newly constructed long tunnels.

Transposition of the EU ITS Directive and supplements – Delegated Acts and mandatory adoption and use of all CEN/TC 278 standards is needed. Moreover, it is essential to establish communication and cooperation between different ministries with expertise and competence in different fields of application of ITS (Infrastructure, Transport, Communications, Environment, Regional Affairs, Interior Affairs, Innovation, Economy, Economic Development and Research). This communication and cooperation should be more than declarative and to be obligatory. Establishment of national ITS body through national legislative, who will gather and enforce the mentioned inter-disciplinary cooperation, coordinate legislative acts, projects and other ITS-related activities of competent authorities and other stakeholders, is recommended.

To this end, an integrated multimodal ITS Strategy and Action Plan should be elaborated, setting the basis for coordinated ITS deployment.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal/ Cross-modal and ICT	Developing a clear Strategy and Action Plan for ITS deployment	Policy Making	Elaboration of an ITS Strategy and Action Plan according to the user needs and aligned with the Regional ITS Strategic Framework	2020
	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	Directive 2010/40/EU - Framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes Directive 98/34/EC - Establishment of a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services Directive 2016/1148/EU - Network Information Security with mandatory implementation 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	2020
Institutional/ Road	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	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	2020
Organizational/ Cross-modal	Signing of a Memorandum of Understanding between public and private entities, which shall specify the actions under the RP's strategy.	Policy Making	Upon signing of the MoU by ITS stakeholders, a well- defined group of agencies shall be created to undertake the promotion and implementation of projects required for the deployment of ITS.	2019
	Establishment of a performance monitoring framework	Performance Monitoring	Set up of national framework for performance reporting and monitoring as part of national ITS Strategy and Action Plan and within TEN-T reporting guidelines under Directive 2010/40/EU	2019
	Supporting research and technological development Make promotions and publicity activities	Promotion of ITS at RP and regional level	Adopt a framework for developing innovative applications and products for ITS and promoting their use. This can be achieved by creating actions focused on research between research institutions, organizations and companies. Inform the public about new ITS applications.	2025

Technical/ Cross- modal and ICT	Adoption and mandatory application of standards	Legal & Technical framework	Mandatory application of DATEX II (CEN/TS) and CEN/TC 278 Standards	2019
	Implementation of ITS Services Bundle 1	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2020
	Implementation of ITS Services Bundle 2	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2025
	Implementation of ITS Services Bundle 3	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2030

Albania is making steps towards the creation of the necessary institutional and legislative framework, through the New Law on Railways, which is based on EU Directive, but without by-law acts and Operating Rules, while an ERTMS dedicated Strategy is absent.

ERTMS and Railway ITS applications have not been implemented yet.

Actions to be taken concern all fields of intervention, from institutional/legal, organizational to technical ones. Transposition of EU legislative framework and adoption/ implementation of TSIs, preparation of technical requirements for ERTMS and ITS applications are needed, and a Strategy for coordinated preparation, implementation and monitoring through specialised technical and Coordination teams.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal	Implementation of EU Interoperability Directive (2008/57/EC) as main legal basis	Completion of Institutional Framework Policy Making - legal basis	 Adoption of relevant EU Interoperability Directives Acceptance and adoption by standardisation authorities as national ITS standards Preparation of necessary bylaws 	2020
	Implementation of Technical Specifications of Interoperability for Control Command and Signalling (TSI CCS) as main technical standards basis	Completion of Institutional Framework Policy Making - technical and standards basis	 Adoption of relevant EU Regulations and TSIs Acceptance and adoption by standardisation authorities as national ITS standards Preparation or adaptation of national standards, if necessary 	2021
	Implementation of TSI for TAF ITS applications	Institutional basis for further ITS adoption	Adoption of Regulation No 1305/2014	2030

Organizational	Preparation of National Implementation Strategy for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Appoint technical team (inhouse or consultant) to develop/ update ITS Strategy Develop stakeholder group and assess user requirements Define and prioritize ERTMS goals, they should provide (safety, reliability, compliance with EU, lower maintenance costs) Define priority directions, alignment and sections to be implemented with ERTMS Define long term goals (cross border interoperability, high traffic, high speeds) Develop and validate ITS Action Plan and assess cost- benefit of proposed projects Finalise ITS Strategy and Action Plan 	2022
Organizational – Technical	Preparation of Technical Requirements for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Define national standards within TSI (balise alphabet, standard HMI interface, frequencies used by GSM-R, minimum trackside bandwidth etc.) develop signalling implementation and maintenance manual for the network encompassing both current legacy system and ERTMS as defined in previous steps 	2023
	Preparation of Technical Requirements for implementation of Secondary ITS (bundle 2 in Chapter 5.3) (TAF/TAP, CIP, PCS, TIS, CIS, CCS TAF, ORFEUS, ISR, CoReDa, WMI)	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Establish an ITS Coordination Team Define the requirements needed for implementation (input data from existing signalling systems, safety protocols, level of access to internal railway network) Join relevant data and international providers networks (such as RNE) 	2030
Technical	Development of necessary project documentation	Justification of investment	 Develop detailed CBA and Feasibility studies Develop Preliminary and Main design Prepare the tender documentation³⁴ 	recurring
	Pilot implementation of ERTMS, with the assumption that most of the relevant short-term goals have been achieved (Implementation of ITS systems on the highest priority reconstructed or newly built alignments)	Deployment first phase – a pilot deployment	Implementation and commissioning	2025

³⁴ First for selected project to be piloted and then for the rest of the network according to selection in national strategy.

Evaluation of ERTMS implemented in the previous step; Whether goals are achieved and in what degree, insight into possible unexpected side benefits, cross correlation with new technology developments and international trade routes developments	Evaluation of first phase implementation	Evaluation of feasibility study results and expected outcomes; Possible adaptation of National Implementation Strategy according to results	2028
Wide scale deployment of ERTMS	Deployment second phase; a wider deployment of a proven system Possible upgrade of existing implementations with newly developed technology if deemed worthwhile in previous step	Tendering, Design, Implementation and Commissioning in line with proven features, updated strategy and international agreements	2030
Implementation of secondary ITS (bundle 2 in Chapter 5.3) - TAF/TAP, CIP, PCS, TIS, CIS, CCS ORFEUS, ISR, CoReDa, WMI	Deployment	Tendering and Production of Preliminary and Main Design, implementation and commissioning	2030

Ports/ Maritime

VTMIS has not been implemented yet. While steps have been made for harmonisation with the relevant IMO/ EU regulatory framework, yet efforts are needed for the completion of the institutional and legislative framework.

