WB16-ALB-TRA-01

Detailed Design for the Rehabilitation of the Railway Line

Vorë – Hani Hotit

Albania

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

July 2021

Revised in July 2022

IPF6 Consortium

Western Balkans Investment Framework

Infrastructure Project Facility

Technical Assistance 6 (IPF6)

TA 2016032 R0 IPA

Western Balkans Investment Framework (WBIF)

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Name of Sub-project

Detailed Design for the Rehabilitation of the Railway Line Vorë – Hani Hotit, Albania

WB16-ALB-TRA-01

Environmental and Social Impact Assessment Study

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

Version	Date of issue	Contributors	Checked out	Approver	Comment
Draft V.01	Dec. 2020	ESIA team	Hector Martinez Alexandre Quintin	Aristides Karlaftis	Draft for comments
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V.03	July 2021	ESIA team	Hector Martinez Alexandre Quintin	Aristides Karlaftis	Final report
V04	July 2022	Abkons	Redion Biba Erjiola Kurti Linda Zacaj	Redion Biba	Revised Report

The Infrastructure Project Facility (IPF) is a technical assistance instrument of the Western Balkans Investment Framework (WBIF) which is a joint initiative of the European Union, International Financial institutions, bilateral donors and the governments of the Western Balkans which supports socio-economic development and EU accession across the Western Balkans through the provision of finance and technical assistance for strategic infrastructure investments. This technical assistance operation is financed with EU funds

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SUB-PROJECT DATA SUMMARY

ACTION	Sub-project implementation
PROJECT CODE	WB16-ALB-TRA-01
BENEFICIARY	Ministry of Transport and Infrastructure, Albania Albanian Railways / Hekurudha Shqiptare
SECTOR	Transport
COUNTRY	Albania
LEAD IFI	EBRD
GAF budget	EUR 4,500,000
IPF6 Budget	EUR 4,500,000
Assigned to IPF6	6th July 2018
Non-Objection by CA	12th December 2018
Commencement date	20th December 2018
Duration (months)	24 months + 7 months (extension)
Due date for completion	July 2021
IPF6 Key Expert responsible	Aristides Karlaftis

LIST OF ABBREVIATIONS

Abbreviation	Description
AGS	Albanian Geological Survey
AKMZ	National Agency of Protected Areas (NAPA)
Al	Albania
asl	above the sea level
CBA	Cost Benefit Analysis
CCC	Communication on Climate Change
CD	Conceptual Design
DCM/DCM	Decision of Council of Ministers
CTC	Centralized traffic control
DD	Detailed Design
DG NEAR	EC DG Neighbourhood Policy and Enlargement Negotiations
EAAA	Ecological Appropriate Area of Analysis
EBRD	European Bank for Reconstruction and Development
ES	Ecosystem Services
EQR	Ecological Quality Ratio
EIB	European Investment Bank
ERA	European Railway Agency
ESIA	Environmental and Social Impact Assessment
EU	European Union
EUD	European Union Delegation
FD	Functional Design Stage of the Preliminary Design
FS	Feasibility study and financial affordability analysis
G/C	Gap/Conclusion
GDP	General Development Plan
Gg	10^9 g (unit for measuring the CO_2 eq)
GHG	Green House Gas (Emissions)
GIP	Good International Practice
GLDP	General Local Development Plan
HC	Health Centre
HPP	Hydro power plant
IBA	Important Birds Area
IFI	International Financial Institution
IHM	Institute of Hydrometeorology
INF TSI	Infrastructure TSI
IPA	Important Plant Area
IPCC	Intergovernmental Panel on Climate Change
IPF	Infrastructure Project Facility

Abbreviation	Description
IPRO	Immovable Property Registration Office
IUCN	International Union for Nature Conservation
Kos	Kosovo
LUCF	Land Use Change and Forestry
MKS-64	Mercalli Scale – scale used for seismic intensity
NMR	Nature Managed Reserve
Mne	Montenegro
MoEFWA	Ministry of Environment, Forestry and Water Administration – Albania (Nowadays Ministry of Tourism and Environment - MoTE)
MoTE	Ministry of Tourism and Environment
NAPA	National Agency of Protected Areas (AKMZ)
NCCC	National Communication on Climate Change
NEA	National Environmental Agency
NIPAC	National IPA Coordinator
NMVOC	Non-methane volatile organic compound
NATD	National Agency of Territory Development
NTC	National Territorial Council
PA	Protected Area
PD	Preliminary Design
PESIA	Preliminary Environmental and Social Impact Assessment
PFS	Pre-feasibility study
R/E	Roma and Egyptian Community
REA	Regional Environmental Agency
SEE	South East Europe
SEETO	South East Europe Transport Observatory
SEP	Stakeholder's Engagement Plan
SoER	State of Environment Report
TA	Technical Assistance
ToR	Terms of Reference
UIC	International Union of Railways
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environmental Programme
WB	World Bank
WBIF	Western Balkans Investment Framework
WFD	Water Framework Directive

GLOSSARY

Name	Meaning
Baseline	An outline the environmental characteristics of a receiving environment that provides the starting point for an assessment.
Consultation Authorities	Public bodies/authorities, who are legally designated to be consulted on the environmental and social aspects of the proposed project.
EIA Directive[1]	Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU: “On the assessment of the effects of certain public and private projects on the environment”
Environmental topic	This term describes the different features of the environment that may be relevant in an environmental study. Alternative terms include “environmental receptor” or “environmental issue”.
Espoo Convention[2]	Adopted in 1991 and entered into force in 1997, the Espoo (EIA) Convention sets out the obligations of Parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of States to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across boundaries.
EU acquis[3]	The *acquis* is the body of common rights and obligations that is binding on all the EU member states. Candidate countries have to accept the *acquis* before they can join the EU and make EU law part of their own national legislation. Adoption and implementation of the *acquis* are the basis of the accession negotiations.
European Site	Includes Special Protection Areas (SPA), Special Areas of Conservation (SAC) and candidate Special Areas of Conservation.
Habitats Directive[4]	Directive 92/43/EU of the European Parliament and of the Council of 22 May 1992: “On the Conservation of natural habitats and of wild fauna and flora”. The Directive aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements. It led to the setting up of a network of Special Areas of Conservation, which together with the existing Special Protection Areas form a network of protected sites across the European Union called Natura 2000.
Indicator	Normally associated with monitoring, an indicator is used to measure the achievement of a Plan or Environmental objective
Law on EIA5 (EIA Law)	Law no 10440, of the Albanian Parliament, of July 07.2011: “On Environmental Impact Assessment”. Law is in full compliance with the EU EIA Directive
Objective	An intended goal, specifying the desired direction and outcome
Post-adoption	A summary prepared by the Responsible Authority (MEI) to outline how the

1http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0052&from=EN

2www.unece.org/fileadmin/DAM/env/eia/documents/legaltexts/Espoo_Convention_authentic_ENG.pdf

3http://ec.europa.eu/enlargement/policy/glossary/terms/acquis_en.htm

4http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043&from=EN

5 http://turizmi.gov.al/wp-content/uploads/2018/09/ligj-10440-2011-per-vleresimin-e-ndikimit-ne-mjedis.pdf

Name	Meaning
statement	assessment and consultation process have been taken into account in the adopted plan.
Recharge area	A recharge area is an area where the surface waters penetrate down into the ground, feeding thus the groundwater bodies/aquifers.
Responsible Authority	Called also Project/plan developer, a public body responsible for a plan/programme/project. The responsible authority for the railway is MIE.
Service road / side road / parallel road	Service road or side road or parallel road is a road located almost parallel to the railway line that serves to connect the area located in one side of the railway line to the closest level crossing or underpass or overpass. Service roads are designed to avoid the unauthorized/illegal railway crossings.
TEN-T	TEN-T is a programme established by the European Commission to support the construction and upgrade of transport infrastructure across the EU6. The ultimate objective is to close gaps, remove bottlenecks and technical barriers, and strength social, economic and territorial cohesion in the EU. Besides, the TEN-T supports the application of new technologies and digital solutions to all modes of transport. The objective is improved use of infrastructure, reduced environmental impact of transport, enhanced energy efficiency and increased safety7.

6 https://ec.europa.eu/inea/en/ten-t

7 https://ec.europa.eu/transport/themes/infrastructure/ten-t_en

1. Introduction

The Government of Albania received from WBIF a grant[8] for the preparation of the "*Detailed Design (DD) and the Environmental Impact Assessment study for the Rehabilitation of the railway line Vorë - Hani Hotit, Albania*" (called hereinafter "the Project").

The Project is part of the indicative extension of the TEN-T Core Network in the Western Balkans. This is Albania's international rail link to the regional and European railway networks through the pan-European Corridor X.

The promoter is the Ministry of Infrastructure and Energy (MIE). The beneficiary is the whole country, as the project will improve the railway traffic for about 1,000,000 inhabitants. The implementation agency is the state-owned company Albanian Railways (HSH), which has undertaken an investment program over eight to ten years to ensure full interoperability with the European network and to raise the general operative standards.

The lead IFI is the European Bank for Reconstruction and Development (EBRD).

The ESIA report (this document) is part of the Environmental and Social Impact Assessment (ESIA) study package on the Project that is prepared by the consortium SUEZ - IPF6 (hereinafter called "the Consultant").

1.1. Project's goal

The Project will contribute to significantly increase the freight and passenger railway traffic entering into/going out of Albania through the extension of the TEN-T core network, arriving at the port of Durres, or going out from Albania to other countries. As part of the connectivity agenda, the Project aims to connect via railway Albania to Montenegro via Tuz/Podgorica and further to Belgrade (Serbia) that links the Albanian network to Corridor X/Orient East-Med Corridor. Moreover, in the future, the Albanian railway network will be connected to Northern Macedonia and Greece and therefore to the Eastern Balkans countries, to attract transit freight business to and from Italy and Western Europe.

The modernization of the Railway Line Durres - Tirana and the construction of a new railway line to Tirana International Airport, a project that is already tendered in September 2020, is expected to enhance the demand on the railway line Vorë - Hani Hotit and Montenegro.

1.2. Project background

The railway line Vorë - Hani Hotit, which is approximately 120 km long, was built in two stages: from Vorë to Laç in the early 1960s, while from Laç to the Al/Mne border in the years 1980.

The track infrastructure is in poor condition due to the lack of maintenance. The maximum operating trains' speed is about 40 km/h. In some sections, it is lower than 20 km/h. In addition to the track conditions, the train speed restrictions stem also from the frequent unauthorized level crossings. The signalling system, heavily damaged during the unrest periods of 1991 and 1997, is almost inexistent. The communication between stations is effectuated via radio. There

8 "Detailed Design for the Rehabilitation of the railway line Vorë – Hani Hotit, Albania", Western Balkans Investment Framework (WBIF) Grant Application sub-project code WB16-ALB-TRA-01, approved during 15th WBIF SC, 15 December 2016

is no controlled safety system for the trains' movement along the line that increases the risk of accidents. The alignment geometry is rather good.

Freight services are poor with long journey times and low demand. The railway line has a good potential for transporting commodities and raw materials, in particular minerals and cement. The railway improvements to permit increased speeds, capacity, and axle loads compatible with European standards will provide a more attractive service for freight transport.

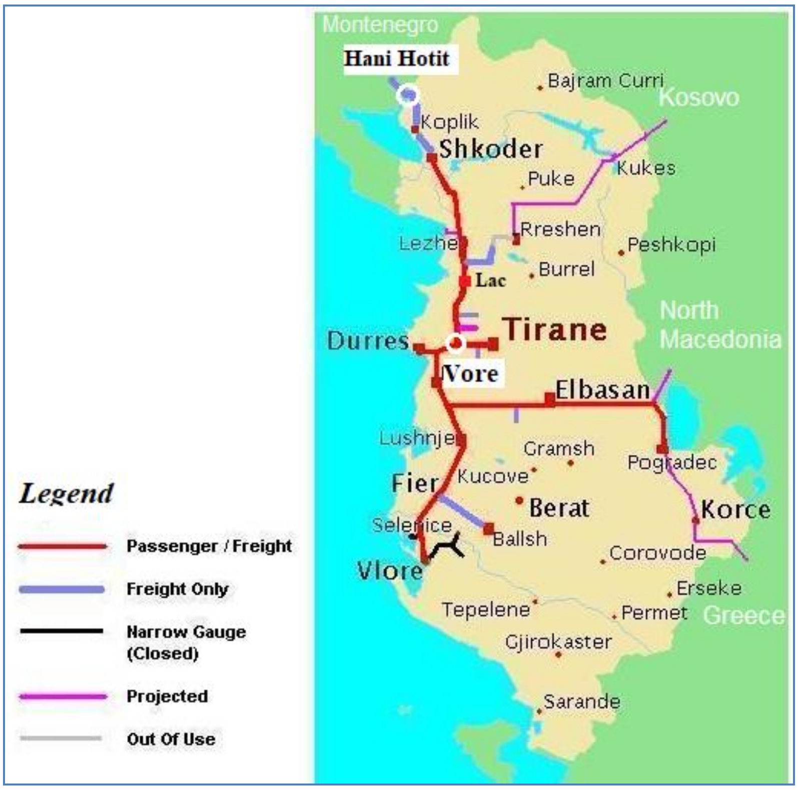

Figure 1-1_Scheme of the Albanian railway line network

1.3. Project purpose and objectives

This section outlines the purpose and objectives of the proposed project.

1.3.1. Purpose

The general purpose of the Project is to develop a Detailed Design with all the supportive studies, an Environmental and Social Impact Assessment, and prepare the Tender Documentation to support the procurement for the rehabilitation works of the railway line and modernize it in accordance with the European Standards.

The implementation of the Project aims at the following:

- increase the safety and the speed conditions along the line;
- put in place an interoperable railway infrastructure connected to neighbouring countries and the wider region that meets the requirements of the European Railway Traffic Management System (ERTMS);
- create better conditions for the development of passenger and freight services;
- increase the economic growth and social development within the country;
- facilitate the trade and economic links with neighbouring and EU Member countries;
- improve transport capacity;

- develop a multimodal and intermodal transport in Albania and the wider region.

1.3.2. Objectives

The overall objective of the Project is the rehabilitation of the Railway Line Vorë - Hani Hotit, including the industrial railway track Budull - Fushë Kruje, to enable the provision of transport services and increased safety and speed to EU standards, as well as implement the EU acquis and meet IFI requirements.

The increased speed and uniform classification (UIC D4 category, 22.5 tons/axle, and 8.0 tons/m) will be reached through the following:

- the replacement and rehabilitation of outdated superstructure components (ballast, sleepers, fastening, switches, and tracks);
- the rehabilitation and improvement of infrastructure components (track bed, culverts, bridges, and tunnel);
- the consolidation of level crossings (proposals for reduction, rehabilitation, and/or interlocking improvements);
- the improvement of interlocking and telecommunications equipment for incorporation into the CTC (Centralized traffic control) system;
- fencing the line (where applicable) and exploring alternatives to physical line fencing.

The specific objectives of the Project include:

- the development of the detailed design and tender documentation for the rehabilitation works for 100 - 120 km/h speed and UIC category D4 line upgrade.
- the preparation of the Environmental and Social Impact Assessment (ESIA) study of the proposed Project to identify the environmental and social risks, impacts and benefits, and structure the Project in compliance with the EBRD’s Environmental and Social Policy (ESP) and Procurement Policies and Rules (PP & R). The ESIA study will also meet the requirements of national environmental and social regulations.

1.4. Key stakeholders and their roles and responsibilities

The table below gives the main Project’s stakeholders and their roles and responsibilities, as identified during the project preparation. The key stakeholders are in bold.

Table 1-1_ Main Project’s stakeholders and their roles and responsibilities

Stakeholder / Institution	Role / Responsibility
Ministry of Infrastructure and Energy (MIE)	The Project’s promoter is the Ministry of Infrastructure and Energy (MIE) that is responsible for the development of policies and mid-term and long-term strategies for the transport sector (including railway). MIE has all the regulatory licensing and policy roles related to railway infrastructure. MIE is responsible for the spatial planning policies and issues licenses for the design, construction, supervision, and testing of construction works. Within MIE operates the National Territorial Planning Agency (NTPA), a public institution responsible for spatial and urban planning, crucial steps in the development process for infrastructure projects.
National Territorial Planning Agency	The National Territorial Planning Agency (NTPA) coordinates the preparation of the General Local Development Plans of the municipalities, as well as for the General National Plans. The Agency is responsible for the monitoring of the implementation of these plans.
Directorate of Rail	The Directorate of Railway Inspection (DRI) is responsible for controlling the

Stakeholder / Institution	Role / Responsibility
Inspection	implementation of the provisions of the Railway Code. This Directorate, which is dependent on MIE, is responsible for controlling the implementation of the legal and sub-legal acts and ensuring the implementation of the rules for: • the protection, maintenance, remodelling, and reconstruction of the railway infrastructure. • the safe movement of trains; • technical control of Rolling Stock in use; all the procedures followed during acceptance for the use of railway vehicles. DRI currently is playing the role of the safety authority, but following the new railway, code needs to be separated into different authorities (regulatory, licensing, and safety authority) and the national Investigation Body for Rail Accidents/Incidents.
Albanian Railways S.A. (Hekurudha Shqiptare - HSh)	The Project beneficiary is the Albanian Railways (Hekurudha Shqiptare – HSh), which has the status of Anonymous Company with 100% state-owned capital. Technically, it is supervised by MIE, whilst financially by the Ministry of Finance and Economy (MFE). The structure of the Albanian Railway consists of four business units financially divided, which are: • Freight railway transport business unit; • Passenger railway transport business unit; • Infrastructure management business unit; • Maintenance of moving assets business unit (locomotives and wagons). The primary counterparts for this project are the Steering Committee and the Project's Implementation Unit (PIU).
European Bank for Reconstruction and Development (EBRD)	EBRD is the lead IFI, which is responsible for assignment implementation coordination and approval of outputs.
Ministry of Tourism and Environment	Ministry of Tourism and Environment (MoTE) is the competent authority for environmental affairs. It is responsible for the approval of EIA studies. MoTE is responsible for policies related to climate change and a focal point for the Albanian government for the UNFCCC and Kyoto Protocol. MTE also exercises the powers of the national authority for Clean Development Mechanism projects defined under the Kyoto Protocol in Albania. Important stakeholders under this ministry are the National Agency for the Protected Areas (NAPA), particularly, and the National Environmental Agency (NEA).
National Agency for the Protected Areas (NAPA)	National Agency for the Protected Areas (NAPA) is a public body under the Ministry of Tourism and Environment, which is responsible for the management of protected areas and other natural networks, such as Natura 2000 in compliance with the Protected Areas Management Plans. NAPA monitors and keeps an inventory of flora and fauna in these areas. Additionally, the Regional Agencies for the Protected Area (RAPAs) are responsible for nature conservation and biodiversity, promoting tourist/recreational values as well as generating revenue from services to others. RAPA Durres, within the territory of which is located the Ishmi Bridge, is one of the key identified stakeholders.
National Environmental Agency (NEA)	National Environmental Agency (NEA) is an institution under the subordination of the Ministry of Environment, which is responsible for reviewing the environmental impact assessment process for projects under law no. 10 440, dated 7.7.2011 "On environmental impact assessment", as amended, and for reviewing environmental permit applications. Further, this Agency is responsible for environmental monitoring.
Institute of Transport	Institute of Transport (IoT), a public body under the ministry responsible for transportation, acts as a research and analytical centre to assist and support the Ministry

Stakeholder / Institution	Role / Responsibility
	of Infrastructure and Energy. As part of the ANTP, IoT is assigned the responsibility for the completion of the National Strategy for the Promotion of Inter-modality and Combined Transport in Albania.
European Union Delegation to Albania (EUDA)	EUDA observers for use of WBIF funds. IPA II contributes grant funding to the WBIF. Responsible for managing IPA II for the programming period 2014-2020.
Ministry of Europe and Foreign Affairs	Ministry of Europe and Foreign Affairs, in its capacity as NIPAC is the leading institution in coordinating programming of IPA funds (national and regional) on behalf of the Albanian Government. It is responsible for coordinating Albania's applications (TA and investment grants) in the WBIF instrument.
JASPERS	Joint Assistance to Support Projects in European Regions (JASPERS) is a partnership between the European Commission (Directorate General for Regional Policy), EIB, EBRD, and KfW. JASPERS is a technical assistance facility that provides the technical support to prepare high-quality major projects, which will be co-financed by EU funds9.
Ministry of Economy and Finance	The Ministry of Economy and Finance (MEF), is responsible for costing and budgeting of various policy alternatives in the medium to long term; it is also responsible for the coordination of external assistance as well as loan negotiations.
Affected Municipalities	The railway crosses the territories of 7 municipalities (Vorë, Kruje, Kurbin, Lezhë, Vau Dejes, Shkoder and Malesia Madhe), which are responsible for preparing and implementing the General Local Development Plans, which preparation is coordinated by the National Territorial Planning Agency. The Agency is responsible for the monitoring of General Local Development Plans implementation.

The Stakeholders Engagement Plan (separate document) provides a completed list of the involved stakeholders and their roles and responsibilities in the project development phases.

1.5. Purpose of this document

This document is part of the package of the ESIA study deliverables on the proposed project.

The main purpose of the ESIA study process is to assess the potential significant adverse impacts of a project before the project is approved. Wherever necessary the ESIA may influence the project design to prepare the most possible environmentally friendly one. This eventual influence is performed during the ESIA scoping stage. Besides, the ESIA study takes into consideration the stakeholders concerns in the environmental decision-making procedures during the whole project's life cycle.

The ESIA report (this document) follows the ESIA Scoping report, which obtained the non-objection (in November 2019) from the key stakeholders10.

Based on the findings of this report the Ministry of Tourism and Environmental (MoTE) decides whether the environmental consent on the Project development should be delivered. The environmental consent/permit or Environmental Declaration is part of the permits' package that is necessary for implementing the Project.

9 https://ec.europa.eu/regional_policy/archive/thefunds/instruments/jaspers_en.cfm

10 Workshop on Preliminary Design and ESIA. Sept. 30 – Oct. 01.2019, Tirana, Albania

Depending on the findings of this document, the future lender(s) will decide on the possibility of the project's financing. IFIs policy, including EBRD11, is financing projects that comply with their environmental and social standards.

1.6. Structure of this document

This document is structured as follows:

- Chapter 1: Introduction. Under this introductory chapter the Project background and key stakeholders, its purpose and objectives along with the ESIA process and the purposes of the ESIA report is provided;
- Chapter 2: The Project. The chapter discusses the Project area along with the Project elements (components, activities, and land use issues);
- Chapter 3: Regulatory framework and guidelines. Under this chapter are discussed the requirements of the EU, national, and EBRD on the different stages of the ESIA process. A detailed comparison between them is provided and after a gap analysis, the applicable regulations/standards are selected;
- Chapter 4: Impacts Assessment Methodology. The chapter provides for the approach and methodology for Project impacts' evaluation; the methodology used for options comparison is also discussed;
- Chapter 5: Baseline information. This chapter describes the baseline information. For environmental each topic the used material and methods are provided;
- Chapter 6: Impacts and Mitigation. This chapter describes the main sources of impacts and the potential impacts that may arise from the project development, as well as the suggested strategies and measures to avoid/reduce any eventual significant impact;
- Chapter 7: Comparison of the considered options. The considered Project's options have been compared during the scoping stage. Under this chapter are compared from the environmental and social point of view the Option "zero" – "do-nothing" option and the preferred Option ("the basic" option);
- Chapter 8: Monitoring program. This chapter provides for the environmental parameters that are regularly monitored by the National Environmental Agency and other institutions and agencies, as well as on the environmental and social parameters that should be monitored during the Project's implementation;
- Chapter 9: Main findings: This short chapter gives the main findings of the ESIA report regarding any negative or positive environmental and socioeconomic effect of the proposed project;

11 https://www.ebrd.com/environmental-and-social-policy.html

2. The proposed Project and the Project Area

This chapter outlines the main features of the project area and the main components of the proposed project. Details on the proposed Project are provided in the main technical report (Detailed Design), while chapter 5 of this document (baseline information) provides a detailed description of the environmental and social characteristics of the Project's area.

2.1. Outline of the project area and its main features

The affected area and its main environmental and social features are closely linked to the identification and assessment of the potential impacts that may arise from the implementation of the proposed project.

The Vorë-Hani Hotit railway line runs in the Western Lowland of Albania and has a general direction from South to North. The railway connects the cities of Vorë, Mamurras, Lac, Milot, Lezhë, Shkoder, and Koplik. It crosses the state border Al/Mne at Hani Hotit.

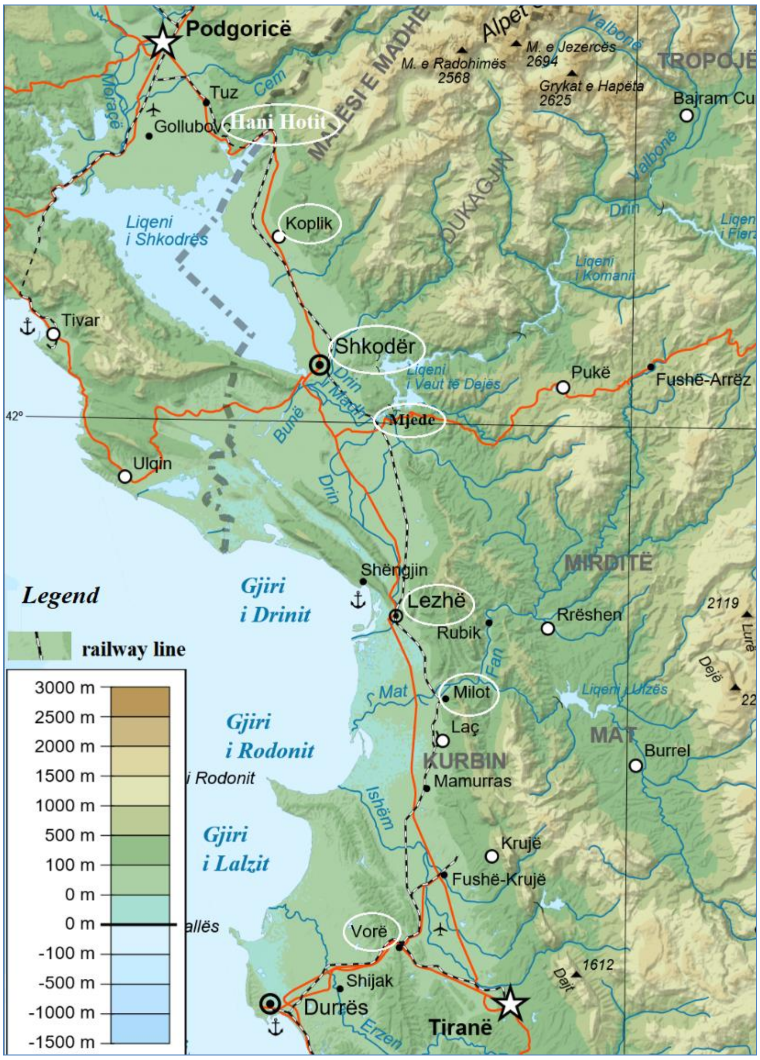

Figure 2-2_General location of the railway line

As per the Albanian administrative division12, the railway line traverses the territories of seven municipalities (Vorë, Kruje, Kurbin, Lezhë, Vau Dejës, Shkoder, and Malësia Madhe).

The planned railway track generally follows the existing line. The improved realignment affects only some short sections, which are located almost joint to the existing track and therefore they do not affect the extent of the geographical location of the project area.

Map 1 (separate file in pdf format) shows the railway line location in the topographical map at 1:25.000 scale.

From Vorë to Hani Hotit the railway line runs almost in flat terrain. From Km 20+560 to Km 133+000, it traverses flat agricultural areas and some urban centres (Mamurras, Lezhë, and Shkoder). From Km 133 to km 139 it runs in flat terrain mostly through shrubs and degraded forest, while from Km 139+000 to Km 140+000 (Hoti Village to Hani Hotit), it runs in a mountain foot near Shkoder Lake.

The railway line crosses seven rivers (Ishmi, Droja, Mati, Drini of Lezhë, Gjadër, Drini, and Kiri) and several streams. Some agricultural plots on both sides of the existing railway line are often inundated during heavy rainfalls (e.g. left side of Ishmi River, north of Lezhë town).

Within the territories of Shkoder and Malësia Madhe Municipalities, the railway line crosses the Traditional Use/Transit subzone of a Protected Area (Nature Managed Reserve (NMR) of Shkoder Lake13. However, as shown in section 3.2.2 below, the Project's development is allowed by both the national regulations and EBRD standards.

Some railway line sections cross areas that may be affected by strong earthquakes. As proved during the earthquake events of both September and November 2019, these sections run over unconsolidated Quaternary deposits that cover areas affected by active neotectonic faults (e.g. section Vorë - Mamurras). In these sections, the earthquakes may cause damages to the bridges (e.g., Ishmi River Bridge damaged on November 26, 2019 - see section 5.2.6) or the rails.

The crossed area is often affected by uncontrolled urbanization that has led also to informal constructions near the railway (e.g. Shkoder and Malësia Madhe municipalities). Numerous unauthorized local roads and pedestrian paths constitute a risk to cars, humans, and farm animals that cross the railway line.

Numerous unauthorized local roads and pedestrian paths constitute a risk to cars, humans, and farm animals that cross the railway line. The proposed solutions to avoid this risk include service and connectivity roads, level crossings and underpasses as discussed in sections 2.3.6 and 2.3.8 of this chapter. These solutions have been consulted during the whole ESIA process, including ESIA scoping stage and Preliminary Design, and the preparation of the ESIA report and the Detailed Design. The consultations included all the local governments (seven municipalities) affected by the project, the Road Authority Directorate, the water and power companies, the heads of administrative units, and the local communities. Details on these consultations are provided in the ESIA Scoping report, the SEP, the SEP appendices and the detailed Minutes of Meeting (nine MoMs – nine separate documents) on the ESIA report public disclosure. The consultations with the local communities were preceded by the preparation of an extended summary of the specific interventions and the related potential impacts for each municipality territory. Therefore, the Consultant prepared seven extended summaries (20-30 pages each of

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12 Law no 115/2014, dated 31.07.2014 "On the administrative-territorial division of local government units in the Republic of Albania. The administrative reform, the ongoing implementation of which began in 2015, was associated with shifts of power from the national level to the local level. Reorganization of LGUs addressed the unnecessary fragmentation of development efforts, experienced before with 373 municipalities and communes. Territorial division is available under the https://akpt.maps.arcgis.com/apps/webappviewer/index.

13 DCM 684/2005

them) for each municipality and seven short summaries (6-10 pages). The extended summaries (together with the ESIA Non-Technical Summary) were published in the web pages of each municipality. Whereas the short summaries, together with leaflets were distributed to the local communities during the ESIA report public disclosure (June 2021).

2.2. Considered Project's options and the preferred option

This section outlines the chronology of historical review and assessment of alternatives considered for the Project.

The feasibility study carried on in 2009 "Albanian Railway Network: Infrastructure and Signalling Improvement Project (TA-ALB-06)" determined that the railway existing alignment, both vertical and horizontal, was appropriate to allow for a maximum speed of 100 km/h and that the horizontal alignment at the location of a number of curves had to be improved in order to increase the maximum speed to 120 km/h. This brownfield intervention has inherently less negative environmental and social impacts than a greenfield investment in a completely new alignment.

Two options were considered in the 2009 feasibility study. The first option represented the minimum improvement to the track and structures that must be achieved to allow the trains to travel safely over the network with the performance required. The second option described the work required to bring the track and structures to a condition that will allow the trains to travel safely over the network with the performance required, but ensuring better earthworks performance, reducing maintenance requirements, providing a longer life for the track components, creating a better safety regime for the staff conducting routine maintenance inspections and repairs, and providing a higher level of safety for passengers at stations. The first option would imply higher maintenance costs and more onerous safety management requirements as well as further upgrade work needed as the service improves and train numbers increase. The second option would allow operating the infrastructure without further upgrade for the normal life of the asset of 20 – 30 years depending on the individual components. It would also provide a safer environment requiring lower levels of safety surveillance.

The financial and economical appraisal of the whole railway network carried out in 2015 was developed following this second option from the feasibility study in 2009 and therefore, following the existing alignment with local alignment element improvements.

The ToR of the current project "Detailed Design for the Rehabilitation of the Railway Line Vorë - Hani i Hotit (WB16-ALB-TRA-01)" were also drafted following the second option from the Feasibility Study and thus, under the assumption that the existing alignment would be respected, with the improvement of a number of horizontal and vertical alignment elements as well as some segments where the track alignment should be updated with a new design and in order to provide flood protection along the line.

The Functional Stage of the Preliminary Design, Option Analysis (May 2019) and the ESIA Scoping Study (August 2019) presented the solutions identified, taking into account the constraints and assumptions for the earlier mentioned studies, assessing how these evolved and their current validity (such as the sustainability of major and minor structures). The Option Analysis Report presented the various options identified during the Inception Phase and the functional stage of the preliminary design. These options primarily relate to the number of level and grade separated railway crossings, whether with road overpasses or underpasses.

The initial evaluation of these options was presented to the beneficiary, end user and lead IFI with the initial results from the supporting studies to assist their decisions. The alternatives and options considered, as well as their assessment from an ESIA approach, and the preferred option are presented in the next pages.

2.2.1. Considered options

From a standard ESIA approach the alternatives considered are:

- **Alternative Zero**: Do nothing
- **Alternative 1**: Reconstruction of the railway line on the existing alignment
- **Alternative 2**: New alignment, greenfield investment

The Alternative 2: new alignment has been discarded (since the feasibility design in 2009) versus the Alternative 1: reconstruction on the existing alignment, due to a number of disadvantages including:

- New alignment would entail additional negative impact to the environment and biodiversity due to the new greenfield investment.
- **New alignment would require significantly larger land acquisition with the subsequent negative social impact to the communities along the new alignment**.
- Significantly increased cost for the construction of a new alignment, compared to upgrading the existing on.

Therefore, the alternative zero or do-nothing and the alternative for reconstruction have been compared from the environmental and social standpoint in chapter 9. The detailed comparison between the alternatives from an environmental and social point of view is provided in the section 9.3, and summarized in the table 9.20, *approximate quantitative assessment of impacts for each Project alternative/option*.

During the Functional Design stage and the ESIA Scoping report preparation, the Consultant has taken into consideration the following options under Alternative 1: Reconstruction of the railway line on the existing alignment.

Basic Solution: Use of the existing grade separated crossings, implementation of the grade separated crossings that are considered as single unambiguous solution (as no other alternative is feasible) and protecting the rest of the necessary crossings (as protected / secured level crossings).

Option 1: In addition to the Basic Solution, replacement of the Secured Level crossings of primary roads (or roads with heavy and / or slow traffic) with grade separated crossings by raising the railway line to allow for road underpasses at 11 locations.

Option 2: In addition to the Basic Solution, replacement of Secured Level Road crossings with off-grade overpasses by raising the road profiles. These are 32 additional cases to the basic solution, in total 33 road overpasses.

Option 3: Is the fusion of Option 1 (railway profile raising to allow for replacement of secured level crossings with underpasses) and Option 2 (raise of local roads to replace secured level crossings with overpasses). This option would leave only seven secured level crossings dispersed along the railway line from Vorë to Shkoder and generally not expected to present problems in safety or track capacity. Each of the remaining seven secured level crossings are considered the only possible solution, due to geometry and social impact constraints. Option 3 is the most expensive solution.

2.2.2. Rapid assessment of the considered options

The steering committee instructed the Consultant to disregard Options 1 and 3 after their presentation in the Option Analysis workshop held in Tirana on seventh of June 2019, due to the higher construction costs required for the raising of the railway line.

The remaining two options are presented in the following table.

Table 2-2_Considered project's options

<table>
<tr><th>Basic Solution 14</th><th>Option 2 - Additional off-grade road overpasses</th></tr>
<tr><td>Construction of 54 secured level crossings</td><td>Construction of 32 new overpasses to avoid the level crossings with the primary roads and roads with heavy and/or slow traffic;

Construction of 22 secured level crossings</td></tr>
<tr><td colspan="2">The common characteristics of both options include:
• Improvement of the railway line horizontal alignment within some short sections (e.g. Vorë), where the railway line radius will be improved from 300m (existing radius) to 500m, for reaching the required EU standards;
• Improvement of the railway line vertical alignment within some short sections (e.g. north of Lezhë town) to avoid the railway line inundation during flash floods;
• Construction of approximately 112 km of service roads, almost parallel to the railway line, to allow the uninterrupted circulation of the cars and local inhabitants and to avoid the informal crossings;
• Closure of all the unauthorized crossings
• Demolition of almost all the existing bridges and the construction of new bridges, in the same locations;
• Reconstruction of almost all the existing stations. The station's buildings will be built within the Albanian Railways property;
• Construction of a new freight station in the north of Lezhë town, partly in Albanian Railways property and partly in private arable land;
• Rehabilitation of protection works against river erosion;
• Fencing the railway line;
• Construction of new signalization and telecommunication system.</td></tr>
</table>

The Steering Committee also disregarded Option 2 because of the higher cost required for the construction of 32 overpasses15. This decision complies also with the environmental and social findings of the ESIA scoping report, according to which Option 2 is less environmentally friendly

14 Please note that it is not OPTION 1 – Basic Solution, but just "Basic Solution", because Option 1 is another option

15 See Stakeholders Engagement Plan report

than the Basic Solution because, in addition to the higher financial cost, **Option 2 significantly affects several environmental receptors, including the following:**

- Impact on the landscape by the presence of 32 overpasses across typical agricultural and urban landscape;
- Impact on the terrestrial part of the Nature Managed Reserve (NMR) of Shkoder Lake16. The construction of new overpasses across the terrestrial part of this protected area (PA) are not included in the list of activities that are allowed by its Management Plan (see in the section 3.2.1 below **The Protected areas and the proposed project**);
- Adverse impact (access difficulties, visual barrier, etc.) to the installations and inhabited areas near the railway line due to the raise of 32 roads on both sides of the 32 new overpasses;
- Need for a considerable amount of raw material for producing concrete and crushed stones and therefore decrease of gravel and sand within the riverbeds;
- Need for a considerable amount of raw material for increasing the vertical alignment of 32 roads on both sides of the 32 overpasses;
- Erosion of the rivers and streams beds as a result of the extraction of sand and gravel for the construction of 32 overpasses;
- Erosion of the coastal area because of the decreased amount of sediments transported to the Adriatic Sea by the rivers crossed by the railway line.

2.2.3. Preferred option

Based on the considered alternatives, options and assessment presented above, Option 2 (construction of 32 overpasses) is disregarded, and therefore the preferred option remains the Basic Solution, using the existing grade separated crossings and the implementation of the grade separated crossings that are considered as single unambiguous solution, while securing the rest of the necessary crossings with protected/secured level crossings. The Steering Committee agreed on this selection and EBRD gave the no-objection17.

As a result, hereinafter and during the whole ESIA report preparation, the term “the Project” refers to this Basic Solution within the alternative 1 of reconstruction of the railway line in the existing alignment.

2.3. Outline of the Project

This section outlines the Project elements, which includes the components and activities.

Details on the Project are provided in the technical reports.

2.3.1. Railway line components

The railway line components are as follows:

- Superstructure: rails, sleepers, fastening components, protective layer, and ballast bedding;

16 DCM No 684/2005

17 EBRD no-objection. See SEP

- Sub-structure: sub-ballast or formation and the subgrade or natural layer;
- Structure: tunnels, bridges, underpasses, overpasses, culverts, drainage channels and retaining walls;
- Other elements: level crossings, stations; signalling and telecommunication, and fencing.

The schematic figure below shows the components of the superstructure and sub-structure of a railway line.

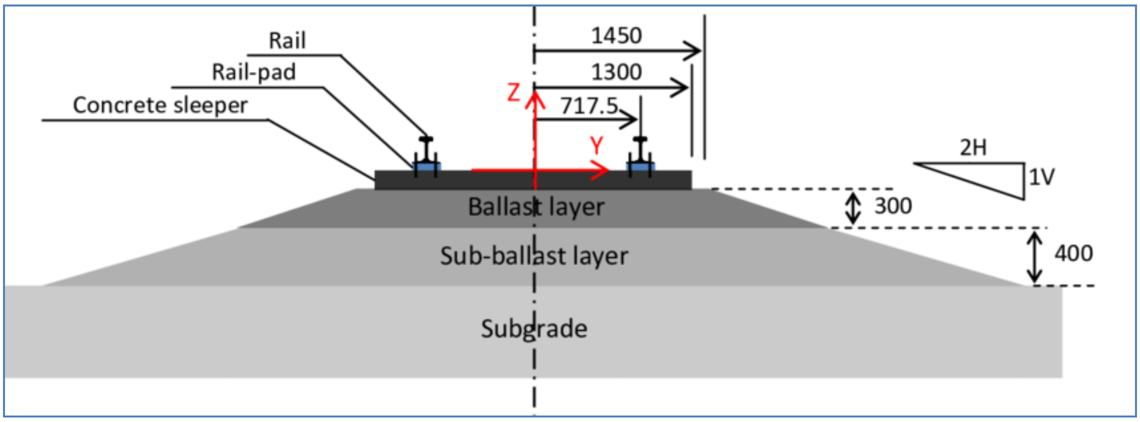


Figure 2-3_Schematic cross-section of the railway track

The subgrade plays a role similar to that of a building foundation. The applied loads are transferred by the deflection of the rail to the ballast bed and then passed on via the subgrade to the subsoil.

2.3.2. Current situation of the railway line

Currently, the railway line is partially out of function because the strong earthquake of November 26, 2919, has heavily damaged the Ishmi Bridge. The damage was caused from the earth shaking. The foundations were built with wooden piles with diameter 400mm that made this bridge sensitive to the strong shakings. Nowadays the railway line is functioning for freight transport from Gjorm station (km 48) to Hani Hotit. Gjorm is the nearest freight station to Ishmi Bridge (km 35).

The railway line was built in two stages: from Vorë to Laç in the early 1960s, while from Laç to the Al/Mne state border in 1985.

The designed operation speed was up to 100 km/h. Due to its deterioration, the line operates under low speeds, which do not exceed 40 km/h while in some sections it is lower than 20 km/h. Passenger services are carried out by only a pair of trains per day, while freight services are scheduled ad hoc. Due to the low speed, the number of passengers is insignificant.

The deterioration of the railroad system includes mainly the following:

- Rails, sleepers, and ballast are damaged and therefore cannot allow the initial design speed (100 km/h);
- Bridges and Lezhë tunnel, although designed to support loads equivalent to 22.5 ton/axel, are severely deteriorated and their width does not comply with the typical 6.0 m required by the TEN-T standards. Moreover, they do not support the future electrification of the line;
- Damaged drainage system, with erosion and sedimentation;

- A considerable number of non-authorized road and passenger crossings have been recorded through inhabited areas, while along the open line most of the “official” crossings with the national and regional road network are not protected;
- The signalling system is out of operation. The communication between stations is effectuated via radio, and there is no controlled safety system for the trains’ movement along the line, that increases the risk of accidents;
- Stations’ buildings are out of standards and stations’ platforms require rehabilitation.

2.3.3. Technical objectives of the planned interventions

2.3.3.1. Technical objectives

The Project aims to improve the passenger and freight transport services and increased safety and trains’ speed in accord with the EU standards.

The increased speed and uniform classification (UIC D4 category, 22.5 tons/axle, and 8.0 tons/m), the improved transport services, and the increase in safety will be reached through the following technical objectives:

- the improvement of the horizontal alignment to allow the required trains’ speed of 100-120 km/h;
- the improvement of the vertical alignment to avoid railway inundation;
- the replacement and rehabilitation of outdated superstructure components (ballast, sleepers, fastening, switches, and tracks);
- the replacement and rehabilitation of substructure components (sub-ballast, subgrade);
- the rehabilitation and improvement of structure components (culverts, retaining walls, underpasses, pedestrians’ overpasses, bridges, and Lezhë tunnel);
- the consolidation of level crossings (reduction of the number of crossings, secured level crossings, rehabilitation and/or interlocking improvements);
- the design of service roads, almost parallel to the railway line that will serve the local population and will avoid unauthorized crossings;
- the improvement of interlocking and telecommunications equipment for incorporation into the CTC system;
- fencing the line (where applicable) and exploring alternatives to physical line fencing;
- the rehabilitation/reconstruction of the stations

The safety benefits of the new railway line are based, in particular, on the following:

- New System of Signalling and Telecommunications will be installed;
- All the Railway Line will be fenced;
- All Level Crossings and Crossing Roads will be protected with automatic barriers and signalling system;
- All the appropriate facilities for persons with disabilities are designed and will be implemented;

Based on EU Directive for Railway Safety, during the operation of the railway line, the following will be included:

- A safety management system will be established;
- Vehicle maintenance inspection will be in place during the operation of the Railway;
- CSI Indicators relating to technical safety of Infrastructure and its implementation will be implemented and monitored.

Besides, the design takes into consideration the future electrification of the railway line. For the "open line", i.e. out of the structures, the necessary electrification cross-section width for the railway corridor has been increased to 6.60m.

The design provides also for the future rail links to Shëngjin Port and Kosovo. The connection to Shëngjin is planned at Lezhë 2 station, while Kosovo link at Mjedë station.

2.3.3.2. Organizational objectives

Following the 90's railways have not been a priority for the Albanian governments, mainly due to lack of funds to maintain and operate them.

The proposed Law dated 09.12.2019 plans to reorganize the Albanian Railways, which will be split into four state owned companies that will have the following responsibilities:

- Infrastructure;
- Passengers' transport;
- Freight's transport;
- Maintenance of locomotives and wagons

Such reorganization together with the special attention in the government policies, especially the commitment for the financial support toward the railway transport in Albania, will guarantee the appropriate maintenance of the railway system.

2.3.4. Railway typical cross-section

The railway cross-section selected is in accordance with the EU requirements and has the same characteristics of the project "Reconstruction of Railway Line Durrës – Tirana – Airport" including:

- New Typical Cross Section of the Railway Line width will be 6.6m.
- New material for ballast and sub-ballast with improved technical parameters will be used (Basalt and Selected Material).
- New Typical Cross Section will allow the future electrification of the Railway Line.
- New Sleepers (Pre stressed Concrete) will be used, increasing safety and lifespan.

Compared to the existing railway line, the new one will be 6.6 m wide on the top, to allow the future electrification. Therefore, the only limitation of the new line is its width, which requires 0.30 cm of land strip on both sides of the railway. However, this land strip falls within railway belt, which is a property of the Albanian Railways.

The Steering Committee required that the design should consider the future electrification of the rehabilitated railway line, thus taking into consideration the necessary provisions in the civil works for the rehabilitated railway line. Such a provision has an impact on the typical cross-section width (and land acquisition needs) and influences the sustainability decisions for existing structures (major and minor bridges) and the construction costs.

The figure below shows the typical cross-section in open lines, taking also into account the necessary space for future electrification.

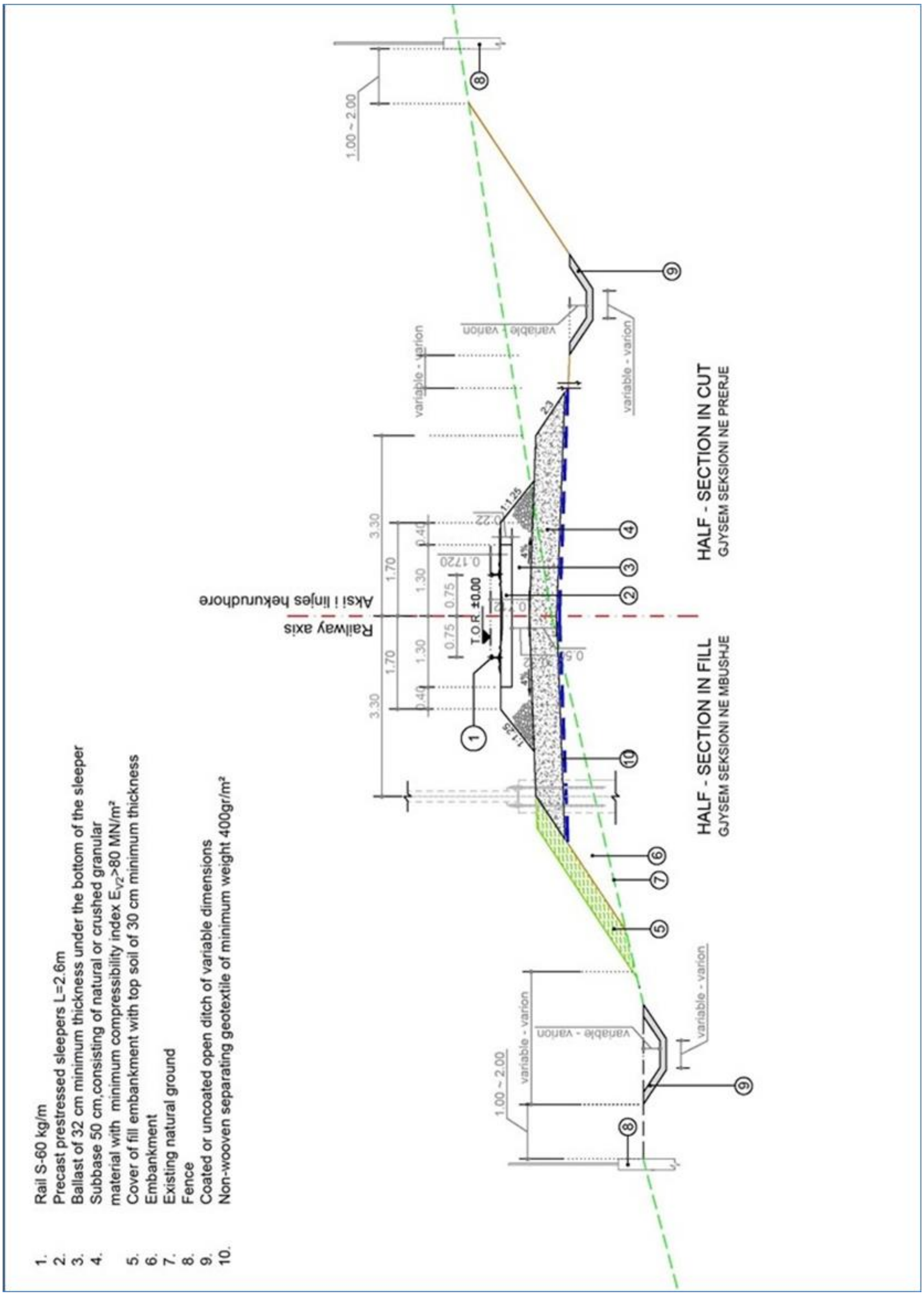


Figure 2-4_Typical cross-section of the railway line

2.3.5. Service and connectivity roads and level crossings

The service roads cross section elements are based on the DCM 628/2015 “On the Approval of the Technical Rules in Designing and Construction of Roads”, on which are based also the service and connectivity roads due to the track safety fencing. The secured level crossings are compatible with the local road network and appropriate to serve the local needs, as expressed in the consultations with the affected municipalities and the local communities. These consultations were held during the whole ESIA process, including the ESIA scoping and Preliminary Design and the preparation of the ESIA report and the Detailed Design. Sections 2.3.6 and 2.3.8 below, as well as SEP and SEP Appendices gives details on these consultations.

Short assessment of the service and connectivity roads

The assessment of the proposed local road network arrangement was based on the following:

- Existing roads that have to be rebuilt, wherever the proposed railway works (stations layout, track elevation etc.) affect them;
- Existing roads that are used and will be maintained;
- The appropriate access to the proposed level or grade separated crossings;
- The access to the settlements and properties on both sides of the railway line;
- Existing and new access roads to the railway stations; and
- Geometric features (design speed, typical cross section, etc.) compatible with the required standards on the service and connectivity roads

The followed strategy regarding the service and connectivity roads was:

- Using as much as practicable the existing local road network as service and connectivity roads.
- Opening new short service and connectivity roads to connect/complete the existing local roads network. This completion is necessary due to the uncontrolled boom of new constructions during the last 30 years.
- Using the state and municipal properties for opening new service and connectivity roads.
- Wherever possible opening new service roads within the railway line belt, which is an Albanian Railways property.
- Opening as less as practicable new service and connectivity roads in private property, especially in agricultural land of good quality.
- All the settlements located on both sides of the railway line must have access to a level crossing through a service and connectivity road.
- All the farmers must have access to their land through a level crossing where the farmhouses and the agricultural lands are located on the opposite sides of the railway line. Therefore, every single house must be connected to the closest level crossing through e service and connectivity road.
- All the service and connectivity roads must have sidewalks or shoulders on both sides in order to be used by pedestrians.

Roughly, 112 km of non-paved service and connectivity roads are needed for the project. The service roads are of category C2 of roads18 (unpaved road, 4m wide, shoulders 0.75 m wide on each side). The new service roads located in private land have a total length of 7.27 km. The total land surface to be expropriated for the new service roads through private property is approximately 4.0 ha. Therefore, the majority of the needed service roads falls in the existing

18 DCM 628/2015 "On the Approval of the Technical Rules in Designing and Construction of Roads"

local roads network and in the railway line belt that are state, municipal and/or Albanian Railways property.

The connectivity roads are mostly of category F2 (asphalted road, width 5.5 to 6.5m, sidewalks/shoulders mostly 0.5 to 1.0m wide on both sides of the road). The new connectivity roads located in private land have a total length of 2.67km. The total land surface required to be expropriated permanently for the new connectivity roads through private property is approximately 2.0 ha. It must be stressed that the majority of the needed connectivity roads falls in the local roads network, which belongs to the state, municipal and/or Albanian Railways property.

Table 2.4 in Appendix 2.1.1 of this report shows the proposed service roads, their category, and length, as well as their starting and ending points (see ESIA report Appendices – separate document). While section 2.3.6 below shows the list of the service and connectivity roads for each Lot of the railway line.

Short assessment of the level crossings

The assessment of the level crossings was based on the following:

- Existing (and maintained) grade separate crossings and missing road links in the vicinity of the crossing;
- Existing grade separate crossings needing clearance and structural adequacy confirmation;
- Level crossings with primary roads and roads with heavy and slow traffic (especially in cases of adjacent intersection that could block the traffic);
- Crossings in the areas of the proposed railway stations;
- Authorised level crossings of other than primary roads;
- Other –not authorised- used level crossings and the fact that it is technically difficult in signaling and generally economically unsustainable to maintain many crossings that are closer to each-other than required by the Project's standards;
- The existing level crossings (both authorised and unauthorised) coupled with the expected increase in train operating speed;
- Taking into account the possibility to avoid the presence of a high number of level crossings close to each-others through opening new service roads, upgrading the existing roads, or linking the existing local roads;
- Consideration of land use, urban plans, stakeholders' concerns, etc.

