Level Crossings Safety Improvement Project Report

Permanent Secretariat of the Transport Community

September 21, 2022

Executive Summary

The aim of this report is to present the current situation on safety at level crossings (LCs) in the Western Balkans as well as to provide recommendations for improving protection at a certain number of LCs in the region.

In the previous eight years, 750 accidents that occurred at LCs in the entire region resulted in 116 people losing their lives and 347 being severely injured. The main reasons for the accidents at LCs are drivers' non-adherence to traffic rules as a direct consequence of insufficient education in this matter, unsatisfactory protection provided by signalling and other types of devices and old and archaic legislation with regard to LCs.

Protection at LCs is one of the key safety issues. In the EU member states, there are 55% of LCs with "active" protection, while in the Western Balkans region, 24% of LCs are equipped with "active" protection (barriers, lights, sounds etc). The rest of LCs in the Western Balkans have "passive" protection (road signs).

There are lists of priorities for LCs upgrade, prepared for each regional partner, most of which are the ones with "passive" protection, where old equipment needs to be upgraded, or where brand new equipment needs to be installed. In addition to that, there are proposals for denivelation in Kosovo*, Montenegro and North Macedonia.

Responsibility for maintenance lies with railway infrastructure managers (IM), with the exception of Serbia where maintenance costs are shared between rail and road IMs for LCs on state roads. This should change, taking into account that road and rail IMs are equally treated by the law and both entities should be included in all activities regarding LCs.

Legislation on LCs is part of the Railway Law, or, in some cases, the Railway Safety Law, but is also part of road traffic related legislation. Road and rail legislation should be aligned in terms of terminology, responsibility and, finally, maintenance costs. What the whole region shares is the fact that legislation has not been amended in the last 30 years.

Statistic data show that 61% of all accidents at LCs resulted in fatalities or severe injuries. Hence, prevention must be considered a top priority. Looking at the statistics of respective regional partners, accidents at LCs make over 40% of the total number of accidents in Albania, Kosovo and Bosnia and Herzegovina, while in Montenegro, Serbia and North Macedonia, this figure goes ranges 10 to 15%.

An additional problem is that a certain number of LCs do not have proper permits, being the case in all regional partners, apart from Kosovo where this has been solved by close cooperation with municipalities

* 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.

and the police. This approach should be followed by the rest of the region. However, municipalities are the main obstacles for abolishing illegal level crossings.

Databases containing all LC features exist only in Serbia, while in other regional partners, there are only excel sheets listing some basic LC features. All regional partners should establish a structured and comprehensive set of data relevant for all LCs on the core and comprehensive railway network. In that context, it is recommended that updates be done annually and that information on the intensity of road traffic at crossings be collected in a more structured manner.

All regional partners should involve all relevant institutions dealing with LCs data in order to reach better monitoring and safety improvement at LCs.

In parallel with physical safety upgrades at LCs in all regional partners, the Transport Community Permanent Secretariat has developed and carried out a public awareness campaign too. The public awareness campaign for improving level crossings safety targeted a wider audience by means of dedicated events, broadcasters and social media, and other communication channels, as well as by using print materials, videos etc. Both measures, the physical upgrade and the campaign, are aimed at decreasing the number of accidents at rail level crossings towards the “Vision Zero” deaths until 2050. For the success of the public awareness campaign, it was out of crucial importance to reach out to as wider audience as possible and use all available communication channels to convey the message.

As this is just the first step, following you may find recommendations and plans for the next phase:

1. To identify potential available grants (e.g. from the envisaged WBIF small scale project fund) for immediate actions for safety improvement based on the priorities identified;
2. To identify the activities eligible for WBIF technical assistance (preparation of justifications for investments and main designs of de-levelling the identified level crossings) and possibilities for applying (e.g. one WBIF TA project for all regional partners or separately by each regional partner);
3. Based on the information and clarifications to be collected by the Transport Community Permanent Secretariat, the approach is to be agreed with the regional partners. The most sensible methodology could be workshops (working meeting) between the regional partners, the Permanent Secretariat and JASPERS during which, depending on the eligibility and availability of grants for both investments and technical assistance, the exact scope and responsibilities of the parties would be clarified. The primary objective will be to agree with the regional partners on their tasks for preparation of technical parts of the future tender documents for safety improvement of level crossings (supply and installation of new equipment) and scope of the services for potential technical assistances for designing for de-levelling (i.e. technical parts of future Terms of References). Even if no funds can be granted by the EC services currently, the pro-activity of the regional partners will be of the outmost importance, i.e. to prepare, with the support of the Permanent Secretariat and JASPERS, the needed inputs for future activities (for both the implementation and technical assistances), which might be used for different sources of financing.
4. Permanent education is needed especially for road drivers. This can be achieved through campaigns organised by ministries of transport, municipalities, road safety agencies, schools and other stakeholders.

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List of abbreviations

TCPS	Transport Community Permanent Secretariat
ERA	European Union Agency for Railway
LCs	Level crossings
MNE	Montenegro
MKD	North Macedonia
SRB	Serbia
BIH	Bosnia and Herzegovina
KOS	Kosovo
ALB	Albania
RS	Republic of Srpska
FBIH	Federation of BIH
JASPERS	Joint Assistance to Support Projects in European Region
HSH	Public railway company in Albania
INFRAKOS	Public railway company in Kosovo
ZICG	Public railway company in Montenegro
MZI	Public railway company in North Macedonia
IZS	Public railway company in Serbia
ZRS	Public railway company in BIH (entity of Republic of Srpska)
ZF	Public railway company in BIH (entity of Federation of BIH)
WB	Western Balkan
IM	Infrastructure manager
RU	Railway undertaking
EIA	Environmental impact assessment
ALBRAIL	Private railway undertaking in Albania

1. Background

1.1. Introduction

Several Technical Committees (TC) are established within the Transport Community, one of them being the Technical Committee on Railway. This body consists of representatives of the regional partners, the EU members states and DG MOVE as well as ERA, Shift2RAIL and other institutions having the observer's status.

During the Sixth TC on Railway in November 2020 and Seventh in February 2021, all the regional partners decided that improvement of safety at level crossings (LCs) is a high ranking priority. An agreement was reached to have a common approach and to submit a single application for JASPERS advisory support under the umbrella of the Transport Community Permanent Secretariat (TCPS). The regional partners authorised Serbia to apply on behalf of all the Transport Community members. In February 2021, Serbia filed a multi-country application and was given a green light in March 2021. It was the first time ever that all six regional partners had applied for the same project in the Transport Community.

The TCPS agreed with Serbia to facilitate all activities on this project mainly with the regional partners and JASPERS.

The main objective of this project has been to improve safety at LCs. LCs are a common safety concerns for both rail and road traffic, and one of the most sensitive topics in land transport.

The main aim of this project is to increase safety at level crossing, while a tangible outcome would be mapping of the most critical LCs in the region.

The project, among other activities, includes:

(i) an inventory/mapping of level crossings, (ii) a prioritisation exercise based on a risk analysis (including traffic and accident statistics) and (iii) preparation of technical parts of tender documentation (TD) according to the selected Contract Conditions (e.g. FIDIC Yellow or Silver Book) for rehabilitation/reconstruction/upgrading activities and for installing new signalling equipment, railway signs and road barriers at prioritised level crossings in order to improve safety at the most risky crossings on the network and, subsequently, reduce the number of serious accidents and related fatalities/injuries.

It is expected that the inventory/mapping and preparation of relevant parts of tender dossier will be carried out in accordance with the relevance level of respective LCs' location on the network, that is, wherter they are located on the Core or Comprehensive network, or on other lines. Grouping along certain lines and/or geographical locations will also be assessed.

Depending on the availability of potential funds and on the implementation strategy, the project could also include preparation of administrative parts of TD according to the templates and rules of financing.

The project is expected to achieve the following:

1. to provide, in close cooperation with the regional partners, an overview (the so-called "mapping phase") of LCs on the entire network (grouped according to relevance, i.e. Core, Comprehensive and other lines);

2. based on a set of comprehensive and available pieces of information collected during the "mapping phase", LCs are to be prioritised according to their safety level (the so-called "prioritisation phase"); and

3. based on the "prioritisation phase" results, the most critical/dangerous LCs will be identified for safety improvement measures and for urgent implementation.

In parallel with the forestated activities, the TCPS will, in coordination with the regional partners, arrange and implement "soft" measures, such as a public awareness campaign, an educational campaign, a launch of potential legal amendments and law enforcement.

An ultimate goal of the overall set of the measures envisaged by the initiative is to decrease the number of accidents at LCs.

The kick-off meeting was held on 15 April 2021 and all the regional partners were present. Following is the list of persons appointed by the regional partners.

1. JASPERS Coordinating Body on behalf of South East European Parties that has formally validated the request for support

Relevant official counterpart	Ministry of European Integration
South East European Party/ Beneficiary	Serbia

2. Project Promoters/Final Beneficiaries and relevant contact person(s) details

2.1. For Serbia:

Entity/Institution	Project promoter: Ministry of Construction, Transport and Infrastructure (MoCTI)
Contact Person	Milos Radosavljević
Title	Associate
Department/ Unit / Business area	Department for Railways and Intermodal transport

Entity/Institution	Final Beneficiary: JSC Serbian Railways Infrastructure (SRI)
Contact person 1	Aleksandra Milosavljevic
Title	msc.civ.eng.
Department/ Unit / Business area	Construction maintenance division
Contact person 2	Zoran Jevtic
Title	Electrical engineering dipl.ing
Department/ Unit / Business area	Manager for Railway Infrastructure Maintenance

2.2. For Albania:

Entity/Institution	Project promoter: Ministry of Infrastructure and Energy (MIE)
Contact Person	Zana Joca
Title	Head of Unit
Department/ Unit / Business area	Railway Policy Unit

Entity/Institution	Final Beneficiary: Hekurudha Shqiptare/ Albanian Railway (HSH)
Contact Person	Bashkim Kasoruho
Title	Director
Department/ Unit / Business area	PIU Director

2.3. For Bosnia and Herzegovina:

Entity/Institution	Project promoter: 1. Ministry of Communications and Transport of Bosnia and Herzegovina 2. Federal Ministry Transport and Communications 3. Ministry of transport and communications of the Republic of Srpska
Contact Person	1. Dinka Maslo 2. Ismet Demirović 3. Snježana Polić-Đurić
Title	1. Expert Advisor 2. Assistant to Minister for Railway, Waterway and Combined Transport 3. Senior associate
Department/Unit/ Business area	1. Transport sector 2. Railway, water and combined transport sector 3. Department for railways transport
Entity/Institution	Final Beneficiary: 1. JP Željeznice FBiH d.o.o. Sarajevo 2. Željeznice Republike Srpske a.d. Doboj

Contact Person	1. Enis Džafić 2. Danijela Janjilovic
Title	1. Director General 2. Head of the Working Unit responsible for Superstructure
Department/ Unit / Business area	1. Office of the General Manager 2. Department of Civil Works

2.4. For Kosovo:

Entity/Institution	Project promoter: Ministry of Infrastructure
Contact Person	Xheme Veseli
Title	Director of Land Transport Department
Department/ Unit / Business area	Land Transport Department

Entity/Institution	Final Beneficiary: Kosovo Railways Infrastructure JSC - INFRAKOS
Contact Person	Vehbi Maloku
Title	Director of Department for Signalling, Telecom and Energetics
Department/ Unit / Business area	Department for Signalling, Telecom and Energetics – Railway Infrastructure

2.5. For Montenegro:

Entity/Institution	Project promoter: Ministry of Capital Investments (MCI)
Contact Person	Milan Banković
Title	Senior advisor
Department/ Unit / Business area	Directorate for the Rail transport

Entity/Institution	Final Beneficiary: Railway infrastructure of Montenegro Joint Stock company Podgorica
Contact Person	Lucija Filipović
Title	Assistant CEO for Investments and Foreign Investments
Department/ Unit / Business area	Sector for investments and foreign investments (PIU)

2.6 For North Macedonia:

Entity/Institution	Project promoter: Ministry of Transport and Communications
Contact Person	Biljana Zdraveva
Title	Head of the Railway Department
Department/ Unit / Business area	Railways

Entity/Institution	Final Beneficiary: Public Enterprise for Railway Infrastructure Railways of Republic of North Macedonia-Skopje
Contact Person	Hari Lokvenec
Title	Director
Department/ Unit / Business area	Railways

The TCPS was the main facilitator of this exercise with the support of JASPERS. The counterparts from the region were the Infrastructure Managers. Certain number of visits and online meetings were organised during the data collection process.

Meetings and regional visits:

Sarajevo – October 2021 - The representatives of the TCPS and JASPERS visited all railway institutions and companies. There were meetings with:

- Public Railway Company "Zeljznice Republike Srpske" in Doboj on 12 October 2021.
- Railway regulatory Agency – "Regulatorni odbor" in Doboj on 12 October 2021
- Public Railway BIH Corporation – in Sarajevo on 13 October 2021
- Public Railway company "Zeljeznice Federacije BIH" – in Sarajevo on 13 October 2021

Podgorica October 2021:

- Public Railway Undertaking "MonteCargo" – in Podgorica on 26 October 2021
- Ministry of Capital investments - in Podgorica on 27 October 2021
- Public infrastructure company "ŽICG" – in Podgorica on 27 October 2021 and 24 March 2022 (JASPERS meeting and site visit for 2 LCs (Mahala and Zagoric) which made need to be de-levelled)
- Public Railway Undertaking "ZPCG" – in Podgorica on 27 October 2021

Skopje – November 2021

- Public Railway company for Infrastructure – "MZI" in Skopje on 08 November 2021
- Public railway undertaking – "MZ Transport"– in Skopje on 08 November 2021
- Ministry of Transport and Communications in Skopje on 09 November 2021

Kosovo – November 2021

- Public railway company "Infrakos"in Pristina on 09 November 2021
- Public railway undertaking "Trainkos" in Pristina on 09 November 2021

- Ministry of infrastructure – in Pristina on 10 November 2021

Albania – February 2022

- Public railway company "HSH" in Tirana on 01 February 2022
- National inspectorate in Durres on 01 February 2022
- Ministry of Infrastructure and Energy – in Tirana on 02 February 2022.

Serbia – November 2021, April 2022

- Public Railway Serbian Infrastructure Manager – November 2021
- Public enterprise "Roads of Serbia" – April 2022

1.2. General description of level crossings at the regional level

Level crossings are points of intersection between roads and railways.

Rail safety is recognised as the most important parameter in rail traffic. There are a lot of subjects which can make higher or lower influence on rail safety. One of the most sensitive issues are level crossings. These are places where collision between two inland modes of transport exists.

In an ideal situation, denivelation is the best solution. However, just one small number of LCs have underpasses or overpasses. It means that the rest of the LCs in the same level require more attention in terms of road and rail safety. Proper legislation is a crucial part for keeping good level of safety but it is not sufficient. Other factors, such as LCs equipment, their operational condition and maintenance, the respect of road signalisation by road users, marking of LCs with proper road signalisation, the triangle of visibility, and density of road traffic can affect safety on LCs.

1.3. Protection of Level Crossings

According to the EU legal classification (reference to Directive (EU) 2016/798 on railway safety of 11 May 2016), protection of LCs are divided into "Active" and "Passive" (where "Passive" are those where roads cross the railway without any form of a warning system or protection activated when it is unsafe for the user to use the crossing, whereas "Active" are those where the crossing users are protected from or warned of the approaching train by the devices activated when it is unsafe for the user to traverse the crossing).

In EU MS, 45% of LCs are "Passive", i.e. 55% "Active", while the related averages in the WB6 are much worse, i.e. in favour of the less safe "Passive" LCs. (24% of "Active" and 76% of "Passive).

Table 1. Total percentage of "active" and "passive" level crossings

	ALB	BIH	KOS	MNE	MKD	SRB	WB Region	EU
Passive	**74**	**88,3**	**90,2**	**17,4**	**62**	**81**	**80**	45
Active	26	11,7	9,8	82,6	38	19	20	55

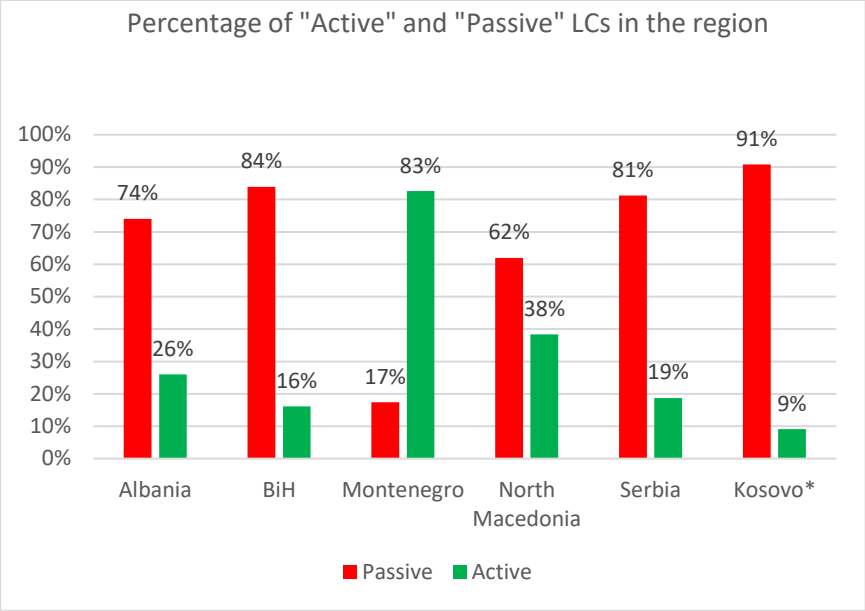

Figure 1. Percentage of "Active" and "Passive" LCs per South East European party

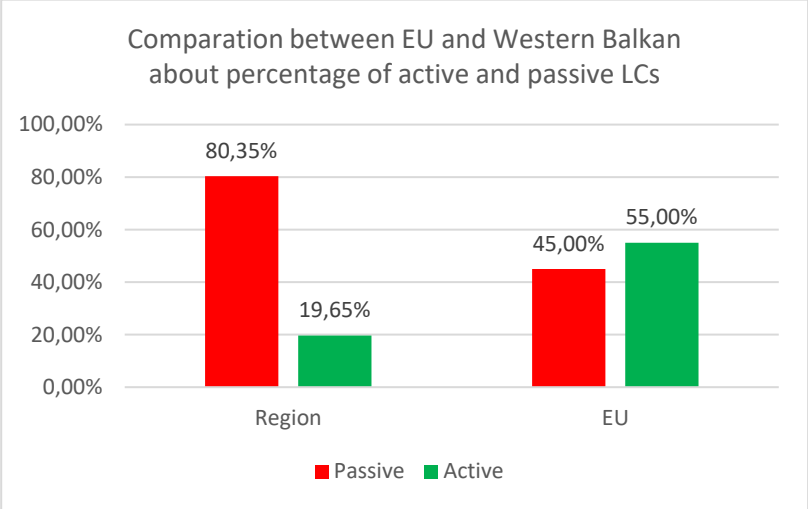

Figure 2. Comparison between EU and Western Balkans in terms of percentage of "Active" and "Passive" LCs

1.4. Accidents on level crossings in the Western Balkan

Accidents are unfortunate consequences of traffic, but the numbers of accident could be lower if all stakeholders work together on common solutions.