Required interventions concern institutional/legal, organizational and technical aspects that would lead to VTMIS proper implementation and the implementation of other systems in the future.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal/ Cross- modal and ICT	Evaluation of current harmonization status and prioritization of the most urgent EU Regulations and Directives to be transposed	Completion of Institutional Framework Policy Making	Prioritization and transposition of EU Directives and implementation of EU/IMO requirements. VTMIS regulatory regime preparation.	High→2020 Medium→ 2022 Low→2025
Organizational	Establishment a "Coordination team for VTMIS"	Policy making Coordination and monitoring	Coordination team to act as focal point between the Administration and EU/IMO	2018
Technical	Technical documentation and specifications for VTMIS implementation in Durres and other Albanian ports	Deployment preparation	Full documentation preparation Tender preparation Financing	2020
	Implementation of the unified software including data input/output to all VTMIS systems	Full VTMIS System in operation	Includes training of personnel	2022
	Technical documentation and specifications for SafeSeaNet implementation on the Albanian ports	Deployment preparation	Full documentation preparation Tender preparation Financing	2023
	Implementation of the unified software including data input/output to all SafeSeaNet systems	Full Operation of SafeseaNet	Includes training of personnel	2025
	Technical documentation and specifications for CleanSeaNet implementation on the Albanian ports	Deployment preparation	Full documentation preparation Tender preparation Financing	2025
	Implementation of the unified software including data input/output to all CleanSeaNet systems	Full Operation of CleanseaNet	Includes training of personnel	2028
	Examination of technical aspects for optional EU Pilot Projects	Participation in EU pilot projects and initiatives	Establishment an Expert team to decide the technical aspects for participation in EU Pilot Projects Preparation of Feasibility & cost-effective plan	2030

D2. Bosnia and Herzegovina

Roads and ICT (cross-modal)

There is no specific ITS Deployment Strategy or Action Plan. The ITS Directive has not been transposed, nor the importance of ITS is acknowledged in the Transport Strategies in force. Nevertheless, ITS has been deployed on several newly built motorway sections on Corridor Vc and are being deployed on ongoing motorway projects.

Transposition of the EU ITS Directive and supplements – Delegated Acts and mandatory adoption and use of all CEN/TC 278 standards is needed. Moreover, it is essential to establish communication and cooperation between different ministries with expertise and competence in different fields of application of ITS (Infrastructure, Transport, Communications, Environment, Regional Affairs, Interior Affairs, Innovation, Economy, Economic Development and Research). This communication and cooperation should be more than declarative and to be obligatory. Establishment of national ITS body through national legislative, who will gather and enforce the mentioned inter-disciplinary cooperation, coordinate legislative acts, projects and other ITS-related activities of competent authorities and other stakeholders, is recommended.

To this end, an integrated multimodal ITS Strategy and Action Plan should be elaborated, setting the basis for coordinated ITS deployment.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal/ Cross- modal and ICT	Developing a clear Strategy and Action Plan for ITS deployment	Policy Making	Elaboration of an ITS Strategy and Action Plan according to the user needs and aligned with the Regional ITS Strategic Framework	2020
	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	 Directive 2010/40/EU - Framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes Directive 98/34/EC - Establishment of a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services Directive 2007/2/EC - Establishment of spatial information infrastructure for integrated access to travel data Directive 2016/1148/EU - Network Information Security with mandatory implementation 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 	2020
Institutional/ Road	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	 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 	2020

Organization al/ Cross- modal	Signing of a Memorandum of Understanding between public and private entities, which shall specify the actions under the RP's strategy.	Policy Making	Upon signing of the MoU by ITS stakeholders, a well-defined group of agencies shall be created to undertake the promotion and implementation of projects required for the deployment of ITS.	2019
	Establishment of a performance monitoring framework	Performance Monitoring	Set up of national framework for performance reporting and monitoring as part of national ITS Strategy and Action Plan and within TEN-T reporting guidelines under Directive 2010/40/EU	2019
	Supporting research and technological development Make promotions and publicity activities	Promotion of ITS at RP and regional level	Adopt a framework for developing innovative applications and products for ITS and promoting their use. This can be achieved by creating actions focused on research between research institutions, organizations and companies. Inform the public about new ITS applications	2025
Technical/ Cross-modal and ICT	Adoption and mandatory application of standards	Legal & Technical framework	Mandatory application of DATEX II (CEN/TS) and CEN/TC 278 Standards	2019
	Implementation of ITS Services Bundle 1	Deployment preparation - implementatio n	Projects preparation, documentation, financing, tender procedures and implementation	2020
	Implementation of ITS Services Bundle 2	Deployment preparation - implementatio n	Projects preparation, documentation, financing, tender procedures and implementation	2025
	Implementation of ITS Services Bundle 3	Deployment preparation - implementatio n	Projects preparation, documentation, financing, tender procedures and implementation	2030

In Bosnia and Herzegovina, the institutional and legislative framework exists, through the Railway Law which is based on EU Directive, but still without by-law acts and Operating Rules.

ERTMS projects have not been implemented yet.

