ЈП ЖРСМ Инфраструктура
NP HRMV Infrastruktura

Construction of new railway section from Kriva Palanka to the border with Republic of Bulgaria, as part of Corridor VIII

Supplementary Environmental and Social Impact Assessment (Addendum)

Public Enterprise for Railway Infrastructure Railways of Republic of North Macedonia – Skopje

June, 2023

This document has been prepared by Mott MacDonald | CONNECTA Consortium as part of the assignment “Gap Analysis and Safeguard Documentation: Category A Project CORRIDOR VIII Railway - Section 3 Kriva Palanka-Border with the Republic of Bulgaria, North Macedonia”, supported by the Technical Assistance to connectivity in the Western Balkans EuropeAid/13785/IH/SER/MULTI.

Explanation note:

The project is expected to be financed in part by an approved Instrument for Pre Accession II (IPA II) grant. This grant shall be deployed through the IPA Operating Structure. See for further details: IPA 2014-2020 (IPA II) - CFCD (finance.gov.mk). In that context, the Environmental and Social instruments, including this document, shall be implemented by the Public Enterprise for Railway Infrastructure Railways of Republic of North Macedonia – Skopje in collaboration with the Contracting Authority, the Central Financing and Contracting Department within the Ministry of Finance, and the Ministry of Transport and Communication.

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List of Abbreviations

Abbreviation	Meaning
AC	Alternating Current
AF	Associated Facility
a.s.l	above sea level
CESMP	Construction Environmental and Social Management Plan
CNOSSOS-EU	Common Noise Assessment Methods in Europe
BOD	Biological Oxygen Demand
BoQ	Bill of quantity
BMP	Biodiversity Management Plan
CAPEX	Capital Expenditures
CH	Critical Habitat
CM	Cadastral municipality
COD	Chemical Oxygen Demand
dB	Decibel
E&S	Environmental and Social
EAAA	Ecologically Appropriate Areas of Assessment
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EMF	Electromagnetic Fields
EN	English
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESPOO	Espoo Convention on Environmental Impact Assessment
ESS	Environmental and Social Standard
EU	European Union
EUNIS	European Nature Information System
FIDIC	Fédération Internationale Des Ingénieurs-Conseils
GPS	Global Positioning System
Hz	Hertz
IPA	Instrument for Pre-accession Assistance
IUCN	International Union for Conservation of Nature
kV	Kilovolt
MK	Macedonian
MoEPP	Ministry of Environment and Physical Planning
MoTC	Ministry of Transport and Communications
MVA	Megavolt Amper

Abbreviation	Meaning
NATM	New Austrian Tunnelling Method
NGO	Non-Governmental Organisation
NM	Republic of North Macedonia
OCL	Overhead contact line
OCLS	Overhead Contact Line System
OHL	Overhead Line
OPEX	Operational Expenditure
PAM	Policies and Measures
PAPs	Project affected persons
PBF	Priority Biodiversity Feature
PE ZRSMI	Public Enterprise Railways of the Republic of North Macedonia, Infrastructure
PESR	Public Enterprise for State Roads
PIU	Project Implementation Unit
PM	Particulate matter
PR	Performance Requirement
PUC	Public Utility Company
RAP	Resettlement Action Plan
RNM	Republic of North Macedonia
SBA	Supplementary Biodiversity Assessment
SEP	Stakeholder Engagement Plan
TPS	Traction Power Substation
TSI	Technical Specifications for Interoperability
UN	United Nations
WHO	World Health Organization
WS	Water sample

1. Introduction

The railway Corridor VIII in North Macedonia (154 km long) is part of the Pan-European Corridor VIII and an important link planned to connect North Macedonia with the Black Sea (Port of Varna in Bulgaria) and the Adriatic Sea (Port of Durres in Albania).

In North Macedonia, the Western Section of the Corridor VIII is 66 km long connecting Kumanovo and the state border with Albania, The Eastern Section is 88 km long traversing from Kumanovo to the state border with Bulgaria.

Public Enterprise Railways of the Republic of North Macedonia – Infrastructure (PE ZRSMI) intend to complete the Eastern Section of the railway Corridor VIII. Key expected benefits of the development will be reducing of the travel time between Skopje and Sofia compared to the current road travel time, shortening the railway link between N. Macedonia and the Black Sea and the Istanbul link, increasing freight capacity and providing alternative to the current road truck transport.

In the wider context, the Eastern Section will facilitate trade between North Macedonia, Bulgaria, and Albania, and will provide part of the transnational route connecting Mediterranean/Adriatic Transport Area with the Black Sea Transport Area.

The European Bank for Reconstruction and Development (the “EBRD”) and the European Investment Bank (the “EIB”) – the Lenders, are considering providing part of the finance to the Ministry of Finance of Republic of North Macedonia and the final beneficiaries – the Ministry of Transport and Communication (MoTC) and Macedonian Railways-Infrastructure (“PE ZRSMI”) for the construction of Section 3 of the Eastern Section of the Railway Corridor VIII and electrification of the entire Eastern Section railway alignment (Section 1, 2, and 3), further referred to as the Project.

As the Project involves a major development – construction of a new railway line with the potential for significant environmental and social impacts as part of a long-distance railway line, the Lenders (EBRD, EIB) have assigned it as a Category A project. This means that a comprehensive Environmental and Social Impact Assessment (ESIA) and review of associated documents must be carried out, followed by their public disclosure for a minimum period of 120 days.

The original Environmental and Social Impact Assessment (ESIA) for Section 3 was developed in 2017 in accordance with national EIA procedures at the time. However, Section 3 of the Project has been subject to design changes and new Lender requirements which required update of the ESIA to address changes to the project, their associated impacts and proposed mitigation measures.

Following the project review, an ESIA Addendum has been prepared to provide up to date information on the project and to address the gaps identified – notably in relation to biodiversity, background noise, surface water, soil quality, ambient air and social quality and social baseline. This ESIA Addendum, together with the Stakeholder Engagement Plan (SEP), Non-Technical Summary (NTS), Environmental and Social Management Plan (ESMP), Environmental and Social Action Plan (ESAP), Resettlement Action Plan (RAP), Supplementary Biodiversity Assessment (SBA) and Biodiversity Management Plan (BMP) form the Supplementary Environmental and Social (E&S) Disclosure Package, which will be disclosed by PE ZRSMI, EBRD and EIB in accordance with their respective disclosure policies as outlined in Section 6 of the SEP.

1.1 Purpose of This ESIA Addendum

The Lenders review of the Project included a Gap Analysis of the existing environmental and social documentation to assess compliance with Lenders E&S requirements (the 2019 EBRD E&S Policy,

2022 EIB E&S Standards and EU requirements). The review critically assessed the existing 2017 ESIA Disclosure Package, the previous 2012 ESIA for the entire Eastern section and other relevant Project information.

Following the Project review, this ESIA Addendum has been prepared to provide supplementary information needed to address the identified gaps between the 2017 ESIA and Lenders E&S requirements including assessment of potential environmental and social impacts and the need for any additional mitigation. Further detail on the relationship between the ESIA and ESIA Addendum is provided in Section 1.4 ESIA and ESIA Addendum. This Addendum is supported by the following documents:

- A Resettlement Action Plan (RAP) has been developed to ensure that project-affected peoples (PAPs) and communities are properly resettled and compensated for any losses, in a manner such that their well-being is restored to at least pre-Project levels. The RAP identifies eligible persons, types of impacts and entitlements to be provided and is supported by the activities included in the Stakeholder Engagement Plan (SEP).
- The SEP for Section 3 has been prepared and sets out PE ZRSMI's commitment to stakeholder engagement during the whole project duration. The SEP serves to identify, map and assess affected parties and other interested stakeholders, and how they may be affected by or interested in the Project and provide an action plan for consultation that allows for meaningful stakeholder engagement. It also outlines the grievance mechanism to allow stakeholders proper addressing of their complaints.
- An Environmental and Social Management Plan (ESMP) has been developed to describe E&S mitigation and monitoring measures aimed at avoiding and reducing the E&S impacts of the Project, including compliance with applicable regulatory requirements and Lender standards. The ESMP has been structured to include all relevant stages of the Project.
- Biodiversity Management Plan (BMP) is prepared which further describes mitigation and management measures as identified in the ESIA Addendum, identifies the parties responsible for their implementation (e.g., company, contractor, and government) and specifies the required monitoring and monitoring schedule, supported by Supplementary Biodiversity Assessment (SBA) as an Annex.
- An over-arching, standalone Non-Technical Summary (NTS) has been prepared and contains a summary of the key environmental and social issues of the Project, including results of supplementary studies and the RAP.

The ESIA Addendum plus the RAP, Stakeholder Engagement Plan, ESMP, Biodiversity Management Plan, and NTS together form the Supplementary E&S Disclosure Package, which will be disclosed by PE ZRSMI, EBRD and EIB in accordance with their respective disclosure policies as outlined in the SEP.

These documents will be available in the following languages[1]:

- RAP - Macedonian and English;
- SEP - Macedonian and English;
- ESMP - Macedonian and English;
- ESAP - Macedonian and English,
- BMP with SBA - Macedonian and English;
- NTS - Macedonian, English, Albanian and Bulgarian;
- ESIA Addendum - Macedonian and English.

[1] Effort has been made to ensure that the Macedonian translation is an accurate and true reflection of the intent and meaning of the English original. In the event of any conflict or disagreement in interpretation of any provisions between these language versions, reference shall be made to the original version.

1.2 The Project Description

The Railway Corridor VIII – Eastern Section runs across the North-Eastern region of Republic of North Macedonia, the municipalities of Kumanovo, Staro Nagoričane, Kratovo, Rankovce and Kriva Palanka. It is a single-track railway and comprises the following sub-sections:

- Section 1: Kumanovo – Beljakovce (30.8 km) which was partially completed between 1994 and 2004 (approx. 50%). The original rehabilitation/ construction works under the EBRD loan were delayed for several reasons between 2013 and 2020 when the works were re-tendered in combination with Section 2. The works contract was signed with Strabag Sp.zoo. & Strabag ag & Strabag Rail a.s. in July 2022. Works commenced shortly after and are ongoing and planned to be completed by the end of 2025;
- Section 2: Beljakovce – Kriva Palanka (34 km) which was under construction between 1996 and 2004 when some of the structures (viaducts, tunnels, underpasses, culverts) were partially built. The rehabilitation/ new construction works under the EBRD loan were awarded to Gulermak Agir Sanayi Insaat Ve Taahhut Anonim Sirketi in July 2022. Works commenced shortly after and are ongoing and planned to be completed by the end of 2025.
- Section 3: Kriva Palanka – Deve Bair (the state border with Bulgaria) which is a 23.4 km-long stretch yet to be constructed with the maximum design speed of 100 km/h.

The Project comprises the construction of Section 3: Kriva Palanka – Border with Bulgaria and electrification of the Eastern Section (Section 1, Section 2, Section 3, i.e. 88 km in total). The Project alignment is shown on Figure 1.

Figure 1 Railway Corridor VIII – Eastern Section

The Project is expected to be tendered in 2023, with construction works commencing in 2024 and to become operational after 5 years, in 2027/2028.

According to the Government Conclusion, the Project will be implemented under FIDIC Conditions of Contract, Yellow Book (Design and Build). The time for completion is set to 5 years (1 year for design and obtaining the construction permit and 4 years for construction).

The Project design was conducted in line with Macedonian and EU technical and operational standards (including the Technical Specifications for Interoperability – TSI).

Project Alternatives

Three strategic alternatives for the entire Eastern Section of the Corridor VIII railway were assessed as part of a Feasibility Study completed in 2011[2], and initially reported on in the 2012 ESIA. Sections 1 and 2 of the Eastern Section were approved for financing in 2012 and 2014 respectively, based on the findings of these documents. A further Feasibility Study was completed in 2017[3], which does not include an update of this assessment of strategic alternatives. Therefore, the 2017 ESIA (and the 2017 Feasibility Study) relied on the assessment of strategic alternatives undertaken in the 2011 Feasibility Study for Section 3 of the Eastern Section.

The three strategic alternatives are:

- The '**Do Nothing/No Project**' option.
- The '**Reference Alignment (or Alternative A)**' (88.114 km in length with a design speed of 100 km/h) that corresponds to the railway corridor route formerly proposed in 2010 by Macedonian Railways
- The '**Alternative Alignment**' (**or Alternative B**), (79.1 km in length with a design speed of 160 km/h) which mainly follows the route of a planned future Corridor VIII motorway.

Do Nothing

The Do Nothing, or 'no project' alternative represents a continuation of the existing situation and has been discounted as an option, including for the following reasons:

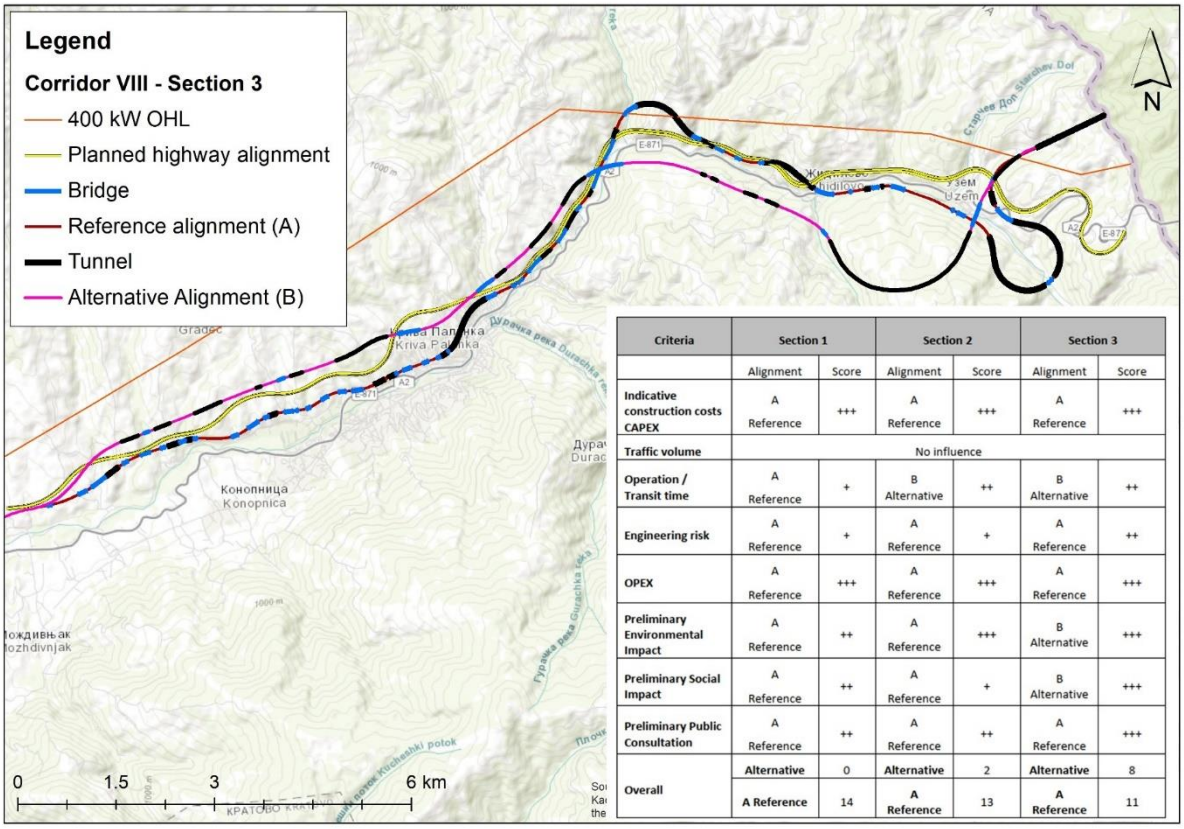
- The railway between Kumanovo and Beljakovce is already under construction and there will be E&S as well as financial impacts associated with dismantling and disposing of any infrastructure that has already been built.
- Without the Eastern Section of the railway, the key objective of providing rail connectivity between the Port of Durres in Albania, Macedonia and the Port of Burgas in Bulgaria cannot be realized.
- The Project is partly driven by the EU transport infrastructure policy 2014 (the aim of which is to transform the existing patchwork of European roads, railways, inland waterways, airports, inland and maritime ports and rail/road terminals into an integrated network covering all Member States). The associated Trans-European Transport Network (TEN-T) Regulation ((EU) No 1315/2013) establishes guidelines for the development of a trans-European transport network. The TEN-T Core rail network includes Corridor VIII and the aim is to complete the core network by 2030.
- South East Europe Transport Observatory (SEETO[4]), considers the project as priority project eligible for funding according to the Multi Annual Development Plan 2016.

[2] Selection of Preferred Alternative Report, Macedonian Railways: Feasibility Study for Corridor VIII - Eastern Section, Contract No: C21196/EBSF-2010-07-101, Ministry of Transport and Communications, Republic of Macedonia, 2011.

[3] Preparation of detailed design and tender documentation for construction of new railway section Kriva Palanka – border with Republic of Bulgaria, as part of corridor VIII. Report on Update of the Feasibility Analysis Version C, 16th November 2017. EuropeAid/136050/IH/SER/MK.

[4] The regional transport organisation established by the Memorandum of Understanding for the development of the Core Regional Transport Network, signed by the Governments of Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro and Serbia, and the UN Mission in Kosovo and the European Commission in 2004.

The 2 route alternative alignments that have been considered are shown in the Figure below, along with the planned motorway route.



Criteria	Section 1		Section 2		Section 3	
	Alignment	Score	Alignment	Score	Alignment	Score
Indicative construction costs CAPEX	A Reference	+++	A Reference	+++	A Reference	+++
Traffic volume	No influence					
Operation / Transit time	A Reference	+	B Alternative	++	B Alternative	++
Engineering risk	A Reference	+	A Reference	+	A Reference	++
OPEX	A Reference	+++	A Reference	+++	A Reference	+++
Preliminary Environmental Impact	A Reference	++	A Reference	+++	B Alternative	+++
Preliminary Social Impact	A Reference	++	A Reference	+	B Alternative	+++
Preliminary Public Consultation	A Reference	++	A Reference	++	A Reference	+++
Overall	Alternative	0	Alternative	2	Alternative	8
	A Reference	14	A Reference	13	A Reference	11

Figure 2 Route of the Reference and Alternative Alignments in Section 3 (Source: Report on Update of the Feasibility Analysis Version C, 16th November 2017)

Section 3 Reference Alignment/Alternative A

From approximately KP 65, the route follows the northern side of the Kriva Valley to the town of Kriva Palanka, where a station will be constructed. As the Kriva Valley and surrounding hills have been significantly developed, a 1100 m long tunnel will be constructed under the town to minimise the need for demolition of buildings. Please see Project description Section 3 below in this Report for a detailed description of the proposed Project route.

Section 3 Alternative Alignment (Alternative B)

The main objective of the alternative alignment is to allow for an increase in train speeds and a reduction in journey times by enlarging the minimum radius of the horizontal curves and reducing the length of the line across the 3 sections. At KP 59.6 this alternative route crosses to the northern side of the planned motorway and enters the town of Kriva Palanka at a higher level and therefore avoids passing through the densely populated valley, with the line also crossing the town through a tunnel to minimise the required demolition of buildings. The station in this option is located at the western limit of the town, approximately 65 m higher than the Reference Alignment and as such there is a shorter distance from the station into the center of Kriva Palanka. From the station, the alternative alignment crosses to the northern side of the planned motorway again and crosses both the motorway and river Palanka at KP 70, whereafter the route follows the south side of the river valley. With a moderate horseshoe tunnel the line turns first to the southeast and then to northeast and joins the Reference alignment at the

entrance to the border tunnel. In this option, the station Zidilovo is located at KP 73.2 in front of the horseshoe tunnel.

The 2011 Feasibility Report included an extensive multi criteria analysis that was completed to compare and evaluate the two alternative alignments, and support the decision making process by making recommendations to the Ministry of Transport and Communications. This analysis used the following criteria, and was completed based on the status of the Project and work completed at the time:

- CAPEX (indicative construction costs),
- Traffic volume (forecast traffic volumes based on modelling),
- Operation / Transit time,
- Engineering risk (e.g. cost overruns, project delays, safe construction and operation, system integrity,
- OPEX (indicative operating costs of the built railway line),
- Preliminary Environmental and Social Impacts (based on available data and information gathered during stakeholder consultations),
- Preliminary Public Consultation (based on data collected during stakeholder engagement activities).

The preliminary analysis of potential environmental impacts included the following six elements:

- **Biodiversity (Flora and Fauna):** direct loss of habitat; modification of adjacent habitats, disturbance of fauna; mortality rates of fauna during construction and operation;
- **Soil**: erosion; loss of function as support for biodiversity, loss of permeability; contamination;
- **Water**: groundwater recharge rates, contamination of ground and surface water;
- **Climate**: microclimate changes due to destruction of vegetation cover;
- **Air**: reduction in air quality due to dust and exhaust emissions;
- **Landscape**: reduction in landscape value due to the presence of the railway structures, particularly bridges and viaducts.

The preliminary analysis of social impacts included the following four elements:

- **Resettlement** of people/loss of land due to land expropriation;
- **Travel times**;
- **Access to train stations/stops**; and
- **Quality of life** (e.g. noise and vibration effects).

A summary of the overall results of the analysis is presented Figure 3 below, which indicates the highest scoring option (one plus stands for one point) for each criterion, for each Section of the Eastern Section of the railway. As can be seen, the Reference Alignment was presented as the preferred option for all Sections and as such, this route was recommended by the Ministry of Transport and Communication to the Government of the Republic of Macedonia, who issued the final decision to adopt the Reference Alignment in 2011 (Decision No. 51-3556/1, 19.07.11).

Criteria	Section 1		Section 2		Section 3	
	Alignment	Score	Alignment	Score	Alignment	Score
Indicative construction costs CAPEX	A Reference	+++	A Reference	+++	A Reference	+++
Traffic volume	No influence					
Operation / Transit time	A Reference	+	B Alternative	++	B Alternative	++
Engineering risk	A Reference	+	A Reference	+	A Reference	++
OPEX	A Reference	+++	A Reference	+++	A Reference	+++
Preliminary Environmental Impact	A Reference	++	A Reference	+++	B Alternative	+++
Preliminary Social Impact	A Reference	++	A Reference	+	B Alternative	+++
Preliminary Public Consultation	A Reference	++	A Reference	++	A Reference	+++
Overall	**Alternative**	0	**Alternative**	2	**Alternative**	8
	A Reference	14	**A Reference**	13	**A Reference**	11

Figure 3 Results of the multi criteria analysis for the alternatives – Strategic Options (Source: Report on Update of the Feasibility Analysis, 2017)

Given the time that has passed since the original multi-criteria analysis was completed in 2011, and the difference between the E&S impact scores for the two Section 3 alternatives, this study has reviewed and updated the basis of the scores given for social impacts (with a focus on resettlement) and environmental impacts (with a focus on biodiversity); based on current baseline conditions and recent changes to the Project design.

The Alternative Alignment was assessed in 2011 to result in significantly fewer households requiring resettlement compared to the Reference Alignment, which contributed to the Alternative Alignment being the better option in terms of preliminary social impacts (as seen in the table above).

Based on current information in the RAP and a review of aerial mapping, the Alternative Alignment would require the demolition of a minimum of 25 buildings, of which approximately 90% are residential compared to 48 buildings for the Reference Alignment, of which 38 are residential (the remainder being garages and ancillary buildings). This aligns with the analysis completed in 2011.

However, the majority of the houses earmarked for demolition to enable construction of the Reference Alignment, were impacted because of the location of planned access roads in Kriva Palanka, rather than the railway line itself. As outlined in Section 10.2 of this Report, public feedback from the residents of Kriva Palanka in relation to the extent of resettlement required has resulted in the re-location/design of the access roads. The main difference is that the locations of the alternative access roads will only affect state owned land parcels and 23 houses as well as a small number of ancillary buildings will be saved from demolition. This means that the Reference Alignment will now only require the demolition of 15 houses compared to around 22 for the Alternative Alignment. As such, based on the element of resettlement, the Reference Alignment can now be considered the better option.

As a result of the preliminary analysis of environmental impacts it was argued that because the Alternative Alignment in Section 3 is 3.5 km shorter than the Reference Alignment, a smaller area of habitat would be affected. With reference to impact on biodiversity, given the recent changes in the area

of impact the Reference alignment further benefits over the Alternative alignment taking into consideration: (i) the Reference Alignment is routed close to the under-construction road and hence, fragmentation is confined to a corridor which today is already degraded at places and therefore impacts associated with habitat loss, fragmentation and 'new' disturbance impacts at these sections are minimized; (ii) assessed lower impact on 6220* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea (CH) and lower impact on 91M0 Pannonian-Balkanic turkey oak-sessile oak forest and 91W0 Moesian Beech Forests (PBF) and (iii) the Reference Alignment is predominantly routed through tunnels and bridges (9 km of tunnels and 4.4 km of bridges and viaducts) and hence negative impacts on sensitive habitats are largely avoided (particularly during operation).

Alternative Design Options

The 2017 Feasibility Study took the assessment of alternatives further by considering possible structural design options in relation to railway bridges, track systems and level crossings. This was only focused on Section 3 of the Eastern Section.

Railway Bridges

Two alternative options have been evaluated using multi-criteria analysis for railway bridges/viaducts. These are: bridges with one continuous deck; and bridges with pre-cast concrete beams and a deck that is formed by several spans supported on the piles and abutments. The criteria considered in the analysis included:

- Duration of construction works
- Standardization of the structural systems
- Deck slenderness
- Piles and abutments slenderness
- Construction costs
- Environmental impact on riverbeds and vegetation
- Need for track joints
- Need for maintenance

As part of the analysis, it is noted that bridges with a continuous deck can be narrower, with smaller piers and as such should have a lower visual impact compared with bridges where the deck is divided into a number of spans, the piers for which must each be designed to support the required horizontal loads and are likely to be bigger. It is also noted that the option that will maximize the use of prefabricated elements, i.e. the bridge with pre-cast concrete beams, should have a lower impact on riverbank vegetation, water quality in rivers (through lower sedimentation levels) and help to ensure the stability of the riverbanks by minimizing erosion.

Each criterion was weighted from 1 to 2 according to their perceived importance (2 being the most important and including: Construction costs; Environmental impact on riverbeds and vegetation; Need for track joints; Need for maintenance. The two alternatives were then scored from 0 – 5 (where 5 represents the case in which the alternative fits perfectly with the criterion). The overall results of the analysis are presented below.

CRITERION	Weight	Bridges with continuous deck		Bridge with precast concrete beams	
		Standard	Weighted	Standard	Weighted
DURATION OF CONSTRUCTION WORKS	1	2	2	3	3
STANDARDISATION OF THE STRUCTURAL SYSTEMS	1	1	1	4	4
DECK SLENDERNESS	1	4	4	2	2
PILES AND ABUTMENTS SLENDERNESS	1	4	4	2	2
CONSTRUCTION COSTS	2	3	6	4	8
ENVIRONMENTAL IMPACT ON RIVERBEDS AND VEGETATION	2	1	2	4	8
NEED FOR TRACK JOINTS	2	0	0	5	10
NEED FOR MAINTENANCE OF CIVIL STRUCTURE	2	4	8	1	2
TOTAL			27		39

As can be seen, the construction of bridges with pre-cast concrete beams (higher score) is considered to be the preferred alternative.

Track Systems

Two alternative track systems have been considered in the 2017 Feasibility Study. The first is a conventional ballasted track, which has a relatively low production cost, and a slab track system which has a higher initial investment cost (2 – 5 times greater).

Maintenance activities for the ballasted track can be achieved relatively efficiently to minimize disruption to rail traffic, and are typically undertaken overnight, although this can result in noise and vibration impacts to sensitive receptors especially in built up areas. A known issue is the need to periodically reposition the tracks as the movement of the trains causes them to move out of line. This requires the track to be lifted and results in dust and noise emissions.

Slab track systems are fixed and therefore do not require realignment and have comparatively low maintenance costs, although these are not expected to offset the increased construction costs over the lifetime of the Project. Slab track systems also rely upon sub-structure settlement of less than 15-30mm and the height of the embankment is limited to 10 m, therefore, the number and length of viaducts and bridges are expected to be higher, further increasing the construction costs.

Whilst a ballasted track will absorb most of the vibration and associated noise generated by a train, the slab track would require the use of absorbent materials below the substructure to mitigate these impacts (noise levels are generally 5db higher than a ballasted track). This is an important consideration when the railway line passes through densely populated areas such as Kriva Palanka.

As for the bridge options, a multi-criteria analysis was conducted using appropriate criterion and the scores weighted. The results are shown below.

CRITERION	Weight	Ballasted Track		Slab Track	
		Standard	Weighted	Standard	Weighted
LOAD CAPACITY	1	3	3	5	5
GEOMETRY CORRECTION	2	4	8	1	2
ALIGNMENT PARAMETERS	2	5	10	1	2
BALLAST EJECTION	1	2	2	5	5
EDDY CURRENT BRAKE	1	2	2	4	4
NOISE AND VIBRATION	2	3	6	2	4
MAINTENANCE AND AVAILABILITY	3	4	12	2	6
PROFITABILITY	3	4	12	2	6
TUNNELS	3	3	9	5	15
BRIDGES AND VIADUCTS	3	3	9	4	12
TOTAL			73		61

The ballasted track alternative is the preferred option, as many of the advantages of the slab track system, such as lack of movement, higher lateral resistance, being more appropriate in tunnels (due to improved access for emergency services) and bridges (where there is a need to minimise the weight of the structure) and lower maintenance costs are highly dependent on the design speed of the line and as the design speed decreases, the significantly higher construction costs, and increased noise and vibration impacts, reduce the benefits of this option.

Level Crossings

Safety is one of the priorities of the National Transport Strategy and as such, an in accordance with the requirements of the Public Enterprise Railways of the Republic of North Macedonia, Infrastructure (PEZRSMI), the railway line should not incorporate any road level crossings. This has already been achieved in Sections 1 and 2. The proposed alignment for Section 3 considers the creation of a bridge (Bridge 22) in Kriva Palanka to remove the need for a road level crossing. Otherwise, there are no road level crossings. The preferred alternative is therefore to construct Bridge 22 and avoid the requirement for any road level crossings in Section 3.

Project description Section 3

Section 3 is a 23.4 km-long new single-track railway with the maximum designed speed of 100 km/h between Kriva Palanka and the border with Bulgaria.

The project area (Section 3) is located on the territory of the municipality of Kriva Palanka, which belongs to the Northeast Region of the Republic of North Macedonia. Section 3 starts before the town of Kriva Palanka (at km 64 + 942.01) and extends to the border with the Republic of Bulgaria (at km 88 + 364.65). The project area encompasses the following settlements: T'lminci, Kriva Palanka, Gradec, Lozanovo, Drenje, Kiselica, Trnovo, Zidilovo, Krklja, Kostur and Uzem (Figure 4).

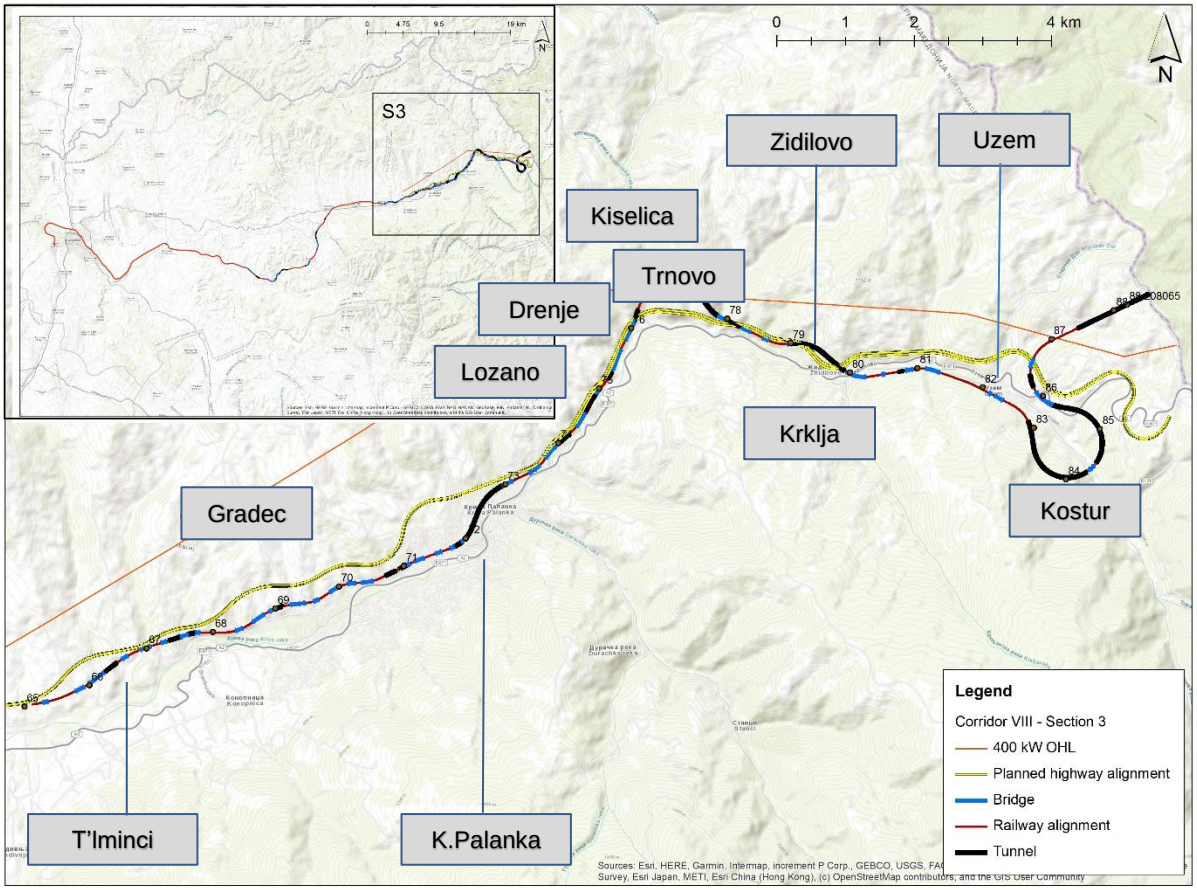


Figure 4 View on the Railway Corridor VIII – Eastern Section with a detailed overview of Section 3 Kriva Palanka (T'lminci) to Deve Bair[5]

The Project comprises the following:

- Section 3: Construction of 23.4km new single-track, 100km/h max. design speed railway between Kriva Palanka and the border with Bulgaria. The scope includes the following:
  - a station in Kriva Palanka with 2 side tracks and 3 tracks for maintenance and stabilisation,
  - a halt in the village of Zhidilovo with 2 side tracks,
  - border tunnel "Deve Bair" on the territory of North Macedonia,
  - 22 tunnels with a total length of about 10 km and
  - 52 bridges (viaducts) with a total length of about 5 km.
- Electrification for Sections 1, 2 and 3 which includes:
  - Construction of approx. 90 km of overhead contact line (OCL) and the relevant earth protection system.
  - Construction of 1 new traction power substation (25 kV TPS) 25 kV AC in Kratovo (located on Section 2: Beljakovce to Kriva Palanka) and 1 in Kriva Palanka.
  - connection to 110 kV feeder and construction of 110 kV current transformer station on the same location of 25 kV TPS.

The scope of work related to Section 3 consists of the following activities:

- The execution of earthworks and drainage,
- The construction of 52 bridges and 22 tunnels, including reconstruction of the 1150m border tunnel within the Macedonian territory,

[5] Figure taken from EIA 2012

- The execution of 23.5 km main track, 4.3 km station tracks and 14 sets of points,
- The construction of a substation West of Kriva Palanka,
- Temporary roads to provide access to construction sites.

In respect of related facilities, Section 3 is foreseen to have:

- one station (in Kriva Palanka at km 70.58 with 2 side tracks and 3 tracks for maintenance and stabilisation),
- one halt in the village of Zhidilovo at km 80.37 with two side tracks, and
- passenger building and a railway maintenance facility.

The railway line will occupy a band with a width of 12 metres, including the tracks and the adjacent slopes of embankments or ~~cuttings~~, which will be kept free of wild vegetation on a permanent basis.

The minimum horizontal design curve radius Is R min = 500 m. The maximum gradient of tracks is 25.0 mm/m on the open line and 1.5 mm/m in the station (halt). The minimum radius of vertical curve is min Rv=2500 m. The minimum distance between the main tracks in station (halt) is 4.75 m. The nominal track gauge is 1,435 mm.

Section 3 will not have road level crossings. All crossings will be grade separated (by overpass or underpasses).

The majority of the railway alignment has gradient in the range from 20 to 25 ‰. Freight trains will therefore have to be pushed by a second locomotive.

The proposed alignment starts near the village of T'lminci (km 64+942.01) and runs along the upland above the northern side of the Kriva River valley. At km 71.0 it reaches the town of Kriva Palanka, where the station is proposed. The station will include the passenger building, railway maintenance and electrical operations building, train traction facility, train traction building, and train inspection facility. The station platform length will be 400 m.

The alignment will cross the densely populated area of Kriva Palanka through two adjacent tunnels, one short (122m) and the other long (996m), about 55m apart.