The followed strategy regarding the level crossings was:

- Wherever the terrain allowed it, replace the level crossings by underpasses, in order to ensure:
    - Better safety for the local communities and cars;
    - The required trains' design speed and shortening of the travel-time
- Avoid the presence of successive level crossings close to each other in order to ensure the required design speed and travel-time. This objective is reached using the service and connectivity roads.
- All the settlements located on both sides of the railway line must have access to a level crossing.

- Across the agricultural areas, the farmers must have access to their land through a level crossing where the farmhouses and the agricultural lands are located on the opposite sides of the railway line.
- The level crossings must be easily accessible and ensure the safety of all users, including the disabled persons, old persons, children, etc.

In total, the Consultant identified 148 level crossings from Vore to Hani i Hotit. They all serve for both cars and pedestrians. According to the Albanian Railways, 57 of them are authorized, while 91 are unauthorized.

It should be underlined that almost all the unauthorized level crossings are informally opened and used by a single building or house, only (see figure below). The informal crossings are the result of a long period of lack of territory control because of the geopolitical situation in Albania and abroad.

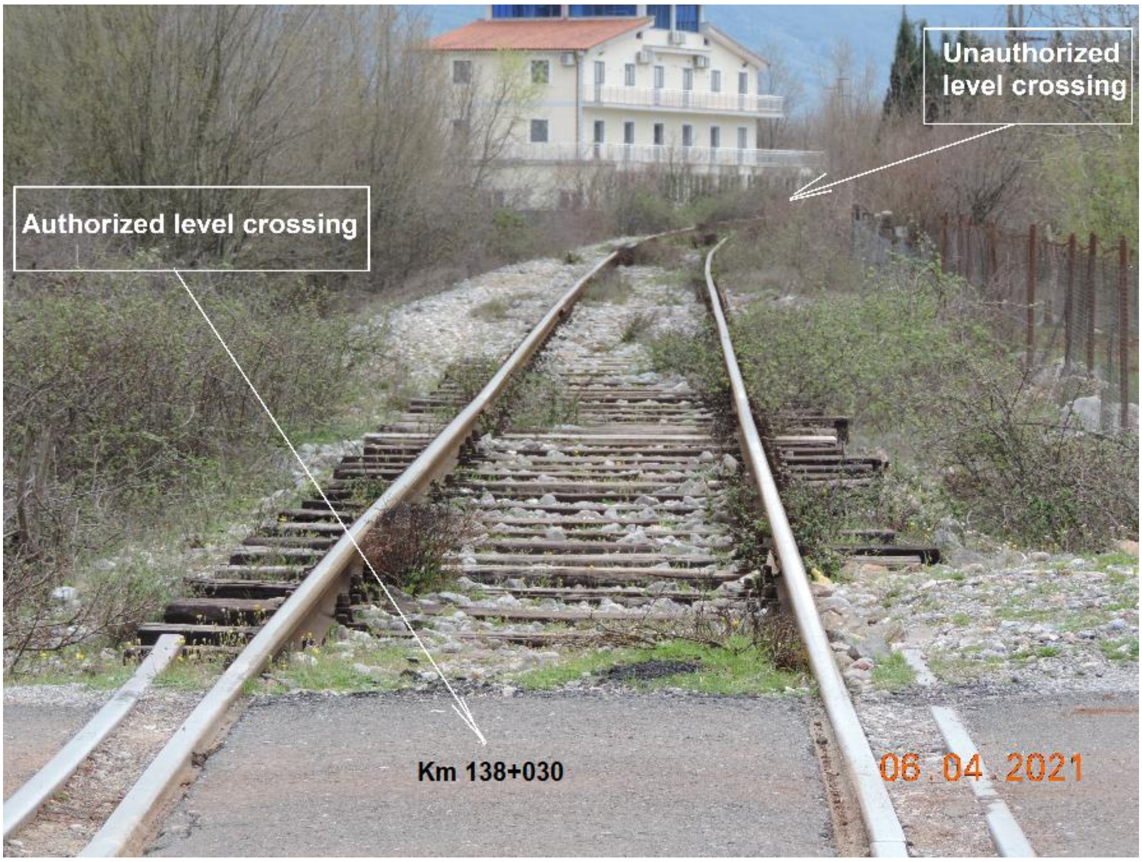


Figure 2-5_Unathorized LC serving only for one building, which is located 270m from an authorized LC

The authorized level crossings are somehow controlled with barriers, which are not interlocked but operate manually. The unauthorized level crossings are uncontrolled. They have been developed by locals along the line for their daily needs.

The unauthorized crossings present a permanent risk to the safety of trains, passengers, cars, goods, pedestrians and livestock. Section 5.2.17 of this report outlines the recent statistics on level crossings' accidents at country level.

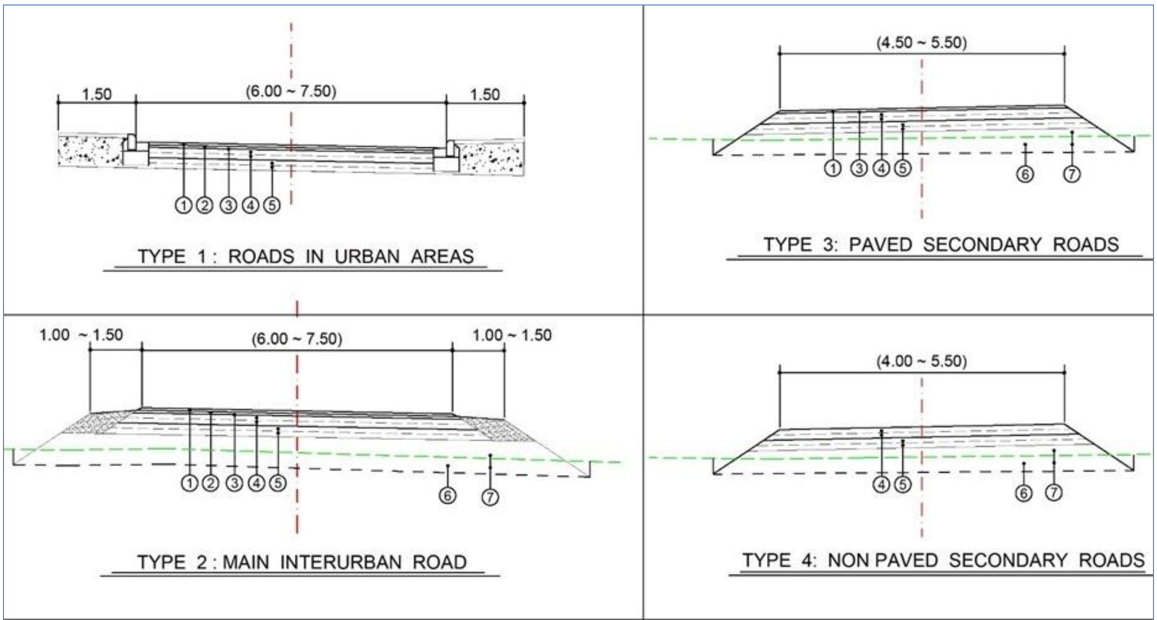
Three of the 57 existing authorized level crossings will be closed, while 54 will remain authorized and therefore will be upgraded according to the required standards. The three existing authorized level crossings that will be closed are located less than one kilometre close to other ones. Their closure is imposed because of the need to ensure the required trains' speed and travel-time. However, their closure is discussed with the Albanian Railways and the crossed municipalities. Thus, the total number of level crossings taken into consideration by the Project's design will be 54.

Table 2.1 in Appendix 2.1.1 of this report shows the proposed list of the level crossings and the category of the crossed roads (see ESIA report Appendices – separate document). Whereas in the section 2.3.6 below are listed the designed level crossing for each Lot of the railway line.

2.3.5.1. Service roads typical cross-section

The typical cross-sections for the new service roads, as well as for the existing ones that will be improved, are as follows:

- Type 1: width 6.00 to 7.50 m in urban areas with lateral sidewalks of 1.50 m width;
- Type 2: main roads of width 6.00 to 7.50 m for interurban traffic;
- Type 3: paved secondary roads of width 4.50 to 5.50 m; and
- Type 4: non-paved secondary roads of width 4.00 to 5.50 m.



1. Asphalt wearing course
2. Asphalt base course
3. Bituminous priming or acidic bitumen emulsion
4. Base 10 cm in two layers
5. Subbase 10 cm in two layers
6. Topsoil excavation
7. Embakment

Figure 2-6_Typical cross-sections of service road categories

2.3.5.2. Level crossings design and functioning

In total, 54 level crossings are designed from Vore to Hani i Hotit. They will all be secured. Details on the design and functioning of the level crossings are provided in the Detailed Design of the Project. The location of the designed level crossings is based on the existing authorized ones, on the local roads network, the existing settlements and the needs of the local communities, as well as on the required standards on the trains' speed and level crossings.

Two types of level crossings are designed:

- Level crossings within the limits of a station.

- Level crossings on the open line.

According to the Signalling report, the following can be said with regard to the functioning of the designed level crossings:

- The station level crossings will be interfaced with the signalling system of the nearest station while the ones on the open line will act as independent systems;
- All level crossings will be equipped with all the necessary warning signals, such as road signals, railway signals, half-barriers, sound (bell) warning, and repetitive road and railway signals;
- The status of the station level crossings and the critical alarms will be transmitted through an optic fibre (FO) to the nearest station and the Central Control Room (CCR) at Vore.
- Level Crossing Control Panels (LC Boxes) will be installed at the station master room to allow manual interventions by authorized personnel at the station level crossings while trains are for the stations level crossings.
- The status of the open line LCs and the critical alarms will be transmitted through an optic fibre only to the Central Control Room at Vore.
- As underlined in the Signalling report (see technical part of the Project's design), the signalling safety-related requirements in the level crossings will strictly fulfil the European standardization.

Figure below shows the components of a typical secured level crossing in open line.

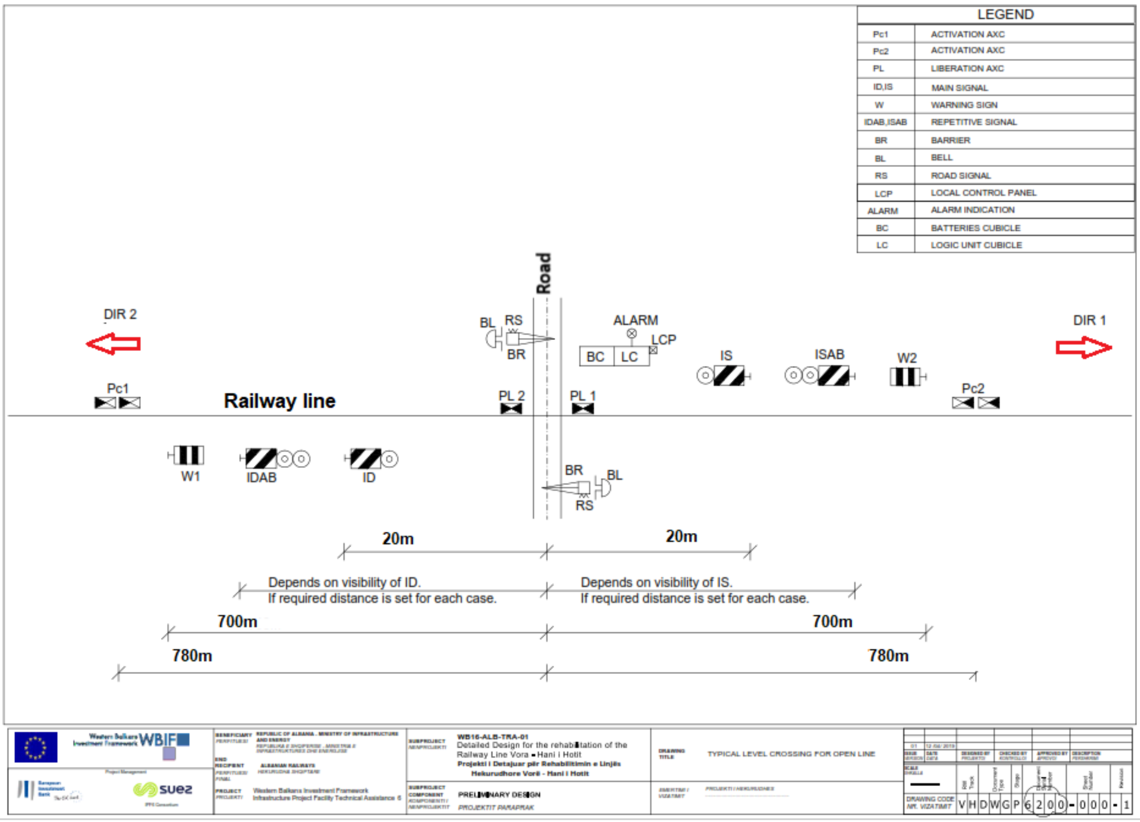


Figure 2-7_Components of a typical secured level crossing in open line

Legend

LEGEND	
Pc1	ACTIVATION AXC
Pc2	ACTIVATION AXC
PL	LIBERATION AXC
ID,IS	MAIN SIGNAL
W	WARNING SIGN
IDAB,ISAB	REPETITIVE SIGNAL
BR	BARRIER
BL	BELL
RS	ROAD SIGNAL
LCP	LOCAL CONTROL PANEL
ALARM	ALARM INDICATION
BC	BATTERIES CUBICLE
LC	LOGIC UNIT CUBICLE

A secured level crossing is protected by road traffic light signals and lifting barriers on each side of the railway19. An audible warning to pedestrians is also provided. The barriers are normally kept in the raised position, and when lowered, extend across the whole width of the carriageway on each approach. The crossing normally operates automatically. The closure sequence is initiated by approaching trains. Confirmation that the crossing is clear, and that railway signals may be cleared for the passage of trains, is provided automatically following a thorough scan for any significant obstruction, by obstacle detection equipment.

At each level crossing, a telephone for emergency public use should be provided. The installed equipment should enable the crossing to operate manually, too. Manual operation may be necessary when a persistent obstruction is detected, when obstacle detection equipment is not in use, and for periodic monitoring of crossing usage and suitability.

All the level crossings will be fenced. All the designed crossings are 5.5 to 7.0 m wide, with sidewalks 1.00 to 1.25 m wide on both sides of the crossed road.

The “strail” (the word strail comes from “the street meets the rail”) technique will be used for paving the space between the rails and on both sides of them, as shown in the figure below. The pavement must have a colour different to that of the crossed road. At the level crossing, the road shoulders will be paved in “strail” and transformed in sidewalks.

19 https://www.orr.gov.uk/sites/default/files/om/level_crossings_guidance.pdf

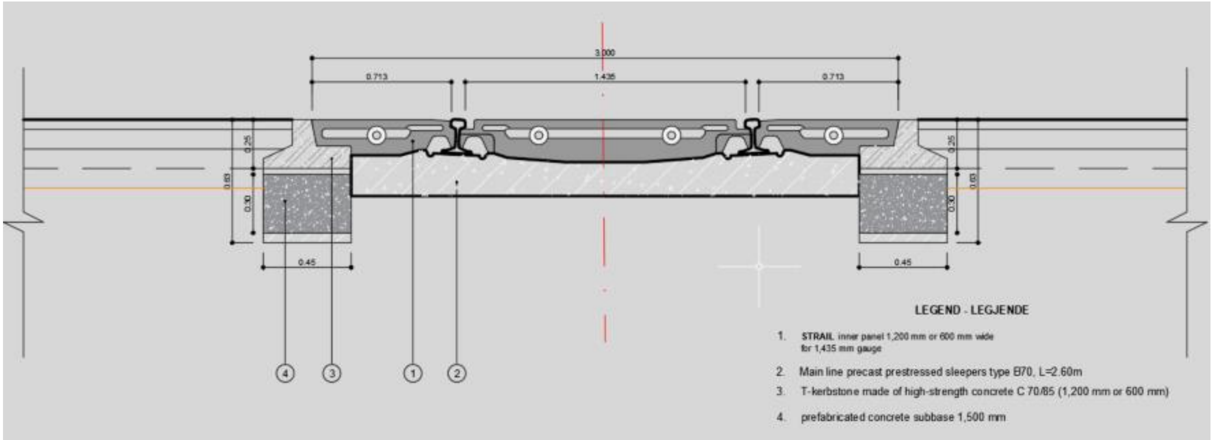


Figure 2-8_Cross section of a typical level crossing for Vore-Hani Hotit railway line

Figure below shows an example of the “strail” technique for paving a level crossing.

Figure 2-9_Example of “strail” paving at a level crossing20

Whereas the figure below shows a simplified version of the functioning of a secured level crossing.

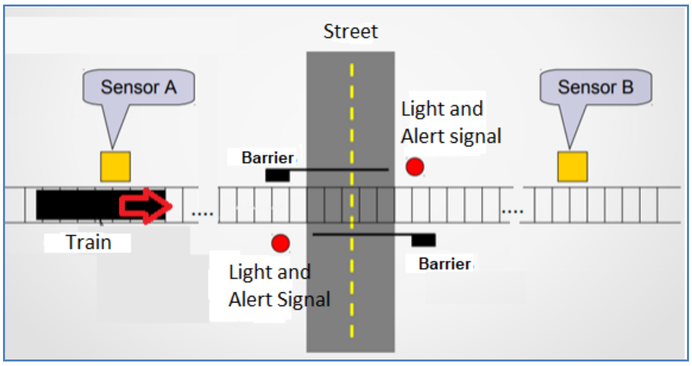


Figure 2-10_Simplified mechanism of a typical secured level crossing

When the train passes near sensor A, the light and the audible alert will be triggered slowly after some seconds. After the train passing through sensor B, the light and the audible signal are deactivated and the barrier open slowly.

The combining of the light and audible warning, as well as the colour of the “strail” increase the possibility the drivers and pedestrians to be aware of the risks of the railway crossing. The

20 https://www.strail.de/level-crossing-systems/?lang=en

paving in "strail" facilitate the passage of cars, motorcycles and bicycles. It facilitate also the passage of the vulnerable pedestrians, including old persons, children, disabled persons in chariots, etc. That is particularly important when the railway line runs across any settlements, where it is necessary the level crossing to be frequently used by children going to school, old persons going to health care facilities, etc.

2.3.6. Outline of the main planned interventions

The whole length of the railway line has been split into four sections, as follows:

Table 2-3_Sections of the whole railway line

No	Section	Length (km)	Start (km)	End (km)
1	Vorë - Gjorm	27.80	20+620	48+420
2	Gjorm - Lezhe	20.36	48+420	68+780
3	Lezhe – Shkoder	35.56	68+780	104+340
4	Shkoder – Hani Hotit	35.74	104+340	140+080

The following sections clarify in more detail the existing situation and the planned interventions for each of the above-mentioned railway line sections.

Section 1 (Vore – Gjorm): Km 20+620 to Km 48+420

The alignment options and design concept are described hereinafter.

Railway line horizontal alignment

The existing railway line horizontal alignment will be improved to allow the required design speed. The horizontal curve improvements and the required design speed are shown in the table below.

Table 2-4_ Horizontal alignment improvements from Vorë to Mamurras

No.	From km	To km	Length (m)	Existing Curve Radius (m)	Proposed Curve Radius (m)	Corresponding min. Design Speed (km/h)
1	22+915	23+600	685	300 300	850 600	120

The proposed railway alignment improvement requires the construction of three retaining walls for the protection of the existing installations and houses. This horizontal improvement also allows for the secured level crossing at km 23+408 that connects the northern area of the rehabilitated railway to the SH52 road to Budull, Fushë-Kruje, and Tirana International Airport Saint Teresa.

Figure 2-11_ Area of horizontal improvement from km 22+915 to km 23+600

The railway alignment crosses the Adriatic – Ionian highway at km 40+343, which is runs in this section, with a grade-separated crossing (road E-752 overpass).

The improvement of the horizontal alignment was consulted with the local communities of ***Vore Municipality*** (Sharke and Fushe Preze areas), ***Kruje Municipality*** (Budull, Bubq, Gramez and Thumane areas) and ***Kurbin Municipality*** (Mamurras and Gjorm). Details on these consultations are provided in the SEP and the SEP's appendices (Minutes of Meetings).

The main concern of the locals on the design of the horizontal improvement was focused on the land expropriation issues and the type of the protection walls that is designed in the hilly foot within the Sharke and Fushe Preze Villages (Vore Municipality).

The Consultant responded that the expropriation issues will fulfil the EBRD standards, according to which the free market prices will be applied. The technical team clarified that retaining walls are already designed in the railway sections at the hilly foot of Vore, where the horizontal alignment will be improved to increase the curve radius in order the trains to reach the 100-120 km/h speed.

Railway line vertical alignment

The proposed vertical alignment follows, in general, the existing railway alignment and improves the existing conditions, as confirmed through the ground elevation measurements.

In the area of Ishmi Bridge (B01), the railway vertical alignment will be raised roughly 0.60m to improve the flooding protection and allow for adequate freeboard to the new bridge that will replace the existing one at the crossing of the Gjola River. The Ishmi Bridge, which has inadequate foundations, has been heavily damaged by the earthquake of November 16.2029, and therefore will be replaced by a new one.

From km 41+053 (minor bridge Br12 and secured Level crossing) to km 42+023 (existing culvert) the vertical alignment will be raised to enhance the flooding protection. Droja Bridge (L=66m), will be replaced with a new one for structural adequacy reasons. The rise of the vertical profile is up to 1.85m compared to the existing elevations, before the Droja Bridge and about 1.10m in the bridge vicinity. This raising provides the required freeboard to the new Droja Bridge.

Besides, a longitudinal profile correction of the existing vertical alignment at Mamurras station is necessary, from km. 43+667 of the secured level crossing up to 44+400 with a maximum elevation difference of about 0.85 m at km. 43+973.

The culverts will be replaced with new ones due to settlement problems, the concrete condition, and the difficulty and inefficiency of the required rather small widening to accommodate the extra width of the rehabilitated railway line width.

The improvement of the vertical alignment was consulted also with the local communities of ***Kruje Municipality*** (Bubq and Thumane areas), because the agricultural land on the right of the railway line at km 32 to km 35 is temporarily inundated during heavy rainfalls period. Details on these consultations are provided in the SEP and the SEP's appendices (Minutes of Meetings). The head of Gramez Village (Kruje Municipality) raised the inundation of the agricultural land. In particular, the temporary inundations affect the agricultural land of Merqine and Gramez Villages.

In few words, the Consultant clarified that the design has increased from 0.0 to 80.0 cm the vertical alignment from roughly km 30 to km 40. Besides, the design has taken into consideration the elevation of the Ishmi and Droja Bridges, in order to increase their water flow conveyance capacity.

The increase of the conveyance capacity of the bridges, the improvement of the drainage channels on both sides of the railway line and the increase of the diameter size of the culverts will avoid the agricultural land inundation. In case of heavy and of long duration rainfalls, this inundation could be only temporary (during the rainy storm).

Furthermore, the Consultant explained that the designed increase of the diameter size of the new culverts aims to appropriately maintain these culverts against sedimentation and to allow to the local farmers to easily circulate on both sides of the railway line.

Stations

According to the results of the functional design of the project proposed stations and to the Master plan, which is currently under elaboration, the characteristics of the stations included in this section are shown in the table below.

Table 2-5_ Stations and their proposed characteristics

No	Station Name	Characteristics
1	Budull	The station has been moved approximately 160m to the south, after km 28+488, so that the existing level crossing (that is to be secured) is functional (out of the station railings); The station is proposed with one passenger track of 450m and one cargo track of 700m useful length. A new parking area and a new platform with dimensions 150x4m, partially covered, are proposed; The industrial railway branch to Fushë-Kruje starts after the Budull station.
2	Ishmi	This station will be relocated approximately 250m to the north to leave the existing road level crossing (that is to be secured) out of the station railings; The station will have one passenger track 480m and the buffer track. The station will be fenced with a provision to include one additional cargo track in the future. A new parking area and new platform 150x4m, partially covered,

No	Station Name	Characteristics
		and new station building are proposed.
3	Mamurras	This station will be relocated approximately 60m to the north to leave free the existing road level crossing at km 43+667 (that is to be secured) out of the station railings; The Station will have one passenger track 480m and a buffer track. A new parking area and new platform 150x4m, partially covered, and a new station building are proposed. The station will be fenced with a provision to include one additional cargo track in the future.
4	Gjorm	Gjorm is a freight station with three cargo tracks of 750m useful length and a dedicated platform of 100x4m for the cargo operators. The station fencing will provide for three additional cargo tracks in the future.

The proposed railway alignment and the proposed local road arrangement are compatible with the stations Master Plans.

Figure below shows the general layout and the 3-D view of Ishmi station. All the buildings of the small railway stations (one-floor buildings of Budull, Ishmi, Gjorm, Baqel and Koplik stations) are similar.

Figure 2-12_General layout and 3-D view of Ishmi station

All the railway stations that have difference in the elevation between the platform and the parking areas are designed with ramps and / or elevators for disabled persons. Besides, there are designed dedicated parking area for this category of persons.

Inside all these four station buildings there are designed dedicated spaces and other facilities for this category of persons and the women with little children. As all the railway stations from Vore to Gjorm have no differences in elevation, it was not necessary to design ramps disabled persons. All the building of these stations are of one floor.

Road crossings and local roads network

The project has made the best use of all the grade-separated existing crossings and identified the preferred solution for the restoration of network connectivity for each area that is being separated by the rehabilitated railway line (that is to be fenced). These areas are as follows:

- Vorë - Budull (Km 20+200 ~ Km 28+500);
- Budull - Ishmi Bridge B01 (Km 28+500 to Km 35+100);
- Ishmi Bridge B01 - Thumanë Bridge (Km 35+100 to Km 38+350);
- Thumanë Bridge - Drojë Bridge (Km 38+300 ~ Km 41+800);
- Drojë Bridge B02 (Km 41+800 to Km 44+800);
- Bridge Br15 - Gjorm Station (Km 44+800 to Km 48+000);

From the above list, it results that there are four bridges within this section of the railway line. Bridges will be demolished and new ones will be built in the same location.

In total 14 level crossings are proposed for the railway line section Vorë-Gjorm. Table 2.1 in Appendix 2.1.1 of this report shows the proposed level crossings and the category of the crossed roads (see Appendices – separate document).

The Consultant has proposed 42 local service roads and connectivity for this railway line section. Table 2.2 in Appendix 2.1.1 of this report shows the proposed service roads, their category and length, as well as their starting and ending points (see Appendices – separate document). All the proposed service roads are of type 2 (non-paved), excepting the road from km 20+778 to km 22+247, which will be paved. All the roads and their shoulders are 4.0 and 0.75m wide, respectively.

The railway line will cross the Ionian-Adriatic highway, close to the Gjola River Bridge, at km40+343, at the existing overpass with the national road E-762. While the Ionian-Adriatic pipeline will be crossed approximately at the km 38+800.

The proposed overpass at km 20+771 allows for a grade separated crossing not only for the two adjacent railway lines (i.e. the Railway Line Durrës – Tirana – Airport and the Vorë- Hani Hotit) but also the important road branch (Rruga Hekurudha) that serves the traffic to the station.

All the authorized and non-authorized existing level crossings were assessed during the - preparation of the Functional Design and Preliminary Design stages. During the ESIA scoping and the Preliminary design stages the seven affected municipalities, including the Vore, Kruje and Kurbin ones (where the section Vore-Gjorm is included), were consulted more than twice (please see the ESIA Scoping report and the Stakeholders Engagement Plan) also on the service and connectivity roads and the level crossings. Besides, these issues were also discussed with the local communities (see SEP, SEP Appendices and MoMs on the ESIA report public disclosure). Their concerns have been taken into consideration whenever the required standards of the new railway are not affected. E.g., Kruje Municipality required to take into account a level crossing at the crossing of the road to the seaside of Patok, where numerous recreational facilities exits.

The standards to fulfil the necessity and safety of the vulnerable persons include:

- The level crossings were designed to fulfil all the requirements for persons with disabilities, elderly, children, etc.;
- The level crossings were designed to fulfil the EU norms and Standards, including the new System of Signalling and Telecommunications;
- Automatic Barriers and Signalling System will be functional to all the Level Crossings along the Railway Line;
- In all the stations will be installed facilities for persons with disabilities;
- The increase of the vertical alignment from approximately km 30 to km 40 as a result of the need to increase the Ishmi and Droja Bridges' conveyance (to avoid the inundation) and the rehabilitation of the culverts has permitted the Consultant to increase the

diameter size of the culverts across the agricultural land. Consequently, these culverts will serve also as additional agriculture underpasses to facilitate the circulation of the farmers on both sides of the railway line.

- During public consultations at ***Vore Municipality,*** the main raised concerns were about the safety at the level crossings, especially the one of Fushe Preze (km 23+408), the underpass at km 22+240, and the expropriation of the land for service and connectivity roads. The Fushe Preze level crossing constitute a permanent risk for the locals, especially for children, who must traverse the railway line to go to school.
- Details on these consultations are provided in the SEP and the SEP's appendices (Minutes of Meetings).

Figure 2-13_Level crossing at Fushe Preze (km 23+408)

The road underpass at km 22+240 is the sole link of Marqinet and Sharke Villages with the national road. The high of the underpass is limited and therefore no high trucks can reach both these villages.

Figure 2-14_ Underpass at km 22+240

The Consultant clarified that all the existing authorized level crossings will be maintained and secured. Besides, the signalling system will avoid any accident at the level crossings. The Consultant clarified also that although the improvement of the road underpass at km 22+240 is an Albanian Road Authority task, the Project's design has planned this underpass to be demolished and rebuilt. The new underpass will have a bigger high of the light space under the railway. Therefore, the situation will be improved compared to the current situation.

During public consultations at ***Kruje Municipality*** (Bubq and Thumane administrative units), the main raised concerns were about the safety at the level crossings, the expropriation of the land for service and connectivity roads and the connection to a group of houses located near Budull station, on the right of the railway line to the nearest level crossing. The Consultant clarified that an existing road on the right of Budull station will be upgraded. This road is connected to the level crossing in the northern part of Budull station.

Another concern was about a group of houses located near the railway line on the left of Budull station. The houses exist before the construction of the railway line Vore-Lac. The owner of this house asked whether the fencing of the railway line would block his house. The Consultant explained that the design has planned the connection of the house of this person to the closest level crossing through e service road. No house will be blocked. In the case any house is located close to the railway line a wall has been designed to protect both the house and the railway line. In any case, no service road will be located between the designed fencing and the railway line.

During public consultations at ***Kurbin Municipality*** (Lac town), the main raised concerns were about the expropriation of the land for service and connectivity roads and the connection to a group of houses located near Mamurras station. Another inhabitant asked whether one of his land parcels cultivated with vineyard and located close to the level crossing at km 43+550 would be affected from the service roads. In general, all the landowners were interested on the land price in case of any eventual expropriation.

The Consultant clarified that no house or other type of building will be demolished neither within the territory of Kurbin Municipality, nor in the territory of the other crossed municipalities.

As per the land surface that may be required for the opening of any new service road, the Consultant explained that the design has taken into consideration firstly the use as much as practical of the existing local roads network and secondly locating the service roads within municipal and Albanian railways properties. The vineyard located on the left of the railway line close to km 43+500 will not be affected from the opening of any new service road. The Consultant addressed the question of another inhabitant who wanted to know whether his house located roughly 25m from the railway line would be affected.

The consultant clarified that in case of any potential land expropriation, the price of the land will be that of the free market, as provided in the EBRD standards. IFIs, including EBRD do not finance any project before a fair expropriation. Details on these consultations are provided in the SEP and the SEP's appendices (Minutes of Meetings).

Section 2 (Gjorm - Lezhe): Km 48+420 to Km 68+780

This railway line section traverses the territories of Kurbin and Lezhe municipalities.

Railway line horizontal alignment

The existing railway line horizontal alignment is improved to allow for the increased design speed, as shown in the table below.

Table 2-6 Horizontal alignment improvements for this section

No	Section (from km to km)		Length (m)	Existing Curve Radius (m)	Proposed Curve Radius (m)	Corresponding min. Design Speed (km/h)
1	54+400	55+700	1300	480 300	600 300	100
2	66+800	67+300	500	480	500	105
3	69+200	69+500	300	550	750	120

The existing alignment between Milot station and the Mati river bridge has a horizontal curve of 300 m, corresponding to a design speed of 80km/h. This does not conflict with the operational requirements, as it is close to Milot station. It is also consistent with the rehabilitation of the station's existing buildings, that otherwise would be demolished.

Figure 2-15_Milot station area and horizontal improvement

The existing alignment on both sides of the Lezhë tunnel has a horizontal curve of R=350m, which corresponds to a minimum design speed of 80km/h. The proposed alignment respects the existing horizontal curve due to the vicinity of the station. Moreover, after Lezhë 1 station the existing tunnel, constructed about 1985 with a length of 199 m, has also a horizontal curve of a radius of 340m.

The improvement of the horizontal alignment was consulted with the local communities, which main concern was the land expropriation. Details on these consultations are provided in the SEP and the SEP's appendices (Minutes of Meetings).

The Consultant clarified that this improvement does not affect any private property. The main improvement will occur within the Mati Riverbed, which is a state property. Therefore, no private land will be affected by this improvement.

Railway line vertical alignment

As the railway corridor follows, in general, a flat terrain, the existing rail line presents appropriate longitudinal gradients and characteristics for the design speed of 120 km/h.

In the area of the stations, the longitudinal gradient is kept in all cases well less than 0.25%.

The Service Roads from km 70 to km 80 have been designed in accordance with the National Standard for road of category C2. This standard allows the temporary inundation in case of heavy rainfalls.

The improvement of the vertical alignment was consulted with the local communities of Kurbin and Lezhe Municipalities. The Consultant clarified that no change in vertical alignment is designed from km 48+420 to Km 68+780, because the installation of culverts of minimum dimensions 2.0 x 2.0 m will provide enhanced flood protection and efficient drainage of the area. The culverts have been designed according to the results of hydraulic and hydrologic surveys implemented during the project and the the drainage system both sides of the railway line will be rehabilitated and improved.

Stations

The table below shows the characteristics of the stations included in this section.

Table 2-7_Stations and their proposed characteristics

Station No.	Station Name	Characteristics
4	Gjorm	Gjorm is a freight station with three cargo tracks of 750m useful length and a dedicated platform of 100x4m for the cargo operators. The station fencing will provide for three additional cargo tracks in the future.
5	Laç	This station is proposed at the existing location with one passenger track 400m. A new parking area and a new platform 150x4m partially covered are planned. The station fencing will provide space for one cargo track in the future
6	Milot	Milot main station is proposed at the existing location with one passenger track 650m., two cargo tracks of 750m useful length, and a buffer track (future connection to industrial area). The station fencing will provide space for additional cargo tracks and development in the future. A new parking area and new platform 150x4m partially covered are proposed.
7	Lezhë 1	This station will stay at the existing location with one passenger track of 650m and one cargo track 750m useful length. A new parking area and new platform 170x4m partially covered and the existing building will be reconstructed.

Figures below show the general layout and the 3-D view of the above stations.

Figure 2-16_ Lac station

Figure 2-17_Milot station

Figure 2-18_Lezhe 1 station

The existing Milot and Lezhe 1 stations buildings will not be demolished, but only reconstracted.

Lac station do not have difference in the elevation between the platform and the parking area and therefore no ramp for disabled persons has been designed. While in Milot and Lezhe, such ramps are designed.

Milot and Lezhe 1 railway stations have difference in the elevation between the platform and the parking area. An elevator is designed for Milot station, while in Lezhe 1 ramps are designed with for disabled persons. Besides, there are designed dedicated parking area for this category of persons in the three above stations.

Inside all the station buildings, there are designed dedicated spaces and other facilities for this category of persons and the women with little children.

Road crossings and local roads network

The project has made the best use of all the grade-separated existing crossings and for the restoration of transport network connectivity for each area that is being separated by the rehabilitated railway line (that is to be fenced). These areas are as follows:

- Gjorm Station - Mati - Miloti Bridge (km 48+400 to km 55+700),
- Mati - Miloti Bridge - Bridge after Lezhë Tunnel (km 55+700 to km 69+700),

In total nine level crossings are proposed for the railway line section Gjorm – Lezhe. Table 2.3 in Appendix 2.1.2 of this report shows the proposed level crossings and the category of the crossed roads (see Appendices – separate document).

The Consultant has proposed 11 local service roads for this railway line section. Table 2.4 in Appendix 2.1.1 of this report shows the proposed service roads, their category, and length, as well as their starting and ending points (see Appendices – separate document). All the proposed service roads are of type 2 (non-paved). The roads and their shoulders are 4.0 and 0.75m wide, respectively.

All the authorized and non-authorized existing level crossings were assessed during the - preparation of the Functional Design and Preliminary Design stages. During the ESIA scoping and the Preliminary design stages the seven affected municipalities, including the Kurbin and Lezhe ones (where the section Gjorm - Lezhe is included), were consulted more than twice (please see the ESIA Scoping report and the Stakeholders Engagement Plan) also on the service and connectivity roads and the level crossings. Their concerns have been taken into consideration whenever the required standards of the new railway are not affected. Spatial attention has been paid to the crossing of Lezhe town and to the crossing of the roads connecting the area of Lac to the seaside area of Patok, where numerous tourist facilities exists.

The standards to fulfil the interest of the local communities and the necessity and safety of the vulnerable persons include:

- The level crossings were designed to fulfil all the requirements for persons with disabilities, elderly, children, etc.;
- The level crossings were designed to fulfil the EU norms and Standards, including the new System of Signalling and Telecommunications;
- Automatic Barriers and Signalling System will be functional to all the Level Crossings along the Railway Line;
- In all the stations will be installed facilities for persons with disabilities;
- Wherever necessary pedestrian underpasses are designed in the train stations (e.g. Shkoder station);
- Wherever the vertical alignment is sufficient, the design has increased the diameter size of the culverts across the agricultural land. Consequently, these culverts will serve also as additional agriculture underpasses to facilitate the circulation of the farmers on both sides of the railway line.

During public consultations at ***Kurbin and Lezhe Municipalities,*** the main raised concerns were about the service roads, the geographical location of the level crossings and the land price in case of any eventual expropriation.

The Consultant clarified that the expropriation will be based on the free market price. The construction cannot start before a full and fair expropriation process fulfilling the EBRD standards.

During the consultation at Kurbin Municipality, the local inhabitant asked about the Shullaz and Patok level crossings. The Consultant answered that both these level crossings will be maintained and secured. All the exiting authorized level crossings within the territory of Kurbin Municipality will be maintained and secured.

In Lezhe municipality, the discussion on the level crossings was focussed in the railway line section crossing the territories of Pllane, Zejmen, Spiten and Manati Villages territories (Lezhe Municipality). An inhabitant of Tresh Village asked whether it is possible to add an additional level crossing at km 64+080. The Consultant answered that there is already designed a secured level crossing at km 63+100 and another at km 65+070. Therefore, it is not possible the level crossings to be so dense. Otherwise the speed standards of the rehabilitated railway line will not be reached.

Section 3 (Lezhe - Shkoder): Km 68+780 to Km 104+340

This railway line section runs across the territories of Lezhe, Vau Dejes and Shkoder Municipalities territories.

Railway line horizontal alignment

Currently the foundations of the existing Drini and Kiri Rivers Bridges serve for both the rail and road transport. Therefore, both these existing bridges will not be demolished. New bridges will be constructed downstream, parallel and close (less than 10m) to the existing ones. The construction of the new bridges requires a slight change in the horizontal alignment.

The improvement of the horizontal alignment was consulted with the local communities of Lezhe, Vau Dejes and Shkoder Municipalities (public consultations in Lezhe, Vau Dejes and Shkoder). Details on these consultations are provided in the SEP and the SEP's appendices (Minutes of Meetings).

The main concern of the locals on the design of the horizontal improvement was focused on the land expropriation issues resulting from the construction of the new bridges at the Drini and Kiri Rivers crossings. The Consultant clarified that the construction of the new bridges requires a slight change in the horizontal alignment. However, this change do not affect any private property, because it falls in the riverbed that is state-owned property.

Railway line vertical alignment

The proposed railway line has been locally corrected, without impact on the level crossings and existing overpasses, to accomplish the efficient drainage of the area and correct settlements.

The vertical alignment is raised from km 72 to km 84 to avoid the railway line inundation in case of heavy rainfalls. This improvement has no impact on the level crossings and existing overpasses, because of the following:

- installation of culverts of minimum dimensions 2.00 x 2.00 m that will provide enhanced flood protection and efficient drainage of the area; and

- correction of the ground settlements of the existing line

The improvement of the vertical alignment was consulted with the local communities of Lezhe and Vau Dejes Municipalities. No vertical improvement of the railway line is designed within the territory of Shkoder municipality.

The main concern of the locals during the consultations in Lezhe and Vau Dejes Municipalities was the inundation of the agricultural land during heavy rainfalls periods when Fangu drainage channel overflow. Details on these consultations are provided in the SEP and the SEP's appendices (Minutes of Meetings).

In the consultations with the locals in Lezhe and Vau Dejes, the Consultant mentioned the inundation of December 2002, when the railway body was damaged by the Fangu channel overflow. At this time, the weir of Torovica was not yet rehabilitated, and none of the three pumping stations of the area was in function because of a blackout. The Consultant clarified that the raise of the vertical alignment will be from 0.0 to 80.0cm in the railway section from km 70 to km 80 has been designed to avoid the railway line to be damaged from the overflow of the Fangu channel during heavy rainfalls like that of the winter 2002. In addition, the improvement of the drainage channels on both sides of the railway line and the increase of the diameter size of the culverts will avoid the agricultural land inundation. In case of heavy and of long duration rainfalls, this inundation could be only temporary (during the rainy storm).

To add the benefits of this vertical railway line improvement, the new culverts will be over dimensioned. They have been designed with a big diameter size (2x2 or 2x3m) in order to protect them from sedimentation, because a big size diameter culvert is easily cleaned. Besides, the big size diameter culverts serve also for the circulation of the farmers and livestock on both sides of the railway line. To increase this positive effect, two additional box culverts are designed at km 73+658 and km 74+076. In total, nine-box culverts are designed from km 73+ 460 to km 78+616. In parallel with the railway line elevation and the increase of the number and size of the box culverts, the design has considered the improvement of the drainage channels at both sides of the railway line to reduce the extent and duration of the inundation of the agricultural lands in case of any flash floods.

Stations

The characteristics of the stations included in this section are as follows:

Table 2-8_Stations and their proposed characteristics

Station No.	Station Name	Characteristics
8	Lezhë 2	This will be a new station, located in the future Lezhë Industrial Area. It will be with one passenger/cargo track 450-800m for locals and cargo operators, one cargo track 950m useful length and the future connection to Shëngjin Port. The station will be fenced to include one additional cargo track in the future, to protect the required HSH land property. New parking area, new platform 150x4m partially covered and new building. The existing road crossing will be used (option to change in the future this road crossing to an overpass at the same location is feasible).

Station No.	Station Name	Characteristics
9	Baqel	A new station will be built at the existing location with one passenger track 460m useful length and the buffer track. The station will be fenced to include one additional cargo track in the future, to protect the current HSH land property. A new parking area and new platform 150x4m partially covered are planned. The existing road crossing will be used (option to change in the future this road crossing to an overpass at the same location is feasible).
10	Mjedë	This station will stay at the existing location with one passenger track 570m, three cargo tracks 900m useful length, the buffer track, and the future railway connection to Kosovo. The station will be fenced to include additional cargo tracks and objects in the future, to protect the actual HSH land property. A new parking area and new platform 200x4m partially covered and the existing building will be reconstructed.
11	Shkoder	This station is proposed at the existing location with two passenger tracks 500m, one cargo track 700m useful length, and the buffer track. New parking area, two new platforms 200x4m partially covered, with underpass connection, ramps for the disability services, and the existing building to be reconstructed with the option of various services administrated by the HSH. The station will be fenced to include additional objects in the future, to protect the actual HSH land property.

Figures below show the general layout and the 3-D view of Mjede and Shkoder stations.

Figure 2-19_Mjede station

Figure 2-20_Shkoder station

The existing Shkoder station building will not be demolished, but only reconstracted.

Lezhe 2 is designed as a freight station only.

Baqel and Shkoder railway station buildings with have both ramps and elevators. Mjede station will be without ramps and/or elevators because there is no fiffecrence in the elevation between th eparking area and the passengers' platform.

Besides, there are designed dedicated parking area for this category of persons in the four Baqel, Mjede and Shkoder stations, inside the buildings of which there are designed dedicated spaces and other facilities for disabled persons and women with little children.

Road crossings and local roads network

The Project foresees as follows:

- Three under bridge crossings will be turned onto underpasses to facilitate the traffic;
- A new underpass will be built at km 95+691;
- Two existing overpasses will not be affected by the Project; and
- The selected level crossing will be secured.

The above will enhance the railway and road traffic, as well as the safety of the cars and pedestrians, and therefore should be included in the category of positive effects of the Project. The planned new underpass (at km 95+691) should be taken into consideration in case of any eventual land acquisition issue.

In total 12 level crossings are proposed for the railway line section Lezhe - Shkoder. Table 2.5 in Appendix 2.1.2 of this report shows the proposed level crossings and the category of the crossed roads (see Appendices – separate document).

The Consultant has proposed 43 local service roads for this railway line section. Table 2.6 in Appendix 2.1.1 of this report shows the proposed service roads, their category, and length, as well as their starting and ending points (see Appendices – separate document). All the proposed service roads are of type 2 (non-paved). The roads and their shoulders are 4.0 and 0.75m wide, respectively. The permanent land acquisition for the project purposes is needed for the service roads is 4 ha, The other land surface needed for the service and connectivity roads falls in the existing municipal roads and in the railway belt, which is an Albanian Railways property. Around 112 km of non-paved service roads are needed for the project. The land surface needed for the service roads is mainly state and municipal land.

There is no need for permanent land acquisition across the shrubby and forested area of the Nature Managed Reserve of Shkoder Lake.

Please consult the table 6 14. Land use and the planned service and connectivity roads from km 113 to km 140 (page 367) and related text page 368

All the authorized and non-authorized existing level crossings were assessed during the - preparation of the Functional Design and Preliminary Design stages. During the ESIA scoping and the Preliminary design stages the seven affected municipalities, including the Lezhe, Vau Dejes and Shkoder ones (where the section Lezhe - Shkoder is included), were consulted more than twice (please see the ESIA Scoping report and the Stakeholders Engagement Plan) also on the service and connectivity roads and the level crossings. Their concerns have been taken into consideration whenever the required standards of the new railway are not affected. Special attention has been paid to the crossing of Lezhe town and to the crossing of the roads connecting the area of Lac with the seaside. The standards to fulfil the interest of the local communities and the necessity and safety of the vulnerable persons include:

- The level crossings were designed to fulfil all the requirements for persons with disabilities, elderly, children, etc.;
- The level crossings were designed to fulfil the EU norms and Standards, including the new System of Signalling and Telecommunications;
- Automatic Barriers and Signalling System will be functional to all the Level Crossings along the Railway Line;
- In all the stations will be installed facilities for persons with disabilities;
- Wherever necessary pedestrian underpasses are designed in the train stations (e.g. Shkoder station);
- The increase of the vertical alignment from approximately km 70 to km 80 because of the need to avoid the railway inundation and the rehabilitation of the culverts has permitted the Consultant to increase the diameter size of the culverts across the agricultural land. Consequently, these culverts will serve also as additional agriculture underpasses to facilitate the circulation of the farmers on both sides of the railway line. Besides, the Consultant has designed two additional culverts within this section that will serve also as agricultural underpasses;
- The Service Roads from km 70 to km 80 have been designed in accordance with the National Standard for road of category C2. This standard allows the temporary inundation in case of heavy rainfalls;
- A new underpass has been designed at km 95+400 following the suggestions of the Vau Dejes Municipality and the head of Spathari Village. This underpass will serve some new houses built on opposite side to this village. Therefore, the inhabitants of these new houses should cross the railway to reach the centre of the village.

During public consultations in ***Lezhe, Vau Dejes and Shkoder Municipalities*** the main raised concerns were about the location of the service roads, the geographical location of the level crossings, the land price in case of any eventual expropriation and the construction of any eventual new underpass whether the terrain allow it.

During the consultation at Lezhe Municipality, the local inhabitant asked about an existing metallic passenger bridge that is located almost joint and parallel to Lezhe 2 Bridge, which will be demolished and a new bridge will be built instead. The existing passenger bridge will be demolished together with the main bridge Lezhe 2. As this small bridge is important for the local community, the local wish it to be rehabilitated.

The Consultant answered that the design has already considered the construction of the new bridge for passengers in the same location, just after the construction of the new main bridge Lezhe2.

A group of inhabitants of Spathari Village in the Municipality of Vau Dejes were concerned about the way haw to reach the centre of the village, as well as the national road to Shkoder and Vau Dejes. This group of house is located on the left of the railway line. Until know they cross illegally the railway line. Their inhabitants required the construction of service roads to the next level crossing located at Ganjolle Village territory. Based on the topographic features of the area and the vertical alignment of the railway line, the Consultant designed and underpass at km 95+691. So, no need for foe any additional service and connectivity road for this group of houses. Furthermore, no need for any additional land expropriation.

During the consultations with locals in the municipality of Vau Dejes, an inhabitant of Nenshat Village asked about the crossing of the farmers, livestock and agricultural machinery on both sides of the railway line. His concern was because many farmers must cross the railway line to reach their land. Although from Raboshte Village to Narac Village (roughly form km 75 to km 90) the rural settlements are rare, the Consultant has designed new service roads on both sides of the railway line. These new designed roads will be connected to the designed secured level crossings in order the fencing of the railway to not be an obstacle for the circulation of the farmers and the agricultural machinery on both sides of the railway line. The Consultant has located these new service roads within the railway line belt and the exiting local network. So, the expropriation of private land for the service roads construction purposes has been avoided as much as practicable.

Locals raised the expropriation procedure and the price of the land during the consultations in the three municipalities. The Consultant clarified that the expropriation will be based on the free market price. The construction cannot start before a full and fair expropriation process fulfilling the EBRD standards.

Section 4 (Shkoder – Hani Hotit): Km 104+340 to Km 140+080

This railway line section runs through the territories of Shkoder and Malesia Madhe municipalities.

Railway line horizontal and vertical alignment

There is no planned any vertical alignment improvement within this section. The only small horizontal alignment is planned near the existing Kiri River Bridge.

In general, the existing rail line presents appropriate longitudinal gradients and characteristics for the design speed of 120 km/h. The maximum longitudinal gradient is 0.9%.

The proposed railway line has been locally corrected, without impact on the level crossings and existing overpasses, to accomplish the efficient drainage of the area and correct settlements.

The improvement of the horizontal alignment was consulted with the local communities, which main concern was the land expropriation. Details on these consultations are provided in the SEP and the SEP's appendices (Minutes of Meetings).

The Consultant clarified that this improvement do not affect any private property. The main improvement will occur within the Kiri Riverbed, which is a state property. Therefore, no private land will be affected by this improvement. The improvement will occur because a new bridge will be built close and parallel to the existing one, which serves for both the railway and the road. The exiting bridge will not be demolished.

During the public consultations in the Shkoder Municipality an inhabitant whose house is located at km 102+800, on the left on the railway line asked whether his house would be affected from the improvement of the horizontal alignment. The Consultant answered that the line diversion will be small because the new bridge will be built close to the existing one. Therefore, no private house or land will be affected. Besides, the railway line diversion will be located only within the Kiri Riverbed, which is a state property.

Details on these consultations are provided in the SEP and the SEP's appendices (Minutes of Meetings).

Table 2-9_Stations and their proposed characteristics

Station No.	Station Name	Characteristics
12	Koplik	This passenger station is proposed to be relocated approximately 400m to the north (to the direction of) Bajzë station to leave free the existing road level crossing that is to be secured The Station will have one passenger track of 450m one cargo track of 750 m. useful length and the buffer track, (connection with the existing railway quarry yard). A new parking area and new platform 150x4m partially covered and new station building.
13	Bajzë	This station is proposed at the existing location with one passenger track 550m, four cargo tracks 750m useful length, and the buffer track. The station will be fenced to include additional cargo tracks and objects in the future, to protect the actual HSH land property. A new parking area and new platform 200x4m partially covered and the existing building to be reconstructed. There will be the existing road crossing and it is the option to change in the future this existing road crossing in the road overpass at the same location. Customs presence is foreseen in this Station.
14	Hani Hotit	Hani Hotit station is not part of the Project

Figures below show the general layout and the 3-D view of Koplik and Bajze stations

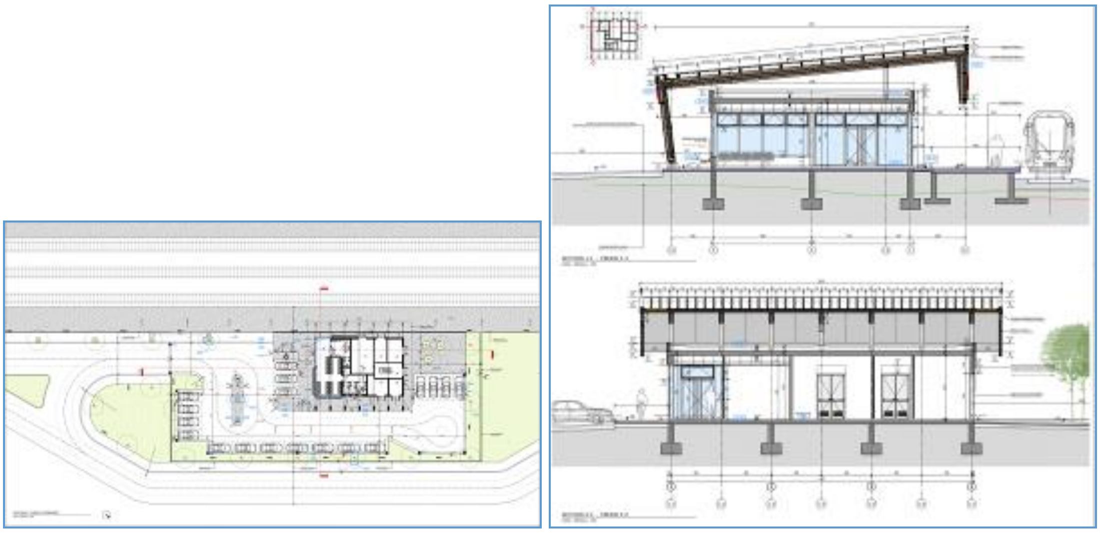


Figure 2-21_Koplik station

Figure 2-22_Bajze station

The existing Bajze station building will not be demolished, but only reconstracted, while at Koplik will be built a new station builiding. Koplik station will be without ramps and/or elevators because there is no fiffecrence in the elevation between the parking area and the passengers' platform, while Bajze station is designed with both ramps and elevators.

There are designed dedicated spaces and other facilities for disabled persons and women with little children. In addition, there are designed dedicated parking area for vulnerable people in both stations.