Actions to be taken concern all fields of intervention, from institutional/legal, organizational to technical ones. Transposition of EU legislative framework and adoption/ implementation of TSIs, preparation of technical requirements for ERTMS and ITS applications are needed, and a Strategy for coordinated preparation, implementation and monitoring through specialised technical and Coordination teams.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal	Implementation of EU Interoperability Directive (2008/57/EC) as main legal basis	Completion of Institutional Framework Policy Making - legal basis	 Adoption of relevant EU Interoperability Directives Acceptance and adoption by standardisation authorities as national ITS standards Preparation of necessary bylaws 	2022
	Implementation of Technical Specifications of Interoperability for Control Command and Signalling (TSI CCS) as main technical standards basis	Completion of Institutional Framework Policy Making - technical and standards basis	 Adoption of relevant EU Regulations and TSIs Acceptance and adoption by standardisation authorities as national ITS standards Preparation or adaptation of national standards, if necessary 	2023
	Implementation of TSI for TAF ITS applications	Institutional basis for further ITS adoption	Adoption of Regulation No 1305/2014	2030
Organizational	Preparation of National Implementation Strategy for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Appoint technical team (in-house or consultant) to develop/ update ITS Strategy Develop stakeholder group and assess user requirements Define and prioritize ERTMS goals, they should provide (safety, reliability, compliance with EU, lower maintenance costs) Define priority directions, alignment and sections to be implemented with ERTMS Define long term goals (cross border interoperability, high traffic, high speeds) Develop and validate ITS Action Plan and assess cost-benefit of proposed projects Finalise ITS Strategy and Action Plan 	2024
Organizational – Technical	Preparation of Technical Requirements for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Define national standards within TSI (balise alphabet, standard HMI interface, frequencies used by GSM- R, minimum trackside bandwidth etc.) Develop signalling implementation and maintenance manual for the network encompassing both current legacy system and ERTMS as defined in previous steps 	2025

	Preparation of Technical Requirements for implementation of Secondary ITS (bundle 2 in Chapter 5.3) (TAF/TAP, CIP, PCS, TIS, CIS, CCS TAF, ORFEUS, ISR, CoReDa, WMI)	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Establish an ITS Coordination Team Define the requirements needed for implementation (input data from existing signalling systems, safety protocols, level of access to internal railway network) Join relevant data and international providers networks (such as RNE) 	2030
Technical	Development of necessary project documentation	Justification of investment	- Develop detailed CBA and Feasibility studies - Develop Preliminary and Main design - Prepare the tender documentation ³⁵	recurring
	Pilot implementation of ERTMS, with the assumption that most of the relevant short- term goals have been achieved (Implementation of ITS systems on the highest priority reconstructed or newly built alignments)	Deployment first phase – a pilot deployment	Implementation and commissioning	2026
	Evaluation of ERTMS implemented in the previous step; Whether goals are achieved and in what degree, insight into possible unexpected side benefits, cross correlation with new technology developments and international trade routes developments	Evaluation of first phase implementation	Evaluation of feasibility study results and expected outcomes; Possible adaptation of National Implementation Strategy according to results	2029
	Wide scale deployment of ERTMS	Deployment second phase; a wider deployment of a proven system Possible upgrade of existing implementations with newly developed technology if deemed worthwhile in previous step	Tendering, Design, Implementation and Commissioning in line with proven features, updated strategy and international agreements	2030
	Implementation of secondary ITS (bundle 2 in Chapter 5.3) - TAF/TAP, CIP, PCS, TIS, CIS, CCS ORFEUS, ISR, CoReDa, WMI	Deployment	Tendering and Production of Preliminary and Main Design, implementation and commissioning	2030

³⁵ First for selected project to be piloted and then for the rest of the network according to selection in national strategy.

Inland Waterways

Serious efforts regarding the creation of the necessary institutional/ regulatory framework are needed, as a prerequisite for RIS implementation on Sava River, in combination with other activities such as capacity building and technical documentation preparation.

Field of intervention	Action	Objective	Sub-actions/ Details	Target vear
Institutional – Legal	Table of Concordance between all relevant EU Directives and BIH legislation (96/75/EC, 87/540/EEC, 96/50/EC)	Completion of Institutional Framework Policy Making	Gap analysis/ evaluation for transposition of EU legal framework	2018
	Strategy on IWW development and Draft Law on navigation (and Inland Ports)	Completion of Institutional Framework Policy Making		2019
	Law on navigation and Inland Ports	Completion of Institutional Framework Policy Making		2019
	Implementation of Directive 2005/44/EC of the European Parliament and of the Council of 7 September 2005 on harmonized RIS on IWW in the Community	Completion of Institutional Framework Policy Making		2020
	Review of the existing legislation: requirement for compliance with Directives in AA, adjustment of national legislation – Mandatory use of RIS on all IWW	Completion of Institutional Framework Policy Making	Legislation adjustment	2025
Organizational	Establishment of authorized institution with jurisdiction over all aspects of IWW development (including RIS activities)	Promotion at RP level (institutional building)	Based on existing agency-models in EU and as such, recognized in the national legislation related to IWW, with clear separation of regulatory from executive powers in IWW-subsectors	2020
	Capacity building – training	Promotion at RP level (institutional building)	Regular training of institutional staff (management and employees)	Recurring
Technical	ToR for the Technical documentation for RIS implementation	Preparation for deployment		2018
	Technical documentation for the RIS implementation on Sava River: procurement procedure for consultancy service	Preparation for deployment		2019
	Preparation of technical documentation for the RIS implementation on Sava River	Preparation for deployment	Full documentation preparation Financing	2019
	Implementation of the RIS on Sava River, basic scenario	Deployment		2020
	Implementation of additional services, accordingly with legal regulation adjustments	Deployment	Full documentation preparation Financing	2025
	Implementation of additional RIS services, AtoNs (Adds to Navigation)	Deployment	Full documentation preparation Financing	2030

D3. the former Yugoslav Republic of Macedonia

Roads and ICT (cross-modal)

The new National Transport Strategy categorizes ITS in main strategic objectives. Existing ITS applications are limited to control centres. The introduction of communication-information system for traffic control and management on Corridor X is foreseen, with the relevant design being under finalisation.

Transposition of the EU ITS Directive and supplements – Delegated Acts and mandatory adoption and use of all CEN/TC 278 standards is needed. Moreover, it is essential to establish communication and cooperation between different ministries with expertise and competence in different fields of application of ITS (Infrastructure, Transport, Communications, Environment, Regional Affairs, Interior Affairs, Innovation, Economy, Economic Development and Research). This communication and cooperation should be more than declarative and to be obligatory. Establishment of national ITS body through national legislative, who will gather and enforce the mentioned inter-disciplinary cooperation, coordinate legislative acts, projects and other ITS-related activities of competent authorities and other stakeholders, is recommended.