From the end of the long tunnel at km 72+789 for the next 3.5 km the alignment runs through an uninhabited upland above the Kriva River valley. At chainage km 76.0, the river valley makes a 90° curve, shifting from the north-east to the south-east direction. The alignment follows this bending with a wide curve to gain length and subsequently height. The major part of the bending is in the tunnel.

Three kilometres further upstream, at the village of Zidilovo, the alignment crosses the regional road and the Kriva River by a viaduct. After the viaduct, on the south side of the valley, the Zidilovo halt is proposed at chainage km 80.8. The halt will include the passenger building and railway maintenance building. The halt platform length will be 220 m.

After the halt, the alignment continues along the uninhabited upland above the left side of the river valley and above the village of Uzem. After Uzem. At chainage km 82.3 a horseshoe curve has been planned in order to gain length and height towards the final stretch at the border with Bulgaria. The horseshoe curve will be passed in two tunnels (1,407 and 1,313 m, respectively) and two short bridges in between, across the Kriva River and will climb up to the entrance of the border tunnel "Deve Bair" (km 87+280.00).

The cross-border tunnel "Deve Bair" tunnel has a design length of 2,383 m, of which 1,189 m are on the Macedonian side. About 250m of the tunnel on the Macedonian side has been drilled but the tunnel entry partly collapsed.

The total number of the project affected land plots for permanent expropriation for the construction of the permanent way and access roads is 522 and total of 646801 m^2 affected area.

The map of the alignment is shown on Figure 5. Detailed railway alignment maps and its surroundings is given in Annex 1.

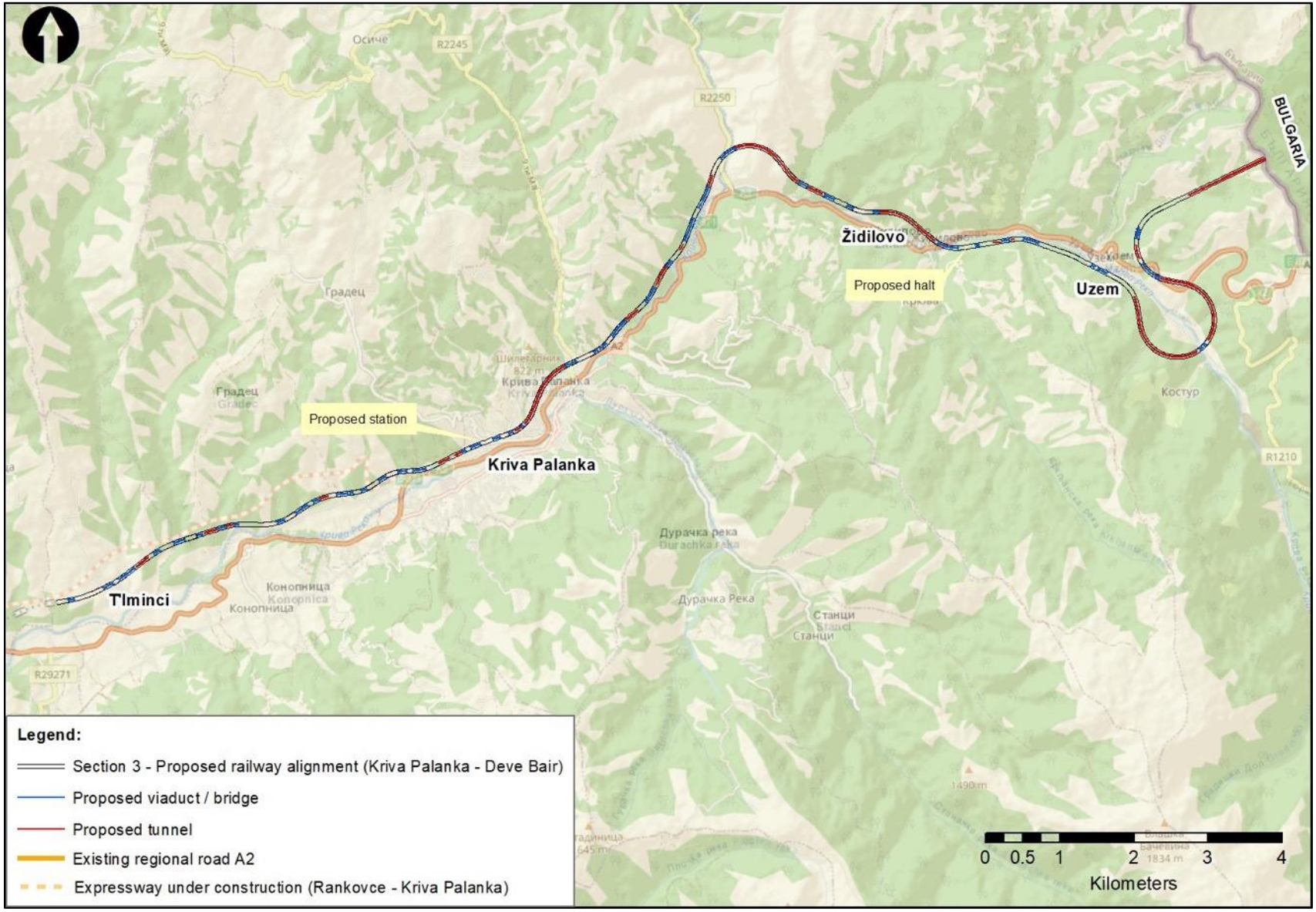


Figure 5 Proposed Alignment of Section 3: Kriva Palanka – State Border with Bulgaria (Deve Bair)

Natural Hazards

The Project design has complied with the European standard EN-1998 Eurocode 8: Design of Structures for Earthquake Resistance by taking into account an earthquake with a probability of exceedance of 10% in 50 years (which corresponds to 475 years return period). However, the Detailed Design has not yet been approved by the competent institutional stakeholder (Institute of Seismic Engineering, University of Skopje), which is a prerequisite for the Construction permit.

As the Project area is moderately to highly susceptible to erosion initiated by heavy rainfall and streams. The landslide risk has been considered in the design. The Detailed Design has been informed by the geotechnical surveys and included the stabilisation with retaining walls in areas prone to erosion.

The Project will cross a number of ephemeral watercourses and the Kriva River. The Project area has not been identified by relevant national institutions as a flood risk area. The Detailed Design has considered the need to maintain flood flow conveyance through proposed hydraulic structures (bridges and culverts). Hydraulic calculations have been undertaken using two best practice methods which both consider drainage catchment of the watercourse, characteristics of the catchment and local meteorological data. These methods are considered to be robust. The watercourse crossings have been designed to have sufficient capacity for the 100-year rainfall event, which is a standard design practice in North Macedonia. Potential effects of climate change are discussed in Chapter 8 Climate Change Mitigation and Adaptation.

Settlements

Section 3 runs near the settlements of T'lminci, Gradec, Kriva Palanka, Drenje, Kiselica, Trnovo, Zidilovo, Krklja, Uzem and Kostur. Apart from the town of Kriva Palanka which is a nucleated settlement, other villages are small and linear, with a limited number of houses. Around 40% of the Section 3 alignment (9km out of 23km) is proposed in tunnels which will help reduce the operational noise impact from the Project.

The majority of proposed tunnels are situated in uninhabited areas, however the residential area of Kriva Palanka will be intersected by two adjacent tunnels (122m and 996m long). The tunnel excavation method will include drilling and blasting. Blasting will involve the controlled use of explosives to break rocks.

Associated Facilities

The EBRD's definition of Associated Facilities is, "facilities or activities that are not financed by EBRD as part of the project but which, in the view of EBRD, are significant in determining the success of the project or in producing agreed project outcomes (ESP, 2019)." EIB defines ancillary/associated works facilities as including those that may be owned by a separate legal entity and without which the project would not be technically viable (ESS, 2022).

As such, the Cross-Border tunnel and planned connection to the existing railway line at Gyueshevo railway station is an Associated Facility (AF) for this Project, as it will not be not funded by the Lenders (or EU grants), as part of this Project, is owned by a separate legal entity but will enable the Corridor VIII railway to connect with the existing railway network in Bulgaria. The new connection on the Bulgarian side is anticipated to be approximately 2 km in length, of which approximately 1.2 km will be within the cross-border tunnel on the Bulgarian side of the border. Since the AF is being developed within a separate legal regime, by a separate entity and is not financed by the Lenders the level of influence the Project has over it is limited.

In accordance with the EBRD and EIB environmental and social requirements an assessment of the environmental and social risks and impacts of associated facilities should be undertaken. However, such an assessment was not included in the 2017 ESIA and the national Environmental Impact Assessment (EIA) which includes this section remains under development by the Bulgarian National Railway Infrastructure Company. Due to the absence of detailed baseline data/information in relation to the cross-border tunnel and connection at Gyueshevo, a high-level assessment (based on publicly available information and professional judgement) has been undertaken as part of this Addendum, including of how the abovementioned AF aligns with the objectives of the applicable EBRD Performance Requirements.

The location and immediate surroundings of the Cross Border tunnel and existing railway station at Gyueshevo are shown in Figure 6 and Figure 7 below.

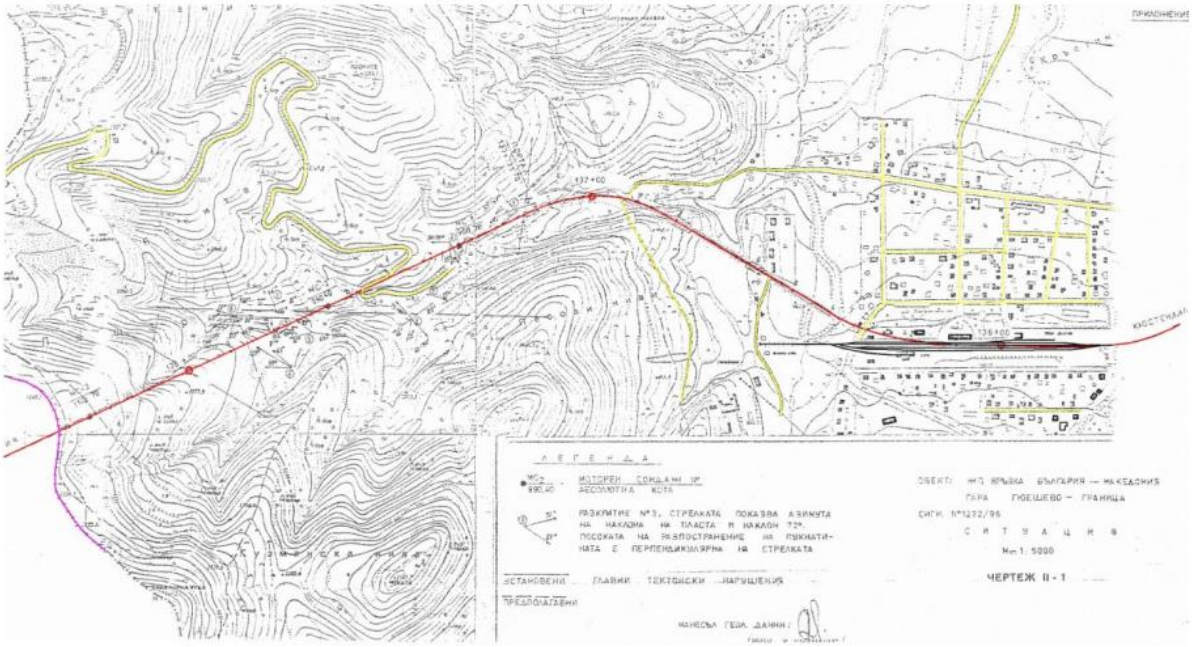


Figure 6 Railway alignment in the territory of the Republic of Bulgaria[6]

[6] Brief Report on Alignment Section within the Republic of Bulgaria, Preparation of Detailed design and tender documentation for construction new railway section Kriva Palanka – Border with Republic of Bulgaria, as part of Corridor VIII, EuropeAid/136050/IH/SER/MK

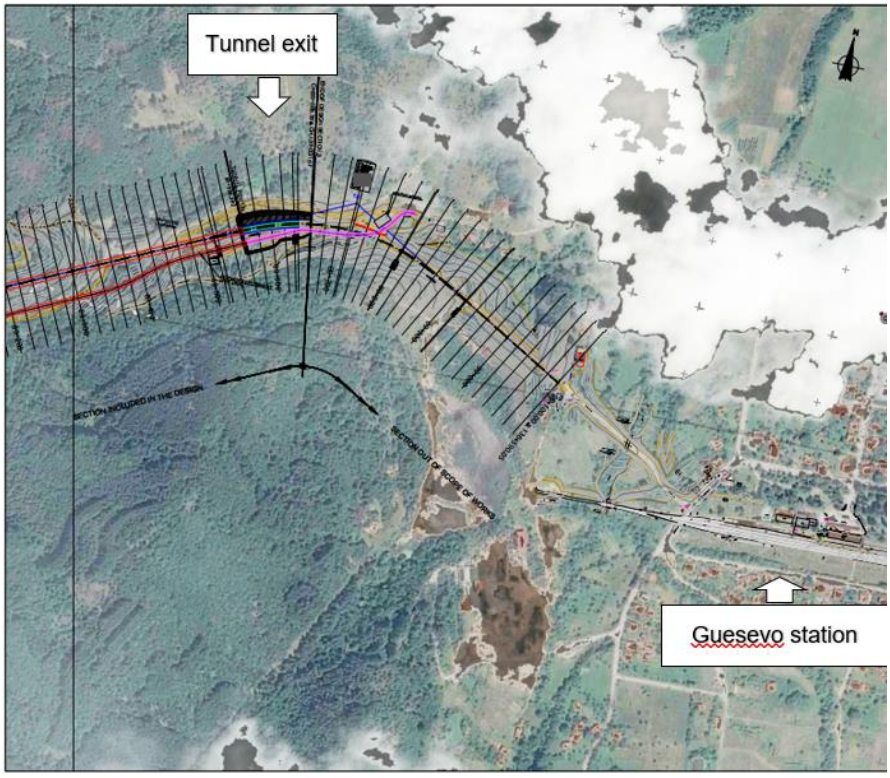


Figure 7 Exit of tunnel and Gyueshevo station in Bulgaria

PR 1/ESS1: Assessment and Management of Environmental and Social Risks and Impacts

The Cross Border tunnel and connection at Gyueshevo is subject to an on-going national level Environmental Impact Assessment (EIA) in accordance with the requirements of the EU EIA Directive ((2011/92/EU as amended by 2014/52/EU), which is aligned with the mitigation hierarchy. The EIA is due for completion in Q4 2023 and should identify any potentially significant environmental impacts, and mitigation measures to avoid or minimise those impacts. In accordance with the Directive, an EIA should assess impacts on population and human health, however, the scope and depth of social impacts considered in an EIA is typically less extensive compared to an ESIA, especially in relation to labour issues. Additionally, there is unlikely to be a requirement for the development and implementation of an ESMS commensurate with the E&S risks and impacts of the Project, as per the objectives of PR1, as a result of the EIA. It is anticipated that any labour risks that are not considered as part of the EIA will be addressed through the relevant labour laws discussed under PR 2 below. Whilst an ESMS may remain a gap in terms of the requirements of PR 1, in general the construction and operation of the AF is expected to align with the objectives of this PR.

PR 2/ESS8: Labour and Working Conditions

Bulgaria became a member of the International Labour Organisation (ILO) in 1920 and has ratified the two core Conventions of the ILO relating to child labour (ILO Convention No. 138 on the minimum working age was ratified in April 1980. ILO Convention No. 182 on the worst forms of child labour was ratified in July 2000). Additionally, the Abolition of Forced Labour Convention (No. 105) the Convention of the Right to Organise and Collective Bargaining Convention (No. 98) and the Discrimination (Employment and Occupation) Convention (No. 111) have been ratified and are in force.

The Bulgarian Labour Code is the most significant source of labour laws and regulates all matters relating to working conditions. In accordance with the Labour Code, the minimum working age is 16 and a minimum wage is specified. Furthermore, the Protection from Discrimination Act prohibits all forms of discrimination and harassment in the workplace (including due to gender, disability and citizenship).

It is considered that the required implementation of the Labour Code in Bulgaria will ensure that the construction and operation of the AF will be in alignment with the objectives of PR2.

PR 3/ESS3: Resource Efficiency and Pollution Prevention and Control

The construction and operation of the Cross-Border tunnel and connection to the existing railway network in Bulgaria is not anticipated to be resource intensive or result in significant, long term GHG emissions (as the trains will be electrified). Impacts relating to environmental pollution will be addressed through the EIA process, which will be aligned with the adoption of the mitigation hierarchy, and are anticipated to primarily be in relation to noise and dust resulting from construction activities (especially if there is a requirement for blasting), as there are a number of residential properties within 500m of the assumed construction area. Based on a review of satellite imagery, there are no surface water bodies (rivers, streams, lakes, ponds) that could be directly affected. It is assumed that hazardous substances and materials will be used during the construction process (e.g. fuel, oils and lubricants) but that the EIA is expected to specify the requirement for the development and implementation of a Construction Environmental Management Plan (CEMP) to ensure good practice measures for their transport, storage and use to avoid or limit any resulting soil pollution or risks to workers. The excavation of the cross-border tunnel will result in the generation of significant quantities of spoil that will need to be disposed of (if not re-used). It is expected that this will be managed in accordance with the abovementioned CEMP and national requirements.

PR 4/ESS9: Health, Safety and Security

The Bulgarian legislation regulating health and safety in the workplace is aligned with current EU legislation. In accordance with Article 275 of the Bulgarian Labour Code, employers are obliged to guarantee safe and healthy working conditions (to prevent occupational illness, work related accidents and to provide favorable conditions for the employees physical, mental and social well-being). As such, this is aligned with the objectives of PR 4 in relation to the protection of workers.

As the AF is located within the EU, the infrastructure will be required to meet the relevant Technical Specifications for Interoperability (TSIs), including for Safety in Railway Tunnels and Infrastructure. Furthermore, the Common Safety Method for Risk Evaluation and Assessment will need to be applied as the Project will involve making changes to the railway system in a Member State.

There is no specific EU legislation on community safety during construction, however, given the setting of the AF and the limited number of residential houses in the immediate vicinity of the assumed route of the new railway connection, it is not expected that there will be significant community health and safety risks during construction. This topic should also have been considered as part of the EIA (under Population and Human health) and appropriate mitigation measures identified to minimise or avoid any risks.

PR 5/ESS6: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement

Based on a review of google earth, there is not anticipated to be a requirement for any physical displacement as there are no buildings located within the assumed route from the border tunnel exit point to the existing station. The majority of the connection is within the tunnel, which passes beneath forested land, and the remainder appears to be across non-agricultural land that has already been partially disturbed. As such it is also not expected that there will be any significant economic displacement or livelihood impacts.

PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

The majority of the connection is within the cross-border tunnel. Whilst this passes beneath a forested area, it is not anticipated that there will be significant impacts on the forest as a result. The AF is not located within a Natura 2000 site, the closest site being Karshalevo (Site Code: BG0000294) located approximately 500 m from Gyueshevo station but which is separated from the AF site by the town of Gyueshevo. The site is also not located within any nationally protected areas. The requirements of the EU Habitats and Birds Directives would apply to the presence of any Annex II and Annex IV, and Annex 1 species respectively.

Based on a review of satellite imagery, it is not considered that the AF will have any impacts on Critical Habitat as the above ground section of the connection appears to be at least partially modified habitat. As such, the PR 6 requirement for no net loss or net gain of Critical Habitat is not expected to apply. It is assumed that the EIA will not include an assessment of impacts on ecosystem services. However, given the location and setting of the AF, there are not expected to be any significant impacts on ecosystem services.

PR 8/ESS10: Cultural Heritage

An assessment of impacts on Cultural Heritage is required under the EU EIA Directive and any necessary mitigation measures will be identified as a result of this assessment. Given the AF's setting, it is not anticipated that there is a high risk to any known cultural heritage assets. There may be risks to undiscovered cultural heritage during excavations, however, the EIA should require the preparation of a Chance Find Procedure to minimise this risk.

PR 10/ESS2: Information Disclosure and Stakeholder Engagement

In accordance with the EU EIA Directive, the EIA Report, once completed, will be subject to public consultation for a minimum of 30 days. In addition, given the nature of the project, transboundary consultations are likely to be required. However, a Stakeholder Engagement Plan containing a Community Grievance Mechanism may not be a requisite part of the EIA process. The National Railway Infrastructure Company does have a feedback mechanism publicly available on its website, an active social media presence and a public relations office, however there could be a risk that stakeholder grievances will not be managed and responded to appropriately and the AF will not fully align with the objectives of PR 10.

Project Related Facilities

Facilities that are related to the Project but which are not Associated Facilities as per the EBRD definition and defined as supporting/enabling activities/facilities by EIB (ESS1) include:

- Existing Quarries and borrow pits
- Existing concrete batching plants that will supply concrete to support Project construction.
- Construction Camps
- Temporary Access Roads

The construction of Section 3 will require operation of borrow pits, quarries, and concrete batching plants. The excess spoil material will require appropriate disposal to a proper spoil disposal site. Temporary roads will need to be built to provide access to construction sites.

Borrow Pits and Quarries

Whilst a significant portion of excavated material from the construction of tunnels and cuttings will be suitable for re-use for the embankments, materials with more strict requirements (ballast, sub-ballast, aggregates) will be obtained from borrow pits and quarries.

As part of the Detailed Design in 2016, preliminary locations for borrow pits and landfills for inert waste had been suggested. Since the Project will be implemented under FIDIC Yellow Book (Design and

Build), final borrow pit locations will be selected by the Contractor who will have to conduct necessary investigations. If the Contractor wishes to use new borrow pits, these must be approved by the regulator, including the environmental authority and subject to the requirements included in the ESMP. PE ZRSMI will oversee and monitor the Contractor's performance, including the selection of borrow pits and related permitting (i.e. EIA consent, usage permit, etc.). When selecting the borrow pits and landfill sites, the Contractor needs to take into account the conclusions of the SBA regarding the review of these locations from a biodiversity perspective:

- Following a review of the locations for proposed borrow pits[7] and landfills for inert waste[8] (Figure 20) landfill and/or borrow pit site that intersects with habitats assessed as as PBF/CH will not be used. Furthermore, all borrow pits and disposal sites should be subject to E&S assessment by the Contractor and include design specifics to insure erosion control, drainage and final reinstatement.
- Hence, alternative borrow pit site will be provided for the one assigned to exploit alluvial and sediments between T-19 and T-20, that is located in the immediate vicinity of C3.62: Unvegetated river gravel banks; C3.61: Unvegetated river sand banks and F9.12 Lowland and collinear riverine [*Salix*] scrub (22°26'13.08"E; 42°12'49.91"N) in the area of Uzem. Alternatively, materials should be procured from outside of the area of interest.
- Alternative landfills will be provided for the ones affecting habitats assessed as PBF/CH. These are:
  - Landfill No 18 (22°21'1.64''E; 42°13'0.90''N) affecting G1.11: Riverine [*Salix*] woodland and C2.22: Hiporhithral streams
  - Landfill No 26 (22°24'2.40''E; 42°13'26.68''N) affecting representative C2.22: Hiporhithral streams; E2.2: Low and medium altitude hay meadows and mesophillous oak forests
  - Landfill No 28 (22°25'4.19''E; 42°13'24.67''N) affecting G1.11: Riverine [*Salix*] woodland
  - Landfill No 29 (22°25'43.79''E; 42°13'9.24''N) affecting E2.2: Low and medium altitude hay meadows and mesophillous oak forests and G1.69: Moesian [Fagus] forests
  - If feasible, Landfill No 30 (22°25'4.19''E; 42°13'24.67''N) affecting the edge of mesophillous oak forest

Extraction from the Kriva River stretch should be avoided to the extent possible. If necessary, environmental impact assessment to be conducted by experienced environmental and biodiversity experts.

Locations of construction camps have not been proposed yet and the Contractor will determine them in liaison with the municipal authority of Kriva Palanka and in accordance with the ESMP.

Special borrow pit for materials to build the embankments are initially not foreseen, because the potential reserves that may be got from the cuttings satisfy the necessary amounts for creating the embankments.

Spoil Disposal

Construction of tunnel structures will result in a significant volume of excavated material. The estimation provided in the Detailed Design is that a total of 2.8 million m^3 of rock and soil will be excavated during the railway construction (2.35 million m^3 of rock and 0.45 million m^3 of soil). The design information suggests that c. 55% of the excavated material will be suitable for re-use for the construction of embankments, however, the excess estimated to 1.3 million m^3 will have to be disposed of at landfills for inert waste. A total of 12 potential spoil disposal sites were identified as part of the Detailed Design and a geotechnical survey was conducted at each site in 2017. Final spoil disposal locations will be

[7] Review of borrow pits along the project corridor. Info provided in Report on Materials, Borrow Pits and Landfills Version B, 30th October 2017 EuropeAid/136050/IH/SER/MK

[8] Review of landfills in need of review along the project corridor (from 35 in total). Info provided in Report on Materials, Borrow Pits and Landfills Version B, 30th October 2017 EuropeAid/136050/IH/SER/MK

selected by the Contractor and subject to regulatory approval from the regulator, including the environmental authority. PE ZRSMI through the Supervision engineer will oversee and monitor the Contractor's performance, including the selection of borrow pits and related permitting (i.e. EIA consent, usage permit, etc.).

Access Roads

According to the Detailed Design, a total of 46 access roads will be constructed (total length about 10.6 km) providing access to bridge abutments and piers, tunnel entrances and exits, and tunnel firefighting points (where there is no access from an existing road). All new access roads are planned as dirt roads with a design speed of 40 km/h. Typical cross section width is 3.50m for the roadway (1.75m for each lane) and 1m shoulder on both sides. Upon completion of construction, the majority of the roads will be restored while some roads might remain if identified to be important for the local community (which will be decided in consultation with communities in the Kriva Palanka Municipality).

Several access roads dominantly in Kriva Palanka have been identified to have significant social impact, due to what a redesign of the access roads has been initiated and done that should result with avoiding of 23 houses to be demolished.

Concrete Batching Plants

Concrete will be delivered to the construction site either by concrete mixers or the materials will be mixed onsite using concrete batch plants. The Contractor will decide how concrete will be delivered, including the possible locations of batching plants. PE ZRSMI will oversee and monitor the Contractor's performance, including the selection of borrow pits and related permitting (i.e. EIA consent, B environmental permit, permit for exploitation of mineral resources etc.).

Storage areas

The construction of Section 3 will need some additional space for workers, camps, storage areas, auxiliary materials and fuels, all to be decided by the future Contractor. PE ZRSMI will oversee and monitor the Contractor's performance, including the selection of borrow pits and related permitting (i.e. EIA consent, usage permit, etc.).

Electrification of Section 1, 2, and 3

The electrification works of the Section 1, 2 and 3 will include building of a completely new Overhead Contact Line System (OCLS) and relevant earth protection system along the entire length of 88 km, using 25kV AC at 50Hz.

According to the Detailed Design, traction power will be provided by the 25kV Traction Power Substation (TPS) of Kratovo which will be built adjacent to the Railway Station Kratovo at km 47.5 and will be connected to the grid via the existing OHL 110kV.

The Kratovo TPS will comprise two traction power transformers 110/27.5 kV of 8 MVA each, and an appropriate switchgear 110kV.

Connection to 110 kV feeder and 110 kV current transformer station (110 kV TS) will be built at the same location of 25 kV TPS.

The first 10km of the Section 1 will be fed from the existing TPS Miladinovci along the railway Corridor X (Skopje – Kumanovo), the remaining part of the Section 1, 2 and 3 will be fed from the proposed TPS in Kratovo. The location of the proposed TPS Kratovo is shown on Figure 1. The aerial view of the TPS site is shown on Figure 8.

Electrical feeding of the initial 10km of the Section 1 will require installation of a load breaker at the Kumanovo Railway Station and building of a switching station at km 10 (Section 1). No additional land acquisition will be required for the electrification works, including the electrical feeding work at the Kumanovo Railway Station and the construction of the proposed TPS Kratovo.

Figure 8 Aerial View of the Area of Proposed Traction Power Substation 25kV and Switchgear 110kV "Kratovo" (August 2020)

According to the Detailed Design, the TPS layout area is approx. 50m x 30m.

The electrification works will comprise installation of steel catenary masts, portal structures, cantilevers, line feeders, feeding cables, switchyard with associated equipment, bonding of tracks, and earthing of all metal structures within the OCLS protection zone.

According to the Detailed Design, mast foundations will consist of cast in-situ reinforced concrete piles. Each mast is fixed at the top of its foundation via steel anchor bolts embedded into the foundation's concrete.

The installation of masts and wires on the rail right-of-way will primarily take place from on-track vehicles. No new access roads will be required apart from those established during the railway construction. The Contractor will decide how concrete will be delivered, concrete mixers are likely to be used. The electrification works will require storage areas for materials and equipment.

An additional TPS in Kriva Palanka or Zidilovo remains a possibility in order to mitigate the potential issue of instable supply of OCL in the case of failure of TPS Kratovo. The TPS site in Kriva Palanka or Zidilovo has not been determined yet.

Benefits of Electrification

The Republic of North Macedonia has signed (2015) and ratified (January 2018) the Paris Agreement, with the following contribution to the global efforts for GHG emissions reduction (Macedonian NDC): "*To reduce the CO_2 emissions from fossil fuels combustion for 30%, that is, for 36% at a higher level of ambition, by 2030 compared to the business as usual (BAU) scenario*".

Participating with 29.3% in 2018, the transport category is the second biggest contributor in the overall Energy sector emissions.[9] Three subcategories actively contributing to the emissions: Road Transportation, Railways and Domestic Aviation. Road Transportation releases almost all of the emissions 99.6% in 2019, while emissions from Railways are nearly 0.4%. The emissions from the Transport show an increasing trend, or 26.5% more emissions in 2019 compared to 2014, and 12.4% more in 2019 compared to 2016. Over the period 1990 – 2016, the emissions had increased by almost 200%.

The scenarios for mitigation of GHG emissions considered in the country climate change documents identify numerous policies and measures (PAMs), among which few are considered for the transport sector[10]:

- Increased use of the railway (PAM 27),
- Construction of the railway to Republic of Bulgaria (PAM 31),
- Electrification of transport.

When it comes to the air emissions, the Annual National Report on the Quality of the Environment[11] identified the following key emission sources of air pollutants: energy industries, road transport sector, residential sector, construction activities, waste and manufacturing industries. Furthermore, the Road transport sector is a significant contributor of NO_x and CO emissions in the country.

The electrified railway along the Eastern Corridor VIII will introduce the energy efficient and sustainable mode of transport to the area where road transport is still predominant. Electrification enables haulage of heavy freight trains and increases their speed. It is expected to result in avoiding air pollution emissions[12] that would otherwise be emitted from diesel locomotives or fossil fuel transport vehicles. Electric trains will also provide lower noise impact to the environment for the passengers and those living nearby, since they are they're quieter than the diesel trains. Electrically powered trains are more energy efficient than diesel-electric trains. Reduced energy use also translates into reduced air emissions. Reductions in air pollutant emissions represent long-term health and quality of life benefits for residents along the Eastern Corridor VIII.

Rail electrification is an important part of every country carbon strategy. Typically, an electric train emits between 20% and 35% less carbon per passenger mile than a diesel train. This benefit will only improve as the electricity generation industry reduces its carbon levels. Electric trains also have zero emissions at the point of use, of particular benefit for air quality in pollution hot spots like cities.

1.3 The Project Status

No works have been done on Section 3 so far, except for some early works on the construction of the tunnels (partly drilled tunnel in Kriva Palanka and border tunnel "Deve Bair" on the territory of North Macedonia).

[9] Fourth National Communication on Climate Change, National Inventory Report, July 2021

[10] MACEDONIAN ENHANCED NATIONALLY DETERMINATED CONTRIBUTIONS, technical document, November 2020

[11] https://air.moepp.gov.mk/wp-content/uploads/2017/07/AirQualityReport_MK.pdf

[12] Soot, volatile organic compounds, nitrogen oxides, and sulfur oxides.

Sections 1 and 2 of Corridor VIII Railway are already financed by the EBRD. About 54% of the works on Section 1 were completed before the works were suspended in 2021. The works on Section 2 have not started yet, although most of the structures on this section (bridges and tunnels) have already been built (Figure 9 and Figure 10). The rehabilitation and construction works at Section 1 and 2 have been commenced in October 2022.

Figure 9 Partially Built Station Buildings on Section 2 – Beljakovce (left) and Shupli Kamen (right)

Figure 10 Partially Built Structures on Section 2 – Viaduct (left) and Tunnel (right)

Permitting

The Section 3 project has a valid EIA Consent and is in compliance with Macedonian environmental regulatory requirements (Decision issued in 2018[13], renewed in 2021[14] and 2023, valid until February 2025). Given that the construction will not commence before 2024, PE ZRSMI has submitted a request for the second renewal of the EIA Decision (Archive No.1902-501/1, 02.02.2023) and the EIA Consent has been extended for two more years (EIA Decision, Archive No.11-986/2, 10.02.2023. The permitting for the Project is continuing, the Construction Permit is yet to be obtained.

Borrow pits and disposal sites must be approved by the regulator, including the environmental authority and in coordination with the municipality (particularly for disposal activities). If the Contractor wishes to use new borrow pits, these must be approved by the regulator, including the environmental authority.

[13] Archive No.11-77/2 from 05.06.2018)

[14] Archive No. 11-485/2 from 10.02.2021

The Contractor will be responsible to conduct the local EIA procedure for any new borrow pit dedicated to the Project in order to obtain the usage permit. Any potential extraction from the Kriva River stretch has to be coordinated with the water management authority. The Contractor will be legally obligated to obtain water management consents and/or permits for in-water and near-water works, in line with the Law on Water, as well as for any use of river water or discharge of wastewater into watercourses. PE ZRSMI will oversee and monitor the Contractor's performance, including the selection of borrow pits and related permitting (i.e. EIA consent, usage permit, etc.). The ESMP for the Project will include general requirements for the selection of spoil disposal sites related to topography, proximity to the alignment, biodiversity features and sensitiveness, presence of watercourses, drainage, etc.

The electrification of Section 1, 2 and 3 was subject to the 2012 ESIA, the EIA Consent was issued in 2012 (Archive No. 11-1974/5, 05.11.2012), and now is formally expired. The ESIA 2017 includes electric traction for this section through an Overhead Contact Line System (OCLS) operating at 25 kV, 50 Hz. However, this noted the following "The Preliminary Design includes a design without substation at Kriva Palanka and with the parallel feeders.". Electrification works should be subject to a new EIA, according to the requirements of the Law on Environment (most probably simpler EIA, under art.24 of the Law).

Transboundary Effects

As the Section 3 project includes the Macedonian part of the cross-border tunnel with Bulgaria, the project is subject to the Espoo Convention on EIA in a Transboundary Context. The national ESIA process involved the environment authorities of Bulgaria which provided their requirements for the ESIA, and particularly asked for consideration of potential effects of the cross-border tunnel construction on existing fissured groundwater bodies (aquifers) on the Bulgarian side. In the ESIA the groundwater aquifer was found to be low-sensitive as the rocks are low-permeable and the groundwater depth was reported to be at about 100 m below ground level.

Upon the consideration of the ESIA and associated design documents, in April 2018 the Bulgarian Ministry informed the Macedonian counterpart that the assessed effects of the cross-border tunnel were found to be acceptable by the relevant water management stakeholders and that no significant health effects were anticipated for the population of the nearby Bulgarian village of Gyueshevo. The Bulgarian Ministry decided that no public consultation for the Project is necessary, concluding that "there is no need for further participation of the country in the EIA procedure, including a public discussion of the report in the border region of the Republic of Bulgaria".

The correspondence conducted as part of the transboundary EIA process is publicly available on the Bulgarian Ministry website: https://www.moew.government.bg/en/construction-of-section-3-of-rail-corridor-viii-kriva-palanka-border-with-the-republic-of-bulgaria/.

1.4 ESIA and ESIA Addendum

The original Environmental and Social Impact Assessment developed for Section 3, done by IDOM in 2017[15] was prepared in accordance with national EIA procedures at the time of its issue.

The original ESIA was a comprehensive document which to a large extent adequately identified the risks and potential impacts of the Section 3 project. The ESIA included an Environmental and Social Management Plan (ESMP) which addressed issues raised in the ESIA and incorporated required mitigation measures.

[15] Study for assessment of the impacts on the environment and social aspects from the construction of a new railway on the section Kriva Palanka-Border with the Republic of Bulgaria, as part of Corridor VIII November, 2017, IDOM in consortium with ADT OMEGA, ZPD and DECONS EMA Skopje, DO EuropeAid / 136050 / IH / SER / MK

However, as the majority of the alignment is situated in an undeveloped and uninhabited upland, it was presumed that environmental receptors were in their natural condition and the baseline settings were presented at a desk study level. The key shortcomings are related to the lack of environmental baseline surveys (biodiversity, ambient air quality, surface water, soil, social baseline) or insufficient surveys (background noise).

In addition, Section 3 of the project has been subject to design changes and new Lender requirements (which now includes the 2019 EBRD E&S Policy, 2022 EIB E&S Standards and EU requirements) so additional information is now needed for this part of the Project. The Lenders review of the project assessed the existing 2017 ESIA Disclosure Package and other relevant project information (e.g. the 2017 Updated Feasibility Study, 2012 ESIA, the Resettlement Policy Framework, stakeholder identification, PE ZRSMI company capacity, etc).