Table 2. Total numbers of accidents and the number of accidents on LCs in the entire WB region

Western Balkan - total	2014	2015	2016	2017	2018	2019	2020	2021	Total
Total number of railway accidents	722	831	633	824	786	752	488	671	5707
Accidents on LCRs	98	91	114	114	117	77	59	80	750
Percentage of accidents on LCs	13.6	11.0	18.0	13.8	14.9	7.8	11.5	13.4	12.9

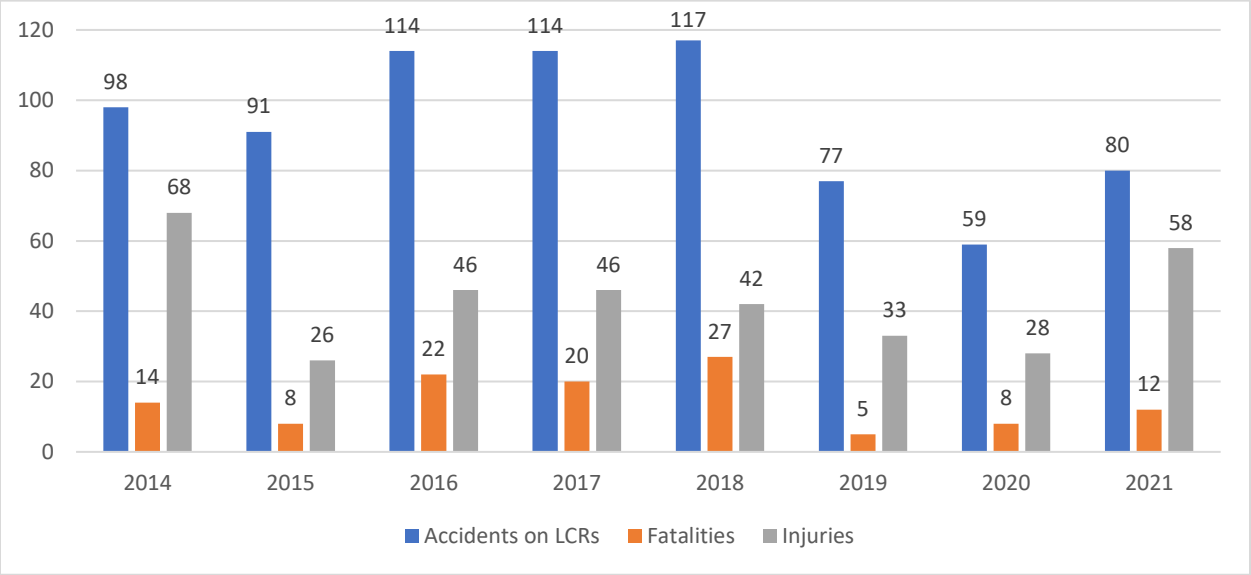

Figure 3. Number of accidents on LCs, fatalities and severity injuries in the entire WB Region for the period 2013-2021

However, the most compelling insight from the above-aggregated statistics for the entire WB Region, and which is more than obvious, is that **61%** of all the accidents on LCs, have **fatalities or severity injuries** as their direct consequences.

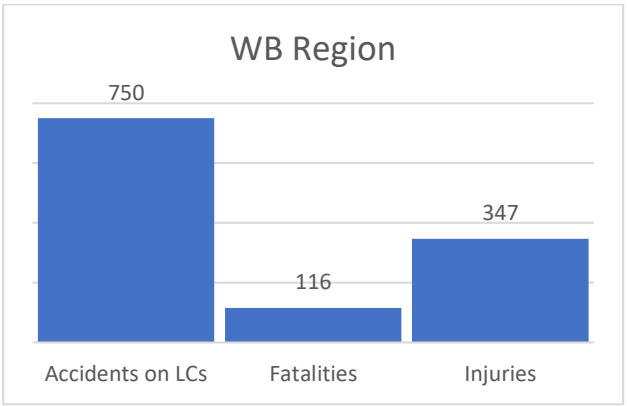

Figure 4. Total number of accidents on LCs, fatalities and severity injuries in the entire WB Region for the period 2013-2021

LCs are the common point for the two modes of transport and because of that their importance should be recognised by all stakeholders (Rail IM, Road IM, drivers in road traffic, railway staff, municipality, educational institution, public media etc …).

At the same time, LCs are sensitive points for rail as well as for road safety. As everywhere, we are still having lost or injured persons at level crossings. And there are several reasons for it:

- Insufficient level of protection
- Lack of knowledge to recognise the problem and lack of reliable data regarding the causes and costs
- Ineffective risk assessment and management
- Poor safety culture of car drivers

At the same time, “owners” of Level Crossings are responsible for the maintenance. Looking at rail legislation, there are different cases and models in the Western Balkans. However, in practice, cost of maintenance is a responsibility of rail infrastructure managers. It is an additional burden, taking into account that they do not have the right to decide about the termination of LCs without the consent of the Ministry of Interior and Municipalities or Road Infrastructure Manager.

2. An overview of the current situation in the Western Balkans

The ultimate goal of the Transport Community Permanent Secretariat is that there should be no more dead or seriously injured because of accidents on railway crossings. The Transport Community has a mission to help the appropriate institutions in the region to make roads safer for everybody.

Our strategic goals for level crossings are clear:

- To reduce safety risk to the public, passengers and workforce
- To increase rail capacity and performance across the rail network
- To reduce operational and financial risk for the Railways

According to the latest research, the reason of a level crossing accident is violation of the rules on the Level Crossings and not stopping at the flash signal. This is the main reason in 67% of the cases. This figure gives the right to think that public awareness on this issue is at the low level and the results of it and the costs are immense. For example, almost 300 people die annually in LC accidents (EU-28), causing economic damage of €1 billion[*].

The reasons behind the decision of drivers and pedestrians not to follow the rules are different and are related to different areas from not knowing the rail system to hazardous behaviour. In order for these reasons to be mitigated, the first step is the Public Awareness Campaign together with amending the laws. This “soft measure” includes the public awareness campaign, an educational campaign, legal framework changes and a law enforcement focus. The Campaign was started during 2022 and it is continuing in almost all Regional Partners where TV commercial is played on the official languges and additional campaign materials are distributed via all chanles of communications of the TCPS and the Regional Partners stakeholders.

Parallel to the campaign, identification of priorities along the Core/Comprehensive Network was done (numbers, allocation, traffic flow, number of accidents, fatalities etc.). This identification is the base for the next step – filing an application for financing and procurement.

Investment in level crossing safety must also be balanced against other safety risks. Competing priorities may, for example, occur with embankments, structures, track, signalling, through trespass and at stations, at roads accessing LCs. Thus, it may not be possible and within funding to immediately implement long-term safety improvements at all level crossings. Where such prioritisation is needed, a model was applied to mitigate risks. Through a safety management framework of re-assessment and monitoring, we can continuously evaluate safety risks and prioritise expenditure appropriately, making sure risks are managed and public money are invested wisely. Finally, the outcome must be continus action, since the situation will not improve by its own as it is shown on the graphic bellow.

[*] ERA report on railway safety and interoperability in the EU - 2020

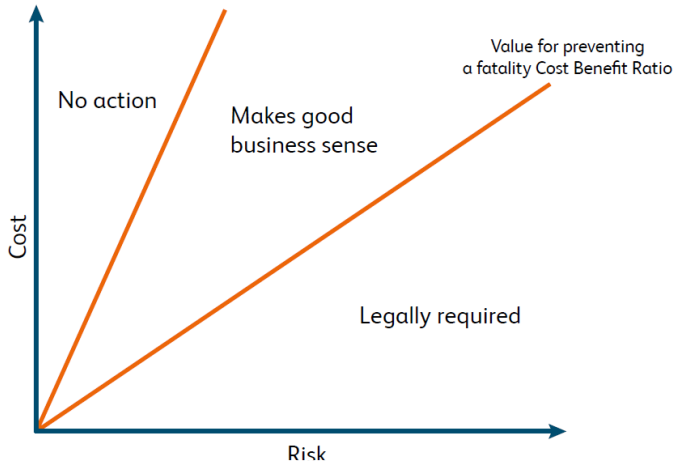

Figure 4. Actions relation with cost and risks

2.1. A legislative overview of the situation in the Western Balkans

Relevant legislation is contained in Laws and rulebooks and, in some cases, in decisions.

In **Kosovo**, the Law on Railway is the relevant document (Article 3, paragraph 1.21; Article 42, paragraph 1.4; Article 43, paragraph 1, paragraph 2, paragraph 3 and paragraph 4; Article 123, paragraph 6; Article 143, paragraph 3/3.18 and paragraph 4.) as well as the Law on Road Traffic.

In terms of responsibility for opening a new LC, an infrastructure manager is a body which must give permission. At the same time, the elimination of current LCs without a proper permission issued by the IM is under the remit of the Infrastructure Manager with assistance of the Police.

Regarding the maintenance, based on the legislation, a responsible entity for maintenance of level crossings is the Infrastructure Manager – INFRAKOS, except for road warning signs for which the relevant road authority is responsible.

Regarding the maintenance costs, an article in the Law on Railway stipulates "*Expenses of the railway infrastructure manager for maintenance and operation of railway level crossings shall be reimbursed by the body responsible for the administration of the infrastructure crossed by a railway line*". However, in operation, IM "Infrakos" is the only legal entity which takes care of maintenance costs of LCs, without any contribution by the road authority or the municipality.

It is worth mentioning that the total number of LCs is 268. There are 107 Level Crossings situated on the Core, while on the comprehensive network, there are 139 (107 + 32). Of 107 LCs on the Core network, 20 are protected with active signalling, therefore 87 are protected with passive signalling. All 32 LCs on the Comprehensive Network are protected only with passive signalling.

The last time the legislation on LCs was changed was in 2011 when the Law on Railways was approved and in 2016 when the Law on Road Traffic Provisions was approved.

North Macedonia regulated this area through the Law on the Railway System, (articles 52, 53, 54, 55) and the Law on Public Roads, article 37 and Rulebook for level crossing between railway and road, from the aspect of safe railway traffic regulation.

National legislation does not provide a detailed definition about opening new and terminating the existing LCs. Following internal procedures of the IM and the best practices, opening of new and termination of the existing LCs is done jointly between the IM and the Ministry of Transport and Communications.

Full responsibility and maintenance costs of LCs is on the side of IM. Despite the solution set forth in the Law in Railway System that *the maintenance cost shall be equally divided between the IM and the relevant road authority*, in practice, this approach has not been implemented. The Rail IM is responsible for the cost and there is no contract between the road IM and the rail IM.

On the Core/Comprehensive Network, there are 283 registered LCs, 98 of which are with active signalisation or equipped with signalling and safety devices, while 185 LCs are with passive signalisation or equipped with traffic signs for road signalisation. Last changes of the legislation linked to the LCs was in 2011 (Law on Railway System).

The Railway Law in **Albania** (article 121 – 131) regulates level crossings. Responsibility for opening lines with the Infrastructure Manager and the road administrator (Road IM or municipality). Responsibility for closing the railway crossings is the institution in charge by the law, the National Inspectorate for the Protection of the Territory, upon request by the Railway Infrastructure Manager.

Maintenance of railway crossings up to 10 meters from the railway line axis, on both sides, is the responsibility of the Infrastructure Manager. The infrastructure manager is obliged to cover the cost of the railway track and road on both sides up to 10 meters from the railway line axis, while the rest of the road is maintained by the road maintenance manager. There is no contract between the infrastructure manager and the road management manager. Each manager is obliged to implement the relevant legislation. Last changes of the legislation were in 2018, when Albania adopted Railway Code (Law on Railway).

Serbia has a certain number of Laws and Rulebooks related to the Level crossings. A few of them are listed below:

- Law on Railways („Official Gazette of the Republic of Serbia“, No. 41/2018), articles 61. to 70.
- Law on Safety in Railway traffic („Official Gazette of the Republic of Serbia“, No. 41/2018), articles 96. and 97.
- Rulebook on the method of crossing the railway and roads, hiking or cycling paths, place where crossing can be made and safety traffic measures („Official Gazette of the Republic of Serbia“, No. 89/2016)
- Rulebook about technical condition and maintenance of railway substructure („Official Gazette of the Republic of Serbia“, No. 39/2016 and 74/2016), articles 6, 8, 11, 16. and 35.
- Rulebook about technical condition and maintenance of railway superstructure („Official Gazette of the Republic of Serbia“, No. 39/2016 and 74/2016), article 37.
- Rule-book about technical condition and maintenance of railway signalling and safety system („Official Gazette of the Republic of Serbia“, No. 18/2016), articles 17, 18. and 25. to 32.

- Law on Roads („Official Gazette of the Republic of Serbia“, No. 41/2018 and 95/2018 – another law), articles 38., 39., 82. and 86.
- Law on Safety in Road traffic („Official Gazette of the Republic of Serbia“, No. br. 41/2009, 53/2010, 101/2011, 32/2013 – decision US, 55/2014, 96/2015 – another law, 9/2016 decision US, 24/2018, 41/2018, 41/2018 – another law 87/2018 and 23/2019), article 18., 23., 25., 71., and 153.
- Rulebook about road traffic signalling system („Official Gazette of the Republic of Serbia“, No. 85/2017), articles 17. and 84.

Besides the Railway IM, Road IM and the Ministry responsible for transport are in charge for the opening of new LCs and termination of existing ones according to the Law on Railways, article 64.

In Serbia two legislation acts (road and rail) which are regulating the LCs from are in collision with each other and it is related to the level of protection of the road side users.

Railway IM and Road IM are both responsible for the maintenance of LCs according to the Law on Railways, Articles 62 and 69. The Railway IM is in charge of maintenance of the railway infrastructure, and the Road IM is responsible for maintenance of the road infrastructure.

In terms of costs, the Railway IM shares maintenance with the road IM in the 50%:50% ratio. Various departments of rail IM (traffic, civil works, signalling) are responsible for cost estimation. There are contracts between rail IM and road IM which are updated yearly.

There are 1441 LCs on rail Core/Comprehensive Network (main and regional lines). 391 LCs have “active” signalling and 1.050 “passive” signalling.

The latest legislative amendments were done in 2018. The Law on Railways and a new Law on Safety in Railway traffic were adopted.

Bosnia and Herzegovina has two entities and two public rail integrated companies. Thus, the description and analysis for BIH will be done at the entity level and where possible at the level of BIH.

In the Federation of BIH, the FBiH Rulebook on level crossings (“Official Gazette of FBiH” No 42/06), FBiH Law on Roads (“Official Gazette of FBiH”, No 12/10, 16/10 and 66/13), Article 65 are regulating the LC issue. While in the Republic of Srpska, there are the Law on Railways of the Republic of Srpska (“Official Gazette of the Republic of Srpska” No. 18/17, 28/17, 100/17, 56/22), Articles 49-60 and Rulebook 322 on the manner of intersection between a railway and a road (“Official Gazette of the Republic of Srpska” No. 89/21).

In RS: According to the legislation on railways and spatial planning, the infrastructure manager as well as the owner of the railway infrastructure are in charge of opening new LCs and termination of the existing ones. However, there are no plans to open any new LCs, which is confirmed by the fact that there are no new LCs opened in last 10 years. In accordance with the legislation on railways, their plan is to reduce the number of LCs. On the distance Samac -Doboj, there are a lot of level crossings with distances between them less than 2000 m what is in collision with the Law.

In FBiH: the Rail Infrastructure Manager and road maintenance competent authorities, in agreement with the FBiH Ministry of Transport and Communications, are in charge of terminating level crossings.

Construction of new level crossings is forbidden on the main railroad, except in special cases if the number of the existing LCs is reduced by such construction.

Regarding the responsibility for maintenance, in RS Rail IM and Road IM share responsibility. Expenses related to maintenance, renewal or reconstruction of level crossing and railway signal infrastructure will be borne by the railway infrastructure manager. The road infrastructure manager will install and maintain road traffic signs at the level crossing and warning the road traffic users about the level crossing. The latest changes of the Railway Law state that IMs (Road and Rail) must have an agreement for maintenance and in accordance with that, costs are shared equally. The same rule is applicable to the new level crossings as well as to the upgrade of the existing ones.

In Federation of BIH, the Rail IM is responsible for LCs maintenance, since they have the capacity to perform such work, whereas Article 65 of the FBiH Law on Roads provides for a possibility for the Agreement on LCs maintenance between rail IMs and road IMs. In practice, in Federation of BIH there is an agreement and sharing of maintenance costs.

The total number of LCs in the RS is 301. 36 LCs are actively secured with road signals and barriers, and 265 LCs are passively secured with traffic signs.

In FBiH: There are 195 LCs in total on the rail network of Željeznice FBIH (the FBIH Railways). 3 LCs are protected by light and sound signals without half barriers, 13 LCs protected by mechanical barriers and 28 LCs protected by light and sound signals with half barriers. Other LCs (151) are equipped with passive protection - St. Andrew's Cross and the STOP sign.

In RS, the last time the legislation linked to the LCs was amended was in 2021. A new Rulebook on the manner of intersection between a railway and a road was done in 2021 as well as amendments to the Railway Law in 2022.

FBiH: Since the issuance of the Rulebook on level crossings in 2006, the FBiH Ministry of Transport and Communications has not made any changes to the legislation related to the LCs, but it should be noted that in 2013 the BiH Railway Regulatory Board issued a Rulebook on the method of intersecting roads and railroads.

In **Montenegro**, there is a Law on Railways articles 44 to 51. With regards to national legislation, article 49 of Railway Law states that "*If a railway crossing is to be replaced by an underpass or an overpass or if a railway crossing is to be eliminated due to road routing, costs of such changes made to the infrastructure and road shall be covered by:*

- *Infrastructure manager, if the change results mainly from railway traffic needs;*
- *Road manager, if such change results mainly from road traffic needs, and in the case of an unclassified road used mainly by a specific entity, the costs of any change on infrastructure and road shall be completely covered by such entity*.

Regarding maintenance costs, the costs of maintaining a railway crossing and costs of ensuring safe and unobstructed traffic at a railway crossing are covered by:

- The infrastructure manager, for maintaining the track and other parts of infrastructure on a railway crossing, signalling equipment and signs that alert train crews about the crossing, railway telephone lines with the road crossing;

- The road manager, for maintaining road surface at a railway crossing and road signs that alert drivers about the railway crossing;
- The infrastructure manager and the road manager, in equal parts, for maintaining instruments for signalling drivers of trains approaching a railway crossing and equipment for closing the traffic at a railway crossing.

Rail IM is obliged to calculate cost of maintenance of LCs.