To this end, an integrated multimodal ITS Strategy and Action Plan should be elaborated, setting the basis for coordinated ITS deployment.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal/ Cross- modal and ICT	Developing a clear Strategy and Action Plan for ITS deployment	Policy Making	Elaboration of an ITS Strategy and Action Plan according to the user needs and aligned with the Regional ITS Strategic Framework	2020
	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	Directive 2010/40/EU - Framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes Directive 98/34/EC - Establishment of a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services Directive 2007/2/EC - Establishment of spatial information infrastructure for integrated access to travel data Directive 2016/1148/EU - Network Information Security with mandatory implementation 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	2020
Institutional/ Road	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	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	2020

Organizational/ Cross-modal	Signing of a Memorandum of Understanding between public and private entities, which shall specify the actions under the RP's strategy.	Policy Making	Upon signing of the MoU by ITS stakeholders, a well-defined group of agencies shall be created to undertake the promotion and implementation of projects required for the deployment of ITS.	2019
	Establishment of a performance monitoring framework	Performance Monitoring	Set up of national framework for performance reporting and monitoring as part of national ITS Strategy and Action Plan and within TEN-T reporting guidelines under Directive 2010/40/EU	2019
	Supporting research and technological development Make promotions and publicity activities	Promotion of ITS at RP and regional level	Adopt a framework for developing innovative applications and products for ITS and promoting their use. This can be achieved by creating actions focused on research between research institutions, organizations and companies. Inform the public about new ITS applications	2025
Technical/ Cross-modal and ICT	Adoption and mandatory application of standards	Legal & Technical framework	Mandatory application of DATEX II (CEN/TS) and CEN/TC 278 Standards	2019
	Implementation of ITS Services Bundle 1	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2020
	Implementation of ITS Services Bundle 2	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2025
	Implementation of ITS Services Bundle 3	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2030

In the former Yugoslav Republic of Macedonia, the institutional/ legislative framework has been prepared, with the Railways Law, which is based on EU Directive, and by-law acts, but without Operating Rules. Many lines' modernisation projects are underway, which comprise ETCS and GSM-R installation.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal	Implementation of EU Interoperability Directive (2008/57/EC) as main legal basis	Completion of Institutional Framework Policy Making - legal basis	 Adoption of relevant EU Interoperability Directives Acceptance and adoption by standardisation authorities as national ITS standards Preparation of necessary bylaws 	2019
	Implementation of Technical Specifications of Interoperability for Control Command and Signalling (TSI CCS) as main technical standards basis	Completion of Institutional Framework Policy Making - technical and standards basis	 Adoption of relevant EU Regulations and TSIs Acceptance and adoption by standardisation authorities as national ITS standards Preparation or adaptation of national standards, if necessary 	2020
	Implementation of TSI for TAF ITS applications	Institutional basis for further ITS adoption	Adoption of Regulation No 1305/2014	2030

Organizational	Preparation of National Implementation Strategy for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Appoint technical team (in-house or consultant) to develop/ update ITS Strategy Develop stakeholder group and assess user requirements Define and prioritize ERTMS goals, they should provide (safety, reliability, compliance with EU, lower maintenance costs) Define priority directions, alignment and sections to be implemented with ERTMS Define long term goals (cross border interoperability, high traffic, high speeds) Develop and validate ITS Action Plan and assess cost-benefit of proposed projects Finalise ITS Strategy and Action Plan 	2021
Organizational – Technical	Preparation of Technical Requirements for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Define national standards within TSI (balise alphabet, standard HMI interface, frequencies used by GSM-R, minimum trackside bandwidth etc.) Develop signalling implementation and maintenance manual for the network encompassing both current legacy system and ERTMS as defined in previous steps 	2022
	Preparation of Technical Requirements for implementation of Secondary ITS (bundle 2 in Chapter 5.3) (TAF/TAP, CIP, PCS, TIS, CIS, CCS TAF, ORFEUS, ISR, CoReDa, WMI)	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Establish an ITS Coordination Team Define the requirements needed for implementation (input data from existing signalling systems, safety protocols, level of access to internal railway network) Join relevant data and international providers networks (such as RNE) 	2030
Technical	Development of necessary project documentation	Justification of investment	 Develop detailed CBA and Feasibility studies Develop Preliminary and Main design Prepare the tender documentation³⁶ 	recurring
	Pilot implementation of ERTMS, with the assumption that most of the relevant short-term goals have been achieved (Implementation of ITS systems on the highest priority reconstructed or newly built alignments)	Deployment first phase – a pilot deployment	Implementation and commissioning	2023
	Evaluation of ERTMS implemented in the previous step; Whether goals are achieved and in what degree, insight into possible unexpected side benefits, cross correlation with new technology developments and international trade routes developments	Evaluation of first phase implementation	Evaluation of feasibility study results and expected outcomes; Possible adaptation of National Implementation Strategy according to results	2025

³⁶ First for selected project to be piloted and then for the rest of the network according to selection in national strategy.

Wide scale deployment of ERTMS	Deployment second phase; a wider deployment of a proven system Possible upgrade of existing implementations with newly developed technology if deemed worthwhile in previous step	Tendering, Design, Implementation and Commissioning in line with proven features, updated strategy and international agreements	2030
Implementation of secondary ITS (bundle 2 in Chapter 5.3) - TAF/TAP, CIP, PCS, TIS, CIS, CCS ORFEUS, ISR, CoReDa, WMI	Deployment	Tendering and Production of Preliminary and Main Design, implementation and commissioning	2030

D4. Montenegro

Roads and ICT (cross-modal)

ITS has been introduced only at Sozina tunnel and a small tunnel at the same junction, with operations monitored by Control Centre at Gluhi Do. ITS will be implemented at the new motorway Matesevo – Smokovac, project for which the documentation is under preparation. Under the New Transport Development Strategy, ITS is identified as one of the four priority areas for infrastructure, where the expected outcomes are upgraded services to users, advanced monitoring and management of network operations and performance and safety improvement with infrastructural measures, such as installation of ITS equipment, installation of integrated system for monitoring and information provision of interurban public transport.