Following the project review, this ESIA Addendum has been prepared to provide up to date information on the project and to address the gaps identified – notably in relation to biodiversity, background noise, surface water, soil quality, ambient air and social quality and social baseline. The ESIA Addendum plus RAP, SEP, ESMP, BMP, and NTS, together form the Supplementary E&S Disclosure Package, which will be disclosed by PE ZRSMI, EBRD and EIB in accordance with their respective disclosure policies as outlined in the SEP.

A Commitment Register is included in Annex 1 and presents the primary topics with the Core Commitment / Management Plan listed in the final ESMP in the E&S Disclosure Package. A summary of gaps identified in the ESIAs (2012 and 2017) which are addressed by this ESIA Addendum is as follows:

The original assessment of biodiversity features[16] of the Project was not proportional to the anticipated environmental risks and not in accordance with the EU Habitats and Birds Directives. A supplemental biodiversity assessment[17] has been conducted by the Consultant to compensate for the gaps and appropriate measures have been identified, together with a Biodiversity Management Plan[18] (BMP). The additional baseline surveys were undertaken for: reptiles, birds and mammals, insects and habitats to establish likely presence or likely absence of species/habitat of conservation concern within the survey area. Habitat map[19] was revised based on the EUNIS, 2012 (parent) habitat types, to establish if any EU Habitats Directive Annex I Habitats are present.

From total of ~40 habitats and ~415 species listed in the ESIA, 2017, the Critical Habitat assessment, took into consideration 10 habitat types and 68 species that, based on the Lenders' requirements qualify for Priority Biodiversity Features/Critical Habitats (PBF/CH). Of these, 8 habitat types were assessed as PBF and 2 were assessed as CH. Total of 21 species were assessed as PBF i.e. 19 birds, 1 amphibian and 1 insect; and 39 were assessed as CH i.e. 16 mammals of which 13 bats; 13 reptiles; 5 amphibians and 5 insects. All species are considered to be relatively widespread and common in the region; for the majority of species assessed, it was found that if appropriate mitigation measures and management actions are implemented to ensure no net loss/net gain, there would likely be no significant impact on the conservation status of the species as a result of the project.

The operational noise impact assessment for the Project was conducted in accordance with Macedonian legislation and did not consider international standards (i.e. World Health Organization, WHO guidelines) which are more stringent. A supplementary operational noise impact assessment and impact modelling has been conducted in order to refine and optimise the noise barriers and mitigate the adverse noise effects on residential areas along the proposed railway alignment (see section 5).

[16] National ESIA for Section 3 (IDOM, 2017)

[17] Supplementary biodiversity assessment, CORRIDOR VIII Railway - Section 3, June 2022

[18] Biodiversity Management Plan, CORRIDOR VIII Railway - Section 3, June 2022

[19] Provided as Annex to the Supplementary biodiversity assessment

The supplementary baseline ambient air quality monitoring (section 2), surface water quality monitoring (see section 3) and soil quality testing (section 4) have been conducted to gather additional data on the state of the environment in the Project area. The monitoring reports are provided as appendices to this ESIA Addendum.

A socio-economic survey has been conducted for the purposes of the Resettlement Action Plan and provides a social baseline for the project. The objective of the survey was to collect data and information on the project affected area and directly affected citizens of the settlements, and especially their affected real-estate and livelihood along the railroad line and the accompanying objects. The project affected settlements are the following: T'lminci, Gradec, Kriva Palanka, Lozanovo, Drenje, Kiselica, Trnovo, Zidilovo, Krklja, Uzem and Kostur. The results from the socio-economic survey are part of the Resettlement Action Plan (RAP).

Cumulative Effects

Cumulative effects of the Project were re-assessed as part of the this ESIA Addendum (see Chapter 10 Cumulative Impacts). ~~T~~

1.5 Methodology

Methodology for determining impact significance has been based on a standard method of assessment considering both sensitivity (i.e. receptor sensitivity to a particular effect) and magnitude of change:

Significance of Impact = Sensitivity of Receptor x Magnitude of Change

The sensitivity of receptor depends on value of the receptor and susceptibility to change. It has been defined as High, Medium, Low or Negligible, based on legislation, international standards, available quantitative/ monitoring data, and professional judgment. Sensitivity of receptors has been determined on the basis of the criteria defined in the Table 1 below.

Table 1 Criteria for Receptor Sensitivity

Receptor Sensitivity	Criteria
High	- The receptor has high (international) importance or ecological value, has very limited potential for substitution. - The receptor is used for horticulture, fruit or other high value crops. - The receptor is used for public water supply / serves more than 50 persons. - Permanently occupied residential structure / hospital / school / kindergarten.
Medium	- The receptor has moderate (national) importance or ecological value, has limited potential for substitution. - The receptor is used for agriculture or permanent grazing. - The receptor is used for limited public water supply / serves less than 50 persons. - Periodically occupied residential structure (e.g. summer house).
Low	- The receptor has local importance or low ecological value or is tolerant of change without detriment to its character. - The receptor is used as industrial land. - The receptor is not used for private water supply or activities relating to water quality. - Non-residential structure (e.g. barn, storage shed).
Negligible	- The receptor is significantly altered has no ecological value. - The receptor is unused land.

The magnitude of change to the receptor arising from the proposed railway project is defined as High, Medium, Low or Negligible. It has been judged in terms of magnitude in space and time and the potential of individual receptor to recover from disturbance. It is based on criteria described in the Table 2 below.

Table 2 Criteria for Magnitude of Change/ Effect

Magnitude of Change	Criteria
High	Long-term loss of resource and/or quality; severe damage to key characteristics, features or elements.
Medium	Loss of resource but not adversely affecting the integrity; short-term loss of resource and/or quality; partial loss of or damage to key characteristics, features or elements.
Low	Minor loss or alteration to one or more key characteristics, features or elements; short-term measurable change in attributes, quality or vulnerability.
Negligible	Short-term very minor loss or detrimental alteration to one or more characteristics, features or elements.

Each impact has been assessed against the change of magnitude and the sensitivity of the receptor as shown in Table 3 below.

Table 3 Criteria for Impact Significance

		Sensitivity of Receptor/Receiving Environment to Change			
		High	**Medium**	**Low**	**Negligible**
Magnitude of Change	**High**	Major	Moderate to Major	Minor to Moderate	Negligible
	Medium	Moderate to Major	Moderate	Minor	Negligible
	Low	Minor to Moderate	Minor	Negligible to Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

The following terms have been used to assess the significance of impacts, where they are predicted to occur:

- Major adverse impact (significant) – where the proposed development would cause a significant deterioration to the existing environment.
- Moderate adverse impact (significant) – where the proposed development would cause a noticeable deterioration to the existing environment.
- Minor adverse impact (non-significant) – where the proposed development would cause a barely perceptible deterioration to the existing environment.
- Negligible impact (non-significant) – where the proposed development would result in no discernible deterioration to the existing environment.

Mitigation Measures

Following the assessment, where appropriate, mitigation measures have been recommended to prevent, reduce or remedy any potentially significant environmental impacts. Such measures are to be implemented during design, construction and/or operation of the proposed development.

Residual Impact Assessment

Following the implementation of mitigation measures, an assessment of the significance of any residual impacts was undertaken.

2. Ambient Air Quality

2.1 Introduction

This chapter reports on the findings on the ambient air quality monitoring conducted on Section 3 and supplements the information related to ambient air as assessed in Chapter 7.5.1: Impacts on Ambient Air of the national ESIA for Section 3 (IDOM, 2017).

2.2 Baseline Conditions

As noted in the ESIA, the primary air polluters in the Project area are traffic and individual fossil-fuel combustion sources used for heating in winter. The local waste dump site in Kriva Palanka is an occasional source of air emissions due to spontaneous waste combustion. The majority of industrial activity in the Project area are small businesses and no large stationary industrial air-polluters are present. The expressway road is currently under construction in the upland above T'lminci and Kriva Palanka and the earthworks are ongoing, likely presenting the additional temporary source of air pollution.

The regional road A2 is a key source of air emission from traffic. Kriva Palanka is the largest settlement with around 6,600 households primarily using fossil fuels for heating (Figure 11).

Figure 11 Air Pollution Sources – A2 Road (left) and Kriva Palanka Town (right)

The Project area is not included to the state ambient air monitoring network. The ESIA did not include ambient air quality monitoring. To determine the ambient air quality along the Project alignment, a supplementary baseline survey was undertaken as part of the supplementary ESIA.

There are no high-sensitive receptors along the majority of the proposed railway alignment. The only high-sensitive receptors identified are in the town of Kriva Palanka. A health centre and several elementary schools are situated between 300 and 500m east of the 996 m tunnel proposed underneath the town. Additionally, some of the proposed access roads in the area of Kriva Palanka would pass through densely populated areas.

2.3 Additional Baseline Surveys

The supplementary baseline monitoring of ambient air quality was undertaken over the course of two weeks in May 2022[20]. The monitoring was focused on settlements within the right-of-way which will be most exposed to dust and particulates emission during the construction phase of the Project.

Ambient air quality was monitored continuously for 7 days at five locations in the settlements of Tlminci, Kriva Palanka (2 locations), Zidilovo, and Uzem (Figure 12). The pollutant of interest was PM10.

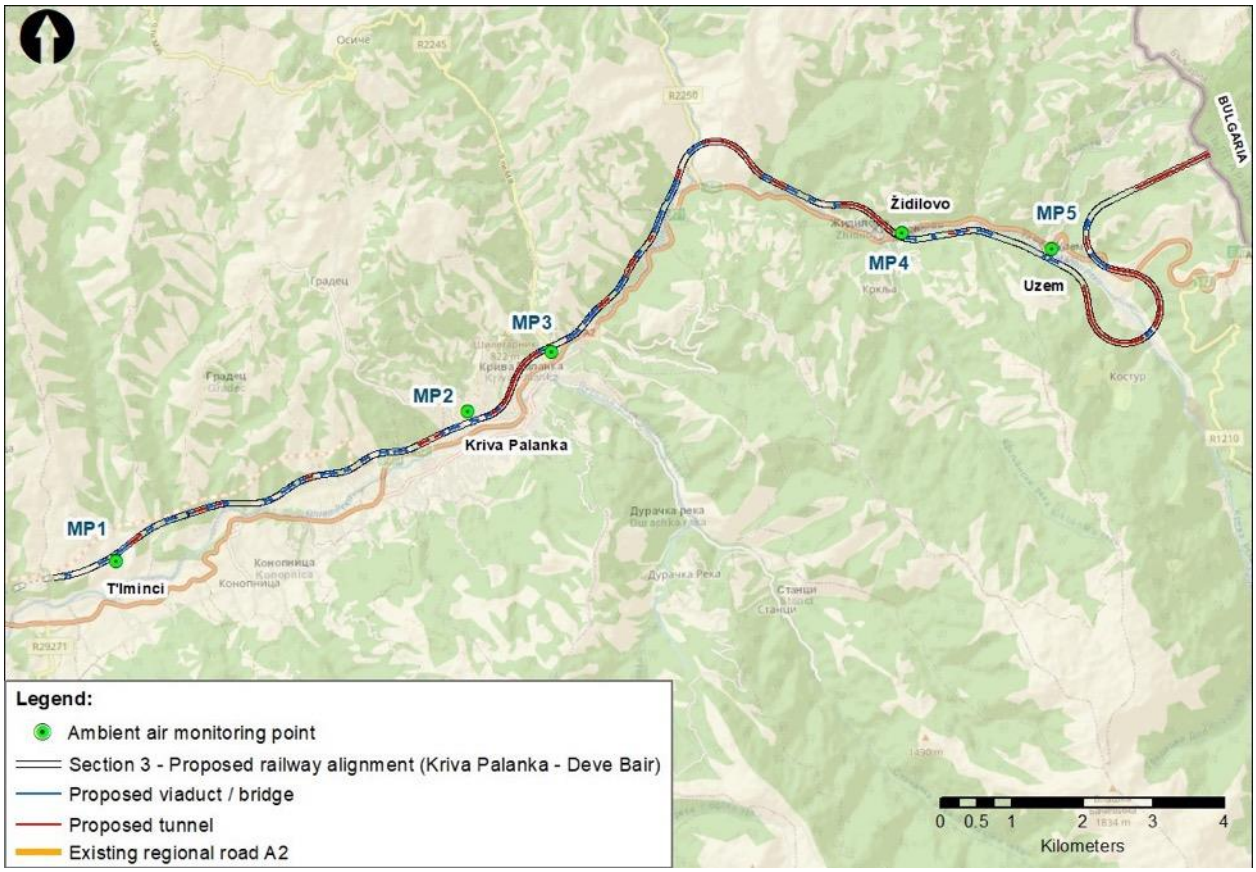


Figure 12 Locations of Ambient Air Monitoring Points

The monitoring results indicated that PM10 was mostly below the 24-hour limit value (50 µg/m^3) except one daily exceedance at the monitoring points in Tlminci (57 µg/m^3), Zidilovo (74 µg/m^3), and Uzem (55 µg/m^3). The Macedonian legal limit is 35 exceedances of a 24-hour value within the period of one year.

2.4 Potential for Additional Impacts to Air Quality

The supplemental baseline survey suggested occasional exceedance of PM10 24-hour limit values in some of the settlements along the proposed route. The recorded morning air temperatures during the monitoring period were relatively low (the minimum was 8° C) which presumably caused burning of wood/ coal for heating in the morning. It is of note that the monitoring was conducted in spring and that

[20] REPORT OF AMBIENT AIR QUALITY –SUSPENDED PARTICULATE MATTER ON THE KRIVA PALANKA MUNICIPALITY, May 2022, AMBICON Lab, Faculty of Natural and Technical Sciences, Goce Delchev University Stip, Connecta: "Gap Analysis and Safeguard Documentation: Category A Project CORRIDOR VIII Railway - Section 3 Kriva Palanka-Border with the Republic of Bulgaria, North Macedonia"; This report is only available in English.

during the heating season (November – April) the ambient air quality is most likely additionally affected by PM10.

The 2017 ESIA in Chapter 7.5.1: Impacts on Ambient Air reported the following potential adverse construction phase impacts:

- Dust and particulate emission;
- Emission of exhaust gases;
- Emission of volatile organic compounds;
- Emission of aerosols and welding gases.

For the purpose of this ESIA Addendum, the air quality impacts have been re-assessed to take into account the supplemental ambient air quality monitoring data.

During the construction phase, dust and PM10 emissions might be potentially exceeded. Key sources of dust and PM10 emissions would be demolition works, earthworks, general construction works and track out. The change would be local, short-term and temporary with the highest concentrations anticipated to be within the construction site footprint and the immediately adjacent areas, within 100m of the centreline of the Project. The change will be temporary and pollutant concentrations will return to ambient levels upon completion of the construction works.

If uncontrolled, dust and PM10 deposition would have direct, temporary and short-term medium magnitude change on the residential receptors (high sensitive) which would result in **moderate adverse impact (significant)**. As the distance increases, the deposition rates would decrease and the magnitude of change at other properties would be low to negligible leading to **minor adverse impact (non-significant).**

The exhaust emissions from construction vehicles and transport equipment would contribute to the existing traffic emissions at the local roads. No long-term idling is anticipated along the transport route in the vicinity of residential receptors. Given the temporary nature of the construction period, the impact on local air quality is likely to be **negligible adverse (non-significant)**.

Chapter 7.5.1: Impacts on Ambient Air of the ESIA reported the following potential adverse operational phase impacts:

- Emission of exhaust gases from diesel locomotives and machinery during track maintenance.

The 2017 ESIA considered EU and Macedonian ambient air quality standards. The ESIA was based on a qualitative assessment and did not include road traffic dispersion modelling; however, it has been assumed that there would be a minor beneficial impact from the Project, particularly for residential receptors located in the vicinity of the existing regional road A2, as the Project will likely contribute to a certain extent to reduction in car, bus and heavy goods vehicle trips along the A2.

Air emissions during the Project operation will be associated with diesel-locomotives (used for hauling in stations) and machinery and equipment for the railway maintenance. The magnitude of these emissions is judged to be low and in areas of high-sensitive receptors (residential properties) it would result in **negligible adverse impact (non-significant)**.

2.5 Consideration of Needs for Additional Mitigation

Due to the occasional exceedance of particulate matter in the settlements of Tlminci, Zidilovo, and Uzem, it is recommended to implement a real-time recording of PM10 emissions levels in these areas during the earthwork activities.

Mitigation and monitoring measures will be implemented through the Environmental and Social Management Plan (ESMP).

Construction risks will be controlled by implementing actions and restrictions in the Contractor's CESMP. The ESIA proposed a set of mitigation measures which have been incorporated into the Project ESMP, including the Ambient Air Quality and Dust Suppression Plan and Construction Traffic Management Plan which will be developed and implemented by the Contractor.

2.6 Residual Impacts

Provided that the mitigation measures required by the ESMP are implemented throughout the construction of the Project, the residual impacts on ambient air quality will be **minor adverse to negligible (non-significant)**.

Once the Project is operational, the significance of impacts on air quality following the implementation of the mitigation measures, the residual impacts are expected remain **minor beneficial (non-significant)**.

2.7 Summary

The results of the supplementary ambient air quality monitoring have not materially altered the conclusions of Chapter 7.5.1: Impacts on Ambient Air of the ESIA.

3. Surface Water

3.1 Introduction

This chapter reports on the findings on the surface water quality monitoring conducted on Section 3 and supplements the information related to surface water as assessed in Chapter 7.3.1: Impacts on Hydrology and Surface Water of the national ESIA for Section 3 (IDOM, 2017).

3.2 Baseline Conditions

The main watercourse in the Project area is the Kriva River which originates at the Osogovo Mountain at the border with Bulgaria and generally runs in the E-W direction. The Project alignment mostly runs

in the upland area above the Kriva River valley and will cross a number of intermittent and ephemeral streams which run down the slopes and discharge into the Kriva (Figure 13).

Figure 13 Hydrological Map of Section 3

Compared to the 2017 ESIA data related to public water supply, there have been no major changes. Kriva Palanka is supplied from a group of mountain springs (Kalin Kamen) situated several kilometers upland from the Project alignment, up-gradient of the alignment, hence outside the Project zone of influence. However, the presence of various solutions for private water supply (PWS) of residential houses (and livestock) in the vicinity of the alignment cannot be ruled out (e.g. shallow groundwater wells, tapped low-yield springs, collection of near-surface or surface water). The ESMP included the requirement for PWS management during the construction, including the tunneling works.

The Kriva River in the area of the proposed Zidilovo halt is shown on Figure 14.

Figure 14 The Kriva River in the Zidilovo Halt Area in January 2022

Flood Risk

The Project area is prone to flash floods of medium to high-gradient ephemeral streams running towards the Kriva River in the valley. During snow melt and high rainfall periods (May, November) the ephemeral streams become torrential, carrying significant sediment load and occasionally flooding the Kriva River valley. However, the Project area is not identified as an area under risk of heavy rainfall and rapid snow melt, according to the national Hydro-Meteorological Institute (Figure 15).

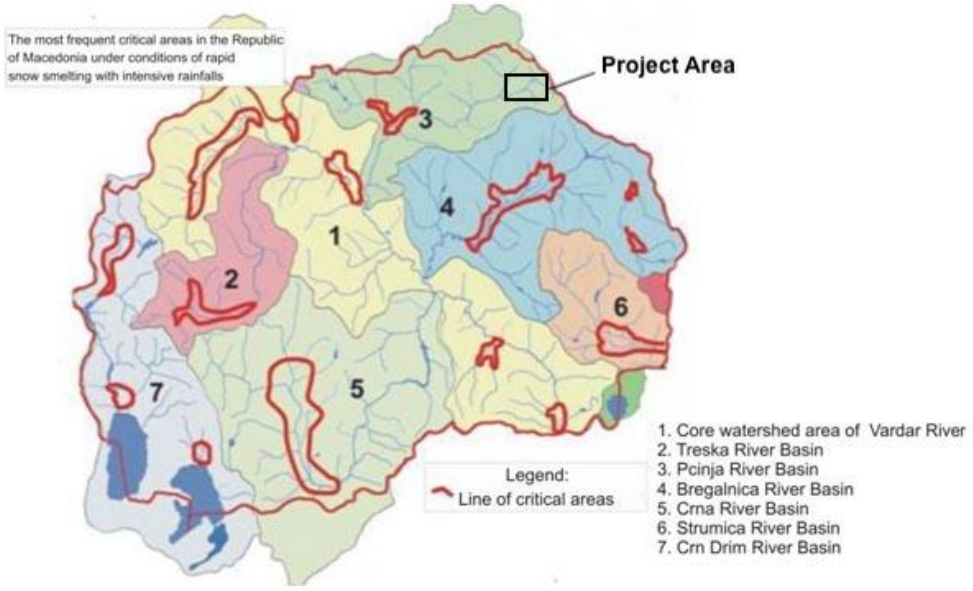


Figure 15 Most Critical Areas in N. Macedonia Affected by Intense Rainfall and Rapid Snow Melt

(source:https://www.eea.europa.eu/soer/2010/countries/mk/freshwater-drivers-and-pressures-macedonia/map-3-the-most-frequent-1/view)

Watercourse Crossing

The Project will cross a number of ephemeral watercourses and the Kriva River. The significant part of the proposed alignment (c. 14km or 60%) runs along viaducts or bridges and tunnels. The remaining 40% of the alignment will include box culverts (2m x 2m) and pipe culverts (1m), all sized for the 100-year rainfall event. The Detailed Design has considered the need to maintain flood flow conveyance through proposed hydraulic structures (bridges and culverts). The culvert design has taken into account flood / climate change risks (discussed in Chapter 9 Climate Change Mitigation and Adaptation).

Where possible, the bridges piers have been designed with a set back from the watercourses floodplains for a 100-year rainfall event to prevent impact of flow conveyance. Where the floodplains of watercourses in the case of the 100-year rainfall could not be avoided, the Detailed Design has included countermeasures for reducing bridge pier scour. The measures include local protection around piers (e.g. mattresses) and stream training works (i.e. construction of gabion and mattress structures) to control the width and velocity of the flow, to minimize flooding areas and to avoid flood interference with the bridge piers or abutments.

No properties have been identified in the 2017 ESIA within the area of culverts that might be affected by the flood risk. No significant issues related to change in drainage pattern and retention of surface run-off as a result of the railway are anticipated in the 2017 ESIA.

The Project will require in-water and near-water works, including the regulation of the Kriva River riverbed near the bridge No. 40 and stabilisation of banks/ construction of gabion and mattress

structures in several streams. Permanent diversion of 2 ephemeral streams which cross deep cuts or tunnels will be necessary and temporary diversion of 2 ephemeral streams during the construction will be needed.

The 2017 ESIA did not include any watercourse sampling in the Project area, i.e. did not provide adequate information on baseline surface water quality. The 2017 ESIA provided data from a state monitoring network station on the Kriva River downstream of the Project area (station Trnovec). In both 2014 and 2015 an exceedance of nitrites and cadmium in the river was recorded. The main pressures to the Kriva River water quality are the lead and zinc mine 'Toranica' (1km upstream from the alignment) and untreated domestic wastewater from villages and Kriva Palanka town. Agriculture (uncontrolled use of chemicals) is another potential pollution source although much less significant as the agricultural activity in the Project area is not intensive. A supplementary baseline survey of surface water along the alignment was undertaken as part of the supplementary ESIA.

3.3 Additional Surveys of Surface Water

The supplementary baseline survey of surface water was undertaken in early May 2022[21]. The survey was focused on watercourses that will be crossed by bridges and will require near-water or in-water works. The selected water quality sampling locations (Table 4) are considered representative of the baseline surface water settings in the Project area. Two considered watercourses (WS4 Domački dol – proposed bridge 23 and WS6 Zidilovski dol – proposed bridge 33) were dry and could not be sampled.

Table 4 Supplementary Baseline Survey – Surface Water Sampling Location

Water Sample No.	Watercourse	Proposed Structure	Chainage
WS1	Gabarska reka	Bridge 03	65+841,065 – 66+106,750
WS2	Gradečka reka	Bridge 05	66+742,660 – 66+884,280
WS3	Rangel	Bridge 07	67+360,246 – 67+455,813
WS5	Kiselička reka	Bridge 32	76+402,00 – 76+611,500
WS7	Kriva reka	Bridge 37 and Bridge 40 (sample taken 1km downstream)	79+785,906 – 80+068,737
WS8	Kriva reka	Bridge 40 (sample taken 2km downstream) and Bridge 43	84+094,529 – 84+107,459

Locations where surface water samples were taken are shown on Figure 16.

[21] SURFACE WATER QUALITY REPORT, May 2022, AMBICON Lab, Faculty of Natural and Technical Sciences, Goce Delchev University Stip Connecta: "Gap Analysis and Safeguard Documentation: Category A Project CORRIDOR VIII Railway - Section 3 Kriva Palanka-Border with the Republic of Bulgaria, North Macedonia"; This report is only available in English.

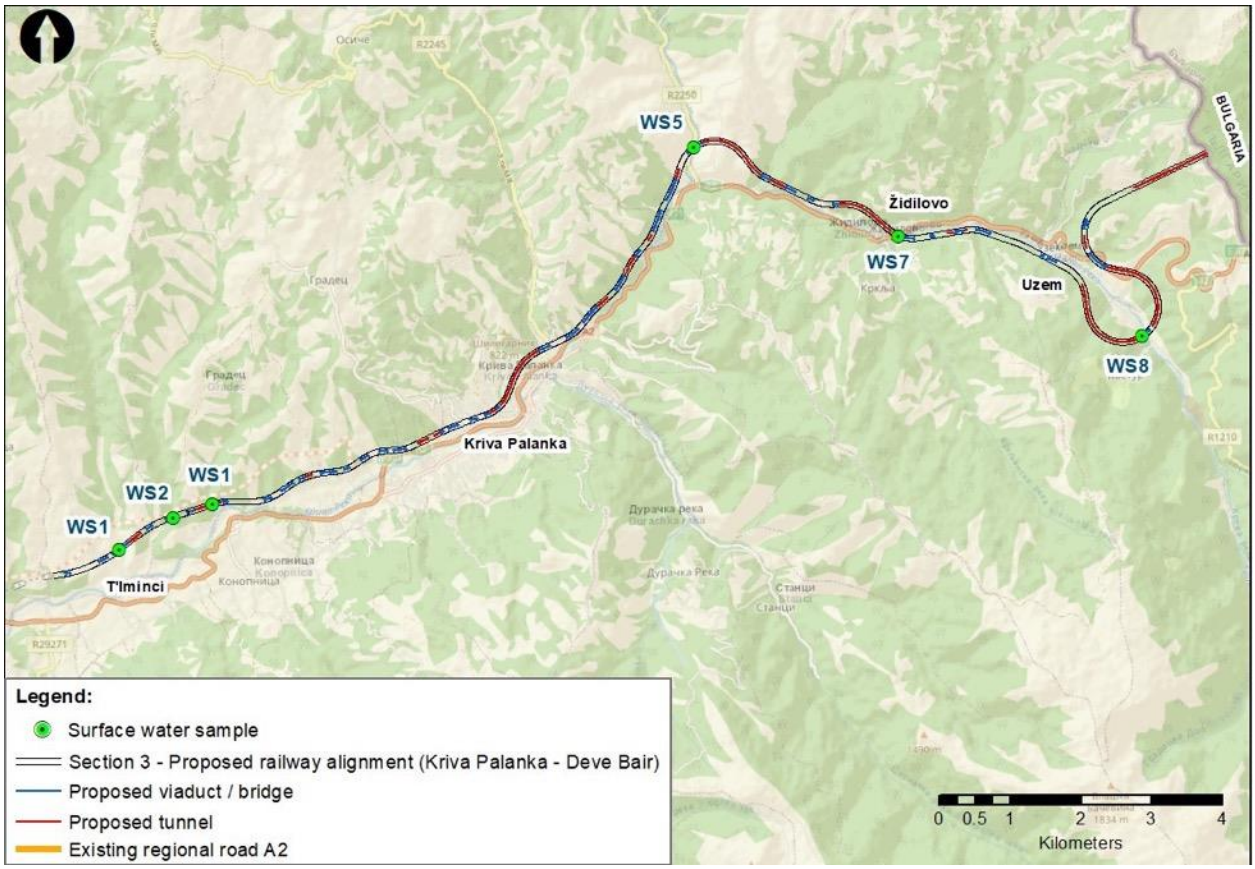


Figure 16 Locations of Surface Water Monitoring Points

The monitoring parameters included basic physical and chemical parameters – pH, Dissolved Oxygen, BOD, COD, Nitrates, Nitrites, Phosphorous, Suspended Solids, Metals (including Arsenic, Copper, Zinc, Lead, Chromium, Nickel, etc), Minerals, Hydrocarbons, Faecal Coliforms, Total Coliforms.

The Macedonian water legislation has not been fully aligned with the EU Water Directive, therefore the ecological status of surface water in the country has not been established yet. Surface waters are classified into 5 classes where the 1st class is unpolluted water with low nutrient content and high-drinking quality, 2nd class slightly polluted, suitable for recreation and drinking (conventional pre-treatment), 3rd class is moderately polluted water suitable for irrigation or industrial use, 4th class is polluted water with high nutrient content that can be used only after specific treatment, and 5th class is heavily polluted water unsuitable for any use. [22]

The monitoring results indicate bacterial contamination in all watercourses, presumably originating from the untreated domestic effluent from villages. Total Coliforms, Faecal Coliforms and Total Aerobic Mesophilic Bacteria were detected in the samples. The most polluted by bacteria are small streams (WS2 – Gradečka reka and WS3 – Rangel), classified as the lowest 5th water quality class, i.e. heavily polluted water unsuitable for any use. The Kriva River and tributaries Gabarska and Kiselička have been classified as the moderately polluted 3rd class, i.e. water suitable for irrigation or industrial use.

Slightly elevated values of zinc and lead have been recorded in the Kriva River samples (WS7 and WS8). This has been expected given that the river has been affected by the nearby lead and zinc mine 'Toranica' (approx. 1km upstream of WS8 and 4km upstream of WS7). The recorded concentrations of zinc belong to the 3rd – 4th class (out of 5 classes) while the lead concentration belongs to 1st – 2nd class of water quality. [22]

[22] Decree on Classification of Waters (Off. Gazette of RM, No. 18/99)

Based on the monitoring results, the general sensitivity of surface water receptors is considered to be low – the watercourses have been affected by untreated wastewater and have not been used for public water supply.

3.4 Potential for Additional Impacts to Surface Water Quality

The supplemental baseline survey confirmed the assumptions regarding the pressures on surface water quality in the Project area. Untreated domestic wastewater from settlements is the primary cause of degraded water quality, followed by the flotation tailings effluent from 'Toranica' mine which affects the upper stretch of the Kriva River.

For the purpose of this ESIA Addendum, the surface water quality impacts have been re-assessed to take into account the supplemental surface water quality monitoring data.

The ESIA (2017) Chapter 7.3.1: Impacts on Hydrology and Surface Water of the ESIA reported the following potential adverse construction phase impacts:

- Impact on the surface water regime (alteration of riverbed morphology);
- Impact on the surface water quality (input of pollutants).

During the construction phase water quality can be affected by excessive sedimentation due to the increase of runoff. The required in-water and near-water works would be related to the regulation of the Kriva River riverbed near the bridge No. 40, permanent diversion of two ephemeral streams and stream training works by construction of gabion and mattress structures.

The sensitivity of the receptor is low and if unmitigated the magnitude of change would be **high**. Therefore, the significance of this impact, without mitigation measures, on the alteration of the Kriva riverbed morphology and water quality, is **moderate adverse (significant)**.

Certain amounts of hazardous materials might be used during the construction. If stored in the immediate vicinity of watercourses, their release would be a change of a high magnitude on a low sensitive receptor which would result in **moderate adverse impact (significant)**.

The ESIA (2017) Chapter 7.3.1: Impacts on Hydrology and Surface Water of the ESIA reported the following potential adverse operational phase impacts:

- Impact on the surface water regime (erosion of riverbed downstream of piers / accumulation of sediment / clogging of drainage systems);
- Impact on the surface water quality (accidental spillages/ input of pollutants).

The Project does not require bridges with piers in the watercourses, however some piers would be below the highest water levels (1 in 100 year flood event). The morphology of the water flow can be altered when bridge piers are constructed within floodplains, causing sediment transportation with the water flow, increasing the sediment load upstream of the piers and causing local erosion of riverbed downstream of the piers. The design-embedded mitigation includes stabilisation of banks of several streams, i.e. training works and construction of gabion and mattress structures to control the width and velocity of the flow. The sensitivity of the watercourses is considered to be medium. Provided that mitigation by design is implemented, the magnitude of change is considered to be low. Therefore, the significance of this impact is **minor adverse (non-significant).**

During the operation phase, accumulation of sediment around bridge piers and in culverts might occur after heavy rainfalls blocking drainage systems and leading to flooding. As the bridges and culverts have been designed for the 1 in 100 year flood event this barrier effect is not likely to be a significant issue. The sensitivity of the receptor is considered to be medium, and the magnitude of change is

considered to be low. Therefore, the significance of this impact, without mitigation is **minor adverse (non-significant).**

In the event of accidental leakage or spillage of hazardous materials on any of the bridges, the surface water recipient would be affected. All surface water recipients crossed by the railway line are considered highly sensitive to the impact of accidental spillage. Depending on the hazardous material and the volume released, the magnitude of change would be considered medium to high and the significance of non-mitigated impact would be **moderate to major adverse (significant)**.

3.5 Consideration of Needs for Additional Mitigation

The Section 3 Project has already included the design-embedded mitigations in order to maintain flood flow conveyance through proposed bridges and culverts, including the local protection around piers and stabilisation of stream banks by mattress and gabion structures). Additional mitigation proposed as part of this ESIA Addendum is related to control of the construction risks and collection and treatment of wastewater effluent at the stations, during the operational phase.

Mitigation measures will be implemented through the Environmental and Social Management Plan (ESMP).

The construction risks will be controlled by implementing actions and restrictions in the Contractor's CESMP. The 2017 ESIA proposed a set of mitigation measures which have been incorporated into the Project ESMP. In addition, the Project ESMP requires the Contractor to develop and implement Specific Method Statements for construction works in or near watercourses, including the construction of bridges, culverts, riverbed regulation and diversion of streams. The Contractor will cross-reference the Statements with a Biodiversity Management Plan, Emergency Preparedness and Response Plan, and a Pollution Incident Management Plan, which will be required as well. Pre-construction sampling of watercourses will be required as well as an indicative baseline for regular monitoring throughout construction.

The ESMP requires regular maintenance of wastewater collection infrastructure and treatment units (septic tanks and oil interceptors at Kriva Palanka station and Zidilovo halt) during the Project operation.

3.6 Residual Impacts

Provided that the mitigation measures required by the ESMP are implemented throughout the construction and operation of the Project, the residual impacts on surface water will be minor adverse to negligible.

3.7 Summary

The results of the supplementary surface water monitoring have not materially altered the conclusions of Chapter 7.3.1: Impacts on Hydrology and Surface Water of the ESIA.

4. Soil Quality

4.1 Introduction

This chapter reports on the findings on the soil quality testing conducted on Section 3 and supplements the information related to soil as assessed in Chapter 7.2.3: Impacts on Soil of the ESIA.

4.2 Baseline Conditions

As noted in the 2017 ESIA, the Project alignment runs across a variety of soils – brown forest soil is predominant in higher elevations, alluvial soil is present in the Kriva River valley (and its tributaries) while the remaining sections are dominated with regosol (weakly developed, low organic matter) and ranker (high organic matter, low clay content).

The 2017 ESIA provided literature data on chemical composition of the soil in the Project area. The soil is known to have naturally elevated concentrations of lead and zinc (hence the history of mining activities). Adverse man-made impacts on soil have been assumed to originate from agriculture, poor waste management and traffic. Apart from the lead and zinc mine 'Toranica' (1km from the proposed railway) there is no significant industrial activity in the area. Agricultural activity is not very intensive, however its contribution to the soil contamination due to uncontrolled use of pesticides cannot be ruled out. To determine the soil properties along the Project alignment, a supplementary baseline survey of soil has been recommended prior to finalizing the tender documentation.

The sensitivity of the development area to soil erosion is considered to be medium. With respect to soil use, the sensitivity is considered to be medium (agricultural land) to negligible (unused land).

4.3 Additional Surveys of Soil

The supplementary baseline survey of soil was undertaken in early May 2022[23]. The aim was to establish the background concentrations of metals and mineral oil in the soil. The soil samples were tested to basic physical and chemical parameters, heavy metals and hydrocarbons.

A total of 10 composite soil samples were taken from 10 locations along the proposed railway. The samples were taken within the right-of-way and were relatively equally spatially distributed along the 23km-long route. The selected sampling locations are considered to be representative of the baseline soil settings in the Project area.