Total number of LCs are 23, out of it 19 is with active and 4 with passive signalling. Lates changes of the connected legislation was in 2014.

2.2. An operational overview of the LCs on the Core and Comprehensive Network in the Western Balkans

Since the goal of this exercise is to identify priorities for the upgrade or denivelation in order to increase safety on level crossings, the current situation is presented below for all the regional partners.

Albania

There are 104 level crossings with a valid permit on the main Albanian railway network. (There are 132 without the permit and there is no data about signalling on them).

Of 104 with a valid permit, 77 LCs are “passive”, which have only road signs, and 27 are “active” that have a mechanical system mounted with metal barriers lowered when the train crosses.

As Albania has a very ambitious investment cycle for the coming years, the majority of level crossings on the main lines will be covered with appropriate projects. Currently, modernisation of the Tirana – Durres line with a direct new link to the airport is ongoing with an expected deadline in 2024. Also, the line Vore – Hani Hotit is ready for financing, taking into account that the detailed design has been finished. This line is also part of the Core Network. The same situation is for the distance Durres – Rrogozhine, but this section is on the Comprehensive network, what could be an obstacle in terms of providing potential grants through European funds.

For the south part of the network, from Rrogozhine towards Vlore, there is no data. Distances Fier Balsh and Fier – Vlore are under concession contract and the company ALBRAIL (the concessioner) expressed interest for upgrading level crossings on their infrastructure as well. Details can be find in the Annex IV.

For the last distance in Albania, from Rrogozhine towards MKD border, a pre-feasibility study has been prepared, and the next step will be the feasibility study and preliminary design with EIAS (the procurement procedure is about to be initiated).

In each of the projects mentioned above, level crossings are part of the anticipated construction works.

Therefore, taking into account that all lines in Albania are covered with projects (in different phase of preparation or implementation) and considering that only a very limited part of the network is used for operations, this exercise will not take into account any level crossings which are already part of other investments. It is in line with the principle to avoid overlapping in prioritisation.

The current state of play regarding safety on LCs in Albania is given in the following figures

Table 3. The structure of rail/road traffic accidents on LCs in Albania

Year	No. of traffic accidents	No. of fatalities	No. of severely injured
2014	9	1	**8**
2015	9	3	**6**
2016	15	2	**13**
2017	4	2	**2**
2018	8	3	**5**
2019	2	1	**7**
2020	0	0	**1**
2021	3	0	**1**
Total	**50**	**12**	**43**

In all cases of accidents, more than 80% of the cases have occurred due to non-enforcement of the rules by drivers. There is a lack of emphasized culture of vehicle drivers in terms of road traffic regulations and vehicle speed.

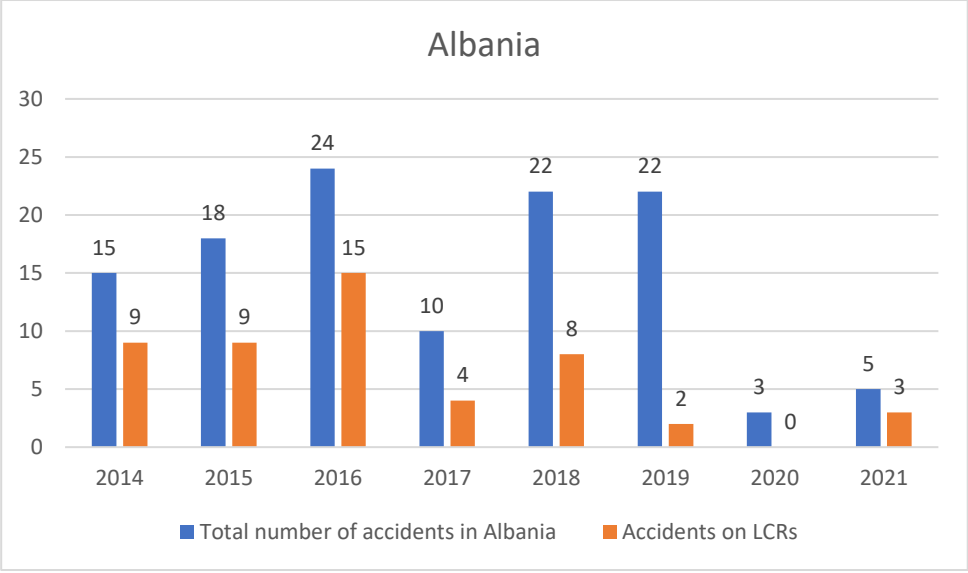

Figure 5. Comparison between the total number of accidents and those on LCs in Albania, for the period 2014-2021

Table 4. Total number of accidents/incidents in Albania

	2014	2015	2016	2017	2018.	2019	2020	2021	Total
Total number of accidents in Albania	15	18	24	10	22	22	3	5	**119**
Accidents on LCs	**9**	**9**	**15**	**4**	**8**	**2**	**-**	**3**	**50**

In Albania, there were 119 accidents/incidents in the last 8 years, 50 of which happened on LCs, making it about 42 %.

What is important to notice and emphasise is the fact that out of a total of 236 crossings only 104 are authorised by the IM, i.e. opened with the explicit approval of Albanian Railways. The reason why this is so important is that according to informal communication with the rest of the WBR railways, the situation is very similar for all of them. In that sense, the so-called "*illegal*" LCs represents one of the major issues and causes of incidents.

It is worth mentioning that a lower number of the accidents in last two years is a result of the small number of trains in operation due to the construction works or other safety issues.

Bosnia and Herzegovina

There are two integrated rail companies in Bosnia and Herzegovina, one per entity who are responsible for the infrastructure and operation at the same time. Also, the owners of the rail infrastructure are entities. In terms of that this exercise will be perform by two different entities. Additional reason for this approach is different level of data availability.

The Entity of Republic of Srpska

There are 301 LCs in total. All of them are authorised. 53 are situated on the Core Network, 205 on the Comprehensive (included 53 on Core), while 96 LCs are out of the Core/Comprehensive Network.

276 are on the rail lines in operation while 26 are on temporarily closed lines.

In terms of equipment, 36 LCs are secured with active signalisation (light signals and barriers), and 265 LCs are secured with passive signalisation (traffic signs and visibility triangle).

Among 36 with active signalisation, 12 are equipped with manual barriers, 14 with light-sound system and 10 with automatic barriers. All devices were installed between 2006 and 2019.

53 LCs are part of the current projects (mainly on Corridor Vc), so it will be excluded from the priorities in this exercise.

One of them, 23+783km of the rail section Samac – Doboj (immediately before the station Samac) is a candidate for the denivelation proposed by the regional partner. This LC is on distance shorter than 2,000 m from the next one in km 23+189, what is in collision with domestic legislation. Additional arguments for it will be described in later phase of the report.

The current intensity of the rail traffic goes from 1 – 19 trains per day, while the number of trains is estimated at 2 – 49 trains per day.

Unfortunately, road traffic data are not available, what will be a significant constrain during the prioritisation of the level crossings as candidate for the upgrade of equipment or denivelation.

The only criteria that will be considered in this assessment is crossing different category roads. In BIH, there are several road categories: magistral road, regional and local with some subcategories. Currently, there are 6 LCs which are crossing with magistral roads, 12 LCs in level with regional roads and 224 LCs on local roads. For the 59 LCs there is no data about road category.

A significant number of level crossings does not have a proper distance between what is 2000 m based o the Railway Law in the Republic of Srpska. In accordance with this principle from the Railway Law, around 70 level crossings should be terminated, manly on Corridor Vc between Samac and Doboj as well as on Route 9a between Novi Grad and Zvornik.

Accidents happened on 41 LCs:

- On 26 LCs – 1 accident
- On 6 LCs – 2 accidents
- On the 5 LCs with active signalisation – 3 accidents
- On the 1 LC with active signalisation – 4 accidents
- On the 1 LC with active signalisation – 7 accidents
- On the 1 LC with active signalisation – 8 accidents
- On the 1 LC with active signalisation – 19 accidents

The Entity of Federation of BIH

There are 195 LCs in total on the rail network of Željeznice FBIH (the FBIH Railways).

44 LCs have active protection (3 LCs are protected by light and sound signals without half barriers, 13 LCs protected by mechanical barriers and 28 LCs protected by light and sound signals with half barriers). Other LCs (151) are equipped with passive protection - St. Andrew's Cross and STOP sign.

2 LCs are part of the current projects (mainly on Corridor Vc), so they will be excluded from the priorities in this exercise.

The Current intensity of rail traffic goes from 1 – 19 trains per day, while the number of trains is estimated at 2 – 49 trains per day.

Unfortunately, road traffic data are not available, what will be a significant constrain during the prioritisation of the level crossings as candidate for the upgrade of equipment or denivelation.

The only criteria that will be considered in this assessment is crossing different category roads. In BIH, there are several road categories: magistral road, regional and local with some subcategories. Currently, there are 6 LCs which are crossing with magistral roads, 11 LCs in level with regional roads and 172 LCs on local roads. For 59 LCs, there is no data about the road category.

A significant number of level crossings does not have a proper distance between what is 2000 m based on Railway Law in Federation of BIH. In accordance with this principle from Railway Law, around 40 level crossings should be terminated, manly on Corridor Vc between Sarajevo and Doboj as well as between Sarajevo and Mostar.

Accidents happened on 55 LCs – in 2021:

- On 20 LCs – 1 accident
- On 19 LCs – 2 accidents
- On the 6 LCs with active signalisation – 3 accidents
- On the 6 LC with active signalisation – 4 accidents
- On the 1 LC with active signalisation – 11 accidents
- On the 1 LC with active signalisation – 15 accidents

In total, there were 131 accidents and incidents on level crossings in the Federation of BIH in 2021. As a result there were 20 fatalities and 25 serious injuries.

Bosnia and Herzegovina (All entities)

One of the most important indicators of rail safety is a number of incidents and accidents.

Table 5. The structure of rail/road traffic accidents on LCs in Bosnia and Herzegovina, 2015-2021

Year	No. of accidents on LCs	No. of fatalities	No. of severely injured	Damage to property (€)
2015	11	1	0	**250.000**
2016	11	5	0	**590.000**
2017	28	10	5	**560.000**
2018	24	5	3	**700.000**
2019*	2	1	0	**20.000**
2020[1]	1	2	0	**8.000**
2021	136	24	26	**15.593**
Total	**214**	**48**	**34**	

* Data just for the Railways of Republic of Srpska

Table 6. Total number of accidents/incidents in BIH for the period 2015-2021

	2015	2016	2017	2018	2019*	2020*	2021*	Total
Total number of accidents in BIH	48	25	60	53	43	25	45	**299**
Accidents on LCs	**11**	**11**	**28**	**24**	**2**	**1**	**5**	**82**

In BIH, there were 299 accidents in the last 7 years, with 82 accidents happening on LCs, i.e. about 40 %.

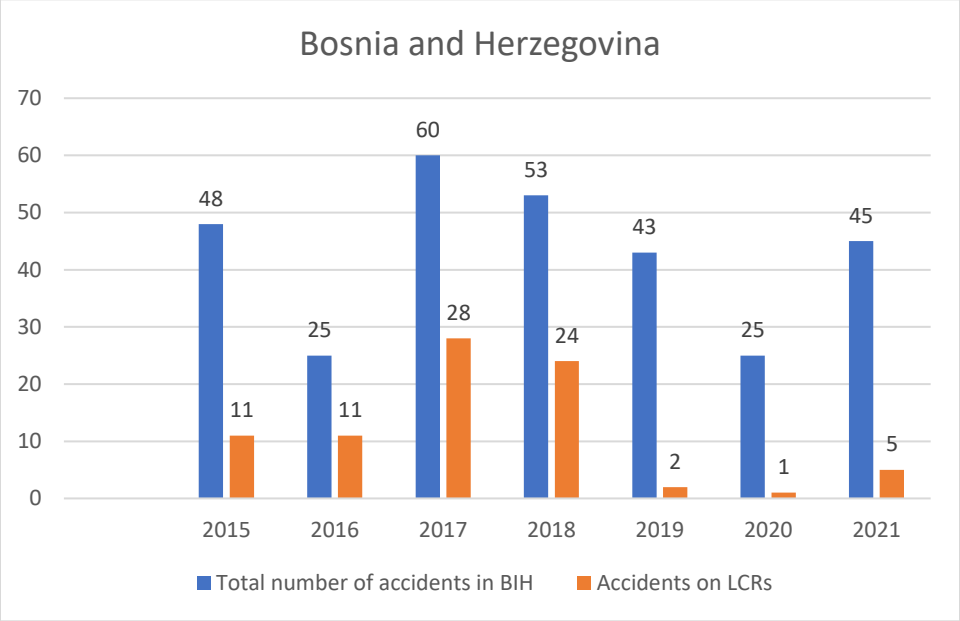

Figure 6. Comparison between the total number of accidents and those on LCs in BiH, for the period 2015-2021

The rest of data for the rail network of the Federation of BIH is not available now.

Kosovo

There are 295 LCs in Kosovo.

292 LCs are authorized and 3 LCs without proper permits. 201 on operational lines, 94 are situated on temporarily closed lines.

Currently, 27 LCs have Active signalisation and 268 LCs have a Passive signalisation. Among the 27 LCs with active signalling there are:

- 2 with manual barriers (1983 and 2003).

* Data just for the Railways of Republic of Srpska

- 2 with light-sound system (installed in 2006).
- 7 with automatic barriers (installed between 2006 and 2019).
- 16 with rail side protected (installed on 1983).

Full rehabilitation of Route 10 (from border with Macedonia toward common crossing point with Serbia) in total length of 152 km is first priority for the Kosovo. This project is ongoing and an estimated completion date is 2026. However, an upgrade of level crossings is part of the project. In total, there are 141 LCs as a part of the current projects, so they should be excluded from the priorities in this exercise.

- 108 out of 141 are under the project – Modernisation of Route 10 while the rest of 31 LCs are situated on Route 7. During the works on Route 10, 27 LCs are planned to be terminated.
- 81 LCs should be installed in 2023, 27 on 2024, for Route 7, installation date has not been estimated because the project documentation has not reached the mature phase.

Table 7. The structure of rail/road traffic accidents on LCs in Kosovo

Year	No. of traffic accidents on LCs	No. of fatalities	No. of severely injured	Traffic interruption (hour)	Damage to property (€)
2014	13	3	11	20,82	**825.00**
2015	13	2	8	17,77	**2595.00**
2016	14	1	15	27,83	**5,610.25**
2017	14	3	16	26,92	**56,018.65**
2018	15	3	13	16,58	**0,00**
2019	10	1	10	16,58	**0,00**
2020	8	0	7	13,01	**2.770,00**
2021	12	0	20	27,80	**2.772,95**
Total	**98**	**13**	**100**	**176,48**	**65.048,9**

Table 8. Total number of accidents/incidents in Kosovo

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Total number of railway accidents	13	17	14	17	19	16	11	18	**125**
Accidents on LCs	**13**	**13**	**14**	**14**	**15**	**10**	**8**	**12**	**98**

In Kosovo, there were 125 accidents in the period (2013-2021) 8 years, 98 of which occurred on LCs, i.e. about 78%.

Rehabilitation of the Kosovo Railway Line has been underway since 2018. Since that, train movement has been restricted. Last year (2021), the railway line was fully closed for 240 days for railway traffic. Therefore, a parameter in determining the degree of risk on level crossings is the number of accidents at crossings compared with the frequency of trains-train km as presented in the table below.

Table 9. Number of accidents at crossings should be compare with the frequency of trains-train km

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Train km (million)	0.416	0.377	0.331	0.267	0.225	0.267	0.165	0.193	2.241

The latest data on accidents that happened on 10 LCs – (annual figures – 2019)

- On 8 LCs – 1 accident (4 with passive and four with active).
- On 2 LCs (one with passive and one with active signalisation) – 2 accidents.

The structure of these 10 LCs are: 5 with Active and 5 with Passive signalisation.

The intensity of rail traffic based on the execution of timetable:

- 226 LCs with less than 10 trains/per day.
- 69 LCs with more than 10 trains/per day.

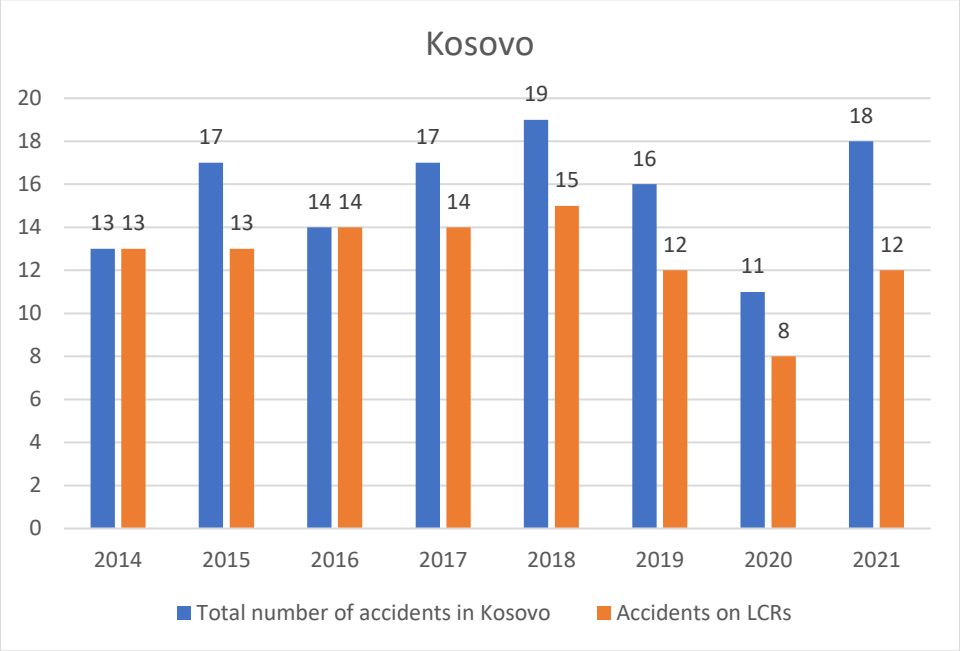

Figure 7. Comparison between the total number of accidents with those on LCs in Kosovo, for the period 2014-2021

The current intensity of rail traffic based on the timetable is:

- 167 LCs with fewer than 10 trains/per day.

- 128 LCs with more than 10 trains/per day.

A forecasted number of trains in the next 10 years:

- 24 LCs with fewer than 15 trains/per day.
- 206 LCs with more than 30 trains/per day (up to the 50).
- 65 LCs with more than 50 trains/per day (up to the 112).

Average Annual Daily Traffic

- For the 242 LCs data are not available.
- On 17 LCs – fewer than 1000 (100 – 1000) vehicles.
- On 28 LCs – between 1,000 – 5,000 vehicles.
- On 9 LCs – between 5,000 – 22,000 vehicles.