Transposition of the EU ITS Directive and supplements – Delegated Acts and mandatory adoption and use of all CEN/TC 278 standards is needed. Moreover, it is essential to establish communication and cooperation between different ministries with expertise and competence in different fields of application of ITS (Infrastructure, Transport, Communications, Environment, Regional Affairs, Interior Affairs, Innovation, Economy, Economic Development and Research). This communication and cooperation should be more than declarative and to be obligatory. Establishment of national ITS body through national legislative, who will gather and enforce the mentioned inter-disciplinary cooperation, coordinate legislative acts, projects and other ITS-related activities of competent authorities and other stakeholders, is recommended.

To this end, an integrated multimodal ITS Strategy and Action Plan should be elaborated, setting the basis for coordinated ITS deployment.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal/ Cross- modal and ICT	Developing a clear Strategy and Action Plan for ITS deployment	Policy Making	Elaboration of an ITS Strategy and Action Plan according to the user needs and aligned with the Regional ITS Strategic Framework	2020
	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	Directive 2010/40/EU - Framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes Directive 98/34/EC - Establishment of a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services Directive 2007/2/EC - Establishment of spatial information infrastructure for integrated access to travel data Directive 2016/1148/EU - Network Information Security with mandatory implementation 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	2020

Institutional/ Road	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	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	2020
Organizational/ Cross-modal	Signing of a Memorandum of Understanding between public and private entities, which shall specify the actions under the RP's strategy.	Policy Making	Upon signing of the MoU by ITS stakeholders, a well-defined group of agencies shall be created to undertake the promotion and implementation of projects required for the deployment of ITS.	2019
	Establishment of a performance monitoring framework	Performance Monitoring	Set up of national framework for performance reporting and monitoring as part of national ITS Strategy and Action Plan and within TEN-T reporting guidelines under Directive 2010/40/EU	2019
	Supporting research and technological development Make promotions and publicity activities	Promotion of ITS at RP and regional level	Adopt a framework for developing innovative applications and products for ITS and promoting their use. This can be achieved by creating actions focused on research between research institutions, organizations and companies. Inform the public about new ITS applications	2025
Technical/ Cross-modal and ICT	Adoption and mandatory application of standards	Legal & Technical framework	Mandatory application of DATEX II (CEN/TS) and CEN/TC 278 Standards	2019
	Implementation of ITS Services Bundle 1	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2020
	Implementation of ITS Services Bundle 2	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2025
	Implementation of ITS Services Bundle 3	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2030

Montenegro misses the necessary institutional/ legislative framework, while an ERTMS dedicated Strategy is absent.

ERTMS and Railway ITS applications have not been implemented yet, and at time being only one project is underway (ETCS level 1 installation at Podgorica railway station).

Actions to be taken concern all fields of intervention, from institutional/legal, organizational to technical ones. Transposition of EU legislative framework and adoption/ implementation of TSIs, preparation of technical requirements for ERTMS and ITS applications are needed, and a Strategy for coordinated preparation, implementation and monitoring through specialised technical and Coordination teams.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal	Implementation of EU Interoperability Directive (2008/57/EC) as main legal basis	Completion of Institutional Framework Policy Making - legal basis	 Adoption of relevant EU Interoperability Directives Acceptance and adoption by standardisation authorities as national ITS standards Preparation of necessary bylaws 	2020
	Implementation of Technical Specifications of Interoperability for Control Command and Signalling (TSI CCS) as main technical standards basis	Completion of Institutional Framework Policy Making - technical and standards basis	-Adoption of relevant EU Regulations and TSIs -Acceptance and adoption by standardisation authorities as national ITS standards -Preparation or adaptation of national standards, if necessary	2021
	Implementation of TSI for TAF ITS applications	Institutional basis for further ITS adoption	Adoption of Regulation No 1305/2014	2030
Organizational	Preparation of National Implementation Strategy for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long- term planning) Performance Monitoring	 Appoint technical team (in-house or consultant) to develop/ update ITS Strategy Develop stakeholder group and assess user requirements Define and prioritize ERTMS goals, they should provide (safety, reliability, compliance with EU, lower maintenance costs) Define priority directions, alignment and sections to be implemented with ERTMS Define long term goals (cross border interoperability, high traffic, high speeds) Develop and validate ITS Action Plan and assess cost-benefit of proposed projects Finalise ITS Strategy and Action Plan 	2022
Organizational – Technical	Preparation of Technical Requirements for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long- term planning) Performance Monitoring	 Define national standards within TSI (balise alphabet, standard HMI interface, frequencies used by GSM-R, minimum trackside bandwidth etc.) Develop signalling implementation and maintenance manual for the network encompassing both current legacy system and ERTMS as defined in previous steps 	2025
	Preparation of Technical Requirements for implementation of Secondary ITS (bundle 2 in Chapter 5.3) (TAF/TAP, CIP, PCS, TIS, CIS, CCS TAF, ORFEUS, ISR, CoReDa, WMI)	Promotion of ITS at RP level (long- term planning) Performance Monitoring	 Establish an ITS Coordination Team Define the requirements needed for implementation (input data from existing signalling systems, safety protocols, level of access to internal railway network) Join relevant data and international providers networks (such as RNE) 	2030
Technical	Development of necessary project documentation	Justification of investment	 Develop detailed CBA and Feasibility studies Develop Preliminary and Main design Prepare the tender documentation³⁷ 	recurring

³⁷ First for selected project to be piloted and then for the rest of the network according to selection in national strategy.

Pilot implementation of ERTMS, with the assumption that most of the relevant short- term goals have been achieved (Implementation of ITS systems on the highest priority reconstructed or newly built alignments)	Deployment first phase – a pilot deployment	Implementation and commissioning	2026
Evaluation of ERTMS implemented in the previous step; Whether goals are achieved and in what degree, insight into possible unexpected side benefits, cross correlation with new technology developments and international trade routes developments	Evaluation of first phase implementation	Evaluation of feasibility study results and expected outcomes; Possible adaptation of National Implementation Strategy according to results	2029
Wide scale deployment of ERTMS	Deployment second phase; a wider deployment of a proven system Possible upgrade of existing implementations with newly developed technology if deemed worthwhile in previous step	Tendering, Design, Implementation and Commissioning in line with proven features, updated strategy and international agreements	2030
Implementation of secondary ITS (bundle2) - TAF/TAP, CIP, PCS, TIS, CIS, CCS ORFEUS, ISR, CoReDa, WMI	Deployment	Tendering and Production of Preliminary and Main Design, implementation and commissioning	2030