[23] SOIL QUALITY TESTING REPORT, May 2022, AMBICON Lab, Faculty of Natural and Technical Sciences, Goce Delchev University Stip Connecta: "Gap Analysis and Safeguard Documentation: Category A Project CORRIDOR VIII Railway - Section 3 Kriva Palanka-Border with the Republic of Bulgaria, North Macedonia"; This report is only available in English.

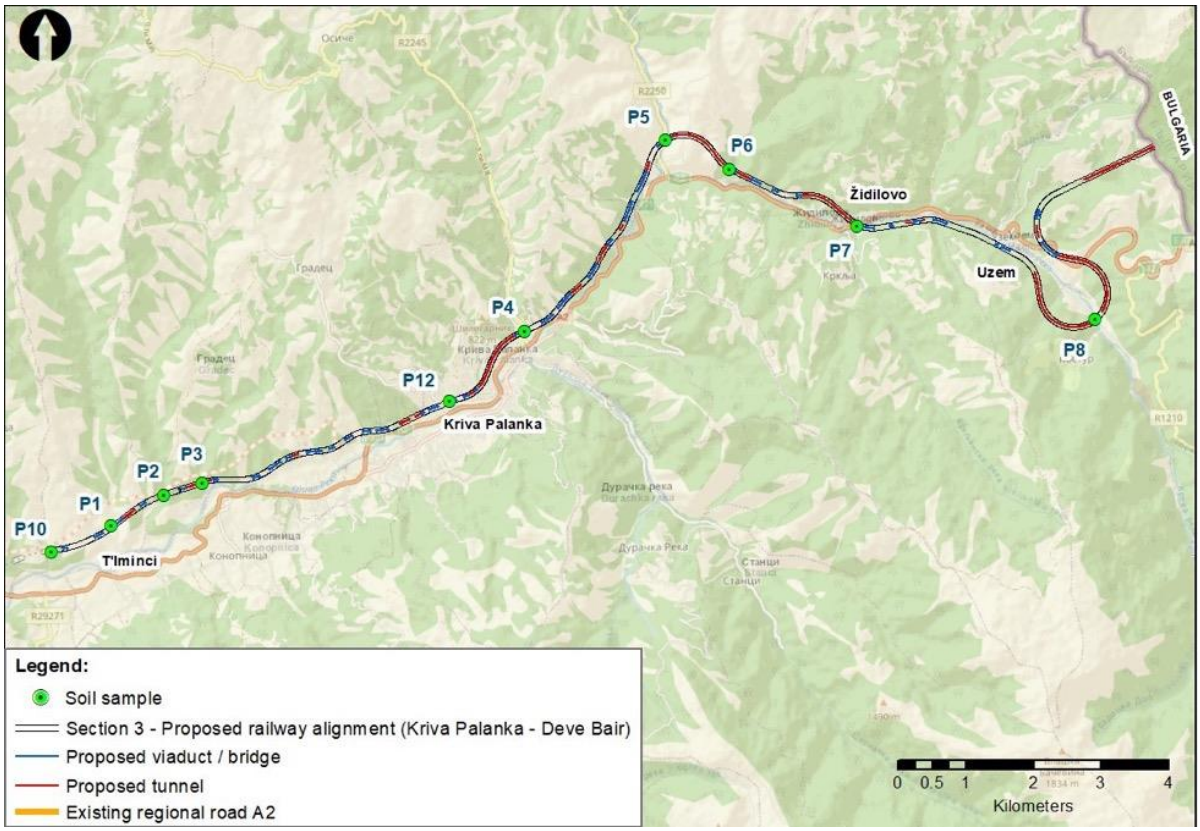


Figure 17 Locations of Soil Monitoring Points

Given the absence of Macedonian regulation related to soil contamination, the testing results have been compared with the internationally recognised standard for contaminated land – the New Dutch List.[24]

Overall, the baseline concentrations of metals were found to be below the intervention values in all samples except the P4 which was taken in the urban area of Kriva Palanka, c. 150 m west of the proposed exit from the tunnel No. 8 and adjacent to a pier of the proposed bridge (viaduct) No. 23. Lead concentration in the sample exceeded the intervention value (552 mg/kg compared to the intervention value of 530 mg/kg). The same sample also showed the exceedance of target values for zinc, nickel, and cadmium. The possibility that the exceedance of several parameter values is a result of contamination rather than natural properties cannot be ruled out.

In other soil samples along the proposed route, some metals (zinc, nickel, cadmium) occasionally exceeded the target values (but not the intervention values) which is most likely due to natural soil properties.

Mineral oil was below the intervention value in all samples.

4.4 Potential for Additional Impacts to Soil Quality

The supplemental baseline survey did not indicate contamination of the local soil in undeveloped areas of the proposed alignment. However, the soil sample taken in the urban area of Kriva Palanka indicated contamination with heavy metals. Based on the results of the baseline soil survey, additional mitigation related to management of contaminated land has been included in the ESMP (see Section 4.5).

[24] The Ministry of Housing, Spatial Planning and Environment of Netherlands (2001).

Chapter 7.2.3: Impacts on Soil of the ESIA reported the following potential adverse construction phase impacts:

- Impact on soil degradation (removal of topsoil);
- Impact on soil erosion (acceleration of erosion, generation of sediment);
- Impact on soil contamination;
- Impact on soil compaction.

During the works, moving of heavy machinery over unmade areas might compact the soil and change its structure. The compaction decreases the soil porosity and restricts infiltration of water which may lead to drainage issues (formation of ponds) and the loss of nutrients. Prior to mitigation, the impact would be localised to areas of construction activities and would present change of a medium magnitude and **moderate adverse impact (significant)** that requires control measures.

The soil stabilisation is mandatory part of the design documents. The Detailed Design was informed by the geotechnical investigations. If uncontrolled during the construction, the soil erosion and sediment build-up have the potential to create a medium magnitude change on a medium-sensitive receptor, resulting in **moderate to major adverse impact (significant)**.

Accidental release of fuels, oils, or chemicals to the ground has the potential to occur in the construction lay-down area, during delivery, storage, handling and use of hazardous materials. Volumes of fuel and chemicals stored at the construction sites would be limited. The impact on soil quality (low sensitive receptor) would be long-term but localised, affecting the area of the release and as such is considered to be of a low magnitude. The impact significance is assessed as **minor adverse (non-significant)**.

Chapter 7.2.3: Impacts on Soil of the ESIA reported the following potential adverse operational phase impacts:

- Impact on soil erosion;
- Impact on soil contamination (accidental spillages).

The local soil and geological features are susceptible to erosion (receptor of a medium sensitivity). Given the slopes and cuttings on the route, the magnitude of change due to potentially non-mitigated erosion would be high, resulting in a **moderate adverse impact (significant)** affecting the Project operation.

Accidental spillages of hazardous materials during freight transport could have a high-magnitude effect, depending on the pollutants and volume released. The substructure layers present a solid protective barrier for propagation of contaminants to soil or subsurface. However, in case of more serious accidents, the risk of soil and groundwater contamination will be higher resulting in a **moderate adverse impact (significant)**.

4.5 Consideration of Needs for Additional Mitigation

As a result of the baseline soil quality testing, a contaminated material management during construction is deemed necessary.

A Contaminated Material Management Plan will be implemented as part of the CESMP to ensure that excavated soil in the area around the proposed exit from the tunnel No. 8 and in the adjacent area of the proposed bridge No. 23 is tested for contamination and if contaminants are detected, segregated from the adjacent-underlying soil to avoid potential cross-contamination. The soil stockpiles should be covered with sheeting and protected from surface run-off. Any contaminated excavated soil should be safely treated or disposed.

Mitigation measures will be implemented through the Environmental and Social Management Plan (ESMP).

Construction risks will be controlled by implementing actions and restrictions in the Contractor's CESMP. The 2017 ESIA proposed a set of mitigation measures which have been incorporated into the Project ESMP. In addition, the Project ESMP requires the Contractor to implement good practice measures related to good organisation of the construction site, management of contaminated land, preservation of topsoil, storage of hazardous substances, prevention of spills, etc.

The ESMP requires maintenance measures related to erosion control and preparedness and response to spillages during the Project operation.

4.6 Residual Impacts

Provided that the mitigation measures required by the ESMP are implemented throughout the construction and operation of the Project, the residual impact on soil will be **minor adverse to negligible (non-significant)**.

4.7 Summary

The results of the supplementary soil quality testing have not materially altered the conclusions of Chapter 7.2.3: Impacts on Soil of the ESIA.

5. Noise and Vibration

5.1 Introduction

This chapter reports on the findings on the background noise survey conducted on Section 3 and the subsequent operational noise modelling, supplementing the information related to noise as assessed in Chapter 7.6.2: Noise Impacts of the 2017 ESIA. The chapter also reports on the assessment undertaken on the potential impacts of vibration as provided in Chapter 7.7.1 Vibration of the 2017 ESIA.

5.2 Baseline Conditions

Noise

The 2017 ESIA identified noise-sensitive receptors, i.e. residential areas where noise from the operation of the Project is likely to be exceeded and mitigation will be required. Apart from the town of Kriva Palanka, which is a nucleated settlement, other noise-sensitive areas have limited number of receptors, and mostly comprise small groups of houses in a linear pattern. The following areas have been identified as noise sensitive:

- Chainage km 65 + 760 to 66 + 100 (Tliminci village);
- Chainage km 70 + 600 and 71 + 807 (station Kriva Palanka);
- Chainage km 72 + 774 to 73 + 840 (Kriva Palanka town);
- Chainage km 75 + 180 and 75 + 500 (Kriva Palanka – Pashina Vodenica settlement);
- Chainage km 79 + 731 and 80 + 080 (Zidilovo village);
- Chainage km 82 + 020 and 82 + 520 (Uzem village).

All sensitive areas are situated in valleys which are proposed to be passed by viaducts or bridges.

The current primary noise sources in the Project area are traffic along the regional road A2 and nearby business activities.

The 2017 ESIA included the background noise monitoring which included only the first 7km out of the total 23.4km of the alignment. The noise monitoring was conducted only during the daytime period, the night-time period was not included. As such, the background noise survey could not be considered appropriate to establish the baseline noise settings in the Project area and properly inform the operational noise prediction model.

To determine the background noise along the Project alignment, a supplementary baseline noise survey has been conducted as part of this ESIA supplementary assessment.

Vibration

The 2017 ESIA identified 13 zones sensitive to vibration during the construction and operation of the Project. The sensitive zones are primarily situated in the areas of proposed tunnels, cuttings, and viaducts.

Three residential areas in Kriva Palanka have been identified as particularly sensitive to construction vibration as they are densely populated areas in the vicinity of the proposed alignment:

- Zone 3: Plateau 1 – the proposed railway station Kriva Palanka (ground floor and single-storey residential structures below and above the proposed station);
- Zone 4: Plateau 2 – the proposed railway station Kriva Palanka (ground floor, single -storey and two-storey residential structures below and above the proposed station):
- Zone 5: Residential area above the proposed tunnel No. 7 (122m long) with ground floor, single -storey and two-storey residential structures.

The 2017 ESIA identified 5 zones sensitive to ground-borne vibration due to railway traffic:

- Zone 3: Plateau 1 – the proposed railway station Kriva Palanka (ground floor and single-storey residential structures below and above the proposed station);
- Zone 4: Plateau 2 – the proposed railway station Kriva Palanka (ground floor, single-storey and two-storey residential structures below and above the proposed station);
- Zone 8: Drenje (north-eastern outskirts of Kriva Palanka) – a group of residential structures with up to two-storeys;
- Zone 11: Uzem 1 – a group of residential structures;
- Zone 13: Uzem 2 – a group of residential structures.

5.3 Additional Noise Surveys

The supplementary baseline noise survey was undertaken in May 2022[25]. The aim was to establish the background noise levels both during the daytime and night-time period along the proposed alignment and to provide the baseline data for the modelling of operational noise and assessment of impacts.

The baseline noise monitoring was carried out over a 24 hour-period at each of 5 monitoring locations. Additionally, 4 series of 15-minutes measurements during the day, evening and night-time were performed at each of 5 locations.

[25] NOISE ASSESSMENT REPORT (BASELINE NOISE SURVEY), May 2022, AMBICON Lab, Faculty of Natural and Technical Sciences, Goce Delchev University Stip Connecta: “Gap Analysis and Safeguard Documentation: Category A Project CORRIDOR VIII Railway - Section 3 Kriva Palanka-Border with the Republic of Bulgaria, North Macedonia”; This report is only available in English.

The noise survey was conducted within the identified noise-sensitive (residential) areas at the locations given in the following table.

Table 5 Supplementary baseline noise survey – sampling locations

Monitoring Location	Location	Description of Location	Legal noise limit Ld (daytime), db(A)	Legal noise limit Ln (night.-time), db(A)
MP1	Village of Tlminci	Quiet areas outside the agglomerations	40	35
MP2	Kriva Palanka South-West	Third (III) degree area of noise protection[26]	60	50
MP3	Kriva Palanka North-East	Third (III) degree area of noise protection	60	50
MP4	Village of Zidilovo	Quiet areas outside the agglomerations	40	35
MP5	Village of Uzem	Quiet areas outside the agglomerations	40	35

It is of note that the Macedonian legal noise limits in mixed-use areas (residential and commercial) are less stringent than the WHO guidelines (average annual exposure L_{den} below 54 db(A) and night-time exposure L_n below 44 db(A)). In addition, the Macedonian noise regulation recognizes “areas exposed to intense railway traffic” where even higher noise limit values are allowed i.e. Ld = 65 db(A) during daytime and Ln = 55 db(A) during night-time period. Once the proposed railway is operational, the settlements along the alignment would be considered areas of intense railway traffic. Macedonian regulation does not envisage any compensation for noise-affected properties.

The locations of noise monitoring points are shown on figure below.

[26] Third (III) degree area is a mix of residential and business area where trade, service, craft and agricultural activities are undertaken

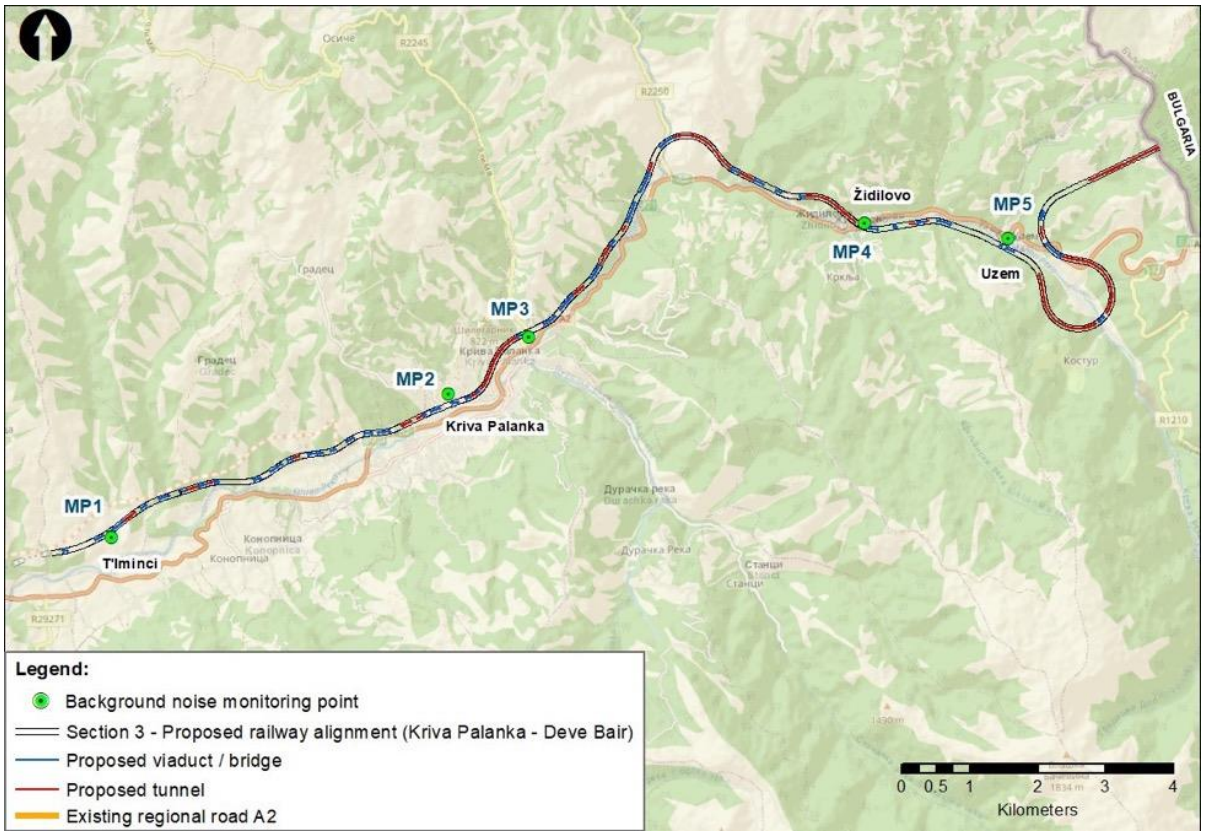


Figure 18 Locations of Background Noise Monitoring Points

The noise monitoring results indicated that the background noise levels at the locations classified as 'Quiet areas outside the agglomerations' exceed the legal limit values for both the day-time (40dB(A)) and night-time periods (35dB(A)). The recorded noise levels were in the range from 49.3dB(A) in Uzem during the daytime (Ld) to 41.7dB(A) during the night-time in Tlminci (Ln).

The recorded background noise levels in Kriva Palanka town (III degree area of noise protection) were lower than the legal limit values for both the day-time (60dB(A)) and night-time periods (50dB(A)).

The WHO threshold for average annual exposure (Lden 55 dB) was not exceeded in any of the monitoring locations. The WHO threshold for night exposure (Ln 44 dB) was exceeded for 0.2 dB only at the monitoring location No. 3 in the urban area of Kriva Palanka (44.2 dB).

5.4 Potential for Additional Noise and Vibration Impacts

Chapter 7.6.2: Noise Impacts of the ESIA reported the following potential adverse construction phase impacts:

- Noise impact during preparatory works;
- Noise impact during earthworks;
- Noise impact during construction of bridges and retaining walls;
- Noise impact during construction of the railway;
- Noise impact during construction of the access roads;
- Noise impact from the construction compounds.

This ESIA Addendum considers the assessment of the noise impacts during construction appropriate. The construction noise impacts would be local, short-term and temporary in nature, with medium to high

magnitude depending upon the levels of anticipated exceedance. For residential receptors (high sensitive to noise), the non-mitigated impact would be **moderate adverse (significant)**.

In respect to the operational noise impacts, the 2017 ESIA included the noise modelling which was found to have shortcomings as it was based on incomplete background noise measurements and considered the Macedonian legal noise limits but not the more stringent international noise guidelines (WHO Environmental Noise Guidelines for the European Region, 2018). This ESIA Addendum has included the revision of the operational noise assessment for the Project.

The revised noise modelling has been conducted using the commercial software dBmap.net Noise Mapping Tools and LimA™ Software[27]. The noise model has been developed for the sections of the Project where sensitive (residential) receptors were previously identified (Tlminci, Kriva Palanka, Zidilovo and Uzem).

The noise model has been based upon the Transport Modelling Report (2017) for the Project, Common Noise Assessment Methods in Europe (CNOSSOS-EU), and the New German Prediction Model for Railway Noise "Schall 03 2006". According to the CNOSSOS-EU method, the following physical sources depending on the generation mechanism, have been considered: 1) rolling noise (including not only rail and track base vibration and wheel vibration but also, where present, superstructure noise of the freight vehicles); 2) traction noise; 3) aerodynamic noise; 4) impact noise (from crossings, switches and junctions); 5) squeal noise and 6) noise due to additional effects such as bridges and viaducts.

Prior to the modelling, a site visit was conducted to determine the height of buildings in the immediate proximity of the proposed railway.

The noise level predictions have been conducted based on the same assumptions used by the 2017 ESIA with respect to the type, number and speed of trains. The assumptions are the outcome of the Updated Feasibility Study for Section 3 (2017) and are still considered to be valid. The expected train frequency to be used by the Project in an indicative period into the future (2040) is shown in Table 6.[28]

Table 6 Expected train frequency at Section 3 in 2040 considered in operational noise assessment

Type of Train	Number of Trains (daytime)	Number of Trains (evening)	Number of Trains (night-time)
Freight	11	4	5
Passenger	5	1	2
High-speed passenger train	6	2	4
International high-speed train	5	1	2

Total of 14 locations along the railway alignment were assessed. The modelled noise levels have been predicted to exceed both the legal limits and WHO guidelines in all receptor areas (L_{day}[29] and L_{night}[30]), but also LAFmax[31] on four locations If unmitigated, this would result in a significant adverse impact.

[27] UPDATED NOISE DISPERSION MODEL AND MITIGATION MEASURES, May 2023, AMBICON Lab, Faculty of Natural and Technical Sciences, Goce Delchev University Stip Connecta: "Gap Analysis and Safeguard Documentation: Category A Project CORRIDOR VIII Railway - Section 3 Kriva Palanka-Border with the Republic of Bulgaria, North Macedonia"; This report is only available in English.

[28] Environmental and Social Impact Assessment (IDEM, 2017), Annex 18 Railway Noise Modeling

[29] Whole day (24hr)

[30] Night-time (8hr)

[31] Max level, LAFmax, 5min

Similar to the initial findings of the ESIA, the introduction of noise barriers has been proposed to mitigate the adverse noise impacts.

Area	Receptor ID/Name	Type of receptor	Baseline survey location	KM Start	KM end	Existing baseline sound levels (dB)		Predicted train noise levels (dB)			Train + baseline noise level (dB)		Proposed Mitigation	No. properties where noise is mitigated	Train + baseline noise level (dB) **WITH MITIGATION**	
						Whole day (24hr), Lden	Night-time (8hr), Lnight	Whole day (24hr), Lden	Night-time (8hr), Lnight	Max level, LAFmax, 5min	Whole day (24hr), Lden	Night-time (8hr), Lnight			Whole day (24hr), Lden	Night-time (8hr), Lnight
Tlminci	Tlminci_0001	Residential	65+600 km to 66+100 km	65,6	66,1	49,7	41,7	64,3	55	59	64,4	55,2	Noise Barrier 500 m	13	50-53	40-44
Tlminci	Tlminci_0002	Residential	67+600 to 68+800 km	67,6	68,8	49,7	41,7	64,3	55	59	64,4	55,2	Noise Barrier 1200 m	17	51	40
K.Palanka	K.Palanka_0001	Residential	68+960 km to 70+350 km	68,96	70,35	47,9	41,5	64,3	55	57	64,4	55,2	Noise Barrier 1390 m	55	50- 53	40-44
K.Palanka	K.Palanka_0002	Residential	70+660 km to 71+630 km	70,66	71,63	47,9	41,5	70,7	63	64	70,7	63	Noise barrier 970 m	260	51	44
K.Palanka	K.Palanka_0003	Residential	72+790 km to 73+050 km	72,79	73,05	51,5	44,2	69,5	62	64	69,5	62	Noise Barrier 260 m	110	50	44
K.Palanka	K.Palanka_0004	Residential	73+050 km to 73+825 km	73,05	73,825	51,5	44,2	69,5	62	64	69,5	62	Noise Barrier 800 m	30	50	44
K.Palanka	K.Palanka_0005	Residential	74+320 to 74+420 km	74,32	74,42	47,9	41,5	64,3	55	57	64,4	55,2	Object insulation	4	50- 53	40-44
K.Palanka	K.Palanka_0006	Residential	76+380 to 76+530 km	76,38	76,53	47,9	41,5	64,3	55	57	64,4	55,2	Object insulation	6	50- 53	40-44
Zidilovo	Zidilovo_0001	Residential	79+740 km to 80+060	79,74	80,06	49,3	41,3	69,3	60	62	69,3	60,1	Noise Barrier 320 m	23	54	44
Zidilovo	Zidilovo_0002	Residential	80+060 km to 80+600	80,06	80,6	49,3	41,3	69,3	60	62	69,3	60,1	Noise Barrier 540 m	13	50- 53	44
Zidilovo	Zidilovo_0003	Residential	81+480 to 81+700 km	81,48	81,7	49,3	41,3	63,4	55	57	63,6	55,2	Object insulation	2	50- 53	44
Uzem	Uzem_0001	Residential	81+950 km to 82+430 km	81,95	82,43	50,1	41,3	64,3	55	58	64,5	55,2	Noise Barrier 480 m	31	54	44
Uzem	Uzem_0002	Residential	82+430 km to 82+790 km	82,43	82,79	50,1	41,3	69,3	60	62	69,4	60,1	Object insulation	7	53	40-44
Uzem	Uzem_0003	Residential	86+178 to 86+300 km	86,178	86,3	50,1	41,3	69,3	60	58	69,4	60,1	Noise Barrier 100 m	10	53	40-44

Figure 19 Overview of baseline, impacts and mitigation related to the assessed sites

The noise dispersion maps show the total noise (both background and rail noise), given in Annex 4.

Construction Vibration

Chapter 7.7.1: Vibration Impacts of the 2017 ESIA reported the following potential adverse construction phase impacts:

- Vibration impact during blasting works;
- Vibration impact from construction machinery and equipment.

The residential area of Kriva Palanka will be intersected by two adjacent single-track tunnels (122m and 996m long). The residential structures are situated between 5 and 20m above the alignment and might experience vibration impacts. According to the Detailed Design, the conventional New Austrian Tunnelling Method (NATM) will be used for the construction of both tunnels. The excavation method will be both mechanical and 'drill and blast'. Blasting will involve the controlled use of explosives to break rocks.

The 2017 ESIA provided a qualitative assessment of construction vibration impacts, which was further complemented by a supplementary construction vibration assessment undertaken[32] as part of this Addendum to obtain further information on the potential magnitude of construction vibration impacts to residential receptors in the Project area.

Since the national laws of the Republic of North Macedonia do not stipulate the permissible values for vibrations and groundborne noise, the German standard DIN 4150-2 (Structural Vibration - Human Exposure to Vibration in Buildings) and 4150-3 (Vibrations in buildings - Part 3: Effects on structures), as well as the Austrian standard ÖNORM S 9012 (Evaluation of human exposure in buildings to vibration immissions by land-based traffic - Vibrations and groundborne noise) have been considered. The Vibrations and groundborne noise due to the railway traffic were calculated using VIBRA-1 (Ziegler Consultants and Swiss Rail) software package which is based on the DIN 4150-2 and ÖNORM S 9012 standards.

For the assessment of vibrations and ground borne noise impact, a preliminary spatial analysis of the area is conducted with the goal of identifying sensitive objects in accordance with the criteria of the standards DIN 4150-2, DIN 4150-3 and ÖNORM S 9012. All of the identified objects sensitive to vibrations and groundborne noise within a 160-meter boundary are intended for residential purposes

[32] VIBRATION AND GROUNDBORNE NOISE ASSESSMENT, May 2023, Aleksandar Gajicki, Connecta: "Gap Analysis and Safeguard Documentation: Category A Project CORRIDOR VIII Railway - Section 3 Kriva Palanka-Border with the Republic of Bulgaria, North Macedonia"; This report is available only in English.

(dwellings in urban and rural areas), except for the primary school in Zidilovo, which is temporarily closed (approximately 65 meters from the rail axis).

A boundary of influence of 160 meters has been determined based on the railway traffic data, maximum speed on the observed section, and all elements that can influence the vibration and/or ground borne noise levels, such as switches and tunnels. The position of the railway line with the boundary of vibration impact in relation to the Kriva Palanka settlement (mark as a blue shade) is shown in Figure 20.

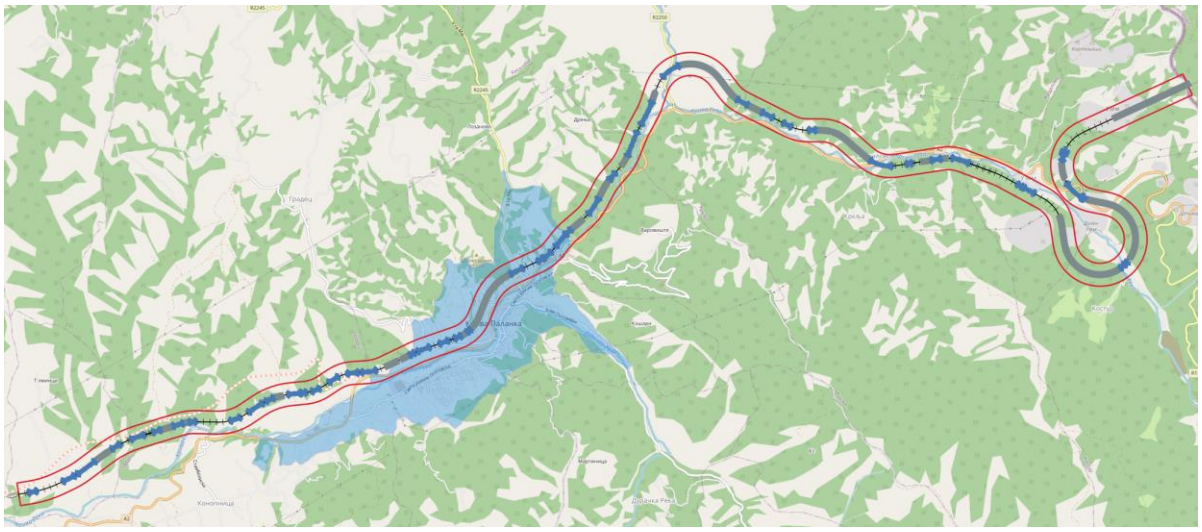


Figure 20 The position of the railway line with the boundary of vibration impact in relation to the Kriva Palanka settlement

Impact assessment during the railway construction The vibration and ground borne noise levels during the railway construction primarily depend on the organization of works at the site, the number and type of the used construction machines and their position and distance from residential and other sensitive buildings in the impact zone. In this project phase, accurate organization and technology of works at the site were not available, as well as which tools, equipment and machinery will be used. The vibration and/or ground-borne noise measurements were not performed in the corridor of the future railway line Kriva Palanka – Border with Republic of Bulgaria. All calculation and analyses are based on assumptions (default values from standards and literature are used), while the actual values will be determined only when the Contractor of the works will be known, and the technique and technology of construction works adopted.

Vibration Impact from Construction Machinery and Equipment

The calculated threshold distances indicate that the impact of vibrations on buildings will exceed the permissible values for dwellings and buildings of similar design and/or occupancy at distances up to 60 meters in the case of piling, and up to 16 meters when using other tools, equipment, and machines.

Other construction tools, equipment and machines will produce lower vibration levels, and the distances at which exceedances occur are smaller (up to 10 m for backhoe, jackhammer and dozer; and up to 5 m for heavy road-heading and heavy rock-breaking. The adverse impact of low frequency noise during construction works can be expected at distances up to 30 m.

Referring to the DIN 4150-2 standard, vibrations at the perception threshold of 0.1 mm/s are detectable at distances of up to 1500 meters during piling operations and up to 400 meters when using other equipment. Sleep disturbances, which can arise at a vibration level of 0.8 mm/s (awakening threshold), may occur at distances up to 375 meters and 100 meters, respectively. Taking into consideration human sensitivity to vibrations and the fact that construction works are carried out during the daytime, it is

possible to tolerate vibration levels ranging from 0.8 to 1.6 mm/s for shorter time periods. The public must be informed in advance when such type of construction works is expected.

Furthermore, the construction of the railway is transient in nature, so that the negative impacts of the vibration and groundborne noise will be reduced as the construction of the railway tracks progresses along the route away from sensitive receivers.

Vibration impacts from blasting

The preliminary design foresees New Austrian Tunnelling Method (NATM) construction method that uses machines (e.g., drill jumbo, dump trucks, loaders) and explosive (blasting) to excavate ground. When an explosive is detonated, only a portion of the energy is consumed in breaking up and moving the rock. The remaining energy is dissipated in the form of seismic waves expanding rapidly outward from the blast, either through the ground (as vibration) or through the air (as air blast). Before the full-scale blasting in the tunnel's critical zones with potential sensitive objects in the range up to 200 meters, a series of test blast (at reduced scale) shall be conducted. This information will be used to define allowable maximum instantaneous charge to meet the ground vibration management levels, and define the safe way of blasting regarding the closeness of the sensitive objects and the safe working conditions.

If unmitigated, blasting might affect the structural integrity of buildings close to the tunnel excavation area. The magnitude of change would be medium to high on residential receptors which are high-sensitive, resulting in **moderate to major adverse impact** (significant).

The vibration impact of blasting operations can be minimized by choosing the appropriate blast charge configurations; ensuring appropriate blast-hole preparation; optimizing blast design, location, orientation and spacing; and selecting appropriate blast times.

The construction vibration has local character (only in vicinity of construction site), limited duration (only during the execution of works) and with no residuals (will end after construction activities).

Operational Vibration

Chapter 7.7.1: Vibration Impacts of the 2017 ESIA reported the following potential adverse operation phase impact:

- Ground-borne vibrations due to railway traffic.

Ground-borne vibrations from passing trains are likely to be experienced by properties situated in the vicinity of the alignment (about 25m impact zone is usually recognised in practice but it may vary depending on ground properties). Ground-borne vibrations primarily present a nuisance rather than risk of structural damage to properties.

The number of properties in the areas identified as sensitive to operational vibration by the 2017 ESIA is not anticipated to be greater than 100:

- Zone 3 - Plateau 1 at the proposed Kriva Palanka station: c. 30 residential structures;
- Zone 4 - Plateau 2 at the proposed Kriva Palanka station: c. 15 residential structures;
- Zone 8: Drenje – NE outskirts of Kriva Palanka: a group of c. 10 residential structures;
- Zone 11: Uzem 1 - a group of c. 15 residential structures;
- Zone 13: Uzem 2 – a group of c. 10 residential structures.

The 2017 ESIA suggested that the local meteorological station in Kriva Palanka is situated in the area which will be passed underneath by the tunnel No. 8 and may potentially be affected by the vibration.

The 2017 ESIA noted that according to the results of conducted geophysical and geotechnical investigations, local frequencies on the ground of 4-30 Hz are expected along the proposed alignment, which can result in possible damage in some of the structures that are more rigid and have their own frequency between 4 and 10 Hz.

A supplementary desktop assessment of operational vibration and low frequency noise has been undertaken as part of this Addendum to predict ground-borne vibration levels from the Project. The vibration and low frequency noise due to the railway traffic were calculated using VIBRA-1 (Ziegler Consultants and Swiss Rail) software package and assessed in accordance with recognised international standards for structural vibration. Vibrations were calculated based on the individual train passing, while the total impact was equal to a sum of standardized procedures in DIN 4150-2.

The data on prospective scope of the railway traffic for modelling and analysis of vibration and ground-borne noise were taken from ESIA2017. The passenger trains are divided into three categories: passenger trains, high-speed passenger trains and international high-speed trains. At this stage of the project, the timetable cannot be accurately predicted, hence the exact number of certain types of trains cannot be envisaged for the periods of day, evening and night, but the calculations follow the rule that most of the transport is performed during the day. The expected train frequency and length and maximum speed considered in the assessment is shown in the next tables.

Table 7 Projected daily number of trains at the section Kriva Palanka - Border with the Republic of Bulgaria in 2040

Type of train	Number of trains			
	Day	Evening	Night	
	[07.00 – 19.00]	[19.00-23.00]	[23.00-07.00]	Max. trains during 1h*
Freight	11	4	5	1
Passenger	5	1	2	1
High-speed passenger	6	2	4	1
International high-speed	5	1	2	1

*) 1-hour traffic assumptions used in the assessment

Table 8 Expected length and maximum speed by train types

Type of Train	Length [m]	Max. speed [km/h]
Freight	500	90
Passenger	150	100
High-speed passenger train	150	100
International high-speed train	205	100

Maximum design speed along Section 3 is 100 km/h. To compensate for shifting tracks and braking at the Kriva Palanka station and the Zidilovo halt, speeds of 70 km/h have also been taken into account.

The calculated vibrations during railway operations are compared with the reference values defined in the DIN 4150-2 for mainly residential areas, and the calculated groundborne noise level during railway operations are compared with the reference values defined in the ÖNORM S 9012.

The calculation has indicated that the adverse operational vibration impact is to be expected on open tracks within 20 m of the railway line and on station tracks within 15 m of the railway line. In the tunnels, the adverse impact of vibrations would be less pronounced, exceeding the reference values at distances of up to 5 m. Areas close to the track switches are the most exposed to ground-vibration where an

adverse impact is predicted within 25 m of the railway line. The exceedance of low frequency noise levels is predicted within 5 m of the railway line, except in the switching areas where it is predicted within 10 m of the railway line.

All calculated vibration levels are far lower than any of the guideline values of short-term and long-term vibrations for the assessment of the impact on building structures according to DIN 4150-3. During railway operations, it is expected that there will be no negative impact of vibrations on buildings.

In regard to human annoyance, the relevant period for defining the negative impact of vibrations is the night period when the allowed values are lower, while for groundborne noise, it has been adopted that the condition of good protection must also be met.

Three influence zones have been defined and are presented in **Error! Reference source not found.**21. The first zone (marked in blue) represents the project area. In principle, all the objects located within this zone will be related to the functioning of the railway, and it will not be necessary to plan special measures to reduce annoyance to people. The second zone (marked in red) is the area where people may be annoyed due to the influence of vibrations and groundborne noise during the operation of the railway. In the third zone (marked in yellow), people may be annoyed only by groundborne noise. For the population located in zones two and three, it is necessary to plan and implement measures to reduce the negative impact of vibrations and groundborne noise as outlined below.