Road crossings and local roads network

In total 17 level crossings are proposed for the railway line section Shkoder - Hani Hotit. Table 2.7 in Appendix 2.1.2 of this report shows the proposed level crossings and the category of the crossed roads (see Appendices – separate document).

The Consultant has proposed 41 local service roads for this railway line section. Table 2.8 in Appendix 2.1.1 of this report shows the proposed service roads, their category and length, as well as their starting and ending points (see Appendices – separate document). All the proposed service roads are of type 2 (non-paved). The roads and their shoulders are 4.0 and 0.75m wide, respectively.

All the authorized and non-authorized existing level crossings were assessed during the - preparation of the Functional Design and Preliminary Design stages. During the ESIA scoping and the Preliminary design stages the seven affected municipalities, including the Shkoder and Malesia Madhe ones (where the section Shkoder – Hani Hotit is included), were consulted more than twice (please see the ESIA Scoping report and the Stakeholders Engagement Plan) also on the service and connectivity roads and the level crossings. Their concerns have been taken into consideration whenever the required railway standards are not affected. Special attention has been paid to the crossing of Shkoder town.

The standards to fulfil the interest of the local communities and the necessity and safety of the vulnerable persons include:

- The level crossings were designed to fulfil all the requirements for persons with disabilities, elderly, children, etc.;
- The level crossings were designed to fulfil the EU norms and Standards, including the new System of Signalling and Telecommunications;
- Automatic Barriers and Signalling System will be functional to all the Level Crossings along the Railway Line;
- In all the stations will be installed facilities for persons with disabilities;
- Wherever necessary pedestrian underpasses are designed in the train stations (e.g. Shkoder station);
- Wherever the vertical alignment is sufficient, the design has increased the diameter size of the culverts across the agricultural land. Consequently, these culverts will serve also as additional agriculture underpasses to facilitate the circulation of the farmers on both sides of the railway line.

The level crossings and the service and connectivity roads have been assessed also during the ESIA preparation. Local communities have been consulted in detail. The Consultant and the Albanian Railways have addressed all their comments/suggestions. During public consultations in ***Shkoder and Malesia Madhe Municipalities*** the main raised concerns were about the location of the service roads, the geographical location of the level crossings and the land price in case of any eventual expropriation.

The Consultant answered that the designed service and connectivity roads has been located as much as practical within the existing local road network and the railway line belt in order to avoid as much as possible the land expropriation. Locals raised the expropriation procedure and the price of the land during the consultations in the three municipalities. The Consultant clarified that the expropriation will be based on the free market price. The construction cannot start before a full and fair expropriation process fulfilling the EBRD standards. The Consultant explained that this procedure is already applied in the rehabilitation of the railway line Durres-Tirana, which construction works will start in September 2021.

During the public consultation in the Municipality of Malesia e Madhe the Consultant answered to locals (Question raised by Mr I. Kurtulaj, biologist) on the service and connectivity roads across the shrubby and forest area within the Nature Managed Reserve (NMR) of Shkoder Lake. The Consultant added that the railway line section Shkoder-Hani Hotit has been built in 1985, while the NMR has been proclaimed in 2005. Although the railway line crosses the Traditional use sub zone of the NMR where the reconstruction of the railway line is legally permitted, no service and connectivity roads are designed across the shrubby and forest area of this sub-zone. Besides, the Consultant clarified that the railway line crosses shrubby and forest area only in a short section from km 132+600 to km 135+100. The other part of the railway line across the NMR of Shkoder Lake runs through rural settlements and arable and scarce lands. Therefore, there is no need for permanent land acquisition across the shrubby and forested area of the Nature Managed Reserve of Shkoder Lake. The permanent land acquisition for the project purposes is needed for th**e service roads (4 ha)**, The other land surface needed for the service and connectivity roads falls in the existing municipal roads and in the railway belt, which is an Albanian Railways property. Roughly, 112 km of non-paved service roads are needed for the project. The land surface needed for the service roads is mainly state and municipal land.

Details on these consultations are provided in the SEP and the SEP's appendices, including the Minutes of Meetings.

2.3.7. Other planned interventions

Geotechnical conditions

In general, the geotechnical conditions of the existing railway embankment did not pose any major problems that would justify the evaluation of an alternative corridor. According to the Preliminary Geological Report, there are three types of embankment along the railway corridor:

- Type 1: Embankments founded on soils with good characteristics, but made of poor-quality fill material. This type of embankment is met from km 20+560 to km 25+000 and from km 90+000 to km 98+000.
- Type 2: Embankments founded on soils with good characteristics, with fill materials of good characteristics but without protection. This type of embankment is located from km 98+000 up to km 140+000.
- Type 3: Embankments founded on soils with weak characteristics and poor fill material. This embankment type is located from km 25+000 up to km 90+000.

The Project design plans to remove all the railway body filling and reuse it again after adding additional limestone material. Besides, two geotextile layers will be installed in the section from Km 20+560 to km 90 (Vorë to Drini River).

Bridges and Culverts

Major Bridges

Almost all the existing major bridges will be demolished, and new ones will be built approximately at the same location. Mati and Kiri bridges will not be demolished due to their dual function that enables both road and railway transport. New bridges parallel and joint to the existing ones will be built at Mati and Kiri Rivers crossings. While Spathari 1 and 2 bridges will not be demolished due to their function as hydro-technical structures, which function as embankments and as railway bridges. The table below shows the list of the major bridges.

Table 2-10_Major bridges

Code	Bridge's name	Chainage	Existing Length
B01	Ishmi bridge	35+071	210.00m
B02	Droja bridge	41+834	70.10m
B03	Mati–Miloti bridge	56+097	781.21m
B04	Lezhe bridge 1	67+757	140.10m
B05	Lezhe bridge 2	69+679	90.10m
B06	Spathara bridge 1	94+458	108.10m
B07	Spathara bridge 2	94+939	248.35m
B08	Kiri bridge	102+980	144.10m
B09	Vraka bridge	111+547	47.44m
B10	Rjolli bridge	118+044	118.45m
B11	Banushi bridge	120+977	70.10m

Code	Bridge's name	Chainage	Existing Length
B12	Perroi i thate bridge	127+092	70.10m

Minor Bridges

Roughly, 74 minor bridges are planned within the whole railway line. Most of them will replace the existing ones, which will be demolished. The design has added some new small bridges in new locations.

Table 2.9 in Appendix 2.2 of this report shows the proposed minor bridges and their location and span (see Appendices – separate document).

Culverts

In total 304 box and pipe culverts will be built. They will replace the existing ones, which will be demolished.

The diameter size of the box culverts will be 2x2, 3x2, and 4x2.5m. While the diameter size of the pipe culverts will be 1.2m.

The diameter size of the existing pipe culverts is from 0.6 to 1.2m.

During the public consultations in the all seven affected municipalities, the Consultant has explained that all the existing culverts will be demolished and new ones will be built in the same locations. Additional culverts will be added in accordance with the hydrologic study.

All the new culverts will be oversized in order to be easily maintained against sedimentation. In general, all the culverts will be box culverts type. The additional pipe culverts are in general designed for the diversion of the water supply pipelines in the same location where the water pipeline cross the railway line. However, even these pipe culverts will be of 1.5 or 2.0 m of diameter size in order to easily clean them from any eventual sedimentation.

Details on these consultations are provided in the SEP and the SEP's appendices, including the Minutes of Meetings.

Retaining walls

The retaining walls are designed for protection against erosion, including rivers and streams erosion.

All the existing retaining walls will be demolished and replaced with new ones. In total 58 retaining walls will be rehabilitated/built within the whole railway line.

Table 2.10 in Appendix 2.3 of this report shows the proposed retaining walls and their location and length (see Appendices – separate document).

Figures below show the retaining walls designed to be built in the territory of Vore Municipality, to protect the land from erosion and sedimentation. Whereas in low terrain retaining walls are designed to protect the buildings close to the railway line belt.

During the public consultations in the all seven affected municipalities, the Consultant has explained the designed types of the retaining walls.

During both public consultations in Vore Municipality (consultations at Sharke and Fushe Preze villages), the locals asked on the protection of the land at the hilly foot where the railway line will be horizontally improved.

The Consultant clarified that the retaining walls are already designed. These walls will also ensure an appropriate drainage. Details on these consultations are provided in the SEP appendices, including the Minutes of Meetings.

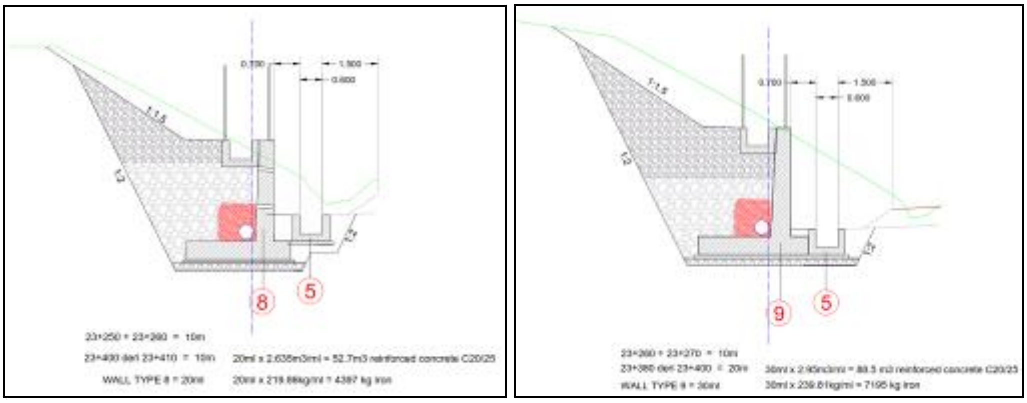


Figure 2-23_Designed retaining wall within the territory of Vore Municipality

Summary of the horizontal improvements

The table below shows the planned horizontal improvements of the railway line

Table 2-11_Planned horizontal improvements of the railway line

No	Section (from km to km)		Length	Existing Curve Radius	New Curve Radius	Minimum Design Speed (km/h)
1	22+915	23+600	685	300	850	120
				300	600	
2	54+400	55+700	1300	480	600	100
				300	300	
3	66+800	67+300	500	480	500	105
4	69+200	69+500	300	550	750	120

Fencing

The existing railway line is not fenced and therefore there is a risk for pedestrians and livestock when crossing the line anywhere.

The project foresees the fencing of the whole railway line, including stations and open lines.

Two typical fencing drawings have been prepared, as follows:

- Fencing for the Open Line, which will be 1.90m height; and
- Fencing for the railway stations, which will be 2.20m height.

The Railway Line fencing is part of the General Layout Design of the Railway Line and Parallel Roads.

Figures below show both types of typical fencing.

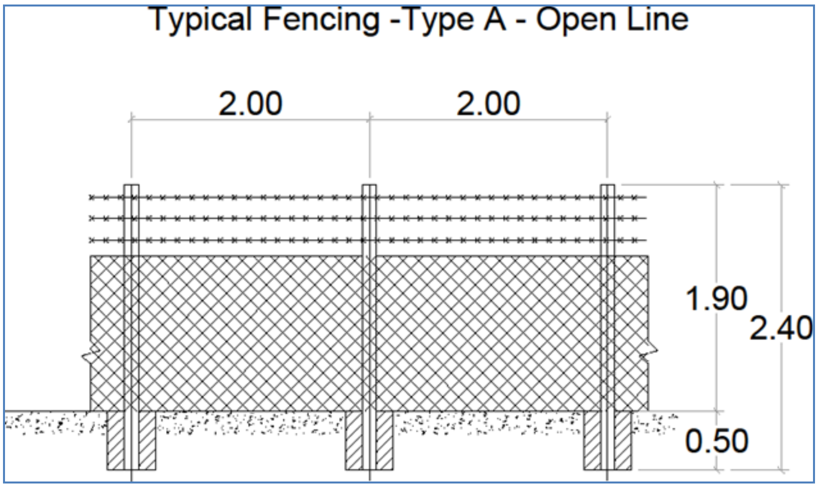


Figure 2-24_Typical fencing for the open line

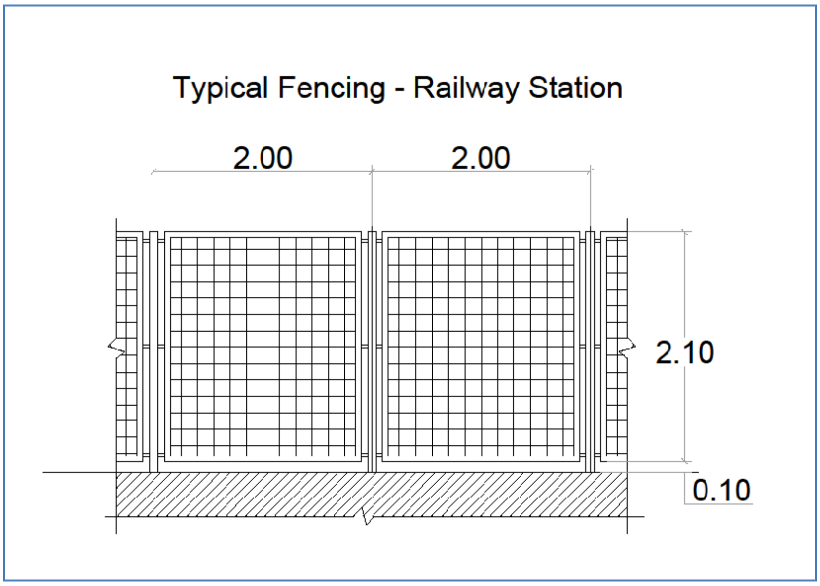


Figure 2-25_Typical fencing for the stations

At the open line, there is a combination of barbed and smooth wires, while at the stations there are designed only smooth wires. The mesh size will be generally 5cm to ensure the fence to be solid. To avoid the small (e.g. rabbit) and middle size fauna (golden jackal, badger, red fox) to cross the railway at the same places, small size spaces (e.g. 20 cm diameter) will be applied every 100m, especially at the crossing of the shrubby area (km 132+600 to km 135+700) to allow the passage of small fauna that use for breeding or living the railway belt and the drainage channels on both sides of the railway21. The same mesh size will be applied across the shrubby and agricultural area from km 135+700 to km 138+500 that is not included within the Nature Park.

It should be underlined that the section from km 139+000 to km 140+000 will be fenced only from the right side, because on the left side a retaining wall separates the railway from the motorway.

The maintenance of the railway fencing will be under the responsibility of the Albanian Railways – owner and operator.

21 https://handbookwildlifetraffic.info/handbook-wildlife-traffic/

The proposed Law dated 09.12.2019 plans to reorganize the Albanian Railways, into four state owned companies that will have the following responsibilities:

- Infrastructure;
- Passengers' transport;
- Freight's transport;
- Maintenance of locomotives and wagons

The company charged to the infrastructure will be responsible for the maintenance of the railway line, including the track (ballast, rails, slippers, fastenings, drainage system, bridges, signalling and telecommunications, fencing, etc.).

This Infrastructure state-owned company will have the responsibility to ensure that fencing will be maintained and protected from vandalism. As already mentioned in the paragraph hereinafter on the signalling and telecommunications, a video surveillance system will help to protect the railway system against vandalism, fire, etc. It will also to support the maintenance staff on any eventual necessary remediation work. The video-monitoring system will be installed at the stations and on critical places, such as bridges, tunnels, level crossings, etc. Besides, there are technical persons responsible for the daily surveillance of the railway line. In Albania, each of them surveys approximately 20 km of railway line.

The legal framework that addresses any damage to public property and specifically to railways is the Penal Code of the Republic of Albania (Law 7895/1995, as amended in 2016). Article 155 of this Law[22] includes specific provisions on the damage to the railway system and the related facilities.

During all the public consultations with the seven municipalities, locals have raised questions about the fencing because of the interruption of the current non-authorized passages across the railway line.

The Consultant has explained that the fencing will serve to protect both the railway and the local people and livestock from accidents. No interruption of the passage from one side of the railway line to the other will be interrupted, because the Project has designed all the necessary service and connectivity roads that lead to the level crossings. In addition, wherever the terrain allows it, the Project has designed new road underpasses (e.g. km 95+405 at Spathari Village territory). Furthermore, the Project has added new oversized box culverts that facilitate the passage under the railway line within the agricultural areas.

Details on these consultations are provided in the SEP and the SEP's appendices, including the Minutes of Meetings.

Signalling and Telecommunication

Current situation: Currently, the communication is based on analogue telephony without clocks, timetables, and speakers in the stations. Some level crossings are not secured. The ones that have barriers operate manually with the assistance of level crossing attendants, according to sound signals from the passing trains. The railway employees often communicate using cell phones. Accidents may happen when there is a signal failure from mobile phone providers.

Planned intervention: A signalling and telecommunication system will be installed within the whole railway line. The communication will be based on the installation of an optical cable, radio-antennas at all stations, and surveillance cameras at the sensitive locations.

22 https://drejtesia.gov.al/wp-content/uploads/2017/11/Kodi_Penal-1.pdf

Signalling system

The signalling system aims at avoiding dangerous situations. Whenever necessary the trains must stop in due time to avoid reaching or derailing. The signalling system is based on the following:

- European Train Control System (ERTMS/ETCS).
- Centralized Traffic Control (CTC) Subsystem.
- Interlocking and Field Elements Subsystem

To prevent any eventual risk of trains' collision, the following steps are undertaken.

- Preventing the train to skip a red light;
- Controlling the train's speed;
- Signalling the driver sufficiently in advance;
- Activating the emergency brakes in case of danger.

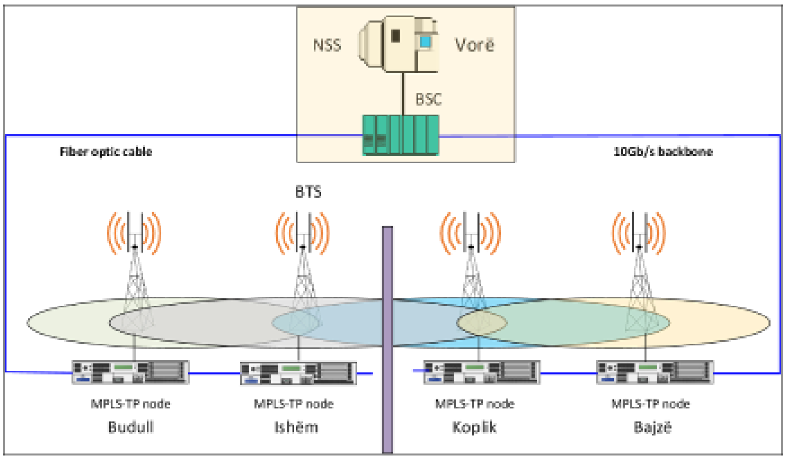


Figure 2-26_Scheme of the signalling system

Telecommunication system

The telecommunication system is based on GSM-R system related to Base-Transceiver Stations that will be installed in each station. The communication centre for the whole network of Albanian Railways will be based in Shkozet station.

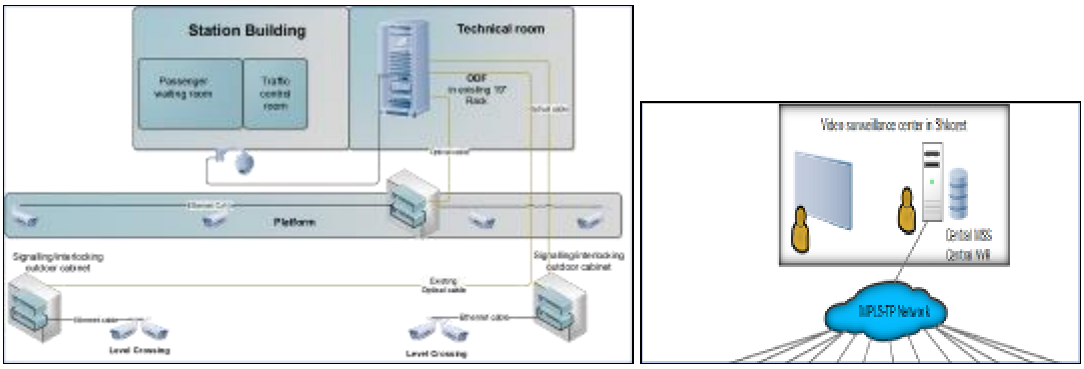


Figure 2-27_Scheme of the surveillance system

Other installations

Other installations include video surveillance, interruptible power supply (UPS), dispatching system, clocks system, passenger and public announcement systems, office telephony, etc.

Video surveillance aims at the protection of the railway line against vandalism, fire, other influences, and protection of passengers and personnel working to support railway systems. Video-monitoring system shall be installed at all stations and on critical places, such as bridges, tunnels, crossings, etc. The video-monitoring system will be remotely controlled from TCC Vorë.

Protection measures

Signalling system: The potential danger sources are electrical, including:

- high touch voltage;
- possible injury because of a fall from the signal mast, possible during the cleaning;
- manual throwing of the point or derailer.

The mechanical risks include mainly any eventual explosion in the battery room.

For all possible risks related to level crossing points, the railway traffic safety rulebook (usually rulebook no. 2) must be applied. It provides for all necessary security actions at these points.

The maintenance team must take the necessary safety measures in case of any intervention at these points. By consulting in advance with traffic officials regarding the circulation of trains at the time of the intervention. They will ensure that the crossing point is provided (staffed) throughout the intervention time for all traffic participants. The main issues related to railway traffic safety includes:

- The maintenance staff of the signalling equipment must have adequate knowledge on traffic safety;
- Before intervening in the device, the maintenance staff must obtain accurate information on the location and type of problem in the device;
- The nearest traffic official must be notified of the intervention;
- at the scene, the maintenance staff must first provide staffed public traffic;
- the maintenance staff must ensure that there is no rail traffic at the time of the intervention;
- the maintenance staff must have protective and signalling clothes during the intervention, etc.

The protection measures include protective insulation, protection earthling, low voltage, danger from the 25 kV, 50 Hz voltage of the overhead catenary line (OCL), protection from fire, etc.

The measures that must be taken to protect the personnel from the risk of low and high voltage 25KV are part of the responsibility of the respective sector, i.e. the leader of this sector, who must take care that all parts are properly protected from electro technical aspects.

All equipment must be subjected to periodic inspections to ensure that they are safe from voltage shocks, making measurements of insulation, grounding, contacts, lightning protection, fire extinguishers, etc.

Telecommunication system: All electrical equipment and installations affect each other when the devices are interconnected or located nearby.

The Directive 2004/108/EC determines the limits of electromagnetic radiation of the equipment. The electromagnetic radiation of the devices must be limited to be ensured that the use of the device will not disrupt the normal functioning of the telecommunication system and the other equipment. The devices used on the field must fulfil the provisions of national legislation (Law 10469/2011, as amended “On the protection from the non-ionizing radiation” and the related sub laws) ensuring the protection of the other equipment against electromagnetic interference, as well as the protection of humans. The Directive requires that the design and manufacture of equipment correspond to the essential requirements of electromagnetic compatibility. The Directive applies to the entire telecommunication equipment - electrical and electronic apparatus and fixed installations.

The essential requirements for electromagnetic protection provide that the telecommunication equipment is designed and manufactured in such a way that:

- The generated electromagnetic interference does not exceed the level above which radio and telecommunication equipment or other equipment cannot operate as intended;
- The level of protection of the device against electromagnetic interference is such that it enables it to operate without unacceptable degradation of its parameters when working as intended.

All external electro technical equipment must be subject to European standards and requirements regarding electromagnetic suitability. The European norm for this is EMC Directive 2014/30/EU, through which the radiation levels of various electrical equipment are determined.

Some of the requirements of this Directive 2014/30/ EU:

- the electromagnetic disturbance generated does not exceed the level above which radio and telecommunications equipment or other equipment cannot operate as intended;
- it has a level of immunity to the electromagnetic disturbance to be expected in its intended use that allows it to operate without unacceptable degradation of its intended use.

CE marking and EU declaration of conformity includes:

- The manufacturer shall affix the CE marking to each individual apparatus that satisfies the applicable requirements of this Directive.
- The manufacturer shall draw up a written EU declaration of conformity for an apparatus model and keep it together with the technical documentation at the disposal of the national authorities for 10 years after the apparatus has been placed on the market. The EU declaration of conformity shall identify the apparatus for which it has been drawn up.

During the public consultations in the seven affected municipalities, the Consultant has explained how the new signalling and telecommunication system will contribute to the good functioning of the stations and level crossings. Details on these consultations are provided in the SEP and the SEP’s appendices, including the Minutes of Meetings (separate documents) during the ESIA report public disclosure (June 2021).

The raised questions were overall about the safety on the level crossings. An ex-staffer of the Albanian Railways (nowadays in pension), who worked as a guard of the Fushe Preze level crossing asked about the safety on the level crossings. The Consultant explained that there is a signalling system thanks to which the level crossings will be closed automatically when the train is 800 to 1000m from the level crossing. Besides, all the stations and the level crossings will be 24/24h under surveillance with cameras, which are linked to the closest station and to the central control centre in Vore.

Noise barriers

In total in 14 short sections of the railway line will be built noise protection barriers.

The location and the suggested type of these barriers are provided in the section on noise and vibrations (see section 6.2.2), chapter on impacts and mitigation measures.

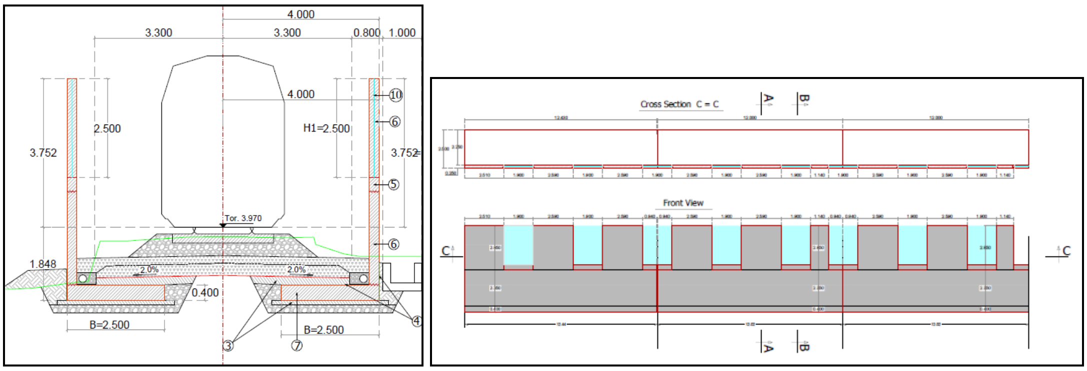


Figure 2-28_Scheme of noise barrier on both sides of the railway line

The Consultant has listed all the sensible areas to noise and vibrations (schools, hospitals, religious objects, etc.) on both sides of the railway line, as well as their distance from the railway line.

Noise barriers have been consulted with all the local people living in vicinity of the railway line sections where such barriers will be installed. Details on the clarifications provided by the Consultant are described in the Minutes of Meetings, which are inserted as an appendix of SEP.

Design of the station buildings and energy efficiency

The tendering process will require the stations' buildings to be "green" buildings, which include the following:

- It is recommended to use *green building materials* with significant recycled content that are non-toxic, regionally available, cost-efficient, durable, and easy to maintain.
- *Rainwater captured* from the stations' roofs and platform canopies can be used for other water needs in the station. Collected water can be stored in cisterns or cleansed before being redirected to other uses or returned to the municipal grey water supply.
- Buildings and stations' areas will be provided with containers for *differentiated waste collection and recycling.*

The stations' buildings and platform canopies must fulfil the *EU standards on energy efficiency*.

The backbone of the EU policy for energy efficiency in buildings are the "Energy Performance of Buildings Directive 2010/31/EU" (EPBD) and the "Energy Efficiency Directive 2012/27/EU" (EED) that include:

- *Onsite renewable energy* supplies should be used in order to reduce environmental and economic impacts associated with fossil fuel energy use. Integrated photovoltaic appliances can be installed on stations' roofs and platform canopies.
- *Building orientation and design:* Buildings will be oriented to bring abundant natural daylight through large windows to reduce lighting requirements. The exteriors will have shading devices (sunshades / stretched metal sheets), canopies, green screens, trees), particularly on the southern and western facades to block hot summer sun.

- *Effective insulation* on building's walls and roof to prevent cool air leakage in the summer and warm air leakage in the winter. All insulating materials must comply with EU Standards.
- Use of high efficiency dual-glaze windows, external doors and curtain walls *with thermal and sound insulation* to reduce heat gain in summer and heat loss during winter months.
- *Indoor Environmental Quality:* Natural daylight should reaches at least 75% of the building's interior. Natural ventilation (via operable windows, building orientation, and wind chimneys) will bring fresh air inside. Besides, the HVAC (heating, ventilation and air conditioning) system must filter all incoming air and vent stale air to the outside.
- Use of *energy-efficient heating, cooling and water-heating systems* to reduce maintenance costs and energy consumption. The use of appropriate lighting system will reduce the waste generation, too.
- All the appliances should fulfil the EU standards and have ENERGY STAR ratings.

The design will improve the services to be offered to passengers: accessibility of public transport, parking areas, access to passenger platforms, pedestrian walkways, sidewalks, asphalt paving for the surrounding area for taxi, bus, car drop off, etc.

All the railway stations that have a difference in the elevation between the platform and the parking area are designed with ramps for disabled persons. In addition, there are designed dedicated parking area for this category of persons. Inside all passengers' station buildings there are designed dedicated spaces and other facilities for this category of persons and the women with little children.

2.3.8. Summary of local communities concerns on the project design

Table below summarizes the main concerns of the local communities that were raised during the last public consultations in the seven affected municipalities. The concerns raised previously during the whole ESIA process are included in the SEP and its related appendices.

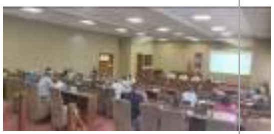
According to the information obtained from the public consultations, participants perceived that the most urgent issue remains secured access to agricultural lands, found west of the railway line; secured level crossing and traffic re-routing taking into consideration existing road network and foreseen service roads.

Nine consultation meetings were organized in June 2021 by the HSH in relation to local communities and other stakeholders' engagement for this Project. The meetings were supported by disclosure of relevant information in the municipalities' web sites, where an extended summary of 20 to 30 pages has been published in the municipalities' web pages. Each summary includes only the relevant information related to the railway line section crossing each municipality.

Table 2-12_Summary of the questions raised during public consultations with regard to the Project's design

Participating stakeholders	Meeting / date	Main questions raised/issues discussed	Pictures from the meeting
Vore Municipality representatives, Sharke inhabitants, kindergarten teacher	15/06/21 Shargë village	• Will the Project affect any buildings? • What about the retaining walls within the railway line sections, which curve radius, will be increased? • How will be done the compensation of the land surface to be permanently occupied? • How will be the circulation of the locals on both sides of the	

Participating stakeholders	Meeting / date	Main questions raised/issues discussed	Pictures from the meeting
		railway line? • How will the rehabilitation address Sharke underpass, where high trucks cannot pass through?	
Vore Municipality representatives, Preze inhabitants	15/06/21 Entrance to Preze village	• What would be the land price in case of any expropriation? • When will start the construction of the railway line? • How will the retaining walls within the railway line sections which curve radius will be increased address the houses nearby the Fushe – Preza settlement? • Will the properties in the process of legalisation (which documents are submitted to the Cadastral Agency) be considered subject to expropriation? • When will start the construction of the railway line?	
Vau Dejes Municipality representatives, inhabitants, local CSOs, local businesses, regional institutions	16/06/21 Mulliri Bar Restaurant, Vau Dejes	• What will happen to the existing level crossings? Currently there are two level crossings being used at Kac and Kac – Narac villages. • Does the railway affect any buildings? • Do you think the planned level crossings are sufficient for the inhabitants of the Municipality? Is it possible to add any new one? • How is Hajmel station foreseen in the project? • How crossing of Drini River will be done? Will the rehabilitation of the railway affect Ashta HPP? • How will the farmers reach their agricultural land in the section from Hajmel to Kac Village? • How will the project deal with solid waste? How is addressed the drainage of the area where the new building of Mjede station will be located? • What would be the land price in case of any expropriation? • When will start the construction of the railway line? • What about the employment of the local work force during the construction activities? Will the locals be trained for the construction and functioning stages?	 
Malesia e Madhe Municipality representatives, inhabitants	17/06/21 Malesia e Madhe Municipality	• What about the ownership of the land currently occupied by the railway, including the railway belt? • What about the price of the land to be compensated? • Will the properties in the process of legalisation (which documents are submitted to the Cadastral Agency) be considered subject to expropriation? • On what criteria the distance between two level crossings has been decided and will the foreseen train speed of 120km/hours affect the functioning of these secured level crossings? • The two under passes located in Grile and Omaraj settlements are quite close to each other, whereas a large part of the territory of Grizhe settlement, around 6-7 km distance remains uncovered with secured level crossing. How will inhabitants and farmers of this settlement cross the railway? • How will the secured level crossing no. 7 to no. 8 be connected? In Përroi i Thatë stream at 127+00km there is an underpass below the bridge; from Pjetroshan to Jubicë and Stërbec villages the farmers cannot cross the road and/or walk by the railway line for a total of 6 km with the livestock? What about the existing roads under the existing bridges? • Is there an option to establish a passenger station just before the	

Participating stakeholders	Meeting / date	Main questions raised/issues discussed	Pictures from the meeting
		border? • How long are the construction works expected to last?	
Shkoder Municipality representatives, inhabitants	18/06/2021 Shkoder Municipality	• Will the design speed of 120 km/h be the same when the railway is electrified? • How long will the trip take and how much will the ticket cost? • Given that the land 25m from the axis of the railway tracks is the property of the railway, what will happen to the buildings within this distance? • Will the railway be single or double line, and how is the connection with Kosovo envisaged? • What is the width of the rail body from the rail axis? • How will the railway pass the Kiri Bridge? • At the underpass connecting the lands on the left of the railway with Ganjoll village, at approx. 95+600km, after the passing the underpass, the local road entrance to the national road Mjede – Shkoder on the right of the railway is a “hot spot”; this is not a railway issue per se, but in terms of the overall traffic management in the vicinity of the railway track is quite important for the safety of not only the community but also the road users. • From the moment that the topography study was completed, the Municipality has done some investments in the road network. Will there be an update of the real situation when the works start? • Will the existing level crossing nearby Juban be still functional? • The design of the Shkoder station yard does not provide space for bicycle parking, when Shkoder is a city that has used and continues to use them en masse. In addition, the car parking spaces foreseen are quite few. • How is foreseen the platform shading?	 
Lezhe Municipality representatives, inhabitants and elderly people of the nearby settlements, Regional Environmental Agency of Lezhe	21/06/2021 Lezhe Municipality	• Will service roads be built for all the settlements to connect them with level crossings? • The price of the land is 750 ALL. What will be the land expropriation price if land will be taken? How will the nearby buildings treated, will they be demolished? • Will there be overpasses in Lezhe? • When the construction are works foreseen to start? How long will the procurement take? • In the past, the road to Markatomaj had a level crossing. Will it be maintained? • In Zejmen administrative unit, there are five water supply with mechanical elevation. How will such facility be protected during the rehabilitation works? • How will the level crossing barrier, automatic? • Will there be a level crossing at Manati – Tresh segment?	
Kurbin Municipality representatives, inhabitants and elderly people of the nearby settlements, County representatives,	22/06/2021 Kurbin Municipality	• Which is the allowed distance of the buildings from the railway? • How has the project foreseen the railway crossing in the Milot station? • Which are the level crossing nearby Gjorm village? • Why should a construction permit be obtained in the Municipality, when the distance of the railway belt is 25m? • What is the level crossing foreseen in Gjorm, it is a village with	

Participating stakeholders	Meeting / date	Main questions raised/issues discussed	Pictures from the meeting
local CSOs		4000 inhabitants who deal with agriculture • Is there a level crossing at Mamurras station? • Are there service roads in Fushe-Mamurras? • Will there be alternative roads to ensure movement to land on the left of the railway when construction works will be implemented? • Can the service road at km 47 touch my vineyard? What will be done in this case?	
Kruje Municipality representatives, Bubq Administrative Unit, inhabitants and elderly, County representatives	23/06/2021 Bubq Administrative Unit	• What will happen to the village roads that will be used by the heavy construction tools? Will they break down? • Who finances the construction of the railway? • When is construction expected to start? • How will the waste generated by the demolition works be treated? • How will the torrent floods be treated, as flooding has been present? • Will the Budull – Fushe Kruje railway line be part of the rehabilitation works? • The railway crosses agricultural land, how will it be done for safe passage from one side to the other? • Will the train stop at Budull station?	
Kruje Municipality representatives, Thumane Administrative Unit, inhabitants and elderly, County representatives	23/06/2021 Thumane Administrative Unit	• Does the railway fence block the exit from our houses? • Will the railway track be lowered or raised? • In the '60s when expropriation took place we refused, can we be expropriated now? • When the distance of the dwellings from the body of the railway is 23m, are they affected? • How will we reach our lands when the construction work star? • Will the level crossing be wide enough to enable passage of agricultural vehicles, taking into account their width?	

3. Regulatory Framework and Guidelines

This chapter analyses the national, EU, and EBRD requirements regarding the ESIA process; the ESIA level assessment; the formal consultations; the land acquisition and resettlement issues; and other aspects concerning the protection of the natural and man-made environment.

The ESIA process should fulfil the Albanian and EU regulations and EBRD standards. As provided in the Inception Report on the Project, when these regulations/standards differ from each other, the most stringent of them will be applied[23].

Note:

The term "EIA" in Albanian and EU environmental regulations, include also the social issues, and therefore "EIA" according to these regulations means "ESIA" according to EBRD environmental terminology

3.1. ESIA process stages

This section provides for the national and EU regulations and EBRD standards on the stages and steps of the EIA process.

The table below gives the stages and steps to be followed during the EIA process, as provided by the EU EIA Guidance on the preparation of the EIA report.[24] As shown in the column on comments, the requirements of the EIA Directive[25], the Albanian Law 10440 "On EIA"[26] and the EBRD Environmental and Social Policy[27] (April 2019), on the different stages of this process are almost the same. This resemblance derives from the fact that the EIA Law complies with the EIA Directive and the EBRD is a signatory to the European Principles for The Environment28.

Table 3-13_ESIA process stages and steps, and EU, Albanian, and EBRD requirements

No	Stage		Comment
1	Screening (as appropriate)	The Competent Authority (MoTE) decides whether an EIA is required and if it does, then which level of assessment is required.	• Not required for projects included in Annex I of EIA Directive, Annex I of the Albanian EIA Law, and Appendix II of EBRD ESP (2019); • Required for projects included in Annex II of EIA Directive and Annex II of the Albanian EIA Law

23 WB16-ALB-TRA-01. Inception Report. SUEZ-IPF6. February 2019

24 https://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf

25 ec.europa.eu/environment/eia/pdf/Revised EIA.pdf

26 Law 10440/2011 "On Environmental Impact Assessment"

27 https://www.ebrd.com/news/publications/policies/environmental-and-social-policy-esp.html

28 https://www.ebrd.com/key-sustainability-downloads.html

No	Stage		Comment
2	Scoping (as appropriate)	Identifies the key issues and impacts, the content and extent of the assessment, and specifies the information to be included in the EIA Report. Thus, scoping refers to: • Preparation of ToR for EIA	• Albanian regulations require a scoping stage but not a scoping report; EU EIA Directive foresees Scoping to be mandatory only when it is requested by the Developer to the Competent Authority; • The scoping report recommended by EU EIA Directive and EBRD
3	EIA report preparation	EIA report includes[29]: • Information on the project, • Baseline information; • Likely significant effects; • Proposed Alternatives; • Mitigation measures; and a • Non-Technical Summary	Required by EU, Albania, and EBRD. • EIA report to be prepared after the Scoping stage; • Structure and content of the EIA report will be prepared during the scoping stage and included in the scoping report; • SEP, LARF, ESAP, and ESMP to be prepared parallel to EIA report
4	Information and consultation	EIA Report is consulted with the public and stakeholders; EIA improved where necessary subject to consultations information	Required by EU, Albania, and EBRD
5	Decision Making and Development Consent	Based on the EIA report and the consultation results, the Competent Authority decides whether the project causes significant environmental effects. This must be incorporated into the final Development Consent decision.	Required by EU, Albania, and EBRD
6	Information on Development Consent	The public is informed about the Development Consent decision.	Required by EU, Albania, and EBRD
7	Monitoring (as appropriate)	During construction and operation, the developer must monitor the identified significant adverse effects as well as the proposed mitigation measures	Required by EU, Albania, and EBRD

The following flow chart, prepared by UNEP[30] gives the relationships between the EIA standard steps, as well as the main stages of the public involvement.

29 Annex IV of the EIA Directive 2011/92/EU as amended

30 unep.ch/etu/publications/EIA_2ed/EIA_E_top2...

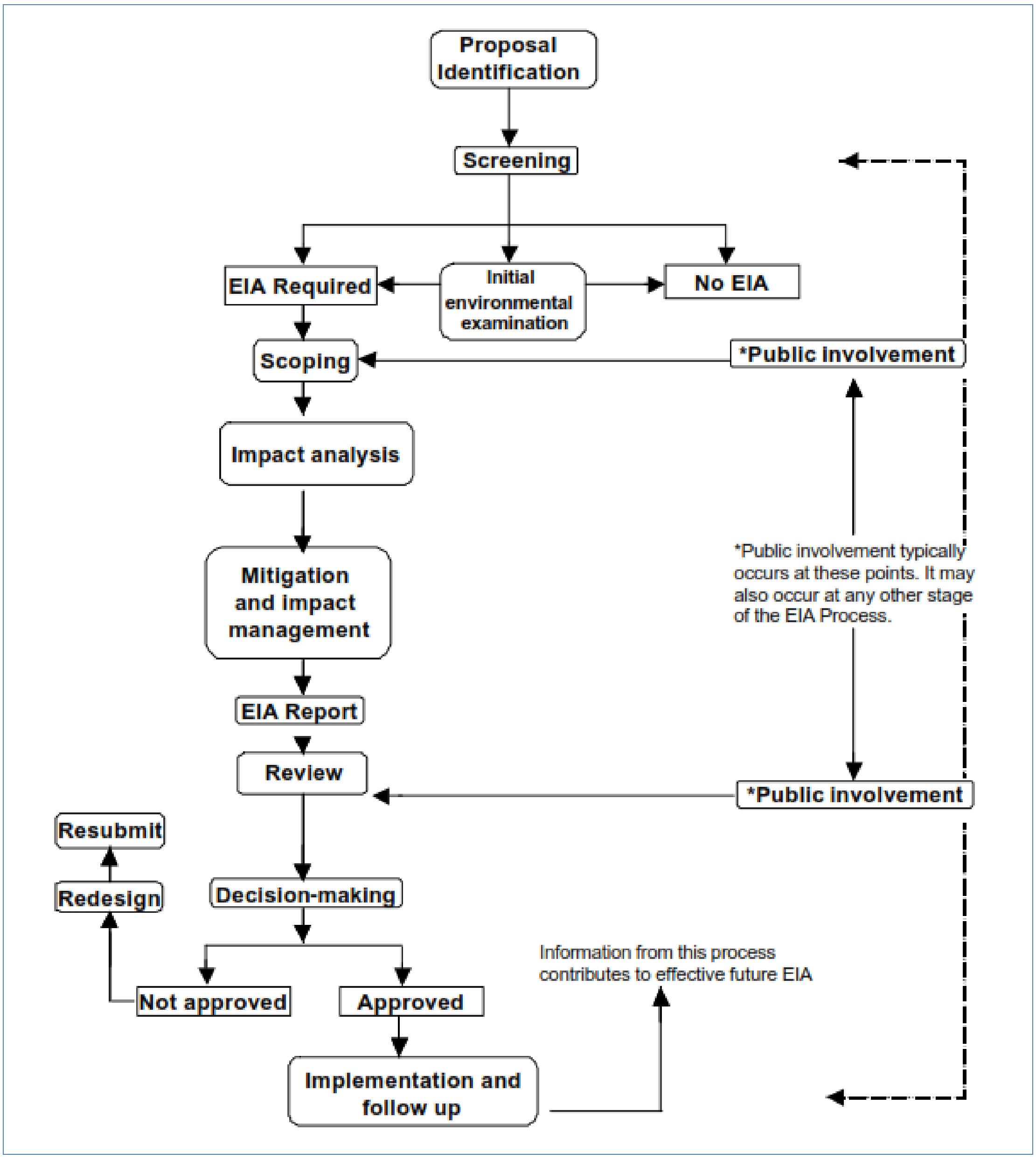


Figure 3-29_ESIA process flowing chart (source: UNEP)

Concerning the proposed Vorë - Hani Hotit railway rehabilitation project and the related ToR provisions endorsed by EBRD, the required ESIA process stages and the related outputs are described hereinafter.

3.2. ESIA process stages for the proposed project

The national, EU, and EBRD requirements on the EIA process stages are as follows:

- Screening;
- Scoping;
- ESIA preparation; and
- Information and consultations

3.2.1. Screening stage

Although the ToR endorsed by EBRD require the Project to be submitted to an ESIA of category A according to EBRD standards, the Consultant judged it necessary to take also into account the EU and national regulations on the EIA level assessment on the proposed project.

Projects explicitly included in Annex I of the EIA Directive, Annex I of the Albanian EIA Law, and Annex 2 of EBRD Environmental and Social Policy (2019), must be submitted to an EIA process. However, the national environmental authorities and EBRD take their formal screening decision on the ESIA level assessment to which a proposed project should be submitted.

Paragraphs hereinafter aim to take discuss the EU, national, and EBRD requirements regarding the appropriate ESIA level assessment to which the proposed development should be submitted. As provided in the ToR and the Inception Report, the Consultant will apply the most stringent of them. The EBRD Environmental and Social Policy (2019) states that in addition to the regulations and standards, the level of assessment should be *"commensurate with the nature, location, sensitivity, and scale of the project and the significance of its potential environmental and social impacts which are new and additional".*

EU regulations and the proposed project

According to the EIA Directive 2011/92/EU, as amended, the list of projects that require a compulsory EIA study (see Annex I of the Directive) includes:

- Point 7: *"(a) Construction of lines for long-distance railway traffic and of airports with a basic runway length of 2100 m or more);*
- Point 24*: "Any change to or extension of projects listed in this Annex where such a change or extension in itself meets the thresholds, if any, set out in this Annex".*

Discussion:

- The Project is listed in Annex I of the EIA Directive, as the existing railway line components (bridges, underpasses, retaining walls, culverts, stations' buildings, etc.) will be demolished and then re-build, mostly within the existing railway track. As such, the Project should be submitted to a compulsory EIA process

National regulations and the proposed project

The main national regulations include:

- The Project's categorization according the EIA Law; and
- The protected areas that can be affected by the Project

EIA Law and the proposed project

The Law 10440/2011 "On EIA"[31], which is in line with the EIA Directive, includes two annexes:

- Annex I: List of projects, which are considered as having significant effects on the environment and consequently require a full EIA;
- Annex II: List of projects, which require a "Preliminary EIA".

The railway projects listed in Annex I of the EIA Law are as follows:

- Point 7: *"(a) Construction of railway lines for long-distances";*
- Point 24: *"Any change to or extension of projects listed in this Annex where such a change or extension in itself meets the thresholds, if any, set out in this Annex".*

Although the name of the project mentions the word "rehabilitation", the Project is a railway construction, as the whole railway line (120 km long) components, including most of the

31 http://www.qbz.gov.al/Ligje.pdf/mjedisi/ligji%20per%20mjedisin.pdf

bridges, underpasses, stations, culverts, etc., will be built from the beginning. The new railway line will be located, more or less, within the existing track.

Conclusion:

- The Project is listed in Annex I of the EIA Law, and therefore it should be submitted to a "full EIA process", which corresponds to an EIA according to EIA Directive

National Environmental Agency formal screening opinion

Despite the EIA Law includes the Project in the list of projects that require a "full EIA", a formal screening opinion by the competent authority (MoTE) is necessary.

This decision is based on the following:

- the provisions of the EIA Law;
- the characteristics of the project's area;
- the project's elements (project's components and activities); and
- The preliminary information and verifications provided by the project's developer. If needed, the necessary information/verifications can be provided under the form of a short EIA screening report that the developer can prepare after the Inception phase.

On September 2019 the Consultant prepared a non-technical summary on the ESIA Scoping report that, together with some maps on the Project area, were sent to MoTE for screening opinion. In addition, a meeting was held in the MoTE offices regarding this opinion.[32] As a result, MoTE decided the proposed project to be submitted to a "full EIA", because it should be understood as a "construction" of a railway line of long distance.

This decision is in accordance with the ToR endorsed by EBRD that provide the Project to be submitted to an ESIA of EBRD category A.

The Protected areas and the proposed project

The Nature Managed Reserve – Nature Park of Shkoder Lake

From km 113+700 to km 135+700, the railway line crosses the Nature Managed Reserve (NMR) of Shkoder Lake - Category IV of IUCN protection status[33]; the DCM 684/2005 proclaimed a NMR or Nature Park34 the Albanian part of Shkoder Lake and its terrestrial part.

According to the DCM 684/20025, the total surface of this NMR is 26,535 hectares that is split as follows:

- Lake's surface: 15,719 ha;
- Shrubs and forests: 1,965 ha
- Other: 8,851 ha

The 8,851 ha included in the "other", include:

- Agricultural land, mainly arable land;
- Unproductive land;
- Rural settlements;

32 See Stakeholders Engagement Plan on the Project

33 http://akzm.gov.al/lista-zonave-mbrojtura/zone-e-menaxhuar/item/175-liqeni-i-shkodres

34 https://qbz.gov.al/eli/fz/2005/91/32de2671-a048-426e-b2eb-ce65fbb80c4d

- Local roads, the railway line, etc.

The DCM 684/2005 establishes the following management zones:

1. Core zone (1/a): areas with high conservation values, managed primarily for nature conservation. The second IUCN level of protection is applied;
2. Habitats management zone - buffer zone (2/a): This zone includes the Lake waters. The third IUCN level of protection is applied.
3. Transit zone/traditional use zone: areas managed to protect natural ecosystems and use natural resources sustainably. The forth IUCN level of protection is applied for this zone.

Map below shows the internal zoning of the NMR as provided by DCM 864/20025

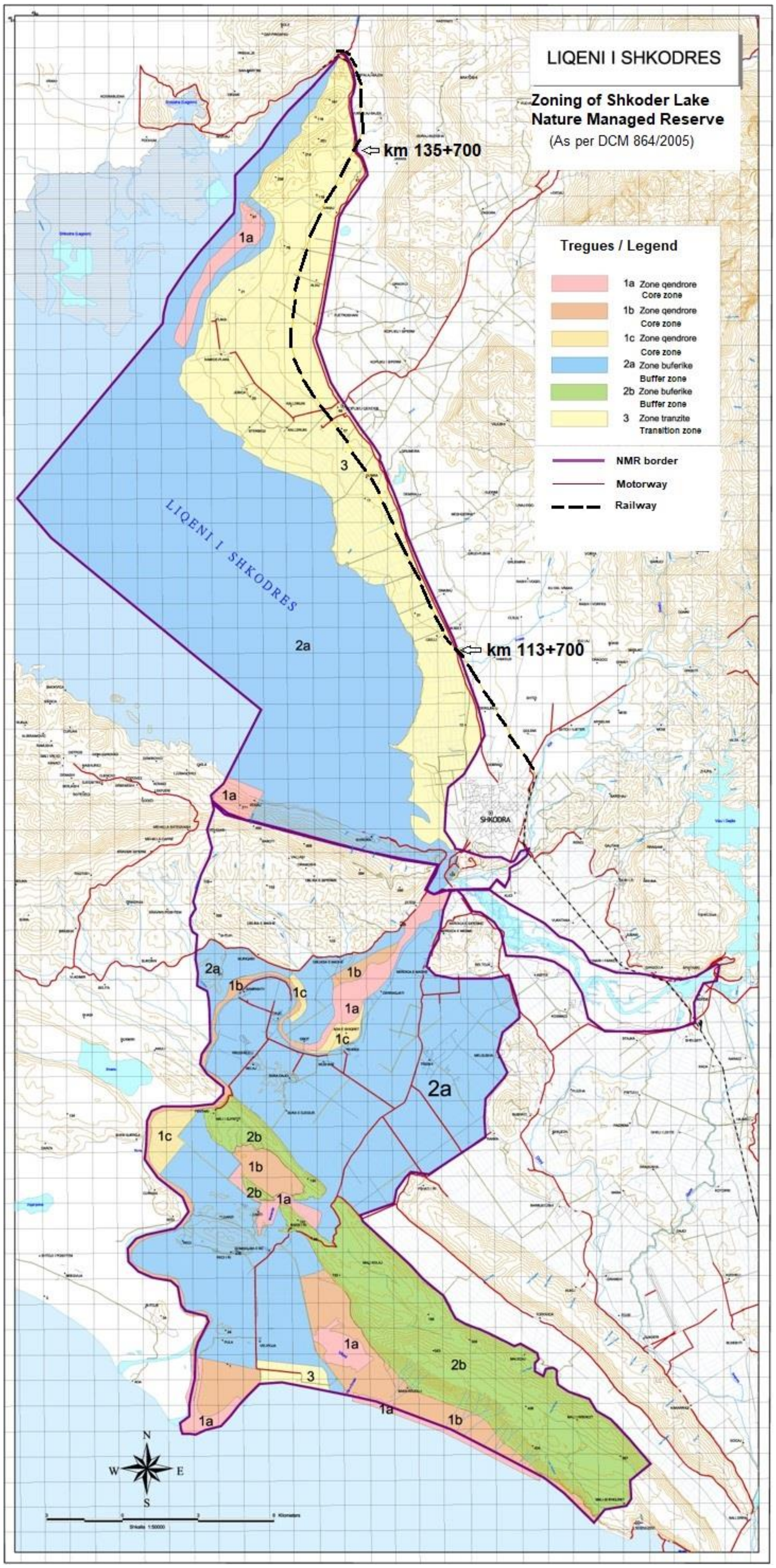


Figure 3-30_Internal zoning of the Shkoder Lake NMR as per the DCM 864/2005 (source NAPA)

The Railway line and the crossing of the Nature Managed Reserve of the Shkoder Lake

The motorway from Shkoder city to the state border Albania/Montenegro serves as a terrestrial border of this NMR.

It must be stressed that the railway line section from Shkoder to Hani Hotit is operating since 1985 that means 20 years before the proclamation of the Nature Managed Reserve. Consequently, the railway line was included within the traditional use or transit subzone of this NMR since its designation as a NMR.

Concerning the railway components within the NMR, the following can be said:

- The railway line crosses only the traditional use or transit subzone of the NMR;
- The station of Bajze is operating since 1985. Therefore, 20 years before the designation of the NMR;
- The railway belt was already an Albanian Railways (HSH) property since 1985. Furthermore, the Railway Code (2004, amended in 2016[35]) states that the land strip of 5 m wide (at minimum) on both sides of the railway line is an HSH property. The railway belt starts at the drainage channels parallel to the railway or at the bottom of the railway slopes when there are no drainage channels.