Ports/ Maritime

VTMIS has been partially implemented. An evaluation of the level of compliance with the EU/ IMO regulatory framework is needed in order to ensure full harmonisation (according to the New Transport Development Strategy 70% of harmonisation has been achieved). Required interventions concern institutional/ legal, organizational and technical aspects that would lead to VTMIS proper implementation and the implementation of other systems in the future.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal	Evaluation of current harmonization status and prioritization of the most urgent EU Regulations and Directives to be transposed	Completion of Institutional Framework Policy Making	Prioritization and transposition of EU Directives and implementation of EU/IMO requirements. VTMIS regulatory regime preparation.	High→2020 Medium→ 2022 Low→2025
Organizational	Establishment a "Coordination team for VTMIS"	Policy making Coordination and monitoring	Coordination team to act as focal point between the Administration and EU/IMO	2018
Technical	Technical documentation and specifications for VTMIS implementation on the other Montenegrin ports	Deployment preparation	VTMIS system for the other Montenegrin ports has to be established and be compatible with the existing VTMIS system and EU/IMO requirements Full documentation preparation Financing	2020
	Evaluation of the existing VTMIS system data input/output in relation of the stakeholders needs and expectations and establish a common software input/output	Deployment preparation	The whole data input/output procedure has to be decided based on EU specific guidance	2021
	Implementation of the unified software including data input/output to all VTMIS systems	Full VTMIS System in operation	Includes Tender preparation. Includes training of personnel.	2022
	Technical documentation and specifications for SafeSeaNet implementation on the Montenegrin ports	Deployment preparation	Full documentation preparation Financing	2023
	Implementation of the unified software including data input/output to all SafeSeaNet systems	Full Operation of SafeseaNet	Includes Tender preparation. Includes training of personnel.	2025
	Technical documentation and specifications for CleanSeaNet implementation on the Montenegrin ports	Deployment preparation	Full documentation preparation Financing	2025
	Implementation of the unified software including data input/output to all CleanSeaNet systems	Full Operation of CleanseaNet	Includes Tender preparation. Includes training of personnel.	2028
	Examination of technical aspects for optional EU Pilot Projects	Participation in EU pilot projects and initiatives	Establishment an Expert team to decide the technical aspects for participation in EU Pilot Projects Preparation of Feasibility & cost-effective plan	2030

D5. Serbia

Roads and ICT (cross-modal)

Currently, ITS has been and is being implemented only on some sections of Corridor X. Toll payment (together with e-toll) exists on all segments of Corridor X and Route 4. Public Enterprise Roads of Serbia has a dedicated ITS department for development and maintenance of ITS services in the national road network.

An ITS Strategy has been elaborated in 2017, covering road transport. Since the completion of this strategy, which is implemented without being officially adopted, a new Road Law has entered into force, which includes mainly provisions related to installation in tunnels as per the Directive, but also definition of ITS and interoperability and the priority areas and activities as per the ITS Directive. The same law provides the possibility for public road managers to conduct traffic management by ITS utilisation.

Transposition of the EU ITS Directive and supplements – Delegated Acts and mandatory adoption and use of all CEN/TC 278 standards is needed. Moreover, it is essential to establish communication and cooperation between different ministries with expertise and competence in different fields of application of ITS (Infrastructure, Transport, Communications, Environment, Regional Affairs, Interior Affairs, Innovation, Economy, Economic Development and Research). This communication and cooperation should be more than declarative and to be obligatory. Establishment of national ITS body through national legislative, who will gather and enforce the mentioned inter-disciplinary cooperation, coordinate legislative acts, projects and other ITS-related activities of competent authorities and other stakeholders, is recommended.

To this end, an integrated multimodal ITS Strategy and Action Plan should be elaborated, setting the basis for coordinated ITS deployment. The following Roadmap is proposed for Road and ICT/ cross-modal sectors:

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal/ Cross- modal and ICT	Developing a clear Strategy and Action Plan for ITS deployment	Policy Making	Elaboration of an ITS Strategy and Action Plan according to the user needs and aligned with the Regional ITS Strategic Framework	2020
	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	Directive 2010/40/EU - Framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes Directive 98/34/EC - Establishment of a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services Directive 2007/2/EC - Establishment of spatial information infrastructure for integrated access to travel data Directive 2016/1148/EU - Network Information Security with mandatory implementation for operators of essential services in the transport areas Directive 2016/1148/EU - Network Information Security with mandatory implementation for operators of essential services in the transport areas Directive 2016/1148/EU - Network Information Security with mandatory implementation 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	2020

Institutional/ Road	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	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	2020
Organizational/ Cross-modal	Signing of a Memorandum of Understanding between public and private entities, which shall specify the actions under the RP's strategy.	Policy Making	Upon signing of the MoU by ITS stakeholders, a well-defined group of agencies shall be created to undertake the promotion and implementation of projects required for the deployment of ITS.	2019
	Establishment of a performance monitoring framework	Performance Monitoring	Set up of national framework for performance reporting and monitoring as part of national ITS Strategy and Action Plan and within TEN- T reporting guidelines under Directive 2010/40/EU	2019
	Supporting research and technological development Make promotions and publicity activities	Promotion of ITS at RP and regional level	Adopt a framework for developing innovative applications and products for ITS and promoting their use. This can be achieved by creating actions focused on research between research institutions, organizations and companies. Inform the public about new ITS applications	2025
Technical/ Cross-modal and ICT	Adoption and mandatory application of standards	Legal & Technical framework	Mandatory application of DATEX II (CEN/TS) and CEN/TC 278 Standards	2019
	Implementation of ITS Services Bundle 1	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2020
	Implementation of ITS Services Bundle 2	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2025
	Implementation of ITS Services Bundle 3	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2030

The necessary institutional and legislative framework exists through the New Law on Railways (adopted in 2018), which is based on EU Directive, with by-law acts, but without Operating Rules, while an ERTMS dedicated Strategy is absent.