The entire graphical illustration depicting the influence zones for the entire alignment is provided in the Vibration assessment report which is available only in English. Annex 5 provides graphical illustration of vibration and groundborne noise influence zones vis-a-vi the object locations along the railway corridor on selected locations.

Preliminary analysis of the annoyance caused to residents by railway traffic vibrations and groundborne noise showed that the occupants of 715 houses will be disturbed to a greater or lesser extent during train movement. By 2040 maximum number of train movements per day are predicted as 48 trains, with 13 of these between 23.00-07.00.

Figure 21 Object locations along the railway corridor with vibration and groundborne noise influence zones

This impact is local and of transitory nature (occurs for a short-duration only when the train is passing). The impact presents a nuisance rather than risk of structural damage to building, however, if unmitigated.

5.5 Consideration of Needs for Additional Mitigation

Construction Noise

In the construction phase, it is likely that the ambient noise levels will be periodically exceeded in the settlements of Tlminci, Zidilovo, and Uzem given that the background noise levels have already been found to be above the legal limits.

The measures identified in the ESIA2017 are considered still relevant. These are related to construction sites, equipment and reduction of noise at sensitive receptors. Night work in proximity of residential properties should be avoided to the extent possible unless no feasible alternatives and subject to a noise risk assessment. Construction noise mitigation and monitoring measures will be implemented through the Environmental and Social Management Plan (ESMP).

It is recommended to conduct continuous noise monitoring in these areas to assess the effect of the applied mitigation measures and apply additional controls should residual impact occur. Temporary accommodation will be offered where works generating significant noise are required for a long duration in a particular area.

Operational Noise

In the operational phase, the Project will benefit from cuttings and tunnels (9km out of 23km) which will reduce the overall noise impact.

The noise-sensitive (residential) areas along the alignment where the exceedance of operational noise levels is predicted to be significant are proposed to be protected by noise barriers. The background noise already exceeds the legal limits for more than 3dB at two locations (MP1 Tlminci and MP5 Uzem). However, the background noise does not exceed the WHO thresholds at these locations. The noise barriers have been modelled to reduce the total noise levels (background and railway) in line with the WHO guidelines (Lden of 54dB(A) and Lnight of 44dB(A)). Therefore, despite the potential increase in the background noise for more than 3 dB due to the Project operation, the total noise should remain below the WHO threshold values.

Compared to the initial ESIA, the noise barriers have been optimised, including their height. The Detailed Design and Bill of quantity (BoQ) (i.e. the tender documents) should be updated to include the revised noise barriers (the ESAP includes this requirement).

The ESAP and ESMP for the Project require the inclusion of noise barriers in the design in the locations given in the following table. The ‘fencing type’ noise barriers modelled are not likely to require additional land acquisition as they can be placed in or adjacent to the rail corridor.

The SEP envisages specific consultations during the disclosure period with affected receptors (residential properties).

Table 9 Proposed Locations for Noise Barriers

Section	Location	Height [m]	Type
1	v.Tlminci, 65+600 km to 66+100 km on the right and left side	3	Solid curved barrier on bridges
		4	Absorptive curved A2 metal barrier on section without bridges

Section	Location	Height [m]	Type
2	Before the Municipality of Kriva Palanka, 67+600 to 68+800 km on the right side	3	Solid curved barrier on bridges
		4	Absorptive curved A2 metal barrier on section without bridges
3	Municipality of Kriva Palanka, 68+960 km to 70+350 km on the right side	3	Solid curved barrier on bridges
		4	Absorptive curved A2 metal barrier on section without bridges
4	Municipality of Kriva Palanka, 70+660 km to 71+630 km on the right and left side	3	Solid curved barrier on bridges
		6	Absorptive curved A2 metal barrier on section without bridges
5	Municipality of Kriva Palanka, 72+790 km to 73+050 km on the right and left side	3	Solid curved barrier on bridges;
		6	Absorptive curved A2 metal barrier on section without bridges
6	Municipality of Kriva Palanka, 73+050 km to 73+825 km on the right side	3	Solid curved barrier on bridges;
		6	Absorptive curved A2 metal barrier on section without bridges
7	v.Zidilovo, 79+740 km to 80+060 km on the right and left side	3	Solid curved barrier on bridges
		4	Absorptive curved A2 metal barrier on section without bridges
8	v.Zidilovo, 80+060 km to 80+600 km on the left side	3	Solid curved barrier on bridges
		4	Absorptive curved A2 metal barrier on section without bridges
9	v.Uzem, 81+950 km to 82+430 km on the left side	4	Absorptive curved A2 metal barrier on section without bridges
		3	Solid curved barrier on bridges
10	86+178 to 86+300 km on the left and right side	3	Solid curved barrier on bridges
		4	Absorptive curved A2 metal barrier on section without bridges

On four other locations (74+320 km to 74+420 km; 76+380 km to 76+530 km; 81+480 km to 81+700 km; 82+430 km to 82+790 km and 86+980 km to 87+180 km), double-glazing of windows within-built ventilation and replacement of doors is suggested so standard noise level is met.

It is suggested that the existing windows are replaced by types 4/12/10, with the sound insulation index Rw = 35 dB. The type 4/12/10 means that the double-glazing unit consists of a 4mm pane, a 15mm spacer and a 4mm pane. The first pane of glass is defined as glass layer 1 and is the exterior pane of glass, while the other pane is glass layer 2 and therefore the interior pane of glass (a three-layer triple glazing unit will have a third layer of glass). The doors should have sound reduction index Rw =35 dB. The affected people will be given the option to accept this mitigation. The ESMP has included this requirement.

The ESMP includes a requirement for the Contractor to prepare the Noise Barrier Design as part of the Detailed Design. The ESAP requires that the Tender document includes the specification for noise barriers at the selected locations. The ESMP also includes a requirement for the Contractor to redo the noise assessment and modelling based on the final design.

The ESMP has incorporated measures for noise control by design proposed by the 2017 ESIA. The Contractor is required to consider good industry practice for the design, including but not limited to continuous welded rail, specially designed sleepers, and flexible rail connectors for sleepers.

Preventive maintenance is important for operational noise control. The ESMP includes a requirement for PE ZRSMI to develop and implement an Operational Maintenance Plan which will include regular rail grinding. PE ZRSMI will cross-reference the Plan with an Operational Noise and Vibration Management Plan which will consider decrease of train speed especially during the night-time, use of disk brakes instead of block, regular shaping of wheels, avoiding acceleration or braking at noise-sensitive locations, etc.

Construction Vibration

The ESMP has addressed the construction vibration through a set of requirements for appropriate method statements and management plans for the Contractor. A Tunnel Construction Plan and a Blasting Management Plan are required to be developed and implemented.

In addition, the ESMP includes a requirement for the Contractor to develop and implement a Construction Noise and Vibration Management Plan as part of its CESMP. The Plan includes the requirement for a detailed pre-condition survey of buildings in the vibration blasting sensitive areas. The pre-condition survey will be undertaken once details of blasting activities are known, including location, the size and frequency of events. Condition survey will be required during prior to construction (including test-blasts) and post-construction (post-blasting and post main construction activities) as well. If any damage is detected, the Contractor will be responsible to provide fair compensation to affected people, in consultation with them.

Before the full-scale blasting in the tunnel's critical zones with potential sensitive objects in the range up to 200 meters, a series of test blast (at reduced scale) must be conducted (special attention should be paid to areas with thin overburden height below the sensitive objects). This applies specially to tunnels No 4, 5, 6, 7, 8, 9, 12, 13, 16, 18a and 22, but does not exclude other tunnels from this obligation if need arise. Measurements from the test blasts will provide data to establish appropriate propagation characteristics for each site and increase the accuracy of blasting predictions. This requirement has been included in the Blasting Management Plan. The test blast measurements will provide data to establish appropriate propagation characteristics for each site and increase the accuracy of blasting predictions. This information will be used to define allowable maximum instantaneous charge to meet the ground vibration management levels, and define the safe way of blasting regarding the closeness of the sensitive objects and the safe working conditions.

For all residential and other sensitive buildings which are in zones up to 50 m from construction site (distance depends on the type of construction work and the tools, equipment and machines used), it is necessary to plan temporary mitigation measures to reduce the negative impact of vibration and/or groundborne noise.

Impact piling works should be avoided in zones where residential buildings are located at a distance less than 60 meters. As an alternative option, low or non-vibratory piling methods can be employed to minimize potential disturbances. However, if impact piling must be used, safe distances for executing works can be managed through pre-works tests, such as a preliminary piling series, which assess vibration levels based on specific equipment, technology and ground conditions, along with establishing monitoring.

The Construction Noise and Vibration Management Plan which will be implemented by the Contractor has to envisage the vibration-minimisation best practice (e.g. selection of low or non-vibratory equipment, reducing the requirement for vibratory compaction, communication with residents to announce potential periods of disruption, etc.). Vibration and noise levels should be monitored during construction to prevent unacceptable loading. Temporary accommodation will be offered where works generating significant vibration are required for a long duration in a particular area. The Plan has to be cross-referenced with a Tunnel Construction Plan and a Blasting Management Plan, which are required as well.

Operational Vibration

Various mitigation measures can be applied to suppress and/or reduce the negative effects of vibration and ground-borne noise. The mitigation systems can be applied at the source and along the transmission path (which is generally the soil). The mitigation measures at source encompass the railway vehicle and the railway track.

The Tender document for the Project (including the ESMP) will require the Contractor to incorporate vibration attenuation measures to the Detailed design. The attenuation measures will include but not be limited to resilient fasteners, ballast mats, undertie pads, and floating slabs. The Contractor will be required to consider the good industry practice related to attenuation of operational vibration

Effective preventive maintenance is an important factor in controlling ground-borne vibration. The ESMP includes a requirement for PE ZRSMI to develop and implement an Operational Maintenance Plan which will include regular rail grinding and profile grinding of the rail head. PE ZRSMI will cross-reference the Plan with an Operational Noise and Vibration Management Plan which will consider adjusting the train speeds in the areas exposed to ground vibration, especially during the night-time. Usage of resilient wheels, improvement of the roundness of wheels and stiffness of vehicle suspension systems can only be indirectly controlled by PE ZRSMI.

5.6 Residual Impacts

Construction Noise

Provided that the construction noise mitigation measures required by the ESMP are implemented throughout the construction of the Project, the residual impacts on noise-sensitive receptors will be **minor adverse to negligible (non-significant)**.

Operational Noise

The noise barriers and noise insulation of individual buildings (ca. 6) would mitigate the noise impacts as a result of the operation of the Project. The mitigated noise impacts are expected to be **minor adverse (non-significant).**

The ESMP includes the requirement for PE ZRSMI to regularly maintain the noise barriers and conduct operational noise monitoring. ESMP also includes a requirement for PE ZRSMI to develop and implement a procedure in case of complaints from the local residents related to noise. The procedure should define how the noise issue should be verified and what mitigation measures will be undertaken in response. The procedure should include regular communication with potentially affected residents (through the SEP and grievance mechanism). In the case that significant noise impact is identified, mitigation measures need to be applied.

Construction Vibration

Provided that the construction vibration mitigation measures required by the ESMP are implemented throughout the construction of the Project, the residual impacts on vibration-sensitive receptors will be **minor adverse to negligible (non-significant)**.

The ESMP requires PE ZRSMI to develop and implement a procedure in the case of complaints from the local residents related to the construction vibration. The procedure should define how the vibration issue should be verified and what mitigation measures will be undertaken in response, including fair compensation in case of any damages. The procedure should include regular communication with

potentially affected residents (through the SEP and grievance mechanism) to highlight potential periods of nuisance. In that case that harmful effect is identified, mitigation measures should be considered.

Operational Vibration

Provided that the operational vibration attenuation measures are implemented, they will reduce impacts as reasonably practicable and are likely to result in a significant reduction in the number of properties predicted that will experience disturbance; the residual impacts on vibration-sensitive receptors will be **minor adverse to negligible (non-significant)**.

The ESMP includes the requirement for PE ZRSMI to develop and implement Operational Noise and Vibration Management Plan (ONVMP) with specific measures, conduct operational vibration monitoring, but also to develop and implement a procedure in the case of complaints from the local residents related to the operational vibration. The procedure should define how the vibration issue should be verified and what mitigation measures will be undertaken in response. The procedure should relate with the SEP and grievance mechanism.

5.7 Summary

The supplementary baseline noise survey and subsequent noise modelling have resulted in the optimisation of the noise barriers to reduce the noise levels in line with the WHO Environmental Noise Guidelines for the European Region (2018). Additional localised mitigation (noise insulation) has been proposed at 4 locations for individual buildings where the noise barriers would not be cost-effective.

Supplementary operational vibration assessment has been conducted and appropriate measures has been identified both for construction and operation phase. The Tender document (including the ESMP) will include the requirement for the Contractor to incorporate best practice vibration attenuation measures into the Project design.

6. Biodiversity

6.1 Introduction

Following a review of the two ESIA documents written in 2012 and 2017, the first covering the whole railway corridor from Kumanovo to Deve Bair, and the latter focusing on Section 3 of the corridor i.e. Kriva Palanka (T'lminci-Deve Bair), a number of gaps were noted in the biodiversity baseline studies. Noted gaps were primarily outlined with reference to non-compliance to the updated EBRD PR6 requirements for a project of this scale, lack of up-to-date information on protected species and limited mitigation with regards to some protected species likely to be present. To cover the identified gaps, supplementary biodiversity surveys were commissioned from April to June. However, with due consideration of the project timeline and the prolonged winter conditions in early spring of 2022, the field surveys were conducted from April to 2nd of June 2022 inclusive. The survey data was then used to inform an updated Supplementary Biodiversity Assessment, Critical Habitats Assessment and to outline additional management actions and mitigation measures as part of the Biodiversity Management Plan – these documents all form part of the Supplementary E&S Disclosure Package.

6.2 Baseline Conditions

The desk study took into consideration all relevant information on biodiversity, including information on habitats and vegetation, insects, reptiles, mammals and avifauna.

The gap analysis of the existing ESIA disclosure package (2012, 2017) found that the description of the assessed biodiversity features (fauna, flora and habitats) has been made based on literature data, personal experience of the experts and their Project field research. Alongside the description, all natural and anthropogenic habitats (those large enough to be represented) have been mapped. However, the study area is confined to a fixed perimeter representing the project's area of influence determined as a buffer of 250 m from both sides of the alignment. This distance has been set to account for both direct and indirect impacts. Hence, it does not follow natural distributions of species or the ecosystem and has no ecologically justified boundaries i.e. no Ecologically Appropriate Areas of Assessment (EAAA). Ecosystem services were not also assessed and considered within 2012 and 2017 ESIA.

Supplementary Biodiversity Assessment (SBA) that included surveys, was carried as part of this Addendum primarily to cover data gaps in line with the updated EBRD requirements, and hence was focused on species of conservation concern listed in the EU Directives and/or national/regional legal conservation documents that in accordance with the updated EBRD PR6 requirements qualify as PBF and/or CH.The SBA is provided in Annex 5.

The SBA also included qualitative assessment on the perceived effect that the project implementation would have on ecosystem service supply is provided in the Supplementary Biodiversity Assessment. The qualitative assessment of effects on ecosystem service supply was focused on relevant stakeholders (beneficiaries of the ecosystem services generated in the area) and a few representatives from the general local population. The ecosystem service assessment was carried in coordination with the social baseline analysis which at this stage focused primarily on the perceived loss of ecosystem services by people affected by resettling.

To compensate data gaps needed to conclude critical habitats assessment and provide an updated assessment on habitats and species supplementary biodiversity surveys were carried out in the period from April to June. For the purpose of conducting the fieldwork, and bearing in mind the target species groups and habitats, relevant experts on mammals, reptiles, avifauna, insects and habitats were engaged.

The monitoring data gathered from the available assessment and monitoring reports for projects implemented in the area, the previous experience of engaged experts in the area with due consideration of their engagement with the local and national environmental NGO's, was sufficient inform the delineation of EAAA as it provides specific distribution data on species that qualify for priority biodiversity assessment.

6.3 Additional Biodiversity Surveys

Habitats, vegetation and invasive species: The vegetation surveys were undertaken by walking and driving along selected routes and stopping in close proximity to areas noted to support the habitats selected for review. At sample points, notes were taken on plant species present, the type of vegetation assemblage and habitat representativeness. Notes on visible degradation were also recorded to determine habitat condition. Where seen, invasive species were also recorded. At all points, either a GPS coordinate or GPS tagged photographs were taken. Species were generally identified in the field and where required, literature and publications were used to enhance species identification.

Habitat description and mapping was carried with reference to EUNIS, 2012.

Mammals: The assessment of the mammalian fauna included desktop analysis and review of the existing literature data and field research in the area of interest, with added consideration of available data from local and national NGO's and hunting societies active in the area. The field visits were carried out on selected locations within EAAAs considering the habitat preferences of the target species and the accessibility of the terrain. For determination of the presence of large mammal species sign surveys, roost inspection and ultrasound audio detection were used. Transects are followed while searching for footprints, scats, hairs and other signs of passing large mammal species. Transects are usually set in specific habitats were the possibility of encountering certain species is higher. When found, all signs were photographed and data on identified species, date, location, habitat and type of data were recorded.

Reptiles: The reptile survey was undertaken by on-site screening the appointed EAAAs for suitable habitat for targeted species. The survey was undertaken by conducting transect surveys directly at sites selected as suitable for target species. This entailed a slow walk-through areas of hill pastures/hill pastures with shrubs for while screening for the Spur-thighed tortoise and Thermophillous forests and forest edges for *Hermann's tortoise*. Road killed individuals were also observed, recorded and species determined and logged. All findings of amphibian and reptile species were noted.

Avifauna: Field surveys were focused in the appointed EAAAs, primarily by using point counting method, but also transect method, and in some places the "free method" was used to generally record presence of bird species present in the area. For visual observation, binoculars with magnification and telescope were used. Terrain tracking and coordinates were recorded with the GPS device.

Insects: Field surveys were focused in the appointed EAAAs with attention to well preserved forest patches or well-structured woodlands with dead wood, determined as suitable habitat for the target species.

Ecosystem services: The ecosystem service assessment made efforts to collect qualitative data on the perceived effect the project implementation would have on ecosystem service supply by the relevant stakeholders (beneficiaries of the ecosystem services generated in the area) and a few representatives from the general local population.

6.4 Potential for Impacts to be Significantly Changed due to the Alignment

The faunal surveys recorded a range of species of conservation concern, though all are considered to be relatively widespread and common in the region. However, it is noteworthy that the mammal, reptile and bird surveys recorded the presence of few species that were not noted in the previous ESIAs: recorded for the first time in the area Soprano pipistrelle (*Pipistrellus pygmaeus)* and Schre'ber's Bent-winged Bat (*Miniopterus schreibersii*), the Black stork (*Ciconia nigra*) and the Dahl's whip snake (*Platyceps najadum*). The Supplementary Biodiversity Assessment and the Biodiversity Management Plan (which should be referred to for the detailed assessment and mitigation measures) include adequate management actions and mitigation measures to reduce any negative impacts that project implementation could have on species.

From total of ~40 habitats and ~415 species listed in the ESIA, 2017, the Critical Habitat assessment, took into consideration 10 habitat types and 68 species that, based on the Lenders' requirements qualify for PBF/CH. Of these, 8 habitat types were assessed as PBF and 2 were assessed as CH. Total of 21 species were assessed as PBF i.e. 19 birds, 1 amphibian and 1 insect; and 39 were assessed as CH i.e. 16 mammals of which 13 bats; 13 reptiles; 5 amphibians and 5 insects. Presence of patches of representative habitats of conservational importance were also noted as present. In this regard, the Supplementary Biodiversity Survey and the Biodiversity Management Plan include offset management

actions and mitigation measures to achieve no net loss/net gain for affected portions of habitats of conservation concern.

Near the analysed railway corridor, there are no areas that are included in the national system of protected areas. Such areas have not been identified either in the Biodiversity Strategy, the Strategy for Nature Conservation or in the Natural Heritage Study of the Spatial Plan of the Republic of Macedonia. However, there are two areas proposed for protection as part of the project for strengthening the Ecological, Institutional and Financial Sustainability of Macedonia's National Protected Areas System in 2011: Osogovo Mountains and Kiselicka Reka. Following the revalorization of Osogovo, in 2020 the site was protected under IUCN Category V – Protected landscape “Osogovo”. The railway line is projected outside of the wider project area of influence. The main reason for proposing the establishment of Kiselichka Reka gorge as a Nature Park is the presence of the otter. However, a decade after, this area still has no legal protection which in turn has resulted in partial loss of its natural values, particularly at the lower boundary of the proposed area. Should the initiative for establishing a Nature Park “Kiselichka Reka gorge” be raised, the area would need to go through process of revalorisation and revision of borders, with due consideration of disturbance and degradation in place primarily linked to housing development.

Although North Macedonia is not an EU member, the Lenders require that an Article 6 assessment is undertaken for this project, as there are Natura 2000/Emerald sites within the zone of influence of the Project. An Appropriate Assessment has therefore been carried (provided as a separate report in Annex 1 of the SBA) with reference to the two Emerald sites in the area: Osogovo and Pchinja-German. The whole area of intersection of the railway alignment with Osogovo is crossed with a tunnel with no consequent habitat loss; hence no adverse impacts on the associated flora and fauna are expected. The degree of habitat loss within the Pchinja-German has been assessed as negligible as no qualifying habitats are noted in the site designation form and 48 % of the affected habitats are anthropogenic/modified. Considering the specific management actions and mitigation measures proposed as part of the SBA and BMP, it is assessed that the project will not have an adverse effect on the Emerald sites and any likely impacts will not have a significant effect on population of species and habitats in the area.

6.5 Consideration of Needs for Additional Mitigation

All species are considered to be relatively widespread and common in the region; for the majority of species assessed, it was found that if appropriate mitigation measures and management actions are implemented there would likely be no significant impact on the conservation status of the species as a result of the project. A range of mitigation strategies have been proposed, combining those already stated in the 2012 and 2017 ESIA reports with additional mitigation measures.

Mitigation for habitat loss should be implemented for habitats assessed as PBF/CH to achieve a no net loss/net gain.

6.6 Residual Impacts

Following the impact assessment and the mitigation (detailed in the Supplementary Biodiversity Assessment), it is considered likely that there will be no significant residual impacts from the project on biodiversity. This does however depend upon the mitigation being implemented through the Biodiversity Management Plan.

6.7 Summary

The supplementary biodiversity surveys, Supplementary Biodiversity Assessment including the critical habitat assessment have provided sufficient information to outline mitigation measures and management actions to inform the Biodiversity Management Plan so that any likely impacts on population of species and habitats in the area will be avoided and/or minimised, whilst the permanent habitat loss will be adequately compensated for.

7. Landscape and Visual Impacts

There is a limited and scattered Landscape and Visual Impact Assessment throughout the ESIA 2017, not enough to establish a good baseline and assess the significance of the effects. For this purpose, as part o tie Addendum, and update of the Landscape and Visual Impact Assessment[33] was conducted in order to consolidate, amend and expand (photomontages) the information already contained in ESIA2017 resulting in transparent new quantification and any additional mitigation measures identified. The entire report is given as Annex 7.

For the most of environmental aspects covered in ESIA, a corridor of 500 m width (250 m from both sides of the railway alignment axis) has been taken as the adequate area to assess the project impacts, sufficiently wide to encompass all impacts during construction works and operational needs on the projected railway alignment. The scope extend is in line with the positions of all likely significant receptors- parts of the receiving landscape as well as the people able to see the project results and who may be affected by the change.

7.1 Baseline

The assessment is made on a comprehensive baseline that considers all relevant landscape features.

The Project, almost completely, extends across an area characterized as Osogovo Mountain Rural Landscape. This landscape is typical for the north-eastern part of Macedonia. This landscape is typically forested rural and hence it is considered to have potential for rural tourism development. The landscape around the Project route is sparsely populated, the largest town being Kriva Palanka, and several smaller rural villages (including Tlminci, Zidilovo and Uzem) with around 300 residents. Agricultural land is found along the Krvia river and areas of uncultivated land and pastures on some hill and mountain areas are gradually being replaced by forests via natural processes. The route passes along the right valley side of the Kriva River, with a 1km section crossing the Kiselička Reka Gorge which is important from a landscape perspective due to its depth and presence of interesting rock-forms. In addition, the route crosses several proposed and protected areas as described in the biodiversity section which are of higher landscape value.

Residents of towns and villages have a high sensitivity to changes in views, although existing views from my properties are already obscured by the combination of terrain, existing buildings and vegetation. Visitors to proposed or protected areas such as Kiselička Reka gorge and Osogovo Emerald site are also considered to be of high sensitivity.

Following table provides a landscape characters summary.

Table 10 Landscape characters summary

[33] Landscape and Visual Impact Assessment - Update, Railway Track Section Kriva Palanka - Border with The Republic Of Bulgaria, Part of Corridor VIII, May 2023

Landscape elements	Location	Sensitivity
Land	Hilly to mountainous terrain that is going to be affected mostly by cut-and-fill tunnels.	Medium
Vegetation	ESIA Chapter 4.3 Land use in the project area (site visit conclusions) gives detailed overview of the land cover types along the route. Only third section (Kriva Palanka exit to Bulgarian border) has significant land cover in form of mostly coniferous forest that will be affected by railway construction.	Medium
Nature protected areas	Railway route overlaps with nature protected areas, bio-corridors and Emerald sites.	High
Cultural and archaeological properties	ESIA Chapter 6.13.8 Cultural heritage, religion, values and habits- in the project area there are no protected goods and goods for which there is an assumption of representing cultural heritage	Low
Telecommunication	As stated in ESIA Chapter 6.12.4 Telecommunications network “in the project area an underground cable infrastructure exists“, but, due to the available information on its location, railway construction won’t affect it	Low
Aviation	Construction of railway- section 3 will not represent an obstacle for civil aviation directorate and structures of the civil aviation used to support the air traffic.	Low
Water supply and sewer facilities	In the project area, especially in Kriva Palanka, there exists a constructed water supply and sewerage network. The layout of the network lines and the eventual conflicts with the planned railroad line are not officially confirmed by the official authorities from municipality Kriva Palanka - ESIA Chapter 6.12.1 Water-supply, irrigation and sewerage	Low
Electric power distribution	In the project area, the 110 kV transmission line runs in the railroad line proximity, as well as the local electro-distribution system for electrical energy. The railroad line intersects the transmission line at three locations (one at Kiselička Reka, identified as a sensitive location)- ESIA Chapter 6.12.3 Electric supply	Medium
Gas infrastructure	There are four intersections of the newly projected line and the constructed gas pipelines whereby 3 are with the main gas pipeline Ø 530 mm and 1 with the town gas supply network for Kriva Palanka Ø 108 mm- ESIA Chapter 6.12.3 Electric supply	Medium
Transport infrastructure	Project development is going to affect the main regional road Kriva Palanka- Deve Bair in two locations, where it will cross it via overpasses in Zidilovo and Uzem.	Low

7.2 Impacts

The location of the route within the Kriva Reka valley provides and the presence of approximately two thirds of the route within tunnels limits the landscape and visual impacts, both during construction and operation. The construction activities will have a temporary impact on the landscape and visual receptors which is reversible and will cease with the completion of construction. The Contractor will be required to manage the disposal of surplus earth materials to avoid proposed and protected areas including Kiselička Reka gorge and to undertake stabilisation and re-vegetation of slopes.

Negative Impacts on the landscape during operation are considered to be of medium significance along the route due to the nature of the railway and presence of linear, large-scale structures, particularly bridges and of high significance between km 73+ 540 to km 88+ 360, in areas of higher value including Kiselička Reka gorge. Negative visual impacts for some residents and facilities (e.g. schools, soccer fields) in Kriva Palanka, Zidilovo and Uzem are also predicted to be of high significance for those with unobstructed views of large bridges and bridge pillars as they are located very close to or in some cases under bridges.

Mitigation measures including re-vegetation and replanting of removed forest areas will be undertaken and defined in a Landscape and Planting Plan, subject to safety restrictions on planting in proximity to the newly operating railway and may mitigate impacts to a small extent. However even with the application of mitigation measures significant impacts will remain which cannot be mitigated. Photomontages of the views of the railway from nine locations are presented in the Landscape and Visual Impact Assessment - Update Report, with selected locations below:

Figure 22: Zidilovo - panoramic view to the west-southwest- photomontage

Figure 23: Kiselička reka - panoramic view to the north-northwest- photomontage

Figure 24: Kriva Reka- soccer field- panoramic view to the north- photomontage

During operation, it is expected that the railway line will increase availability and accessibility of visual scenery towards the surrounding mountainous terrain during travelling, and there may be some indirect benefits for increased tourism in the Municipality.

Cumulative impacts with the new highway being constructed from Dlabočica - Kriva Palanka are not expected to be significant because the landscape in this area is already urbanized and because railway and highway routes are above one another, parallel to each other and on the same side of the hill.

8. Social Impacts

8.1 Introduction

The social aspects related to Section 3 has been assessed twice, once as part of the ESIA2012 assessing the impact from the entire Railway Corridor VIII Eastern Section and second time as part of ESIA2017 assessing the Section 3 only (Chapter 8: Social Impact Assessment and Mitigation Measures of the ESIA (2017)). Additional social assessment is done in 2022 as part of this ESIA Addendum, which included an analysis of existing documentation and development of key safeguard documentation complementary to Lenders' standards. As part of this assessment, Resettlement Action Plan was prepared based on the analysis of following main data sources:

i. Socio-economic Survey (including meetings, questionnaires, and interviews) supported by PE ZRSMI in May 2022, which is primarily used to establish a resettlement baseline;
ii. Geodetic report / Elaborate for Expropriation prepared by Geodetic company (on behalf of PE ZRSMI) in January and February 2022, which is primarily used to identify affected land, properties and PAPs eligible for compensation, and
iii. Asset Inventory and Valuation prepared by the Bureau of Judicial Expertise (BJE), under the Ministry of Justice of the Republic of North Macedonia, covering land, buildings and crops related to the permanent way (excluding the crops in Kriva Palanka).

8.2 Baseline conditions

The social baseline data presented in ESIA 2017, Chapter 6.13 on Demography, economy, employment and professions, health and social welfare, education and vulnerable groups remains relevant for the assessment of social impacts. However, the social baseline has been updated and includes information

from the additional socio-economic surveys. This Addendum includes published data of the Census of population, households, and dwellings, conducted in 2021.

Demography. The demographic profile of the municipality of Kriva Palanka drastically changed since the census in 2002. The population in Kriva Palanka decreased to 18.059 inhabitants in 2021. In the period between the two censuses, the population decreased by 2.761 inhabitants or 13.26%, but the number of households and dwellings increased (see the table above).

Table 11 Demographic image of the Municipality of Kriva Palanka

		Population	Households	Dwellings
1.	Census 2002	20.820	6.600	9.448
2.	Census 2021	18.059	6.984	11.614

The population density was on average 43.30 inhabitants per km^2 in 2002, in Kriva Palanka. Comparing the data from the last two censuses, from 2002 and 2021, there is a significant decrease in population density. In fact, the population density decreased from 43.30 persons per km^2 to 37.56 inhabitants. The last registered population condition, by gender and with a 5-year interval, is represented in the picture below. Women, in 2021 Census, make up 48.50% of the Municipality's population. Men dominate in all series up to 65 years.

The project affected settlements are the following: T'lminci, Kriva Palanka, Gradec, Lozanovo, Drenje, Kiselica, Trnovo, Zidilovo, Krklja, Kostur and Uzem. Following figure depicts the settlements along the railway alignment.

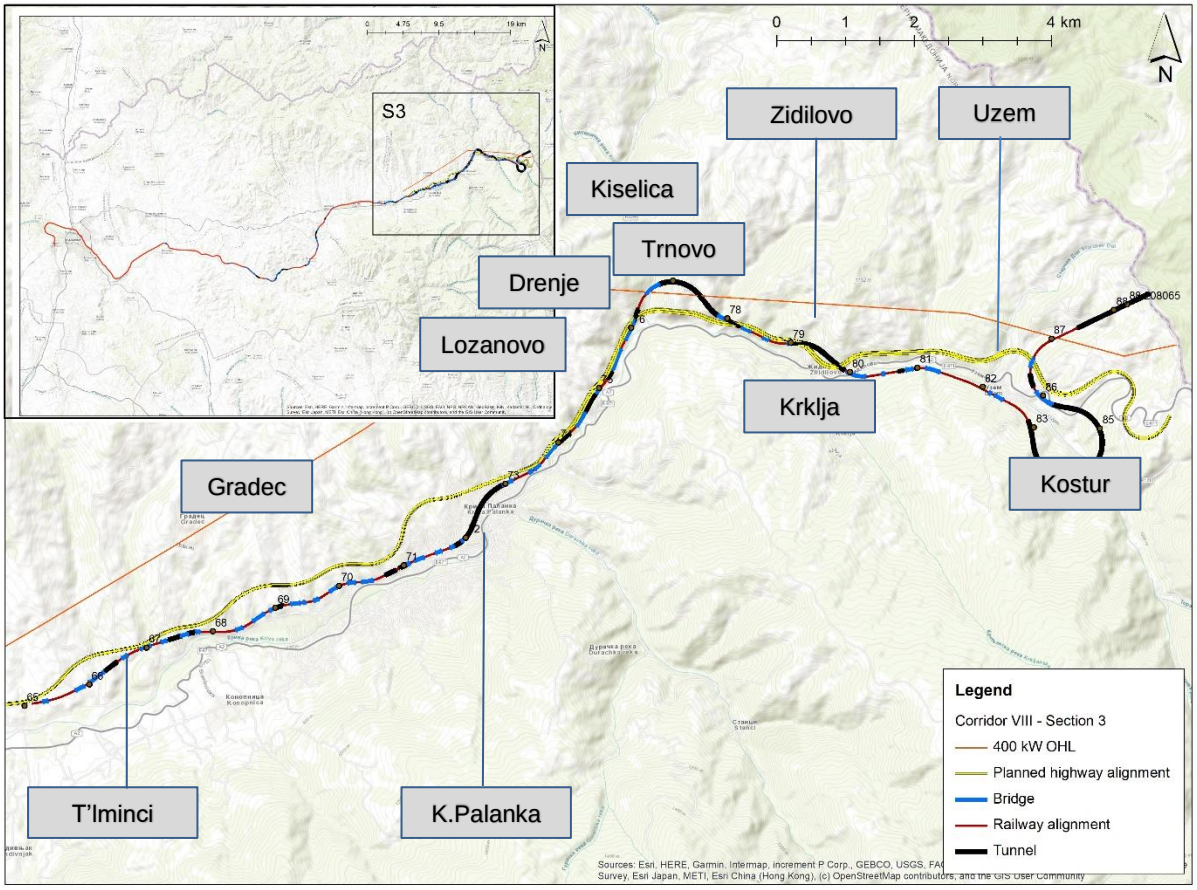


Figure 25 Project affected settlement along the section

Based on the data of last Census in 2021, 92% of the residents of Kriva Palanka declared themselves as Macedonians and 3% identified themselves as Roma. Regarding the religious affiliation, Orthodoxy is the dominant religion in Kriva Palanka, and the majority residents declared themselves as Orthodox.

Land use and livelihood. At the start of the section, the land use corresponds to hilly pastures and conifer forests. There are also landscapes where the land is used for agriculture or orchards, especially in the lowlands near the river of Kriva Reka. In the middle part of the section 3, the railway passes the town of Kriva Palanka, where the dominant use of land is housing. In the last part of the section, in the higher mountainous places, there are more types of natural deciduous forests that dominate the area. Agricultural land can be found along the river Kriva Reka. The uncultivated land and pastures are gradually being replaced by forests over the slopes of the hills and mountains.

The geographical position of the Municipality determines the dominant manner by which the population provides the income. Because the municipality Kriva Palanka stretches over mountainous terrain and is located in the immediate vicinity of a border crossing through which passes a considerable traffic connection, the dominant activity of the households in providing means of life are the service activities, followed to a lesser degree by agriculture/farming of animals and very little industrial production. The main income source for the people living in the urban area comes from services and production, whereas those living in the rural areas mainly lean on agriculture, farming of animals, fruit-farming, apiculture, gathering herbs and forest fruits and some from salary, pensions, and other social transfers. The Toranica mine operates on the territory of the municipality, also there are small production capacities for production of plastic, textile, ready-made clothing, shoes, carpets and rugs, wood mass and furniture, pastry products, metal constructions, etc. Trade is the most developed economy branch in Kriva Palanka, due to the proximity of the Bulgarian border. This is especially true about used vehicles import. Also, in the immediate vicinity of the urban area, several sawmills are operational, logging for firewood and furniture wood. There are fishponds for fish farming. In the last decade, there is a tendency for increase in entrepreneurship, especially in the construction, transportation and storage sector and retail trade for motor vehicles/motorbikes repair.