In accordance with the Article 49 of the Law 81/2017 “On protected areas”, the following activities are prohibited in the subzone of traditional use:

a. changes in natural status of the water resources, springs, lakes and wetland systems
b. storage of chemicals
c. mobility and parking of cars outside the public roads and places designated for parking
d. intensive collection of plants, minerals, paleontological findings and stones
e. placement of billboards, information panels, publicities, signs and posters except for those that provide information on the protection objectives of the nature managed reserve
f. alpine hiking, skiing, camping and fires outside the defined sites and trails.

As demonstrated, railway mobility is not affected by the above prohibitions.

The Railway line runs within the traditional use or transit zone from km 113+700 to km 135+700. The land surface occupied by the railway line (excluding Bajze station and the railway belt) within the NMR is approximately 13.2 ha (22 km long, 6.0 m wide), while the land surface occupied by Bajze station is approximately 1.5 ha.

The total land surface occupied by the railway line (6.0 m wide), the railway belt (at minimum 5.m wide on both sides of the line) and the Bajze station is 38.7 hectares, from which:

- Railway line: 13.2 ha;
- Bajze station: 1.5 ha; and
- Railway line belt: 24 ha

35 http://planifikimi.gov.al/index.php?eID=dumpFile&t=f&f=2379&token=d1d0f04d58bba37bf08a279265ebb3cf3688c7fd

The above-mentioned land surface has been an Albanian Railways property 20 years before the proclamation of the NMR.

The distance of the railway line from the borders of the Shkoder Lake NMR – Nature Park is as follows:

- From km 113+700 to km 119+300, the railway runs close and parallel to the motorway, which constitute the terrestrial border of the NMR. The railway crosses only arable land and rural settlements. The distance of the line to the motorway varies from 0.0 to 70m. While the distance of the railway line from the lakeshore varies from 1.4 to 2.8 km.
- From km 119+300 to Bajze level crossing (km 132+600), the railway crosses only arable land, rural settlements and two streambeds without vegetation. The railway runs between the lakeshore and the terrestrial border of the NMR. The distance of the line to the terrestrial border varies from 30m to 1.4 km. Whereas the distance from the lakeshore varies from 2.0 to 3.7km.
- From km 132+600 to km 135+700 (end of the protected area), the railway crosses an area covered mainly of shrubs (dominated by *Corpinetum orientalis*). There is also presence of Turkey oak (*Quercetum confertae*). Plots of pastures and agricultural land split the shrubby and forested area. The vegetation within the whole railway belt on the left side (km 132+600 to km 135+700) is already cleaned because of the recent works for installing a water pipeline. The distance of the line to the terrestrial border varies from 0.0m to 1.0 km. Whereas the distance to the lakeshore varies from 1.8 to 2.5 km. Besides, a hilly terrain lies between the railway line and the lakeshore.
- The closest distance of the nearest core zone to railway line (km 130+300) is 2.5 km. It should be underlined that at km 130+300, a hilly terrain lies between the railway and the core zone, which is located at the shoreline.

In section 5.2.11 are included some representative photos of the crossed NMR, from km 113+700 to km 135+700

The Project and the Management Plan of the Nature Managed Reserve of Lake Shkoder

Law 81/2017 "On protected areas" (Article 19, item 6), as amended, states "the allowed activities within a NMR are described in the management plan, in compliance with the national legislation". Article 19 of the Law provides also for the formal opinion from the responsible environmental institutions.

The Management Plan of the Shkoder Lake NMR includes the list of activities that are allowed or prohibited within the NMR36. It specifies that the transit or traditional use zone covers urban areas as well as areas of intensive use. Activities allowed in the traditional zone include commerce, production and storage of goods and extraction of raw materials. Transport of goods, including railway transport, is not specifically mentioned by the management plan and it is neither is mentioned among the prohibited activities.

However, according to the Management Plan of the NMR, the construction of new roads and reconstruction of the existing ones are allowed. The rehabilitation of the railway line can be considered as a reconstruction, because the horizontal alignment of the line across the NMR will not change. It should be added that the National Agency for the Protected Areas sent to the

36 https://www.cepf.net/sites/default/files/Shkoder-managment-plan-english.pdf

Albanian Railways its written formal opinion, according to which the proposed project is included in the list of the allowed activities.

Table below shows the activities that are allowed and those prohibited within the different subzones of the NMR of Shkoder Lake, as provided by its Management Plan.

The provisions of the Management Plan were enlisted in Table 3-1. Activities allowed and prohibited by the Management Plan of the NMR of Shkoder Lake.

Table 3-14_Activities allowed and prohibited by the Management Plan of the NMR of Shkoder Lake

No	Activities	Internal zoning (as per the DCM 864/2005)		
		Core zone	Habitats Management zone	Traditional use zone
1	Scientific research (with a permit)	Yes	Yes	Yes
2	Hiking (along the marked trails)	Yes	Yes	Yes
3	Horse/mule/donkey riding	Yes	Yes	Yes
4	Motor vehicles (on the existing roads)	No	Yes	Yes
5	Sailling/motor boats	No	Yes	Yes
6	Camping (in the designated places)	No	Yes	Yes
8	Campfire (in the designated places)	No	Yes	Yes
9	Collection of wild animals and plants	No	Yes	Yes
10	Grazzing (with a permit)	No	Yes	Yes
11	Traditional agriculture	No	Yes	Yes
12	Wood harvesting	No	Yes	Yes
13	Commercial/subsistence fishing	No	Yes	Yes
14	Recreational fishing	No	Yes	Yes
15	Hunting	No	No	No
16	Building of soft-tourism infrastructure (trails, shelters, information boards, etc.)	Yes	Yes	Yes
17	Construction of new tourist facilities	No	Yes	Yes
18	Mining	No	No	No
19	Commerce	No	No	Yes
20	Industry	No	No	Yes
21	Quarries	No	No	No
22	Opening of canals in karstic springs	No	No	No
23	Cuttings of reeds and trees in the shoreline Shkoder-Grile-Vrake	No	No	No
24	**Construction of new roads**	No	Yes	**Yes**
25	**Reconstruction of existing buildings**	Yes	Yes	**Yes**
26	**Reconstruction of existing roads**	Yes	Yes	**Yes**
27	**Opening of canals**	No	Yes	**Yes**
27	**Cutting of vegetation**	No	No	**Yes**
28	**Storage**	No	No	**Yes**

The only activities undertaken during construction and operation of the railway will be those mentioned 24-28. All those activities will occur in the traditional use zone, therefore outside the prohibited areas.

Apart from the above, the management plan does not provide specific mitigation measures. The plan is rather focused on providing guidelines for the activities of the administration of the protected areas in preserving the biodiversity and at controlling pressures. The administration could implement those guidelines when permitting the different activities foreseen under the ESIA report. In order to facilitate the role of the administration, the project team has contacted both NAPA and RAPA concerning the project activities (Please see below the box 3.1). As such, the ESIA process and more specifically the consultation with the authorities during the drafting of ESIA as well as the potential Environmental Declaration has and is offering opportunities for working closely with the administration in order to avoid and mitigate the impacts foreseen during construction and operation.

Based on the table above, the construction of new roads and reconstruction of the existing ones are classified among the activities allowed by the Management Plan of the NMR of Shkoder Lake. The rehabilitation of the railway line can be considered as a reconstruction activity, because the horizontal alignment of the line across the NMR will not change. While the reconstruction of the railway stations (Bajze station) is simply considered as a building's reconstruction.

As a result, the Management Plan of Shkoder Lake allows all the planned Project's activities across the NMR. Besides, the minimal distance of the nearest core zone to railway line (km 130+300) is 2.5 km. It should be underlined that at km 130+300, a hilly terrain lies between the railway and the core zone, which is located at the shoreline.

It should be added that the National Agency for the Protected Areas sent to the Albanian Railways its written formal opinion, according to which the proposed project is included in the list of the allowed activities.

Formal opinion of the National Agency for Protected Areas

According to the Law 81/2017, "On Protected Areas", Article 33, the allowed interventions within a protected area need the formal consent of the environmental authorities.

The environmental authority responsible for the protected areas is the National Agency for Protected Areas (NAPA), which opinion was expressed through a formal letter to the Albanian Railways.

This letter and its translation in English is provided in Appendix 1.1 (see ESIA Appendices – separate document), while a summary is given in the box below.

Discussion

The National Agency of Protected Areas agrees the proposed project to be developed. In addition, NAPA is not expecting the Project to have any significant environmental effect on the Shkoder Lake NMR because the railway line crosses the traditional use zone of this NMR.

All the activities foreseen by the ESIA, either during construction or operation are in line with the relevant legislation on Protected Areas as well as the Management Plan of Nature Managed Reserve of Lake Shkoder.

Box 3.1_Formal Opinion of the National Agency for Protected Areas on the proposed project

Summary of the NAPA opinion on the proposed Project
"According to the management plan and the internal zoning of the NMR, the railway route lies in subzone no. 3, transit/traditional use zone". *"Given that this investment is necessary, of benefit to the local community and the impact on the environment is low as the works will be carried out on the existing railway track, from the developer of this project we shall demand to respect the conditions of the environmental permit and especially the waste generated during the construction works, should be deposited outside the territory of the Nature Managed Reserve. At the end of the construction, rehabilitation works in the area, under the supervision of Regional Administration of Protected Areas in Shkoder, should be carried out"*

3.2.1.1. EBRD standards and the proposed project

EBRD ESP, Appendix 2 – List of category A projects

According to EBRD ESP (Appendix 2), projects categorized A "*are projects that could result in potentially significant environmental and/or social impacts that are additional and new and therefore require an environmental and social impact assessment. The categorisation of each project will depend on the nature and significance of any actual or potential environmental or social impacts that are additional and new, as determined by the specifics of nature, location, sensitivity and scale of the project.*"

Discussion:

The Project is explicitly included in the list of category A projects (EBRD ESP, Appendix 2), as follows:

- Point 6: *"Construction of lines for long-distance railway traffic"*

As a result, the Project should be submitted to an ESIA of EBRD category A projects.

EBRD PR 6 and the proposed project

With regard to the "Legally Protected and Internationally Recognised Areas of Biodiversity Value", EBRD PR6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources) provides as shown in the table below37:

Table 3-15_EBRD PR6 provisions on the projects located within protected areas

No	EBRD PR6 (paragraph 22)	Discussion
1	The Client will demonstrate that any proposed development is legally permitted, which may have entailed that a specific assessment of the project related impacts on the protected area has been carried out as	-The project is legally permitted by the national law (see 3.2.1.2); - All the activities foreseen by the ESIA, either during construction or operation are in line with the relevant legislation on Protected Areas as well as the

37 https://www.ebrd.com/news/publications/policies/environmental-and-social-policy-esp.html

	required under national law	Management Plan of Nature Managed Reserve of Lake Shkoder. -According to the DCM 864/2005, the railway line is located within the Shkoder Lake NMR's transit/traditional use subzone, where the fourth IUCN level of protection is applied (see section 3.2.1 above); -The added new box culverts and the replacement of the existing ones will facilitate the fauna circulation; -The new and the replaced box culverts will have a bigger diameter size than the existing ones; -The existing box culverts are partly filled with sediments; -The railway line runs between the Lake and a motorway, which serves as an external border for the NMR. As the motorway lies on the surface level (no embankment) and has a very dense traffic compared to the railway, the only fauna passages (through the motorway) are the bridges, underpasses and any rare pipe culvert; -From km 113+700 to roughly km 134+500, the landscape on the right of the motorway is characterized by flat agricultural lands and rural settlements. Therefore, there are no good conditions for wildlife paths across the motorway (excepting any accidental passage of any small mammal – e.g. hare). However, the bridges of the Rrjolli, Banushi and Perroi thate Streams serves as pathways for these small mammals as the above streams are dry for the major part of the year. Anyway, these three streams cross the railway line, too; -From km 134+500 to km 135+ 700, there are some bar-restaurants and other buildings both sides of the motorway, under which at this section there is no any culvert. That make difficult the crossing of the motorway by the wildlife; -The best and most probable wildlife pathway is the underpass at km 135+700 (at the end of the NMR), where the motorway passes over the railway. At this location, the motorway crosses a shrubby and forested area that lies from the motorway to a mountain foot located roughly 1.6 km on the East (see underpass photo in the section 5.2.12). In addition, the underpass at km 135+700 is roughly 80m long. As a result, it constitutes the most probable wildlife pathway within the whole section of the railway line crossing the NMR (from km 113+700 to km 135+700); -According to the Law 81/2017, the Project development requires the consent of the National Agency for the Protected Areas (NAPA), which has

		already responded positively to this development. Besides, NAPA expressed its requirements, which consist: a- the rehabilitation of the working area under the supervision of the Shkoder Regional Agency for Protected Areas (RAPA); and b-during the construction the solid waste should be deposed outside the NMR (see box 3.1 above).
2	Act in a manner consistent with any government-recognised management plans for such areas.	The proposed project is included in the list of interventions that are allowed by the Managing Plan of the Shkoder Lake NMR (see Table 3-14 above). According to this Plan, the railway line crosses the NMR's sustainable development zone.
3	Consult protected area managers, relevant authorities, local communities and other stakeholders on the proposed project in accordance with PR 10	The consulted stakeholders include: - Municipalities of Shkoder and Malesia Madhe within the territories of which lies the Shkoder Lake NMR (see SEP); -National Environmental Agency, National Agency of Protected Areas, Shkoder Regional Agency of Protected Areas, etc. (see SEP; Box 3.1 in 3.2.1 above; and the section 6.2.9 below)
4	Implement additional programmes, as appropriate, to promote and enhance the conservation objectives of the protected area.	Additional culverts have been designed to facilitate the circulation of wild fauna on both sides of the railway line (see section 6.2.9 below – impact on wildlife). The new "box culverts" will be large enough (size 2x2 m or 2x3m) to allow the passage of mammals such as Red fox, Golden Jackal, Badger etc. The culverts are designed to avoid blocking from sediments, to allow for regular maintenance and the temporary flows. The area is karstic and very permeable. The main stream of the area is called "Perroi i thate" which means "Dry stream". It is dry most of the time and it is filled with water only for very short periods under the torrential rains. Based on the above geological characteristics, the culverts will serve mainly for fauna passage. -A Biodiversity Action Plan will be implemented concerning the railway section that crosses shrubby and forest areas (km 132+600 to km 135+100). The other sections crosses arable land.

3.2.2. Scoping stage

The ESIA scoping stage has been based mainly on EU regulations. Besides, the already prepared ESIA scoping report38 includes a gap analysis between the national requirements and the EBRD PRs. The gap analysis concerns mainly the consultations and the land acquisition issues that are developed in SEP and LARF, respectively.

38 WB16-ALB-TRA-01_ESIA Scoping report. SUEZ-IPF6, October 2019

The main regulations for preparing the scoping stage include the following:

- EU Guidance on Scoping (2017)39; and
- DCM 912/2015 "On national EIA methodology40";
- EBRD ESP (2019)41

Details on the regulatory framework and guidelines for undertaking the scoping stage are provided in the ESIA Scoping report.

3.2.3. ESIA report preparation

The ESIA report (this document) is prepared based on the ESIA scoping report, in accordance with the national, EU, and EBRD requirements.

The main regulations for preparing the ESIA report include the following:

- Law 10440/2011 "On EIA" and DCM 912/2015 "On the national EIA methodology";
- EIA Directive 2014/52/EU42 and EU Guidance on EIA (2017)43; and
- EBRD ESP (2019)

3.2.4. The regulatory framework for information and consultations

Information and consultations during the ESIA process must fit with the EU, national, and EBRD requirements on this matter and should be commensurate with the expected impacts and the formal requirements of the affected stakeholders.

As stressed in the Inception Report, amongst EU, national and EBRD standards on the consultations, the most stringent of them should be applied by the Consultant.

3.2.4.1. EU regulations

EIA Directive 2014/52/EU provides for the approach to public consultation. Article 6 of the Directive stipulates "*Member States shall take the measures necessary to ensure that the authorities likely to be concerned by the project by reason of their specific environmental responsibilities or local and regional competences are given an opportunity to express their opinion on the information supplied by the developer and on the request for development consent. To that end, Member States shall designate the authorities to be consulted, either in general terms or on a case-by-case basis. The information gathered pursuant to Article 5 shall be forwarded to those authorities. Detailed arrangements for consultation shall be laid down by the Member States*".

Albania is not a member state and therefore the EU Directive is not binding. However, given the status of the candidate country and the process of approximation of Albanian legislation to the EU legislation, EU directives are relevant in the case of Albania as well.

As a result, due to the full approximation of Albanian Law on EIA with the EU EIA Directive, and DCMs 247/2014 44 and 598/2015 45 which provide for the necessary information and

39 https://ec.europa.eu/environment/eia/pdf/EIA_guidance_Scoping_final.pdf

40 http://mjedisi.gov.al/wp-content/uploads/2018/09/VKM-912-2015.pdf

41 https://www.ebrd.com/news/publications/policies/environmental-and-social-policy-esp.html

42 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02011L0092-20140515

43 https://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf

consultations on the EIA process, then, according to EU regulations, the consultations for all stages of the EIA will be arranged based on the Albanian requirements.

3.2.4.2. National regulations

The "Right to Information" is a constitutional right, as provided by the Albanian Constitution (Article 23). This universal right is further strengthened by the applicable environmental legislation.

The Albanian legislation on the consultations on the EIA process comprises a national and a trans-boundary context.

The EIA Law and CDM 247/2014 "On the rules and procedures for consultation with public consultation and public involvement during the environmental assessment process" provide for the consultations requirements at the national context. Article 14 of the EIA Law provides for the public and stakeholders to be involved in the EIA process.

Similarly, EIA Law and DCM 598/2015, "On the rules and procedures for consultation with public and stakeholders, and public consultations during the environmental assessment process in trans boundary context" regulate the public information in trans-boundary context.

Both the EIA Law and DCM 247/2014 are in line with the EIA Directive, while DCM 598/2015 complies with the Espoo Convention, which sets out the obligations of Parties to assess the environmental effects of certain activities at an early stage of planning. It also lays down the general obligation of States to notify and consult each other on all major projects whether they are likely to have any significant adverse environmental impact across boundaries.

The DCM 598, date 1.7.2015 "On the determination of rules and procedures for cross-border environmental impact assessment, which transposes the Directive 2011/92/EU, defines the procedure to be followed for screening and consultation. The process of notification and consultation with the affected parties is driven by the Ministry of Tourism and Environment (MoTE). The MoTE screens the application and confirms if the project falls into Appendix 1 of the DCM 598 (in fact, it is part of appendix 1, point 7, a) and assesses the potential impacts in line with Appendix 2. If MoTE decides to follow cross-border environmental impact assessment shall ask the developer to prepare a notification and undertake public consultation(s) beyond or in addition to the national EIA requirements. If the affected party expresses that it has no interest in participating in the EIA procedure in a cross-border context or does not express itself within the deadline specified in the notification of the ministry and in the notification format, which cannot be more than 6 (six) weeks, the EIA procedure continues without the involvement of the affected party. In case the affected party shows interest to participate in the EIA procedure in a cross-border context, the MoTE invites it to participate in the EIA procedures: a) Consultation on issues to be addressed by the EIA report; b) The process of informing and involving the public in the environmental decision-making, according to national and affected party legislation; c) Decision-making regarding environmental consent. This step lasts 2 months after receiving the notification.

SEP (separate report) provides details on the formal consultations.

3.2.4.3. EBRD standards

The consultation process is a critical part of EBRD Environmental and Social Policy (ESP), specifically Performance Requirement 10 (Information Disclosure and Stakeholder Engagement) points out the importance of an open and transparent engagement between the project developer and the different stakeholders at an early stage of the project cycle. "*Stakeholder engagement is central to building strong, constructive, and responsive*

44 DCM 247/2014 provides for consultations at country level

45 DCM 598/2015 provides for consultations at transboundary level

relationships which are essential for the successful management of a project's environmental and social risks and impacts ". This PR that is guided by the UNECE Convention principles, states that "*the nature and frequency of stakeholder engagement at all phases of the project development will be proportionate to the nature and scale of the project, its potential adverse environmental or social risks and impacts and the level of stakeholder interest*".

EBRD ESP states *"As a signatory to the European Principles for the Environment, EBRD is committed to ensuring that projects are structured to meet EU environmental principles, practices and substantive standards, where these can be applied at the project level, regardless of their geographic location. When host country regulations differ from EU substantive environmental standards, projects will be required to meet whichever is more stringent46".*

Regarding the consultations and disclosure, the EBRD PR 10 requires "*the consultation and disclosure process shall meet any applicable requirements under national environmental impact assessment laws and other relevant laws*"47.

The requirements of the EBRD PR 10, related to Information Disclosure and Stakeholder Engagement, can be summarized as follows:

- Stakeholder consultation is an ongoing process that continues during all the Project's life cycle;
- Stakeholder engagement involves stakeholder identification, proactive stakeholder engagement, the availability of a grievance mechanism open to all, and monitoring.
- The nature and frequency of stakeholder engagement actions are proportionate to the nature and scale of the project, its potential adverse impacts, and the level of public and other stakeholders' concerns.

EBRD has also issued several guidelines that deal with stakeholders' engagement and grievance mechanisms. The Stakeholders Engagement Plan provides details on how these guidelines are useful for the proposed project.

3.3. The regulatory framework for land acquisition and resettlement

This section describes shortly the national and EBRD requirements on land acquisition and resettlement. It includes also a gap analysis of these requirements.

Further details are provided in the Land Acquisition and Resettlement Framework (LARF) – a separate document.

3.3.1. National regulations

3.3.1.1. Key regulations and guidelines

The key law regulating the expropriation and governing the land acquisition process for the Project is Law 8561/1999 on "Expropriation and Temporary Takings of Private Property for a Public Interest", as amended (Expropriation Law). This Law is complemented by several Decisions of the Council of Ministers (DCM), guidelines and regulations, including:

- DCM 127/2000 on the "Content and procedures of introducing the request and or initial announcement of expropriation and temporary takings of private property for a public interest";

46 EBRD ESP, Section III (1)

47 EBRD PR 10, paragraph 25

- DCM 138/2000 on "The technical criteria for the assessment and calculation of the compensation amount of private properties that are going to be expropriated for a public interest, of properties that are devaluated and of the rights of the third parties" as amended;
- DCM 257/2007) on "The criteria and procedures for the physical compensation with state properties of expropriated subjects, in special cases";
- Guideline No.1 (Oct.05.2000) on the "Technical criteria to calculate the value of the fruit trees that are being expropriated for public interest, in the cases when indicators of declared purchase are missing"

Expropriation Law regulates expropriated or temporarily occupied properties (land and structures), in the public interest for activities that cannot be realized in another way and which bring greater benefit to the public. The law provides compensation in such cases and even when the land is temporarily occupied. Only registered properties and formal legal owners of the properties are entitled to benefit by the law. No provision applies to unregistered properties. Furthermore, the Expropriation law does not provide for any resettlement regime.

DCM 138/2000 regulates the compensation issues. Properties are categorized as Category 1: Construction objects (a-residential structures; and b-any other structures rather than residential (warehouse, shops, etc.); Category 2: Agriculture land; Category 3: Construction land. For (a) residential structures, the valuation is set as the average of sales and purchases, as determined by the Immovable Property Registration Office (IPRO), or in case such information is not available, the valuation is to be made based on the building costs, using the prices as provided by the National Entity of Residences. Another method that can be used for evaluating the industrial or agricultural objects is through the method of building cost.

The compensation for construction and agriculture land, forests, fruit trees, etc., is based on prices set by the Immovable Property Registration Office based on the location of the property. The valuation for fruit and trees is made using the cost method (investments, number of roots, surface area, other expenses, etc.); valuation of crops is based on expected productivity.

3.3.1.2. Informal constructions on both sides of the railway

Law 9317/2004, on the "Railway Code of the Republic of Albania", as amended, provides for the limitations of constructions on both sides of the railway. According to Article 18, it is forbidden any form of construction along the railway belt, except those that facilitate the railway line. For any construction within the railway belt, the approval of the Albanian Railway Authority is required. Article 35/d of this law prohibits any kind of construction along the railway line, closer than 25 meters from the railway belt, outside urban areas. For the construction of any type of object located in urban areas, at a distance of up to 25 meters from the railway belt, permission from the Albanian Railway Authority is required.

Law 9482/2006 on "Legalization, Urbanization Planning and Integration of Unauthorized Buildings" aims to formalize the informal constructions and develop the relevant areas. DCM 280/2016, as amended, provides a list of those informal buildings exempted from the legalization process. Section II, 2/b of the DCM provides that informal constructions cannot be formalized when they affect the railway system/lines or crosses the existing railway protection belt defined by the Railway Code. The railway protection belt consists of the land on both sides of the railway line, with a width of 100 meters, starting from the outer extremity of the railway line.

3.3.2. EBRD standards and guidelines

3.3.2.1. EBRD PR5

Under EBRD's Environmental and Social Policy48, the involuntary resettlement issues are covered by PR5, the main points of which are the following:

- Avoid or, when unavoidable, minimize, involuntary resettlement by exploring alternative project designs;
- Mitigate adverse social and economic impacts from the land acquisition or restrictions on affected persons' use of and access to assets and land by (i) providing compensation for loss of assets at replacement cost; and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation and the informed participation of those affected;
- Restore or, where possible, improve the livelihoods and standards of living of displaced persons to pre-displacement levels;
- Improve living conditions among physically displaced persons through the provision of adequate housing, including the security of tenure at resettlement sites.

3.3.2.2. EBRD Guidance on resettlement and good practice

EBRD has issued in 2017 a guidance on resettlement best practices[49], which sets out the process by which the beneficiary can fulfil the requirements of the EBRD PR5 when projects involve resettlement. PR5 is based on the Land Acquisition and Involuntary Resettlement Performance Standard of the IFC Performance Standards[50]. This guidance provides an overview of the resettlement process, discussing planning techniques, and identifying major challenges. It clarifies the role of each principal actor in the resettlement process - the project proponent, the project affected people, and the key stakeholders.

The guidance provides practical advice to face the difficulties that are commonly encountered in the resettlement process, including the following:

- ***Legislative Review:*** Identification of the national regulations dealing with the protection of the most vulnerable groups (e.g. poor people, people lacking legal title of land, ethnic and/or cultural minorities, etc.). The beneficiary must identify the areas in which the national regulations fail to meet the EBRD PR5 applicable standards and attempt to "fill in the gaps";
- ***Census:*** The beneficiary must undertake a census to identify the individuals and households that may be benefiting from the resettlement. Conducting the census too early may necessitate additional or repeated steps as the residents and the economic activities may change over time. Whilst a late census may result in opportunities for some individuals to move onto the land for obtaining benefits from the resettlement process. That is why preparing and undertaking a census requires careful timing;
- ***Socio-Economic Survey:*** Each project and each PAP have their characteristics and therefore it is expected that no two socio-economic surveys will be exactly alike. That is why the guidance suggests the involvement of skilled experts, who should be independent of stakeholders and, wherever possible, locals;
- ***Asset Inventory and Valuation:*** This is the most important and amongst the most difficult issues in the resettlement process. PAPs assets inventory such as informal

48 EBRD Environmental and Social Policy, 2019

49 https://www.ebrd.com/news/2017/ebrd-launches-new-resettlement-guidance-and-good-practice-publication.html

50 IFC Performance Standards on Environmental and Social Sustainability, 2012

housing and/or land are difficult to value using traditional methods of calculation. The guidance recommends considering alternative valuation methods (e.g. the cost of replacing the building materials, the damage to agricultural assets, etc.), and allowing PAPs to select their valuators, where practical. The assets, including affected land, should be rigorously documented, including aerial photography, to avoid attempts by opportunistic individuals to artificially increase their potential benefits;

- ***Livelihood Restoration:*** Once the resettlement has been achieved, the beneficiary must be ensured that the livelihoods of affected people have been correctly restored. The livelihood restoration issues cover more than a simple economic restoration and may involve cultural and familial considerations (e.g. interruption of the passage to school, to agricultural land, etc.). The guideline suggests a combination of providing options to affected people at each step of the process and careful documentation of the beneficiary's efforts and results; and
- ***Importance of appropriate consultations:*** Major impediments to the completion of the project (e.g. problems with the assets inventory, assets valuation, livelihood restoration, etc.) can be avoided by obtaining the opinion of PAPs and stakeholders and involving them to take an active role in shaping the resettlement process.

3.3.3. Gap analysis and regulations/standards to be applied to the proposed project

An analytic gap analysis regarding the standards to be applied during the land acquisition issues is provided in Appendix 3.1. A summarized version of this analysis is given in the table below, while a detailed analysis is given in the LARF (a separate document).

Table 3-16_Gap analysis between national and EBRD requirements

No	National regulations	EBRD standards	Standard to be applied / comment
1	The Albanian law provides regulation only for people having legal rights over the properties and focuses on assets that may be expropriated or temporarily occupied properties for the public interest.	EBRD includes PAP that has formal and/or informal rights.	EBRD standards to be applied
2	The law provides no regulation on restrictions resulting in people experiencing loss of access to physical assets or natural resources	EBRD standards foresee these issues	EBRD standards to be applied; The Consultant will pay special attention to the PAP that may be affected by the land use restriction from the limitation of the unauthorized crossings. Side roads, underpasses, and overpasses will be built to avoid/minimizing land use restriction (e.g. km 104 to km 106, etc.)
3	The law imposes no requirements for avoiding and/or minimizing physical and/or economic displacement;	EBRD standards foresee these issues	EBRD standards to be applied; The Consultant (helped by the affected municipalities) will scrutinize all kind of potential physical and/or economic displacement; Anyway the only physical and/or economic displacement may occur

No	National regulations	EBRD standards	Standard to be applied / comment
			concerning the land surface required for the proposed new freight station of Lezhë; The Consultant will pay special attention to the PAP that may be affected by the land use restriction from the limitation of the unauthorized crossings. Side roads, underpasses, and overpasses will be built to avoid/minimizing economic displacement.
4	A resettlement/ livelihood restoration plan nor the implementation of a socio-economic survey is required by the Albanian legislation in force. The law is also silent regarding consultations with affected persons or informing vulnerable groups	EBRD standards include a careful socioeconomic survey and early consultation with the vulnerable groups	EBRD standards to be applied; However Albanian Law “On EIA” requires a public hearing before the delivery of the Environmental Consent; The Consultant (helped by the affected municipalities) will identify all the affected persons, including vulnerable ones.
5	No specific provision on the compensation of registration costs and transfer taxes is provided	EBRD standards foresee this compensation	EBRD standards to be applied
6	The expropriation law, as amended through Article 19, provides for compensation in cash and in-kind, which was not the case before	EBRD standards include physical compensation	EBRD standards to be applied; The land surface required for railway line improvement may be compensated by the land surface being free from railway line relocation; The land surface required for the proposed new freight station of Lezhë may be compensated in cash (at the free market price) and therefore the landowner may buy agricultural land.
7	Public consultations are not required before expropriation. Only those having formal legal rights over the affected properties are consulted once the expropriation process has initiated	EBRD standards apply to all the PAP at the early stages of the project development	EBRD standards to be applied to this category of PAP; However Albanian Law “On EIA” requires a public hearing before the delivery of the Environmental Consent; The Consultant (helped by the affected municipalities) will scrutinize all kinds of claims on the ownership of the affected land surfaces.
8	Relocation costs and assistance for vulnerable groups are not foreseen	EBRD standards apply to all PAP	EBRD standards to be applied to this category of PAP;

No	National regulations	EBRD standards	Standard to be applied / comment
	by the Expropriation law, however, homeless persons are entitled to social welfare assistance		However, no homeless persons are affected by the Project; No relocation is needed for the proposed project; Anyway, the Consultant (helped by the affected municipalities) will scrutinize all potential impacts on the vulnerable groups.
9	Consultation of communities regarding the loss of public amenities is not provided	EBRD standards include the loss of public amenities	EBRD standards to be applied to this category of PAP; The Consultant has already taken into consideration this issue. Side roads, underpasses, and overpasses will be built to resolve this issue.
10	The law does not apply to those who have a claim to land that is recognized or recognizable under national laws and those who have no recognizable legal right or claim to the land. Furthermore, those belonging to these categories are not entitled to any compensation or livelihood restoration assistance (except social housing)	EBRD standards apply to all PAP	EBRD standards to be applied to this category of PAP; The Consultant will pay special attention to the PAP that may be affected by the land surface required for the construction of the proposed side roads, underpasses, overpasses, and the proposed new freight station in Lezhë.
11	No requirements for the monitoring of the expropriation process are provided	Monitoring of the expropriation process is required	EBRD standards to be applied

3.4. Other regulations/standards relevant to the proposed project

3.4.1. National regulations

In addition to the regulations/standards/guidelines mentioned in the text above, other relevant environmental regulations relevant to the Project include the following:

- Law No. 10431/2011, “On environmental protection”, amended by Law no. 31/2013;
- Law No. 10440/2011, “On environmental impact assessment”;
- Law No. 119/2014, “On the Right of Information”;
- Law No. 146/2014, “On Public Informing and Consultation”;
- Law No. 81/2017, “On the protected areas”;
- Law No. 9587/2006 “ On the protection of biodiversity”, as amended;
- Law No. 10006/2008 “On the protection of wild fauna”;
- DCM No. 683/2005 “On Declaring Albanian part of Shkoder Lake as a Ramsar site”;

- DCM No. 684/2005 "On Declaring Albanian part of Shkoder Lake as a Nature Managed Reserve";
- Minister of Environment order No. 815/2012 "On approval of the Management Plan on the Nature Managed Reserve of Shkoder Lake";
- Law No. 8897 dated 16.05.2002, "On air protection from pollution" as amended by Law no. 10266/2010, Law no. 10448/2011 and Law no. 28/2013;
- Law No. 9774/2007, "On the assessment and administration of noise in the environment", amended by Law no. 39/2013;
- Law No. 111/2012, "On integrated management of water resources";
- Law No. 8905/2002, "On protection of the marine environment from pollution and damage" amended by Law no. 10137/2009 and Law no. 30/2013;
- Law No. 10463/2011, "On integrated waste management", as amended by Law no. 32/2013;
- Law No. 10463/2011, "On integrated management of solid waste", amended by Law No. 32/2013 and Law no. 156/2013;
- Law No. 9548/2006, "On the accession of the Republic of Albania to the protocol on the records of discharge and transfer of contaminants of the Aarhus convention on the public right for environmental information, its participation in decision making and to address the court on environmental issues";
- Law No. 8672/2000 on ratification by the Albania of the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention);
- Law No.10237/2010 "On occupational safety and health", as amended;
- DCM No. 564/2013 on the approval of the Regulation "On Minimum Requirements for the Safety and Health at the Workplace";
- Law No.5/2014 On safety and health in construction";
- Law No. 9048/2003, "On cultural heritage" as amended by Law No. 9592/2006, Law No. 9882/2008 and Law 10137/2009;
- Law No. 9244/2004, "On protection of agricultural land", as amended by Law no. 69/2013 and Law 131/2014;
- Law No. 9385/2005, "On forests and forest service", as amended by Law no. 38/2013;
- Law No. 107/2014, "On territory planning and development", and respective secondary legislation;
- Law No. 93/2015, "On tourism".

3.4.2. Relevant international multilateral agreements

The most relevant multilateral agreements, in which Albania is part, and which are related to the project activities include:

- UN Convention on Wetlands of International Importance – Ramsar Convention, (Ramsar, Iran, 1971);

- Convention Concerning the Protection of the World Cultural and Natural Heritage – UNESCO World Heritage Convention (Paris, 1972);
- CITES Convention on Trade in Endangered Species of Wild Flora and Fauna (1975);
- Barcelona Convention for the Protection of the Mediterranean Sea against Pollution (Barcelona, Spain,1976);
- UN Convention on the Conservation of Migratory Species of Wild Animals – CMS (Bonn, Germany, 1979);
- Convention of the Conservation of European Wild Life and Natural Habitats – Bern Convention (Bern, Swiss, 1982);
- UN Framework Convention on Climate Change – UNFCCC (New York, USA, 1992);
- Kyoto Protocol to the UN Framework Convention on Climate Change (Kyoto, Japan, 1997);
- UN Convention on Biological Diversity – CBD (Rio de Janeiro, Brazil, 1992);
- UNECE Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), signed in Espoo, Finland, in 1991 and entered into force in 1997
- UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters- Aarhus Convention (Aarhus, Denmark, 1998);
- ILO Convention C155 “On Occupational Safety and Health”, 1981 - ratified on Feb. 2004;
- ILO Convention C167 “On Safety and Health in Construction”, 1988 - ratified on April 2016
- ILO Convention C187 “On Promotional Framework for Occupational Safety and Health”, 2006 - ratified on April 2016

3.5. Key requirements on ESIA study deliverables

ToR requires the ESIA study deliverables to be as follows:

- ESIA Scoping report;
- ESIA report;
- ESIA non-Technical summary;
- LARF;
- SEP;
- ESAP; and
- ESPM

Amongst the above documents, the ESIA scoping report, the LARF, and the first draft of SEP are already prepared during the scoping stage. The beneficiary and EBRD gave their non-objection to these documents in November 2019.

The sections hereinafter highlight the requirements on the other documents listed above.

3.5.1. ESIA report

3.5.1.1. ESIA report content

This section aims to highlight the key requirements on the content of the ESIA report, as provided in the EU EIA Directive (Annex IV) and the Albanian DCM 686/2015 "On the rules, responsibilities, and timelines for the environmental impact assessment procedure and the procedure for the transfer of the environmental declaration". It should be stressed that this DCM fully complies with the EIA Directive 2014/52/EU. DCM 686/2015 requires the ESIA report to include the following:

1. A description of the project, including in particular:
    a. Location of the project;
    b. Physical characteristics of the project, including, the land-use requirements;
    c. Main characteristics of the operational phase of the project, including materials and natural resources, used;
    d. Estimation of expected residues and emissions (water, air, soil and subsoil pollution, noise, vibration, radiation) and waste produced.
2. Project's alternatives (in terms of design, technology, location, size, and scale), and the reasons for selecting the chosen option, including an environmental comparison.
3. Baseline information and an outline of the likely evolution thereof without the implementation of the project as far as natural changes from the baseline scenario can be assessed based on the availability of environmental information.
4. Description of the environmental receptors: population, human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage, and landscape.
5. Description of the likely significant effects of the project on the environment resulting from, inter alia:
    a. the construction works, including, where relevant, demolition works;
    b. the use of natural resources (e.g. land, soil, water, and biodiversity);
    c. the emission of pollutants, noise, vibration, radiation, etc., and the disposal and recovery of waste;
    d. the risks to human health, cultural heritage, or the environment (for example due to accidents or disasters);
    e. the cumulating of effects with other existing and/or approved projects;
    f. the impact of the project on climate change;
    g. the technologies and the substances used.

    This description should take into account the environmental protection objectives established at Union or Member State level that are relevant to the project.
6. The impacts assessment methodology, including details of difficulties.
7. Description of the mitigation measures (to avoid, prevent, reduce, and/or offset any adverse effect), and, where appropriate, of any proposed monitoring arrangements.
8. Expected adverse environmental effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned.
9. A non-technical summary of the information provided under points 1 to 8.
10. A reference list detailing the sources used for the descriptions and assessments included in the report.

Appendix 3.2 of this document outlines the indicative content of the ESIA report, as required by the national and EU regulations and the EBRD standards.

3.5.1.2. ESIA scoping matrix

In addition to the issues included in the indicative content of the ESIA report, the Consultant will also take into consideration the likely impacts on the environmental receptors included in the Scoping matrix that was prepared during the scoping stage. This matrix is revised in accordance with the stakeholders' (MIE, HSH, EBRD, and JASPERS) comments on the ESIA Scoping report package.

The scoping matrix is given in Appendix 3.3 of this document.

3.5.1.3. Impacts assessment methodology

The approach and methodology for impacts assessment are based on the EU "Guidance on EIA51" and GIP, as well as on the previous experience of the ESIA team on similar projects in Albania. It should be underlined that the Albanian DCM 912/2015 "On national EIA methodology52" fully complies with the EIA Directive. Thus, the used methodology complies with both the national and EU requirements.

Details on the used methodology are given in chapter 4 "Impacts assessment methodology"

3.5.1.4. Quality of the ESIA report

Box 19 of the EU "Guidance on EIA" provides for the characteristics that a good EIA Report should have to meet its objectives. These characteristics are as follows:

- A clear structure with a logical sequence of the issues described in the report;
- A table of contents at the beginning of the document;
- A description of the Development Consent procedure and how EIA fits within it;
- Reads as a single document with appropriate cross-referencing;
- Is concise, comprehensive,, and objective;
- Is written impartially without bias;
- Includes a full description and comparison of the Alternatives studied;
- Makes effective use of diagrams, photographs, and other graphics to support the text;
- Uses consistent terminology with a glossary;
- References all information sources used;
- Has a clear explanation of complex issues;
- A good description of the used methods for the studies of each environmental factor;
- Covers each environmental factor in a way, which is proportionate to its importance;
- Provides evidence of effective consultations;
- Provides a basis for effective consultations to come;
- Commits to mitigation (with a program) and monitoring;
- Contains a Non-Technical Summary, which does not contain technical jargon;
- Contains, where relevant, a reference list detailing the sources used for the description and assessments included in the report.

51 https://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf

52 http://mjedisi.gov.al/wp-content/uploads/2018/09/VKM-912-2015.pdf

3.5.2. ESIA Non-Technical Summary

ToR, national and EU regulations and EBRD standards require the preparation of a Non-Technical Summary that should be understandable to stakeholders and the public. Its preparation is based on the EU "Guidance on EIA53", which provides that such a summary should fulfil the following characteristics:

- To be written in non-technical language, avoiding detailed information and discussion;
- To be comprehensible to a lay member of the public;
- To be easily identifiable within the EIA Report

While the content of the Non-technical Summary should be focused on the following:

- To explain the role of the EIA in the Development Consent process;
- To provide a concise and comprehensive description of the Project, the baseline information, the likely environmental effects, and the proposed Mitigation Measures, and monitoring arrangements;
- To highlight any significant uncertainties about the Project and its environmental effects;
- To provide an overview of the approach to the assessment

3.5.3. Land Acquisition and Resettlement Framework

ToR, national and EU regulations, and EBRD standards require the preparation of a LARF and a LARP to address the land acquisition and resettlement issues. LARF and LARP are prepared as stand-alone documents. LARF is prepared during the scoping stage and is part of the ESIA scoping report package. LARF is updated during the Preliminary Design and Detailed Design. The update includes the land surface required for service roads and Lezhë new station.

The key law regulating expropriation and governing the land acquisition process for the Project is Law 8561/1999 on "Expropriation and Temporary Takings of Private Property for a Public Interest", as amended (Expropriation Law) that is complemented by several DCMs, guidelines, and regulations.

EBRD's PR 5 (Land Acquisition, Involuntary Resettlement, and Economic Displacement)54 address the land acquisition and resettlement issues

3.5.3.1. Land Acquisition and Resettlement Framework

The LARF outlines the general principles, procedures, and entitlement framework concerning the potential impacts of land acquisition, required for the Project, in compliance with the national laws and EBRD requirements.

The LARF serves as additional guidance to bridge any gaps between the national legislation and the EBRD requirements related to land acquisition and livelihood restoration.

The preparation of the LARF is based on both the Albanian Expropriation Law and EBRD PR 5 (see section 3.5.3 above).

3.5.3.2. Land Acquisition and Resettlement Plan

53 EU "Guidance on EIA" (2017), Box 41

54 EBRD Environmental and Social Policy, 2019

The LARF serves as a basis for the development of a detailed LARP, which is developed once the exact nature and magnitude of the land acquisition or restrictions on land use related to the Project are known. The LARP provides more details on the Project Affected People (PAP), the eligibility criteria, and the procedures to be applied for the Project in line with the LARF and in compliance with the national laws (wherever applicable) and EBRD PR5.

The preparation of the LARP will be based on the EBRD PR5 and the EBRD "Guidance on resettlement best practices" (2017[55]), as well as on the national legislation. Between EBRD and the national regulations, the most stringent will be applied.

The key objectives of LARP include:

- Provide compensation for loss of assets at replacement cost;
- Ensure that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of the affected communities;
- Improve or restore the livelihoods and standards of living of displaced persons to pre-project levels, to facilitate sustainable improvements to socioeconomic status; and
- Pay particular attention to the needs of vulnerable groups.

An approach to LARP, include:

- Comprehensive description of the project including the land/easement to be acquired;
- Legal framework and legal procedures of private land/easement acquisitions;
- Measures to avoid and minimize physical and economic displacements;
- Comprehensive assessment of the impacts of the economic displacement;
- Entitlement matrix that identifies the type of impact from land and easement acquisition and provides detailed guidance on stakeholder's compensation;
- Detailed cost estimate for identified items based on the principle of replacement cost;
- Organizational responsibilities for the expropriation process;
- Stakeholder Engagement Plan, which outlines the principle of consultations during the expropriation process.
- LARP Disclosure, which outlines procedures and timeline to disclose draft and final plan as well as monitoring reports at local level;
- Grievance Mechanism for addressing complaints, including the judicial recourse;
- Evaluation of the quality, outcomes and stakeholders' satisfaction;
- Monitoring the participatory performance to ensure on the objective information

55 https://www.ebrd.com/news/2017/ebrd-launches-new-resettlement-guidance-and-good-practice-publication.html

3.5.4. Stakeholders Engagement Plan

ToR endorsed by EBRD requires the preparation of Stakeholders Engagement Plan, as a stand-alone document. SEP reflects the communication and consultation approach with the identified stakeholders throughout the whole project development stages. Albanian regulations require the public consultation to be documented, but these requirements are less stringent than the EBRD ones (see Appendix 3.1 of this document). Thus, the SEP is prepared in accordance with the EBRD requirements.

EBRD PR 10 "Information disclosure and Stakeholders Engagement" provides for the characteristics and objectives of an appropriate SEP. According to this PR, Stakeholder engagement involves the following elements:

- stakeholder identification and analysis;
- stakeholder engagement planning;
- disclosure of information;
- meaningful consultation, implementation of a grievance mechanism; and
- on-going reporting to relevant stakeholders.

The grievance mechanism is based on the EBRD Guidance note on "Grievance Management[56]".

The Stakeholders Engagement Plan is developed as a separate report that is part of the ESIA report package. The SEP will be improved during the ESIA disclosure and information, once the ESIA report will be sent to the Ministry of Tourism and Environment for obtaining the environmental permit.

3.5.5. Environmental and Social Management System

To integrate the implementation of the environmental and social requirements into the project development phases, the beneficiary (HSH) should establish and maintain an Environmental and Social Management System (ESMS), which should be "*commensurate to the environmental and social risks and impacts of the project in a manner consistent with the relevant PRs[57]*"

The preparation of the ESMS is based on the findings of the environmental and social assessment process and the stakeholders' concerns. It addresses the identified project's environmental and social impacts and issues and other performance improvement measures to meet the required lender (EBRD) standards. Besides, the ESMS should comply with the national and EU requirements.

According to the provisions of the ToR and Inception Report, endorsed by EBRD, the Consultant will prepare the following:

- An Environmental and Social Action Plan (ESAP), which will reflect the requirements of the EBRD PRs; and
- An environmental and social management plan (ESMP), which will be based on the provisions of the EBRD PRs, national[58] and EU regulations[59] and guidance[60], and good international practice.

56 https://www.ebrd.com/downloads/about/sustainability/grievance-mechanism.pdf

57 PR1 of EBRD ESP, 2019

58 Law 10440/2011 "On EIA", as amended on 2015, Article 9 (dh)

3.5.5.1. Environmental and Social Action Plan

The Environmental and Social Action Plan (ESAP) describes the key actions (or mitigation strategies/measures) to be undertaken by the beneficiary (HSH) during the Project's implementation phases to ensure the required environmental and social standards are met. ESAP includes also a timeline for implementing these corrective actions, as well as the related standards for each of them.

As stated above, the ESAP on the proposed project will be based on the EBRD PRs.

3.5.5.2. Environmental and Social Management Plan

The ESMP is a framework plan that is developed in order for the Beneficiary (HSH) and the project implementation Contractors to be provided with the necessary regulations/standards to be followed for reaching the ESAP purposes.

The ESMP is based on the ESAP and the ESIA study. As such, it should comply with the EBRD PRs and the national and EU regulations.

The main national regulations applicable to ESMP are the DCM 912/2015 "On the EIA methodology", which requires the preparation of a monitoring program, and the Law 10431/2011, "On Environmental Protection" (article 41) that provides for the parameters/environmental receptors to be monitored during a project development stages.

The ESMP is composed of a set of management plans, which aim to address the management of the main impacts resulting from the ESIA study. The Beneficiary and/or Contractor(s) should detail each of these plans later, before the construction stage.

Table below gives the list of the topic-specific plans included in the ESMP.

Table 3-17_List of topic-specific sub-plans proposed by the Consultant

No	Topic-specific sub-plan	Comment
1	Stakeholders Engagement Plan	
2	Land Acquisition and Livelihood Restoration Framework	Standalone document
3	Resettlement Plan	Standalone document
4	Social and Environmental Investment Plan	Already taken into consideration in the Project's design. Therefore there is no need for this Plan.
5	Erosion and Sedimentation Control Plan	
6	Topsoil Management Plan	
7	Water Management Plan	
8	Watercourse Crossing Plan	
9	Biodiversity Action Plan	
10	Infrastructure and Utilities Management Plan	

59 EU Directive 2014/52 "On EIA"

60 EU "Guidance on EIA" (2017), box 37

No	Topic-specific sub-plan	Comment
11	Traffic Management Plan	
12	Landscape Management Plan	
13	Cultural Heritage Management Plan	
14	Construction Material Management Plan	
15	Waste Management Plan	
16	Pollution Prevention and Response Plan	
17	Community Health and Safety Management Plan	
18	Occupational Health and Safety Management Plan	
19	Labour and Working Conditions Management Plan	
20	Supply Chain Management Plan	
21	Emergency Response Plan	
22	Security Management Plan	

The main lines of each of these management plans are described in the ESMP - separate document.

The only protected area close enough or crossed by the railway line is the Shkoder Lake NMR – Nature Park (Category IV of IUCN).

From km 113+700 to km 135+700, the railway crosses the sustainable use zone (category VI of IUCN protection status) of the Shkoder Lake NMR. It should be stressed that the core zone and the habitat/species management zone that belong to IUCN categories II and III, respectively, are located far away from the railway line. The characteristics of the sustainable use zone crossed by the railway line are as follows:

- Km 113+700 to km 119+300: the railway runs through arable land and rural settlements near the motorway, which serves as a NMR terrestrial border;
- Km 119+300 to km 132+600: the railway runs through arable land and rural settlements; and
- Km 132+600 to km 135+700: the railway runs through a shrubby area that is already defragmented from the following:
    - The railway line, which runs in a northward direction;
    - Three local roads that runs generally perpendicularly to the railway line. Each of them crosses an authorized level crossing;
    - Some plots of arable land and pastures
- The railway crosses three streams (Rrjolli, Banushi and Perroi Thate), which beds have water only during rainfalls, covered of gravel and therefore without vegetation.

Based on the above, the topic-specific Biodiversity Action Plan will pay special attention to the crossing of the shrubby area from km 132+600 to km 135+700.

BAP aims to protect the existing biological environment and restore the affected local biodiversity once the construction activities are performed. It identifies and describes the ways, actions and means needed for its implementation. In addition, BAP defines the time, resources and responsibility to accomplish these needs.

The main elements of a Biodiversity Action Plan include:

- Audit, to review the condition of the local biodiversity;
- Objectives, to focus actions on precise targets;
- Priorities, to optimize the available resources;
- Action plans for species and habitats, to list and describe all actions to be implemented on natural components;
- Monitoring and review arrangements, to keep track of how the targets are progressively met and to adapt the actions to changing conditions.

As part of this exercise, a consultation process will be undertaken with key stakeholders, including the Ministry of Tourism and Environment (MoTE), NAPA, RAPA Shkoder, and local community representatives.

ESIA study package for obtaining the Environmental Declaration

3.5.6. ESIA study package content

The ESIA Study package for obtaining the Environmental Declaration includes the following61:

1. Full EIA Report;
2. Non-Technical Summary;
3. Technical Report;
4. Information on the public information and consultations; and
5. Payment bill.

3.5.7. Administrative procedure and timing

Starting from January 2020, the request for the environmental permit shall be done electronically via the government portal e-Albania62. The necessary documentation and timing are based on the DCM 686/2015, as amended in 2019.

The Environmental Declaration is valid only for two years. If the construction does not start within two years after the delivery of the Environmental Declaration, the ESIA process must restart from the beginning.

Appendix 3.4 of this document provides the list of the documentation required for delivering the Environmental Declaration.

3.6. Construction permit and Environmental Declaration

Given that the project area covers the territory of seven municipalities, the construction permit for the proposed project needs to be approved by the National Council of Territory Planning (NCTP), which is led by the Prime Minister. The necessary documents are the Environmental Permit and the approval from the National Agency of Territorial Planning (NATP).

Article 39(1) of Law 107/2014, "On Territory Planning and Development", as amended, states "*a Construction permit is required for any construction, repair, restoration or demolition of existing buildings, installation or building of temporary constructions, except for the cases provided by Article 41 of this Law*".

Both the EIA Law and CMD 247/2014 are in line with the EIA Directive, while CMD 598/2015 is aligned with the Espoo Convention63.

In addition, given the potential transboundary impact of the project, which extends to the border with the Republic of Montenegro, the Espoo (EIA) Convention on Environmental Impact Assessment in a Transboundary Context, which Albania has ratified in 1991, applies to the Environmental Impact Assessment process..

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61 DCM 686/2015, Chapter II

62 https://e-albania.al/eAlbaniaServices/UseService.aspx?service_code=13278

63 UNECE Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) available at https://treaties.un.org/doc/Treaties/1991/02/19910225%2008-29%20PM/Ch_XXVII_04p.pdf

This convention sets out the obligations of Parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of States to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across boundaries.

The convention states out that:

- The Party of origin shall ensure that in accordance with the provisionof this Convention an environmental impact assessment is undertaken prior to a decision to authorize or undertake a proposed activity that is likely to cause a significant adverse transboundary impact, and
- Environmental impact assessments as required by this Convention shall, as a minimum requirement, be undertaken at the project level of the proposed activity. To the extent appropriate, the Parties shall endeavour to apply the principles of environmental impact assessment to policies, plans and programmes.

4. Impacts Assessment Methodology

The approach to the ESIA study includes a general approach for structuring the ESIA report and the adopted methodology for impacts evaluation.

There are some strong relationships between the environmental standards, the project's components and activities, the land use requirements, and the general approach to be followed for such studies.