There are seven LCs as potential candidates for denivelation with underpass or overpass (proposed by Kosovo). Two of them are situated on the Core/Comprehensive Network. One is already covered by the current project. One LC is proposed for the denivelation with underpass.

Table 10. The list of LCs where underpasses/overpasses are proposed:

No. in Database	Rail line section	KM position on network (km x+xxx)
28	Mitrovicë-Vushtrri	214+778.40
60	F.Kosovë -Miradi	249+522.28
128	Drenas-Baicë	23+175
181	Siperant - Pejë	79+000
184	Siperant - Pejë	80+842
276	Bardh-Medvec	5+540
285	Miradi-Badovc	3+650

A detailed description of candidates for underpasses and overpasses is presented in Chapters 5 of the present report as well as in the Annex 2.

North Macedonia

There are 305 LCs on the Macedonian rail network. 250 with valid permits and 29 without, while for 26 data is not available because of the temporarily closed line Bakarno Gumno – Sopotnica.

253 LCs are suited on the Core/Comprehensive Network, while 70 is out. Also, 267 LCs are on operational lines, 56 are situated on temporarily closed lines.

Of 250 with valid permits, 95 LCs have active signalling and 155 passive. Active signalling is presented on:

- 2 LCs with manual barriers (1990 and 2008).
- 61 LCs with light-sound system (installed in 2006).
- 33 LCs with automatic barriers (installed between 2006 and 2019).

As North Macedonia started construction works on Corridor VIII, and a detailed design has been finished for the bigger part of Corridor VIII, all LCs which are recognised as integral part of these projects, will be excluded from the list of priority LCs for the upgrade in North Macedonia.

The eastern part of Corridor VIII is in the final phase of tender evaluation and completion of the construction works is predicted by 2026, so all LCs on this distance are recognised through the preparatory work on the project.

A similar case is in the rest of Corridor VIII in North Macedonia, a detailed design is ready for the current missing link Kicevo – Lin and rehabilitation of the line between Skopje and Kicevo.

Regarding safety on LCs in North Macedonia, the following tables show the statistics in the past years.

Table 11. The structure of rail/road traffic accidents on LCs in North Macedonia, 2014-2021

Year	No. of traffic accidents on LCs	No. of fatalities	No. of severely injured	Traffic interruption (hour)	Damage to property (€)
2014	19	0	40	50	**12.375**
2015	6	1	4	27,5	**14.961**
2016	14	5	4	35,5	**49.070**
2017	6	0	2	8,5	**0**
2018	11	3	2	2	**11.100**
2019	10	0	4	13,5	**11.065**
2020	13	1	11	0	**0**
2021	6	0	5	0	**0**
Total	**85**	**9**	**72**	**137**	**98.571**

Table 12. Total number of accidents/incidents in North Macedonia for the period 2014-2021

	2014	2015	2016	2017	2018.	2019	2020	2021	Total
Total number of accidents in MKD	90	115	88	96	97	81	63	45	**675**
Accidents on LCs	**19**	**6**	**14**	**6**	**11**	**10**	**13**	**6**	**85**

In North Macedonia, there were 486 accidents in the last 5 years, 56 of which happened on LCs, i.e. about 11.5 %.

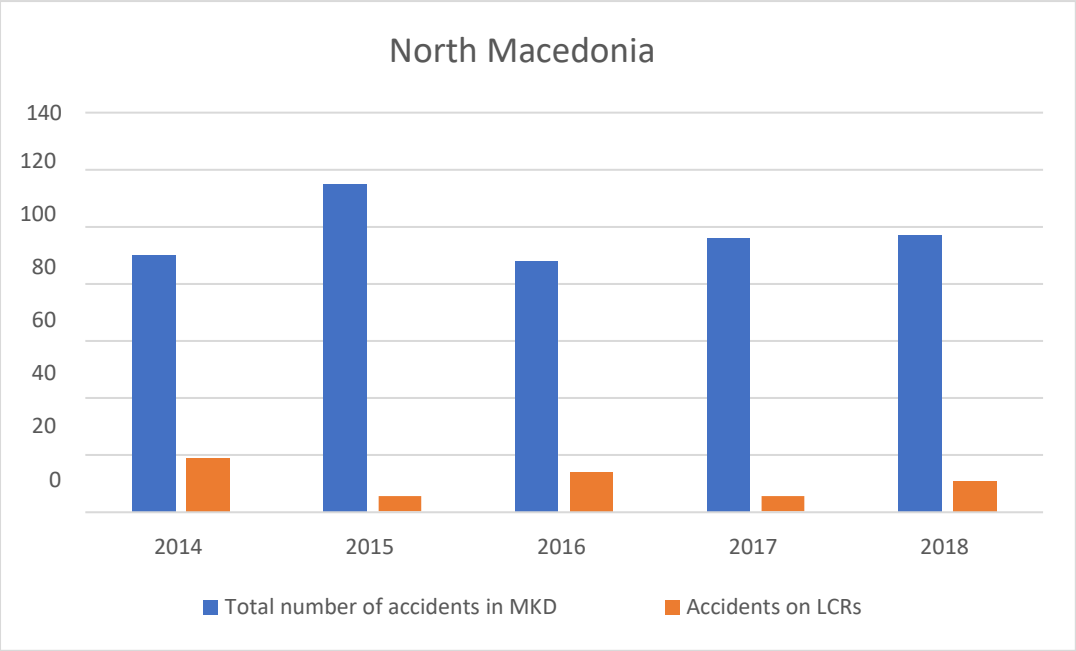

Figure 8. Comparison between the total number of accidents with those happening on LCs in the entire WB region, for the period 2014-2018.

The latest data from 2019 say that accidents happened on 22 LCs

- On 18 LCs – 1 accident happened (9 with passive and 9 with active signalisation).
- On 3 LCs (all with active signalisation) – 2 accidents.
- On the 1 LC with passive signalisation – 3 accidents.

Regarding the volume of rail traffic based on the timetable:

- 201 LCs with fewer than 10 trains/per day.
- 5 LCs with 10-35 trains/per day.
- 59 LCs with 70-82 trains per day.
- 58 LCs are not in operation or situated on the closed lines.

Forecast of the trains in the next 10 years is almost at the same level as the number of trains in the current timetable. However, this is a significant increase of the number compared to the current execution of operation.

One of the very relevant parameters for evaluation is road traffic over the LCs. Average annual daily traffic is presented here for 223 level crossings (data are not available for 100 LCs)

- On 134 LCs – number of road vehicles is fewer than 100.
- On 47 LCs – between 100 – 1,000 vehicles.
- On 31 LCs – between 1,000 – 5,000 vehicles.
- On the 11 LCs – between 5,000 – 20,000 vehicles.

Taking into account the position of level crossings, there are several candidates for denivelation. Details are explained in Chapters 3 and 5 of the present report as well in the Annex III.

Montenegro

Montenegro is the only regional partner which has a higher percentage of active signalling on level crossings than passive. In total, there are 23 LCs – all with permits.

19 LCs have active and 4 passive protection. 10 LCs are situated on the Core/Comprehensive Network, while 13 LCs are out of the Core/Comprehensive Network. All 23 LCs are on operational lines.

The intensity of rail traffic based on the timetable is presented here:

- 13 LCs with 27 trains/per day.
- 9 LCs with 64 trains/per day.
- 1 LC with 82 trains per day.

The number of trains by execution of the timetable is presented as:

- 10 LCs with more than 10 trains/per day – all on the line Bar-Podgorica-Bijelo Polje.
- 13 LCs with fewer than 10 trains/per day (7 trains actually) – all on the line Podgovrica-Niksic.

Currently, there is no data regarding the level crossings involved in the infrastructure projects as well as the data on the intensity of road traffic.

Regarding safety figures, MNE has relatively good parameters as presented in the table:

Table 13. The structure of rail/road traffic accidents on LCs in Montenegro, 2009-2021

Year	No. of LC accidents	No. of fatalities	No. of severely injured	Traffic interruption (hours)	Damage to property (€)
2009	3	0	2	6,5	**3.323,44**
2010	8	2	1	13,5	**84.943,44**
2011	0	0	0	0	**0,00 €**
2012	2	0	1	14	**466.669,10**
2013	6	0	2	18	**10.145,00**
2014	4	1	1	6	**202.150,00**
2015	3	0	0	5	**1.500,00**
2016	5	1	1	12	**24.209,00**
2017	5	1	1	9	**56.425,85**
2018	4	0	0	4,5	**5.500,00**

2019	0	0	0	0	**0**
2020	2	0	0	1,5	**1.020,00**
2021	5	5	9	90	**36.467,95**
Total	**47**	**10**	**18**	**180**	**897.980,91**

Of the total number of LC accidents (41) in the monitored period, 37 occurred due to disrespect of road traffic signalisation, while railway workers (drivers and TMD drivers) were responsible for 4 emergency crossings.

Table 14. Total number of accidents and incidents in Montenegro for the period 2014-2021

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Total number of accidents and incidents in MNE	40	31	43	43	47	60	37	67	**368**
Number of accidents on LCs	**4**	**3**	**5**	**5**	**4**	**0**	**2**	**5**	**28**

In Montenegro, there were 368 accidents/incidents in the last 7 years, with 28 accidents happening on LCs, i.e. about 9 %.

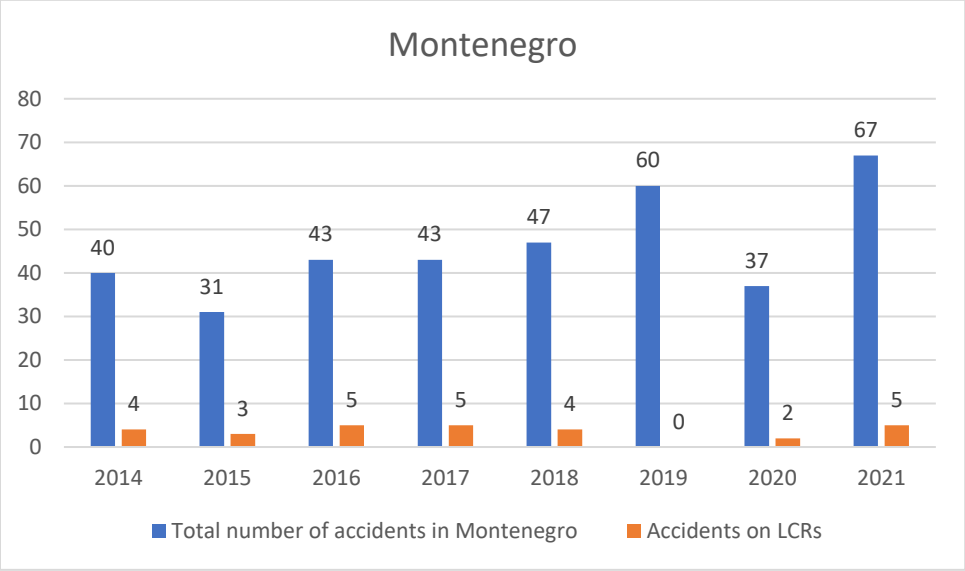

Figure 9. Comparison between the total number of accidents and those happening on LCs in Montenegro in the period 2014-2021

Looking at the figures below, it seems as a conclusion that Montenegro is a regional partner with the smallest percentage of accidents on level crossings compared to the total number of accidents on the railway network. Details about LCs in the Montenegro are part of the Annex I of this Report.

Serbia

Serbia has the highest number of level crossings in the region, which is not a surprise, bearing in mind that almost half of the rail tent-t Core Network is in Serbia. The total number is 2,118, all with proper permits. 1,648 are situated on the lines in operation, while 470 are on temporarily closed lines. 917 LCs are located on the Core/Comprehensive, while 1,549 are outside of it.

397 LCs have active level of protection:

- 104 with manual barrier and average age 50 years.
- 25 with light-sound system (installed between 1960 and 2003).
- 256 with automatic barriers (installed between 1969 and 2019).

Furthermore, 254 LCs are part of the current projects, so they should be excluded from the priorities in this exercise. Serbia signed an agreement with the World Bank for the upgrade of 150 LCs as well as an agreement with the EBRD for 35 LCs.

All of them are located on the Core/Comprehensive Network. However, Serbia has a very ambition plan for the renewal of infrastructure, so next projects will be implemented in the coming period and all level crossings located within these sections will be upgraded/removed. The projects are as follows:

- Modernization of the Nis-Dimitrovgrad with a bypass around Nis.
- Modernisation of the Subotica – Horgos.
- Modernisation of the Belgrade – Sid.
- Modernisation of the Belgrade – Tabanovce.

All projects are part of the national single project pipeline and should be finished by 2030.

There are safety figures in the tables below. The first impression is that the percentage of accidents at the level crossings as part of the total number of rail accidents is around 10% being the smallest percentage within the region together with North Macedonia.

Table 15. The consequences of rail/road traffic accidents on LCs in Serbia, 2014-2021

Year	No. of traffic accidents	No. of fatalities	No. of severely injured	Traffic interruption (hours)	Damage to property (€)
2014	53	9	8	52	**40.000**
2015	49	2	8	67	**50.000**
2016	55	8	13	62	**100.000**
2017	57	4	20	95	**250.000**
2018	55	13	19	115	**300.000**

2019	43	2	16	94	**1.089.167***
2020	45	6	20	92	**2.310.825***
2021	**53**	**3**	**27**	**140**	**1.845.144***

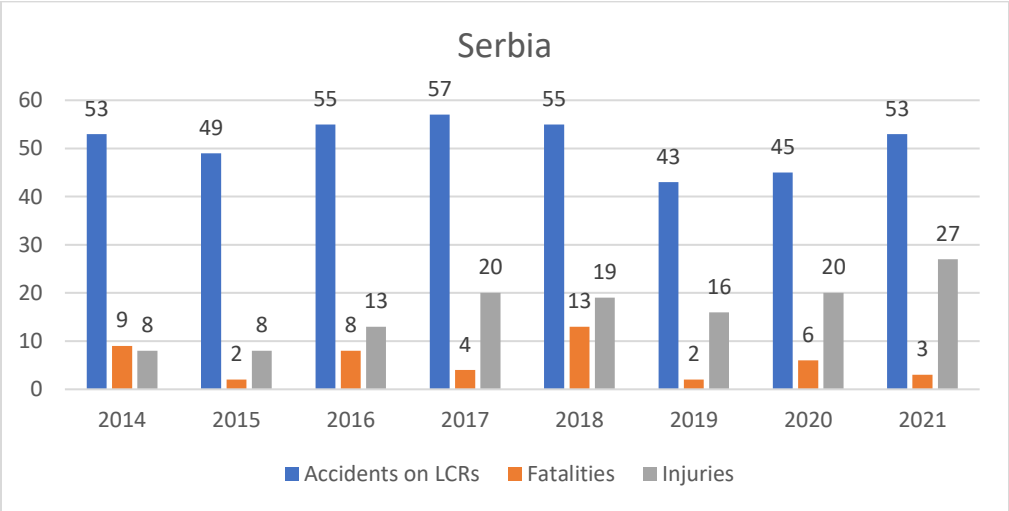

Figure 10. Number of fatalities and injuries in accidents happened on the LCs in Serbia

Table 16. Total number of accidents and incidents in Serbia for the period 2014-2021

	2014	2015	2016	2017	2018.	2019	2020	2021	Total
Total number of accidents in Serbia	564	602	439	598	548	595	401	518	**4265**
Number of accidents on LCs	**53**	**49**	**55**	**57**	**55**	**43**	**45**	**53**	**410**

In Serbia, there were 4,265 accidents/incidents in the period 2014-2021, 410 of which occurred on LCs, making it about 10 %.

* Calculation was done in accordance with Article 7. of Rulebook on common indicators of railway safety („Official Gazette of the Republic of Serbia“, No. 25/19)

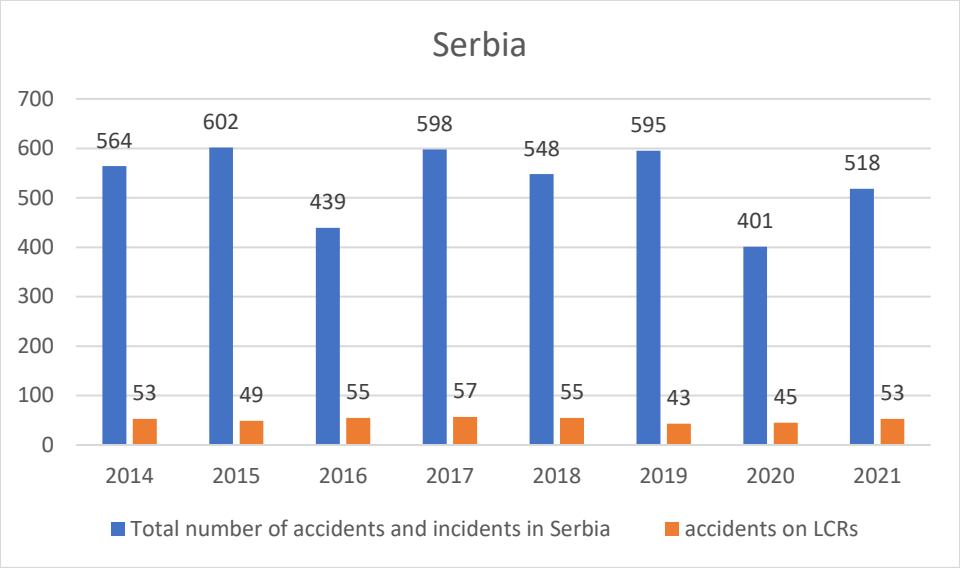

Figure 11. Comparison between the total number of accidents and those happening on LCs in Serbia for the period 2014-2021

The latest figures about safety on level crossings in Serbia show that 44 accidents happened on 40 LCs in 2019:

- On 37 LCs – 1 accident.
- On 2 LCs (both with passive signalisation) – 2 accidents.
- On 1 LC (with passive signalisation) – 3 accidents.

The structure of these 40 LCs are: 11 with active and 29 with passive level of protection.

3. Methodology for the prioritisation

The proposed prioritisation method follows the step-by-step process described below:

- Step 0 – Calculation of indexes used in the classification process
  - Calculation of a combined traffic index, as the multiplication between the railway traffic and road traffic at each crossing.
  - Calculation of a safety index, as the multiplication between the number of accidents and the severity of those accidents.
  - Ranking of the type of LC protection from 1 – automatic/manual full closure to 4 – no protection.
  - Ranking of combined traffic index from 1 – values less than 5000 to 6 – values between 40000 and 100000.
  - Calculation of a combined safety performance index, as the multiplication between the ranking of the combined traffic, the safety index and the ranking of the protection. The high results of this index show a poor safety performance of the LC.
- Step 1 – Sorting the level crossings list by a hierarchical descending classification based on the combined traffic index. The resulting short list 1 will consist in the level crossing with a high potential safety risk.
- Step 2 – Sorting the level crossings list by descending classification based on the safety index. The resulting short list 2 will consist in the level crossing with a high existing safety risk.
- Step 3 – Sorting the level crossings list by descending classification based on combined safety performance index. The resulting short list 3 will consist in the level crossings with a poor safety performance. This list is a comprehensive one, identifying both the level crossings with potential safety risk, along with the ones having existing considerable safety risks.
- Step 4 – Based on the short list 3, a classification of the level crossings is realized on various levels:
  - First level of prioritisation – the level crossings that are identified as common to all three sorting steps, by intersecting all 3 resulting lists, showing that the existing and potential safety risks are high regardless of the sorting method
  - 2nd level of prioritisation - the level crossings that are identified as common to the intersection of the Step 2 and Step 3, showing the level crossings that will maintain their exiting safety risks in the overall safety performance evaluation
  - 3rd level of prioritisation - the level crossings that are identified as common as common to the intersection of the Step 1 and Step 3, showing the level crossings that will maintain their potential safety risks in the overall safety performance evaluation
  - 4th level of prioritisation - the level crossings remaining after applying step 3 within the short list 3.