ERTMS and Railway ITS applications have not been implemented yet. Actions to be taken concern all fields of intervention, from institutional/ legal, organizational to technical ones. Transposition of EU legislative framework and adoption/ implementation of TSIs, preparation of technical requirements for ERTMS and ITS applications are needed, and a Strategy for coordinated preparation, implementation and monitoring through specialised technical and Coordination teams.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal	Implementation of EU Interoperability Directive (2008/57/EC) as main legal basis	Completion of Institutional Framework Policy Making - legal basis	 Adoption of relevant EU Interoperability Directives Acceptance and adoption by standardisation authorities as national ITS standards Preparation of necessary bylaws 	2019
	Implementation of Technical Specifications of Interoperability for Control Command and Signalling (TSI CCS) as main technical standards basis	Completion of Institutional Framework Policy Making - technical and standards basis	 Adoption of relevant EU Regulations and TSIs Acceptance and adoption by standardisation authorities as national ITS standards Preparation or adaptation of national standards, if necessary 	2020
	TAF ITS applications	for further ITS adoption	Adoption of Regulation No 1305/2014	2030
Organizational	Preparation of National Implementation Strategy for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long- term planning) Performance Monitoring	 Appoint technical team (in-house or consultant) to develop/ update ITS Strategy Develop stakeholder group and assess user requirements Define and prioritize ERTMS goals, they should provide (safety, reliability, compliance with EU, lower maintenance costs) Define priority directions, alignment and sections to be implemented with ERTMS Define long term goals (cross border interoperability, high traffic, high speeds) Develop and validate ITS Action Plan and assess cost-benefit of proposed projects Finalise ITS Strategy and Action Plan 	2020
Organizational – Technical	Preparation of Technical Requirements for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long- term planning) Performance Monitoring	 Define national standards within TSI (balise alphabet, standard HMI interface, frequencies used by GSM- R, minimum trackside bandwidth etc.) develop signalling implementation and maintenance manual for the network encompassing both current legacy system and ERTMS as defined in previous steps 	2022
	Preparation of Technical Requirements for implementation of Secondary ITS (bundle 2 in Chapter 5.3) (TAF/TAP, CIP, PCS, TIS, CIS, CCS TAF, ORFEUS, ISR, CoReDa, WMI)	Promotion of ITS at RP level (long- term planning) Performance Monitoring	 Establish an ITS Coordination Team Define the requirements needed for implementation (input data from existing signalling systems, safety protocols, level of access to internal railway network) Join relevant data and international providers networks (such as RNE) 	2030
Technical	Development of necessary project documentation	Justification of investment	 Develop detailed CBA and Feasibility studies Develop Preliminary and Main design Prepare the tender documentation³⁸ 	recurring

³⁸ First for selected project to be piloted and then for the rest of the network according to selection in national strategy.

Pilot implementation of ERTMS, with the assumption that most the relevant short-terr goals have been achieved (Implementation of IT systems on the highe priority reconstructed newly built alignments	of Deployment first phase – a pilot of deployment n S st or s)	Implementation and commissioning	2023
Evaluation of ERTMS implemented in the previous step; Wheth goals are achieved ar what degree, insight i possible unexpected benefits, cross correla with new technology developments and international trade rou developments	Evaluation of first phase implementation nto side ation	Evaluation of feasibility study results and expected outcomes; Possible adaptation of National Implementation Strategy according to results	2025
Wide scale deployme of ERTMS	nt Deployment second phase; a wider deployment of a proven system Possible upgrade of existing implementations with newly developed technology if deemed worthwhile in previous step	Tendering, Design, Implementation and Commissioning in line with proven features, updated strategy and international agreements	2030
Implementation of secondary ITS (bundl in Chapter 5.3) - TAF/TAP, CIP, PCS, CIS, CCS ORFEUS, CoReDa, WMI	Deployment e 2 TIS, SR,	Tendering and Production of Preliminary and Main Design, implementation and commissioning	2030

Inland Waterways

Additional institutional/ regulatory actions, amendments or regulations, as well as adoption of any additional EU legislation into existing legislation is not necessary at the moment.

The Strategy on the Waterborne Transport Development for the period 2015-2025, with corresponding Action plan for the period 2015-2020, covers general plan and indicative budget for further development of RIS. Although RIS is not part of specific (separate) strategy for ITS development, the existing Strategy is sufficient base for proper further development of services. The Strategy covers the time period until 2025, but further development should be already subject of timely planning.

Actions to be taken are of technical nature, which concern the preparation and deployment of RIS on the entire IWW system Danube – Tisa – Danube.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Technical	Technical documentation and specification for RIS implementation on Tisa River	Preparation for deployment	Full documentation preparation Financing	2019
	Development and installation of the navigation monitoring and electronic fairway marking system on the Danube River (AtoNs)	Deployment	On-going	2019
	Implementation of a system of modern hydro-meteorological stations	Deployment		2021
	Implementation of the RIS on Tisa River	Deployment		2020
	Establishing of VTS and VHF radio-telephone system along IWW	Deployment		2021
	RIS implementation on entire Canal system Danube-Tisa-Danube	Deployment		2025
	RIS support to the ship waste disposal operations	Deployment		2030

D6. Kosovo

Roads and ICT (cross-modal)

ITS applications have not been deployed in the previous period. Furthermore, a high-performance telecommunication network has not been yet installed. ITS are to be deployed on two Core Network Routes: Route 7 and Route 6.

Transposition of the EU ITS Directive and supplements – Delegated Acts and mandatory adoption and use of all CEN/TC 278 standards is needed. Moreover, it is essential to establish communication and cooperation between different ministries with expertise and competence in different fields of application of ITS (Infrastructure, Transport, Communications, Environment, Regional Affairs, Interior Affairs, Innovation, Economy, Economic Development and Research). This communication and cooperation should be more than declarative and to be obligatory. Establishment of national ITS body through national legislative, who will gather and enforce the mentioned inter-disciplinary cooperation, coordinate legislative acts, projects and other ITS-related activities of competent authorities and other stakeholders, is recommended.

To this end, an integrated multimodal ITS Strategy and Action Plan should be elaborated, setting the basis for coordinated ITS deployment.