4.1. General approach

The approach used for assessing the potential impacts is summarized below, and it includes more specifically the following steps:

- Defining the project's area; outlining the project's specific technical interventions and the related environmental and social impacts;
- Consultations with the affected municipalities and other relevant stakeholders;
- Describing the baseline information;
- Defining the environmental and social impacts that will be taken into consideration;
- Evaluating the significant potential environmental and social impacts.

4.2. Assessment of Impacts

For comparing the considered railway line spatial alternatives/options from the environmental and social point of view, it is necessary to assess the main potential impacts of the Project on the affected environmental and social receptors.

4.2.1. Factor influencing the significance of impacts

Impacts are evaluated in terms of "significance", which assessment "*relies on informed experts' judgments about what is important, desirable or acceptable with regards to changes triggered by* the *Project in question. These judgments are relative and must always be understood in their context*[64]", as given in the following box.

Box 4.2_Experts' judgment to changes triggered by a project

Box 4.1_Experts judgment concerning changes triggered by a project
- *They are value-dependent: while judgments are, in most cases, informed by scientific data (e.g. regarding the type of impact being examined), they are subjective to some degree as they are the opinion of one practitioner or by a team of practitioners. Experts' judgements vary, depending on the perspective (legal or institutional recognition, political or public recognition), deemed to be important professionally;*
- *They are context-dependent: judgments are made within the socio-cultural, economic, and political contexts of a Project. A thorough understanding of contextual factors (e.g., local ecological, social, and cultural conditions, judgments in related decision-making areas), likely to influence judgments' significance, is essential when identifying a Project's impact on the environment.*

64 http://ec.europa.eu/environment/eia/pdf/EIA_guidance_Scoping_final.pdf

The assessment methods should define clear thresholds or criteria for determining whether an impact is significant, based on the characteristics of an impact, in a clear manner.

4.2.2. Formal considerations and guidelines

As per the EU and Albanian regulations, the evaluation of impacts' significance must be based on the criteria set out in points 1 and 2 of Annex III (3) of EIA Directive[65], as well as in points 1 and 2 of Annex I of DCM 686/2015[66], concerning the impact of the project on the factors specified in Article 3(1) of the EIA Directive and Annex I (3) of this DCM, considering:

a. The magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected);
b. The nature of the impact;
c. The transboundary nature of the impact;
d. The intensity and complexity of the impact;
e. The probability of the impact;
f. The expected onset, duration, frequency, and reversibility of the impact;
g. The cumulating of the impact with the impact of other existing and/or approved projects;
h. The possibility of effectively reducing the impact.

Once evaluated, the potential impacts should be dealt with a mitigation strategy, which will aim at minimizing and reducing the likely adverse effects and, whenever possible, enhancing the positive environmental effects of the project. The principles of mitigation, including their hierarchical setup, follow four steps:

1. Preference for avoidance and prevention;
2. Cancellation;
3. Mitigation; and
4. Remedial/Compensation

The table below describes the hierarchy of mitigation strategy.

Box 4.3_Hierarchy of mitigation[67]

Box 4.2_Hierarchy of mitigation strategy
Avoidance measures: These are intended to stop or prevent effects from occurring, or to eliminate (completely remove or get rid of) the risk of them occurring, perhaps by relocating a project away from a sensitive area, or removing from a project the element that may cause an adverse effect. Successful avoidance measures mean there will be no adverse effect. E.g., Avoid the risk of polluting groundwater that might affect the health of local water consumers by avoiding the design and construction of the underpasses over recharge areas (e.g. recharge area of Mati gravelly aquifer at km 55+500 to km 56+650).
Cancellation measures: Are intended to completely neutralize or fully negate the adverse nature of

65 http://ec.europa.eu/environment/eia/eia-legalcontext.htm

66 http://www.qbz.gov.al/botime/fletore_zyrtare/2015/PDF-2015/145-2015.pdf

67 Adopted from "Environmental Impact Assessment Handbook". Scottish Natural Heritage. 2018

Box 4.2_Hierarchy of mitigation strategy
effects. There will be an effect, but its negative outcomes will be cancelled out. E.g. Increasing the vertical alignment of the railway in some sections affected by flash floods (e.g. north of Lezhë town, from km 69+000 to km 75+000) will cancel the source of inundation of the railway in periods of heavy rainfalls.
Mitigation/reduction measures: These are intended to make effects smaller or less in amount, degree, size, or likelihood, either by reducing the effect itself, or the likelihood of it occurring, or both. These measures may so reduce the adversity of the effect, or they become so unlikely, that they are no longer of concern. There will, nevertheless, be a residual effect, it may be necessary to check that the residual effects of one proposed change do not exacerbate the effects of others, by way of cumulative, combined, or synergistic processes***.*** E.g. the designing of new drainage channels and additional culverts alongside the railway within the sections affected from flooding in case of heavy rainfalls (e.g. km 32+000 to km 35+000, etc.) will reduce the risk of inundation of the nearby agricultural land and therefore the railway will no more serve as an embankment that impedes draining.
Remedial/Compensation: In the environmental assessment, these measures are only taken into account after a decision has been made. They are intended to at least try to recompense, or otherwise make up for, or offset, the adverse effects of a proposed change that could or would occur and would be of concern. Thus, an important negative effect is anticipated and environmental loss or harm is likely to occur. However, it has been decided that the project should nevertheless go ahead, and the compensatory measures try to make amends. The objective should be that the recompense is made in time to make good the environmental benefit or function that would be affected. E.g. remedial of the vegetation cleaned/damaged during construction work across the shrubby area in the north of Bajze station (km 132+700 to km 140+000); Compensation of the landowners for the land surface necessary for the construction of the proposed new freight station of Lezhë.

4.2.3. Practical considerations

Common criteria for evaluating the significance include the magnitude of the predicted impact and the sensitivity of the receiving environment that should be understood as given in the following box68:

Box 4.4_Magnitude and sensitivity of the predicted changes triggered by a project

Box 4.3_Magnitude and sensitivity of changes caused by a project
Magnitude *considers the characteristics of the change (timing, scale, size, and duration of the impact), which would probably affect the target receptor as a result of the proposed Project;* ***Sensitivity*** *is understood as the sensitivity of the environmental receptor to change, including its capacity to accommodate the changes the Projects may bring about.*

Magnitude defines how large of an impact there might be. Magnitude reflects the area of land and the amount of a particular resource or the number of people being impacted.

68 http://ec.europa.eu/environment/eia/pdf/EIA_guidance_Scoping_final.pdf

Figure 4-31 below, taken from the best experience, shows the impact's significance as a function of the magnitude and the sensitivity.

Hereinafter are described as the factors that help to evaluate the magnitude and the significance of impacts.

Table 4-18_Factors influencing the impacts' magnitude

Factor	Description
Quality (direction) of impact	
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change. E.g., the rehabilitation of the railway will positively affect the passengers and freight circulation and therefore will enhance the economic situation at the country level.
Negative	Impacts that are expected to cause an adverse change from the baseline, or to introduce any new undesirable factor (e.g. invasive species)
Timing (period)	
Preconstruction and Construction	The impact may occur as a result of preconstruction and construction activities
Operation	The impact may occur as a result of operational activities
Reinstatement	The impact may occur as a result of reinstatement activities
Nature (type) of impact	
Direct	Impacts that result from a direct interaction between planned project activity and the receiving environment/receptors (e.g. between the occupation of a site and the pre-existing habitats or between wastewater discharge and the receiving water body).
Indirect	Impacts caused by other activities, which result as a consequence of the Project development (e.g. employment increase within the project area as e result of the reconstruction of the railway – the increase of the employment will enhance the life quality)
Secondary	Impacts (mainly socioeconomic ones) may occur at a point in space or time that is removed from both direct and indirect impacts.
Cumulative	Impacts that act together with other impacts resulting from other plans/projects in the same project area or the same sector (e.g. noise from the reconstruction of the railway and the Adriatic-Ionian highway)
The spatial extent of the impact	
Working site	Impacts are limited to the spatial boundaries of the development site.

Factor	Description
Local/ Moderate	Impacts affect a large area (e.g. several kilometres square) around the development site (e.g. the improvement of the railway line horizontal alignment affects an area of several km long).
Regional	Impacts affect regionally environmental resources or are experienced at a regional level as determined by administrative boundaries, habitat type/ ecosystem, etc. (e.g., the pollution of the Mati River gravelly aquifer may affect the drinking water quality of the area between Mati River and Durrës city).
National	Impacts affect environmental resources that extent at a national scale or affect nationally important areas / or have macro-economic consequences (e.g. Shkoder Lake Protected Area is important at a national level; the improvement of the railway transport will have positive economic impacts at a national level).
Duration of impact	
Temporary	Impacts are temporary and of short duration (e.g. during some construction activities) or occasional.
Short term	Impacts last only during the construction period.
Medium-term	Impacts last after the construction period, but cease in course of the operation stage (e.g. rehabilitation of the vegetation that has been cleared for the opening of temporary road access).
Long term	Impacts continue for the life of the Project, but ceases when the project stops operating (e.g. positive impact of the Project on the economic situation at the country level continue as long as the railway Vorë – Hani Hotit will be operational)
Permanent/ irreversible	Residual change in the affected receptor or resource (e.g. destruction of an ecological habitat; or use of blasting for opening any site construction over hard limestone rocks) that lasts during the whole operation phase and/or beyond the project lifetime.
Intensity of impact	
Intensity describes the physical dimension of development. Depending on the type of impact, intensity can often be measured with various physical units and compared to reference values, such as the decibel (dB) for sound[69], etc.	
The intensity of impact can also be considered in terms of sensitivity of the environmental or social receptor (e.g. habitats, species or communities; water resources, vulnerable people, archaeological sites/objects, etc.).	
Probability of occurrence/ Likelihood of impact	

69 http://ec.europa.eu/environment/eia/pdf/EIA_guidance_Scoping_final.pdf

Factor	Description
Unlikely to occur	Impacts have a very low chance of occurring now or in the future. E.g. Estimated less than 95% chance of impact occurring (e.g. leakage of oil from dredging engines during construction period)
Likely – possibly will occur	The impact is likely to occur under most conditions. E.g. Estimated from 5% to 95% chance of the impact occurring
Definite – Probably will occur	The impact will probably occur. E.g. Estimated greater than 95% chance of the impact occurring

The two successive tables below give a characterization of the environmental and social impacts in terms of intensity70.

Table 4-19_ Characterisation of potential nature impacts in terms of intensity

Intensity of impact	Description
Bio-physical receptors	
Negligible	Impacts are not detectable
Low	Impacts will neither destabilize nor modify any important attribute of the environmental receptor
Moderate	Impacts are sufficient to modify important attributes of the receptor but not to destabilize it
High	Impacts are noticeable and sufficient to destabilize the environmental receptor, which natural functions will temporarily or permanently cease.

While the intensity of the socioeconomic receptors can be considered in terms of the ability of affected people/communities to adapt to changes that may be caused by the development, as showed in the table below.

Table 4-20_Characterisation of potential socio-economic impacts in terms of intensity

Intensity of impact	Description
Socioeconomic receptors	
Negligible	There is no perceptible change to people’s livelihood and/or life's conditions.
Low	People/communities can adapt easily and maintain pre-impact livelihoods and/or life's conditions.

70 Source: Environmental Resources Management (ERM)

Intensity of impact	Description
Moderate	The affected people/communities can adapt with some difficulty and to maintain pre-impact livelihoods and/or life's conditions, but only with some support.
High	The affected people/communities will not be able to adapt to changes or to continue to maintain-pre impact livelihoods and/or life's conditions.

Where appropriate, national, and/or international standards are to be used as a measure of quantification or semi-quantification of the receptors' intensity. In other cases, specialist studies should try to quantify this intensity and outline the necessary reasoning.

In the case of cultural or natural heritage, the international/national/local protection status and /or the conditions of the site/object may serve as a means to evaluate the intensity.

For some issues (e.g. air quality, water quality, etc.), formal standards are used to determine the quantification or semi-quantification of the receptors' intensity. For other issues (e.g. biodiversity, etc.), professional judgment on a case-by-case basis is used.

Concerning social issues, vulnerable people (e.g. minorities, women, children, unemployed persons, etc.) can serve as an indicator of the intensity.

The criteria for defining the intensity and magnitude of impacts depend also on the Project elements (components, activities, land use aspects).

As magnitude considers the characteristics of the change, which would probably affect the target receptor because of the proposed Project, it can be said that the magnitude is a function of both the intensity and the likelihood, as shown in the table below.

Table 4-21_Magnitude of impact in the function of intensity and probability of occurrence

		Likelihood		
		Unlikely	**Likely**	**Definite**
Intensity of impact	**Negligible**	Negligible	Negligible	Low
	Low	Negligible	Low	Low
	Moderate	Low	Moderate/medium	Moderate/medium
	High	Moderate	High/Large	High/Large

Impacts characterization depends also on the socio-cultural, economic, and political context of a project*, including judgments in related decision-making areas71.* Thus, in addition to the magnitude, impact characterization should take into account the stakeholders' concerns.

The stakeholders' concerns are linked overall with the purpose and the project's objectives and therefore are related to the positive socio-economic and environmental impacts at the local, national, and trans-boundary levels. On a smaller scale, these concerns are linked to the potential negative effects on the local population directly affected by the project.

The table below gives an indicative characterization of both magnitude and stakeholders' concerns.

71 http://ec.europa.eu/environment/eia/pdf/EIA_guidance_Scoping_final.pdf, Box 20

Table 4-22: Characterisation of potential impacts in terms of magnitude

Magnitude and stakeholders concern	Description
Negligible	The size of the affected geographical area is negligible; The impact is not significant in the context of the stakeholder and the formal standards; The impact is of short duration, reversible, and practically imperceptible; No mitigation is required.
Small/Low	The affected geographical area is of small size (working site to local); The impact is within the accepted standards (with or without mitigation); The impact is of short to medium term duration and reversible; No further action is required if it can be controlled by adopting normal good working practices
Medium/Moderate	The affected geographical area is of medium/moderate size (local to regional); The impact exceeds accepted limits and thresholds; The impact is of medium to long term duration and therefore not reversible; The impact is likely or probable/definite; Mitigation measures are required
Large/High	The affected geographical area is large /national /international); The affected receptor is of high importance (national /international) for stakeholders; The impact exceeds accepted limits and thresholds; The impact is long term to permanent; Impact is probable/definite; Mitigation/compensation measures are required

While the impact magnitude is determined mostly by empirical prediction, the determination of the sensitivity involves more subjective judgments in terms of how a certain environmental receptor is valued in society. Some discretion from the environmental and/or social expert is, therefore, required in assigning different weights to the criteria.

The following table gives some criteria that help in determining the characterization of the sensitivity of a receptor.

Table 4-23_Description of the receptors' sensitivity72

Components of criteria	Description

72 http://ec.europa.eu/environment/eia/pdf/EIA_guidance_Scoping_final.pdf, Box 21

Components of criteria	Description
Existing regulations and guidance (law, programs, guidelines, zoning)	There are specific receptors in the impact area which have some level of protection, either by law or other regulations (e.g. prohibition against polluting groundwater and Natura 2000 areas) or whose conservation value is increased by programs or recommendations (e.g. landscapes designated as nationally valuable). The receptors mentioned in the Directive (Article 3 and Annex IV.4) are population and human health, biodiversity, land, soil, water, air and climate, material assets, cultural heritage, and the landscape.
The value of the receptor to the society (recreational values, natural values, number of affected people)	Depending on the type of impact, it may be related to economic values (e.g. water supply), social values (e.g. landscape or recreation), or environmental values (e.g. natural habitat).
Vulnerability to the changes (ability to tolerate changes, number of sensitive targets)	Vulnerability to the change describes how liable the receptor is to be influenced or harmed by pollution or other changes to its environment. For instance, an area that is quiet is more vulnerable to increasing noise than an area with industrial background noise.

Based on the above, a practical characterization of the sensitivity of a receptor would be as given in the table below.

Table 4-24_Example of the scale of the sensitivity of the receiving environment[73]

Sensitivity importance	Description
Negligible	The resource/ receiving environment has common or imperceptible /indistinguishable values from the natural/social background. The receiving environment is tolerant to the project. Changes are imperceptible or negligible and therefore no mitigation action is necessary
Low	Low or medium importance and rarity, local scale. The receiving environment is tolerant of the proposed change subject to design and mitigation
Medium/moderate	Medium importance and rarity, regional/county scale, and limited potential for substitution. The receiving environment has some tolerance of the proposed change subject to design and mitigation
High	High importance and rarity, international/national scale, limited potential for substitution, and low capacity to accommodate the proposed form of change

The last and final step for evaluating a potential impact on a receiving environment is the definition of the impact significance, the principle of which is illustrated in the figure below.

73 Adapted from http://ec.europa.eu/environment/eia/pdf/EIA_guidance_Scoping_final.pdf, Box 23

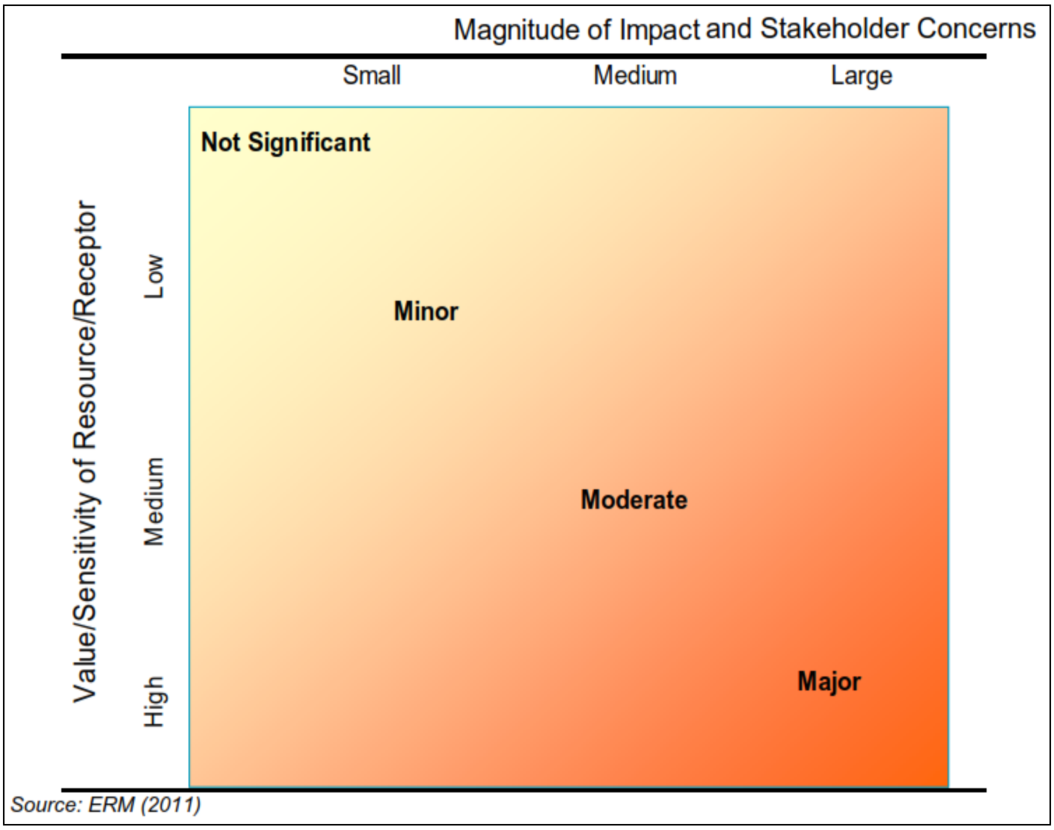


Figure 4-31_ Principle of used evaluation of impact significance (source ERM[74])

For making easier the evaluation of the impacts' significance, the figure above can be given in a more explicit version, as follows.

Table 4-25_Significance of impact, magnitude, and receptors' sensitivity

		Magnitude and stakeholder concerns			
		Negligible	**Small**	**Medium**	**High (Large)**
Value/Sensitivity of Resource/Receptor	**Negligible**	Negligible – Not significant	Negligible - Not significant	Negligible/Minor - Not significant	Minor - not significant
	Low	Negligible – Not significant	Minor - not significant	Minor/Moderate - not significant	Moderate - significant
	Moderate	Negligible/Minor -Not significant	Minor/Moderate - not significant	Moderate - significant	Major/Moderate - significant
	High	Minor - not significant	Moderate – significant	Major/Moderate - significant	**Major - significant**

The table below describes the impact significance.

74 ESIA on Trans Adriatic Pipeline - Albanian section. ERM, 2012

Table 4-26_Characterisation of potential impacts in terms of significance

Significance of impact	Description
Biophysical and socio-economic receptors	
Insignificant (Negligible)	The receptor will not be affected in any way by the proposed development activities, or the potential effect is considered to be of "negligible" intensity or is imperceptible/indistinguishable from the natural/social background variations;
Minor (Low)	The impact will occur (with and without mitigation. The impact magnitude is small (with and without mitigation) and within the accepted standards, and/or the value/sensitivity of the receptor is low.
Moderate	The impact can be reasonably reduced to a level that is as low as practicable. This does not mean that a "moderate" impact can be reduced to a "minor" one, but that moderate impacts can be effectively managed.
Major (High)	Impacts of large magnitude affect a resource/receptor of high value/sensitivity, or the accepted standards/limits are exceeded. In this case, in the function of the regulations/standards, the adverse effects must be weighed against the positive ones until a decision of the key stakeholders.

A scoring matrix that helps for a more practical and better quantification of the impacts' significance is given in the following table.

Table 4-27_Scoring criteria on the impacts' significance related to the environmental receptors

Quality of impact (Direction of change)	Significance of impact							
	No impact	**Negligible**	**Negligible to minor**	**Minor**	**Minor to Moderate**	**Moderate**	**Moderate to High**	**High**
Negative	0	-1	-2	-4	-5	-6	-8	-10
Positive	0	+1	+2	+4	+5	+6	+8	+10

The adopted values in this scoring matrix are subjective. The weighting, which has been based on the description of the significance of impacts (see Table 4-25) and on the characteristics of the project area and the planned interventions, might be considered as semi-quantitative.

It should be underlined that only the significant impacts will be taken into account for comparing the considered options from the environmental and social point of view.

4.3. Options to be compared to the environmental and social point of view

As Option 2 (construction of 32 overpasses) is already eliminated by the Consultant and the Steering Committee (see sections 2.2.2 and 2.2.3 above), the only remaining options to be compared from the environmental and social point of view are the following:

1. The existing situation (Option “zero” or “do-nothing” option); and
2. The basic option, as described in chapter 2 (section 0) of this document

Chapter 8 of this document deals with the comparison of the above-mentioned options.

5. Baseline information

The main environmental and social concerns of the proposed project derive from the environmental and social features of the target area and the required interventions, as well as of the stakeholders' concerns.

5.1. Approach to Baseline information

The approach to baseline information description includes:

- Sources of information at country and project area level; and
- A specific approach for each of the considered environmental and social receptors

5.1.1. Sources of information at country and project area level

The description of the baseline information along the whole Project area is based on the following main resources that include:

- Prefeasibility study, preliminary design, and ESIA Scoping report on the Vorë-Hani Hotit project;
- Technical reports prepared for the DD on the Project;
- Literature research on the geology, hydrogeology, flood events, biodiversity, and protected areas, air quality and noise, socioeconomic issues, accidents, etc.;
- State of Environment Report, published early by the National Environmental Agency;
- Thematic maps (state of the environment, geological risks, hydrogeology, geology) that are published in 2014 by the Albanian Geological Survey;
- The web page of the National Agency of Protected Areas;
- Map of Protected areas, National Agency of Protected Areas, 2018;
- The web page of the National Agency of Protected Areas;
- The web page of the official geoportal (geoportal.asig.gov.al);
- The web page of the National Agency on Territory Planning;
- Data/information on climate conditions, IHM;
- Site visits; etc.

5.1.2. Specific approach for each environmental receptor

The considered environmental and social receptors are already selected during the scoping stage. The specific approach for each of them includes:

- Materials and methods that involve:
  - the formal standards for each receptor (whether possible);
  - the used materials (literature, maps, data/information, site visits, etc.); and
  - the specific methodology
- Description of the baseline information for each environmental receptor within the target area. The list of the environmental receptors is provided by the scoping matrix (see Appendix 3.3 of this report – separate document), which was prepared at the end

of the scoping stage and included in the ESIA Scoping report. The environmental and social topics taken into consideration in this chapter are as follows:

- Air quality;
- Noise;
- Climate conditions;
- Climate change;
- Geology;
- Tectonics and seismicity;
- Ground waters and groundwater's quality;
- Surface waters and surface waters quality;
- Flooding;
- Ecological sources and protected areas;
- Landscape;
- Infrastructure;
- Cultural heritage;
- Socioeconomic issues;
- Other plans/programs within the same sector and/or the same area;
- Waste;
- Accidents and safety situation

- Main findings

The main findings for each environmental receptor help to know where to be focused to facilitate the preparation of the chapter on the likely impacts and mitigation measures.

5.2. Baseline information on biophysical environment

The baseline information discusses the main biophysical and social features, which can influence the natural and man-made environment. The social issues are discussed in the section 5.3.

5.2.1. Air quality

The air quality is affected during the construction (construction works, transport) and operation stages.

5.2.1.1. Materials and method

The information on the sources of ambient air quality pollution and the key air polluting substances is provided by the European Environmental Agency75.

Appendix 5.1 of this document summarizes the key primary and secondary air pollutants and their sources.

The air quality standards are based on the following:

- Law 162/2014 "On protection of ambient air quality", and DCM 352/2015 "On air quality assessments and requirements for certain pollutants", as amended in 2019.
- Air Quality Directive (2004/107/CU, 2008/50/CU and 2011/850/EU)

75 https://www.eea.europa.eu//publications/air-quality-in-europe-2019

The information on the air quality is taken from the State of Environment Reports, 2017 and 2019, published by the National Environmental Agency. The State of Environment Report, 2018 does not include any air monitoring data/information.

The monitored parameters include SO_2, NO_2 (NOx), CO, O_3, PM10 (PM2.5), and Benzene. For each of them, the annual average value is given.

The governmental web page www.geoportal.asig.gov.al gives the location of the monitoring stations.

5.2.1.2. Baseline information

The cities crossed by the railway Vorë-Hani Hotit are Shkoder, Lezhë, and Mamurras. Among them, there are air quality monitoring measures only for Shkoder, which is the biggest of them.

The data from air monitoring during 2017 and 2019 show that typical air polluting substances like SO_2 and NOx are at acceptable levels as per the DCM 352/2015. In recent years, the air quality concerning suspended particulate matters and PM10 has been improved because of the improvement of the road infrastructure.

The data below, taken from the Reports on Environment (years 2017 and 2019), indicates the levels of Pollution Clouds in some Albanian cities. The DCM 352/201576 provides the national norms and critical values. Annex XI of this DCM provides for the national norms that are already in force since January 01.2020 (CO, CO_2, NO_2, Benzene) or will be in force on January 01.2030 (PM_{10}). Thus, the national norms in the table below are those of that Annex.

Table.5-28_Annual average of air quality indicators (µg/m3) for 2017 and 2019_Shkoder station

Station/ standards	Air quality indicator					
	PM_{10}	$PM_{2.5}$	NO_2	SO_2	O_3	CO	benzene
Shkoder (2017)	25.07	22.74	12.29	6.39	77.47	1.43	2.91
Shkoder (2019)	No data	no data	9.65	11.73	78.3	1.51	no data
National standards							
Annual	28	17	32	75	n/a	10	5
Critical value/ period	50 (24 hours)	25 (1 hour)	200 (1 hour)	350 (1 hour)	120 (8 hours)	n/a	n/a
EU standards77							
Annual	40	25	40	125 (24 hours)	25	10	5
Critical value/ period	50 (24 hours)	n/a	200 (1 hour)	350 (1 hour)	120 (8 hours)	10 (8 hours)	n/a

Note:

- $PM_{2.5}$ is not applied for human health, but only for the protection of the flora and ecosystems.
- The norms of the O_3 are those of the EU norms, as DCM 352/2015 does not give any information on the O_3 concentrations.

The map on the location of the air quality and monitoring stations is extracted from governmental sources.78

76 DCM 352/2015: "On air quality assessments and requirements for certain pollutants "

77 https://ec.europa.eu/environment/air/quality/standards.htm

The figure below shows the location of Shkoder air quality monitoring station, and the railway line and station. The figure shows that the distance of the railway line and station from the air quality monitoring station is approximately 600m and 800m, respectively. The monitoring station is located in an area of dense urban traffic. While the railway line runs across the eastern neighbourhood of the city, where the traffic is less dense and therefore the air quality is expected to be better than in the area of the monitoring station.

There is no available data/information on the air quality in the other urban centres crossed by the railway line (Lezhë and Mamurras towns). However, Lezhë and Mamurras have smaller populations compared to Shkoder and therefore the traffic in these towns is lower. Thus, it is expected the air quality within Lezhë and Mamurras to be within the national standards.

Even though there are no data to monitor the air quality in the rural parts of the project area, this quality, including the suspended particulate matters, is within the acceptable parameters set by the Albanian legislation, because of the lack of activities that pollute the air.

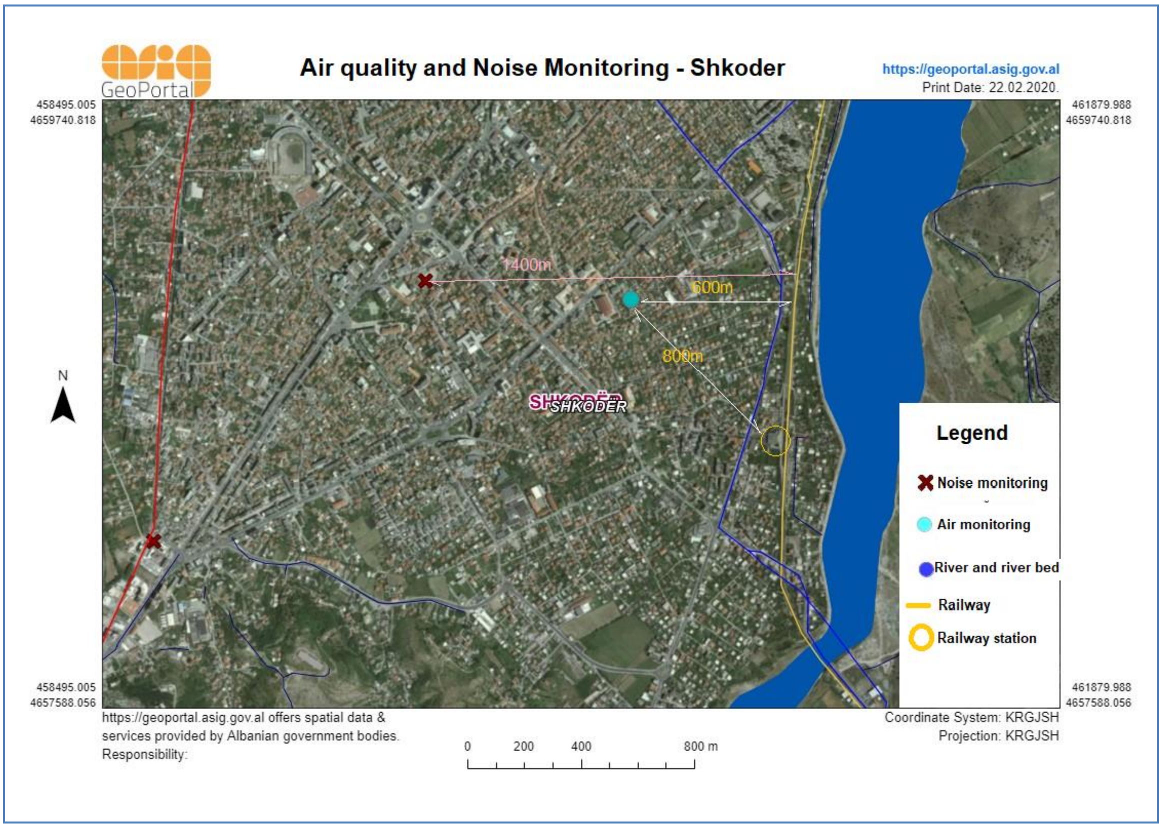


Figure 5-32_Location of the air quality and noise monitoring stations -Shkoder

5.2.1.3. Findings

The air quality in the project area is within the required standards, excepted O_3 in Shkoder city. Ozone near ground level is formed when pollutants emitted by cars and other sources react chemically in the presence of sunlight. However, the air monitoring station is located in the centre of the city (600m from the railway line), where the traffic is very dense and therefore the high concentration of ozone (O_3) is expected. While within the railway line, it can be supposed the values of ozone concentration to be within the accepted standards because of the lower traffic.

78 https://geoportal.asig.gov.al/

5.2.2. Noise

The railway line crosses several villages and three towns (Mamurras, Lezhë, and Shkoder). Noise and vibrations are of concern during both construction and operational stages. Noise and vibrations generated during construction last only during this stage and may be reduced by taking the related routine mitigation measures. While the noise and vibrations from the operational phase last as long as the trains circulate, and therefore they are of concern for the inhabitants of the crossed towns, as well as for the wild fauna.

Thus, the rolling noise and vibrations should be taken into consideration during the preparation of the detailed design and ESIA.

5.2.2.1. Materials and method

The legal framework on environmental noise includes the Law 9774/2007 "On evaluation and management of environmental noise", the DCM 587/2010 "On the monitoring and control of noise levels in urban and tourist centres", and the Minister Ordinance no 37/1 of April 12. 2011 "On evaluation and management of environmental noise". The maximum noise levels are provided in the Minister Ordinance No. 8 of November 27, 2007 "On maximal levels of noises in the environment". This ordinance, which relies on the WHO recommendations, provides that the acceptable noise levels shall be up to 50 -55 dB outside the residential dwellings during day time, 45 dB during night time, and 35 dB (A) inside the residential dwellings during day time and 30 dB (A) during night time.

It should be underlined that the WHO norms on the permitted noise levels are more stringent than the EU ones.

The WHO Regional Office for Europe published in 2018 a new noise guideline, which the main purpose is to provide recommendations for protecting human health from exposure to environmental noise originating from various sources, including transportation road and railway traffic79. This guideline, which aims to be suitable for policy-making in the WHO European Region80, suggests that noise levels generated by the railway should be 54 dB during daytime and 44 dB during nighttime.

The information on the monitored noise levels in the cities crossed by the railway line has been extracted from the State of Environment Reports, 2018 and 2019, published by the National Agency of Environment. The monitoring is based on DCM 1189/2009 "On the rules and procedures for and implementation of the National Environmental Monitoring Programme". The noise has been monitored according to the method IEC 61672-181

The governmental web page www.geoportal.asig.gov.al gives a map of the location of the noise monitoring stations82.

5.2.2.2. Baseline information

Among the urban centres crossed by the railway line (Shkoder, Lezhë, and Mamurras), only Lezhë and Shkoder are included in the cities where noise levels are monitored by NEA. There

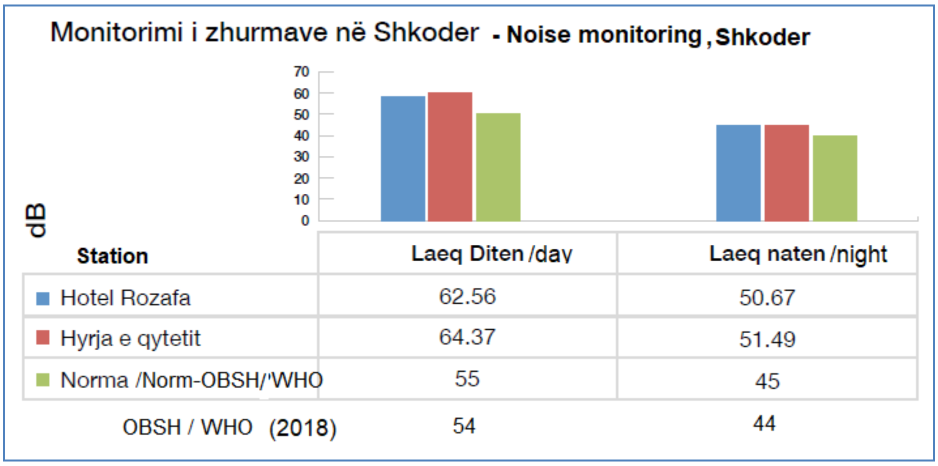
79 Environmental Noise Guidelines for the European Region (2018)

80 https://www.euro.who.int/__data/assets/pdf_file/0009/383922/noise-guidelines-exec-sum-eng.pdf

81 https://idoc.pub/download/iso-iec-61672-1-eletroacoustics-sound-level-meterspdf-6ngejqq731lv

82 https://geoportal.asig.gov.al/

are two noise-monitoring stations in each of these cities. Figure 5-32 and Figure 5-3783 shows the location of these stations and the annual results of the noise measurements.



Station	Laeq Diten /day	Laeq naten /night
Hotel Rozafa	62.56	50.67
Hyrja e qytetit	64.37	51.49
Norma /Norm-OBSH/'WHO	55	45
OBSH / WHO (2018)	54	44

Figure 5-33_Average annual values of noise in Shkoder stations (year 2018) and the WHO norms

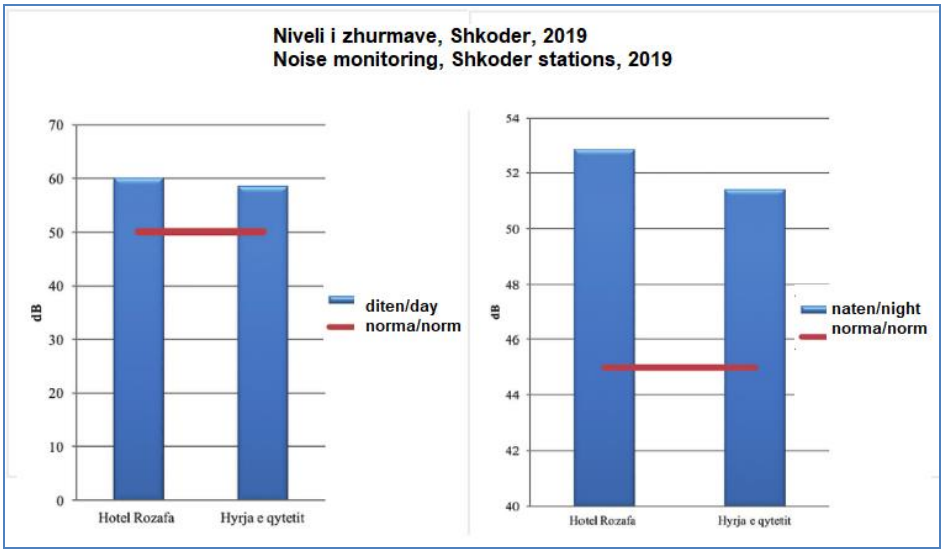


Figure 5-34_Average annual values of noise (Laeq (dB)) in Shkoder stations (the year 2019)

The closest Shkoder monitoring station is that of Hotel Rozafa, which is located roughly 1400m from the railway line and 1600m from the railway station (see Figure 5-32 above).

83 State of Environment Report for 2018. National Environmental Agency. In Albanian

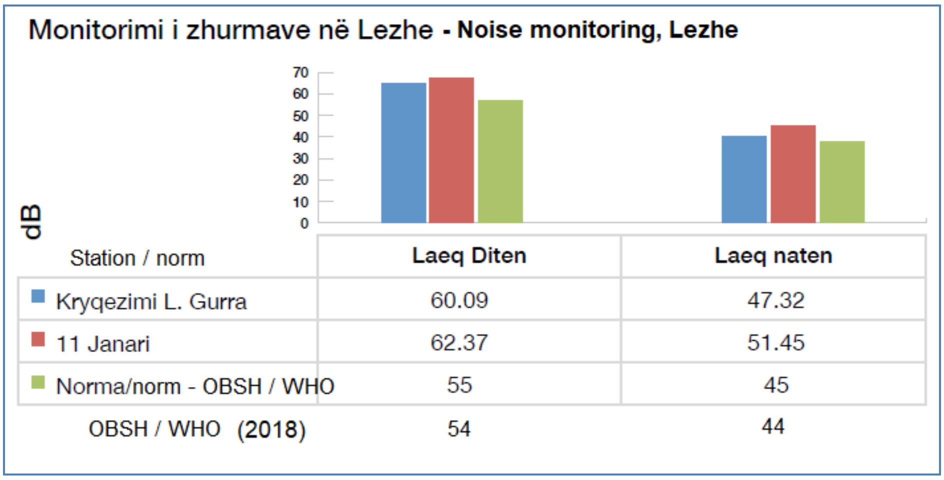


Figure 5-35_Average annual values of noise in Lezhë stations (the year 2018) and the WHO norms.

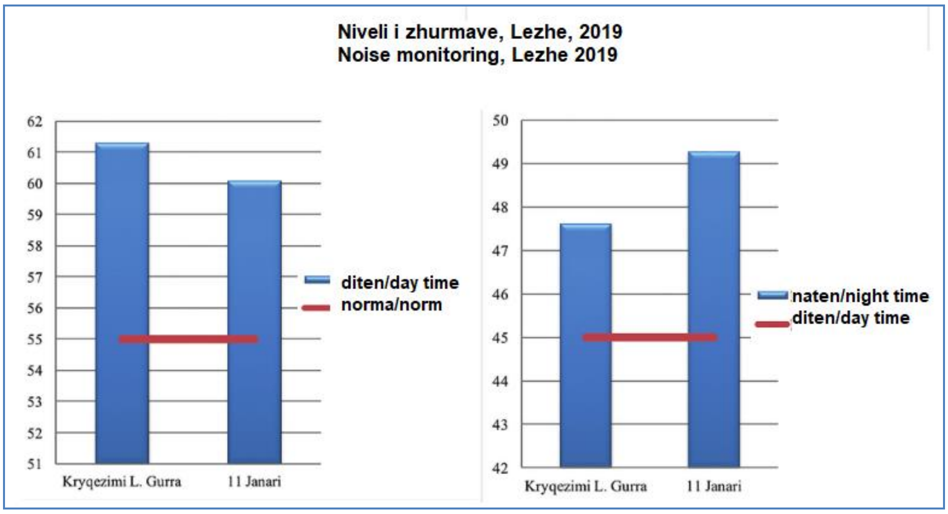


Figure 5-36_Average annual values of noise (Laeq (dB)) in Lezhë stations (the year 2019) and the WHO norms.

The closest Lezhë monitoring station is that of 11 January, which is located roughly 600m from the railway line and the railway station (see Figure 5-37 below).

The table below gives the annual average of the noise measured in Shkoder and Lezhë, as well as the WHO standards.

Table 5-29_ Average annual noise values, in Shkoder and Lezhë in 2018 and 2019, compared to WHO standards

No	City/standard	Monitoring Station	Closest distance from the railway (m)	Laeq (dB) - day time	Laeq (dB) - night time
1	Shkoder - 2018	Hotel Rozafa	1400 - railway; 1600 - railway station	63.47	51.50
2	Shkoder - 2019			60.00	51.60
3	Lezhë - 2018	11 Janari	600 - railway; 600 - railway station	61.23	49.38
4	Lezhë- 2019			60.18	49.20
5	WHO standard (before 2018)	n/a	n/a	55	45

No	City/standard	Monitoring Station	Closest distance from the railway (m)	Laeq (dB) - day time	Laeq (dB) - night time
6	WHO standard (2018)	n/a	n/a	54	44

The table above shows that the noise levels in both Shkoder and Lezhë cities are higher than allowed by WHO standards because the monitoring stations are located in places with heavy traffic, as shown in Figure 5-32 above (Shkoder) and Figure 5-37 below (Lezhë). The railway line runs across the neighbourhoods of these cities, where the traffic is less dense and therefore the noise value is expected to be lower compared to noise values in the areas where the monitoring stations are located.

It should be underlined that the rolling noise is included in the results of the table above, too.

There are no available data/information on the noise values within Mamurras. However, this town is small (7000 inhabitants), with low buildings spread in the lowland, and therefore the road traffic is much lower than in Shkoder and Lezhë. Thus, it is expected the noise values within Mamurras to be within the national and WHO standards.

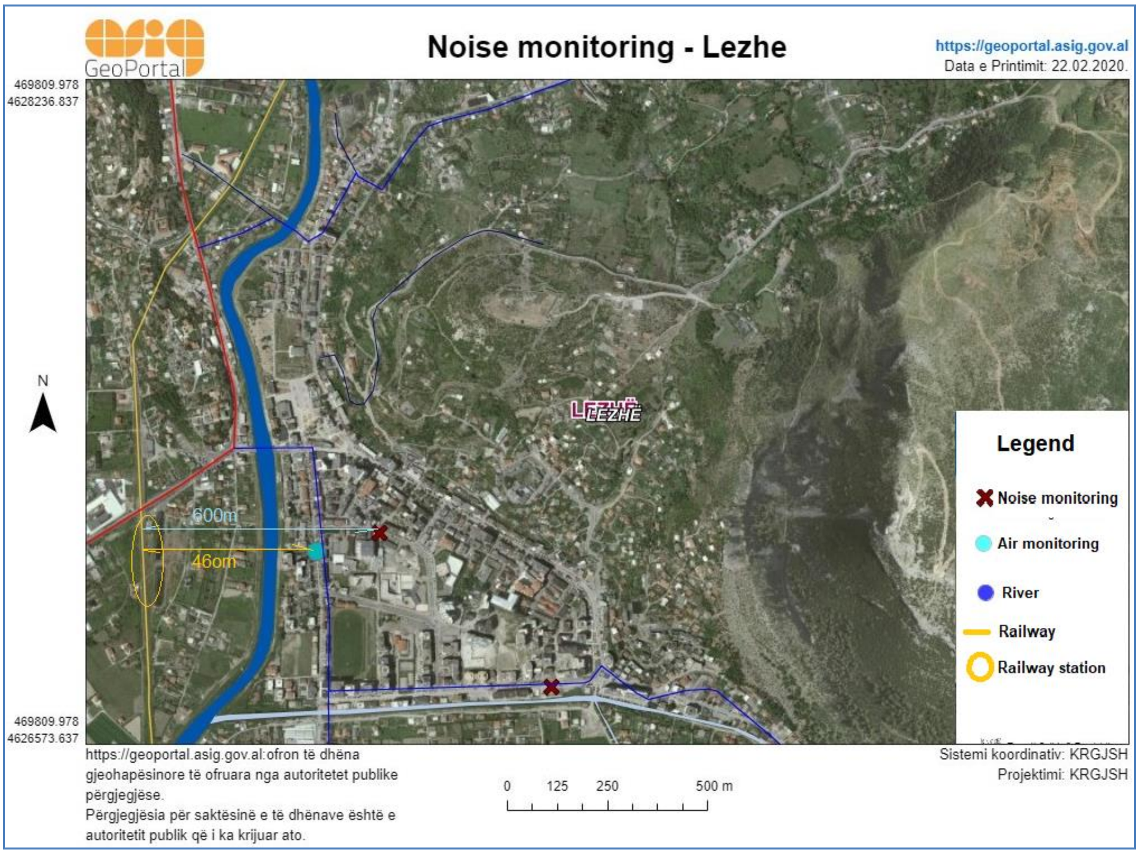


Figure 5-37_Location of the air quality and noise monitoring stations -Lezhë

Noise levels in the rural areas crossed by the railway line are low as they are far from the influence of urban, transport, and or industrial activities. Even though there is no monitoring of noise levels in these areas, it is supposed that noise is within the national and WHO standards.

5.2.2.3. Findings

Annual average noise levels measured in densely inhabited urban centres of the project area (Shkoder and Lezhë) show that these levels are higher than the national norms because of the heavy road traffic and other urban activities. As the railway line runs across the neighbourhoods of these cities, where the traffic and urban activities are limited it is supposed the noise levels on both sides of the railway line to be within the acceptable national, EU, and WHO limits.

A specific Annex developed as a stand-alone report has been enclosed in the ESIA package to provide additional information on the impacts related to Noise and Vibration (Noise and Vibration Report (Appendix to ESIA).

5.2.3. Climatic conditions

5.2.3.1. Materials and method

The data/information on the climate characteristics are extracted from the information published by the former Institute of Hydro Meteorology (IHM), nowadays the Institute of Geo-Sciences[84] that deals with the climate issues.

To study the climate characteristics of the project area, long-term weather data provided by the nearby meteorological stations were collected. These meteorological stations are located in Larushk, Mamurras, Lezhë, Shkoder, and Koplik. Larushk station is located close to the railway, 7 km in the Northeast of Vorë.

5.2.3.2. Baseline information

Based on the climatic division of the Albanian Territory (IHM, 1984), the project area is part of the Mediterranean Climatic Zone.

84 www.geo.edu.al

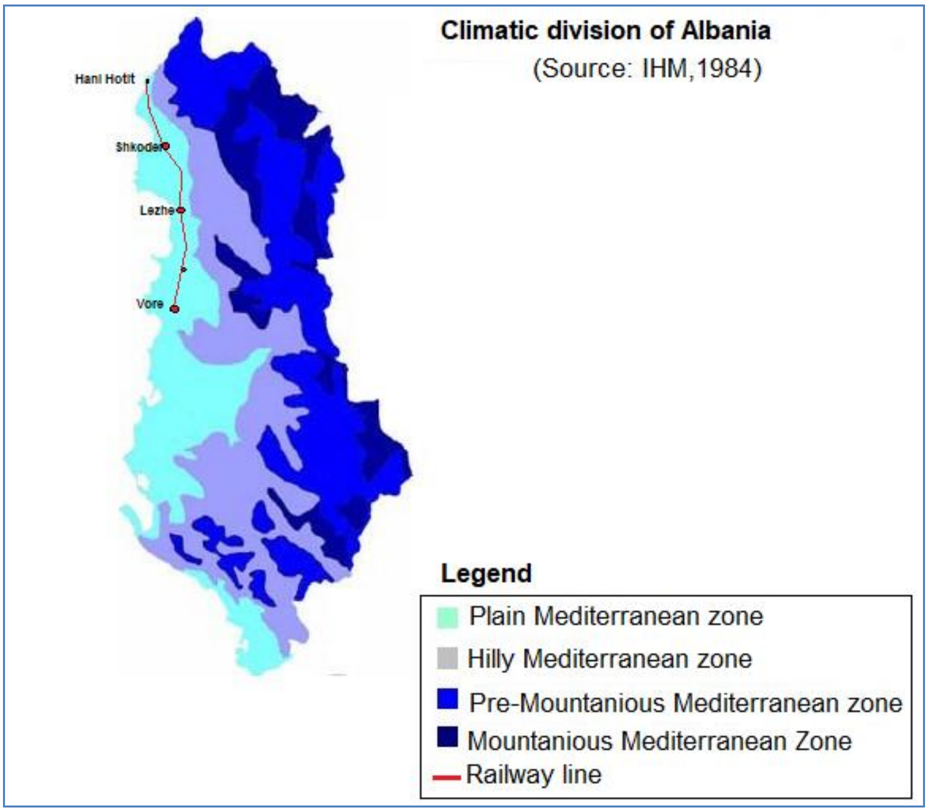


Figure 5-38_ Climatic division of Albania

In particular, the section Vorë to Lezhë is part of the Central Mediterranean Sub-zone, while the section from Shkoder to Hani Hotit is part of the Northern Mediterranean Continental Sub-zone. Mild and wet winters and hot and dry summers characterize this zone.

It is important to note that the entire area of the Western Lowland of Albania is highly influenced by the Adriatic Sea. The values of minimum, maximum, and average air temperatures reflect this influence. The coldest month is January, whereas the warmest months are July and August.

The table below shows the temperatures measured at the above-mentioned meteorological stations.

Table 5-30_Monthly and yearly air temperatures within the Project area

Station	Month												Annual average
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Larushk	6.3	7.5	9.9	13.2	17.6	21	23	22.9	20.1	15.8	11.3	7.6	14.7
Mamurras	5.9	8.2	9.6	13.3	17.8	21.1	23.5	23.1	20.3	16	11.4	8.1	14.8
Lezhë	6.5	7.8	9.9	13.1	17.6	21.4	23.4	23.3	20.3	15.9	11.8	7.9	14.9
Shkoder	5.0	6.5	9.5	13.5	18.0	22.0	24.6	24.5	20.9	15.7	10.9	6.9	14.8
Koplik	4.6	6.6	9.6	13.5	18.4	22.4	25	25.1	21.9	16	11.2	6.5	15

While the extreme temperatures are shown in the table below.

Table 5-31_ Extreme air temperature in the target area

Parameter (°C)	Station				
	Larushk	Mamurras	Lezhë	Shkoder	Koplik
Annual average temperature	14.7	14.8	14.9	14.8	15
Max abs.	39.8	40.1	41.5	41.5	41.5
Min. abs.	-12.6	-12.8	-11.4	-13.0	-13.6

Another important parameter is the precipitation. The table below shows the monthly and yearly average precipitations in Larushk and Mamurras stations during the period 1965-1990.

Table 5-32_Monthly and yearly precipitation within the Project area

Station	Month												Annual average
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Larushk	145.3	115.1	129.1	112.5	82.4	64.8	39.5	51.7	75.6	115.6	178.3	156.3	1264.6
Mamurras	135.1	102.3	101	104.1	74.1	58.6	39.1	61.2	81.7	123.4	159.2	123.9	1163.7
Lezhë	151	121.5	126.5	110.4	92.9	65.2	46.2	57.9	80.8	110.6	138.1	158.7	1299
Shkoder	243	200	180	174	127	67	42	70	179	231	274	280	2070
Koplik	172	150	137	126	81	53	32	58	118	170	245	208	1550

Typically, the northern part of the study area has high rainfalls, which reach 2000 mm of rain per year. The maximum daily precipitation in Shkoder is about 200 -240 mm. The rainfall is less pronounced in the southern part.

Storm events are characteristic of the climate of Albania. According to data from Shkoder meteorological station, the 15 minutes rainfall height reaches 30 to 40 mm, the 30 minutes may reach up to 80 mm, while the rainfall for 1, 2, and 3 hours are registered at respectively 120 mm, 152 mm, and 161 mm (all data refers to a repetition probability of one storm event during one year).

Snowfalls in the study area are rare and of no particular concern. The snow layer within this area may reach only a few centimetres. However, it does not last for a long time. The table below gives the yearly distribution of the snowy days alongside the railway line.

Table 5-33_ Average number of snowy days

Station	Month												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Tirana	1.3	0.7	0.4	-	-	-	-	-	-	-	0.1	0.3	3
Lezhë	1	0.8	0.3	-	-	-	-	-	-	-	0.1	0.8	3
Shkoder	1.9	1.8	0.9	-	-	-	-	-	-	-	0.2	0.7	5.5
Koplik	1.7	1.3	0.6	-	-	-	-	-	-	-	0.2	0.8	4.6

5.2.3.3. Findings

The project area is part of the Mediterranean Plains Climatic Zone, which is characterized by mild and wet winters and hot and dry summers. The minimum absolute air temperature is -13.6°C, while the maximum absolute one is 41.5 °C. The annual average precipitation varies from 1190 to 2070 mm. The snowy days are a rare event, while the thickness of the snow layer is insignificant.