All LCs already planned within a rail project are excluded from this exercise because they are or will be part of upgrade during the project implementation phase.

All LCs which are already identified as subject of any project are excluded as well (for instance upgrade of LCs with local municipalities).

Intention was to use methodology mentioned above in full capacity. However, due to the lack of data for road traffic as well as partly lack of data for rail traffic, using this methodology in full capacity was limited. It can be applied on some regional partners (Kosovo, North Macedonia, Montenegro and partly in Serbia) but not for the rest of the Regional Partners.

In that case, we took in account inputs from the regional partner i.e. Infrastructure Managers from the region in aim to indicatively filed gaps in data collection.

Serbia is in process of establishing road priority corridors for the emergency aid in case of accidents just on highways in this phase. In the later phase they are planning extension to all regional and local road network. However, they faced with level crossings as a challenge in definition fastest route from the concrete section on highway to the nearest hospital. This is not criteria but important thing what should be considered for the prioritisation in the next period.

4. Denivelation or an equipment upgrade as a potential solution

This chapter will explain possibilities for an upgrade based on the assessment made by the regional partners. Bearing in mind that denivelation is more expensive and usually significantly more complex (particularly within inhabited areas) than an upgrade or termination of level crossings, an assessment about the possibility to apply the forestated must be supported by a detailed analysis.

However, data collection process was not fully completed in all the regional partners and only a few candidates for the denivelation in Kosovo, Montenegro and North Macedonia will be presented.

One of the criteria used here for the denivelation is location in urban areas. The LCs situated in urban areas are the main obstacle for road traffic and always pose as a potential source of danger. Drivers' behaviour is main reason but regular stopping time in front of barriers tend to be very long and participants in road city traffic are losing time in long queues.

Albania

As almost the whole railway network in Albania is covered with ongoing projects which included upgrade of level crossings, potential candidates will be presented just for the distance Fier – Vlore. This distance is under concession and the concessionary company is ALBRAIL which is, at the same time, both the infrastructure manager and the railway undertaking. Three level crossings as are candidates for the upgrade:

1. The Frakulla level crossing

Location: km 93+150, Municipality of Fier, Administrative Unit Levan
Traffic intensity during the day: 2,710 vehicles and during the night: 1,843 vehicles
In total for 24 hours: 4,553 vehicles
LC Frakulla is situated on the local road and equipped with manual barriers. Based on the information from ALBRAIL there were no significant accidents and incidents in the past.

2. The Mifol level crossing

Location: km 101+675, Municipality of Vlore, Administrative Unit Novosele
Traffic intensity during the day: 760 vehicles and during the night: 480 vehicles
In total for 24 hours: 1,240 vehicles.
LC Mifol is situated on the local road and equipped with manual barriers. Based on the information by ALBRAIL there were no significant accidents and incidents in the past.

3. The Narta level crossing

Location: km 114+975, Municipality of Vlore, Administrative Unit Narte
Traffic Data
During the day: 771 vehicles
During the night: 410 vehicles
Total 24 hours: 1,184 vehicles

The presented traffic data does not include the number of motorbike/motorcycles.

The current number of trains is between 60-70 per month. It means 2,2 trains per day. It is very hard to estimate traffic in the future, but ALBRAIL estimates that 5 trains/per day is a reachable goal in the next ten years.

Montenegro

Taking into account that MNE has 23 LCs in total, it was possible to make a detail overview and analysis for each of them. It was done with the great support of the "Zeljeznicka Infrastructura" Crne Gore.

A summary of the whole assessment is presented in the table below.

Table 17. Potential LCs as a candidate for denivelation.

Rail distance NIKŠIĆ PODGORICA				
	Location of LCs	overpass	underpass	note
1	MUŠOVINA	Not applicable	Not applicable	
2	KLIČEVO	Applicable	Applicable	Advantage for underpass
3	SLAP	Not applicable	Applicable	
4	SEKULIĆI	Applicable	Applicable	Advantage for underpass
5	KOPITO PETROVIĆA	Not applicable	Applicable	
6	KRUŠČICE	Not applicable	Not applicable	Reason: parallel roads
7	MARTINIĆI	Not applicable	Applicable	
8	PRENTINA GLAVICA	Not applicable	Applicable	
9	BURUM	Applicable	Applicable	
10	ŠUNJINE	Not applicable	Not applicable	
11	PRIČELJE	Not applicable	Applicable	
12	DUKLJA	Not applicable	Applicable	
13	ZAGORIČ 2 (GROBLJE)	Not applicable	Not applicable	Reason: parallel roads

Rail distance PODGORICA BAR				
	Location of LCs	overpass	underpass	note
1	ZAGORIČ	Applicable	Applicable	But very complex area with more connecting roads. LCs is over two lines: Podgorica-Niksic and Podgorica-Vrbnica
2	CIJEVNA	Applicable	Applicable	
3	MAHALA	Not applicable	Applicable	
4	VUKOVCI	Not applicable	Not applicable	Reason: not enough space
5	MORAČA	Not applicable	Applicable	It is used just for the private company

6	BISTRICA	Applicable	Applicable	It has to be installed under the angle regarding the rail and magistral road.
7	VIRPAZAR	Not applicable	Not applicable	Perhaps a different road solution for accessing Virpazar should be assessed
8	ZUKOTRLICA	Not applicable	Not applicable	
9	ŠUŠANJ	Not applicable	Not applicable	

A comprehensive analyses involves data collection, visits to the LCs, an exchange of data and opinion between rail experts from "ZICG", JASPERS and TCPS.

To support this project, General Manager of the Infrastructure company in Montenegro established an internal working group for the assessment of possibilities for denivelation or termination of level crossings.

They visited all level crossings in Montenegro and the main findings are given in the table above.

Particularly details about assessment are divided on two rail lines: Podgorica-Niksic and Vrbnica Bar and presented in Annex I of this report

Kosovo

Bearing in mind that Kosovo has the highest percentage of accidents and incidents on level crossings among all regional partners, special attention was paid by the General Manager of Infrakos, Deputy General Manager and their team. They did some analyses regarding the possibility for denivelation.

There are seven LCs as potential candidates for denivelation with an underpass or an overpass. Two of them are situated on the Core/Comprehensive Network. One is already covered by the current project. One LC is proposed for denivelation with an underpass.

Table 18. The list of LCs where underpasses/overpasses are proposed:

Rail line section	KM position on network	Preferable option
Mitrovicë-Vushtrri	214+778.40	Underpass/overpass
F. Kosovë -Miradi	249+522.28	Overpass
Drenas-Baicë	23+175	Overpass
Siperant - Pejë	79+000	Underpass/overpass
Siperant - Pejë	80+842	Underpass/overpass
Bardh-Medvec	5+540	Underpass/overpass
Miradi-Badovc	3+650	Underpass/overpass

Detail description of the candidates for underpasses and overpasses is in Annex II of this report.

North Macedonia

This document presents described proposals for the rehabilitation and upgrade of 35 new Level Crossings which need to be rehabilitated because of safety reasons. The all-proposed LCs need new equipment (automatic half-barriers and new signalisation along with railway security equipment) or denivelation in case of high road traffic density.
All 35 LCs are divided into three groups:

- LCs secured with automatic half-barriers and road, light and sound signalisation.
- LCs secured with road, light and sound signalisation.
- LCs with road signs and manual-controlled barriers.

Level Crossings secured with automatic half-barriers and road, light and sound signalisation:

Rail line section	KM position on network	**Preferable option**
Tabanovci – Kumanovo	405+975	Underpass
Tabanovci – Kumanovo	410+814	Upgrade of equipment
Kumanovo – Romanovci	414+130	Upgrade of equipment
Romanovci – Miladinovci	430+545	Upgrade of equipment
Ilinden – Madzari	439+855	Upgrade of equipment
Ilinden – Madzari	443+763	Upgrade of equipment
Madzari – Skopje	445+317	Upgrade of equipment
Lisice – Dracevo	456+700	Upgrade of equipment
Lisice – Dracevo	460+943	Upgrade of equipment
Jane Sandanski – Zelenikovo	469+278	Upgrade of equipment

The above LCs are located on Railway Corridor X and are on magistral railway line crossing with high frequent roads. They are secured with SIEMENS equipment which is 44 years old.

Note: LC on km 460+943 is located on a junction formed by two railway tracks, therefore it is considered as a double level crossing.

Rail line section	**KM position on network**	**Preferable option**
N. Karev – Bitola	126+308	Upgrade of equipment
N. Karev – Bitola	126+874	Upgrade of equipment
N. Karev – Bitola	127+095	Upgrade of equipment
N. Karev – Bitola	128+179	Upgrade of equipment
N. Karev – Bitola	128+195	Upgrade of equipment
N. Karev – Bitola	128+534	Upgrade of equipment

The above LCs are located on Railway Corridor X, branch Xd, and are on the railway line crossing with high frequent roads. They are secured with ISKRA – Lorenz equipment, and there are no shield signals.

Note: LCs on km 128+179 and on km 128+195 shall be joined in one LC, because of the very short interspace between them.

Level Crossings secured with road, light and sound signalisation:

Rail line section	KM position on network	Preferable option
Gjorce Petrov – Radusha	001+825	Upgrade of equipment
Gjorce Petrov – Radusha	004+515	Upgrade of equipment
Gjorce Petrov – Radusha	007+590	Upgrade of equipment
Gjorce Petrov – Radusha	012+091	Upgrade of equipment
Gjorce Petrov – Radusha	014+806	Upgrade of equipment
Radusha – Jegunovce	020+590	Upgrade of equipment

The above LCs are located on Railway Corridor VIII and are on a magistral railway line crossing with frequent roads. The majority of LCs on this railway section are out of function because the equipment has been stolen.

Rail line section	KM position on network	Preferable option
Tabanovci – Kumanovo	401+496	Upgrade of equipment
Tabanovci – Kumanovo	409+275	Upgrade of equipment
Kumanovo – Romanovci	417+295	Upgrade of equipment
Kumanovo – Romanovci	418+052	Upgrade of equipment
Kumanovo – Romanovci	419+403	Upgrade of equipment
Romanovci – Miladinovci	423+548	Upgrade of equipment
Romanovci – Miladinovci	427+246	Upgrade of equipment
Miladinovci – Ilinden	431+820	Upgrade of equipment

The above LCs are located on Railway Corridor X and are on a magistral railway line crossing with high-frequent roads. They are secured with SIEMENS equipment which is 44 years old.

Level Crossings with road signs and man-controlled barriers:

Rail line section	KM position on network	Preferable option
Veles – Tosho Arsov	002+386	Upgrade of equipment
Shtip – Vancho Prke	052+048	Upgrade of equipment
Sokolarci – Kochani	084+930	Upgrade of equipment
Sokolarci – Kochani	085+264	Upgrade of equipment
Sokolarci – Kochani	086+206	Upgrade of equipment

The above LCs are located on the railway section Veles – Kochani, and are on a railway line crossing with frequent roads. Currently the LCs are secured with road signs and half-barriers which are man-controlled. The LCs need revitalization and installation of automatic equipment (half-barriers, light and sound signalisation).

There are a lot of level crossings in North Macedonia as potential candidates for denivelation. For the purpose of improving safety in both rail and road, denivelation of level crossings in urban areas by constructing underpasses and/or overpasses will be assessed. In order to obtain a detailed assessment, the General Manager of the "MZI" – infrastructure Manager company, established a team which assessed the needs regarding denivelation, cancellation or equipment upgrade on level crossings. A detailed overview is presented in Annex III to the present report.

5. Preliminary results. A list of priorities per regional partners

The main objective of this project is to identify priorities for upgrading a certain number of level crossings in all the Transport Community members.
Taking into account specific features of all the parties as well as data availability, six priority lists will be presented here - one per regional partner.
A significant constraint was data availability (especially for road traffic), thus, implementation of methodology was not possible in full capacity. In few cases, we were using experiences from experts from the region in terms to make interpolation in calculation.
However, for North Macedonia, Kosovo and Serbia full methodology is applied. Thanks to the colleagues from their side, we completed all necessary data and priority lists have been completed.
In the case of Montenegro and Bosnia and Herzegovina, there is no road traffic data, and as a result, calculation was not possible without this parameter.

Albania

All main railway lines in Albania are covered with ongoing projects. It has already been explained in detail in Chapter 4 of the present report. It is the main reason why this exercise has not proposed anything for Albania in order to avoid overlapping with current projects.

One railway line in Albania is under concession and Albrail is the concessioner for the next 25 years. Taking into account that there will be no construction on this line in near future, we have taken into account their needs for the distance Fier – Vlore as a potential candidate for interventions (equipment upgrade or denivelation)

Table 19. Rank of LCs candidates for upgrade in Albania

Rank	Rail line number	Rail line section	Road section	Road type	Traffic rank	Combined traffic index	Safety index	Rank of protection	Total index
1.	Corridor VIII	Fier - Vlore	Levan	Local	6	22665	1	4	24
2.	Corridor VIII	Fier - Vlore	Vlore	Local	4	6200	1	4	16
3.	Corridor VIII	Fier - Vlore	Vlore	Local	4	5920	1	4	16

Bosnia and Herzegovina – due to insufficient road traffic data, it was not possible to apply the methodology for ranking of level crossings in Bosnia and Herzegovina.

North Macedonia

The following table shows the first 50 level crossings as candidates for upgrade:

Table 20. Rank of LCs candidates for upgrade in North Macedonia

Rank	Proposal Number	Rail line number	Rail line section	Road section	Road type	Combined traffic index	Safety index	Rank of protection	Total index
1	14	01GL01	Ilinden-Madzari	Madzari - Trubarevo	local	1036000	3.00	2	60.00
2	97	05GL01	Prilep-Bakarno Gumno	Prilep - Krusevo	local	120000	1.43	5	42.86
3	34	03GL01	Veles-Zgropolci	Veles - Gevgelija	regional	280000	1.00	4	32.00
4	39	03GL01	Zgropolci-Gradsko	Gradsko - Nogaevci	local	28000	2.43	3	29.14
5	4	01GL01	Tabanovci-Kumanovo	Kumanovo - Lipkovo	local	398638	1.29	2	20.57
6	15	01GL01	Madzari-Skopje	Madzari - Industrija	local	1148000	1.00	2	20.00
7	33	03GL01	Veles-Zgropolci	Veles - Prilep	regional	1400000	1.00	2	20.00
8	13	01GL01	Ilinden-Madzari	Ilinden - Skopje	local	1036000	1.00	2	20.00
9	5	01GL01	Kumanovo-Romanovci	Kumanovo - Umin Dol	regional	503348	1.00	2	18.00
10	62	05GL01	Veles-Topolka	Veles - Orizari	regional	19200	1.14	5	17.14
11	16	02GL01	Lisice-Dracevo	Lisice - Hemteks	local	229600	1.00	2	16.00
12	18	02GL01	Lisice-Dracevo	Dracevo - Jurumleri	regional	328000	1.00	2	16.00
13	7	01GL01	Kumanovo-Romanovci	s. Prevoj	local	59200	1.00	3	15.00
14	189	09GL01	Stip-Vanco Prke	Stip - Kocani	regional	16400	1.00	5	15.00
15	295	04GL01	Volkovo-Gjorce Petrov	s. Volkovo - Volkovo	local	15000	1.00	5	15.00
16	59	05GL01	Veles-Topolka	Veles - field road	regional	10200	1.00	5	15.00
17	205	09GL01	Sokolarci-Kocani	Gorni Podlog - field road	local	3000	1.43	5	14.29

Rank	Proposal Number	Rail line number	Rail line section	Road section	Road type	Combined traffic index	Safety index	Rank of protection	Total index
18	213	07GL01	Gjorce Petrov-Radusa	Saraj - Radusa	local	14000	1.57	3	14.14
19	10	01GL01	Romanovci-Miladinovci	Deljadrovci - field road	local	39960	1.00	3	12.00
20	61	05GL01	Veles-Topolka	Veles - Prilep	regional	30000	1.00	3	12.00
21	252	07GL01	Tetovo-Gostivar	Tetovo - Faliste	local	10000	1.00	4	12.00
22	50	03GL01	Klisura-Miravci	Veles - Gevgelija	local	35000	1.00	3	12.00
23	60	05GL01	Veles-Topolka	Veles - field road	regional	27000	1.00	3	12.00
24	63	05GL01	Topolka-Caska	Veles - Prilep	regional	9000	1.14	5	11.43
25	26	02GL01	J.Sandanski-Zelenikovo	Zelenikovo Street	local	54600	1.00	2	10.00
26	32	03GL01	Veles-Zgropolci	Veles - street	regional	70000	1.00	2	10.00
27	41	03GL01	Gradsko-Kukuricani	Stobi - field road	local	2100	1.00	5	10.00
28	82	05GL01	Gostirazni-Brailovo	Slepce - Crniliste	local	1080	1.00	5	10.00
29	87	05GL01	Gostirazni-Brailovo	Brailovo - Dolneni	local	3000	1.00	5	10.00
30	91	05GL01	Brailovo-Prilep	Senokos - Mazuciste	local	2400	1.00	5	10.00
31	102	05GL01	Prilep-Bakarno Gumno	Galicani - Obrsani	regional	4000	1.00	5	10.00
32	110	05GL01	Bakarno Gumno-N.Karev	Trojkrsti - Topolcani	local	3200	1.00	5	10.00
33	126	05GL01	N.Karev-Bitola	Bitola - Novaci	local	72000	1.00	2	10.00
34	168	09GL01	Veles-Toso Arsov	Veles - Skopje	regional	2800	1.00	5	10.00
35	182	09GL01	Toso Arsov-Ovce Pole	Veles - Sveti Nikole	regional	1600	1.00	5	10.00
36	196	09GL01	Vanco Prke-Sokolarci	Stip - Probistip	magistral	3000	1.00	5	10.00
37	202	09GL01	Sokolarci-Kocani	Oblesevo - field road	local	3600	1.00	5	10.00

Rank	Proposal Number	Rail line number	Rail line section	Road section	Road type	Combined traffic index	Safety index	Rank of protection	Total index
38	207	09GL01	Sokolarci-Kocani	Kocani - field road	local	1200	1.00	5	10.00
39	208	09GL01	Sokolarci-Kocani	Kocani - field road	local	5400	1.00	5	10.00
40	209	09GL01	Sokolarci-Kocani	Kocani - field road	local	1200	1.00	5	10.00
41	227	07GL01	Radusa-Jegunovce	Radusa - field road	local	1000	1.00	5	10.00
42	240	07GL01	Jegunovce-Tetovo	Ozance - Slatino	local	4000	1.00	5	10.00
43	245	07GL01	Jegunovce-Tetovo	Trebos - Neprosteno	local	2000	1.00	5	10.00
44	289	07GL01	Kicevo	Kicevo street	local	9200	1.00	5	10.00

Serbia

Due to the ongoing infrastructure projects in Serbia, a certain number of LCs are excluded because they are part of investments projects. Also, due to the lack of road traffic data this list covered just level crossings situated on the state level.