Gender aspect. This aspect has been noted in the gap analysis conducted for Section 3. In that context the key points related to the gender issues are elaborated:

- In 2022 was adopted new Strategy on Gender Equality 2022-2027 – including clearly stated general and specific goals, expected results, and indicators for monitoring and evaluation.
- Equal opportunities and the prohibition of discrimination in employment or workplace are regulated with the Law on Labor Relations (OG of RM, No. 167/15).
- Macedonia's Gender Inequality Index rank of 35 (2018) was better than other countries in the region, such as Bulgaria (46) and Romania (68). In the wage equality for similar work rank in the 2016 Global Gender Gap, Macedonia recorded a decrease in female legislators, senior officials, and managers, and a re-opening of its educational attainment gender gap - and is ranked 73rd.
- In North Macedonia, the women's status and social role varies between communities. Roma women and girls face the highest rates of discrimination, violence, and gender inequality. Macedonia ranks 66 in the Global Gender Gap Index for 2018 (out of 149 countries) but slips down to 103 for indicators around women's economic participation. There is a 27 percentage-point gap in labour force participation between women (51%) and men (78%). Indicators around education, health and women's political participation show more progress. Gender-responsive budgeting is now compulsory by law and work is ongoing to institutionalise gender budgeting in national policy-making and budgets at central and local levels.
- The gender structure in the Census (2021) shows the bigger number of male than female population in the project affected municipality of Kriva Palanka. In fact, in 2021 Census, women make up 48.50% of the enumerated population. Men dominate in all series up to 65 years.

- According to the economic status, the total working age population aged 15 and over in the municipality of Kriva Palanka in Census (2021) was 15,796 persons. Out of the total number working age population in the municipality, the number of men was higher (8,129) than the number of women (7,667). The difference is 2.5% in favour of the male working age population.
- The total number of active or employed population aged 15 and over, in Census 2021 was 5653 persons. The number of employed male was significantly bigger (3358 men) than the female population (2295 women). At the level of the municipality, manufacturing, human health, and social work are the sectors with the biggest concentration of women, followed by education and wholesale and retail trade.
- According to the total resident population aged 15 and over in formal (regular) education by gender, the dominance of the female population is noticeable. Namely, the total number of 808 women has formal education, while the number of male population is significantly lower (668 men).
- The total number of unemployed in Kriva Palanka, in 2021 was 1,752 persons. The number of unemployed men (890 men) is slightly higher than the number of unemployed women (862 women).
- Given the fact that the bigger part of railway passes through rural areas in the municipality of Kriva Palanka, it is important to note the following facts concerning the rural woman. Only 4% of women in rural areas are owners of homes. The unadjusted gender wage gap is 17%. 90% of men in agricultural households make decisions related to land. 39% of women dedicate time on a daily basis for care and education for their children or grandchildren. Findings of a UN Women-supported research34 showed that only 12% of women in rural areas are landowners and less than 10% have decision-making roles related to land. While women in agriculture work on average 11.06 hours per day, 41.7% of the total workload belongs to unpaid work. Before the COVID-19 pandemic, rural women in North Macedonia already worked more hours every day than men, much of this time unpaid. The health crisis has increased their workload and they are also struggling to access health services and other support.

Vulnerable groups. The social protection in the RNM is administered through the inter-municipal centres for social work[35], the civil associations and the local authorities. The public centre for social affairs is responsible for provision of social work services and delivery of financial support to address various social issues including childcare allowances, parental allowances, special allowances, guaranteed minimum assistance payments, etc.

The socio-economic survey conducted with PAPs revealed that 64 household members are identified as vulnerable. The vulnerability component is mainly consisted of elderly people, over 65 years. Elderly persons or persons age 65 and older, according to this age indicator are considered vulnerable. However, according to the Macedonian law on social protection, the age over 65 years is considered as an indicator for vulnerability. It is important to underline that there is the need to combine the other factors with this indicator, like the incomes, ownership of the land, recipients of social welfare, etc. In this context, only the age is not considered as a main indicator to assess the vulnerability.

Potentially vulnerable groups in the project area are women, elderly persons, persons with disabilities, persons with chronic illness, households under poverty line, households headed by women etc. The vulnerable PAPs should be provided with additional assistance including legal assistance and help, if and where necessary.

[34] Faculty of Agricultural Sciences and Food, University St. Cyril and Methodius, Skopje, Measuring Women's Empowerment in Agriculture with survey-based and experimental economics methods, 2019

[35] Relevant to the project area is the Inter-Municipal Centre for Social Affairs - Kriva Palanka

8.3 Additional socio-economic survey

A socio-economic survey has been conducted as part of the RAP presenting information on the socio-economic environment of the project affected persons (PAPs). The sample for the socio-economic survey was designed based on the data collected in the Geodetic report / Elaborate for expropriation. The main objectives of the analysis are to provide a societal baseline for PAPs, assist in identifying appropriate mitigation measures and to identify vulnerable persons who may need additional support due to the project`s impact. The conducted survey included the PAPs related to the permanent way and the access roads in Kriva Palanka.

The socio-economic baseline was prepared in two phases. In the first phase, involved the collation and analysis of secondary data from the Geodetic report / Elaborate for expropriation for the project affected municipality and settlements (maps, plans, statistical data, etc.). The second phase involved the collection and analysis of primary data obtained using 62 household questionnaires, 2 business questionnaires, 15 in depth qualitative interviews and three focus group discussions with PAPs over a period of approximately three weeks in May 2022. The questionnaires were applied following Project Information Meetings with PAPs between May 9 and May 23, 2022. Additional surveys were conducted in October 2022 for the PAPs related to the access roads and slopes in Kriva Palanka.

8.4 Potential for additional impacts

The social impact assessment presented in Chapter 8: Social Impact Assessment and Mitigation Measures of the ESIA (2017) remains applicable to this Addendum, as identified and indicated in the Commitments register.

Based on the Geodetic report / Elaborate for expropriation for Section 3 prepared in 2022, the Asset Inventory and Valuation for the permanent way and the Socio-economic survey conducted as part of this Addendum and RAP, an update of the key physical and economic Project displacement impacts was done.

The total number of the project affected land plots for permanent expropriation for the construction of the permanent way and access roads in the following cadastre municipalities: T'lminci, Gradec, Lozanovo, Kiselica, Trnovo, Drenje, Krklja, Zidilovo, Kostur and Uzem and on the permanent way in the cadastre municipality of Kriva Palanka is 514. Of these 514 parcels, about 6% of them will be fully acquired, while 94% will be partially acquired. These land plots by ownership status are shown in table below.

Table 12 Land parcels affected by permanent project land acquisition for construction of the permanent way and access roads in CM T'lminci, CM Gradec, CM Lozanovo, CM Drenje, CM Kiselica, CM Trnovo, CM Krklja, CM Zidilovo, CM Kostur and CM Uzem and the permanent way in CM Kriva Palanka

	Ownership	No of parcels affected by permanent land acquisition		
		No. of parcels	Area in m^2	%
1.	Private owned	293	232,792	36.69%
2.	State owned	217	391,051	61.64%
3.	Co-owned state / private	2	1,952	0.31%
4.	Company owned	1	1	0.00%
5.	Macedonian Orthodox Church	1	7,628	1.20%
	TOTAL	514	633,423	100.00%

Based on the analysis of the Geodetic report / Elaborate for expropriation, the total number of affected buildings was originally identified to be 48. Since all buildings are registered in the cadastre or in the Geodetic report / Elaborate for expropriation as Ground Under Buildings (GUB), subsequent ground truthing survey established the number of affected houses to be 38, with the other 10 buildings identified as garages or ancillary buildings.

Most of the affected buildings are located on the project access roads in and slopes in Kriva Palanka. Due to the very significant social impact and the concern raised by the community, a redesign of the access roads was made[36] that will save 23 houses. Thus, the total number of project affected buildings is 15, as presented on the table below.

Table 13 Privately owned buildings affected by Land Expropriation and their legal status

	Cadastre Municipality	Number of the buildings	Illegally constructed buildings	Legally constructed buildings	No information
1.	CM Trnovo	-	-	0[37]	-
2.	CM Kiselica	1	1	-	-
3.	CM Kriva Palanka	7[38]	5	1	1
4.	CM Drenje	1[39]	-	-	1
5.	CM Zidilovo	1	1	-	-
6.	CM Uzem	5	3	2	-
	TOTAL	**15**	**10**	**3**	**2**

The redesign of the access roads in CM Kriva Palanka and CM Trnovo will additionally affect total of 13.378 m^2 and 1 residential building. Bearing this in mind, the total area affected by the project is 646 801 m^2 and 522 plots.

The project will likely affect men and women differently. This is because the type of employment opportunities provided by the project in the construction phase are more likely to be directed towards men. Women typically benefit from different type of service activities. Therefore, it is unlikely that woman will benefit from the limited construction employment opportunities that will be created by the project.

8.5 Consideration of Needs for Additional Mitigation

The mitigation measures and compensation related to the expropriation of houses and land acquisition will be in detail elaborated in RAP.

All activities related to the land acquisition and resettlement will be planned to ensure that compensation is paid prior to expropriation and commencement of Project construction. Public consultations, internal monitoring and grievance mechanism will be undertaken intermittently throughout the project duration. The RAP sets out a time frame for key resettlement tasks, however, the implementation schedule is subject to modification depending on the progress of the project activities.

Loss of crops and trees in Kriva Palanka and Trnovo, loss of land, building and crops related to the redesign and loss of income will be subject to a separate valuation and any costs associated with

[36] May 2023, as part of the Connecta project

[37] The access road in this area will be redesigned with approval from the EBRD. With the redesign of the access road, the demolition of this house will be avoided. The house is given on the Figure no. 4.

[38] One house for demolition is semi-detached house.

[39] The valuation for this parcel was added later.

various types of assistance will also be estimated in accordance with the timeline established in the RAP.

Upon completion of the final design, approval of the construction permit and preparation of the Geodetic report / Elaborate for Expropriation for the access roads, valuation will be conducted for permanent loss of land, buildings and annual / perennial crops and trees related to access roads and compensation subsequently provided in accordance with the timeline established in the RAP.

8.6 Residual Impacts

Provided that the mitigation measures required by the supporting plans, CESMP and OESMP are implemented throughout the construction and operation of the Project, the residual effects impact on social environment will be **small adverse**. On the following table are given the social impacts, mitigation measures and magnitude of the residual impacts.

Social impact	Mitigation Measure	Residual impact
✓ Improper management of the implementation of the social environment management system; ✓ Delay in the implementation of the project due to the company's non-compliance with the requirements of the IFIs; ✓ Increased anxiety among the population due to the lack of communication with local settlements and property owners near the project area; ✓ Reducing stakeholder engagement activities during construction;	✓ Development and implementation of SEP with Grievance Mechanism in construction phase; ✓ Development and implementation of SEP with Grievance Mechanism included in OESMP. ✓ Community Liaison Officer will be appointed to be responsible for supporting the implementation of the SEP, including participating in regular consultation with affected communities and handling grievances related to the Contractor's activities.	Small adverse
✓ Expropriation of houses / homes; Increasing the expectations of the affected population in terms of employment; ✓ Delay in the realization of the project due to badly performed expropriation and dissatisfaction of the stakeholders; ✓ Adults in remote areas; ✓ Impact on housing from vibration; ✓ Disturbance of livestock due to construction noise, blasting and / or displacement of grazing livestock away from the alignment of the railway; ✓ Loss of agricultural land and property for railway purposes; ✓ Economic loss to local businesses.	✓ Development and implementation of RAP.	Small adverse
✓ Increased threat to the community and livestock due to the presence of a construction site; ✓ Emergencies due to of transportation of materials for and along the railway; problems related to workers'	✓ Development and implementation of the Construction Health, Safety and Security Plan (including community and occupational health and safety) included in CESMP.	Small adverse

Social impact	Mitigation Measure	Residual impact
behaviour towards the local environment; ✓ Problems related to workers` behaviour towards the local environment; ✓ Fear for personal health and safety due to the increased volume of traffic across settlements; ✓ Noice disturbance due to construction activities; ✓ Disruption of everyday life caused by limited access to inhabited settlements, land; ✓ Degradation of local roads due to construction transport related to the project; ✓ Impact on housing from vibration; ✓ Interruption of access to communal and road infrastructure; ✓ Disturbance from an interrupted process of education and learning; ✓ Disturbance from an interrupted process of education and learning.	✓ Development and implementation of the Construction Traffic Management Plan included in CESMP. ✓ Development and implementation of Operational Community Health, Safety and Security Plan included in OESMP.	
✓ Stress caused by a noisy work environment; Influx of workers; Incidents caused by easily flammable, corrosive and explosive materials; ✓ Stress caused by exhaust gases in the workplace; ✓ Endangered health for workers due to work at a height; ✓ Endangered health of workers from rotating and mobile equipment; ✓ Endangered health of workers for driving industrial vehicles and traffic on the construction site.	✓ Development and implementation of the Occupational Health and Safety (OHS) System and Policy included in the CESMP; ✓ Development and implementation of the Environmental, Health, Safety and Social Incidents Procedure included in the CESMP; ✓ Development and implementation of the Resource Efficiency and Pollution Prevention and Control included in the CESMP; ✓ Development and implementation of the Construction Worker`s Accommodation Management Plan included in the CESMP; ✓ Development and implementation of the Recruitment, Labour Management and Monitoring Plan included in the CESMP; ✓ Development and implementation of the Training Plan included in the CESMP; ✓ Development and implementation of the Operational Occupational Health, Safety and Security Plan included in the OESMP; ✓ Development and implementation of the Gender plan, included in CESMP and OESMP.	Small adverse
✓ Emergencies due to transportation of materials for and along the railway	✓ Development and implementation of the Construction Emergency	Small adverse

Social impact	Mitigation Measure	Residual impact
	Preparedness and Response Plan included in the CESMP; ✓ Development and implementation of the Operational Emergency Preparedness and Response Plan included in the OESMP.	
✓ Potential destruction and loss of undiscovered archaeological sites ✓ Anxiety due to blasting during religious ceremonies	✓ Development and implementation of the Cultural Heritage Management Plan in the CESMP.	Small adverse
✓ Supply Chain	✓ Development and implementation of the Supply Chain Management Plans included in the CESMP; ✓ Development and implementation of the Supply Chain Management Plans included in the OESMP.	Small adverse
✓ Maintenance	✓ Development and implementation of the Operational Maintenance Plan included in the OESMP.	Small adverse
✓ Management of Change Procedure	✓ Development and implementation of the Management Plans included in CESM and OESMP.	Small adverse

8.7 Summary

The redesign of the access roads will significantly reduce the total social impact from the project will result in significant reduction of the social impact from the project, in particular avoiding 23 houses to be demolished and reduction of related nuisance. Additional mitigation measures have been identified in the ESMP in both construction and operational phase to provide compliance with the relevant national and E&S requirements.

9. Climate Change Mitigation and Adaptation

9.1 Observed and Projected Climate

The Project area is characterised by moderate continental climate with local microclimate differences due to the terrain elevation which gradually increases from 600m a.s.l in the west to 1,100m in the east. The lower areas in the west are characterised by warm continental climate while the very east in the Osogovo Mountain has an alpine and cold continental climate.

Whilst the average annual temperature in Kriva Palanka is moderate (10.9º C), temperature extremes are pronounced (from -21º C to +36º C).

Average annual rainfall is around 600mm which is moderate but the intensity of events varies throughout the year. The highest rainfall is recorded in May-June and November and the lowest in August-September and February. Short bursts of high intensity rainfall are common.

The area is windy with an average speed of 2.9m/s (the southern wind) while a NE wind is the most frequent.

According to available official national reports on climate change, predictions for the period 2025-2100 suggest a continuous increase in air temperature compared to the baseline period (1961-1990), especially in summer. Total annual rainfall is predicted to decrease, with the greatest decrease predicted in July and August. However, more moisture in a warmer atmosphere can result in heavy rainfall events followed by flash floods, storms and more snowfall.

9.2 Climate Change Mitigation

In a wider context, the Project is part of the national strategy to mitigate the effects of climate change. The Republic of North Macedonia has committed to an 82% reduction in net greenhouse gas emissions in 2030 compared to 1990 under the 2015 Paris Agreement. The development of railroads and improvement of railway connections between towns has been incorporated into the transport sector mitigation and adaptation strategies.

According to the National Energy and Climate Plan - NECP (July 2020), once the Railway Corridor VIII – East (Section 1, Section 2, Section 3) is operational, it will result in GHG savings of 24.6 Gg CO2-eq (in 2030) and 32.3 Gg CO2-eq (in 2040). This result is based on the assumption that by 2040 up to 5% of the tonne kilometers (to the Republic of Bulgaria) of the heavy goods vehicles will be replaced by the railroad transport.

At the Project level, the key mitigation can be implemented at the construction phase. The ESMP includes provisions for the Contractor to implement the following, where practicable:

(1) Maximise the use of construction materials with recycled or secondary and low carbon content;

(2) Use locally sourced materials to minimise transport distances to the construction site;

(3) Use efficient construction processes, including construction plant, equipment and delivery vehicles;

(4) Reduce requirements for excavation and construction materials, where possible;

For the operational phase, the ESMP requires consideration of methods for energy efficiency (energy efficient lighting, efficient water fittings at the stations, etc.).

9.3 Climate Change Adaptation

The 2017 ESIA considered the vulnerability of the Project to climate change. The major climate risks that the Project region may encounter identified by the 2017 include increased frequency of heat waves potentially affecting the railway infrastructure, prolonged drought periods which may increase the risk of wildfire, heavy rainfall events leading to flash floods and erosion, heavy snowfall events, and wind gusts.

The Project design was conducted in line with the EU Technical Specifications for Interoperability (TSIs). The design included structural and engineering measures for climate adaptation related to temperature increases, strong wind events, drainage systems, protection of structures from 100-year rainfall events, landslide and erosion control.

As part of the Detailed Design, hydraulic calculations have been undertaken using two best practice methods which both consider drainage catchment of the watercourse, characteristics of the catchment and local meteorological data. These methods are considered to be robust. The watercourse crossings have been designed to have sufficient capacity for the 100-year rainfall event, which is a standard design practice in North Macedonia. The Project area has not been identified by relevant national institutions as a flood risk area. However, the hydraulic calculations date from 2016 and the Contractor will be required by the ESMP to undertake assessment whether the calculations include the appropriate allowance with respect to climate change effects.

The ESMP sets out the climate change adaptation measures that should be implemented during the construction and operation phase. The Contractor's CESMP and relevant sub-plans are required to establish working procedures during high water and heavy rain periods, hot weather, winter preparation works, construction site drainage, stabilisation of soil in erosion prone areas, wildfire preparedness and response, etc. The Contractor is required to consider air temperature and material use, i.e. to select construction materials which do not have rapid-drying properties, where appropriate.

The ESMP sets out provision for the maintenance and safety practices including regular inspection of track buckle, power loss emergencies in overhead lines, flash floods preparedness and response, wildfire preparedness and response, drainage inspections following extreme events, monitoring of slope stability, etc.

Taking into account the design-embedded mitigations and adaptation measures included in the ESMP, it is considered that the impacts of the Project during its construction and operation as a result of climate change will be minor adverse (not significant).

10. Cumulative impacts

10.1 Screening of Cumulative Impacts

The Project is situated along Pan-European Corridor VIII and its wider area is subject to development of adjacent railway sections and roads along the corridor. Construction and operation of the railway and road schemes might result in in-combination effects with the Project.

At the time of writing (December 2022) the following projects are under development in the Project area and considered relevant with respect to potential cumulative effects:

- Construction of the expressway road Rankovce – Kriva Palanka (11km). The project is financed by the World Bank. The construction work started in June 2018 with an initial deadline of 3 years which has been delayed. The proposed road runs within 300-400m as the first 7km of the Section 3, intersecting the Project alignment in Kriva Palanka.
- Reconstruction and upgrade of the existing regional road A2 Kriva Palanka – Deve Bair (13km). The project is financed by the EBRD. The reconstruction started in November 2020 and is planned to be completed in 2023. The road follows the Kriva River valley while the Project mostly runs along the nearby hills.
- Section 2 of railway Corridor VIII (Beljakovce - Kriva Palanka, 34km) is adjacent to the Section 3 project. Section 2 was partially built from 1996-2004 when the permanent way was established and some of the structures (bridges, tunnels) were partially built. The EBRD is currently financing the project's completion and the rehabilitation and construction works commenced in October 2022.

Other projects which have been proposed in the area are:

- Construction of the Corridor VIII planned highway alignment, re-projected to be implemented as expressway at one section as A2 , LOT 2: Sub-section Kriva Palanka – Dlabocica going from Dlabocica to Kriva Palanka to merge with the regional road to Bulgaria, that is now in phase of rehabilitation: Kriva Palanka Road Rehabilitation Project from Kriva Palanka to Deve Bair. The construction of the remaining portion of the initially planned highway alignment, section Kriva Palanka to Deve Bair is reported to be uncertain and is excluded from further analysis.
- .
- Construction and rehabilitation of local roads which connect villages within the municipality. These roads are minor, used locally by residents, without significant interaction with the Project and are excluded from the analysis.

10.2 Potential Cumulative Impacts

The Expressway Road Rankovce – Kriva Palanka

The expressway road Rankovce – Kriva Palanka which runs in the vicinity of the Section 3 alignment was considered in the Project design. The relationship between the expressway road which is under construction and Section 3 is shown in Figure 26.

Figure 26 Relationship Between the Project and the Expressway Road Under Construction

(source: Google Earth, imagery date: 11th August 2020)

The expressway road construction site seen from the A2 regional road in Kriva Palanka is shown in Figure 27.

Figure 27 Expressway Road Rankovce – Kriva Palanka Under Construction (January 2022)

The major earthworks appear to be completed for the Project, with works expected to be completed by the end of 2023. It is sensible to assume that by the time the Project construction commences, the expressway construction will be near to completion. No significant overlap in the construction of the two developments is anticipated that would contribute to significant in-combination effects for the local community (air emission, construction noise and vibration, etc). The in-combination impact of the construction is considered to be **minor adverse (non-significant)**.

Once both the expressway and the Section 3 project are operational, they will represent a potential source of cumulative noise in the area. On the other hand, both projects run through a largely unpopulated area in the upland above Kriva Palanka and are likely to redirect part of the traffic from the existing regional road A2 running through the town. This may result in a reduction of noise levels at residential receptors currently exposed to traffic noise from the regional road A2. The in-combination impact of the operational noise is considered to be **minor beneficial (non-significant)**.

The number of residential receptors potentially exposed to the cumulative operational noise of the new expressway road and the Project would be limited to hamlets belonging to Tlminci and Konopnitsa villages (between 65+000 and 69+000). The hamlets are situated approx. 150m of the proposed Project and approx. 500m of the new expressway road.

On this section of the Project, two noise barriers have been proposed (see Table 9 Proposed Locations for Noise Barriers in Section 5 Noise). The noise barriers have been modelled to reduce the operational railway noise below the WHO threshold of 44 dB(A) for the night-time period (Ln).

No information is available whether any noise mitigation measures have been proposed for the expressway road. The operational noise from the expressway road might contribute to the cumulative noise from both developments which would potentially exceed the recommended WHO noise threshold values in the affected hamlets. If the WHO threshold for night-time noise exposure is exceeded that would constitute a **major to moderate adverse impact (significant)** that must be mitigated.

The ESMP and the ESAP include the requirement for PE ZRSMI to collaborate with the road management company (Public Enterprise for State Roads - PESR) in the operational phase, in case of complaints from the local communities of Tlminci and Konopnitsa related to the cumulative noise issues and their mitigation.

Considering the ongoing construction linked to other infrastructural projects in the AOI: Kriva Palanka Road Rehabilitation Project; Expressway A2, LOT 2: Sub-section Kriva Palanka – Dlabocica and SHPP “Kriva Reka”, PCC HYDRO, impacts related to habitat degradation/fragmentation, noise and disturbance are feasible. Hence, in line with the EBRD PR6 requirements, care should be taken to cease further fragmentation of any habitats identified as CH and restoration management actions are provided for all habitats identified as PBF/CH to insure no-net loss and where possible net gain.

The degradation from the ongoing construction of the Expressway A2, LOT 2: Sub-section Kriva Palanka – Dlabocica is most notable from T’lminci to Stambolica. Most relevant in terms of cumulative impacts is the noted disturbance at Kiselichka Reka valley, where habitat disturbance has occurred due to residence development and the ongoing reconstruction and rehabilitation of the A2 state road, section Kriva Palanka – Deve Bair. Nonetheless, the footprints of all infrastructural projects currently implemented in the area of Kiselichka Reka are discrete, since there is no intersection with the railway alignment. Furthermore, the effects of the Kriva Palanka A2 Road Rehabilitation Project projected alongside the railway line have been accounted for in the expressway ESIA that assumes no significant impact. Hence, accounting for the monitoring in place and further considering the management actions and mitigation measures outlined for both, including the revegetation planned to offset the habitat loss and increase habitat connectedness, no significant cumulative impacts are expected.

Section 2 of the Railway Corridor VIII

The Corridor VIII section whose development might partially overlap with the Project is the adjacent Section 2, 34km-long, developed by PE ZRSMI. Rehabilitation and construction works on Section 2 commenced in October 2022.

It is assumed that there will be at least a 2-year gap between the commencement of the two projects which suggests that earthworks on Section 2 will be completed when the Project construction starts.

Potential in-combination effects on air quality are therefore not likely, while cumulative noise effects, visual intrusion, and impacts on traffic cannot be excluded.

The number of residential receptors close to the area of concurrent works is small, with Tlminci village being at a distance of more than 600m. Given that the construction works will be of limited duration, providing that anticipated mitigation measures are implemented, the in-combination effects on the nearby receptors are considered to be **minor adverse (non-significant)**.

Reconstruction and Upgrade of the Regional Road A2

The Project construction is not likely to overlap with the reconstruction and upgrade of the A2. The in-combination effects of the operation of the reconstructed and upgraded regional road A2 and the Project Section 3 are not considered to be significant.

11. Potential Impacts of Electrification

This section provides a summary of potential impacts of the electrification component of the Project. The electrification was subject to the 2012 ESIA (Eptisa & DB) which considered the entire Eastern section of the Corridor VIII. The 2012 ESIA provided an assessment of electrification impacts at an appropriate level of detail. The potential electrification impacts are anticipated to be limited.

The main materials required for the electrification works will include steel structures and prefabricated switches, breakers, transformers, and cables. The foundations of catenary masts will require cement. The access road to the TPS will require crushed rock/ gravel. The material resource consumption for the electrification works is considered to be at a local scale and non-significant.

During the construction of foundations for masts, portal structures and the TPS, earthworks and grading will generate dust (PM10). Throughout the electrification works, the construction equipment and vehicles will be a source of NO_2, SO_2, CO, and hydrocarbons. The settlements where residential houses are situated between 10 and 30m from the alignment might be temporarily affected.

These settlements are: Section 1 – Cherkesko selo, Lopate, Rezanovce, Kumanovo settlements (Sredorek, Pero Čičo, Proevce 1, Proevce 2, Kumanovo Spa), Šupli Kamen, and Dovezance; Section 2 – Odreno; Section 3: T'lminci, Kriva Palanka, Zidilovo, Uzem.

Construction of masts and installation of wires within the right of way will generate short-term and temporary noise and vibration that will affect residents in the settlements intersected by the alignment. The construction equipment may include hi-rail trucks, auger drill rigs, excavators, concrete mixers, cranes, telescoping bucket trucks, etc. As the electrification proceeds down the railway corridor, the noise will dissipate.

Construction of electrification structures will not require deep excavations or large earth movements. Catenary mast foundations are typically between 2 and 4m deep with the hole of up to 1m diameter. If groundwater is encountered during construction, dewatering can be conducted locally.

The Project alignment crosses numerous streams (ephemeral and perennial) and the Pčinja River. The watercourses will be crossed by culverts and bridges. The catenary masts are typically included in the bridge design and no impact on surface water from their construction is anticipated.

There are no surface water bodies in the area of the proposed TPS Kratovo. There will be no direct path between the sediment load created during excavation and grading for the TPS construction and watercourses in the wider area. If an additional TPS is built in Kriva Palanka or Zidilovo area, the Contractor is required by the ESMP to implement a Surface Water Management Plan to prevent adverse impacts to any watercourse in the vicinity.

The electrical equipment at the substation and switchgear is a minor source of SF6 greenhouse gas. According to the Detailed Design, the 100kV switchgear will have sulphur hexafluoride (SF6)-insulated circuit breakers. Circuit breakers are equipped with SF6 density meters which can indicate potential leakage. During the normal operation, the gas leak is very minor (less than 0.5% per year).

Operation and maintenance of the TPS and switchgear will be split between PE ZRSMI (27.5kV equipment and part of the switchgear) and the national transmission grid operator (MEPSO) which will be in charge for the high-voltage part.

Spoils resulting from the excavations for the catenary masts foundations and construction of the TPS will be relatively small in quantity. It is anticipated that part of this spoil can be used for landscaping along the right-of-way and in the TPS area.

Maintenance of the overhead contact line system and the TPS will generate both hazardous and non-hazardous waste. The key waste stream will be waste oil which will be periodically generated and should be delivered for regeneration to a licensed operator.

The electrification facilities contain hazardous materials such as insulation oil in the transformers. SF6 gas is not hazardous (unless directly inhaled). Improper handling of transformer oil during maintenance could result in contamination of soil and groundwater. Transformer containment bunds are standard design practice in the Republic of North Macedonia.

No major interference with the existing underground utilities is anticipated given that catenary masts foundations can be adjusted to avoid them. Community health and safety risks are related to exposure to electromagnetic fields (EMF), electromagnetic interference (EMI), and electrical accidents and also electrocution risk of birds. The 2012 ESIA identified one settlement (Pero Čičo in Kumanovo, Section 1) where residential structures are situated 6 m from the proposed railway and can potentially be exposed to increased EMF levels. The ESMP for the Project has addressed this as well as other community HS risks.

12. Stakeholder Engagement

12.1 Stakeholder engagement and public participation requirements

EBRD's performance requirements 1 and 10 and EIB Standard 2 require effective and inclusive engagement with the project stakeholders in a systematic approach that will help PE ZRSMI build and maintain a constructive relationship with its stakeholders, the local community and the contractors.

The Law on Environment, as well as the EIA Directive , outlines the need for public participation as part of the decision-making procedure accentuating the role and importance of the Environmental Impact Assessment (EIA) in informing the public of the effects associated with the Project. A Non-Technical Summary (NTS) was prepared following the preparation of the ESIA addendum. As part of the disclosure package, the NTS shall be translated into Bulgarian and further disclosed to the relevant Bulgarian public.

12.2 Previous Stakeholder Engagement Activities

Consultations for both ESIA studies, in 2012 for the entire railway alignment (Section 1, 2 and 3) and in 2017 for Section 3 have been conducted prior to ESIA approvals by the Ministry of Environment and Physical Planning (MOEPP) in line with the with national legislation. Consultations for ESIA 2012 were conducted at several locations where different stakeholders participated and also consultations for the ESIA in 2017 were conducted in Kriva Palanka.

Given that the Project includes a cross-border tunnel with Bulgaria, it has been subject to the Espoo Convention on Environmental Impact Assessment (EIA) in a Transboundary Context as part of the national ESIA process in 2017 and involved the environment authorities of Bulgaria.

Additional public consultations for Section 3 had been conducted in 2022 and 2023 for project information and resettlement purposes, having in total 15 meetings with different stakeholders and relevant institutions. The meetings were organized by PE ZRSMI, inviting the stakeholders directly by phone calls, by public invitations and in cooperation with the local municipality.

Two more meetings were also organized for biodiversity purposes related to the project, one with MoEPP and second with local biodiversity practitioners to present and discuss relevant biodiversity findings and mitigation measures, based on what additional useful information was collected.

Annex 8 provides a summary of all stakeholder engagement activities conducted so far.

12.3 Stakeholder Engagement Plan (SEP)

Previous work on stakeholder engagement is a SEP prepared as part of the ESIA in 2012 covering the entire railway alignment and recently, SEP was developed for the section Beljakovce – Kriva Palanka.

A new stakeholder engagement plan for the purposes of the Section 3 has been developed to design PE ZRSMIs strategy for communication and engagement of the stakeholders on national and local level, with particular focus to the Project affected parties. The SEP sets out PE ZRSMIs commitments to stakeholder engagement and disclosure activities in connection with the project. This document identifies the relevant project stakeholders, provides their categorization and outlines the grievance mechanism to allow stakeholders proper addressing of their complaints regarding this project. This plan should be regularly updated throughout the life of the Project.

The SEP will be disclosed, as part of the project disclosure package, in EN and MK language on PE ZRSMIs web site (www.mzi.mk), in accordance with the demographical characteristics of the municipality of Kriva Palanka. Hard copies will be available at PE ZRSMI and the municipality of Kriva Palanka. Also in addition, project leaflet will be available in hard copy in public places in the affected communities in the project area.

PE ZRSMI will consult the Bulgarian National Railway Infrastructure Company in order to publish the E&S deliverables as news on their website. (https://www.rail-infra.bg/).

The SEP includes consultation activities to inform local communities about how the Project design has changed in response to their concerns, provide information on the nature and location of the realignment, and also to engage them during the design, construction and operational phase.

The SEP includes also a Grievance Mechanism to allow affected individuals to raise grievances, concerns and queries to the PE ZRSMI, the Construction Contractor or Maintenance Contractor and all other suppliers. A copy of the Grievance Mechanism form is also included in the NTS.

13. Environmental and Social Management Arrangements

To ensure effective implementation and management of the Project, a number of parties will be involved. Each party will appoint resources to ensure implementation of the E&S regulatory requirements and Lenders' standards. The roles and responsibilities of the parties have been described in detail in the ESMP.

The project is expected to be financed in part by an approved Instrument for Pre Accession II (IPA II) grant. This grant shall be deployed through the IPA Operating Structure. See for further details: IPA 2014-2020 (IPA II) - CFCD (finance.gov.mk).

In that context, the Environmental and Social instruments, including this document, shall be implemented by the Public Enterprise for Rail Infrastructure Management of the Republic of North Macedonia in collaboration with the Contracting Authority, or Central Financing and Contracting Department (CFCD) within the Ministry of Finance, and the Ministry of Transport and Communication.

The selection and implementation of the works contract will be done by the IPA Operating Structure with the following structure:

1. Central Financing and Contracting Department within the Ministry of Finance shall be the Contracting authority for the Project, shall conduct the tendering procedure, shall sign the contract agreements, and observe the contractual and financial project implementation.

   Head of Operating Structure (HOS) the Ministry of Finance will also ensure monitoring and on-the spot checks over the contracts execution, during the implementation of the Project according to the CFCD Internal Manual of Procedures and shall coordinate the IPA Coordinator in the Ministry of Transport and Communications and the PIU Coordinator in the Public Enterprise for Railway Infrastructure Railways in carrying out the tasks delegated under the Operational Agreement.

2. The EU Department represented by an appointed IPA Coordinator and relevant monitoring officers within the EU department, as well as the Department for Railway within the Ministry of Transport and Communications shall monitor the overall implementation of the Project.

3. The Public Enterprise for Railway Infrastructure Railways of Republic of North Macedonia (PE ZRSMI) as the Final Beneficiary of the Project represented by the appointed PIU Coordinator and the relevant PIU members shall closely monitor the implementation of the Project.

~~PE ZRSMI~~ The IPA Operating Structure will have ultimate responsibility for the Project and will oversee the implementation of the Lenders requirements during construction by overseeing construction contractor, construction sub-contractors and their involved third parties.

~~PE ZRSMI~~ The IPA Operating Structure will be responsible for creating a Project Implementation Unit (PIU) which will ensure the implementation, financial management and overall delivery of the Project.

PE ZRSMI will appoint a Supervision Consultant, consisting of a range of expertise, to supervise the activities of the Contractor on a day-to-day basis, to ensure that recommendations and requirements, as set out in the disclosure package, are applied.

The Contractor will be responsible for ensuring that all their work and staff activity during the construction is compliant with the legislation, policies and standards for E&S and the permits provided by national (and local) regulators and the Project E&S requirements.

EBRD and EIB (‘the Lenders’) are considering financing but will not directly develop the Project. The Lenders will require the submission of progress reports that monitor the E&S performance of the Project against their requirements.

14. Concluding Remarks

No significant or insurmountable environmental or social issues related to the Project have been identified, which cannot be mitigated using generally standard measures in either the design, construction or operation stages. No significant cumulative in-combination effects have been identified related to the adjacent railway and road schemes. Provided that the mitigation measures proposed in the ESMP, BMP, SEP, LARF, RAP, ESAP are implemented, the overall E&S impact of the Project is considered to be acceptable.

~~PE ZRSMI~~ The IPA Operating Structure will establish a Project Implementation Unit (PIU) to implement the Project and will appoint a Supervision Consultant to supervise and monitor the activities of the contractor on a day-to-day basis and report to the PIU. PE ZRSMI will regularly report to the Lenders.