Storm events with high rainfalls may occur overall during the winter period. The maximum daily precipitation is about 200 to 240mm.

As a result, the only climate parameter that may constitute a concern for the implementation of the proposed project is the maximum daily precipitation that can cause flash floods. However, the flash floods are described in the sections on flooding (see section 5.2.9 below).

5.2.4. Climate change

5.2.4.1. Materials and method

This section is prepared based mainly on the Third National Communication on the Climate Change (Albanian Ministry of Environment, 2016[85]), which deals mostly with the Albanian coastal zone where lies the whole Project area (see figure below). Another reference document is the fifth synthesis report of the Intergovernmental Panel on Climate Change (IPCC), 2014[86].

The climate change parameters that are of concern for the Project include the temperature, rainfalls, and sea-level rise.

This section deals also with GHG emissions, as these emissions are part of the national communications on climate change.

5.2.4.2. Baseline information

The Project area is included within the coastal zone of Albania (see figure below), which is the target area of the Third National Communication on the Climate Change (NCCC).

85 https://unfccc.int/sites/default/files/resource/Albania%20NC3_13%20October%202016.pdf

86 https://www.ipcc.ch/report/ar5/wg2/europe/

Figure 5-39_Project area of the Third National CCC and the main railway line stations

Climate change projections for the coastal zone of Albania show an increase in temperatures and frequency and intensity of floods, as projected by IPCC[87]. The latest figures of the European Environmental Agency predict an increase of about 5-15% of the heavy precipitation in the winter period. While summer periods will be dryer.

87 Climate Change. *Synthesis Report, IPCC, 2014*

The table below shows the main projected climate parameters in the coastal zone of Albania based on the Third National Communication on Climate Change.

Table 5-34_Parameters of projected climate change for Albanian coastal area, compared to 1990'

Parameter	Time Horizon			
	2030	2050	2080	2100
Annual average temperature (°C)	+1.0	1.7	2.8	3.2
Annual average precipitation (%)	-3.8	-8.5	-14.4	-18.1
Sea level rise (cm) - (worst scenario)	+13	+25	+50	+73

Hereinafter follows a more detailed analysis of projections on temperature, precipitation, and sea-level changes.

Temperature

The table below shows the projections of seasonal temperature changes for different time horizons.

Table 5-35_Temperature changes projections for the coastal area compared to 1990

Years	2030	2050	2080	2100
Annual				
$T_{average}$(°C)	1.0	1.7	2.8	3.2
T_{max} (°C)	1.2	2.2	3.5	4.1
T_{min}(°C)	0.7	1.3	2.0	2.4
Winter				
$T_{average}$(°C)	0.8	1.2	2.0	2.4
T_{max} (°C)	0.9	1.4	2.3	2.7
T_{min}(°C)	0.7	1.1	1.7	1.9
Spring				
$T_{average}$(°C)	1.0	1.5	2.6	3.1
T_{max} (°C)	1.12	1.8	3.0	3.6
T_{min}(°C)	0.8	1.3	2.2	2.6
Summer				
$T_{average}$(°C)	1.6	2.5	4.3	5.3
T_{max} (°C)	1.8	2.8	4.9	6.0
T_{min}(°C)	0.5	2.1	3.8	4.6
Autumn				
$T_{average}$(°C)	1.0	1.6	2.8	3.5
T_{max} (°C)	1.1	1.8	3.0	3.7
T_{min}(°C)	1.0	1.5	2.7	3.2

The projections show that maximum temperatures in the summer period are expected to increase. Besides, it is projected a drastic decrease in the return periods of maximum absolute temperatures over the Albanian coastal area. The expected simultaneous increase of the minimum and maximum temperatures would cause an increase in the heat waves.

Precipitation

All the scenarios reveal a likely decrease in annual precipitation compared to 1990'. The annual precipitation is likely to decrease by up to -8.5% by 2050, by up to -14.4% by 2080, and by up to -18.1% by 2100 (see Table 5-36 and Table 5-37).

Table 5-36_Precipitation changes projections for the coastal area compared to 1990

Years	2030	2050	2080	2100
Annual				
$P_{average}$(%)	-3.84	-8.46	-14.37	-18.13
P_{max} (%)	27.70	47.42	81.12	94.90
P_{min}(%)	-35.39	-56.00	-78.64	-89.69
Winter				
$P_{average}$(%)	-5.96	-10.10	-14.33	-18.13
P_{max} (%)	4.01	7.70	16.10	19.57
P_{min}(%)	-15.92	-27.91	-44.75	-55.84
Spring				
$P_{average}$(%)	2030	2050	2080	2100
P_{max} (%)	-2.45	-7.26	-14.26	-17.74
P_{min}(%)	7.03	10.75	16.61	19.79
$P_{average}$(%)	-11.9	-25.3	-45.1	-55.3
Summer				
$P_{average}$(%)	-10.4	-19.7	-41.9	-50.4
P_{max} (%)	-7.9	-15.3	-34.5	-41.3
P_{min}(%)	-12.8	-24.1	-49.2	-59.4
Autumn				
$P_{average}$(%)	0.5	-2.5	-6.9	-9.5
P_{max} (%)	11.1	16.3	25.2	29.1
P_{min}(%)	-10.1	-21.3	-38.1	-48.1

According to the Third National Communication on Climate Change, heavy rainfalls are expected to be intensified over Albania's coastal area. While the return periods of maximum precipitation are likely to decrease. Consequently, more frequent heavy rains with longer duration are likely to happen and to cause flood events. The occurrence of 24h maximum precipitations is predicted by using the time series of the 1957-2010 period.

The table below shows the expected 24h precipitation for different return periods for the Albanian coastal area.

Table 5-37_Expected 24h precipitation for different return periods for the Albanian coastal area.

Table 4.7. The expected 24hours precipitation (mm) for the different return periods for three regions of the coastal zone.

	Return period (year)					
Time	2	5	10	20	50	100
North	93±7	132±11	158±14	182±17	215±21	239±25
Central	79±8	105±11	125±14	145±17	170±22	189±25
South	74±6	97±8	116±11	134±13	157±16	174±19

Furthermore, the reduction of rainfalls is an indicator of a likely increase in drought frequency.

Sea level rise

During the 20th century, the level of the Adriatic Sea has raised by roughly 15cm. It should be stressed that the Albanian coastal area from Vlorë to Shkoder is prone to subsidence that might intensify the impact of sea-level rise. The expected average sea level rise is roughly 30 cm by 2080 and 40cm by 2100. While the respective maximum values are 50 and 70cm.

The graph below shows the projected sea-level rise, as given by the third National Communication on Climate Change.

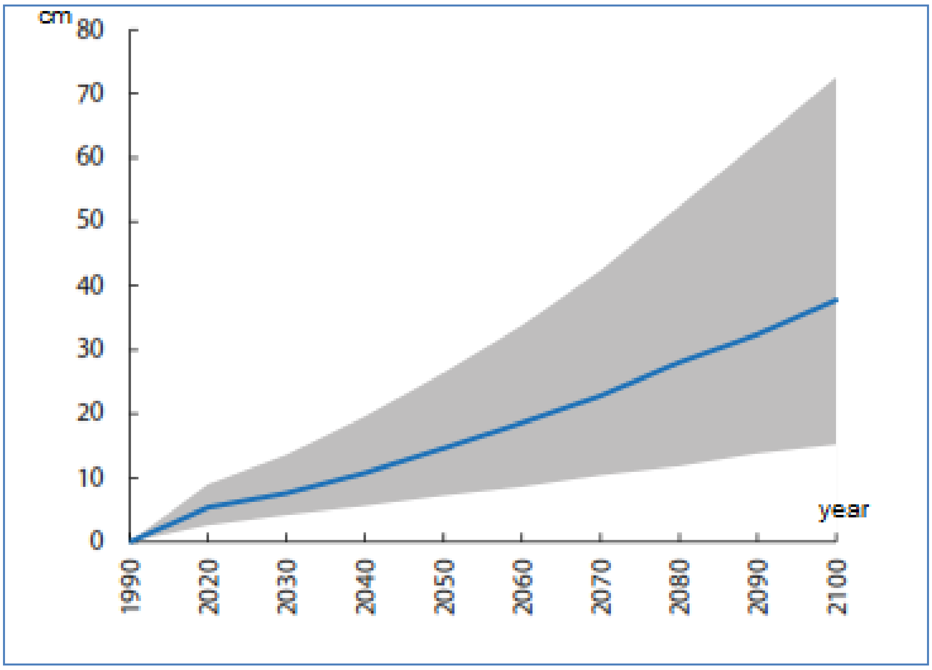


Figure 5-40_Predicted sea level rise on the Albanian coastal area

The likely expected impacts of the projected climate change on the main receiving environments are described hereinafter.

Climate change and hydrology

The increase of the intensive precipitation frequency (see figure and table below) will cause an increase in flood frequency in autumn, winter, and spring.

The predicted values for precipitation minima will lead to an increase in droughts frequency in the summertime. Climate change will affect the hydrology of watersheds and the size and thickness of the snowpack. Given the warmer than average temperatures in winter, it is expected a reduction of the snowfall amount and earlier melting. This will reduce runoff patterns in spring and a shift of maximum values in the winter period (see table below).

Table 5-38_Projection of runoff changes by seasons for the period 2030 – 2100

	Runoff changes (%)			
	2030	2050	2080	2100
Winter	-6.4 (-19.1 to +5.8)	-11.7 (-32.6 to +11.3)	-17.3 (-50.4 to +23.9)	-23.0 (-60.2 to +29.5)
Spring	-3.1(-16.7 to +8.2)	-9.6(-42.7 to +11.7)	-20.6 (-67.1 to +17.1)	-26.9 (-82.6 to +19.8)
Summer	-14.6 (-22.5 to -10.5)	-27.1 (-58.0 to -22.3)	-54.2 (-78.4 to -45.6)	-63.6 (-82.7 to -63.6)
Autumn	0.7(-14.2 to +10.2)	-3.6 (-29.2 to +12.1)	-9.8 (-49.9 to +16.8)	-13.4 (-61.1 to +23.9)

Graphs below show the projection of runoff changes for winter and summer periods up to 2100.

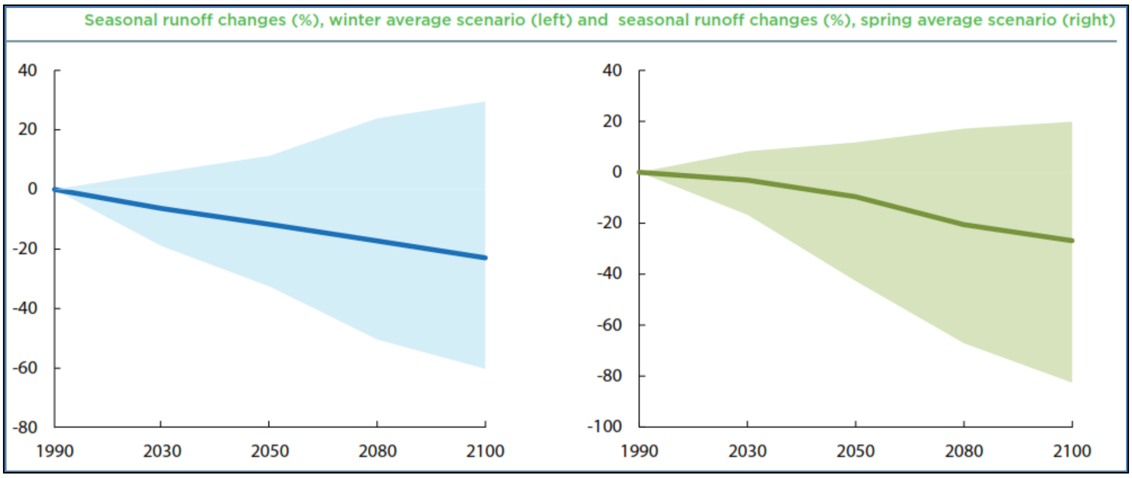


Figure 5-41_ Projection of winter (left) and spring (right) runoff changes

Climate change and flooding

Climate variability will increase and more extreme events are likely to happen[88]. The increase of heavy precipitation is expected to affect both the magnitude and increase the frequency of floods.

Rivers and seawater (storm surges) might flood the coastal area; inundation from floods may last some hours (flash floods) or several days/weeks. The likely increase in frequency and intensity of heavy rains could make the coastal region even more vulnerable, urging adaptation into long-term development strategies.

MTE published in 2015[89] a study that provides details on the projected climate change background for the Shkoder region and the flood events. The section on flooding (see section 5.2.9 below) provides details on this study.

88 European Environmental Agency, 2014

89 Flood Risk Management Plan, Shkoder Region. MTE, 2015

Climate change and sea-level rise

In the pessimistic scenario, the sea level will be rise roughly 70 cm by 2100. As the lowest part of the terrain crossed by the railway line is roughly 4.0 m a.s.l. (within Lezhë territory), it is not expected any impact of the sea level rise on the Project.

Climate change and combined sea-level rise, precipitations, and flood events

The Consultant has taken into consideration the worst case when there is a combination of sea-level rise, precipitations increase, flood events, and low terrain. That can happen within the lowland crossed by the Ishmi River, as given hereinafter.

Global Risk Data Platform90 provides rough information on the inundation risk for flood with a return period of 1 in 100 years within the Project's area. The figure below shows the predicted flood depth and the areas expected to be inundated by Ishmi River with a return period of 100 years.

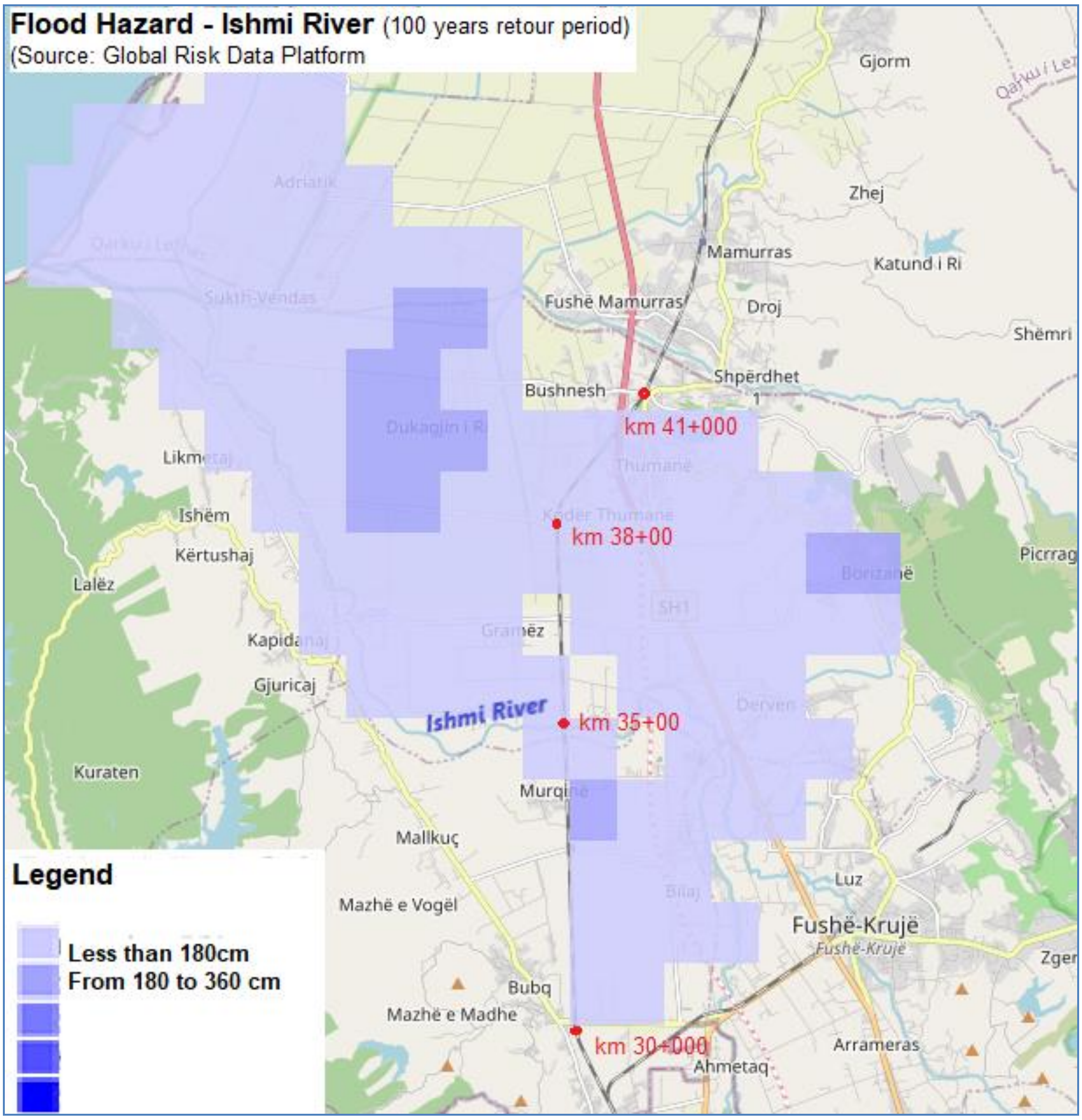


Figure 5-42_Flood risk hazard from Ishmi River (100 years return period)

90 https://preview.grid.unep.ch/index.php?preview=map&lang=eng

This projection shows that the inundation depth along the railway track could reach up to 180cm. Although this figure seems high, it should be noted that the terrain within this section is roughly 7.0m a.s.l. and the railway line body is approximately 6.0m high (both sides of Ishmi River crossing). Besides, the railway body in the section from km 30 to km 41 will be raised to 70 cm, and therefore there is no risk that the railway body to be inundated.

5.2.4.3. GHG emissions

The GHG emissions per capita in Albania are 4–5 times lower than the average of industrialized countries. According to the Third National Communication on Climate Change, Albania's contribution to the global greenhouse gas emissions is estimated at an average of 9, 4 million tons/year of CO_2 eq. The reason is that over 95 percent of Albania's electricity is produced from hydro sources and high-energy intensity industries are no longer operating. Transport, followed by agriculture and waste sectors are the main categories that are found to have a significant contribution to the total greenhouse gas emissions.

Climate change policy in Albanian is developed through national communications that deal separately with the mitigation of GHG emissions and adaptation to climate change. Analysis has been carried out for each economic sector, scenarios for the future have been constructed, and measures have been proposed for mitigating and adapting to expected climate change.

The third Albanian National Communications on the Climate Change did not address any GHG issue. It refers to Albania's Second National Communication on the Climate Changes (MoEFWA, 200991), according to which two scenarios are foreseen for the evaluation of the total greenhouse gas emissions, namely the baseline and the abatement scenarios. The former considers the development of sectors without taking account of the effect of climate change, while the latter assumes implementation of a set of prioritized measures aimed at reducing emissions by 48% by 2025 compared to the baseline scenario.

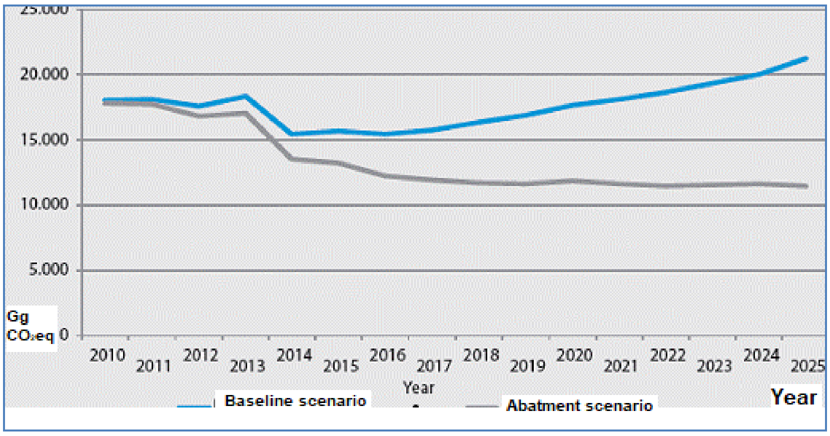


Figure 5-43_ GHG emissions according to the baseline and abatement scenarios for 2010-2025 [Gg CO_2 eq]

The national GHG inventory92 considers three direct GHGs (CO_2, CH_4, and N_2O) and three indirect93 ones (CO, NO_x, SO, and NMVOC). Emission factors are represented by default factors.

91 https://www.adaptation-undp.org/sites/default/files/downloads/albanianc2.pdf

92 Third National Communication on the Climate Change. Albanian Ministry of Environment, 2016

93 Direct GHG emissions are emissions from sources that are owned or controlled by the reporting entity. Indirect GHG emissions are emissions that are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity.

The amount of direct GHG emissions is bigger than the indirect ones. Total direct GHG emissions for the base year 2005 amounted to 8,863 Gg of CO_2 eq., while the total indirect GHG emissions estimated for the year 2005 were roughly 227 Gg.

The main contributors to GHG emission are energy and transport, as given in the schema below.

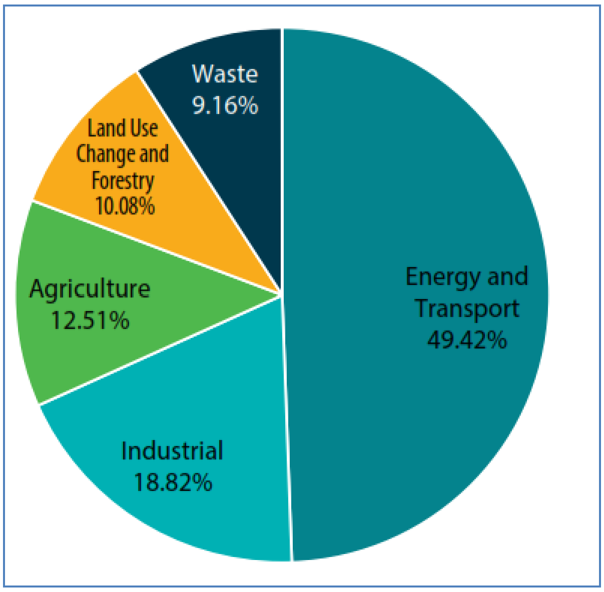


Figure 5-44_Main contributors to GHG emissions in CO_2 eq.

As shown in the figure below, transport is the main GHG contributor of all economic activities.

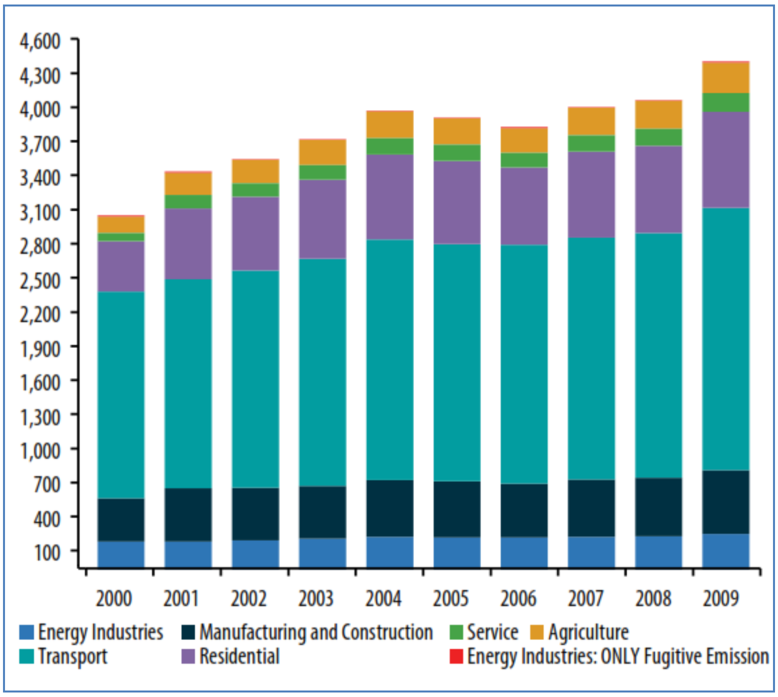


Figure 5-45_ contribution of economic sectors to the GHG emissions94

While the table below gives details on the GHG amount (in CO_2 eq) for each energy subsector.

94 Third National Communication on the Climate Change. Albanian Ministry of Environment, 2016

Table 5-39_Amount of CO_2 eq (in Gg) emission from the energy subsectors in Albania

Table 2.7: Contribution of CO_2, CH_4, and N_2O from the Energy subsectors (Gg)

Sub-sectors	Gases	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Whole Energy and Transport Sectors	CO_2	2,987.90	3,372.10	3,477.95	3,648.75	3,896.11	3,835.33	3,749.38	3,925.06	3,983.30	4,319.45
	CH_4	4.73	4.75	4.92	5.13	5.43	5.34	5.38	5.45	5.50	5.50
	N_2O	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10
	CO_2 eq.	3,111.93	3,499.67	3,609.11	3,784.34	4,038.02	3,975.37	3,890.28	4,067.45	4,129.86	4,466.04
Whole Energy and Transport Sectors	All fossil fuel	3,111.93	3,499.67	3,609.11	3,784.34	4,038.02	3,975.37	3,890.28	4,067.45	4,129.86	4,466.04
	Fuel wood	1,005.00	652.00	665.00	663.00	660.00	658.00	781.00	654.00	649.00	650.00
Energy Industries: ALL	CO_2	245.87	247.86	257.43	270.38	286.42	282.47	284.80	287.71	291.20	312.40
	CH_4	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	N_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CO_2 eq.	246.29	248.28	257.85	270.80	286.84	282.89	285.22	288.13	291.62	312.82
Energy Industries: ONLY Fugitive Emission	CO_2	0	0	0	0	0	0	0	0	0	0
	CH_4	0.35508	0.35608	0.35708	0.35808	0.35908	0.36008	0.36108	0.36208	0.36308	0.36408
	N_2O	0	0	0	0	0	0	0	0	0	0
	CO_2 eq.	7.46	7.48	7.50	7.52	7.54	7.56	7.58	7.60	7.62	7.65
Manufacturing and Construction	CO_2	372.77	458.84	455.92	456.46	492.76	484.44	461.39	497.27	506.17	553.64
	CH_4	0.12	0.12	0.12	0.13	0.14	0.13	0.13	0.14	0.14	0.14
	N_2O	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	CO_2 eq.	381.49	467.56	464.64	465.39	501.90	493.37	470.32	506.41	515.31	562.78
Transport	CO_2	1,815.93	1,830.58	1,901.29	1,991.93	2,110.10	2,080.96	2,098.12	2,119.58	2,145.32	2,301.47
	CH_4	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09
	N_2O	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	CO_2 eq.	1,817.61	1,835.36	1,906.07	1,996.71	2,115.09	2,085.95	2,103.11	2,124.57	2,150.31	2,306.46
Transport	Domestic Aviation	8.38	8.45	8.77	9.19	9.74	9.60	9.68	9.78	9.90	10.62
	Road	1,774.53	1,788.84	1,857.95	1,946.52	2,061.99	2,033.52	2,050.29	2,071.26	2,096.41	2,249.00
	Railways	7.44	7.50	7.79	8.16	8.65	8.53	8.60	8.68	8.79	9.43
	National Navigation	25.58	25.79	26.78	28.06	29.72	29.31	29.55	29.86	30.22	32.42
	Pipeline Transport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential	CO_2	353.14	536.46	556.49	599.43	645.25	632.78	579.22	654.87	667.03	738.69
	CH_4	3.47	3.49	3.63	3.80	4.03	3.97	4.00	4.05	4.09	4.09
	N_2O	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06
	CO_2 eq.	441.51	625.25	648.22	694.73	745.38	731.65	678.72	755.42	771.52	843.18
Service	CO_2	56.31	99.15	104.43	113.46	125.27	122.69	109.59	126.91	130.01	145.02
	CH_4	0.66	0.66	0.69	0.72	0.77	0.75	0.76	0.77	0.78	0.78
	N_2O	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	CO_2 eq.	73.27	116.11	122.02	131.68	144.54	141.54	128.65	146.18	149.49	164.50
Agriculture	CO_2	143.88	199.21	202.39	217.09	236.31	231.99	216.26	238.72	243.57	268.23
	CH_4	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	N_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CO2 eq.	144.30	199.63	202.81	217.51	236.73	232.41	216.68	239.14	243.99	268.65
International Marine Bunkers	CO_2	18.54	18.69	19.41	20.34	21.54	21.25	21.42	21.64	21.90	23.50
	CH_4	0.0008	0.0008	0.00084	0.0009	0.0009	0.00092	0.0009	0.0009	0.00094	0.00101
	N_2O	0.0002	0.0002	0.00021	0.0002	0.0002	0.00023	0.0002	0.0002	0.00024	0.00025
	CO_2 eq.	18.62	18.77	19.49	20.43	21.63	21.34	21.51	21.73	21.99	23.60
International Aviation Bunkers	CO_2	35.91	36.20	37.60	39.39	41.73	41.16	41.49	41.92	42.43	45.52
	CH_4	0.0004	0.0004	0.00042	0.0004	0.0005	0.00046	0.0005	0.0005	0.00047	0.00051
	N_2O	0.0015	0.0015	0.00157	0.0016	0.0017	0.00172	0.0017	0.0018	0.00177	0.0019
	CO_2 eq.	36.38	36.68	38.10	39.91	42.28	41.70	42.04	42.47	42.99	46.12
International Bunkers	CO_2	54.45	54.89	57.01	59.73	63.27	62.41	62.91	63.56	64.33	69.02
	CH_4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CO_2 eq.	54.45	54.89	57.01	59.73	63.27	62.41	62.91	63.56	64.33	69.02
Others	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

From the table above, it results:

- Among CO_2, CH_4, and NO_2, the main amount of gas released into the atmosphere is CO_2;

- The contribution of CH_4 and NO_2 is practically insignificant compared to that of CO_2;

The table below gives a clear view of the contribution of the railways sector compared to road transport and the total GHG emissions.

Table 5-40_Amount of CO2 eq per each transport sector in Albania

Unit	All sectors	Energy and transport	Transport and transport sector				
	Total CO_2 eq	Energy and transport	Transport	Road transport	Maritime transport	Air transport	Railways transport
%	100	49.42	26.31	25.66	0.367	0.121	0.108
Gg	9036.91	4466.04	2306.46	2249.00	32.42	10.62	9.42

Therefore, the contribution of the railways sector is only 0.108% of the total GHG emissions released into the atmosphere by all the economic sectors of the country.

5.2.4.4. Findings

Climate change

The projections on climate change for the Western Lowland of Albania, where the project area is included, show an increase in annual temperature and a decrease in precipitation. Summer periods will be dryer and winter periods will be wetter, affecting thus both the magnitude and frequency of floods.

Temperature

The projected increase in maximum temperature value in the summer period will be roughly 6°C by 2100. As the maximum absolute temperature recorded in the Project area is 41.5°C, the maximum absolute projected temperature value could reach 47.5 °C.

The minimum absolute temperature in the winter period is projected to increase from 0.7°C (by 2030) to 1.9°C (by 2100). As the minimum absolute temperature value recorded in the project area is -13.6 °C, it is expected this value to be -12.96 °C by 2030 and -11.36 °C by 2100. However, it is not expected that the minimum absolute temperature value to be lower than the already recorded one (-13.6 °C).

As a result, the temperature increase does not represent any risk for the Project if the Project's components are manufactured to work appropriately in these extreme temperatures.

Sea level rise

In the pessimistic scenario, the highest value of sea level will be roughly 70 cm by 2100. As the lowest part of the terrain crossed by the railway line is roughly 4 m a.s.l. (at Lezhë – see Map 1), it is not expected any impact of the sea level rise on the Project.

Precipitation

Climate variability will increase heavy precipitation. The maximum projected 24-hours precipitation in the Project area could reach roughly 240mm for a return period of 100 years.

Hydrology

The increase of the intensive precipitation frequency will cause an increase in the runoff. The maximum projected runoff in the Project area could reach 29.5% in the winter period by 2100.

Flooding

The increase of the intensive precipitation frequency will cause an increase in flood frequency in autumn, winter, and spring. The combined action of the runoff increase, sea-level rise, and topography could affect the railway line body. Details on this issue are provided in the section on flooding.

Climate change and combined sea-level rise, precipitations, and flood events

The Consultant has taken into consideration the worst case when there is a combination of the sea level rise, precipitations increase, flood events, and low terrain. That can happen within the lowland crossed by the Ishmi River, as shown in section 5.2.4.2 and Figure 5-42 above.

GHG emissions

The GHG emissions at the country level are low because of the low industrial activities, lack of intensive agriculture, and lack of thermo power plants.

Currently, the contribution of the transport sector and railway transport to the total GHG emissions at the country level is 26.31% and 0.108%, respectively. Therefore, it is not expected the GHG emissions to be a concern for the proposed project.

The use of new engines and the overall improvement of the railway line will reduce the fuel consumption, which at present is low (0.108 % of the total GHG amount at country level. Furthermore, the future electrification of the railway will avoid even this small amount.

The electrification will drastically decrease the indirect GHG emissions because more than 90% of the national electricity amount is generated by clean sources (hydropower plants). In a long run, the ability of the country to maintain this ration or to improve it further could signficately reduce the GHG emissions.

Summary of the GHG emissions estimation

Table below summarizes the comparison of estimated total GHG emissions for the Vore-Hani i Hotit railway line without and with the rehabilitation of the line.

Table 5-41_Comparison of estimated total GHG emissions for the Vore-Hani i Hotit railway line without and with the rehabilitation of the railway line

Option			Year			
	Railway section	Type of transport	2014	2025	2030	2040
			CO_2 amount (tons/year)			
No rehabilitation	Vore -Shkoder	Passenger	1299.23	176.84	121.44	111.86
		Freight	38.85	40.73	31.09	32.77
		Total	**1338.09**	**217.56**	**152.53**	**144.63**
	Shkoder - Hani Hotit	Passenger	0	0	0	0
		Freight	23.78	23.81	17.97	18.96
		Total	**23.78**	**23.81**	**17.97**	**18.96**
	Total CO_2 eq. Vore-Hani Hotit		**1361.87**	**241.37**	**170.50**	**163.59**
Railway line rehabilitation	Vore -Shkoder	Passenger	n/a	466.70	326.35	327.09
		Freight	n/a	178.26	136.43	217.35
		Total	**n/a**	**722.01**	**521.63**	**608.95**
	Shkoder - Hani Hotit	Passenger	n/a	96.32	64.20	64.51
		Freight	n/a	124.41	95.53	163.97
		Total	**n/a**	**201.46**	**154.38**	**228.48**
	Total CO_2 eq.		**n/a**	**923.47**	**676.00**	**837.43**

Option			Year			
	Vore-Hani Hotit					

The detailed calculations are provided in the *Appendix 7: Estimation of the GHG emissions during the operation phase*

According to these results, the project implementation will emit below 25,000 t/a.

5.2.5. Geology

Geological settings, the ground conditions, and the seismologic features affect the design, operation, and maintenance of the railway, especially the bridges. For this section, soil conditions mean the geotechnical features of the ground/subsoil.

5.2.5.1. Materials and method

The material used for assessing the geological issues in the project area included the following:

- Geological Map of Albania, scale 1:200,000 (Xhomo et al, 2002);
- Geological Hazards Map of Albania (Shkupi et al., 2000);
- Geological engineering map of Albania, 1; 200.000. Albanian Geological Survey, 2014;
- Maps extracted from the governmental site www.geoportal.gov.al;
- The assessment of the results from earlier geological and/or hydro-geological reports carried out by the Albanian Geological Survey for the infrastructure projects around the project area;
- Scientific articles on the geomorphology, geology, seismology, hydrogeology, etc., regarding the wide project area;
- Geological report (draft) on the PFS and PD on the proposed project;
- Field investigations in the project area concerning the proposed project.

The geological issues are described from Vorë to Hani Hotit. The outcropping geological formations that are crossed by the railway line are described carefully. Special attention has been paid to the unconsolidated geological formations and the geological cross-section at the rivers crossings for the bridges' construction. Whenever necessary, fragments of maps have been inserted into the text, while a geological map of the whole project area is provided separately as an appendix (see Map 2 – Geological map, 1:200.000 scale).

The classification of the soil (ground/subsoil) types is based on the Eurocode 8 (Eurocode 8, ground types, 2004) and the lithology provided by the geological report and the geological maps.

For each crossed geological deposit has been defined as a respective ground/soil category, as provided by the Eurocode 8 (see Appendix 5.2 of this document).

This section includes the geomorphology, lithology, and geological hazards, except for the tectonics and seismicity issues, which are developed in the next section (tectonic and earthquakes).

5.2.5.2. Baseline information

Geomorphology and lithology

According to the geological map of Albania (see Figure 5-46 and Figure 5-47 below), the railway Vorë – Hani Hotit runs over Quaternary, Molassic, and Flysch deposits, as well as over hard limestone formations.

From Vorë to Budull station the railway line runs in lowland, at the foot of the Vorë hills. The hilly terrain on the left of the railway line is covered mostly of olive yards.

In general, the whole railway line runs across open lowland, except the following sections:

- Km 22 to km 25 (Vorë): there is a hilly terrain on the left of the railway line;
- Km 57 to km 69 (Lezhë): there is a hilly terrain on the right of the railway line;
- Km 95+200 to km 95+500 (Vau Dejës): there is a hilly terrain on the east of the railway line;
- Km 139 to km 140: there is mountainous terrain on the right of the railway line.

The lowland is covered by Quaternary (Q) deposits, which are composed of Holocene (Qh) and Pleistocene-Holocene (Qph) deposits. Some of the Holocene deposits are of marshy origin and area represented by clays, silts, and sands, while others are alluvial and composed of silts, sands, and gravel.

The hills of Vorë (Km 22 to km 25) and Zejmen (57 to km 69) are represented by Pliocene and Miocene age formations that are composed of clay stones, sandstones, and conglomerates.

The hilly terrain within the territory of Ganjollë village (95+200 to km 95+500) is composed of limestone with silica.

The mountainous area on the right of the railway line (km 139 to km 140) is composed of hard limestone.

Figure 5-46 and Figure 5-47 below, extracted from the geological map of Albania[95], show the geological map of the project area. A better representation of the geological map area is given in Map 2 (Geological map of the project area, 1:200.000 scale – separate file in pdf format).

95 Geological map of Albania, 1:200000, Albanian Geological Survey, 2002.

Figure 5-46_ Geological map of the section Lezhë-Hani Hotit

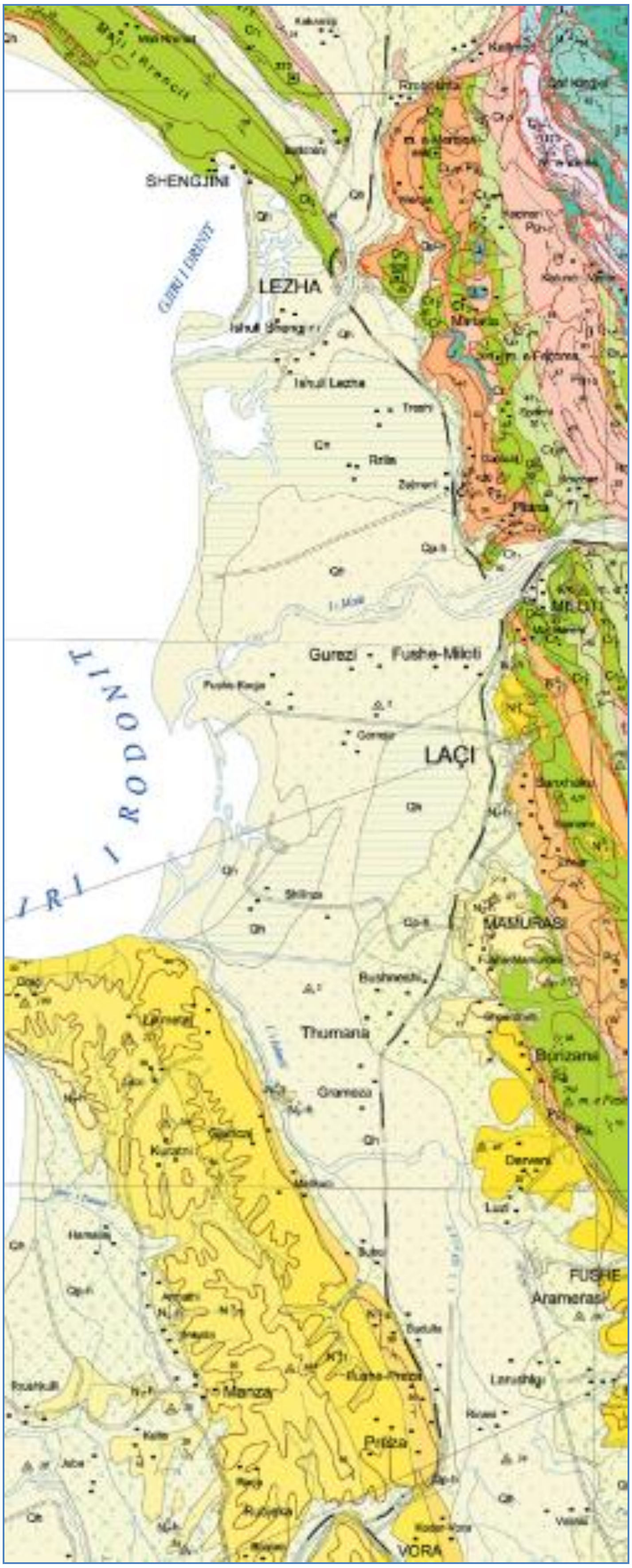


Figure 5-47_ Geological map of the section Vorë-Lezhë

Legend

Qh: Holocene; Marshy-Lacustrine Deposits: clays, silts, sands, peats.

Qh: Holocene; Alluvial Deposits: silt, sand, gravel.

Holocene; Prolluvial-Alluvial deposits: sand, gravel, silt

Qh: Holocene. Lagoon deposits

Qp-h: Pleistocene-Holocene; Mixed alluvial- prolluvial deposits: sand, gravel.

Qp: Pleistocene; Alluvial Deposits: silt, sand, gravel.

N_2: Pliocene; Clays, sandstone, gravelites, conglomerates

Pg^1_3: Lower Oligocene; Clayey – silty - sandy flysch

Pg_{1-2}: Palaeocene-Eocene; Red Marls, silty flysch, Krasta sub-zone.

Cr_2m-Pg_2: Upper Cretaceous-Palaeogene; Clayey-sandy-marly flysch

$Cr_{2\ sen}$: Upper Triassic. Senonian; Limestone, limestone with conglomerates.

Cr_2; Upper Triassic. Limestone, dolomitized limestone.

$Cr_{1\ be\text{-}v}$: Lower Triassic. Beriasian-Valanginian; Limestone and dolomites

J_3k: Upper Jurassic. Kimmeridgian; Limestone. Limestone with silica.

$J_{2\text{-}3}$ Middle-Upper Jurassic; Limestone with dolomites in the Albanian Alps zone

T_3: Upper Triassic; Limestone and dolomites in the Albanian Alps zone

T_2l: Middle Triassic. Ladinian; Limestone with gastropods. Dolomites.

The table below gives a detailed description of the geological formations that are outcropped alongside the railway line.

Table 5-42_Outcropped geological formations and their main characteristics

No	Location	Symbol	Composition
1	Vorë	Qp-h	Pleistocene-Holocene; Mixed alluvial-prolluvial deposits: sand, gravel.
2	Vorë	N_1^3t	Upper Miocene, Tortonian; sandstone, clays, limestone

No	Location	Symbol	Composition
3	Vorë	N_1^2s	Middle Miocene, Serravalian; clays, sandstone, limestone
4	Vorë- Bubq	Qp-h	Pleistocene-Holocene; Mixed alluvial- prolluvial deposits: sand, gravel.
5	Bubq-Thumane	Qh	Holocene; Alluvial Deposits: silt, sand, gravel.
6	Thumane-Fushe Milot	Qp-h	Pleistocene-Holocene; Mixed alluvial- prolluvial deposits: sand, gravel.
7	Fushe Milot Mati River	Qh	Holocene; Alluvial Deposits: silt, sand, gravel.
8	Mati River-Zejmen	Qp-h	Pleistocene-Holocene; Mixed alluvial- prolluvial deposits: sand, gravel.
9	Zejmen-Tresh	Qh	Holocene. Lagoon deposits
10	Tresh-Lezhë	Qh	Holocene; Alluvial Deposits: silt, sand, gravel.
11	Lezhë (Rrenci Mountain)	Cr_2	Upper Triassic. Limestone, dolomitized limestone.
22	Lezhë-Raboshte	Qh	Holocene; Alluvial Deposits: silt, sand, gravel.
13	Rraboshte-Hajmel	Qp-h	Pleistocene-Holocene; Mixed alluvial- prolluvial deposits: sand, gravel.
14	Hajmel - Ganjolle	Qh	Holocene; Alluvial Deposits: silt, sand, gravel.
15	Ganjolle - Juban	Qp-h	Pleistocene-Holocene; Mixed alluvial- prolluvial deposits: sand, gravel.
16	Juban-Lumi Kir-Dobrac	Qh	Holocene; Alluvial Deposits: silt, sand, gravel.
17	Dobrac – Guci e Re	Qp	Pleistocene; Alluvial Deposits: silt, sand, gravel.
18	Guci e Re - Grile	Qh	Holocene; Prolluvial-Alluvial deposits: sand, gravel, silt
19	Grile-Bajze	Qp	Pleistocene; Alluvial- prolluvial deposits: gravel, silt.
20	Bajze- Hot	J_3t J_3k	J_{3t} and J_{3k}: Upper Jurassic: Titonian Limestone, dolomites) and Kimerigian (limestone with Silica)
21	Hot-Hani Hotit	Cr_1be-v	Lower Cretaceous: Limestone, dolomites

According to Eurocode 8,96 the outcropped deposits can be classified as follows:

- Marshy deposits: Category S1 of soil (subsoil/ground);
- Alluvial deposits: Category E
- Alluvial-proluvial deposits: Category E
- Helmasi deposits: Category B to D in the function of the layers' thickness
- Rrogozhine deposits: Category D

96 http://eurocodes.jrc.ec.europa.eu/doc/WS_335/report/EC8_Seismic_Design_of_Buildings-Worked_examples.pdf

The Quaternary deposits over which lies Ishmi Bridge, which was damaged by the earthquake of November 2019, can be classified as Category S1 of soil.

Geological Hazards

The geological hazard alongside the railway line is based on the geological hazard map of Albania[97] (see Map 3: Geological Hazard Map of the project area -separate file in pdf format), as well as on the geological report carried out for the project purposes.

According to these sources, the main geological hazards encountered alongside the railway line are as follows:

- Earthquakes;
- Subsidence;
- Flash floods; and
- Shallow water table

The railway section that is most vulnerable to earthquakes lies from Baqel to Shkoder (approximately from km 90 to km 103 – see Map 3: Geological Hazard Map of the project area - separate file). Details on this topic are given in the section on tectonic and seismicity.

Detailed information on the areas most affected by the subsidence is provided in the Geological Report, according to which the most vulnerable sections are approximately from km 25+000 to km 50 +000, km 60+000 to km 68+000 and km 70+000 to km 90+000. Within these sections, the railway slope body is slightly affected by deformations that may derive from the inappropriate characteristics of the underlying quaternary geological formations, which are composed of unconsolidated clay, silty clay, peat, sand, and gravel.

The railway section that can be affected by flash floods is located approximately from km 34 to km 34 (see figure below; and Map 3: Geological Hazard Map of the project area). The flash floods are described in detail in the section on flooding (section 5.2.9 below).

The shallow water table is found almost along the whole railway line, especially from km 32 to km 55, from km 64 to km 68, from km 70 to km 95, and from km 96 to km 110.

The water table is described in the section on groundwater (section 5.2.7 below).

97 Geological hazard map of Albania at 1:200.000 scale. Albanian Geological Survey, 2002

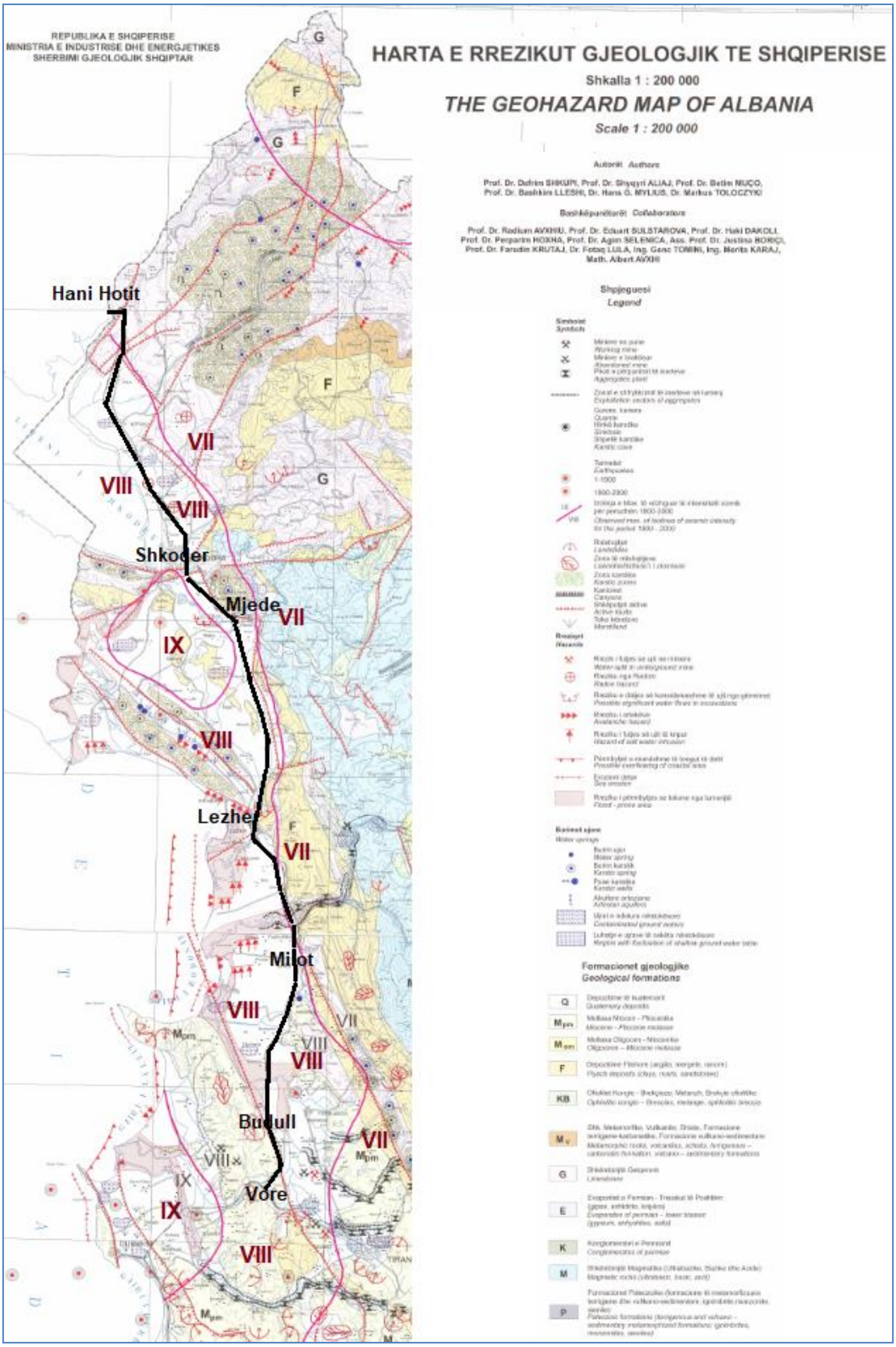


Figure 5-48_Geological hazards within the target area

Geological Risks relevant to the proposed Project

The geological risks relevant to the proposed project derive mainly from the lithology, the water table, and the running waters, as follows:

- The lithology of the area crossed by the railway line. The lithological composition of the outcropped geological formation is linked to some geological risks such as subsidence, earthquakes, and erosion. The most vulnerable section to the earthquakes lies approximately from km 90 to km 103.
- The water table alongside the crossed area is linked to the seismic risks, because of the soil liquefaction during earthquakes. Besides, the shallow water table makes difficult the construction of any eventual underpass. The shallow water table is found almost along the whole railway line, especially from km 32 to km 55, from km 64 to km 68, from km 70 to km 95, and from km 96 to km 110.
- The erosion is more pronounced during dredging works throughout unconsolidated geological formations (clays, sands, gravels), as well as within the river and streambeds during the construction of bridges (e.g. Mati and Kiri Bridges). The railway line section the most sensitive to erosion lies from km 103 to km 107. This section runs on the right of Kiri Riverbed where protection works in gabions against erosion already exist.

Due to the topography alongside the railway line route, no other geological risk such as landslides, mudflow, rock falls, etc. is expected.

5.2.5.3. Findings

The main geological risks that can affect the railway line are linked to the lithology, the tectonics and seismicity, the water table, and the running waters. These risks are subsidence, erosion, and earthquakes. The section that is most vulnerable to earthquakes lies approximately from km 90 to km 103.

The subsidence is encountered along the railway line sections that run over marshy deposits (from km 25+000 to km 50 +000, km 60+000 to km 68+000, and km 70+000 to km 90+000).

The lithological composition and the shallow water table, together with the tectonic and seismic features of the project area can affect the railway line during earthquake events.

Both the lithological composition and the running waters play an important role in the erosion of the river and streambeds. This erosion might affect the bridges’ stability and the railway embankment. The railway line section the most sensitive to erosion lies from km 103 to km 107, on the right of Kiri Riverbed where protection works in gabions against erosion already exist.

5.2.6. Tectonics and seismicity

The railway line crosses an area of high seismic intensity. Besides, the recent significant earthquakes that occurred in 2019 caused structural damage to Ishmi Bridge (# km 35 of the railway line) closing it to traffic for security reasons and putting since then the railway line Vorë – Hani Hotit out of work. Thus, the seismic features of the Project area should be taken carefully into consideration during the Project’s design.

5.2.6.1. Materials and method

The seismic hazard in the project area is provided according to the current official Albanian norms as well as to the Eurocode 8[98]. Following a decision of the Albanian Government, the latter will be introduced as the unique official norm in the evaluation of seismic hazards.

In the absence of official maps of seismic risk calculations according to Eurocode 8, the PGA values (horizontal peak ground acceleration) are taken from partial studies carried out by the Albanian Institute of Seismology.

The description of the seismological characteristics of the target area has been based on the following referenced sources:

- Seismotectonic map of Albania, 1:500,000. Academy of Sciences, Institute of Seismology. Tirana 2000;
- The map of the seismic regionalization of Albania (Sulstarova et al., Tirana, 1980);
- Seismic regionalization of Albania (Sulstarova et al., Tirana, 1980);
- Geological engineering map of Albania, 1; 200.000 scales. Albanian Geological Survey, 2014;
- Catalogue of historical and instrumental earthquakes in Albania (Sulstarova et al., 2005);
- Aliaj Sh. et al. Seismicity, seismo-tectonics and seismic hazard "Harmonization of seismic hazard assessment in Albania. Academy of Sciences of Albania. 2010;
- KTP-N.2-89, "Technical Seismic Regulations" (Academy of Sciences, 1989);
- Eurocode 8 (Design of structures for earthquakes Resistance, 2003);
- Scientific articles concerning the use of PGA as seismic action parameter;
- Information/data on the destructive earthquakes of the year 2019.