Rank	Proposal Number	Rail line number	Rail line section	Road section	Road type	Combined traffic index	Rank traffic	Safety index	Rank of protection	Total index
1	71002	211	Štitar-Bođanovci			0	1	3.3	5	98.57
2	70002	101	Sremska Mitrovica	1200501	State	315937	8	1	5	40.00
3	70003	101	Sremska Mitrovica	12701	State	253213	8	1	5	40.00
4	70004	101	Sremska Mitrovica	12009	State	258123	8	1	5	40.00
5	70005	101	Sremska Mitrovica	12007	State	337520	8	1	5	40.00
6	70312	105	Rasputnica Sajlovo-Kisač	01009o3		316216	8	1	5	40.00
7	71337	219	Minićevo-Vratarnica	10208	State	67683	5	1	5	40.00
8	70239	102	Preševo	04202o1	State	164920	7	1	5	35.00
9	70695	125	Niš Ranžirna	31904	State	171000	7	1	5	35.00
10	70834	205	Padej-Čoka	02110	State	171608	7	1	5	35.00
11	70836	205	Čoka	02702	State	177344	7	1	5	35.00
12	70839	205	Čoka-Orom	02311	State	55589	5	1	5	35.00
13	70841	205	Čoka-Orom	01403	State	89933	6	1	5	35.00
14	71339	219	Vratarnica-Grljan	10206	State	37367	4	1	5	35.00
15	71345	219	Grljan-Zaječar	16006	State	36672	4	1	5	35.00
16	71364	219	Trnavac-Tabakovac			0	1	1	5	35.00
17	71029	211	Lešnica-Loznica			0	1	1.57	5	31.43
18	70054	102	Klenje-Ripanj Tunel	34601	State	100500	6	1	5	30.00
19	70079	102	Velika Plana	15603	State	100500	6	1	5	30.00
20	70335	105	Vrbas-Lovćenac	11601	State	120501	6	1	5	30.00
21	70336	105	Vrbas-Lovćenac	01515	State	97614	6	1	5	30.00
22	70825	205	Padej	11101	State	86694	6	1	5	30.00
23	70837	205	Čoka-Orom	02619	State	90383	6	1	5	30.00
24	70838	205	Čoka-Orom	02619	State	90383	6	1	5	30.00
25	70842	205	Čoka-Orom	15801	State	59592	5	1	5	30.00
26	70889	207	Gajdobra-Ratkovo			0	1	1	5	30.00
27	71171	218	Požarevac-Bratinac			0	1	1	5	30.00
28	71338	219	Vratarnica-Grljan	01512	State	39632	4	1	5	30.00
29	71363	219	Trnavac-Tabakovac	02813	State	28101	4	1	5	30.00
30	70796	202	Novi Bečej	01505	State	131960	7	1	4	28.00
31	70826	205	Padej	11001	State	51395	5	1	5	25.00
32	70827	205	Padej	01207	State	69996	5	1	5	25.00

Rank	Proposal Number	Rail line number	Rail line section	Road section	Road type	Combined traffic index	Rank traffic	Safety index	Rank of protection	Total index
33	70831	205	Padej-Čoka	12902	State	51680	5	1	5	25.00
34	70832	205	Padej-Čoka	12902	State	51680	5	1	5	25.00
35	70833	205	Padej-Čoka	13601	State	73378	5	1	5	25.00
36	70840	205	Čoka-Orom	02312o1	State	126365	7	1	5	25.00
37	70843	205	Čoka-Orom	03310	State	26871	4	1	5	25.00
38	70994	211	Rasputnica D.Borina-Štitar			0	1	1	5	25.00
39	71340	219	Grljan	10901	State	20792	3	1	5	25.00
40	71346	219	Grljan-Zaječar	16006	State	36672	4	1	5	25.00
41	71347	219	Grljan-Zaječar	18601	State	31968	4	1	5	25.00
42	71361	219	Trnavac-Tabakovac	01317o1	State	128894	7	1	5	25.00
43	71362	219	Trnavac-Tabakovac	10809	State	61674	5	1	5	25.00
44	71365	219	Tabakovac			0	1	1	5	25.00
45	71724	406	Sremska Rača Nova			0	1	1	5	25.00
46	71842	609	NULL			0	1	1	5	25.00
47	70207	102	Suva Morava-Priboj Vranjski	44103	State	40000	4	1	5	20.00
48	70217	102	Vranje	44201	State	60000	5	1	4	20.00
49	70334	105	Vrbas-Lovćenac	13001	State	41934	4	1	5	20.00
50	70432	107	Ovča-Pančevo Varoš	22103o1	State	32000	4	1	5	20.00
51	70443	107	Pančevo Varoš-Banatsko Novo Selo	22306	State	32000	4	1	5	20.00
52	70448	107	Banatsko Novo Selo-Vladimirovac	22103o4	State	32000	4	1	5	20.00
53	70449	107	Banatsko Novo Selo-Vladimirovac	22103o3	State	32000	4	1	5	20.00
54	70451	107	Banatsko Novo Selo-Vladimirovac	22103o3	State	32000	4	1	5	20.00
55	70491	107	Vršac	31003	State	32000	4	1	5	20.00
56	70823	205	Padej	10808	State	45278	4	1	5	20.00
57	70824	205	Padej	11202	State	30138	4	1	5	20.00
58	70830	205	Padej-Čoka	12901	State	43938	4	1	5	20.00
59	70845	205	Čoka-Orom	03311	State	20774	3	1	5	20.00
60	70848	205	Čoka-Orom	03313	State	25388	4	1	5	20.00
61	70849	205	Čoka-Orom	03313	State	25388	4	1	5	20.00
62	70850	205	Orom	03523	State	46111	4	1	5	20.00
63	70851	205	Orom			0	1	1	5	20.00
64	70942	208	Kać-Šajkaš			0	1	1	5	20.00
65	70963	208	Farkaždin-Orlovat			0	1	1	5	20.00
66	71055	213	Dedina			0	1	1	5	20.00

Rank	Proposal Number	Rail line number	Rail line section	Road section	Road type	Combined traffic index	Rank traffic	Safety index	Rank of protection	Total index
67	71093	213	Vrnjačka Banja-Podunavci			0	1	1	5	20.00
68	71341	219	Grljan	10802	State	24000	3	1	5	20.00
69	71342	219	Grljan-Zaječar	01401	State	127983	7	1	5	20.00
70	71348	219	Grljan-Zaječar	16009	State	27554	4	1	5	20.00
71	71349	219	Zaječar	16009	State	27554	4	1	5	20.00
72	71350	219	Zaječar	13301	State	34181	4	1	5	20.00
73	71355	219	Vražogrnac-Trnavac	13403	State	46609	4	1	5	20.00
74	71356	219	Vražogrnac-Trnavac	01702	State	20729	3	1	5	20.00
75	71357	219	Vražogrnac-Trnavac	15813o1	State	49400	4	1	5	20.00
76	71358	219	Vražogrnac-Trnavac	12102	State	57228	5	1	5	20.00
77	71360	219	Trnavac	01905	State	82422	6	1	5	20.00
78	71366	219	Tabakovac			0	1	1	5	20.00
79	70176	102	Leskovac-Đorđevo	03909	State	260000	8	1	2	16.00
80	70434	107	Pančevo Varoš-Banatsko Novo Selo	22103o3	State	32000	4	1	4	16.00
81	70657	110	Aleksa Šantić-Bajmok	01202	State	43700	4	2	2	16.00
82	71352	219	Zaječar-Vražogrnac	01807	State	48570	4	1	4	16.00
83	71353	219	Zaječar-Vražogrnac	01807	State	48570	4	1	4	16.00
84	71354	219	Zaječar-Vražogrnac	01807	State	48570	4	1	4	16.00
85	70664	110	Šebešić	30401	State	19000	3	1	5	15.00
86	70753	202	Kovačica-Uzdin	13001	State	18000	3	1	5	15.00
87	70828	205	Padej-Čoka	01702	State	20729	3	1	5	15.00
88	70835	205	Padej-Čoka	13501	State	17830	3	1	5	15.00
89	70847	205	Čoka-Orom	03312	State	28509	4	1	5	15.00
90	71043	211	Koviljača-Brasina			0	1	1	5	15.00
91	71101	213	Podunavci-Ratina			0	1	1	5	15.00
92	71220	218	Kaona-Brodica	14721	State	12000	3	1	5	15.00
93	71223	218	Kaona-Brodica			0	1	1	5	15.00
94	71300	219	Svrljig-Palilula			0	1	1	5	15.00
95	71314	219	Knjaževac-Minićevo			0	1	1	5	15.00
96	71343	219	Grljan-Zaječar	02736	State	58233	5	1	5	15.00
97	71344	219	Grljan-Zaječar	02736	State	58233	5	1	5	15.00
98	71359	219	Vražogrnac-Trnavac	12102	State	57228	5	1	5	15.00
99	71552	307	Kula			0	1	1	5	15.00
100	71615	308	Zvornik			0	1	1	5	15.00
101	71653	311	Resava-Despotovac			0	1	1	5	15.00
102	71671	404	Stari Popovac			0	1	1	5	15.00
103	70102	102	Paraćin	18402	State	142500	7	1	2	14.00

Rank	Proposal Number	Rail line number	Rail line section	Road section	Road type	Combined traffic index	Rank traffic	Safety index	Rank of protection	Total index
104	71497	303	Novi Sad Ložionica			0	1	1	2	14.00
105	70532	109	Kragujevac	36101	State	24000	3	1.142857	4	13.71
106	70058	102	Sopot Kosmajski-Vlasko Polje	15001	State	100500	6	1	2	12.00
107	70062	102	Vlasko Polje-Mladenovac	15001	State	100500	6	1	2	12.00
108	70075	102	Palanka	15603	State	100500	6	1	2	12.00
109	70227	102	Bujanovac	25813	State	88000	6	1	2	12.00
110	70977	211	Buđanovci-Platičevo			0	1	1	2	12.00
111	71169	218	Požarevac	37701	State	83000	6	1	2	12.00
112	70060	102	Sopot Kosmajski-Vlasko Polje	34901	State	67000	5	1	2	10.00
113	70292	103	Krnjevo-Trnovče	35401	State	58000	5	1	2	10.00
114	70329	105	Zmajevo-Vrbas	10001	State	61364	5	1	2	10.00
115	70511	108	Lajkovac-Slovac	36101	State	69000	5	1	2	10.00
116	71198	218	Rabrovo-Klenje-Zvižd			0	1	1	5	10.00
117	71247	218	Zagrađe			0	1	1	5	10.00
118	71262	219	Matejevac			0	1	1	5	10.00
119	71270	219	Matejevac-Gramada			0	1	1	5	10.00
120	71287	219	Gramada-Svrljig			0	1	1	5	10.00
121	71326	219	Minićevo			0	1	1	5	10.00
122	71411	222	Rasputnica Kastrat	16901	State	6000	2	1	5	10.00
123	71413	223	Žitorađa	16901	State	6000	2	1	5	10.00
124	71414	223	Žitorađa			0	1	1	5	10.00
125	71416	223	Žitorađa			0	1	1	5	10.00
126	71420	223	Žitorađa			0	1	1	5	10.00
127	71424	223	Žitorađa			0	1	1	5	10.00
128	71425	223	Žitorađa-Prokuplje			0	1	1	5	10.00
129	71432	223	Žitorađa-Prokuplje			0	1	1	5	10.00
130	71477	223	Rasputnica Kastrat-Rudare			0	1	1	5	10.00
131	71481	223	Rudare-Kosanička Rača			0	1	1	5	10.00
132	71513	306	Temerin-Gospođinci			0	1	1	5	10.00
133	70668	110	Šebešić	10501	State	5833	2	1	4	8.00
134	71351	219	Zaječar-Vražogrnac	01807	State	48570	4	1	2	8.00
135	70748	202	Debeljača-Kovačica			0	1	1.571429	5	7.86

Rank	Proposal Number	Rail line number	Rail line section	Road section	Road type	Combined traffic index	Rank traffic	Safety index	Rank of protection	Total index
136	71039	211	Loznica-Koviljača			0	1	1.428571	5	7.14
137	70294	103	Krnjevo-Trnovče-Veliko Orašje			0	1	1.285714	5	6.43
138	70350	105	Bačka Topola-Žednik			0	1	1.285714	5	6.43
139	70510	108	Lazarevac-Lajkovac			0	1	2	3	6.00

Kosovo

After applying the methodology referred to in Chapter 3 of this report, the preliminary results for Kosovo are listed below. The implementation of the methodology was limited on level crossings covered with road traffic data. Among the total number of LCs, the table below presents 50 LCs as candidates for upgrade.

Rank	Proposal Number	Rail line number	Rail line section	Road section	Road type	Combined traffic index	Safety index	Rank of protection	Total index
1	266	Route 7	Prishtinë-F.Kosovë	Prishtinë	Local	83440	2.00	5	60.00
2	181	Conventional primary rail line (T-I)	Siperant - Pejë	Pejë	Local	391392	1.14	5	45.71
3	267	Route 7	Prishtinë-F.Kosovë	Prishtinë	Local	944048	1.00	5	45.00
4	276	Industrial rail line	Bardh-Medvec	Sllatinë e M.,Fushë Kosovë	Local	169920	1.29	5	45.00
5	58	Route 10	Kastriot-F.Kosovë	Fushë Kosovë	Local	278544	1.00	5	40.00
6	184	Conventional primary rail line (T-I)	Siperant - Pejë	Pejë	Local	437184	1.00	5	40.00
7	271	Route 7	Prishtinë-F.Kosovë	Fushë Kosovë	Local	380128	1.00	5	40.00
8	29	Route 10	Mitrovicë-Vushtrri	Mitrovicë	Local	190904	1.00	5	35.00
9	264	Route 7	Bardhosh-Prishtinë	Prishtinë	Local	190320	1.00	5	35.00
10	44	Route 10	Vushtrri-Druar	Druar,Vushtri	Local	110040	1.00	5	30.00
11	59	Route 10	Kastriot-F.Kosovë	Fushë Kosovë	Local	76720	1.00	5	30.00
12	64	Route 10	Miradi - Lipjan	Miradi e Epërme,Fushë Kosovë	Local	81456	1.00	5	30.00
13	243	Route 7	Besianë-Dumosh	Podujevë	Regional	105420	1.00	5	30.00
14	265	Route 7	Bardhosh-Prishtinë	Prishtinë	Local	121530	1.00	5	30.00
15	269	Route 7	Prishtinë-F.Kosovë	Fushë Kosovë	Local	120064	1.00	5	30.00
16	285	Industrial rail line	Miradi-Badovc	Llapnasellë-Konjuh,Graçanicë	Main	105840	1.00	5	30.00

Rank	Proposal Number	Rail line number	Rail line section	Road section	Road type	Combined traffic index	Safety index	Rank of protection	Total index
17	60	Route 10	F.Kosovë - Miradi	Fushë Kosovë	Local	142896	1.00	4	28.00
18	52	Route 10	Prelluzh-Kastriot	Plemetin,Obiliq	Local	59192	1.00	5	25.00
19	62	Route 10	Miradi - Lipjan	Miradi e Poshtme,Fushë Kosovë	Local	68640	1.00	5	25.00
20	242	Route 7	Livadhi-Besianë	Podujevë	Local	61650	1.00	5	25.00
21	259	Route 7	Kulinë-Vranesh	Vranidoll,Prishtinë	Local	74160	1.00	5	25.00
22	261	Route 7	Vranesh-Bardhosh	Besi,Prishtinë	Local	55410	1.00	5	25.00
23	39	Route 10	Vushtrri-Druar	Vushtrri-Bukosh,Vushtrri	Regional	266000	1.00	3	24.00
24	113	Conventional primary rail line (T-I)	Bardh - Dritan	Bardh i Madh,Fushë Kosovë	Local	37632	1.00	5	20.00
25	116	Conventional primary rail line (T-I)	Bardh - Dritan	Graboc i P.,Fushë Kosovë	Local	44288	1.00	5	20.00
26	245	Route 7	Besianë-Dumosh	Surkish,Podujevë	Local	33510	1.00	5	20.00
27	247	Route 7	Besianë-Dumosh	Sfeqël,Podujevë	Local	26370	1.00	5	20.00
28	255	Route 7	Penuh-Kulinë	Sallabajë,Podujevë	Local	25920	1.00	5	20.00
29	257	Route 7	Kulinë-Vranesh	Lupç i Poshtëm,Podujevë	Local	42000	1.00	5	20.00
30	262	Route 7	Vranesh-Bardhosh	Trudë,Prishtinë	Local	35280	1.00	5	20.00
31	273	Industrial rail line	Bardh-Medvec	Pomazotin,Fushë Kosovë	Local	30072	1.00	5	20.00
32	30	Route 10	Mitrovicë-Vushtrri	Frashër-Mitrovicë	Regional	90888	1.00	3	18.00
33	128	Conventional primary rail line (T-I)	Drenas-Baicë	Gllogoc-Korroticë e P.,Gllogoc	Regional	287296	1.00	2	16.00
34	57	Route 10	Kastriot-F.Kosovë	Krushevc,Obiliq	Local	21672	1.00	5	15.00

Rank	Proposal Number	Rail line number	Rail line section	Road section	Road type	Combined traffic index	Safety index	Rank of protection	Total index
35	114	Conventional primary rail line (T-I)	Bardh - Dritan	Bardh i Madh,Fushë Kosovë	Local	11424	1.00	5	15.00
36	248	Route 7	Besianë-Dumosh	Gllamnik,Podujevë	Local	20100	1.00	5	15.00
37	250	Route 7	Dumosh-Penuh	Siboci i Epërm,Podujevë	Local	14730	1.00	5	15.00
38	252	Route 7	Dumosh-Penuh	Llugë,Podujevë	Local	20550	1.00	5	15.00
39	260	Route 7	Vranesh-Bardhosh	Vranidoll,Prishtinë	Local	18750	1.00	5	15.00
40	112	Conventional primary rail line (T-I)	F.Kosovë - Bardh	Pomozotin,Fushë Kosovë	Regional	117216	1.00	2	12.00
41	115	Conventional primary rail line (T-I)	Bardh - Dritan	Graboc i P.,Fushë Kosovë	Local	65760	1.14	2	11.43
42	28	Route 10	Mitrovicë-Vushtrri	Mitrovicë	Regional	1230600	1.00	1	10.00
43	272	Industrial rail line	Bardh-Medvec	Pomazotin,Fushë Kosovë	Local	4704	1.00	5	10.00
44	275	Industrial rail line	Bardh-Medvec	Bardh i Vogël,Fushë Kosovë	Local	1416	1.00	5	10.00
45	277	Industrial rail line	Bardh-Medvec	Harilaç,Fushë Kosovë	Local	7368	1.00	5	10.00
46	278	Industrial rail line	Bardh-Medvec	Vrellë - Medvec,Lipjan	Regional	8196	1.00	5	10.00
47	281	Industrial rail line	Bardh-Medvec	Medvec,Lipjan	Local	2352	1.00	5	10.00
48	38	Route 10	Vushtrri-Druar	Vushtrri-Shtitaricë,Vushtrri	Regional	190120	1.00	1	7.00
49	54	Route 10	Kastriot-F.Kosovë	Obiliq	Regional	165928	1.00	1	7.00
50	50	Route 10	Prelluzh-Kastriot	Prelluzhë,Vushtrri	Local	106792	1.00	1	6.00

Montenegro

Following the support and suggestions provided by JASPERS and in agreement with relevant national authorities, the design for de-levelling of 2 level crossings Mahala and Zagoric has been included in the scope of services of the Project Preparation Facility for Transport (PPF), which is a separate ongoing technical assistance financed from the national IPA. The PPF scope for services includes the preparation of the Main Design for the reconstruction of the permanent way of railway sections where these 2 level crossings are located (on railway line Vrbnica-Bar).