Field of intervention	Action	Objective	Sub-actions/ Details	Target year
Institutional – Legal/ Cross- modal and ICT	Developing a clear Strategy and Action Plan for ITS deployment	Policy Making	Elaboration of an ITS Strategy and Action Plan according to the user needs and aligned with the Regional ITS Strategic Framework	2020
	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	Directive 2010/40/EU - Framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes Directive 98/34/EC - Establishment of a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services Directive 2007/2/EC - Establishment of spatial information infrastructure for integrated access to travel data Directive 2016/1148/EU - Network Information Security with mandatory implementation for operators of essential services in the transport areas Directive 2016/1148/EU - Network Information Security with mandatory implementation for operators of essential services in the transport areas Directive 2016/1148/EU - Network Information Security with mandatory implementation 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	2020

Institutional/ Road	Transposition of EU relevant legislation	Completion of Institutional Framework Policy Making	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	2020
Organizational/ Cross-modal	Signing of a Memorandum of Understanding between public and private entities, which shall specify the actions under the RP's strategy.	Policy Making	Upon signing of the MoU by ITS stakeholders, a well-defined group of agencies shall be created to undertake the promotion and implementation of projects required for the deployment of ITS.	2019
	Establishment of a performance monitoring framework	Performance Monitoring	Set up of national framework for performance reporting and monitoring as part of national ITS Strategy and Action Plan and within TEN-T reporting guidelines under Directive 2010/40/EU	2019
	Supporting research and technological development Make promotions and publicity activities	Promotion of ITS at RP and regional level	Adopt a framework for developing innovative applications and products for ITS and promoting their use. This can be achieved by creating actions focused on research between research institutions, organizations and companies. Inform the public about new ITS applications	2025
Technical/ Cross-modal and ICT	Adoption and mandatory application of standards	Legal & Technical framework	Mandatory application of DATEX II (CEN/TS) and CEN/TC 278 Standards	2019
	Implementation of ITS Services Bundle 1	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2020
	Implementation of ITS Services Bundle 2	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2025
	Implementation of ITS Services Bundle 3	Deployment preparation - implementation	Projects preparation, documentation, financing, tender procedures and implementation	2030

In Kosovo the necessary institutional and legislative framework is missing. New Law on Railways will be based on the EU Directive, but there is no indication about the required preparation of by-law acts and Operating Rules, while an ERTMS dedicated Strategy is absent. ERTMS and Railway ITS applications have not been implemented yet, however certain pre-conditions for ERTMS deployment do exist.

Actions to be taken concern all fields of intervention, from institutional/legal, organizational to technical ones. Transposition of EU legislative framework and adoption/ implementation of TSIs, preparation of technical requirements for ERTMS and ITS applications are needed, and a Strategy for coordinated preparation, implementation and monitoring through specialised technical and Coordination teams.

Field of	Action	Objective	Sub-actions/ Details	Target
Institutional – Legal	Implementation of EU Interoperability Directive (2008/57/EC) as main legal basis	Completion of Institutional Framework Policy Making - legal basis	 Adoption of relevant EU Interoperability Directives Acceptance and adoption by standardisation authorities as national ITS standards Preparation of pecessary bylaws 	2020
	Implementation of Technical Specifications of Interoperability for Control Command and Signalling (TSI CCS) as main technical standards basis	Completion of Institutional Framework Policy Making - technical and standards basis	-Adoption of relevant EU Regulations and TSIs -Acceptance and adoption by standardisation authorities as national ITS standards -Preparation or adaptation of national standards, if necessary	2022
	Implementation of TSI for TAF ITS applications	Institutional basis for further ITS adoption	Adoption of Regulation No 1305/2014	2030
Organizational	Preparation of National Implementation Strategy for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Appoint technical team (in-house or consultant) to develop/ update ITS Strategy Develop stakeholder group and assess user requirements Define and prioritize ERTMS goals, they should provide (safety, reliability, compliance with EU, lower maintenance costs) Define priority directions, alignment and sections to be implemented with ERTMS Define long term goals (cross border interoperability, high traffic, high speeds) Develop and validate ITS Action Plan and assess cost-benefit of proposed projects Finalise ITS Strategy and Action Plan 	2023
Organizational – Technical	Preparation of Technical Requirements for development of European Rail Traffic Management System (ERTMS) on the railway network	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Define national standards within TSI (balise alphabet, standard HMI interface, frequencies used by GSM-R, minimum trackside bandwidth etc.) develop signalling implementation and maintenance manual for the network encompassing both current legacy system and ERTMS as defined in previous steps 	2024
	Preparation of Technical Requirements for implementation of Secondary ITS (bundle 2 in Chapter 5.3) (TAF/TAP, CIP, PCS, TIS, CIS, CCS TAF, ORFEUS, ISR, CoReDa, WMI)	Promotion of ITS at RP level (long-term planning) Performance Monitoring	 Establish an ITS Coordination Team Define the requirements needed for implementation (input data from existing signalling systems, safety protocols, level of access to internal railway network) Join relevant data and international providers networks (such as RNE) 	2030
Technical	Development of necessary project documentation	Justification of investment	 Develop detailed CBA and Feasibility studies Develop Preliminary and Main design Prepare the tender documentation³⁹ 	recurring

³⁹ First for selected project to be piloted and then for the rest of the network according to selection in national strategy.

Pilot implementation of ERTMS, with the assumption that most of the relevant short-term goals have been achieved (Implementation of ITS systems on the highest priority reconstructed or newly built alignments)	Deployment first phase – a pilot deployment	Implementation and commissioning	2025
Evaluation of ERTMS implemented in the previous step; Whether goals are achieved and in what degree, insight into possible unexpected side benefits, cross correlation with new technology developments and international trade routes developments	Evaluation of first phase implementation	Evaluation of feasibility study results and expected outcomes; Possible adaptation of National Implementation Strategy according to results	2026
Wide scale deployment of ERTMS	Deployment second phase; a wider deployment of a proven system Possible upgrade of existing implementations with newly developed technology if deemed worthwhile in previous step	Tendering, Design, Implementation and Commissioning in line with proven features, updated strategy and international agreements	2030
Implementation of secondary ITS (bundle 2 in Chapter 5.3) - TAF/TAP, CIP, PCS, TIS, CIS, CCS ORFEUS, ISR, CoReDa, WMI	Deployment	Tendering and Production of Preliminary and Main Design, implementation and commissioning	2030