Annexes:

Annex 1: Commitments Register

Annex 2: Detailed railway alignment maps

Source: Google Maps


Varovishte Варов
Babin Do
Kriva Palanka Крива Паланка
Koshari Ko
Image © 2023 CNES / Airbus
Town of Kriva Palanka


Drenja Дрења
Lozanovo Лозаново
Pashina Vodenica Пашина Воденица
Zhidilovo Жид
Varovishte Варовиште
Babin Dol
Image © 2023 CNES / Airbus


End of Section 3,
border with Bulgaria
Zhidilovo Жидилово
Uzem Узем
Image © 2023 CNES / Airbus

Annex 3: Chainage Locations of Tunnels and Bridges/ Viaducts

Chainage Locations of Proposed Tunnels on Section 3

TUNNELS					
Nº	Start point	End point	Lenght (m)	Total lenght included C&C (m)	Type (*)
1	66+126,00	66+352,70	226,70	226,70	Single track tunnel (good underground conditions)
2	66+895,35	67+039,41	144,06	144,06	Single track tunnel (good underground conditions)
3	67+155,30	67+356,39	201,09	201,09	Single track tunnel (good underground conditions)
4	67+464,66	67+579,90	115,24	115,24	Single track tunnel (good underground conditions)
5	68+821,56	68+957,23	135,67	135,67	Single track tunnel (good underground conditions)
6	70+528,00	70+646,00	118,00	118,00	Double track tunnel (good underground conditions)
7	71+636,02	71+758,63	122,61	122,61	Single track tunnel urban area
8	71+793,14	72+789,87	996,73	996,73	Single track tunnel urban area
9	73+824,63	74+040,55	215,92	215,92	Single track tunnel (good underground conditions)
10+11	74+423,70	74+759,77	336,07	336,07	Single track tunnel (good underground conditions)
11a	74+989,95	75+171,26	181,31	181,31	Single track tunnel (good underground conditions)
12	75+968,75	76+156,68	187,93	187,93	Single track tunnel (good underground conditions)
13	76+622,00	77+678,00	1056,00	1056,00	Large tunnel
14	77+799,89	78+058,80	258,91	258,91	Single track tunnel (good underground conditions)
15	78+851,77	79+092,00	240,23	240,23	Single track tunnel (good underground conditions)
16	79+092,00	79+720,00	628,00	644,00	Large tunnel
17	80+571,00	80+639,00	68,00	68,00	Triple track tunnel (C&C)
18	80+792,00	80+842,00	50,00	50,00	Triple track tunnel (C&C)
18a	80+842,00	80+916,00	74,00	74,00	Triple track tunnel (C&C)
19	82+670,00	84+070,00	1400,00	1407,00	Large tunnel
20	84+300,00	85+564,00	1264,00	1313,00	Large tunnel
21	85+982,00	86+119,00	137,00	257,00	Single track tunnel (bad underground conditions)
22	87+280,00	89+560,00	2280,00	2350,00	Large tunnel

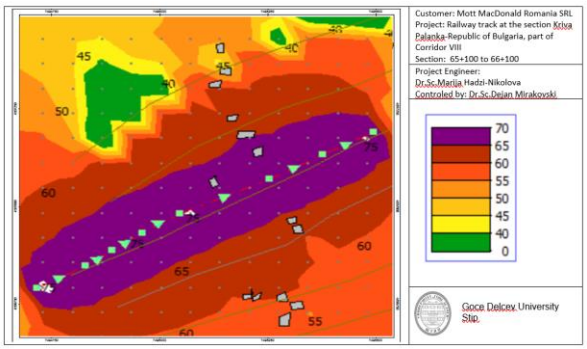
Chainage Locations of Proposed Bridges/ Viaducts on Section 3

BRIDGES					
N°	Start point	End point	Lenght (m)	Number/length spans	Type (*)
1	65+095,735	65+155,280	59,545	2*28.5	Single track viaduct
2	65+605,724	65+758,346	152,622	5*28.5	Single track viaduct
3	65+841,065	66+106,750	265,685	3*28.5-4*33.5-28.5	Single track viaduct
4	66+447,279	66+516,721	69,442	2*33.5	Single track viaduct
5	66+742,660	66+884,280	141,620	4*33.5	Single track viaduct
6	67+068,750	67+128,250	59,500	2*28.5	Single track viaduct
7	67+360,246	67+455,813	95,567	3*28.5	Single track viaduct
8	67+596,622	67+630,125	33,503	33,5	Single track viaduct
9	68+167,685	68+273,442	105,757	3*33.5	Single track viaduct
10	68+457,248	68+636,856	179,608	7*23.5	Single track viaduct
11	68+738,717	68+814,348	75,631	3*23.5	Single track viaduct
12	69+066,200	69+193,750	127,550	5*23.5	Single track viaduct
13	69+250,000	69+273,500	23,500	23,5	Single track viaduct
14	69+402,142	69+478,073	75,931	3*23.5	Single track viaduct
15	69+683,217	69+778,911	95,694	33.5-23.5-33.5	Single track viaduct
16	69+965,189	70+070,852	105,663	3*33.5	Single track viaduct
17	70+159,478	70+343,707	184,229	6*28.5	Single track viaduct
18	70+889,500	70+923,000	33,500	33,5	Triple track viaduct
19	71+038,977	71+127,140	88,163	2*33.5-16.00	Triple track viaduct
20	71+323.500	71+419.000	95,500	28.5-33.5-28.5	Viaduct with 4 tracks
21	71+569,000	71+602,502	33,502	33,5	Single track viaduct
22	71+760,00	71+768,00	8	8,00	Underpass
23	72+804,013	72+935,520	131,507	28.5-2*33.5-28.5	Single track viaduct
24	Replaced by Culvert C08 (2x2)				

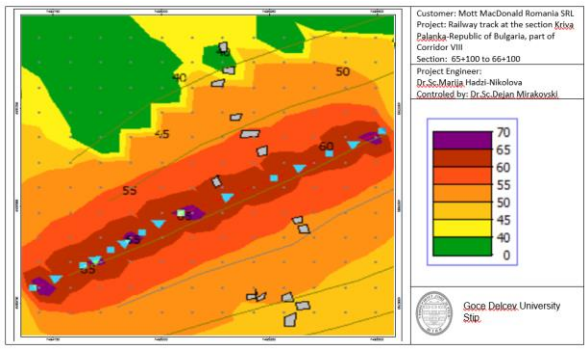
(continues on next page)

25	73+329,000	73+398,753	69,753	2*33.5	Single track viaduct
26	73+558,500	73+721,265	162,765	33.5-3*28.5-33.5	Single track viaduct
27	73+766,218	73+815,775	49,557	2*23.5	Single track viaduct
28	74+195,656	74+409,944	214,288	6*33.5	Single track viaduct
29	74+767,234	74+842,762	75,528	3*23.5	Single track viaduct
30	75+187,692	75+473,294	285,602	8*33.5	Single track viaduct
31	75+667,100	75+952,510	285,41	34,75-6*36-34,75	Single track viaduct
32	76+402,00	76+611,500	209,50	29,88+5*31,254+24,42	Single track viaduct
33	77+698,75	77+789,25	90,50	29,56+30,88+29,69	Single track viaduct
34	78+078.739	78+200.239	121,50	4*30m	Single track viaduct
35	78+417.444	78+492.991	75,55	3*25m	Single track viaduct
36	78+783.458	78+842.958	59,50	2*30m	Single track viaduct
37	79+785.906	80+068.737	282,83	2*30m+5*35m+2*25m	Large viaduct
38	80+314.800	80+338.300	23,50	1*25m	Single track viaduct
39	80+670.300	80+745.800	75,50	3*25m	Triple track viaduct
40	80+959.858	81+164.750	204,89	1*25m+5*35m	Triple track viaduct
41	81+947.750	81+971.250	23,50	1*25m	Single track viaduct
42	82+056.250	82+177.750	121,50	4*30m	Single track viaduct
43	84+094.529	84+107.459	12,93	1*12m	Single track viaduct
44	84+145.800	84+154.600	8,8	1*8.8m	Alignment underpass
45	85+607.648	85+628.578	20,93	1*20.93m	Road overpass
46	85+698.471	85+882.732	184,26	6*30m	Single track viaduct
47	86+262.000	86+311.614	49,61	2*25m	Single track viaduct
48	86+345.870	86+384.870	39,00	2*12m+1*15m	Motorway crossing
49	86+373.630	86+412.630	39,00	2*12m+1*15m	Motorway crossing
50	86+594.830	86+633.830	39,00	3*13m	Alignment overpass
51	87+023.890	87+032.970	9,08	1*9.09m	Overpass
52	0+045,26	0+069,24	48,00	48 m	Overpass

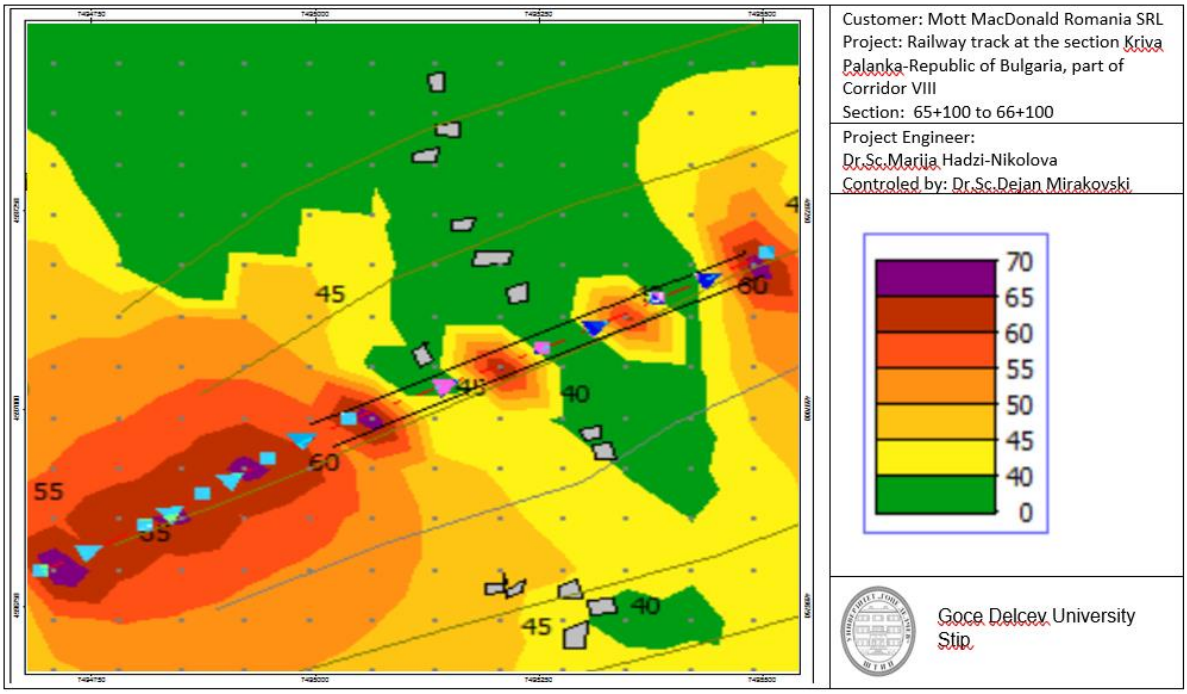
Annex 4: Noise Modelling Maps



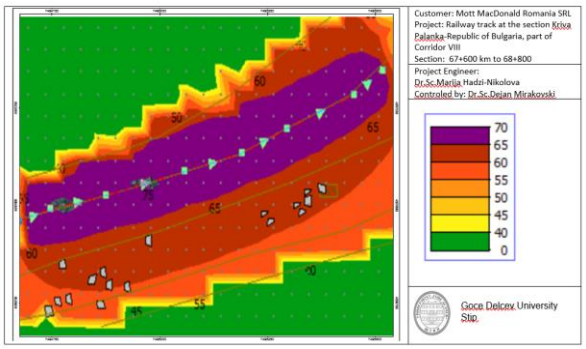
Noise Dispersion Model for section at village of Tlminci during the day time



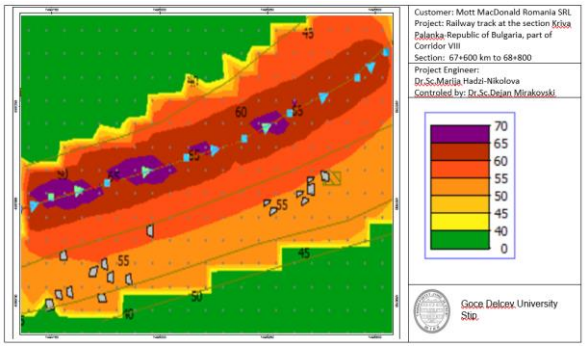
Noise Dispersion Model for section at village of Tlminci during the night time



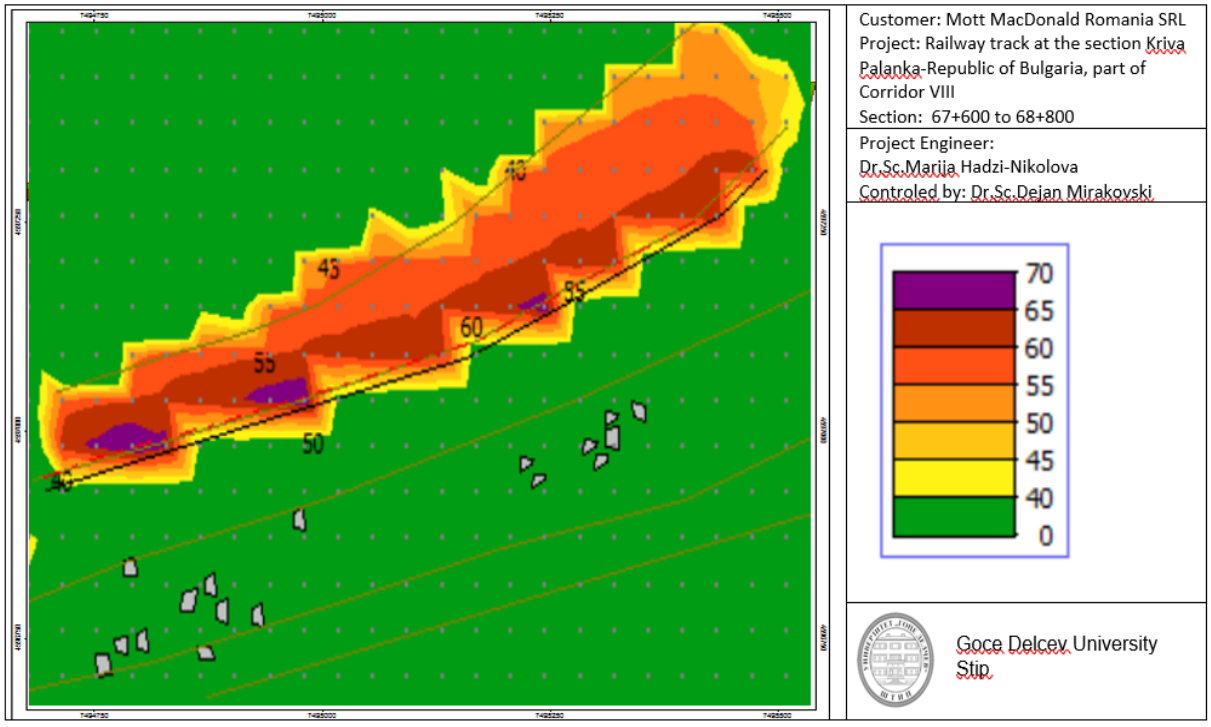
Noise Dispersion Model for section at village of Tlminci, once the proposed noise barriers are built



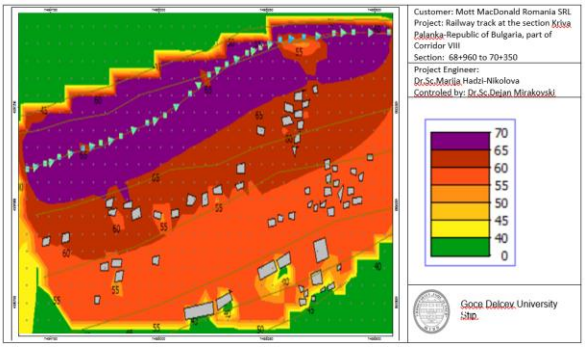
Noise Dispersion Model for section 67+600 do 68+800 before Municipality of Kriva Palanka during the day time



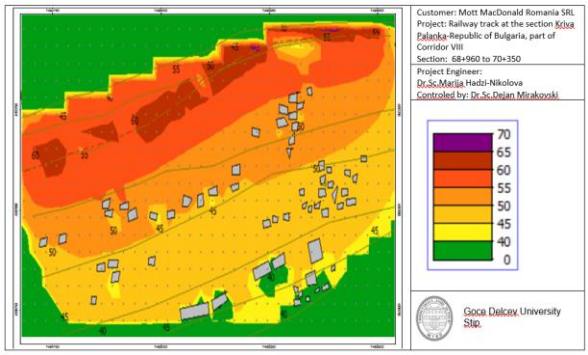
Noise Dispersion Model for section 67+600 do 68+800 before Municipality of Kriva Palanka during the night time



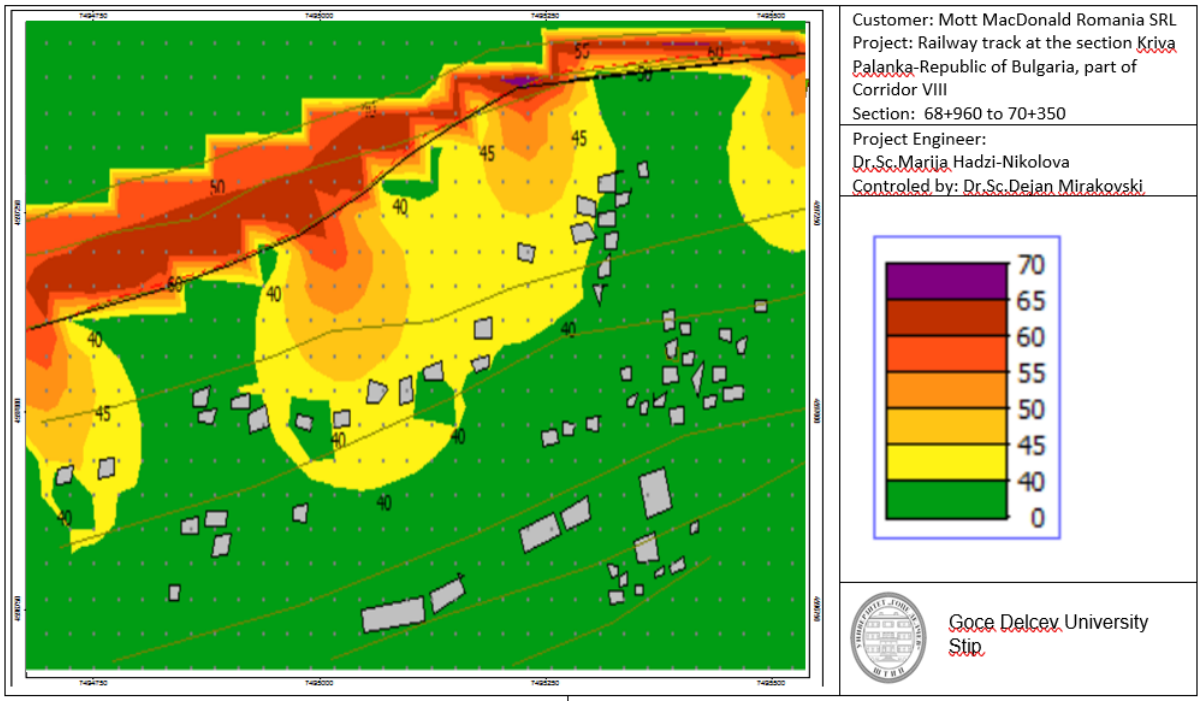
Noise Dispersion Model for section 67+600 to 68+800 before the Municipality of Kriva Palanka, once the proposed noise barriers are built



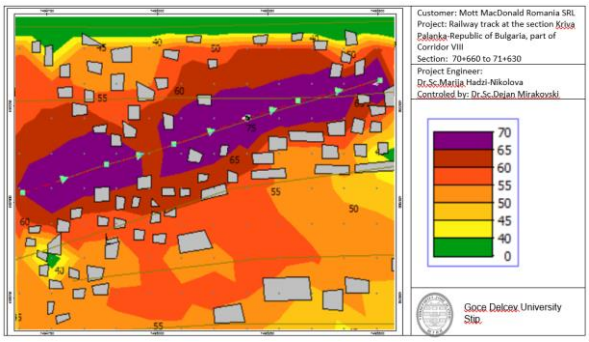
Noise Dispersion Model for section 68+960 to 70+350 at Municipality of Kriva Palanka during the day time



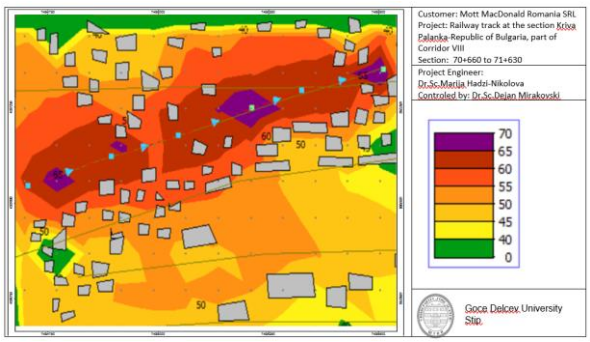
Noise Dispersion Model for section 68+960 to 70+350 at Municipality of Kriva Palanka during the night time



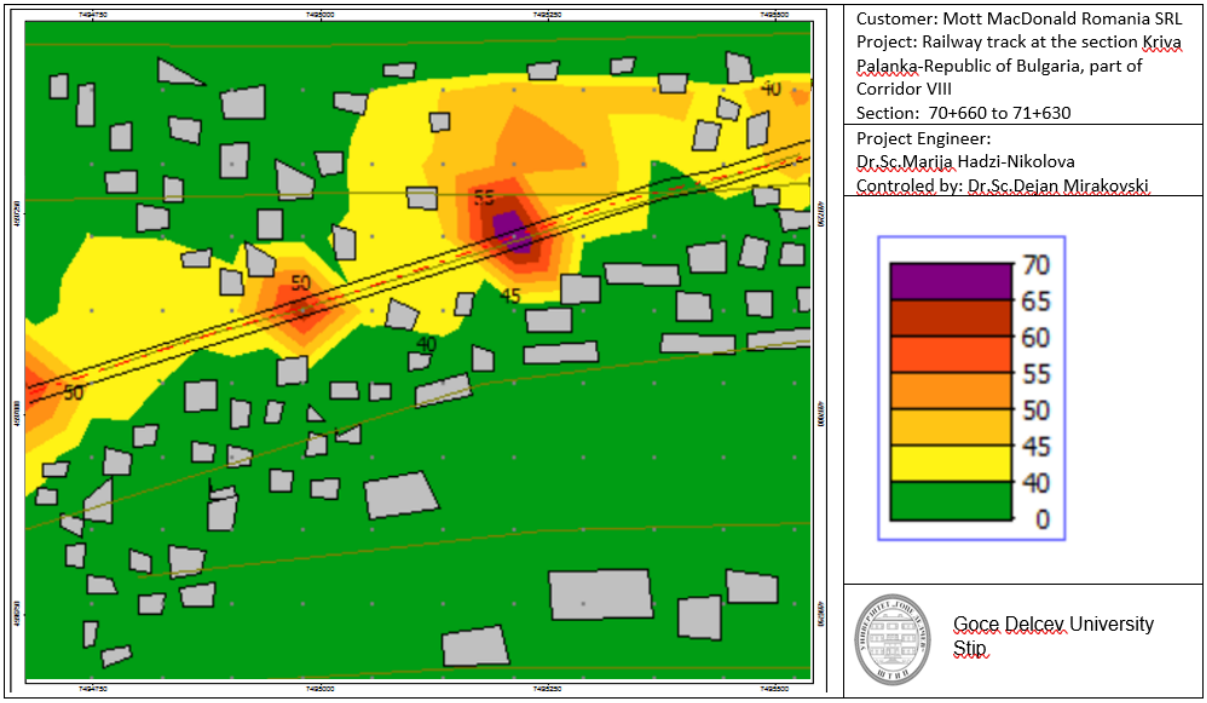
Noise Dispersion Model for section 68+960 to 70+350 before the Municipality of Kriva Palanka, once the proposed noise barriers are built



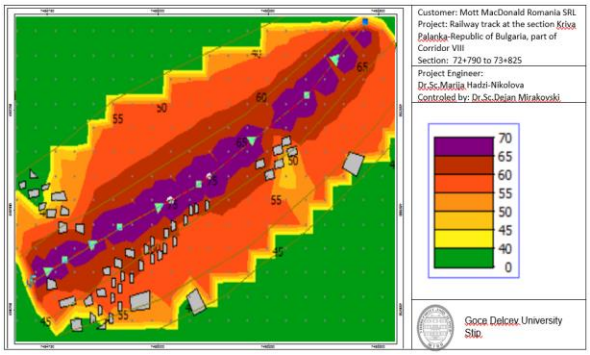
Noise Dispersion Model for section 70+660 do 71+630 at Municipality of Kriva Palanka during the day time



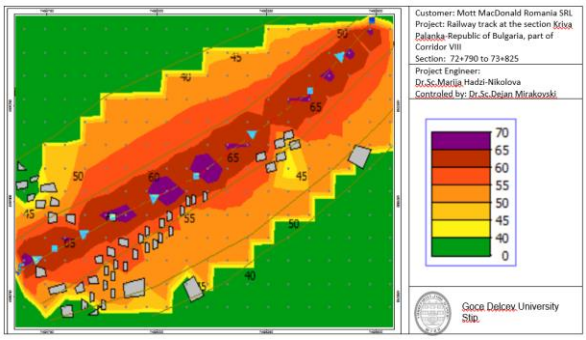
Noise Dispersion Model for section 70+660 do 71+630 at Municipality of Kriva Palanka during the night time



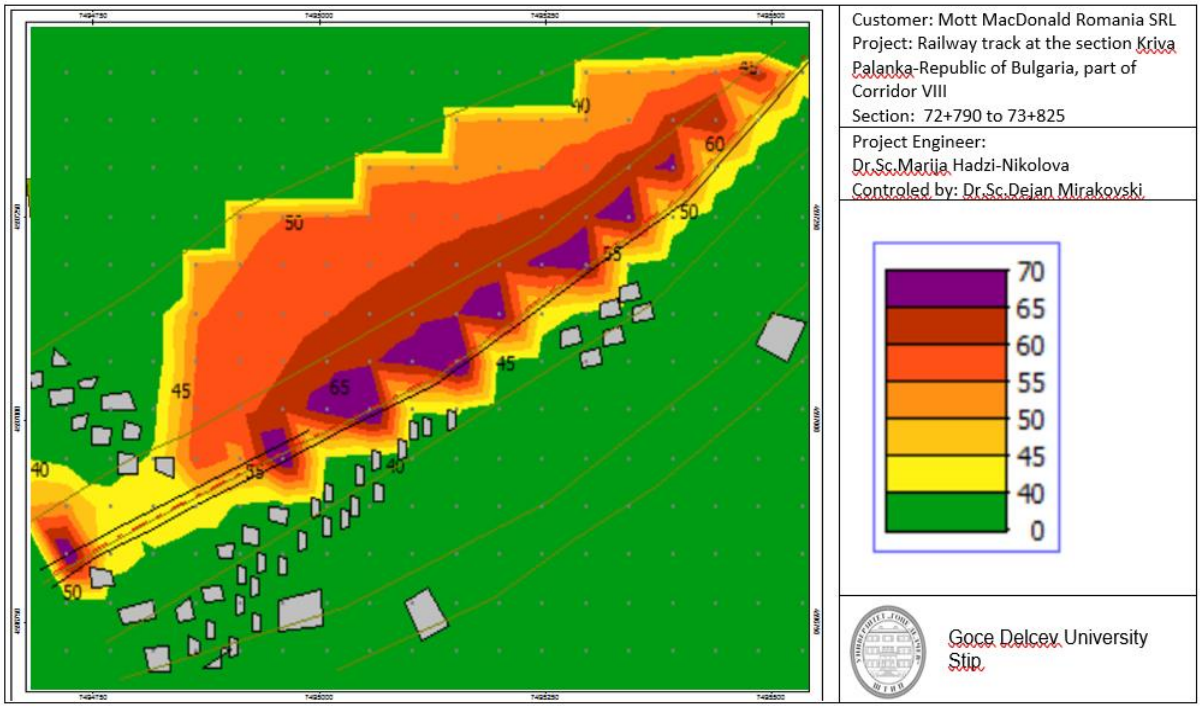
Noise Dispersion Model for section 70+660 do 71+630 at Municipality of Kriva Palanka, once the proposed noise barriers are built



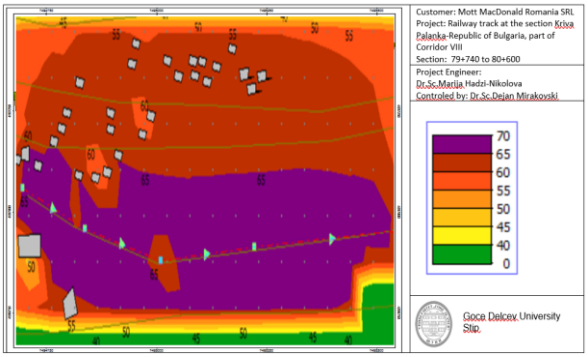
Noise Dispersion Model for section 72+790 to 73+825 at Municipality of Kriva Palanka during the day time



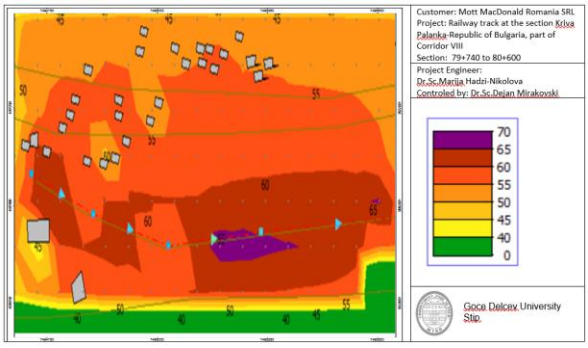
Noise Dispersion Model for section 72+790 to 73+825 at Municipality of Kriva Palanka during the night time



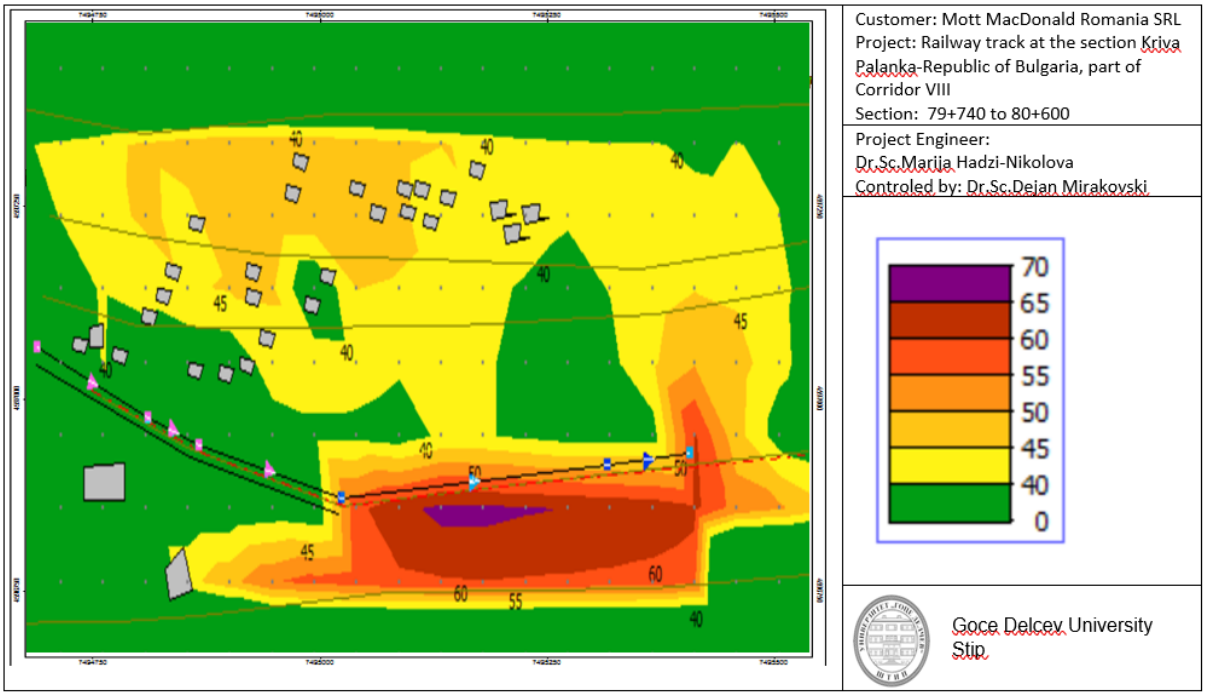
Noise Dispersion Model for section 72+790 to 73+825 at Municipality of Kriva Palanka, once the proposed noise barriers are built



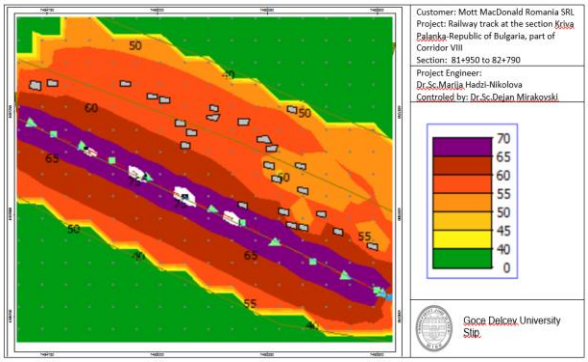
Noise Dispersion Model for section of Zidilovo during the day time



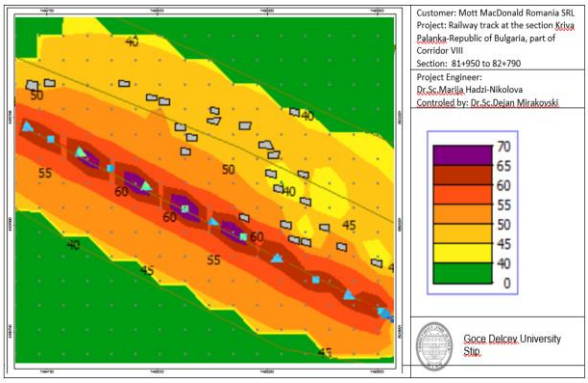
Noise Dispersion Model for section of Zidilovo during the night time



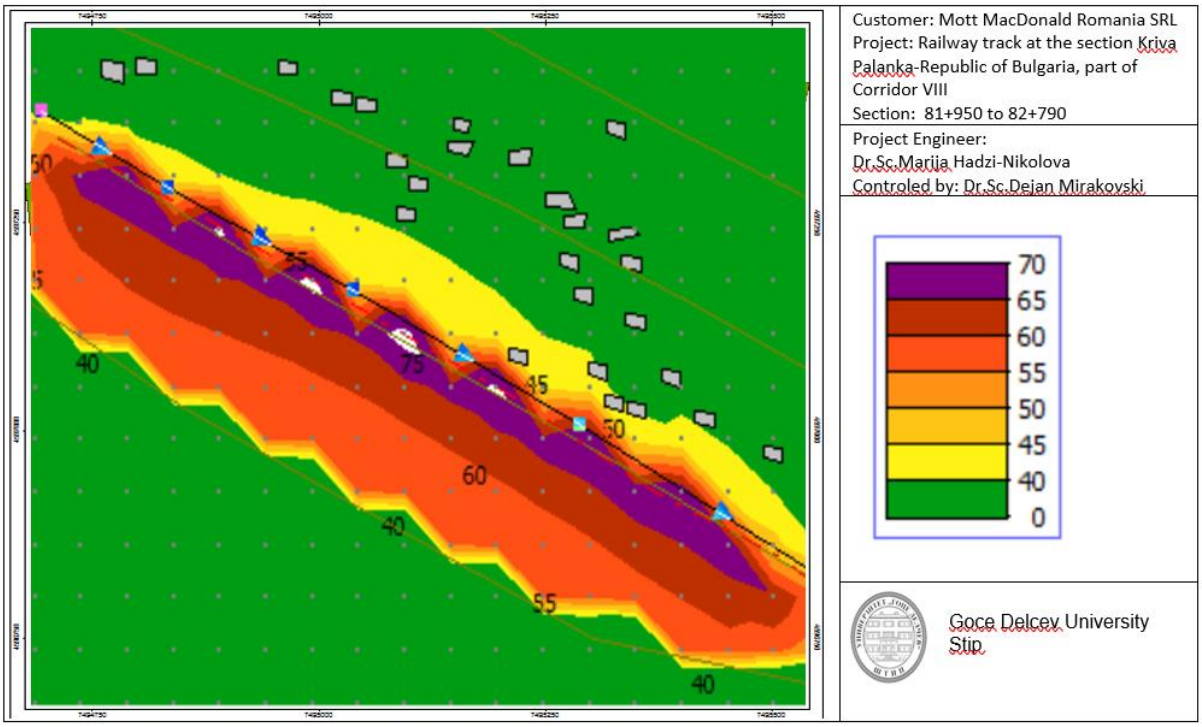
Noise Dispersion Model for section of Zidilovo, once the proposed noise barriers are built