After applying the methodology referred to in Chapter 3 of this report, the preliminary results for Montenegro are listed below.

Rank	Proposal Number	Railroad LC	Rail line section	Road section	Road type	Combined traffic index	Safety index	rank of protection	TOTAL index
1	1	PP Zagorič	PG-Bar/NK-PG	PG-BP	Magistralni	549400	1	2	18
2	7	PP Virpazar	PG-Bar	PG-Bar	Magistralni	204800	1	2	16
3	8	PP Žukotrlica	PG-Bar	PG-Bar	Magistralni	153600	1	2	14
4	9	PP Šušanj	PG-Bar	PG-Bar	Magistralni	185600	1	2	14
5	11	PP Zagorič 2	NK-PG	PG-NK	Magistralni	143100	1	2	14
6	22	PP Kličevo	NK-PG	PG-NK	Magistralni	94500	1	2	12
7	2	PP Cijevna	PG-Bar	PG-Bar	Magistralni	61440	1	2	10
8	14	PP Šunjine	NK-PG	PG-NK	Magistralni	11340	1	3	9
9	3	PP Mahala	PG-Bar	PG-Bar	Magistralni	44800	1	2	8
10	4	PP Vukovci	PG-Bar	PG-Bar	Magistralni	42880	1	2	8
11	13	PP Pričelje	NK-PG	PG-NK	Magistralni	25110	1	2	8
12	20	PP Sekulići	NK-PG	PG-NK	Magistralni	35100	1	2	8
13	23	PP Mušovina	NK-PG	PG-NK	Magistralni	26460	1	2	8
14	5	PP Morača	PG-Bar	PG-Bar	Magistralni	12800	1	2	6
15	6	PP Bistrice	PG-Bar	PG-Bar	Magistralni	12800	1	2	6
16	12	PP Duklja	NK-PG	PG-NK	Magistralni	21600	1	2	6
17	15	PP Burum	NK-PG	PG-NK	Magistralni	15120	1	2	6
18	16	PP Prentina glavica	NK-PG	PG-NK	Magistralni	14040	1	2	6
19	17	PP Martinići	NK-PG	PG-NK	Magistralni	21060	1	2	6
20	18	PP Kruščice	NK-PG	PG-NK	Magistralni	22950	1	2	6
21	19	PP Kopito petrovića	NK-PG	PG-NK	Magistralni	21600	1	2	6
22	21	PP Slap	NK-PG	PG-NK	Magistralni	8100	1	3	6
23	10	PP Bjeliši	PG-Bar	PG-Bar	Magistralni	0	1	2	2

Annex I – A detailed overview of LCs in MNE

Podgorica- Niksic

1. LC “MUŠOVINA” km 0+000 (42.772787,18.9426749)

The level crossing “Musovina” is located near the main rail station in Niksic in front of the switch number. It is not a part of the open rail, just shunting operation are performing with low speed. There are half barriers as well as light sound signalling.

Figure 12. Level crossing “Musovina”

The LC is located out of the open rail (Niksic is last station) and signalling is active and work well. There is limited space around the LC because of buildings and houses. Data about the intensity of road traffic are not available. There were no accidents at this level crossing in the last three years.

Taking into account everything mentioned, the LC “Musovina is not a candidate for denivelation.

2. **The level crossing “Klicevo**” is located between the stations of Niksic and Ostrog in km 2+082. It is a part of the open rail and there is significant intensity of road traffic. Unfortunately, exact data are not available but for sure it is the one with the highest number of vehicles. There are half barriers as well as light sound signalling. Here, denivelation is possible but land acquisition could be an issue. In case of denivelation, the preferable option is an underpass because of land issues.

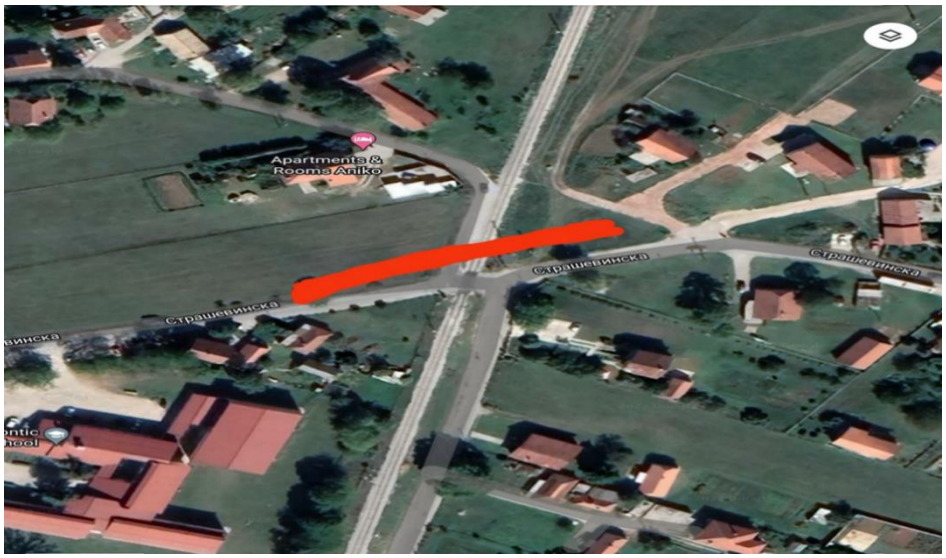

Figure 13. Level crossing "Klicevo"

Figure 14. Level crossing "Klicevo"

3. LC "SLAP" km 26+429 (42.599999,19.096746)

The level crossing "Slap" is located between the stations of Ostrog and Danilovgrad in km position 26+429.

This is a LC with passive protection – sign STOP and Saint Andrew Cross. Looking at the number of trains, accidents and incidents as well as the forecast of rail traffic, this LC could be a candidate for denivelation. In case of a positive decision, an underpass is a preferable option because of the terrain.

Figure 15. Level crossing "SLAP"

4. LC SEKULIĆI km 34+939 (42.558938,19.120105)

This LC is located at the exit point of the Danilovgrad station. There is active protection with half barriers and light sound system signalling. Taking into account a potential problem with water collecting, an overpass is a better option.

Figure 16. Level crossing "Sekulici"

5. LC "KOPITO PETROVIĆA" km 36+589 (42.557308,19.140034)

The LC "Kopito Petrovića" is located between the railway stations of Danilovgrad and Spuž in km position 39+589. It is equipped with active protection with automatic half barriers with sound-light signalling. Here, it is possible to make denivelation by creating an underpass but a potential problem could be groundwater as well as collecting precipitations.

Figure 17. Level crossing "Kopito Petrovica"

6. LC KRUŠICE km 37+596 (42.553470,19.151043)

The LC "Krušice" is located on the distance Danilovgrad-Spuž in km 39+589. Denivelation is not possible at this part of the rail because of the other parallel road. In case of denivelation, access to the road must be resolved.

Figure 18. Level Crossing Krusice

7. LC MARTINIĆI km 39+014 (42.545722,19.164530)

The LC "Martinici" is situated on distance Danilovgrad – Spuz in km position 39+014. Due to the terrain conditions, denivelation is possible by constructing an underpass. In case of an underpass, attention must be paid to the water collection and drainage system.

Figure 19. Level Crossing Martinici

8. LC PRENTINA GLAVICA km 40+257 (42.536742,19.173518)

The LC “Prentina Glavica” is situated on distance Danilovgrad – Spuz in km position 40+257. Due to the terrain conditions, denivelation is possible by constructing an underpass. In case of implementation underpass, attention must be paid to the water collection and drainage system.

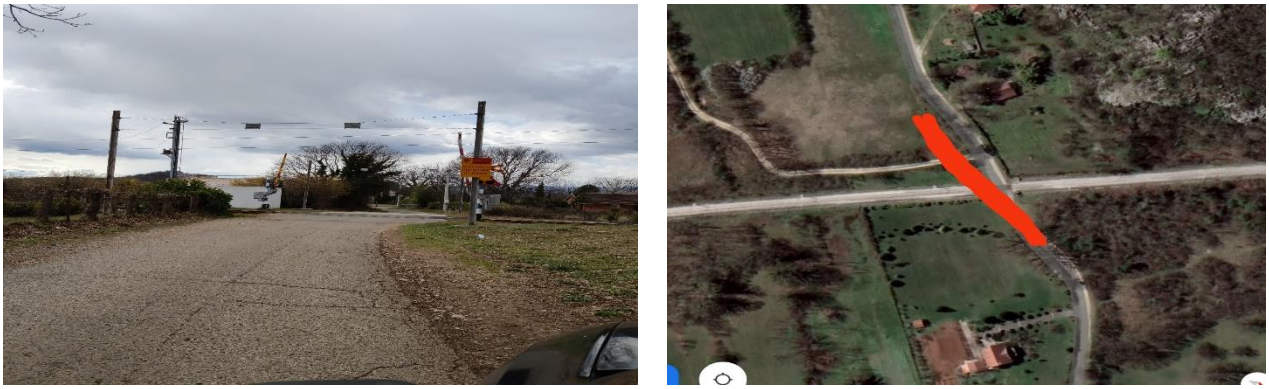

Figure 20. Level Crossing Prentina Glavica

9. LC BURUM km 42+908 (42.518480,19.193780)

The LC Burum is located within the railway station Spuz in km position 42+908. Each technical solution is possible (underpass and overpass) but additional land acquisition is a challenge. Additional issue for an underpass is the water collection and drainage system. Also, bearing in mind that the level crossing should not be in the station area in accordance with rail legislation in MNE, termination of this LC is an option as well. However, an alternative for road traffic should be defined beforehand.

Figure 21. Level Crossing Burum

10. LC ŠUNJINE km 44+716 (42.508592,19.210967)

The Level Crossing “Šunjine” is located between the rail stations of Spuz and Podgorica in km position 44+716. An overpass is possible as a technical solution. However, land acquisition could be an issue, because it would be necessary. Also, an overpass should be located around 100m toward Podgorica compared to the current location of the level crossing.

Figure 22. Level Crossing Šunjine

11. LC PRIČELJE km 45+880 (42.504311,19.223022)

The level crossing “Pričelje” is located between the rail stations of Spuz and Podgorica in km position 45+880. An underpass is a preferable option in this case. It should be dislocated around 30 m before the existing LC because of the embankment at this point (picture 23 marked with a red line).

Figure 23. Level Crossing Pričelje

12. LC DUKLJA km 51+590 (42.466792,19.265782)

The LC “Duklja” is located between the stations of Spuž and Podgorica in km position 51+590. An underpass is a preferable option in this case, because of the embankment at this point.

13. LC ZAGORIČ 2 (Groblje) km 52+689 (42.466792,19.265782)

The LC "Zagorič 2" is situated on the rail distance Spuz – Podgorica in km position 52+689. Bearing in mind the conditions, existing roads and buildings, denivelation would be very difficult. The main obstacle is the street parallel with the rail line and traffic in this street would not be possible in case of denivelation.

Figure 24. Level Crossing Zagorič 2

14. LC "ZAGORIČ" km 53+623 (42.455459,19.283660)

The level crossing "Zagorič" is located just in front of the station Podgorica in km position 52+689. It is a crossing between two single track rail lines with a local road. Denivelation is possible with an underpass or an overpass. Land acquisition is needed from Park Sume with some potential challenges regarding justifying with other local roads.

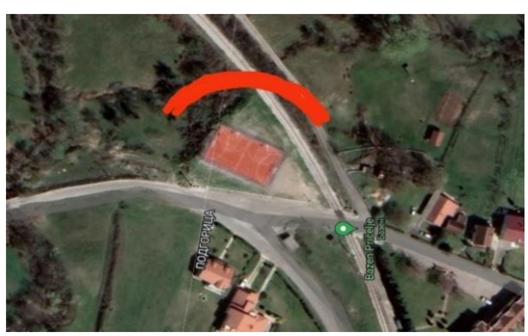

Figure 25. Level Crossing Zagorič

15. LC CIJEVNA in km 411+660 (42.377199,19.240139)

The Level Crossing “Cijevna” is located between the rail stations of Podgorica and Golubovci in km position 411+660. Here, denivelation is possible with both an underpass or an overpass).


Figure 26. Level Crossing Cijevna

16. LC MAHALA km 414+241 (42.355812,19.228182)

The Level Crossing “Mahala” is located between the rail stations of Podgorica and Golubovci in km position 414+241. Denivelation is possible by an underpass.


Figure 27. Level Crossing Mahala

17. LC VUKOVCI km 417+193 (42.332968,19.209899)

The LC Vukovci is located in the area of the rail station Golubovci in km 417+193. In accordance with very complex local road conditions, denivelation is not an option because of very high project costs.

Figure 28. Level Crossing Vukovci

18. LC MORAČA km 419+105 (42.315937,19.206771)

The Level Crossing “Morača” is located on the distance between stations Golubovci and Zeta in km position 419+105. An underpass is a preferable option here, however, special attention should be paid to groundwater. This LC is particular because it is used not by citizens but only trucks and employees of one private company.

Figure 29. Level Crossing Morača

19. LC BISTRICA km 422+692 (42.305944,19.174002)

The Level Crossing Bistrica is located on the distance between stations Golubovci and Zeta in km position 422+692. Denivelation is possible but the object must be alligned with the current magistral road. Groundwater could be a potential problem.

Figure 30. Level Crossing Bistrica

20. LC VIRPAZAR km 433+136 (42.274081,19.089782)

The level crossing “Virpazar” is located within the railway station “Virpazar” in km position 433+136. Due to the lack of space and other conditions in the neighbourhood, denivelation is not possible at this point. However, it could be done within 100m from the current position.

Figure 31. Level crossing Virpazar

21. LC ŽUTOKRLICA km 450 839 (42.114430,19.087473)

The LC "Žutokrlica" is located between the stations Sutomore and Bar in km position 450+839. Denivelation is not possible due to the conditions in the area.

Figure 32. Level Crossing Žutokrlica

22. LC "ŠUŠANJ" km 452+039 (42.110550,19.099893)

The LC "Šušanj" is situated on the rail distance Sutomore–Bar in km position 452+039. Denivelation is not because of the conditions in the area.

Figure 33. Level Crossing Šušanj

Annex II – A detailed overview of LCs in Kosovo

1. LC Mitrovica in km position 214+778.40

The LC is located on the Core Network – Route 10 between Mitrovica and Vucitrn.

There are several reasons why the presented level crossing should be in two levels:

- The LC is located within the entrance signal;
- The road intersects with two rail tracks, and one of these tracks is an industrial track;
- The intersection road category is regional with four lanes and connects two parts of the city.
- Many business premises are located in the area;
- The LC is highly frequented by vehicles, pedestrians and cyclists (~21975 vehicles per day);
- The LC is located in railway Route 10 (Leshak –Hani i Elezit);
- Shunting in the railway station is performed in this LC, since on the other side of the railway station there are no conditions for shunting;
- There is a road junction on both sides of the LC, and the distance between these two road junctions is around 90 m. One road junction is very close to the railway track (18 m) and road vehicles endanger train movement. One of the road junctions is equipped with traffic lights.
- The property in this area is public, thus, land acquisition is not an issue.

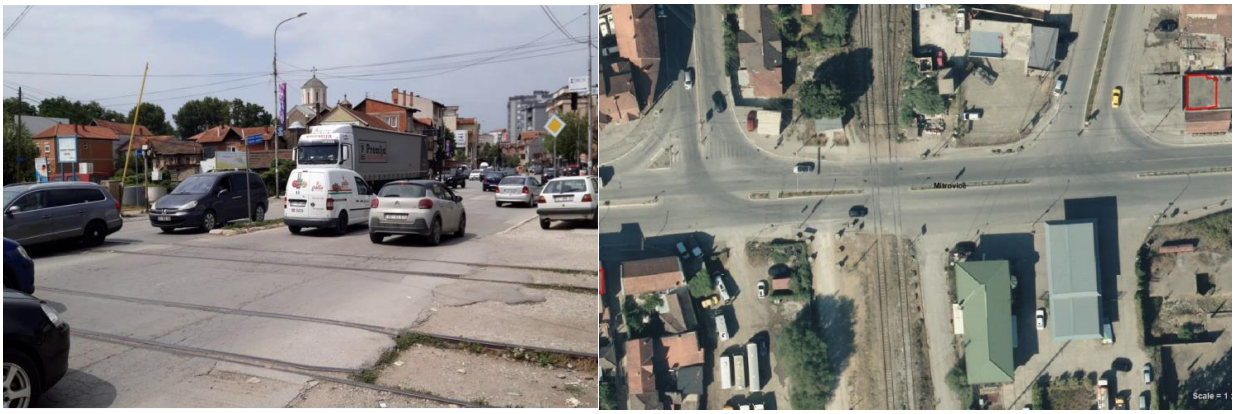

Figure 34. Level Crossing Mitrovicë

2. LC Fushe Kosovo in km position 249+522.28

This LC is situated on the Core Network near the main railway node Kosovo Polje.