The table below gives the values of the seismic coefficient k_E. By definition, in KTP No 2-89, the product $k_E g$ is the peak ground acceleration.

Table 5-43_Seismic coefficient and ground category according to the Albanian norms (KPT No 2-89)

Parameter	subsoil/ground category			
Seismic intensity (MSK-64)		VII	VIII	IX
Seismic coefficient	I	0.08	0.16	0.27
	II	0.11	0.22	0.36
	III	0.14	0.26	0.42

The description of the subsoil/ground conditions (see table below) is based on the Albanian norms, as provided by the KTP-No 2-89.

Table 5-44 Description of subsoil/ground conditions according to the Albanian technical standards (KTP No 2-89)

98 https://eurocodes.jrc.ec.europa.eu/

No	Subsoil /ground category and subcategory			Lithological description of the subsoil/ground conditions
1	I	I.a		Hard rocks, magmatic, partly metamorphized, and sedimentary rocks with high static and dynamic stability
2		I.b		Average strength flysch formations not influenced by tectonic or alteration phenomena, sandstones, conglomerates, etc.
3	II	II.a		Rock formations with developed fissures and alteration phenomena
4		II.b		Stiff or semi-stiff silty clay formations independently of water content
5		II.c	1	Loose formations: Sandy and silty clays, clays in the strong plastic and elastic state with saturation
6			2	Loose formations: Stiff or semi-stiff sands and gravels with saturation
7	III		1	Loose formations: Coarse, medium, and fine grain size sands, dusty sands with near-surface water level
8			2	Loose formations: Clays and soft up to flowing state plastic silty clays

5.2.6.2. Baseline information

Seismic source zones in the project area

Nine seismic source zones are distinguished within the territory of Albania and its surroundings[99] (see Figure 5-49 below) based on the historical earthquakes and tectonic features. The railway line lies within three of them, as follows:

1. Preadriatic Lowland (PL), with an expected maximum magnitude Mx=7.0 (Richter scale);
2. Lezhë - Ulqin (LU), with expected maximum magnitude Mx=7.2 (Richter scale); and
3. Eastern Albania Background (EAB), which expected maximum magnitude Mx = 5.5 (Richter scale).

In geographical terms, the railway line runs across the following seismic source zones:

a. From Vorë to Lezhë across the Preadriatic Lowland (PL) source zone; and

b. From Lezhë to Bajzë across the Lezhë - Ulqin (LU) source zone.

From Bajzë to Hani Hotit the railway traverses the Eastern Albania Background (EAB) source zone, which expected maximum magnitude is low (Mx = 5.5) and therefore it is not taken into consideration in this report.

99 Aliaj Sh et al. Seismicity, seismotectonics and seismic hazard “Harmonization of seismic hazard assessment in Albania. Academy of Sciences of Albania. 2010

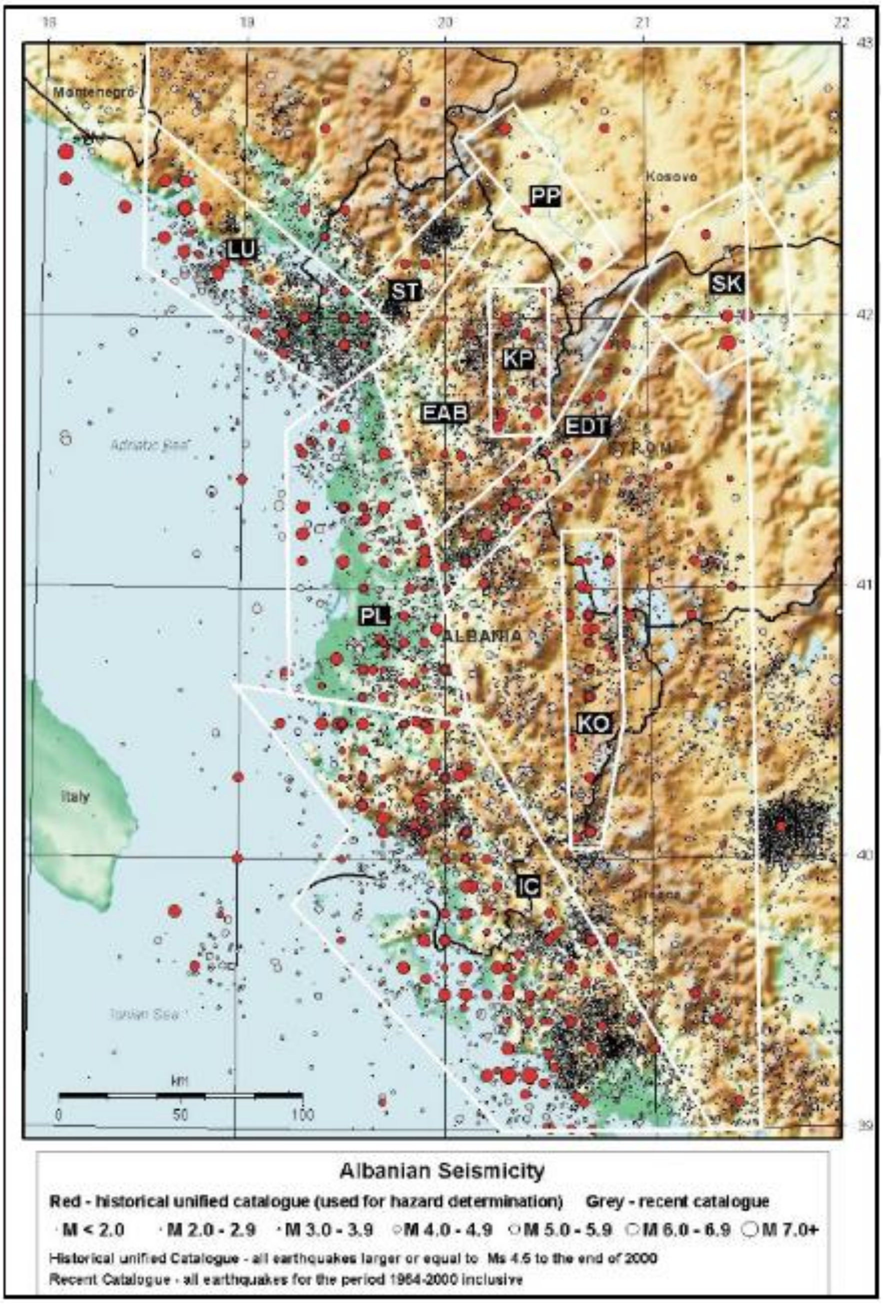


Figure 5-49_Historical earthquakes and seismic source zones in Albania

The Lezhë-Ulqin (LU) is a coastal zone affected by pre-Pliocene WNW-striking pure compression thrust faults, which are cut across by rare ENE-trending strike-slip faults. The pre-Pliocene thrust faults are still active and seismogenic. Hence, along with and near them, numerous strong earthquakes have been recorded (see Figure 5-50 below). The last one occurred on April 15, 1979, with Ms=6.9. The focal mechanism solution of the April 15, 1979 earthquake demonstrates that this fault zone is in a compressional regime with an SW-NE trend. Therefore, the future earthquakes in the Lezhë-Ulqin zone may occur with Mmax=7.2.

The Pre-Adriatic Lowland (PL) is a coastal zone affected by post-Pliocene oblique compression thrust faults, N to NNW-striking, which are cut by rare ENE-trending strike-slips faults. Along this thrust fault zone, numerous strong earthquakes have been recorded (see Figure 5-49 and Figure 5-50). The last one occurred on November 26, 2019, with Ms=6. .4 Future earthquakes in this source zone may occur with Mmax=7.0.

The figure below shows the active neotectonic faults and the location of the main historical earthquakes within the Project area and its' neighbouring100.

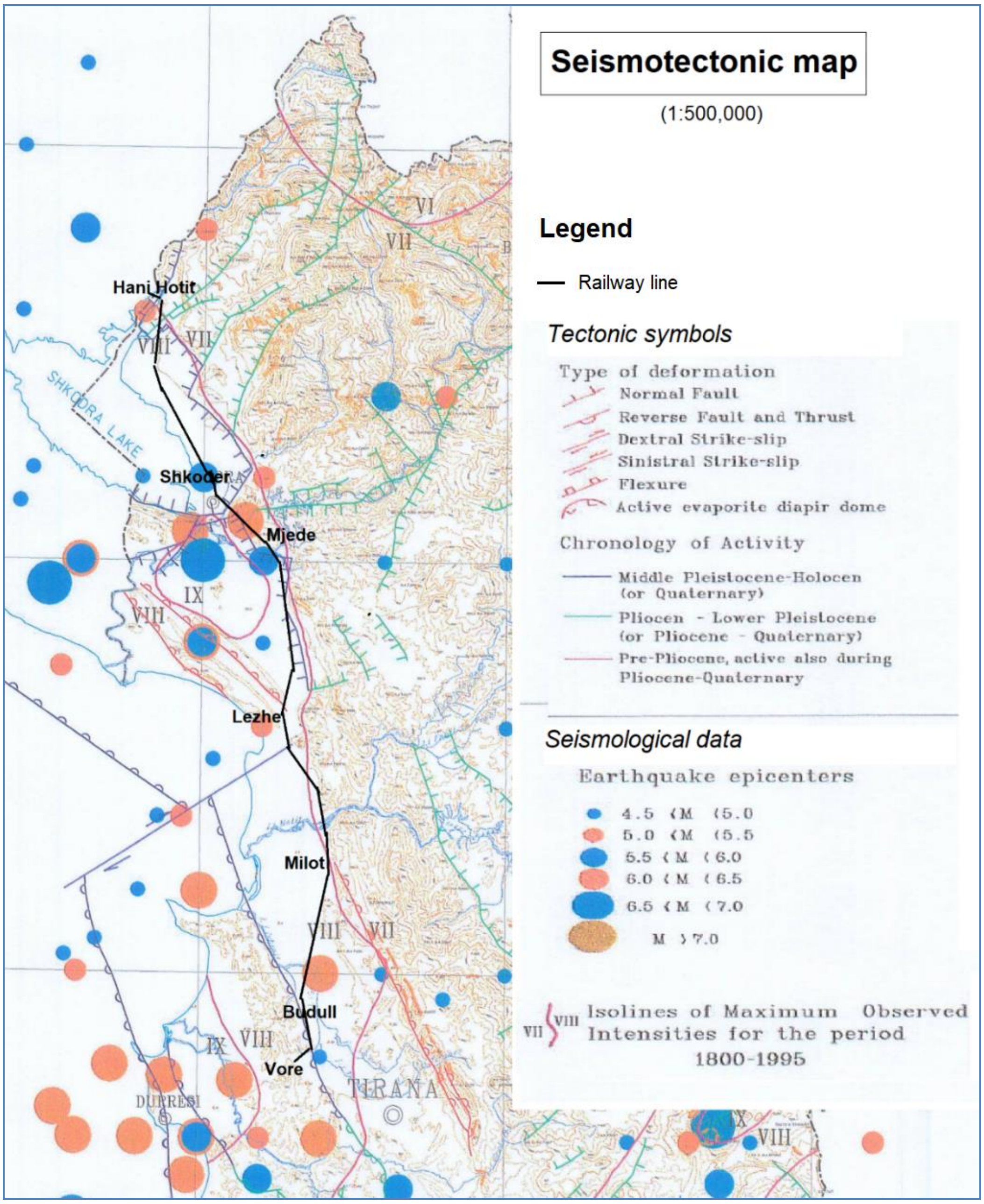


Figure 5-50_Seismotectonic map of the Project's area

Seismologic classification according to the Albanian norms

The seismic hazard map of Albania is based on the observed intensity of the largest historical earthquakes, on the earthquakes that occurred during the 20th century, as well as on the seismotectonic synthesis101. Thick Consolidated quaternary sediments characterized by deep groundwater level have been accepted as average soil conditions102.

100 Seismotectonic map of Albania, 1:500,000. Academy of Sciences, Institute of Seismology. Tirana 2000

101 Sulstarova E. and Aliaj Sh. "Seismic hazard assessment in Albania" AJNTS, 2001.

102 Sulstarova et al. Seismic regionalization of Albania. Academy of Sciences of Albania. Tirana, 1980

According to the map of seismic intensity map of Albanian territory103, the project area is situated on the seismic intensity VIII and VII degree MSK-64 (see Figure 5-50 above), estimated for 100 years (with 70% probability), for an average soil category (2nd Soil Category, according to the technical condition KTP-N.2-89).

Seismic hazards according to Eurocode 8

According to Euro code 8 (Design of structures for earthquakes Resistance, 2003), the main parameter considered in calculating the seismic hazard is the PGA (horizontal peak ground acceleration) or Amax (Maximal acceleration of vibration of the ground at foundation levels). To assess and calculate the PGA, the considered issues are the regional and local tectonics, a geotechnical model of soil/subsoil/ground, and the water table level.

Currently, in Albania, there is not any detailed official map of seismic risk based on PGA values. In the absence of such a map, our estimation is based on a schematic research map from the Institute of Seismology (see figure below) prepared in the framework of the project "Harmonization of Seismic Hazard Maps for the Western Balkan Countries" 104. The calculations were carried out for PGA for a repetition period of 475 years of firm rock conditions, with shear wave velocity Vs – 800 m/s at 30 meters depth that corresponds to the A class of Euro code 8 (EC8, 2004) – see Appendix 5.2 of this ESIA report. This parameter corresponds to a seismic risk level of 10% probability of exceedance in 50 years (return period of 475 years). According to this estimation, the maximum horizontal acceleration (for Return Period = 475 years for firm rock conditions) in the Project area varies from 0.15 to 0.35g (see Figure 5-51 below).

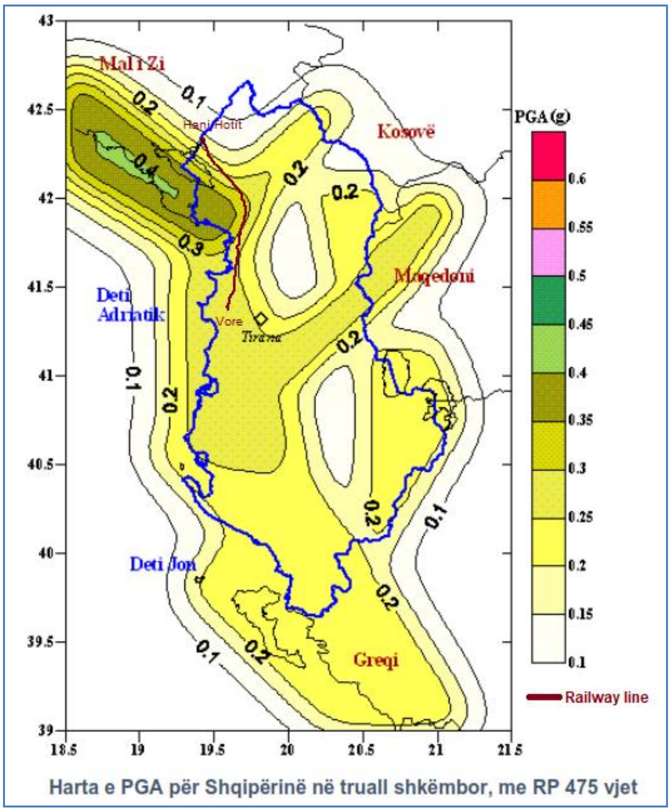


Figure 5-51_Schematic map of PGA values (for a return period of 475 years) and the railway line

103 Map of Seismic Regionalization of Albania, Scale. 1:500.000, Tirana 1980; approved by DCM no 371/1979

104 Aliaj Sh. et al. Seismicity, seismotectonics and seismic hazard "Harmonization of seismic hazard assessment in Albania. Academy of Sciences of Albania. 2010

To calculate the right values of PGA along the railway line, it is necessary to know in detail, especially for each bridge location, the local parameters including the regional and local tectonics, the geotechnical model of the soil/ground, and the water table level.

Latest significant earthquakes and the railway line Vorë – Hani Hotit

The railway section from Vorë to Laç is built in the early 1960’ years, while the section Laç to Hani Hotit in the years 1980’.

Two significant earthquakes have hit the Western Lowland of Albania from the early 1960’ up to now (Spring 2020), as follows:

- Earthquake of April 15, 1979: Ms = 6.9; MM = IX+; Epicentre in Petrovac, Montenegro.
- Earthquake of November 26, 2019: M105s = 6.4; MM106 = IX+; Epicentre roughly 10 km westward of km 35 of the railway line Vorë-Hani Hotit (see Figure 5-53 below).

Hereinafter follows a summary of these earthquakes and their impact on the railway line components.

Earthquake of April 15, 1979, and the railway

The earthquake of April 15, 1979, occurred within the Lezhë-Ulqin seismic source zone. Its magnitude has been evaluated from 6.6 to 7.2. The epicentre of this earthquake was in the coastal area, near Petrovac, Montenegro. The magnitude of the main shock has been evaluated between 6.6 and 7.2 (MSK-64), while the intensity in the epicentre IX to X degree (Modified Mercalli Scale). The aftershock continued for roughly 9 months. The magnitude of the strongest of them that occurred on May 24, 1979, was evaluated by M=6.3.

In Albania, the main shock caused 35 casualties and 382 injuries. More than 100,000 inhabitants were left homeless in Shkoder and Lezhë. Roughly, 17,120 dwelling houses and social-cultural facilities were destroyed.

The earthquake has been accompanied by some physical-geological phenomena like soil cracks, soil liquefaction, riverbanks subsidence, and rock falls.

The local soil conditions played a crucial role in the amplification of the earth shaking during this earthquake. The most affected area was the area filled by the Drini River with loose alluvial deposits. The seismic intensity of this area is evaluated by IX degree MKS-64 (see figure below).

105 Ms – magnitude in Mercalliscale

106 MM- Intensity in Modified Mercalliscale

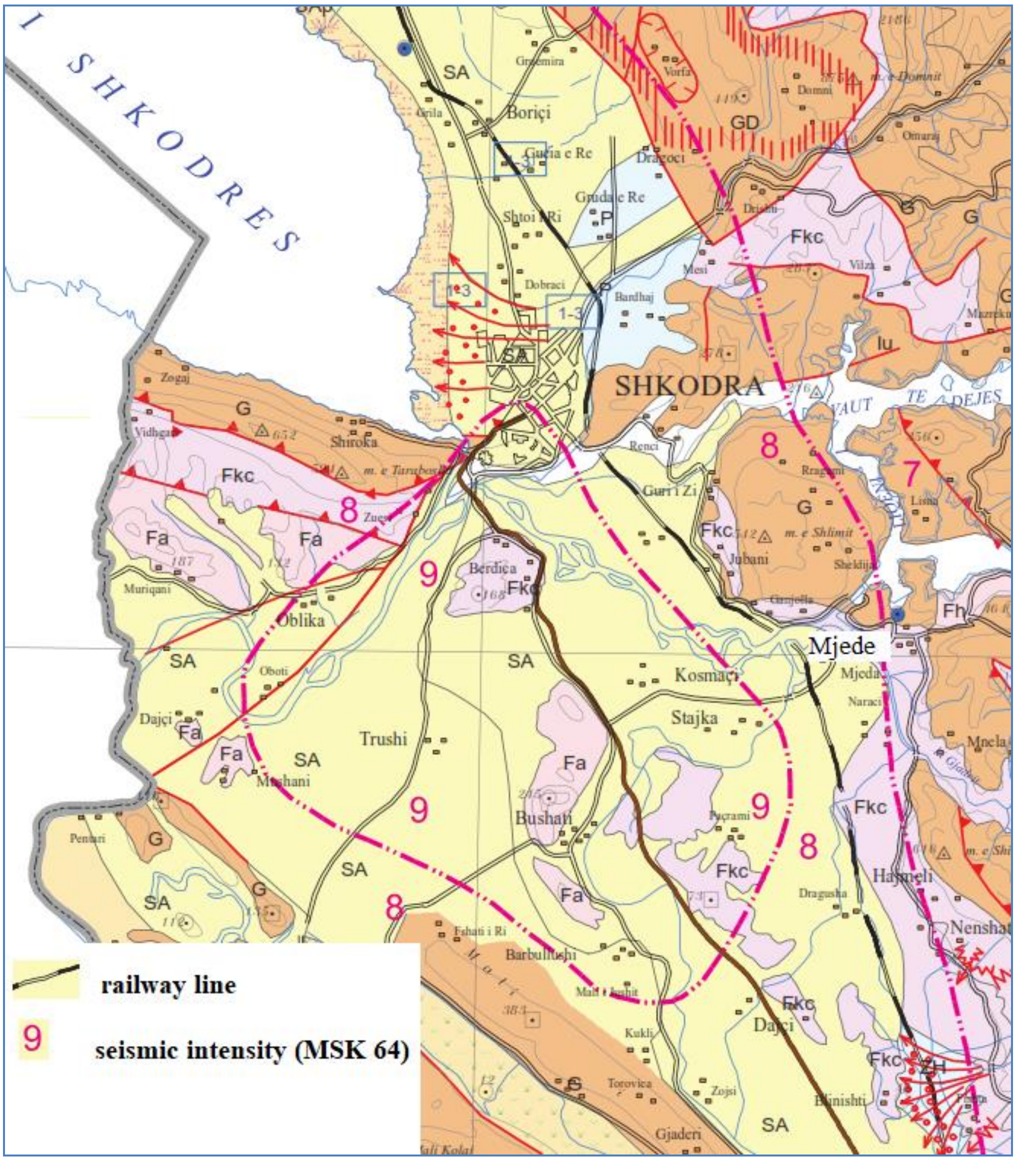


Figure 5-52_ Seismic intensity map (MSK-64) and railway line at Shkoder region[107]

At the time of this earthquake, the railway section Laç-Hani Hotit was not yet built. As the existing railway line runs close to the eastern border of this area, the design of the bridges needs to take into consideration the seismic risk, which should be calculated by taking into consideration the regional and local tectonic and the geotechnical characteristics of the subsoil/soil/ground. The water table level at the crossings of Gjadër, Drini, and Kiri Rivers is at the level of the river's surface. Therefore, bridges' design must take into consideration any eventual soil liquefaction in case of a strong earthquake.

Earthquake of November 26, 2019, and the railway

The earthquake of November 26, 2019, occurred within the Preadriatic Lowland seismic source zone. The epicentre was in the Adriatic coastline, some 20km in the NW of Vorë (see figure below). The magnitude of the main shock has been evaluated at least 6.4, while the intensity in the epicentre to IX degree (MSK-64)108. The earth shake lasted at least 50 seconds.

107 Geological engineering map of Albania, 1; 200.000 scale. Albanian Geological Survey, 2014

108 https://www.volcanodiscovery.com/earthquakes/albania/archive/2019-nov-26.html

The main shock caused more than 50 casualties, 3000 injuries, and thousands of homeless. Thousands of buildings were damaged in Durrës, Shijak, Vorë, Fushe Kruje, Mamurras, Thumanë, Laç, Milot, Lezhë, Tirana, etc.

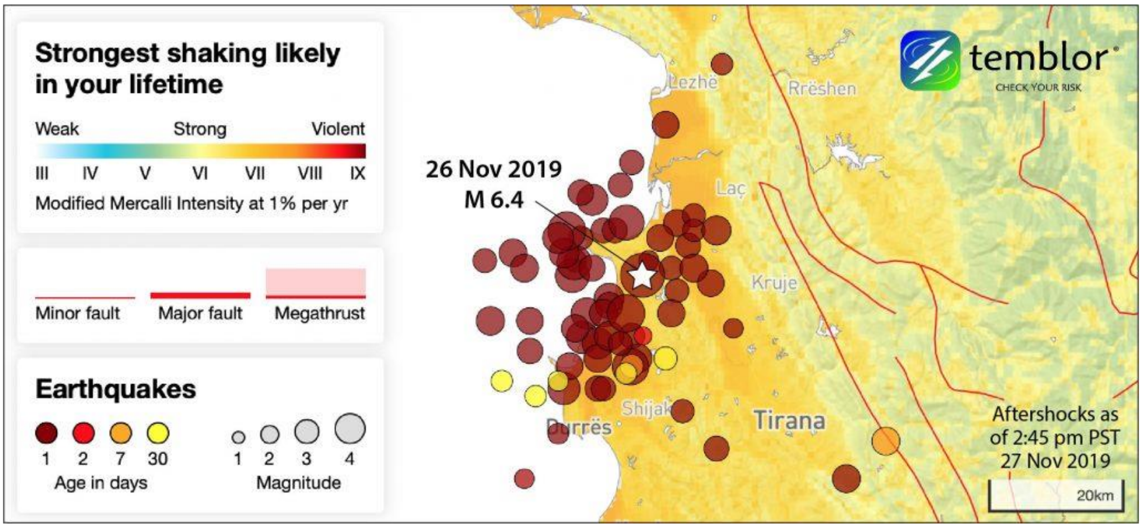


Figure 5-53_Epicenter of the earthquake of November 26.2019 and aftershocks of 24 hours

The figure below shows the role of the soil conditions within the Project area in the amplification of the earth shaking during earthquakes. The information has been collected during the earthquake of November 26, 2019, that damaged also the Ishmi Bridge.

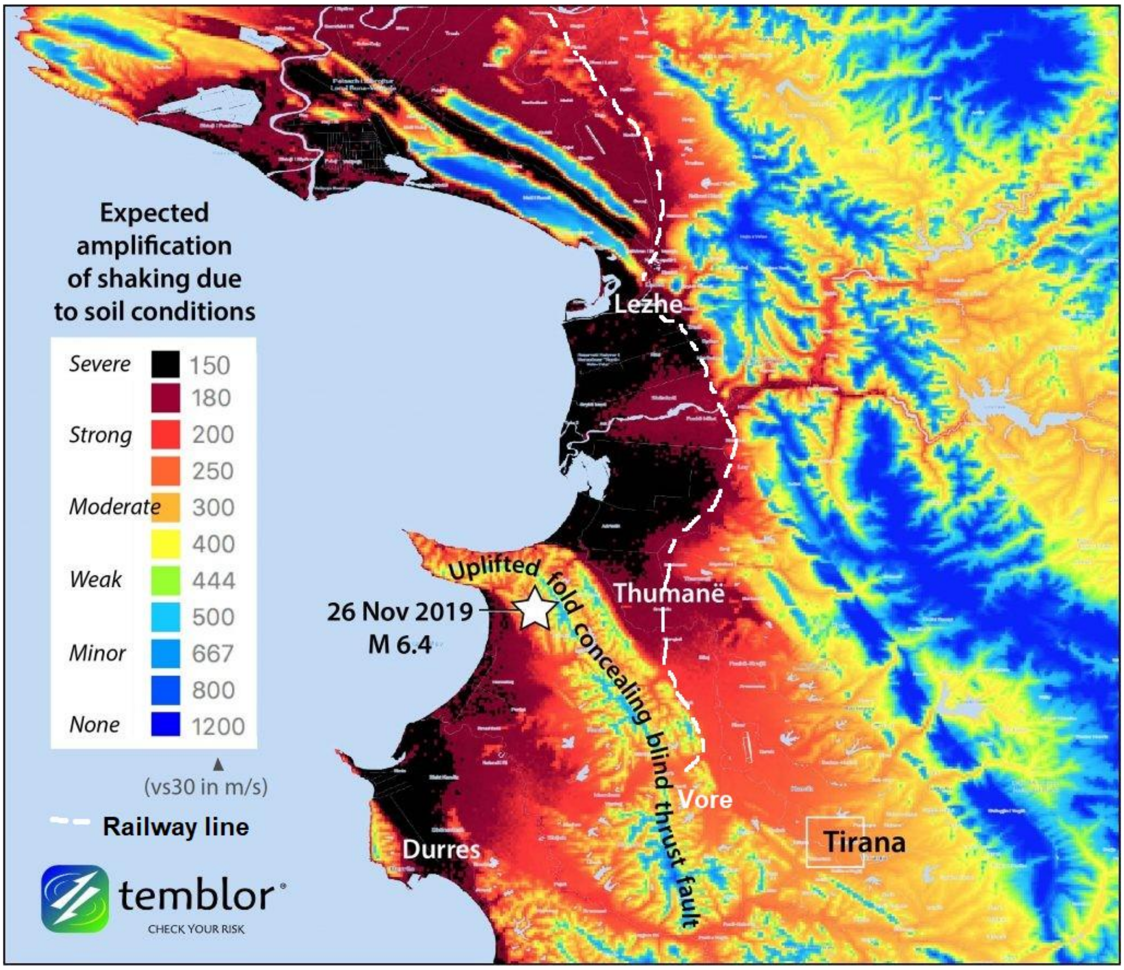


Figure 5-54_Amplification of the earth-shaking due to soil conditions

The shaking produced by the earthquake was almost certainly amplified in the weak, unconsolidated deposits surrounding the epicentre. *Temblor's STAMP model shows amplification factors of 4-5 over the shaking that was experienced at bedrock sites, such as at the epicentre itself109.*

The shaking was higher within the flat areas covered by water-saturated unconsolidated Quaternary deposits, especially marshy deposits. The area crossed by the railway line (see figure above) is affected by active post-Pliocene thrust faults (see Figure 5-50 above)

The earthquake of November 26, 2020, damaged also the Ishmi Bridge, which is currently (Spring 2020) out of work. Consequently, the whole railway line from Vorë to Hani Hotit is not in operation.

Figure 5-55_Ishmi Bridge damaged by the Earthquake of November 26.2019

As shown in the geological cross-section (see Figure 5-56 below), the thickness of the unconsolidated deposits at the crossing of Ishmi River is approximately 70m, while the water table is almost close to the surface110.

109 https://temblor.net/earthquake-insights/albania-earthquake-strikes-highest-hazard-zone-in-the-balkans-devastating-nearby-towns-10153/

110 Albanian Geological Survey, TDK project, 2003

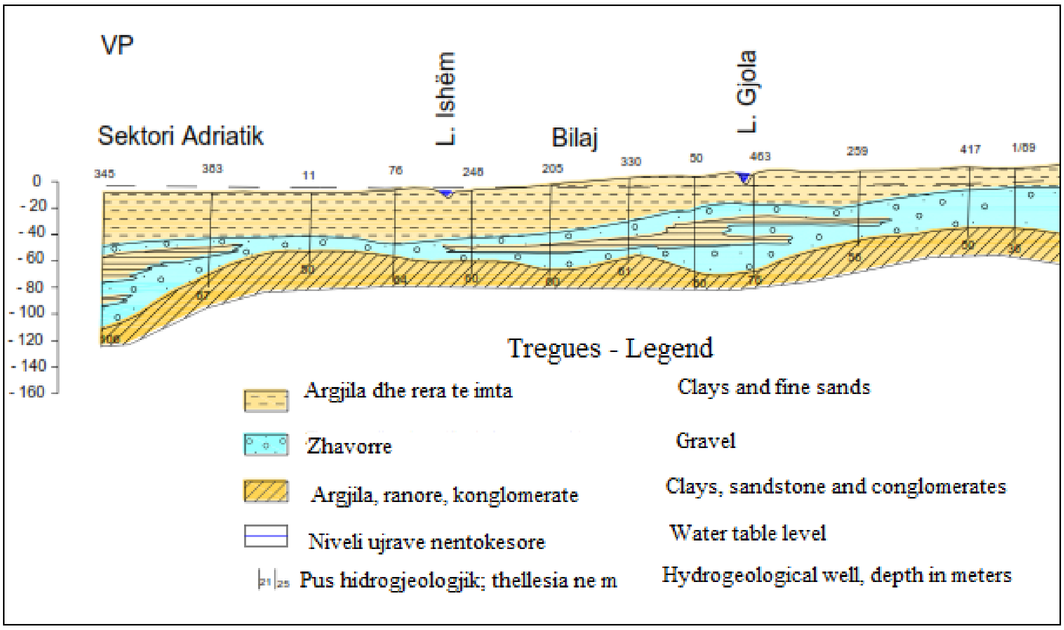


Figure 5-56_Geological cross-section and thickness of the unconsolidated deposits at Ishmi Bridge

5.2.6.3. Findings

The railway line runs across the seismic zone sources of Preadriatic Lowland and the Lezhë-Ulqin. Both these belts are seismically active.

According to the map of the recorded earthquakes, the expected maximum magnitude (in Richter scale) within the Preadriatic Lowland is Mx=7.0, while within the Lezhë-Ulqin is Mx=7.2.

Based on the seismotectonic map of Albania (see Figure 5-50 above) and the map of the seismic zonation of Albania, the railway line is included in areas where the expected earthquakes could have an intensity (in the epicentre) of VIII degree (MSK-64).

From Vorë to Bajzë the PGA values (see Figure 5-51 above) are from 0.25 to 0.3, for a return period of 475 years. According to the Albanian norms (KPT-89), the section from Bajzë to Hani Hotit, where these values vary from 0.1 to 0.2, runs over hard limestone formations of category I of subsoil (see Table 5-43 and Table 5-44 above). From Vorë to Bajzë the railway runs through loose formations that can be classified as category III of subsoil (see Table 5-43 and Table 5-44 above).

To calculate the right values of PGA along the railway line, it is necessary to know in detail, especially for each bridge location, the local parameters including the regional and local tectonics, the geotechnical model of the soil/ground, and the water table level.

Based on the lithological composition of the crossed geological formations (category III of subsoil), as well as on the shallow water table, the section from Vorë to Bajzë can be affected by the soil liquefaction phenomenon during strong earthquakes.

From Baqel to Shkoder (roughly from km 90 to km 103), the railway runs close to an area where the expected intensity is IX degree MSK-64 (see Figure 5-52 above). That imposes the design of the bridges to take into consideration this high seismic risk, which should be calculated by taking into consideration the regional and local tectonic and the geotechnical characteristics of the subsoil/soil/ground. The water table level at the crossings of Gjadër, Drini, and Kiri Rivers is at the level of the river's surface. Therefore, bridges' design must take into consideration any eventual soil liquefaction in case of a strong earthquake.

In any case, it is compulsory to understand the geotechnical model of the soil through geotechnical studies, including the information collected by the borehole logs. The evaluation of the seismic risk is made based on the geotechnical model. The Consultant has prepared a seismic study report based on the detailed seismic measurements for all the area crossed by the railway line. Special attention has been paid to the site locations of the bridges and railway stations' buildings. For more information please refer to the section 6.2.6 (Tectonics and seismicity), chapter 6 (Impacts and mitigation measures).

Based on this study, The Consultant does not believe that the project will be subject to surface fault rupture hazard. The recent large earthquakes in the region are consistent with the seismic model used to estimate PGA along the alignment, while liquefaction is anticipated in the lowlands during seismic events. The design of the project, considered these aspects, has been engineered and will be constructed to withstand local seismic events and associated liquefaction, without catastrophic failure.

5.2.7. Groundwater

The assessment of the ground waters is crucial for the ESIA on the proposed project as the earthworks may pollute the ground waters and therefore affect the quality of the drinking water. It should be underlined that the principal urban centres (Durrës, Shkoder, Lezhë, etc.) and rural areas alongside the railway line are supplied with drinking water through the wells drilled in the aquifers of the area.

5.2.7.1. Materials and method

The assessment of the hydrological issues of the project area was based on the following:

- Hydro-geological map of Albania, scale 1:200,000, Albanian Geological Survey, 2015;
- The assessment of the results from earlier hydro-geological reports carried out by the Albanian Geological Survey for the infrastructure projects around the project area;
- Scientific articles on the geology, hydrology, and ground waters within the wide project area;
- Earlier ESIA reports on similar projects, where the project team members have participated;
- Geological report for the Detailed Design for the Vorë-Hani Hotit railway project; and
- Field investigations in the project area and its surroundings.

The purpose of the surface and groundwater assessment in the project area is to demonstrate the potential impacts on the quantity and quality of these waters. For each segment of the railway corridor, it is specified the approximate depth of the water table and any eventual risks on the water pollution during and after the implementation of this project.

The factors that were considered relevant to the railway line rehabilitation include:

- The water table level;
- The water protection zones (sanitary zones);
- The vulnerability of the aquifers;
- The importance of the aquifers for the drinking water supply;
- Any eventual formal protection status of the water sources

Special attention has been paid to the groundwater at the rivers' crossings where new bridges are planned to be built, as well as at the location of the new underpasses that require dredging works.

The description of the quality of the ground waters has been based on the Albania State of Environment Reports (SoER), 2018 and 2019. The State of Environment Report is published yearly by the National Environmental Agency.

The monitoring of the groundwater's quality has been based on the DCM 1189/2009 "On the rules and procedures on the preparation and application of the national monitoring program", as well as on the DCM 177/2005 "On the permitted liquid discharge into the water bodies and their zoning criteria".

The water quality parameters and the related norms are based on both the national and EU norms of drinking water quality. DCM 379/2016 "On the approval of the regulation on the drinking water quality" fully complies with the EU Directive 98/83/EC "On the quality of the water intended for human consumption".

The classification of the groundwater quality is based on Annex I of the EU Directive 2006/118/EC "On the protection of groundwater against pollution and deterioration", called also Groundwater Directive (GWD).

5.2.7.2. Baseline information

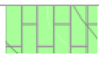
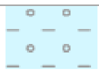
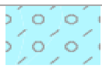
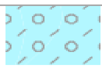
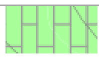
Groundwater along the whole railway line

The table below gives the water-bearing formations alongside the railway line, according to the hydrogeological map of Albania, 1:200,000[111].

Table 5-45_Water-bearing formations alongside the railway line.

No	Geographical location	Symbol	Name and characteristics of the water-bearing formation	Relevance to the project (Yes/No)
1	Vorë	Qh	Holocene age; Unconsolidated rocks; Clays, silts, sand; Formation practically without water bearing and permeability.	No
2	Vorë		Consolidated rocks: Clay stone, sandstone, conglomerates; Low water-bearing and permeability	No
3	Budull - Bubq	Qp-h	Palaeocene - Holocene age deposits; Unconsolidated rocks; Clays, silts, sand; Formation practically without water bearing and permeability.	No
4	Bubq – Mamurras		Unconsolidated rocks; sand, gravel, clays; -High to medium porosity and permeability; Tirana-Ishem Quaternary Gravel Aquifer;	Yes
5	Mamurras to North of Laç	Qp-h	Palaeocene - Holocene age deposits; Unconsolidated rocks; Clays, silts, sand; Formation practically without water bearing and permeability.	No
6	North of Laç – Mati River		Unconsolidated rocks; sand, gravel, clays; -High to medium porosity and permeability; -Fushe Kuqe Quaternary Gravel Aquifer	Yes
7	Mati River-		-Lezhë Quaternary Gravel Aquifer;	Yes

111 Hydrogeological Map of Albania, 1:200.000, Albanian Geological Survey, 2015

No	Geographical location	Symbol	Name and characteristics of the water-bearing formation	Relevance to the project (Yes/No)
	Lezhë		-High to medium porosity and permeability	
8	Lezhë tunnel		Karst aquifer; Low to medium to high porosity and permeability; Carbonate Aquifer of Rrenci	Yes/No
9	Lezhë-Raboshtë		Palaeocene - Holocene age deposits; Unconsolidated rocks; Clays, silts, sand; Formation practically without water bearing and permeability.	No
10	Raboshtë – North of Hajmel		Unconsolidated rocks; clays, sand, gravel; Medium to low water-bearing and permeability; (Zadrima Aquifer)	Yes/No
11	North of Hajmel - Shkoder (Kiri River)		Unconsolidated rocks; sand, gravel, clays; -High to medium porosity and permeability; -Lower Shkoder Quaternary Gravel Aquifer	Yes
12	Dober Village		Palaeocene - Holocene age deposits; Unconsolidated rocks; Clays, silts, sand; Formation practically without water bearing and permeability.	No
13	North Dober-Aliaj		Unconsolidated rocks; sand, gravel, clays; High to medium porosity and permeability; -Upper Shkoder Quaternary Gravel Aquifer;	Yes
14	Aliaj-Hani Hotit		Karst aquifer; Low to medium to high porosity and permeability; -Carbonate Aquifer of Albanian Alps	Yes

The most sensitive groundwater bodies are the aquifers used for drinking water supply purposes. The railway line runs across the Western Lowland of Albania where are located the most important Quaternary gravel aquifers of the country that supply drinking water to some of the main urban centres of Western Albania, including Durrës, Lezhë, and Shkoder.

Crossed aquifers

Below follows a description of the ground waters over which runs the railway line. The aquifers have been described based on the Hydrogeological map of Albania, 1:200.000 scale[112] (see Map 4_Hydrogeological Map -separate file in pdf format).

From Vorë to Hani Hotit the railway runs over the following aquifers:

1. Porous aquifer of Tirana-Ishmi;
2. The porous aquifer of Fushe Kuqe;
3. The porous aquifer of Lezhë;
4. The porous aquifer of Lower Shkoder;
5. The porous aquifer of Upper Shkoder;
6. Karst Aquifer of Rrenci Mountain (crossed by Lezhë tunnel); and
7. Karst Aquifer of Albanian Alps Mountains (from Bajze to Hani Hotit).

112 Hydrogeological Map of Albania, 1:200.000. Albanian Geological Survey, Tirana 2015

Figures below that have been taken from the text of the hydrogeological map of Albania, 2015, show the aquifers crossed by the railway line.

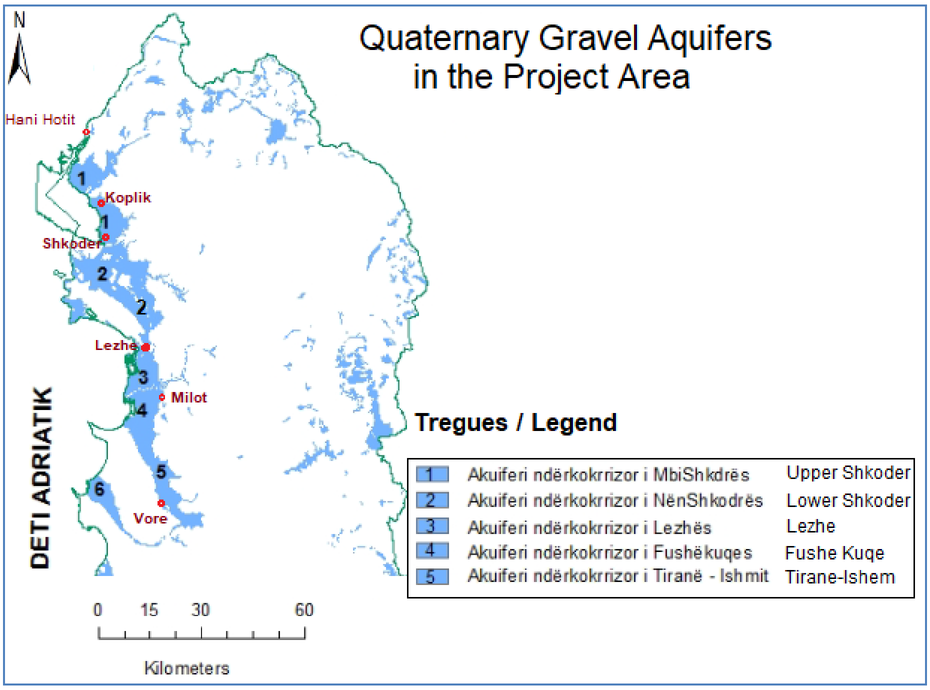


Figure 5-57_Quaternary aquifers crossed by the railway line

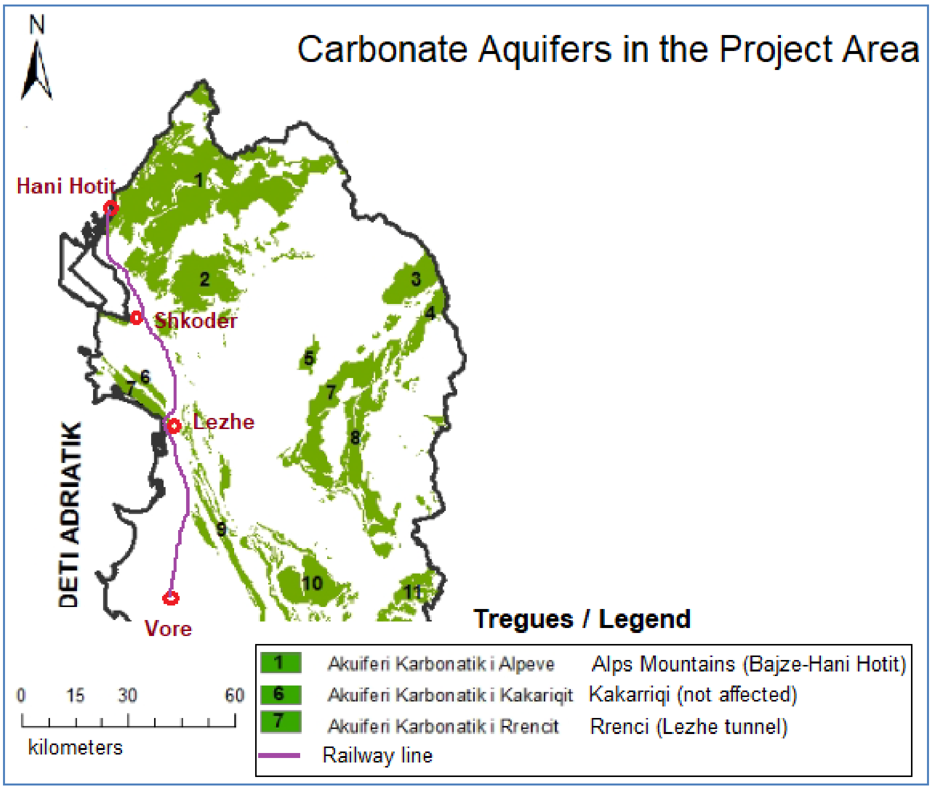


Figure 5-58_Carbonate aquifers crossed by the railway line

Hereinafter are described the main aquifers crossed by the railway line as well as their importance at country and local level.

1. **Tirana-Ishmi aquifer**

This aquifer lies from Tirana to Thumanë. The railway line runs over this aquifer approximately from km 25 to km 40.

Hydrogeological settings: The Tirana – Ishmi is a sub artesian aquifer that is composed of alluvial gravelly deposits. Between Thumanë and Mamurras, the deposits of this aquifer are intercalated with the Mati River gravels. The recharge area is located close to Tirana and therefore no recharge area is present alongside the railway line. The water-bearing capacity and permeability have high to medium values. The highest values are encountered in the section between Fushe Kruje and Thumanë. From Thumanë to Mamurras the water-bearing capacity and permeability decrease. The water table level decrease from East to West. Within the Project area and its vicinity, there is no any water spring

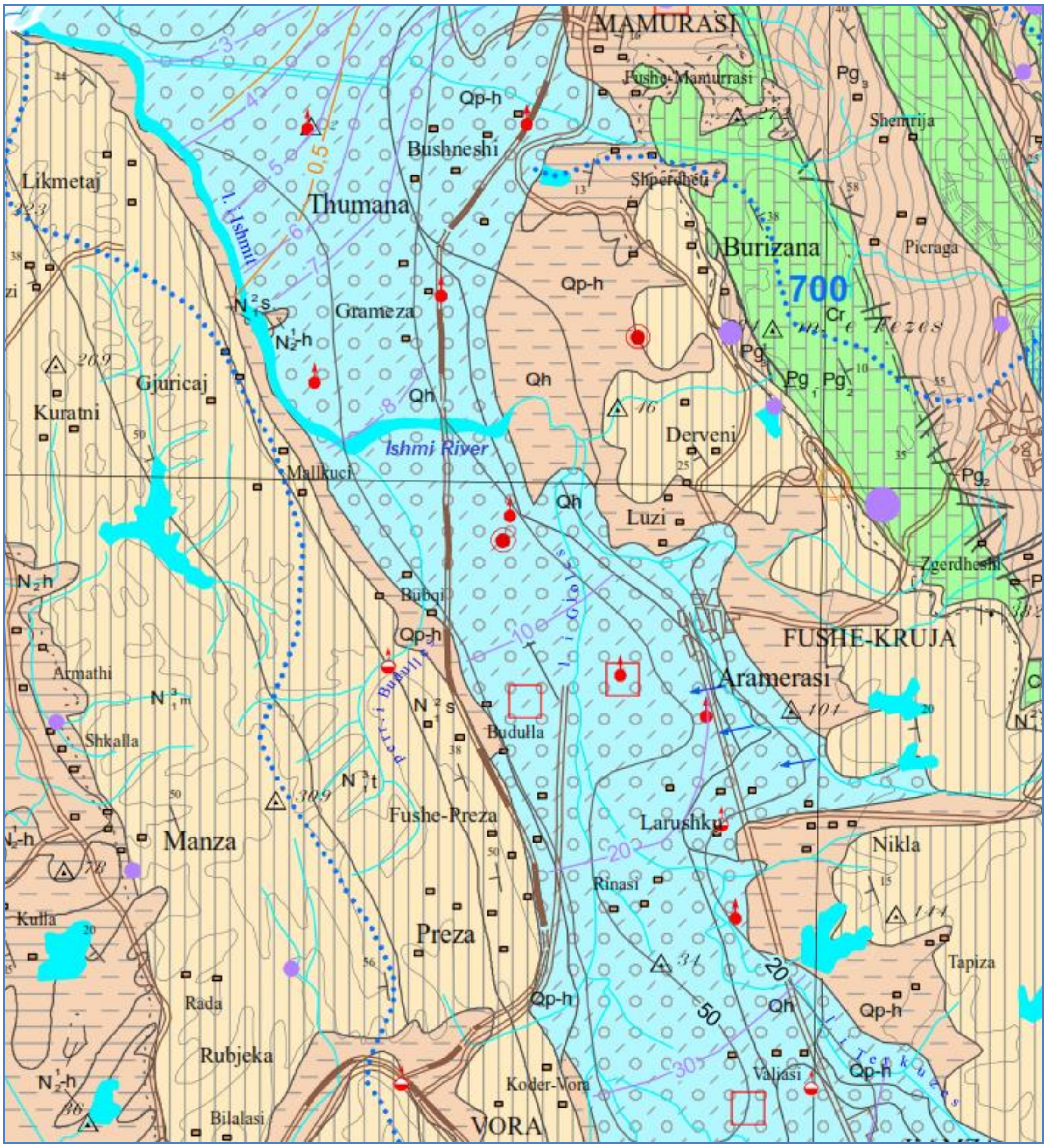


Figure 5-59_Hydrogeological map of the Vorë – Mamurras Project area (1:200.000)113

Legend

113 *Source: Hydrogeological Map of Albania, 1:200.000. Albanian Geological Survey, 2015*

Porous aquifer of high water-bearing capacity and permeability (mainly sand and gravel)

Porous aquifer of medium to low water-bearing capacity and permeability (sand, clays)

Karst aquifer. Non-uniform permeability varying from high to low (limestone, dolomite)

Formations with very low porosity (clays, sub clays)

Water extraction work

Water well. Confined aquifer

Water well. Unconfined aquifer

Spring

Lake

River

The average thickness of the Quaternary (Q) clayey-silty-sandy deposits that overlie this aquifer varies from 20 m in the south to 30 m in the north. In Rinas, this thickness is around 6-7m, while at the crossing of Ishmi River it is around 40m (see figure below).

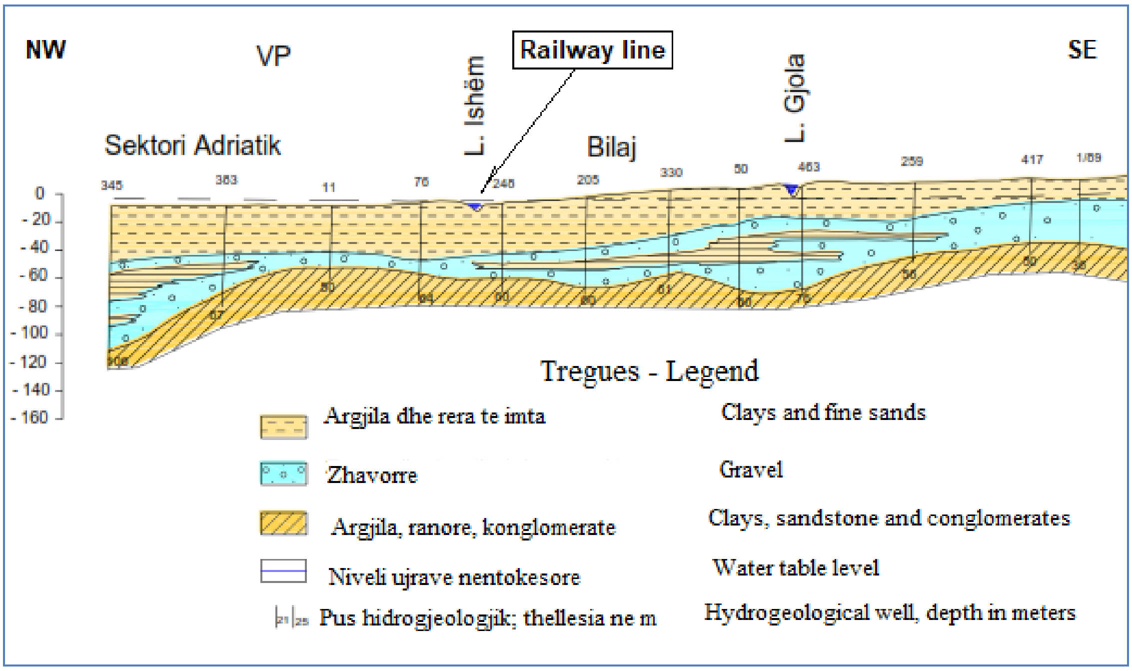


Figure 5-60_Hydrogeological cross-section (1:50.000) of the Tirana-Ishmi aquifer[114]

Water quality:

According to the Albanian State of Environment Reports, 2018 and 2019, the water quality is measured in two different sectors: 1-Tirana; and 2-Fushe Kruje.

The Railway line runs across the Fushe Kruje sector, which water quality is given hereinafter.

114 Albanian Geological Survey. TDK project. 2003

Table 5-46_Physical water quality parameter for Tirana –Ishmi Aquifer

Parameter		Value	National norm				EU	Comment
Name	Unit		STASH 97		DCM 379/2016		98/83/EC	
			Limit value	Max. accept	Limit value	Max. accept	Max. accept	
Temperature	Degrees Celsius	16.1-16.6	5-15	20	15	20	20	5-years period
Acidity (pH)	unit	7.33-7.74.	6.5-8.5	9.5	≥ 6,5 ≤9,5	9.5	≥ 6,5 ≤9,5	Within AL/EU Standards
Total hardness	German degrees	21.7-27.3	10-15	20	10-20	25	25	Hard water
Mp - Total mineralization	mg/l	606.93-782.08	700	1200	n/a	2000	n/a	5-years period; Within AL/EU Standards
Mth – Total Dissolved Solid (TDS)	mg/l	430.7 – 563.25	500	1000	500	1000	1000	Within AL/EU Standards

While the chemical parameters are given in the table below.