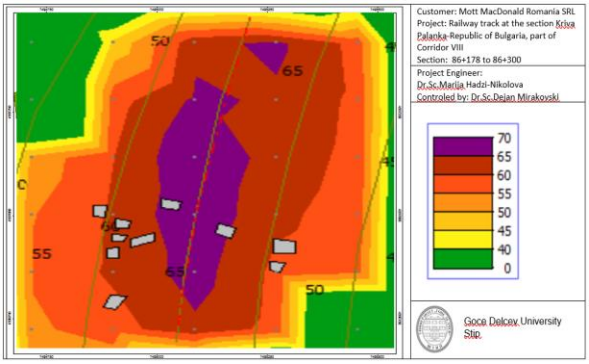
Noise Dispersion Model for section at village of Uzem during the day time



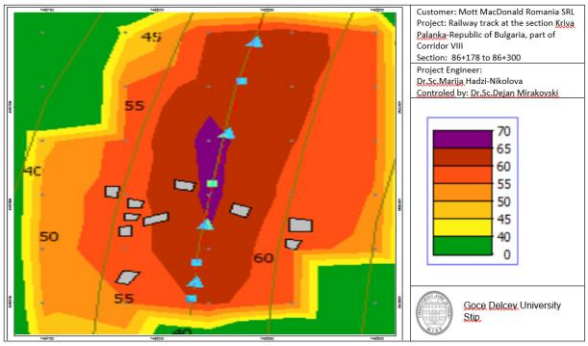
Noise Dispersion Model for section at village of Uzem during the night time



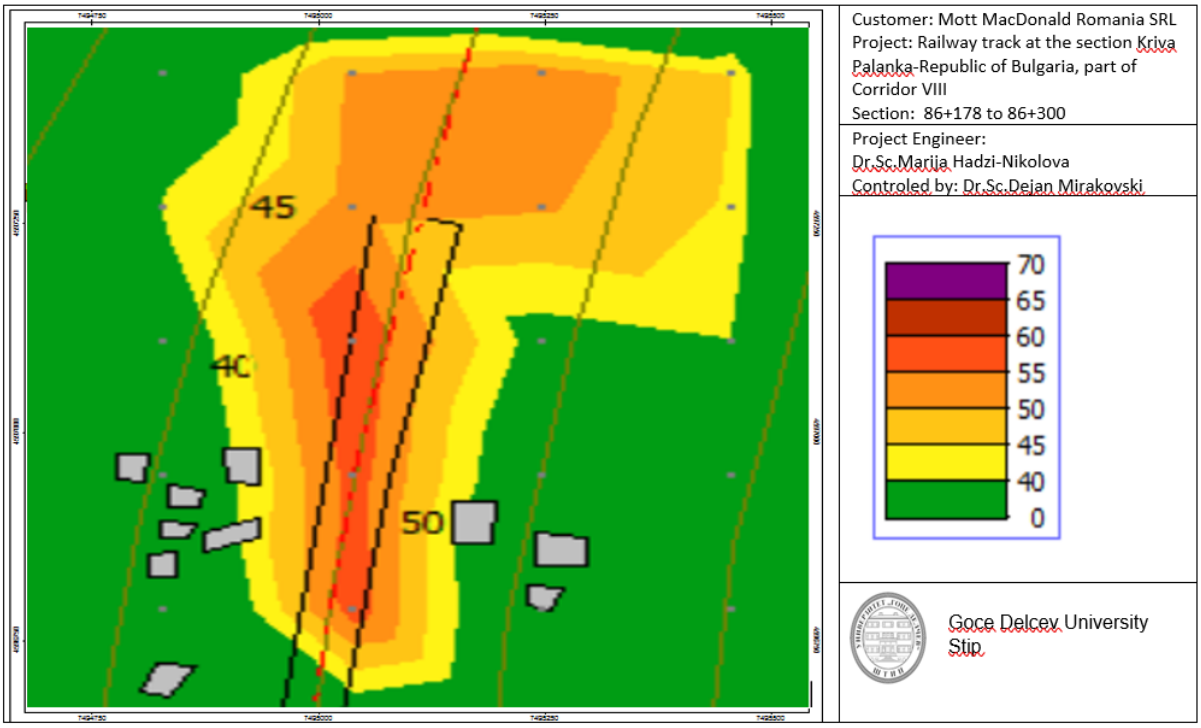
Noise Dispersion Model for section at village of Uzem, once the proposed noise barriers are built



Noise Dispersion Model for section 86+178 to 86+300 during the day time



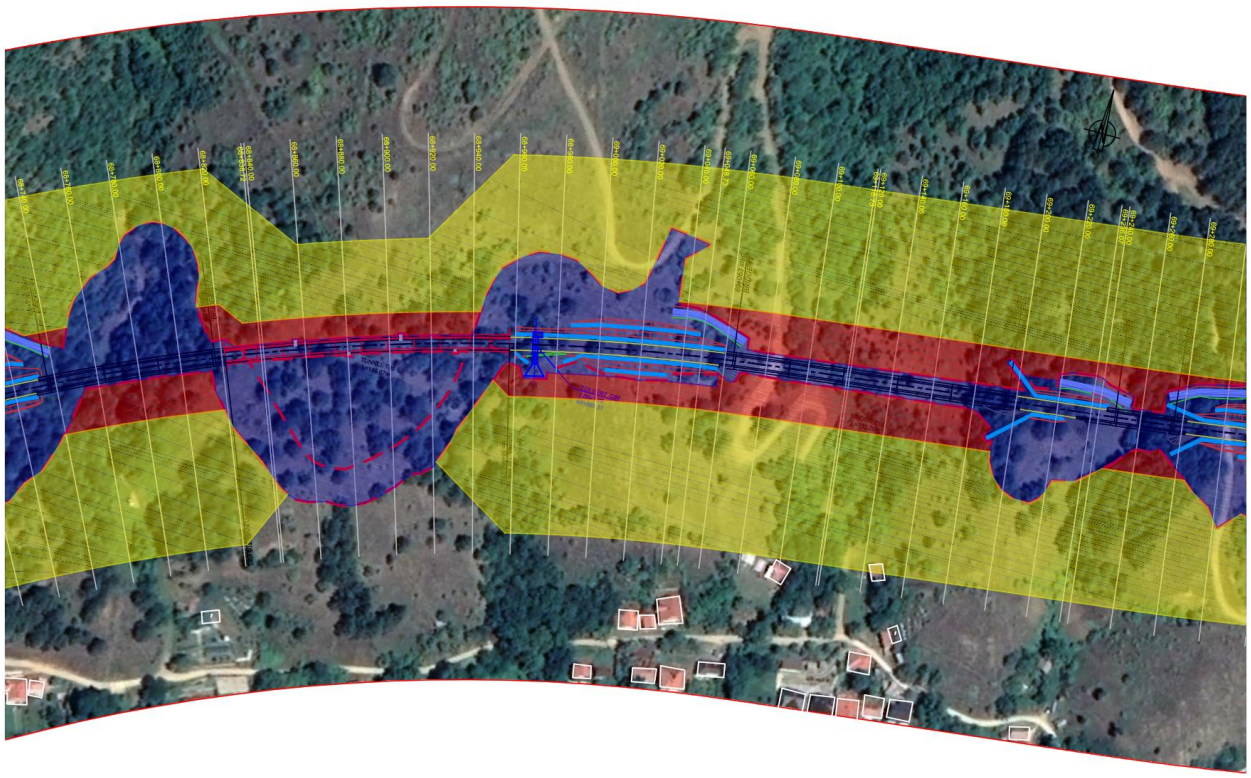
Noise Dispersion Model for section 86+180 to 86+300 during the night time

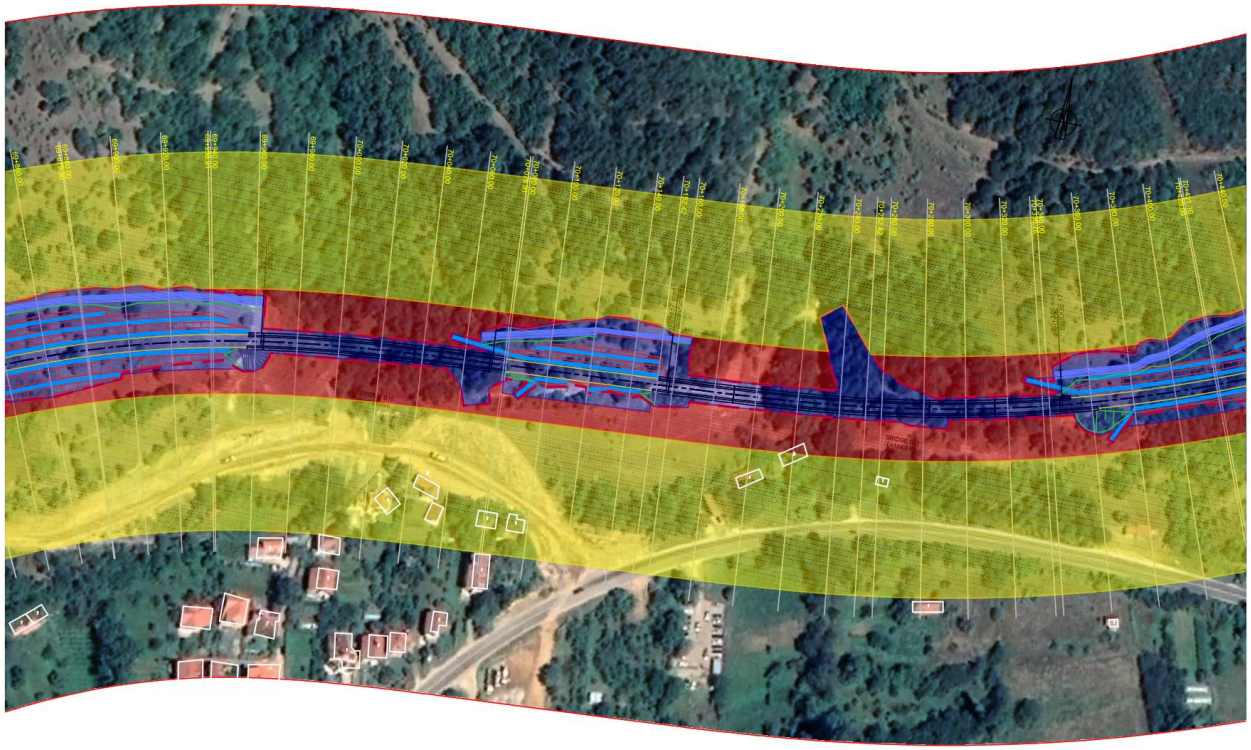


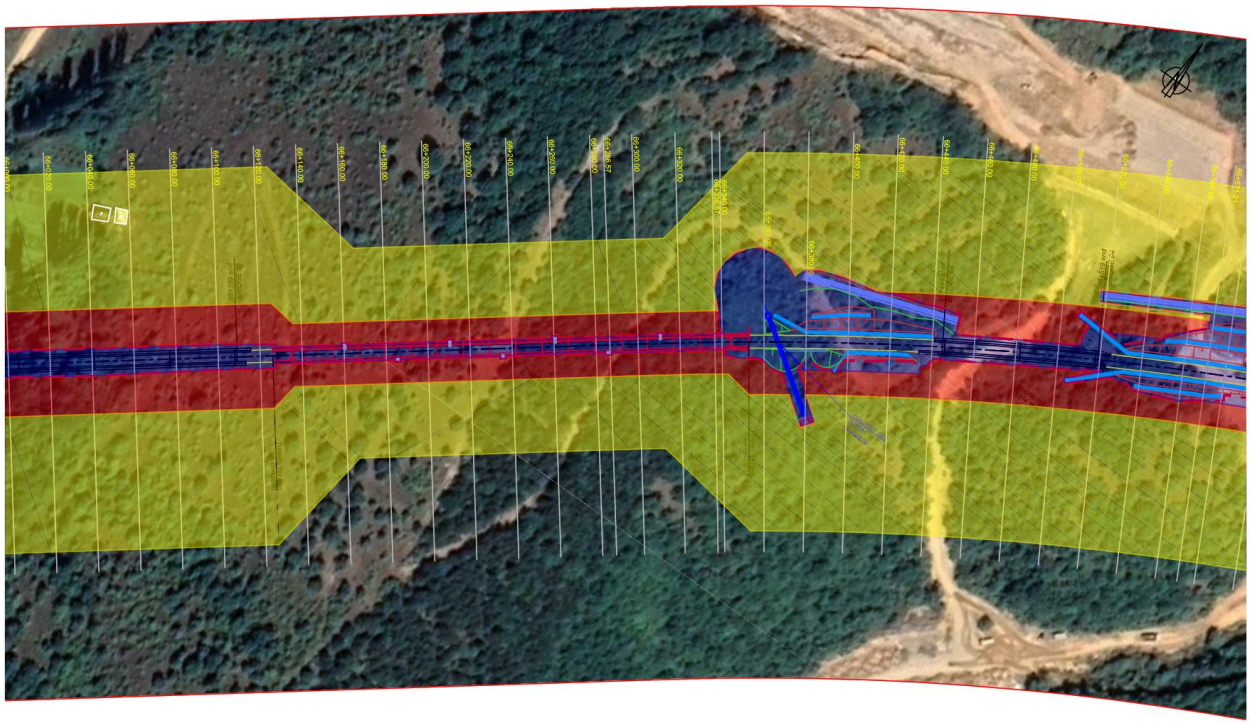
Noise Dispersion Model for section from 86+178 to 86+300 km after at village of Uzem, once the proposed noise barriers are built

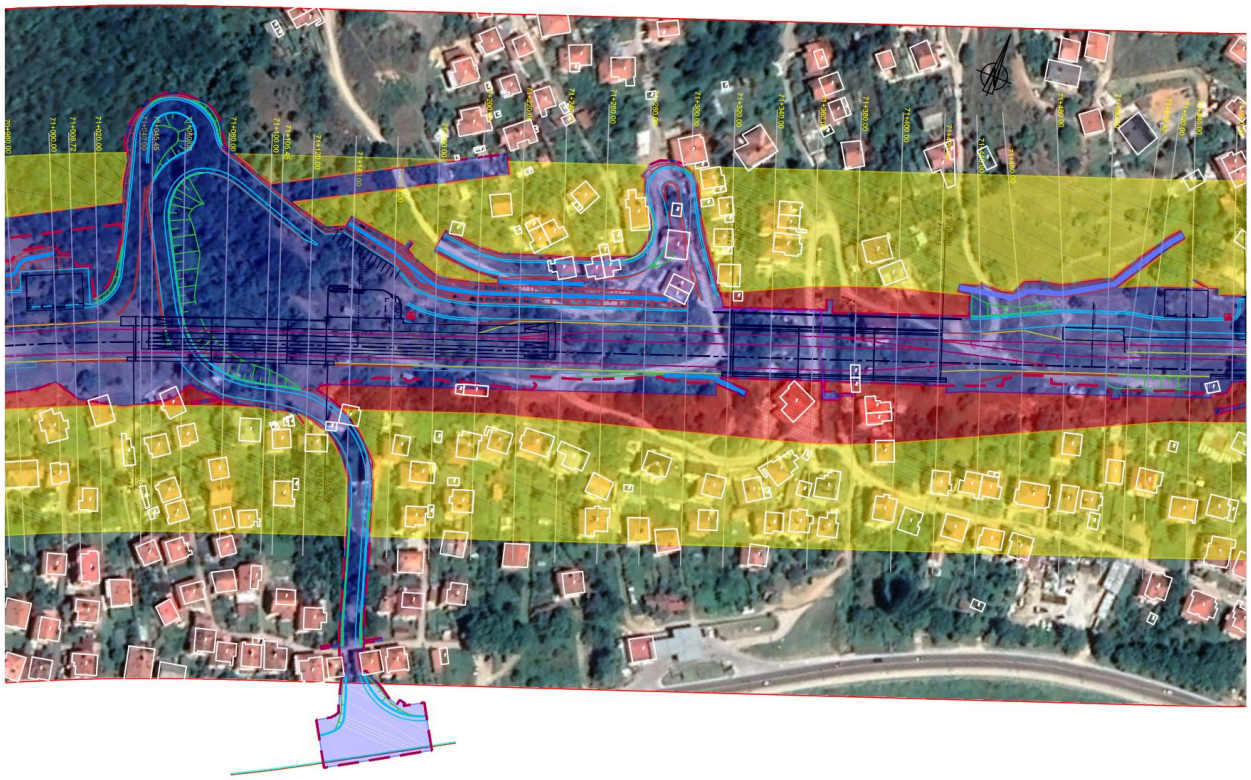
Annex 5: Vibration modelling graphics

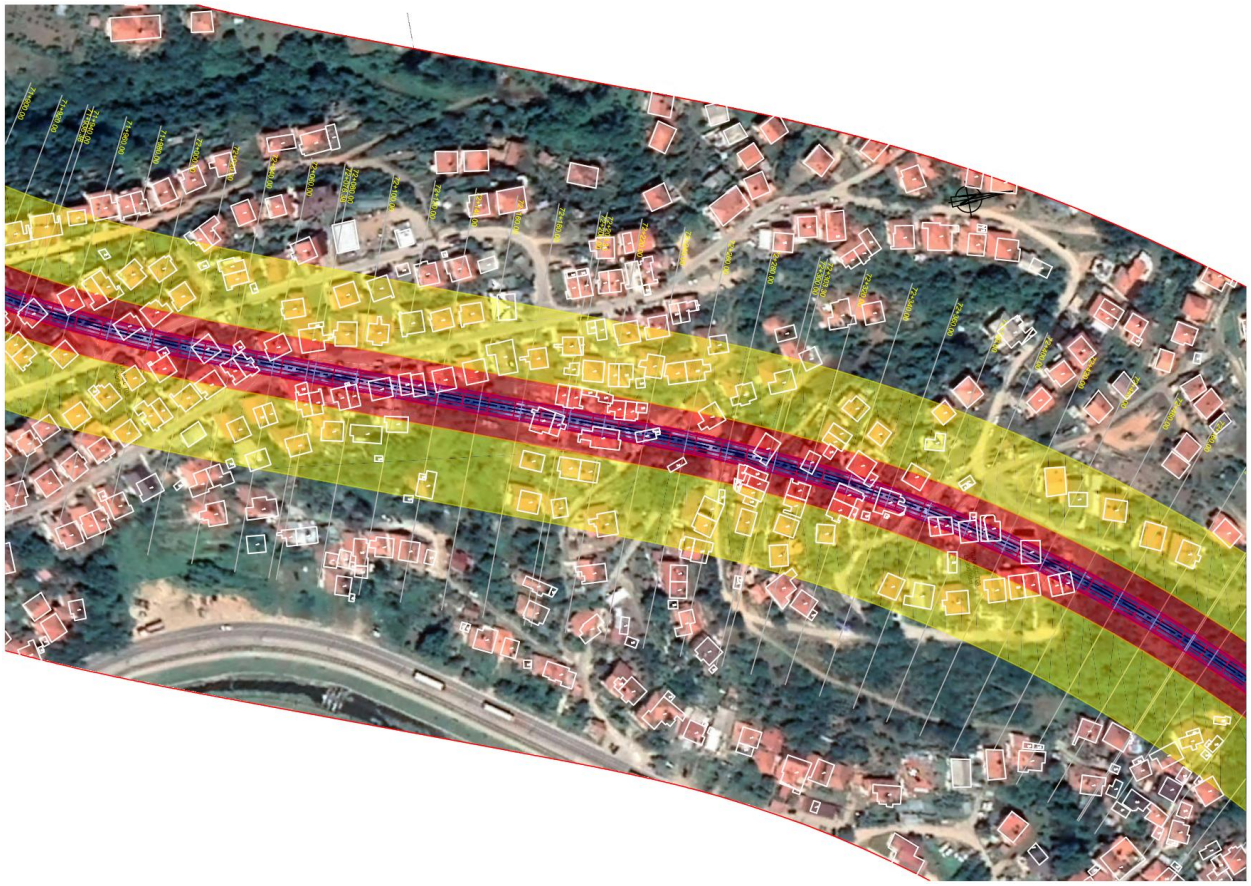
This annex provides graphical illustration of vibration and groundborne noise influence zones vis-a-vi the object locations along the railway corridor on selected locations.
The entire graphical illustration is part of the Vibration assessment report which is available only in English.

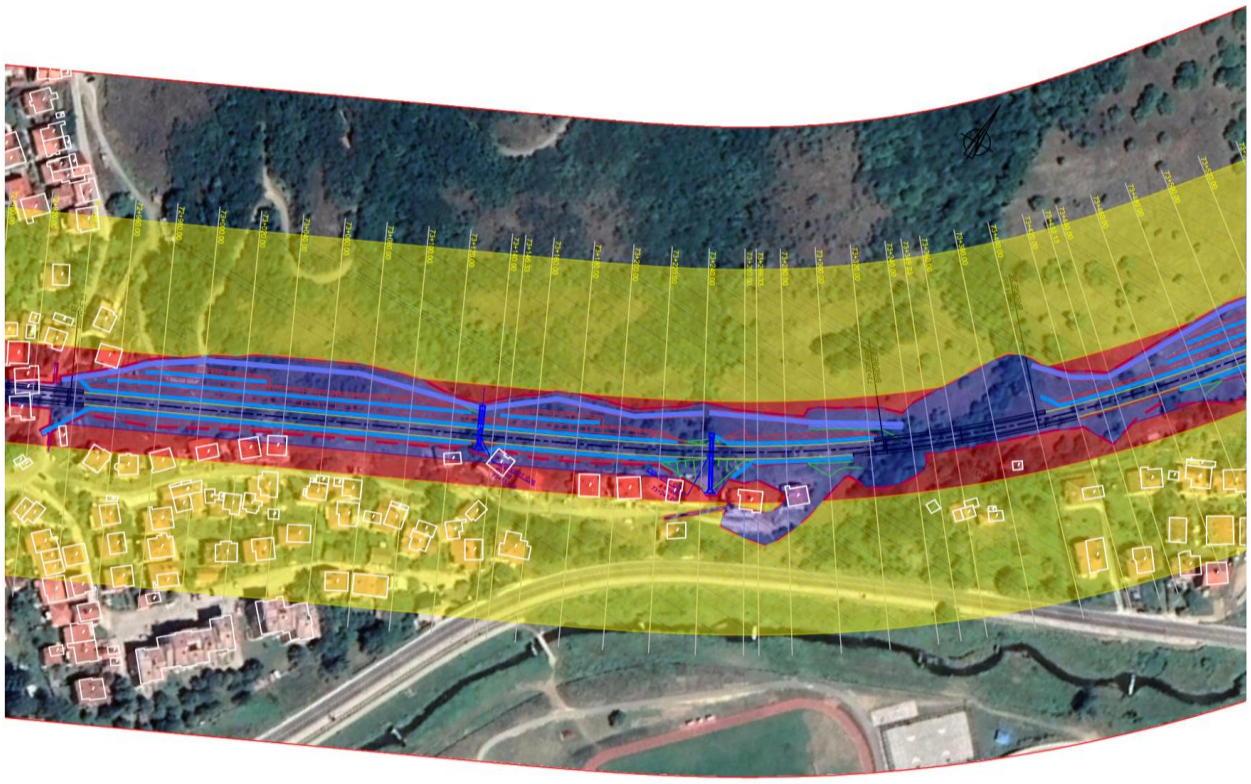


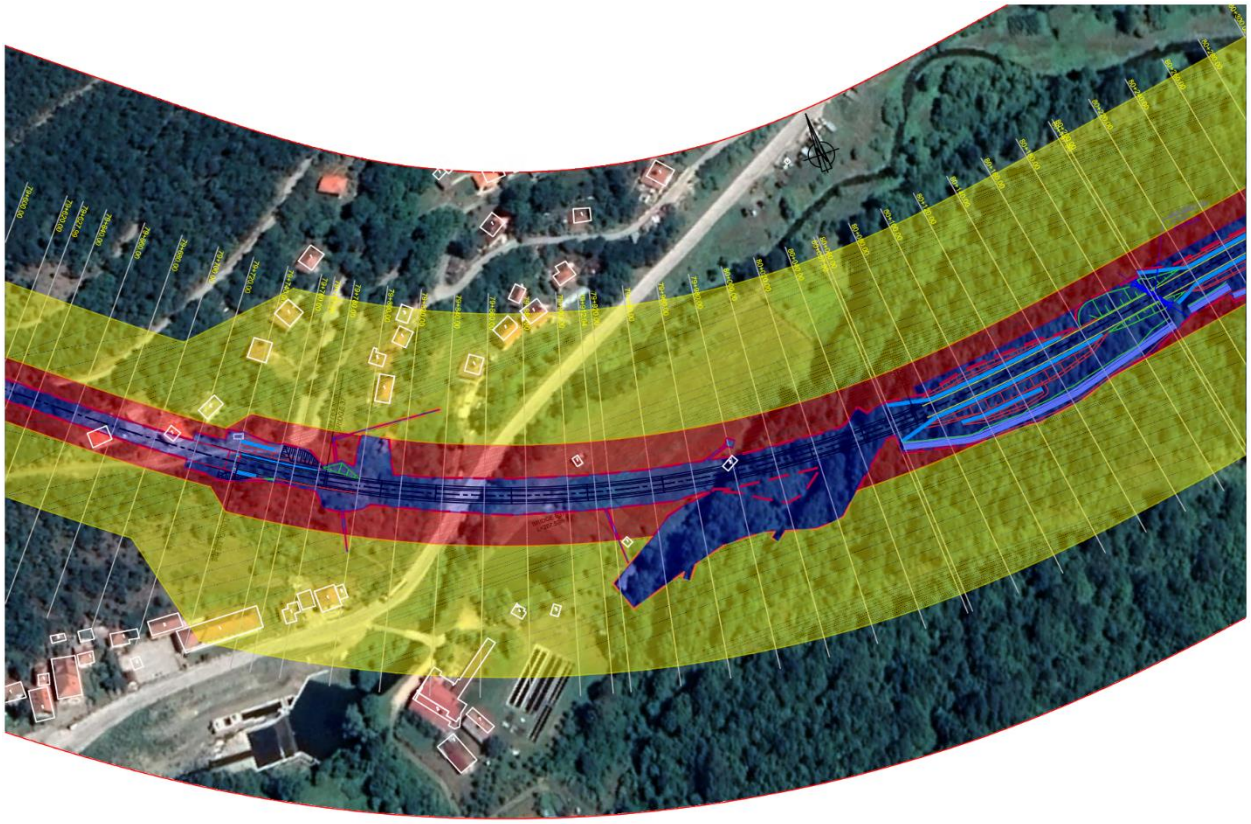












Annex 6: Supplementary Biodiversity Assessment

Annex 7: Landscape and Visual Impact Assessment - Update

Annex 8: Summary of Macedonian EIA Consultation (entire railway alignment)

Date	Location	Section	Purpose and discussion	Participants/Stakeholders
24.04.2012, 11:00h	Kratovo	S1, S2, S3	Public hearing for ESIA study 2012 Discussion: 1. Is there a potential for disruption of the monument of nature "Kuklici" 2. Will there be potential impact on the dam "Vakuf"	Eptisa representatives, Municipality of Kratovo, Agency for cadastre – Kratovo, House of culture – Kratovo, MAFWE – branch office Kratovo, EVN Macedonia, primary school, Ministry of Transport and communications, PE ZRSMI, Ministry of environment and physical planning, CSO Izvor – Kratovo Source: https://www.moepp.gov.mk/wp-content/uploads/2014/10/Zapisnik%20Javna%20rasprava%20ovzs%20-%20Zeleznicki%20koridor%20VIII-Istocna%20Delnica%20-%20Kratovo.pdf
24.04.2012, 14:30h	Rankovce	S1, S2, S3	Public hearing for ESIA study 2012 Discussion: There were no issues raised for discussion	Ministry of Environment, Ministry of Transport and Communication, Municipality of Rankovce, PE ZRSMI, Eptisa Source: https://www.moepp.gov.mk/wp-content/uploads/2014/10/Zapisnik%20Javna%20rasprava%20ovzs%20-%20Zeleznicki%20koridor%20VIII-Istocna%20Delnica%20-%20Rankovce.pdf
25.04.2012, 14:30h	Kumanovo	S1, S2, S3	Public hearing for ESIA study 2012 Discussion: 1. Question by CSO "DOM" was raised regarding resettlement of households nearby the alignment in this settlement The consultant responded that current settlements will remain at the same place because they are built at the time when the alignment was existing and operational. However, additional measures are predicted such as noise barriers, house insulation, playgrounds, improving the house constructions, etc. The representative of PE ZRSMI added that the intention is the houses not to be resettled but to be seriously protected.	Ministry of Environment, PE ZRSMI, Ministry of transport and communications, Eptisa, EBRD, Municipality of Kumanovo, North-east planning region, CSO "DROM"-Kumanovo Source: https://www.moepp.gov.mk/wp-content/uploads/2014/10/Zapisnik%20Javna%20rasprava%20ovzs%20-%20Zeleznicki%20koridor%20VIII-Istocna%20Delnica%20-%20Kumanovo.pdf
26.04.2012, 10:00h	Kriva Palanka	S1, S2, S3	Public hearing for ESIA study 2012 Discussion:	Ministry of Environment, PE ZRSMI, Ministry of transport and communications, Eptisa, EBRD, Municipality of Kriva Palanka, Tourism Custer, Regional

Date	Location	Section	Purpose and discussion	Participants/Stakeholders
			Main questions that were raised was regarding the alignment and possibility to check what plots are going to be subject to expropriation Another question that was raised regarding the project start and the investor explained that at the moment they work on securing financing but it is expected construction works to start in 2013 and railway to be operational at 2018-2020. Based on the discussion, the comments from stakeholders are incorporated in the final decision and approved ESIA. Summary of the feedback is available at the following link	Development Agency, Center for sustainable development EGRI, citizens – general public, local TV station – Zlaten Kanal, Source:https://www.moepp.gov.mk/wp-content/uploads/2014/10/Zapisnik%20Javna%20rasprava%20ovzs%20-%20Zeleznicki%20koridor%20VIII-Istocna%20Delnica%20-%20Kriva%20Palanka.pdf
24.03.2015	Meeting with Municipality of Kumanovo	S2	Information meetings Purpose: PE ZSMRI has initiated the consultation process with stakeholders at an early stage in order to determine a suitable project choice and project design that would meet all requirements, as well as technical needs. In 2015, there was a series of meetings in the affected municipalities. The goal of these meetings was to present the design of the Project, its components and activities to those most affected and who can provide relevant information during the main design phase. Some activities were performed in the period March-May 2015	Representatives of Municipality of Kumanovo
26.03.2015	Meeting with residents of Beljakovce	S2		Residents of the v. Beljakovce
10.04.2015	Meeting with Municipality of Kratovo	S2		Representatives of Municipality of Kratovo
24.04.2015	Meeting with residents of Dimonce	S2		Residents of v. Dimonce
08.05.2015	Meeting with residents of Shopsko Rudare	S2		Residents of Shopsko Rudare
18.05.2015	Meeting with residents of Ketenovo	S2		Residents of Ketenovo

Date	Location	Section	Purpose and discussion	Participants/Stakeholders
17.06.2015	Meeting with residents of Krilatica	S2	Source: SEP for Section 2 developed by PE ZRSMI	Residents of Krilatica
30.06.2015	Meeting with business sector	S2		Representatives of the business sector
22.07.2015	Meeting with civil organizations	S2		Representatives of CSOs
28.07.2015	Meeting with public enterprises	S2		Representatives of the public enterprises
11.08.2015	Meeting with local administrations from Rankovce	S2		Representatives of municipality of Rankovce
12.08.2015	Meeting with residents of Opila	S2		Residents of Opila
12.11.2015	Meeting with Public Utility Company CLEAN DAY	S2		Representatives of PUC Clean Day
13.11.2015	Meeting with business sector	S2		Representatives of the business sector
24.09.2015	Meeting with residents of Ginovci	S2		Residents of Ginovci
25.09.2015	Meeting with residents of Psaca	S2		Residents of Psaca
29.10.2015	Meeting with residents of Petralica	S2		Residents of Petralica
30.10.2015	Visit of Ljubinci	S2		Residents of Ljubinci

Date	Location	Section	Purpose and discussion	Participants/Stakeholders
20.11.2015	Visit of Ginovci	S2		Residents of Ginovci
05.07.2018	Petralica	S2	Information meetings Purpose: Following the engagement in 2015, there was a gap in the process until 2018. This was because the Basic Design for the Project and information needed to determine additional expropriation was not ready. Once this determination was made, PE ZRSMI organized the following meetings with the local residents from the communities along the alignment in relation to the socio-economic survey in order to provide information and further assistance to the local residents Source: SEP for Section 2 developed by PE ZRSMI	Residents of Petralica
26.07.2018	Psacha	S2		Residents of PSacha
24.08.2018	Rankovce	S2		
25.08.2018	Opila	S2		
30.08.2018	Ginovci	S2		
31.08.2018	Ljubinci	S2		
07.09.2018	Dlabochica	S2		
27.09.2018	Talashmance	S2		
28.09.2018	Krilatica	S2		
04.10.2018	Shopsko Rudare	S2		
12.10.2018	Ketenovo	S2		
18.10.2018	Vakuf	S2		
19.10.2018	Dimonce	S2		
16.11.2021	Kumanovo	S2	Information meetings	

Date	Location	Section	Purpose and discussion	Participants/Stakeholders
17.11.2021	Rankovce	S2	Purpose: In order to explain the Project progress, PE ZRSMI again organized information meetings in November 2021 in Municipality of Kratovo, Municipality Kumanovo and Municipality of Rankovce	The local administration, including Mayors, representatives of Local Communities, Business Sector, Civil Sector, Public companies, Ministry of Interior, and NGOs were present
18.11.2021	Kratovo	S2		
13.02.2018, 13:00h	Kriva Palanka, Museum of K. Palanka	S3	Public hearing for ESIA study 2017 Discussion: Issue regarding forest loss and compensation measures was raised by Ministry of Environment. The consultant responded that beside the Plan for management of forest vegetation other compensation measures are also proposed at the ESIA study.	Dekons-Ema – consultant for developing the ESIA, Ministry of Environment, Ministry of transport and communications, Municipality of Kriva Palanka, PE ZRSMI Source: https://www.moepp.gov.mk/wp-content/uploads/2018/04/Zapisnik-od-javna-rasprava-21.02.2018.pdf
25.02.2022	Kriva Palanka	S3	First information meeting Purpose: Main aim of the meeting was to inform the project affected people (representatives from district units affected with land acquisition and resettlement) with railway alignment, the intention of continuing the efforts on commencement of the construction of Corridor VIII – Easter Section, to inform the project affected people on the land acquisition and resettlement procedures as well as to handover the information with parcels that will be subject to resettlement and land acquisition to the responsible representative from each district units.	PE ZRSMI, Connecta team, Municipality of Kriva Palanka, Representatives of the district units
10-11 March 2022	Kriva Palanka	S3	Clarification meetings with project affected population	PE ZRSMI, Connecta social team, project affected people

Date	Location	Section	Purpose and discussion	Participants/Stakeholders
			Purpose: clarification meetings were conducted with PAPs affected with land acquisition and resettlement, aiming towards transparent and direct communication.	
04.04.2022	Kriva Palanka	S3	Second information meeting with local population Purpose: second information meeting was held jointly with PE ZRSMI and Municipality representatives where the Director of PE ZRSMI lead the meeting and discussed issues relevant for the expropriation	PE ZRSMI, project affected people
09.05.2022	T'lminci and Gradec	S3	Meetings with PAPs related to the permanent way	PE ZRSMI, Connecta social team, project affected people
10.05.2022	Drenje, Kiselica and Trnovo	S3	Meetings with PAPs related to the permanent way	PE ZRSMI, Connecta social team, project affected people
11.05.2022	Skopje	S3	Meetings with PAPs related to the permanent way	PE ZRSMI, Connecta social team, project affected people
12.05.2022	Uzem	S3	Meetings with PAPs related to the permanent way	PE ZRSMI, Connecta social team, project affected people
13.05.2022	Zhidilovo, Krklja, Kostur	S3	Meetings with PAPs related to the permanent way	PE ZRSMI, Connecta social team, project affected people
16.05.2022	Kriva Palanka	S3	Meetings with PAPs related to the permanent way	PE ZRSMI, Connecta social team, project affected people
23.05.2022	Kriva Palanka	S3	Meetings with PAPs related to the permanent way	PE ZRSMI, Connecta social team, project affected people
14.10.2022	Kriva Palanka	S3	Meetings with PAPs related to the access roads and slopes	PE ZRSMI, Connecta social team, project affected people
23.01.2023	Kriva Palanka	S3	Presentation of conceptual design for alternative access roads	PE ZRSMI, Connecta social team, project affected people
13.01.2023	Online	S3	Presentation and discussion of Supplemental Biodiversity Assessment (SBA) findings	Connecta bio team, Biodiversity practitioners (representative of Faculty of Natural Sciences and Mathematics, NGOs etc)

Date	Location	Section	Purpose and discussion	Participants/Stakeholders
12.01.2023	Online	S3	Presentation and discussion of Supplemental Biodiversity Assessment (SBA) findings	Connecta bio team, Ministry of Environment and Physical Planning, Nature Department

Annex 7: Commitments Register