The description of the conditions around the level crossing:

- The LC is located within the entrance signal of the station;
- The road intersects with four rail tracks;
- The LC is highly frequented by vehicles, pedestrians and cyclists (~2977 vehicles per day);
- The LC is located on railway Route 10 (Leshak–Hani i Elezit), the railway line Fushë Kosovë – Pejë, and the airport railway line;

- the railway line is frequented by railway vehicles from terminal in Miradi, and railway vehicles (locomotives) from the diesel depot. Shunting is performed here, and there are above 80 trains per day;
- The area during autumn and winter is often covered with dense fog which endangers traffic;
- The daily market takes place on both sides of the LC;
- Schoolchildren attending a nearby school walk through this area;
- There were fatal accidents on this LC;
- The Property in this area is owned by the railway company.

Figure 35. Level Crossing Fushe Kosovo

3. LC Drenas, in km position 23+175

The reasons for denivelation of this LC are:

- The LC is located within the entrance signal of the station;
- The railway line intersects with a regional road (four lanes are foreseen);
- The LC is highly frequented by vehicles, pedestrians and cyclists (~8978 vehicles per day);
- The LC is used by schoolchildren of a nearby school;
- There have been fatal accidents;
- The property in this area is public property.

Figure 36. Level Crossing Drenas

4. LC Peje 1, in km position 79+000

The level crossing should be a two-level crossing because of the following reasons:

- The LC is used by BY-PASS Road that connects Kosovo with Montenegro, where there is heavy road transport (trucks) from the border with Montenegro pass.
- The LC is highly frequented by vehicles and pedestrians (~10872 vehicles per day);
- The road junction is very close and road traffic endangers free movement of trains;
- The LC is located in an industrial area where large business premises are located;
- The property in this area is public property, thus, land acquisition would not be a problem.

Figure 37. Level Crossing Peje 1

5. LC Peje 2, in km position 80+842

The reasons for denivelation are:

- The LC connects the two parts of Peja;
- The LC is highly frequented by vehicles and pedestrians (~12144 vehicles per day);
- The roundabout is very close and road traffic endangers free movement of trains;
- The LC intersects with two railway tracks (one main railway track and one industrial track, which are used for shunting since it is within the entrance signal);
- Many business premises are located in this area;
- The property in this area is public property.

Figure 38. Level Crossing Peje 2

6. LC Airport, in km position 5+540

The reasons why the level crossing should be a two-level crossing:

- The LC directs road traffic towards the airport (the only road that goes to the airport and is planned to be turned into a 4-lane road);
- The LC is highly frequented by vehicles (~14160 vehicles per day);
- In autumn and winter, the area is often covered with dense fog which endangers traffic;
- The LC goes over the industrial track;
- According to the airport statistics, there were 340,000 passengers in July 2021;
- The property in this area is public property, hence, there will not be any issues in relation to land.

Figure 39. Level Crossing Airport

7. LC Gracanica, in km position 3+650

Denivelation is an option due to the following:

- The new road roundabout has been built near the industrial railway track (the railway track is located in the middle of the roundabout). The LC is located on M2 road (six lanes) that connects Prishtina to Skopje;
- The LC is highly frequented by vehicles (~21168 vehicles per day);
- The industrial railway track leads to a mine and was also used in the past for passenger transport;
- The LC is located in the biggest industrial area in Kosovo;
- The property in this area is public property, so there will be no land issues.

Figure 40. Level Crossing Gracanica

Based on the abovementioned factors, such as location (the proximity of residential area, schools, road junctions/roundabouts, and airport), road type (regional, transit) and railway altitude, the mentioned LCs are highly recommended to be replaced with underpasses or overpasses.

When a LC is located in urban areas, pedestrian and bicycle paths are needed in order to ensure that all users are accommodated during the full lifespan of an underpass or an overpass.

An example of replacement of a LC is given below where a new underpass in Varosh (Ferizaj) has been built.

Figure 41. Construction phase of the underpass in Varosh, Ferizaj

The underpass has been built by the Municipality of Ferizaj in the village of Varosh at km 284 + 144 on Rail Route 10, Section Fushë Kosovë - Hani i Elezit, construction costs at 750,00.00 €. The Rail Route 10 Rehabilitation Project does not cover the construction of overpasses or underpasses. This model can be used for other underpasses where terrain conditions allow.

Some comparative pictures for the same LC, with two reference points in the years of 2014, 2017 and 2021 are illustrated below:

Figure 42. Comparison between 2014 (Unsecured LC in Varosh), 2017 (Secured with manual half-barriers)

Figure 43. Level Crossing Varosh in 2021 (Underpass in Varosh)

Annex III – A detailed overview of LCs in North Macedonia

In this Annex, 35 LCs have been proposed as candidates for upgrading:

1. Level crossing on km 405 + 975

This level crossing is located on Railway Corridor X on the TEN-T core network. Currently, this active level crossing is equipped with road signs, light and sound signalisation, with half-barriers, which were installed 44 years ago. The level crossing is on a local road, close to the urban area of Vaksince (Kumanovo).

In the opinion of the JP ZRSMI, this level crossing should be upgraded by constructing an overpass; however, the technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 44. Vaksince LCs

2. Level crossing on km 417 + 295 and Level crossing on km 418 + 052

These level crossings are located on Railway Corridor X on the TEN-T core network. Currently, these active level crossings are equipped with road signs, light and sound signalisation, which were installed 44 years ago. The level crossings are on a local road, close to the urban area of Romanovce (Kumanovo).

JP ZRSMI is of the opinion that the level crossings should be eliminated or built at different levels by constructing an underpass between them. It should be also noted that this solution is not included and foreseen in the General Urban Plan (GUP for future reference) of the respective municipalities. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.


Figure 45. Romanovce LCs on km 417 + 295


Figure 46. Romanovce LCs on km 418 + 052

3. Level crossing on km 430 + 545 (see Annex 4)

This level crossing is located on Railway Corridor X on the TEN-T core network. Currently, this level crossing is equipped with road signs, light and sound signalisation, with half-barriers which were installed 44 years ago. The level crossing is on a local road, closed to the urban area of Miladinovci (Skopje).

In the opinion of the JP ZRSMI, this level crossing should be upgraded by constructing an overpass; however, the technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 47. Miladinovci LC

4. Level crossing on km 439 + 855 (see Annex 5)

This level crossing is located on Railway Corridor X on the TEN-T core network. Currently, this level crossing is equipped with road signs, light and sound signalisation, with half-barriers which were installed 44 years ago. The level crossing is on a local road, close to the urban area of Ilinden (Skopje).

In the opinion of the JP ZRSMI, this level crossing should be upgraded by constructing an overpass; however, the technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 48. Ilinden LC

5. Level crossing on km 445 + 317 (see Annex 6)

This level crossing is located on Railway Corridor X on the TEN-T core network. Currently, this level crossing is equipped with road signs, light and sound signalisation, with half-barriers which were installed 44 years ago. The level crossing is on a local road, close to the urban area of Madzari (Skopje).

In the opinion of the JP ZRSMI, this level crossing should be upgraded by constructing an overpass; however, the technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 49. Madzari LC

6. Level crossing on km 456 + 700 (see Annex 7)

This level crossing is located on Railway Corridor X on the TEN-T core network. Currently, this level crossing is equipped with road signs, light and sound signalisation, with half-barriers which were installed 37 years ago. The level crossing is on a local road, close to the urban area of Lisice (Skopje).

In accordance with JP ZRSMI engineers' opinion, this level crossing should be constructed at different levels. It should be noted that this solution is not included and foreseen in the GUP of the respective municipality. The technical solution should be contained in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 50. Lisice LC

7. Level crossing on km 460 + 943 (see Annex 8)

This level crossing is located on railway corridor X on the TEN-T core network. Currently, this level crossing is equipped with road signs, light and sound signalisation, with half-barriers (it is located on a junction formed by two railway tracks, therefore it is considered as a double level crossing) which were installed 44 years ago. The level crossing is on a regional road, close to the urban area of Dracevo (Skopje).

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 51. Dracevo LC

8. Level crossing on km 520 + 329 (see Annex 9)

This level crossing is located on Railway Corridor X on the TEN-T core network. Currently, this level crossing is equipped with road signs, light and sound signalisation, which were installed 30 years ago. The level crossing is on a local road, close to the urban area of Nogaevci (Veles).

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be providedin the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 52. Nogaevci LC

9. Level crossing on km 548 + 685 (see Annex 10)

This level crossing is located on the Railway Corridor X on the TEN-T core network. Currently this level crossing is equipped with road signs, light and sound signalisation which was installed 30 years ago. The level crossing is on local road, close to the urban area Krivolak (Negotino).

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

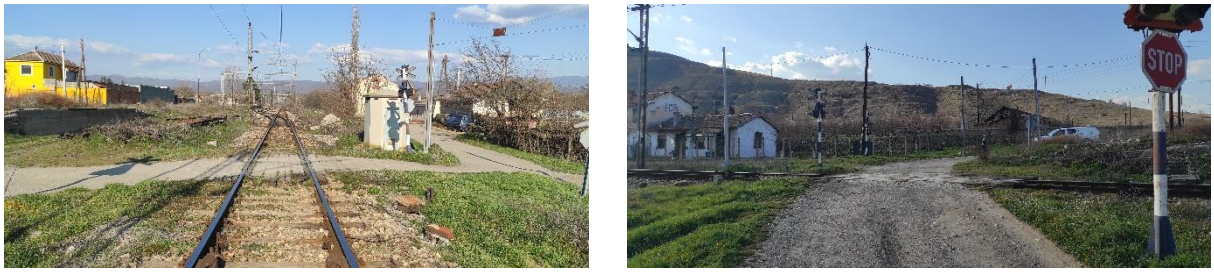

Figure 53. Krivolak LC

10. Level crossing on km 565 + 178

This level crossing is located on Railway Corridor X on the TEN-T core network. Currently, this level crossing is equipped with road signs, light and sound signalisation which was installed 30 years ago. The level crossing is on a local road, close to the urban area of Dubrovo (Demir Kapija).

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 54. Dubrovo LC

11. Level crossing on km 589 + 432 (see Annex 12)

This level crossing is located on Railway Corridor X on the TEN-T core network. Currently, this level crossing is equipped with road signs, light and sound signalisation which was installed 30 years ago. The level crossing is on a local road, close to the urban area of Udovo (Valandovo).

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 55. Udovo LC

12. Level crossing on km 590 + 349 (see Annex 13)

This level crossing is located on Railway Corridor X on the TEN-T core network. Currently, this level crossing is equipped with road signs, light and sound signalisation which was installed 30 years ago. The level crossing is on a local road, close to the urban area of Davidovo (Valandovo).

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 56. Davidovo LC

13. Level crossing on km 591 + 750 (see Annex 14)

This level crossing is located on Railway Corridor X on the TEN-T core network. Currently, this level crossing is equipped with road signs, light and sound signalisation, with half-barriers which was installed 30 years ago. The level crossing is on a local road, close to the urban area of Miravci (Valandovo).

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 57. Miravci LC

14. Level crossing on km 085 + 355 (see Annex 15)

This level crossing is located on Railway Corridor X -branch Xd on the TEN-T comprehensive network. Currently, this level crossing is equipped with road signs, combined with a man-regulated traffic with manual half-barriers which was installed 30 years ago. The level crossing is on a regional road, in Prilep.

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. It should be noted that this solution is included and foreseen in the GUP of the respective municipality. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design (for the GUP solution see GUP-085 in Annex 14).

Figure 58. Prilep LC

15. Level crossing on km 002 + 836 (see Annex 16)

This level crossing is located on Railway Corridor VIII on the TEN-T comprehensive network. Currently, this level crossing is equipped with road signs, light and sound signalisation which were installed 14 years ago. The level crossing is on a local road, close to the urban area of Kondovo (Skopje).

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 59. Kondovo LC

16. Level crossing on km 020 + 590 (see Annex 17)

This level crossing is located on Railway Corridor VIII on the TEN-T comprehensive network. Currently, this level crossing is equipped with road signs, light and sound signalisation which were installed 14 years ago. The level crossing is on a local road close to the urban area of Orasje (Jegunovce).

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 60. Orasje LC at km 020 + 590

17. Level crossing on km 022 + 207 (see Annex 18)

This level crossing is located on Railway Corridor VIII on the TEN-T comprehensive network. Currently, this level crossing is equipped with road signs only which were installed 14 years ago. The level crossing is on a local road close to the urban area of Orasje (Jegunovce).

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 61. Orasje LC at km 022 + 207

18. Level crossing on km 029 + 077 (see Annex 19)

This level crossing is located on Railway Corridor VIII on the TEN-T comprehensive network. Currently, this level crossing is equipped with road signs, light and sound signalisation with half-barriers, which were installed 14 years ago. The level crossing is on a local road, in Jegunovce.

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 62. Jegunovce LC

19. Level crossing on km 036 + 043 (see Annex 20)

This level crossing is located on Railway Corridor VIII on the TEN-T comprehensive network. Currently, this level crossing is equipped with road signs, light and sound signalisation which were installed 14 years ago. The level crossing is on a local road close to the urban area of Ratae (Tetovo).

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 63. Ratae LC

20. Level crossing on km 044 + 530 (see Annex 21)

This level crossing is located on Railway Corridor VIII on the TEN-T comprehensive network. Currently this level crossing is equipped with road signs and man-regulated traffic with manual half-barriers which were installed 14 years ago. The level crossing is on a regional road, close to Tetovo.

In accordance with JP ZRSMI engineers' opinion, this level crossing should be upgraded by constructing an overpass. The technical solution should be provided in the conclusions of the project documentation both with regards to preliminary and detailed design.

Figure 64. Tetovo (Teteks) LC

21. Proposed underpass on km 095+500 (see Annex 22)

This underpass is located under Railway Corridor VIII on the TEN-T comprehensive network, close to the urban area of Dlapkin Dol (Trapchin Dol - Kichevo). Currently, there is an underpass which is not sufficiently high and it is impossible for higher vehicles to pass.

Therefore, JP ZRSMI engineers have foreseen a higher underpass ("a higher underpass" refers to an underpass with an increased height that would enable trucks and busses to pass); however, this solution is currently not foreseen in the respective municipality's GUP. This underpass is the main entering point to the urban area of Dlapkin Dol.

Figure 65. Dlapkin Dol LC

22. Proposed underpass on km 451+150

This underpass would be located under Railway Corridor X on the TEN-T comprehensive network, between the urban areas of Aerodrom and Kisela Voda (Skopje). This location consists of an unauthorised LCs for pedestrians, and there are 12 railway tracks because of the PE ZRSM Transport management facility. Therefore, the engineers and the municipality's GUP foresee an underpass on this line. This underpass will connect two big and densely populated municipalities (Aerodrom - Kisela Voda).

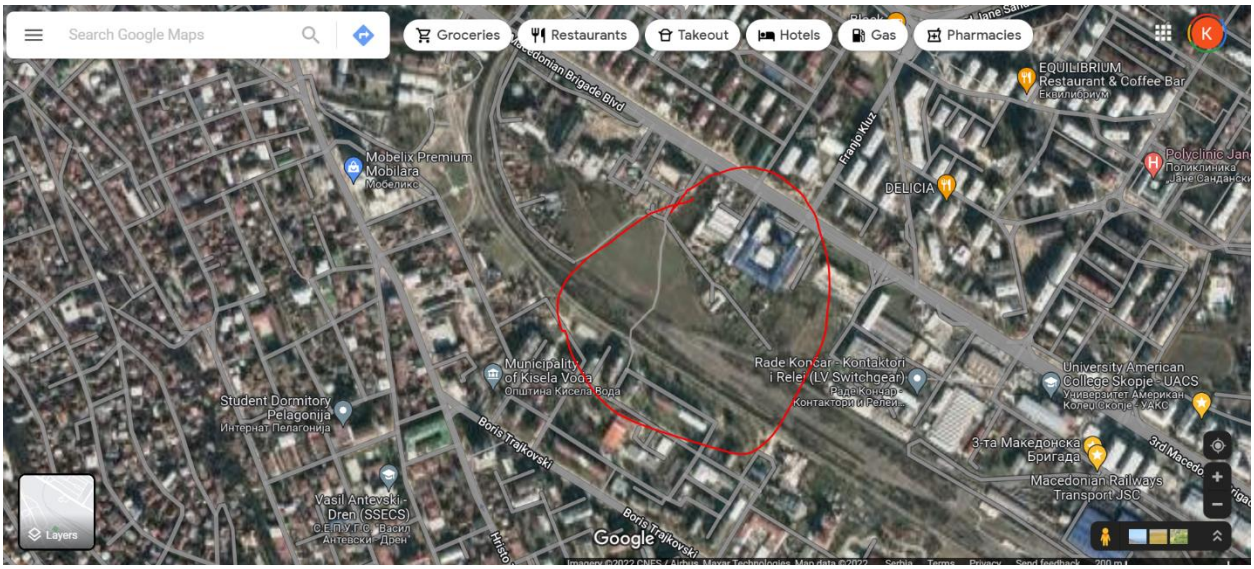

Figure 66. Kisela Voda - Aerodrom

REMARK:

The data concerning the proposed technical solutions that are to be included in the GUP is currently available and during future activities for denivelation of level crossings in urban areas, the designer will contact the respective municipalities.

Annex IV – A detailed overview of LCs in Albania

1. Frakulla level crossing

Location: km 93+150, Municipality of Fier, Administrative Unit Levan
Traffic Data
During the day: 2,710 vehicles
During the night: 1,843 vehicles
Total 24 hours: 4,553 vehicles

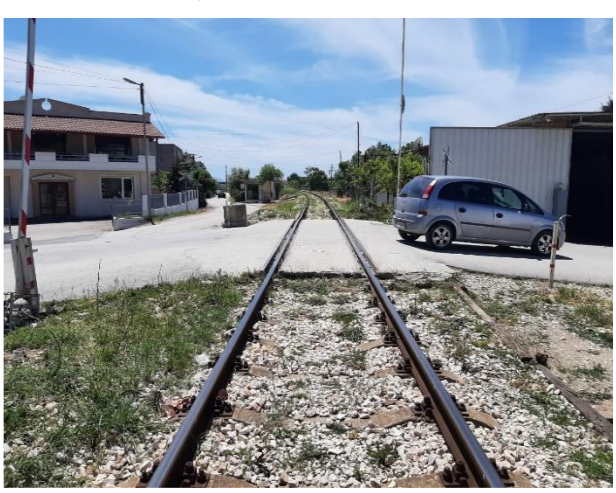


Figure 67. Frakulla level crossing

2. Mifol level crossing

Location: km 101+675, Municipality of Vlore, Administrative Unit Novosele
Traffic Data
During the day: 760 vehicles
During the night: 480 vehicles
Total 24 hours: 1,240 vehicles


Figure 67. Mifol level crossing

3. Narta level crossing

Location: km 114+975, Municipality of Vlore, Administrative Unit Narte
Traffic Data
During the day: 771 vehicles
During the night: 410 vehicles
Total 24 hours: 1,184 vehicles
Photos
Note: *at all the traffic data is not included the number of motorbike/motorcycles.*


Figure 68. Narta level crossing