Table 5-47_Chemical water quality parameter for Tirana –Ishmi Aquifer

Parameter		Value	National norm			EU	Comment
Name	Unit		STASH 97		DCM 379/2016	98/83/EC	
			Limit value	Max. acceptable	Limit value	Max. accept.	
Sodium (Na)	(mg/l)	13.7-22.86 16.6	20	100	200	200	Within AL/EU Standards
Calcium (Ca)	(mg/l)	69.83-106.71	75	200	200	200	Within AL/EU Standards
Magnesium	(mg/l)	31.61-66.88	20	50	50	50	Over AL/EU standards
Iron (Fe)	(µg/l)	0.033-0.305	50	300	300	200	Slightly over AL/EU standards
Ammonia (Nh4)	(mg/l)	0.01	0	0.05	0.1	0.5	Within AL/EU Standards
Chloride (Cl^-)	(mg/l)	15.08-31.24	25	200	250	250	Within AL/EU Standards
Sulphate (SO_4)	(mg/l)	28.51-67.15	25	250	250	250	Within AL/EU Standards
Nitrate (NO_3)	(mg/l)	2.43-19.5	25	50	50	50	Within AL/EU Standards
Nitrite (NO_2)	(mg/l)	0.005 - 0.008	0	0.05	0.5	0.5	Within AL/EU Standards
Dissolved oxygen (O_2)	(mg/l)	0.46-9.3	> 8.0	n/a	> 8.0	>8.0	Lower than required Standards

Water supply: This aquifer is considered of medium importance from the water supply point of view. The villages of the area are supplied with drinking water from this aquifer.

The railway line and the aquifer: The biggest railway line component that will be built within this section is the Ishmi River Bridge that was heavily damaged by the earthquake of November 26, 2019. At the location of this bridge, the thickness of the cover deposits is around 50m, and therefore no impact of the project, especially from bridge construction, is expected on the quality of the aquifer water.

2. Fushe Kuqe aquifer

Hydrogeological settings: Fushe Kuqe aquifer (10 x 5.5 km) is one of the most important in the country. It lies roughly from Thumanë to Mati River. Between Mamurras and Thumanë, the deposits of this aquifer are intercalated with those of the Tirana – Ishmi aquifer (see Figure 5-61 below).

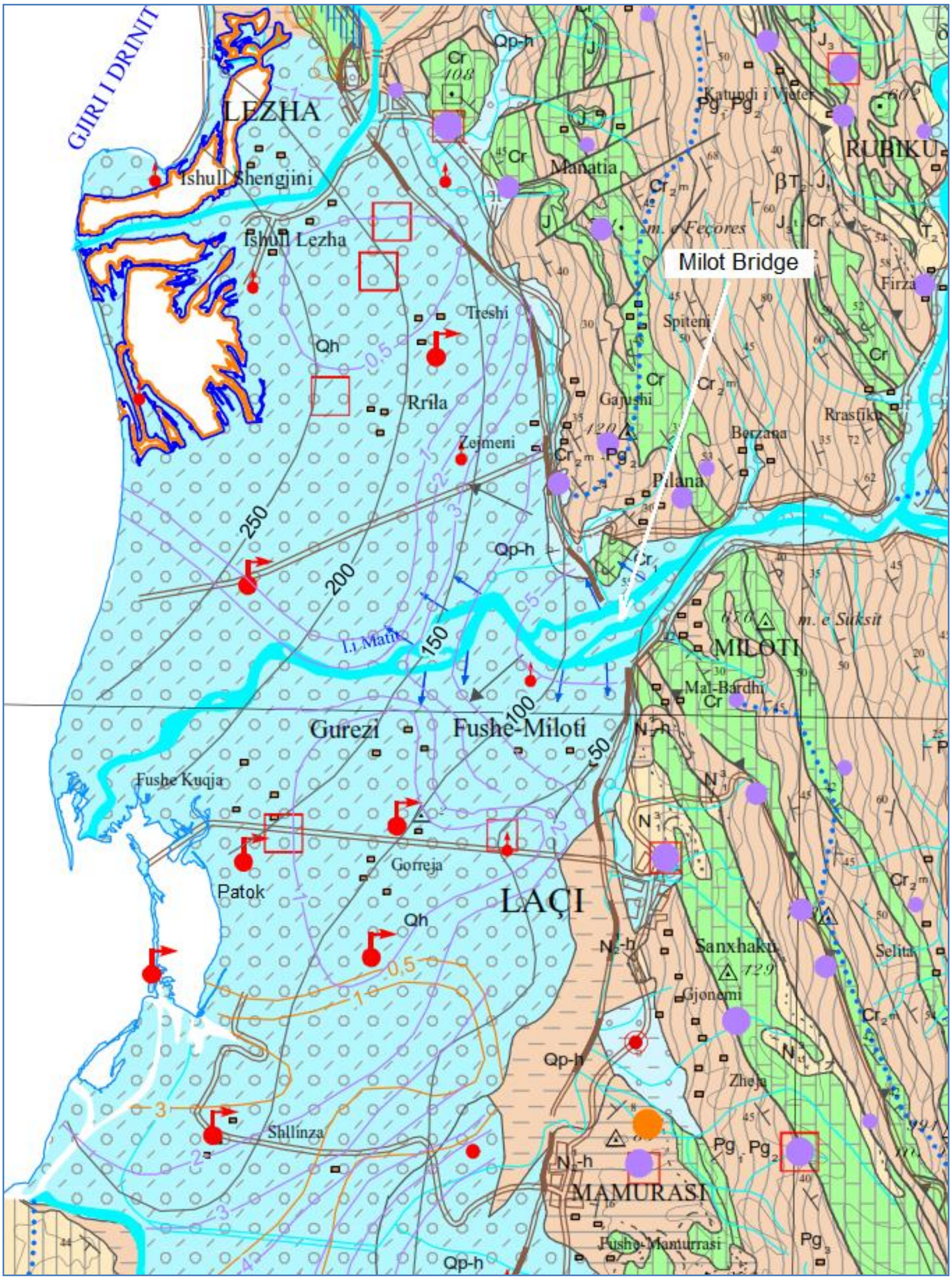


Figure 5-61_Hydrogeological map of Fushe Kuqe and Lezhë Aquifers

Legend

	Porous aquifer of high water-bearing capacity and permeability (mainly sand and gravel)
	Porous aquifer of medium to low water-bearing capacity and permeability (sand, clays)
	Karst aquifer. Non-uniform permeability varying from high to low (limestone, dolomite)
	Formations with very low porosity (clays, sub clays)
	Water extraction work
	Water well. Confined aquifer
	Water well. Unconfined aquifer
	Spring
	Lake
	River

The figure below gives the hydrodynamic scheme of the Mati River alluvial Plain115, where are included the Lezhë and Fushe Kuqe aquifers.

115 Source: R. Eftimi, Hydraulic properits of the gravelly aquifers of Western Lowland of Albania

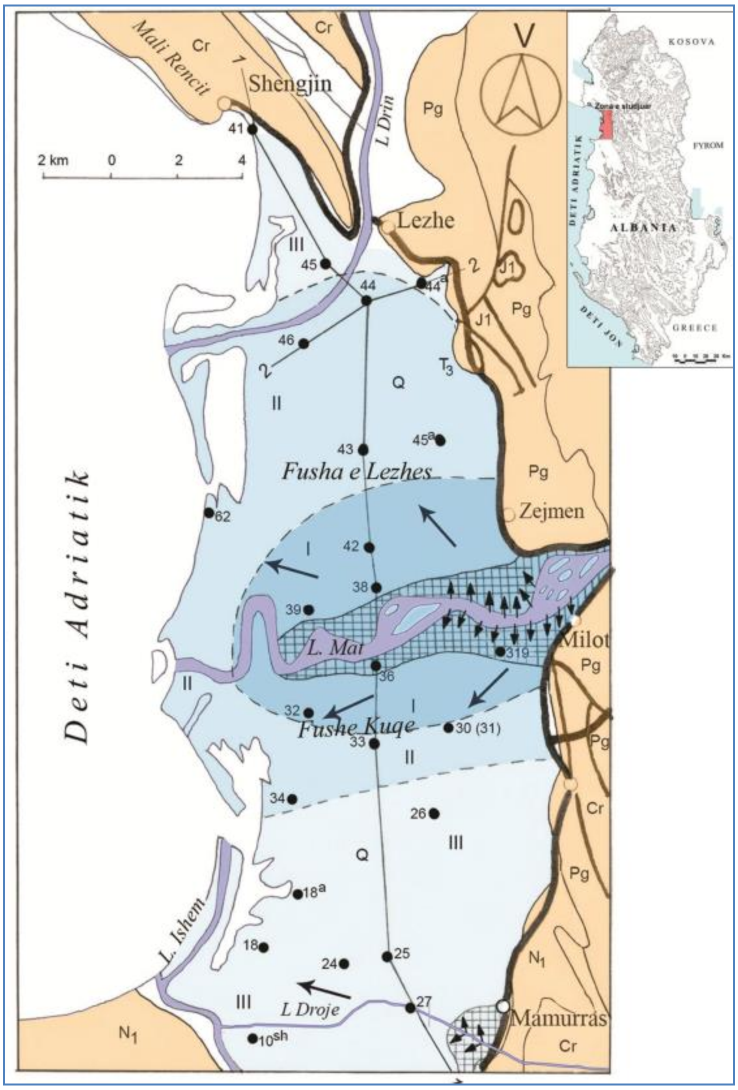
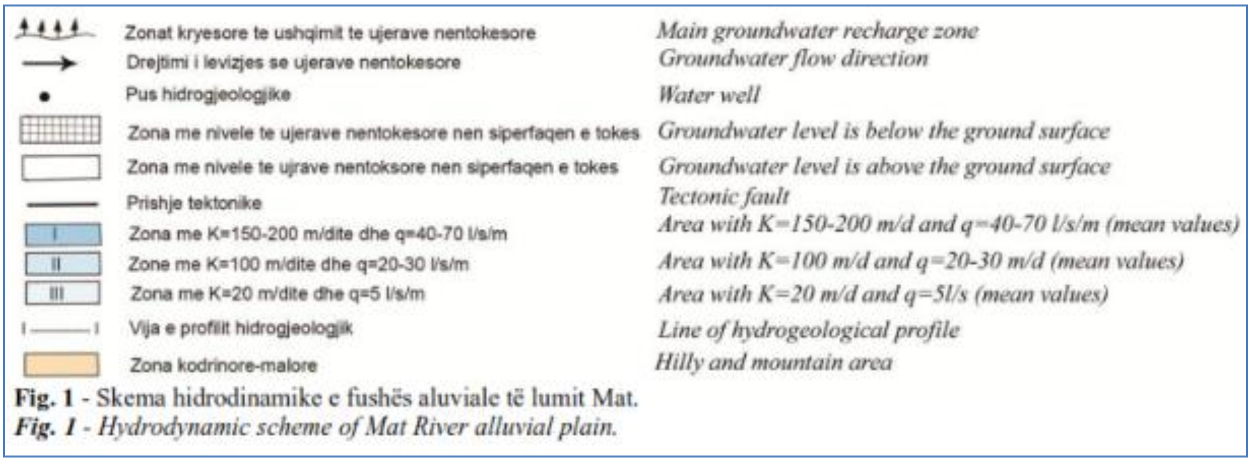


Figure 5-62_Hydrodynamic scheme of the Mati River Alluvial Plain

Legend



Fushe Kuqe Aquifer is composed of three water-bearing layers that are intercalated with impermeable clayey layers of thickness that vary from 5 to 25 m. The upper layer outcrops on the surface at Mati Riverbed. The water table is close to the surface.

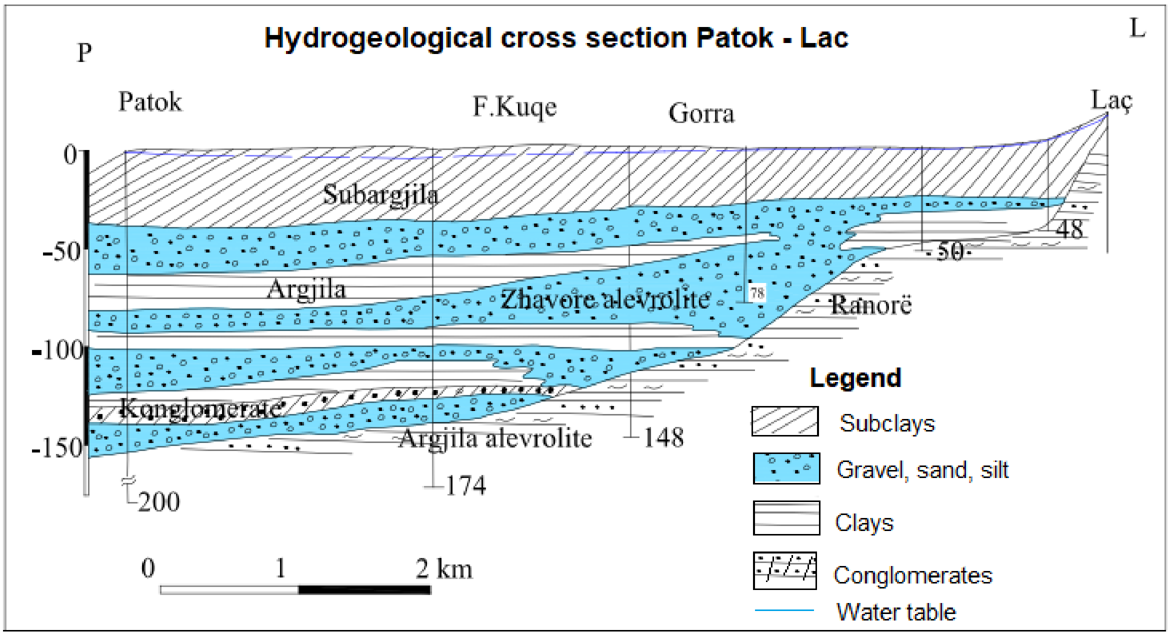


Figure 5-63_Hydrogeological cross-section Patok -Lac

Water quality: The quality of the groundwater is good. The physical-chemical parameters are good. Besides, the groundwater is not polluted.

The monitoring of the groundwater quality is performed during 2014-2019, in five monitoring wells, in Milot, Gurrëz, Fushe Kuqe, Patok, and Laç. The monitoring was performed twice a year.

The water monitoring results are extracted from SoER, 2018116 , and 2019117, except for the water temperature, which is taken from SoER, 2017.

The table below gives the physical parameters of the monitored wells of Fushe Kuqe Aquifer.

Table 5-48 _Physical parameters of Fushe Kuqe aquifer groundwater

Parameter		Value	National and EU norm				EU	Comment
Name	Unit		STASH 97		DCM 379/2016		98/83/EC	
			Limit value	Max. accept	Limit value	Max. accept	Max. accept	
Temperature	Degrees Celsius	15.1-19.7	5-15	20	15	20	20	5-years period
Acidity (pH)	unit	7.8-8.3	6.5-8.5	9.5	≥ 6,5 ≤9,5	9.5	≥ 6,5 ≤9,5	Within AL/EU Standards
Total hardness	German degrees	8.27-12.35	10-15	20	10-20	25	25	Within AL/EU Standards
Mp - Total mineralization	mg/l	232.86-361.2mg	700	1200	n/a	2000	n/a	5-years period; Within AL/EU Standards
Mth – Total Dissolved Solid (TDS)	mg/l	154.64 - 273.75	500	1000	500	1000	1000	Within AL/EU Standards

While the chemical parameters are given in the table below.

116 Albania State of Environment Report, 2017 (in Albanian). NEA, 2018

117 Albania State of Environment Report, 2018 (in Albanian). NEA, 2019

Table 5-49_Chemical parameters of Fushe Kuqe aquifer groundwater

Parameter		Value	National norm			EU	Comment
Name	Unit		STASH 97		DCM 379/2016	98/83/EC	
			Limit value	Max. acceptable	Limit value	Max. accept.	
Sodium (Na)	(mg/l)	6.76 – 18.15	20	100	200	200	Within AL/EU Standards
Calcium (Ca)	(mg/l)	18.46 – 49.09	75	200	200	200	Within AL/EU Standards
Magnesium	(mg/l)	22.5 – 29.81	20	50	50	50	Within AL/EU Standards
Iron (Fe)	(µg/l)	0.02 - 0.04	50	200	300	200	Within AL/EU Standards
Ammonia (Nh4)	(mg/l)	0.02 -0.03	0	0.05	0.1	0.5	Within AL/EU Standards
Chloride (Cl^-)	(mg/l)	5.32– 39.05	25	200	250	250	Within AL/EU Standards
Sulphate (SO_4)	(mg/l)	19.65 – 69.46	25	250	250	250	Within AL/EU Standards
Nitrate (NO_3)	(mg/l)	1.16 – 4.44	25	50	50	50	Within AL/EU Standards
Nitrite (NO_2)	(mg/l)	0.006 – 0.017	0	0.5	0.5	0.5	Within AL/EU Standards
Dissolved oxygen (O_2)	(mg/l)	1.65 – 8.69	> 8.0	n/a	> 8.0	>8.0	Lower than required Standards

Water supply: Fushe Kuqe aquifer supplies drinking water to the cities of Durrës, Laç, Milot, Mamurras, as well as 15 villages of the area.

The depth of the water wells is from 52 to 56 m close to Mati River and roughly 60m in its southern part.

The railway line and the aquifer: The drinking water is extracted more than 50m depth and therefore no risks of pollution are expected from the construction of the bridges within this area. However, mitigation measures related to soil and surface water pollution should be undertaken.

These mitigation measures are described in the chapter 6 that deals with the impacts and mitigation measures (see sections 6.2.7, 6.1.1 and 6.2.11 below)

The railway line runs over this aquifer at Laç, East of Fushe Milot and West of Milot. Across Laç the railway runs over Qph deposits (see Figure 5-63 above; and Map 4: hydrogeological map – separate file in pdf format), which have low permeability and porosity. The thickness of this layer is roughly 40m. Moreover, this layer is under laid by an impermeable clayey layer, which thickness is more than 20m. . Thus, the construction works across this section are not expected to affect the Fushe Kuqe Aquifer.

At Fushe Milot (km 53 to km 55), the railway line overlies the Fushe Kuqe gravelly aquifer. The thickness of the cover layer is roughly 40 m118). Although no water well is located in the proximity of this section, it should be taken into consideration during the Project implementation.

118 R. Eftimi, Hydraulic properits of the gravelly aquifers of Western Lowland of Albania

At the crossing of the Mati River bed (km 55+500 to km 56+620), the railway line passes over the recharge area of Fushe Kuqe Aquifer. Consequently, this section is the most sensitive concerning the potential impacts on ground waters.

3. Lezhë aquifer

Hydrogeological settings: Lezhë field has the shape of a triangle, bordered in the south by Mati River. Mati and Lezhë's Drini Rivers depose the gravelly sediments that constitute the aquifer. In the western part of Lezhë field, there are marshy and marine deposits.

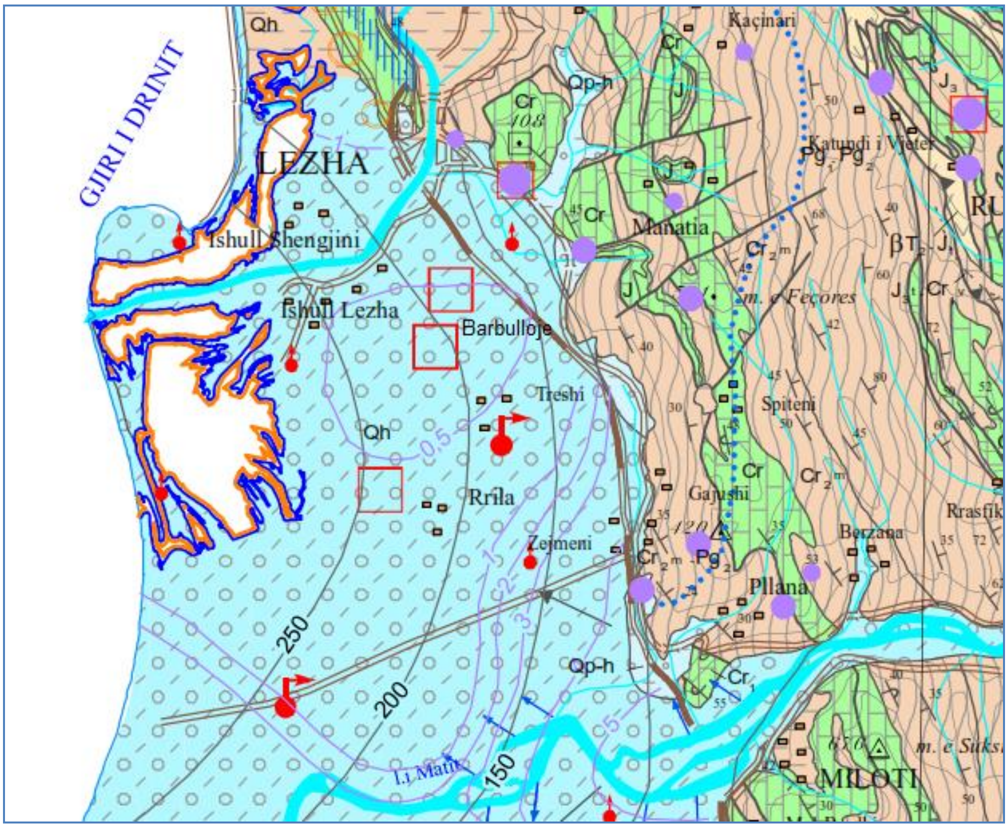


Figure 5-64_Hydrogeological map of Lezhë Aquifer

Legend

	Porous aquifer of high water-bearing capacity and permeability (mainly sand and gravel)
	Porous aquifer of medium to low water-bearing capacity and permeability (sand, clays)
	Karst aquifer. Non-uniform permeability varying from high to low (limestone, dolomite)
	Formations with very low porosity (clays, sub clays)
	Water extraction work
	Water well. Confined aquifer
	Water well. Unconfined aquifer
	Spring

 River

The Aquifer is fed in groundwater by Mati River. The groundwater flow is generally from southeast to northwest (see figure below).

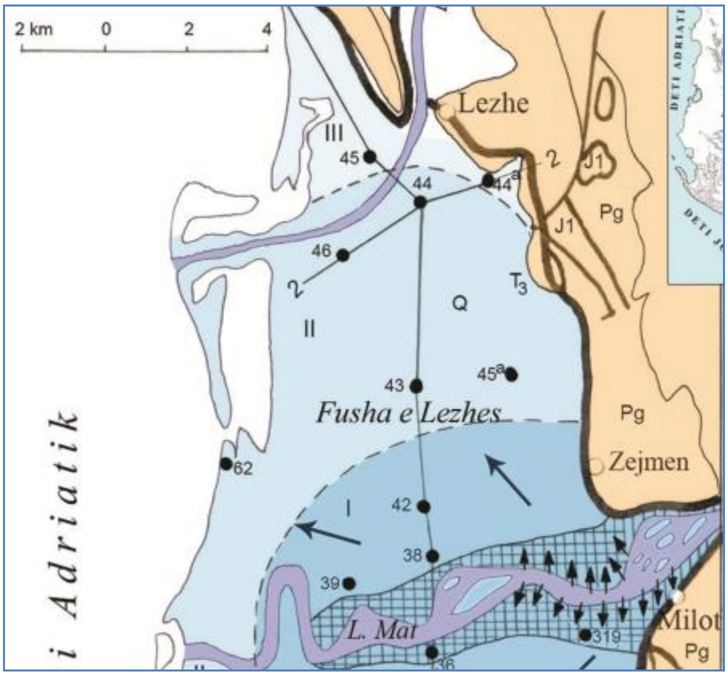
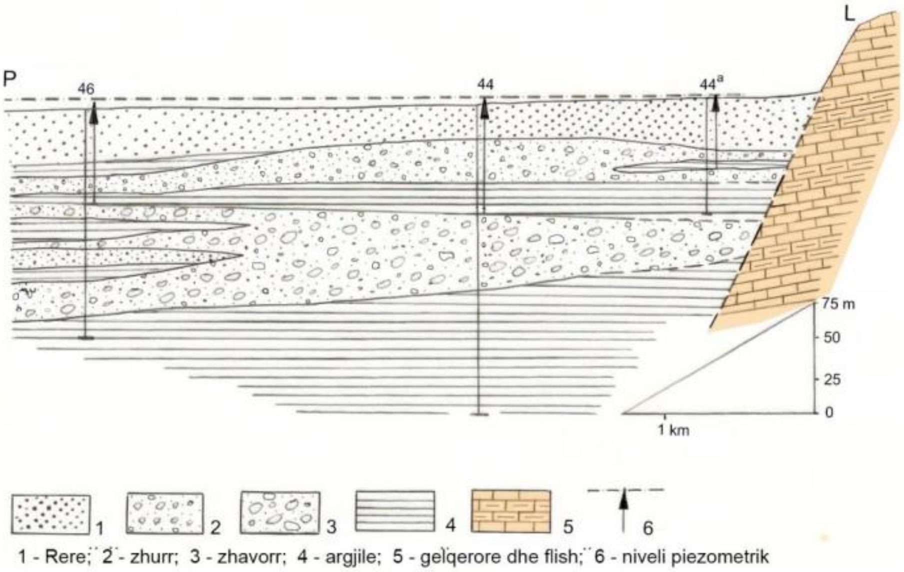


Figure 5-65_Hydrodynamic scheme of the Lezhë alluvial Plain

As shown in the hydrogeological profile below, the first water-bearing layer is overlaid by a relatively permeable cover deposit, while the deepest one is overlaid by an impermeable clayey layer.

The closest hydrogeological well to the railway line is the well 44 at Barbullojë that is located approximately 300m from the railway line. In the hydrogeological cross-section in the figure below, the water-bearing formations exploited by this well are overlaid by an impermeable clayey layer.



rofili hidrogjeologjik 2 – 2.
ydrogeological profile 2 – 2.

Figure 5-66_Hydrogeological cross-section 2-2 (East-West) close to Lezhë

Water quality: Water quality analyses show good physic-chemical features. Besides, the water is not polluted.

The water quality monitoring is carried out in four wells (Barbullojë, Rrilë, Shëngjin, and Hoteli Gjuetisë). Each well is monitored twice a year. The following monitoring results are extracted from SoER 2018 and 2019. Ten water quality parameters are analysed for each water well. For the purposes of the railway line project, the most important is the monitored well at Barbullojë.

Table 5-50_Physical parameter of groundwater of Lezhë Aquifer

Parameter		Value	National norm				EU	Comment
Name	Unit		STASH 97		DCM 379/2016		98/83/EC	
			Limit value	Max. accept	Limit value	Max. accept	Max. accept	
Temperature	Degrees Celsius	15.4-17.4	5-15	20	15	20	20	5-years period
Acidity (pH)	unit	8.0-8.7	6.5-8.5	9.5	≥ 6,5 ≤9,5	≥ 6,5 ≤9,5	9.5	5-years period
Total hardness	German degrees	8-8	10-15	20	10-20	25	25	5-years period; Low hardness
Mp - Total mineralization	mg/l	430.37 – 672.43	700	1200	n/a	1200	n/a	5-years period; Within the standards
		2788.83						5-years period Out of the standards; Rrile well; high depth
Mth – Total Dissolved Solid (TDS)	mg/l	274.2 – 590.17	500	1000	500	1000	1000	5-years period Within the standards; Lezhë & Barbulloje wells
		2655.5 - 2742.6						5-years period Out of the standards; Rrile well; high

Parameter		Value	National norm				EU	Comment
								depth

While the chemical parameters are given in the table below.

Table 5-51_Chemical parameter of groundwater of Lezhë Aquifer

Parameter			National standards			EU	
Name	Unit	Value	STASH 97		DCM 379/2016	98/83/EC	Comment
			Limit value	Max. accept.	Max. accept.	Max. accept.	
Sodium (Na)	(mg/l)	128.45 – 216.97	20	100	200	200	Within the standards
		216					5-years period Out of the standards; Rrile well; high depth
Calcium (Ca)	(mg/l)	4.26 – 9.43	75	200	200	200	Within the standards
		100.82					5-years period Within the standards; Rrilë well; high depth
Magnesium	(mg/l)	4.26 – 13.38	20	50	50	50	5-years period Low concentration
		75.39 – 79.64			50	50	5-years period High concentration
Iron (Fe)	(µg/l)	0.01- 0.05	50	300	300	200	5-years period Within the standards
Ammonia (Nh4)	(mg/l)	0.01 – 0.07	0	0.05	0.1	0.5[119]	5-years period; Slight pollution related to the non-respect of the sanitary zones
Chloride (Cl^-)	(mg/l)	97.17mg	25	200	250	250	5-years period; Within the standards
		243.18					5-years period Out of the standards; Barbullojë well
Sulphate (SO_4)	(mg/l)	26.34 – 41.56	25	250	250	250	5-years period Within the standards
Nitrate (NO_3)	(mg/l)	1.05 – 4.62	25	50	50	50	5-years period Within the standards
Nitrite (NO_2)	(mg/l)	0.002 - 0.096	0	0.05	0.5	0.5	5-years period; Slight pollution related to the non-respect of the sanitary zones
Dissolved oxygen (O_2)	(mg/l)	0.02 – 4.21	> 8.0	n/a	> 8.0	>8.0	Lower than the required standard

Water supply: Lezhë city and the villages of the area are supplied with drinking water from this aquifer.

The railway line and the aquifer: the closest water well to the railway line is the wells of Barbullojë, which are located more than 300m from the line. A shown in Figure 5-66 above, the cover layer close to the railway line has a thickness of more than 50m. However, this cover is

119 0.05 mg/l whether the ammonium comes from the water-bearing layer

composed of almost permeable sandy material. Consequently, mitigation measures related to the pollution of the surface waters and soil should be undertaken. These measures are described in the chapter 6 that deals with the impacts and mitigation measures (see sections 6.1.1 and 6.2.11 below). Anyway, the closest hydrogeological well to the railway line (well 44) exploits a water-bearing formation that is overlaid by an impermeable clayey layer. Thus, there is a risk to groundwater pollution, but the aquifer's layers exploited for drinking water are not risked by the pollution because of this impermeable clayey layer.

4. Lower Shkoder aquifer

Lower Shkoder aquifer is composed of:

- Zadrima sector; and
- Lower Shkoder sector

From Lezhë to Hajmel (at the crossing of Gjadër River), the railway line runs over the Merqia (km 70 to km 74) and Zadrima (km 74 to km 93) Plains, which are filled with Quaternary loose deposits.

From Lezhë to Rroboshtë, the railway line traverse the Merqia Plain, which is filled mostly with marshy deposits of Pleistocene age (Qh) that have low porosity and therefore do not have any interest concerning water-bearing capacity and permeability. The planned new freight station of Lezhë will be located within this section of the railway line.

From Rroboshte to Hajmel (km 74 to km 90 – crossing of Gjadër River) the railway line runs over the eastern part of Zadrima Plain, which hydrogeological features are described hereinafter.

4.1 Zadrima Plain Aquifer

Hydrogeological settings: This field is poor in groundwater. The total thickness of quaternary deposits is 25-50m, while the thickness of the water-bearing layers (gravelly layers) is less than 2-3m. The permeability of the clayey cover layer is very low. Besides, the groundwater has high mineralization and consequently, it is not suitable for use as drinking water. As a result, it not expected any potential impact of the proposed project on the ground waters in the section from km 70 to km 90.

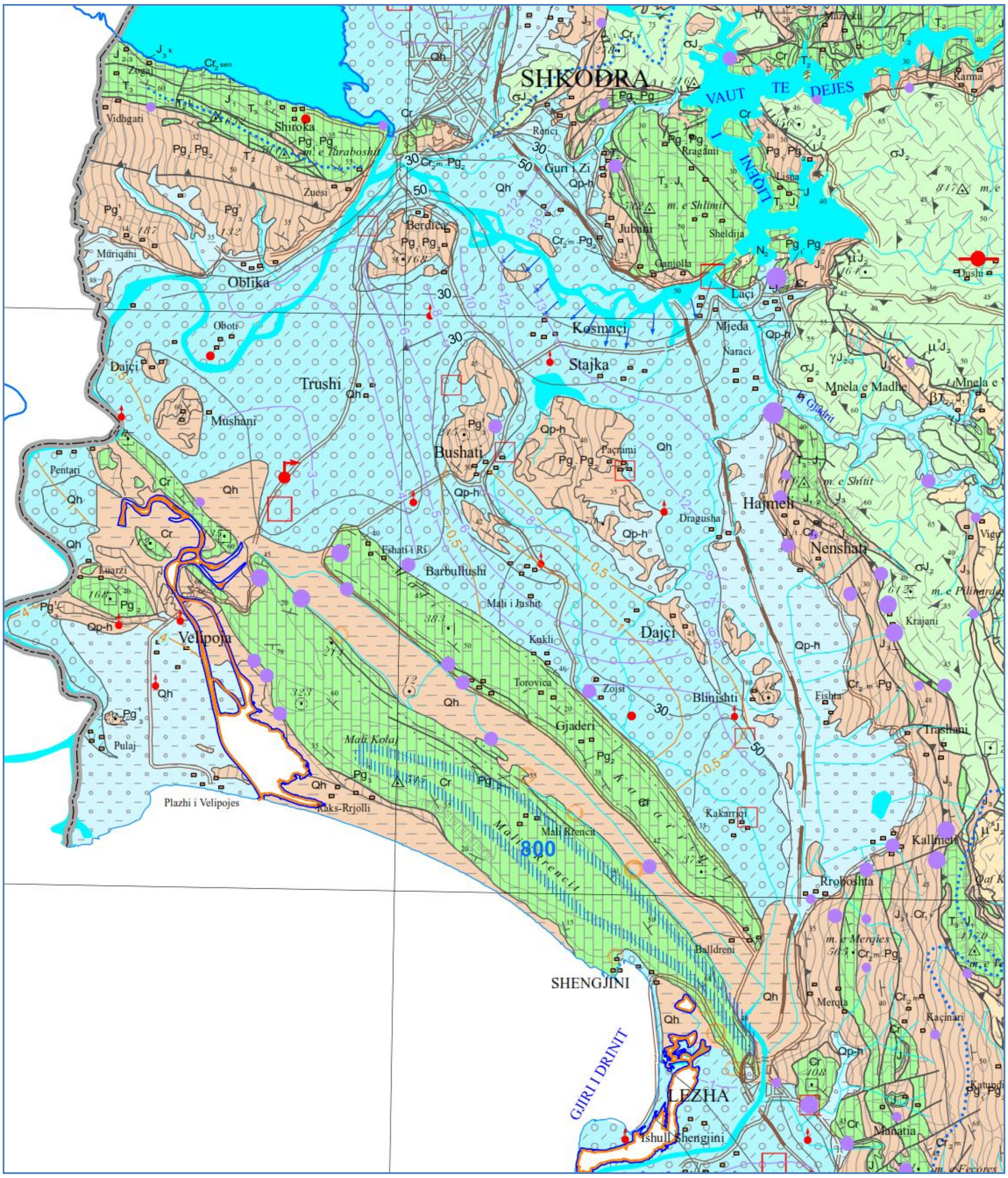
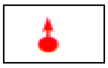
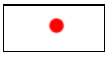


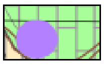
Figure 5-67_Hydrogeological map of the section Lezhë-Shkoder

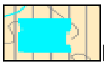
Legend

	Porous aquifer of high water-bearing capacity and permeability (mainly sand and gravel)
	Porous aquifer of medium to low water-bearing capacity and permeability (sand, clays)
	Karst aquifer. Non-uniform permeability varying from high to low (limestone, dolomite)
	Formations with very low porosity (clays, sub clays, flysch)
	Water extraction work

 Water well. Confined aquifer

 Water well. Unconfined aquifer

 Spring

 Lake

 River

Zadrima Aquifer and the railway line:

The railway line runs over the Eastern part of this aquifer, which does not present any interest concerning drinking water supply. The water of the underlying Quaternary gravelly aquifer has high mineralization and therefore is not appropriate for drinking purposes. Besides, the clayey cover layer that is 25-50 thick (close to the railway) is almost impermeable. Therefore, no significant risk of groundwater pollution is present.

4.2 Lower Shkoder Aquifer

Between Hajmel and Kiri Bridge (km 90 to km 102), the railway line routes pass over the eastern part of the Low Shkoder Aquifer.

Hydrogeological settings: The recharge areas of this Quaternary gravel aquifer are the Drini and Kiri riverbeds.

The gravelly layers outcrop on the surface at the Drini Riverbed. In the other parts of the aquifer, the thickness of the cover layer goes up to 50m

Water quality: As this aquifer has only local importance regarding the drinking water supply, it is not monitored by the National Environmental Agency. The Albanian Geological Survey has provided the data/information on the quality of the groundwater in this area.

Table 5-52_Physical parameter of groundwater of Lower Shkoder Aquifer

Parameter		Value	National and EU norm				EU	Comment
Name	Unit		STASH 97		DCM 379/2016		98/83/EC	
			Limit value	Max. accept	Limit value	Max. accept	Max. accept	
Temperature	Degrees Celsius	12-16	5-15	20	15	20	20	Within the standards
Total hardness	German degrees	7-20	10-15	20	10-20	25	25	Low hardness
Mp - Total mineralization	mg/l	200 -700	700	1200	n/a	1200	n/a	Within the standards

Water supply: This is an aquifer of local importance as it supplies drinking water to all villages in this area.

Lower Shkoder Aquifer and the railway line: Spathari and Kiri Bridges are located over recharge areas.

5. Upper Shkoder aquifer

This aquifer lies from Kiri River to Aliaj Village (roughly from km 100 to km 130).

This aquifer is composed of two different parts that differ from each other from the geological and hydrogeological features:

- Shkoder Aquifer
- Koplik Aquifer

Clayey formations of Pliocene age (N_2) outcrop on the surface between these aquifers at the location called "Koplik Spring".

Figure 5-68_Hydrogeological map of the section Shkoder – Hani Hotit

Legend

	Porous aquifer of high water-bearing capacity and permeability (mainly sand and gravel)
	Porous aquifer of medium to low water-bearing capacity and permeability (sand, clays)
	Karst aquifer. Non-uniform permeability varying from high to low (limestone, dolomite)
	Formations with very low porosity (clays, sub clays, flysch)
	Water extraction work
	Water well. Confined aquifer
	Water well. Unconfined aquifer
	Spring
	Lake
	River

5.1 Shkoder Aquifer

Hydrogeological settings: This aquifer comprises only one water-bearing layer, which is composed of gravelly alluvial deposits deposed by Kiri River and Vraka and Rrjolli Streams. Sediments composed of sub-clays and sub sands overlay the aquifer body and therefore the ground waters are almost sub-artesian. The thickness of the aquifer goes up to 80-85 m at Shkoder city (Dobrac area).

The Quaternary deposits overly clay formations of Pliocene geological age (N_2), which outcrop at the northern border of this Aquifer.

The water table level is maximal in the winter period and minimal in August-September. The groundwater flow direction goes towards the West (Shkoder Lake).

The railway line runs over the Upper Shkoder Quaternary gravel aquifer of thickness over 70 m between the Drini riverbed and the Gruda field. This aquifer is fed from the karst formations, the Drini and Kiri rivers, and from rainfall. The water table is dependent on the elevation and the water level of the Shkoder Lake. The clayey sandy cover is only a few meters thick in the western part of this aquifer and inexistent in its eastern part. Thus, the eastern portion serves as a recharge area. However, Shkoder city and the railway line are located within the western part of this aquifer.

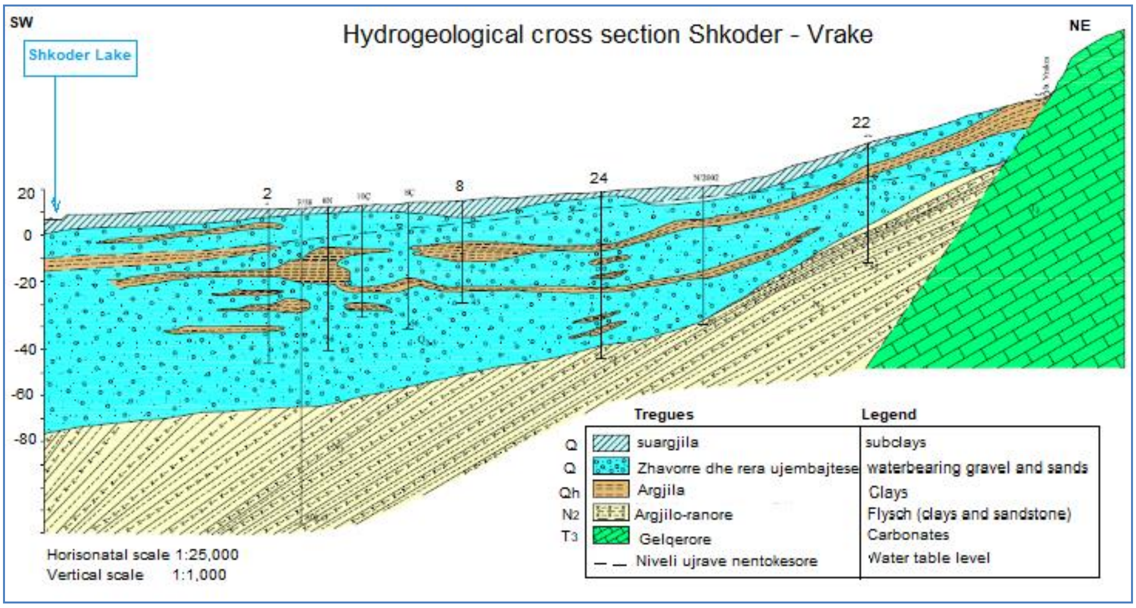


Figure 5-69_Hydrogeological cross-section Shkoder – Vrake

Water quality: Water quality is very good. The monitoring was performed for the period 2014-2018. The monitoring results are extracted from SoER 2918120. The monitoring wells are located in the centre of Shkoder (Kisha Madhe), Dobrac, and Hot i Ri.

Table 5-53_Physical parameter of water quality for Shkoder Aquifer

Parameter			National standards				EU	Comment
			STASH 97		DCM 379/2016		98/83/EC	
Name	Unit	Value	Limit value	Max. accept	Limit value	Max. accept	Max. accept	
Temperature	Degrees Celsius	15.4-16.2	5-15	20	15	20	20	5-years period; Dobrac wells
Acidity (pH)	unit	7.4 to 8.2	6.5-8.5	9.5	≥ 6,5 ≤9,5	9.5	9.5	5-years period; Class II- neutral waters
Total hardness	German degrees	10 - 11.5	10-15	20	10-20	25	25	Dobrac wells
		8-12						Big Church well
Mp - Total mineralization	mg/l	338.31 – 345.46	700	1200	n/a	1200	n/a	5-years period; Within the standards
Mth – Total Dissolved Solid (TDS)	mg/l	139.03 - 219.03	500	1000	500	1000	1000	Within the standards

120 Albania State of Environment Report, 2018 (in Albanian). NEA, 2019

The table below gives the chemical parameters of the groundwater.

Table 5-54_chemical parameter of water quality for Shkoder Aquifer

Parameter			**National and EU norm**			**EU**	**Comment**
Name	**Unit**	**Value**	**STASH 97**		**DCM 379/2016**	**98/83/EC**	
			Limit value	Max. acceptable	Limit value	Max. accept	
Sodium (Na)	(mg/l)	10 – 15	20	100	200	200	Lower than the required standards
Calcium (Ca)	(mg/l)	30-80	75	200	200	200	Within AL/EU Standards
Magnesium	(mg/l)	4.26 – 34.05	20	50	50	50	Within AL/EU Standards
Iron (Fe)	(µg/l)	35 – 50	50	300	300	200	Dobrac; Within AL/EU Standards
		10 - 75	50	300	300	200	Big Church; Within the maximal permitted standards
		20- 65	50	300	300	200	Hot i Ri: Within AL/EU Standards
Ammonia (Nh4)	(mg/l)	0.01 – 0.05	0	0.05	0.01	0.5[121]	Within AL/EU Standards
Chloride (Cl^-)	(mg/l)	1.8 - 9.5	25	200	250	250	Within AL/EU Standards
Sulphate (SO_4)	(mg/l)	4.3 - 24.2	25	250	250	250	Within AL/EU Standards
Nitrate (NO_3)	(mg/l)	0.77 – 11.44	25	50	50	50	Within AL/EU Standards
Nitrite (NO_2)	(mg/l)	0.003 to 0.007	0	0.05	0.05	0.5	Within AL/EU Standards
Dissolved oxygen (O_2)	(mg/l)	4.8 – 9.9	> 8.0		> 8.0		Lower than the required standard

The hydrodynamic water level varies as follows:

- Minimal level: from -4.3 to -36m; and
- Maximal level: from -0.6 to -14.6m

The minimal level has been recorded in 2018, while the maximal one in 2013.

Water supply: The quality of the groundwater is very good, and the water wells are characterized by a high discharge. Located in Dobrac (northeast surrounding Shkoder) are waterworks that supply with 500 l/s this city and its surroundings (more than 150,000 inhabitants).

121 0.5 mg/l whether the ammonium comes from the water-bearing layer

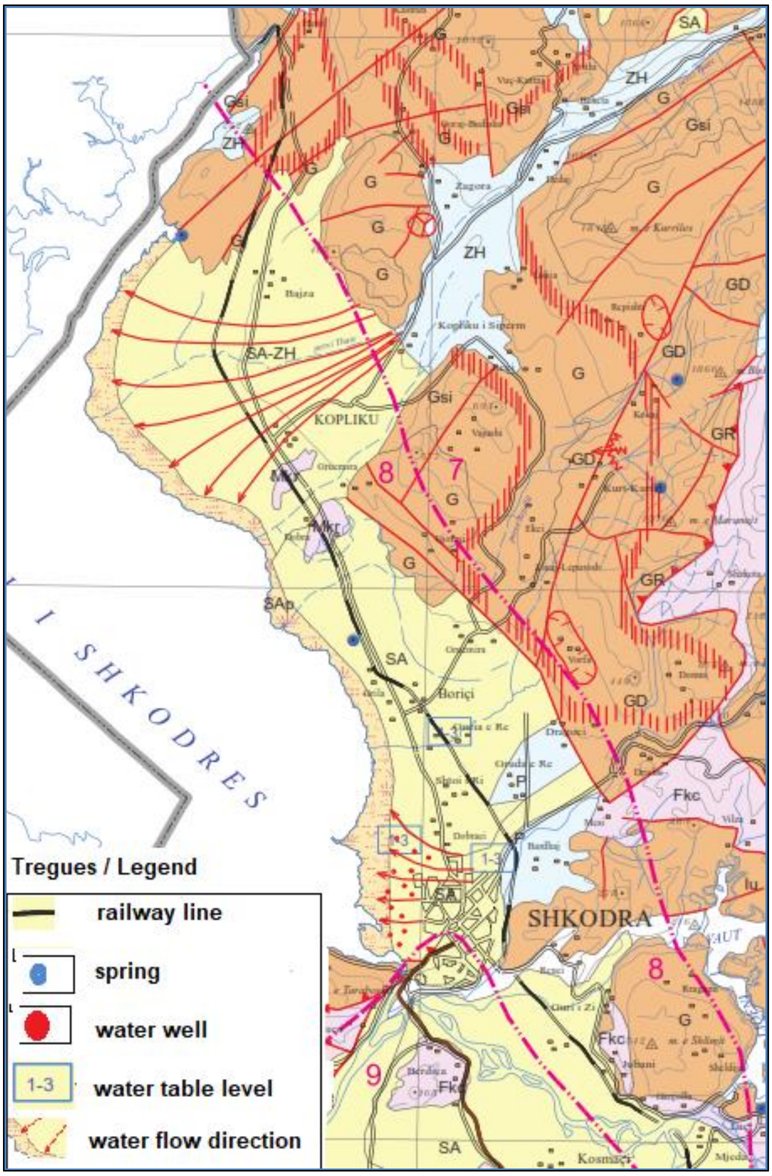


Figure 5-70_Water wells of Shkoder

Shkoder aquifer and the proposed project: The distance of the water wells from the Shkoder railway station is roughly 3.0 km, while the shortest distance from the railway line (km 109 of the railway line) is 2.6 km. The thickness of the Quaternary cover deposits alongside the railway line is 5-10 m. These deposits are composed of sub-clays and sub sands and therefore they are not completely impermeable. Given the low permeability of the quaternary cover deposits, mitigation measures related to soil and surface and groundwater pollution should be undertaken. These measures are described in the chapter 6 that deals with the impacts and mitigation measures (see sections 6.2.7, 6.1.1 and 6.2.11 below). Besides, the hydrodynamic water level often is a few meters from the surface that should be taken into account during dredging works in depth.

5.2 Koplik Aquifer

Hydrogeological settings: Palvar to Bajze: From Palvar to Bajze, the railway line runs over the Koplik aquifer created from the alluvium and prolluvium deposits of Rrjolli River and of the Përroi Thatë ("Dry Stream") stream. This aquifer is composed of weakly cemented gravel and sands that are generally characterized by high permeability and are fed from the karst formations to the east and rainfalls. The water table is dependent on the elevation and on the water level of Shkoder Lake, which serves as a drainage area. The thickness of the aquifer varies from 14 m (Koplik) to 40m (south of Bajze). These water-bearing deposits have a very good hydraulic connection with the underlying karstified limestone.

Water quality: There are no monitoring wells within this area.

Koplik aquifer and the proposed project: The cover layer is permeable and therefore routine mitigation measures related to soil, waste, and surface and groundwater should be undertaken. These measures are described in the chapter 6 that deals with the impacts and mitigation measures (see sections 6.2.7, 6.1.1, 6.2.11 and 6.2.15 below).

6. Karst aquifer of Alps Mountains

Hydrogeological settings: From Aliaj to Bajze to Ivanaj and further to the south of Hoti, the railway line runs mainly over a karst plain (see Figure 5-71 and Figure 5-72 below), as there are no significant Quaternary deposits located in this area.

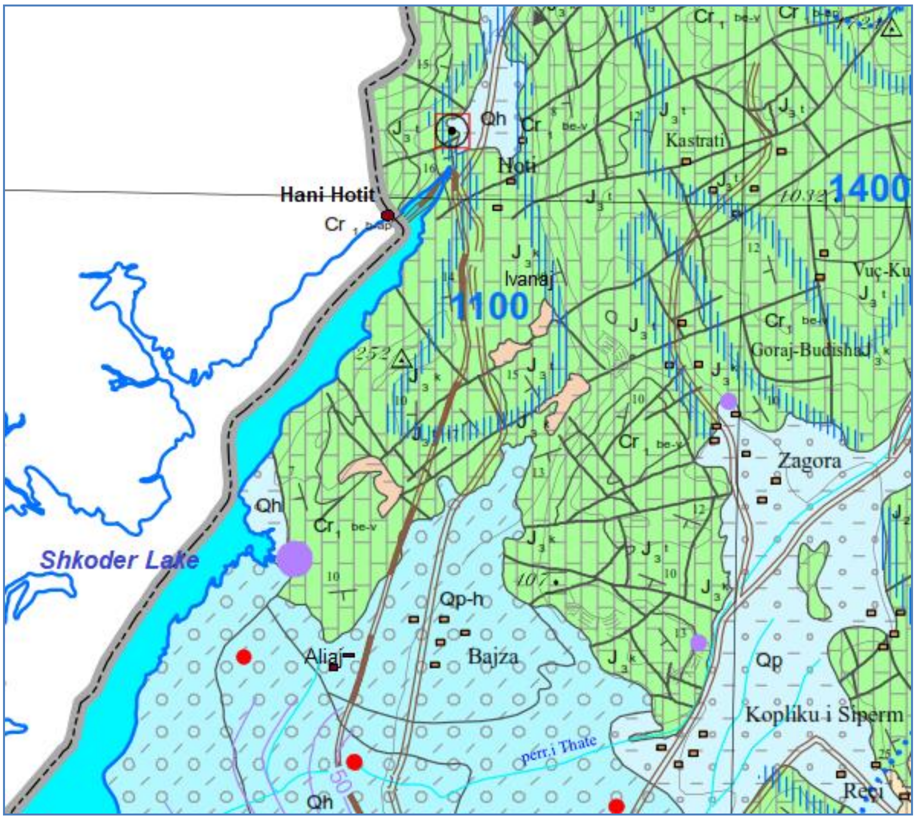


Figure 5-71_Hydrogeological map of the karst aquifer in the northern part of the Project area

Legend

	Porous aquifer of high water-bearing capacity and permeability (mainly sand and gravel)
Qp	Porous aquifer of medium to low water-bearing capacity and permeability (sand, clays)
	Karst aquifer. Non-uniform permeability varying from high to low (limestone, dolomite)
	Formations with very low porosity (clayey flysch)

	Water well. Unconfined aquifer
	Spring

Ground waters flowing from the mountainous area in the east and rainfalls drain in the Shkoder Lake. Several perennial and temporary karst lakes and karst springs can be found on the shores of this lake. Hydro-geological studies (Kalaja, 2000; Eftimi, 2008) show that some karst lakes and karst springs communicate with each other from east to west direction that is the assumed direction of groundwater flow. The water of the karst lakes and karst springs is of good quality. Besides, the karst lakes and springs have high landscape values. The karst springs appear as small round lakes with a diameter size of about 15 - 20 m, which by the local population are called “Syri” which means “Eye”. On the shores of Lake Shkoder, many temporary karst springs and lakes can be found as well. These are only active during the periods of rainfalls or during the snow-melting period.

Figure 5-72_Karst plain, small temporary karst lakes and railway line close to Hoti village

Three small karst lakes (Hurdhana 1, Hurdhana 2, and Hurdhana Kalbet) communicate through karst canals with the Lake Shkoder as well as with Syri Sheganit Spring (Nature Monument). This hydraulic connection is the reason why the water level in the karst lakes varies accordingly to the variation of the Shkoder Lake level; therefore the yearly amplitude of the lake’s level variation is about 5 m. Urdhana Lake 1 and Syri Sheganit spring are used for the irrigation of the surrounding cultivated lands through pumping stations with a capacity of about 200 -250 l/s.

Figure 5-73_Shkoder Lake at Gashaj, where are located numerous karst springs

A detailed investigation has been performed in the framework of the hydrogeological study for the preparation of the report on the "Preliminary Environmental Assessment, Risk Assessment and Preparation of Bidding Documents and Action Plan for Repackaging and Temporary Store of Hazardous Chemicals - Bajze Hot-Spot" (Mon Tec, Tirana, 2008).

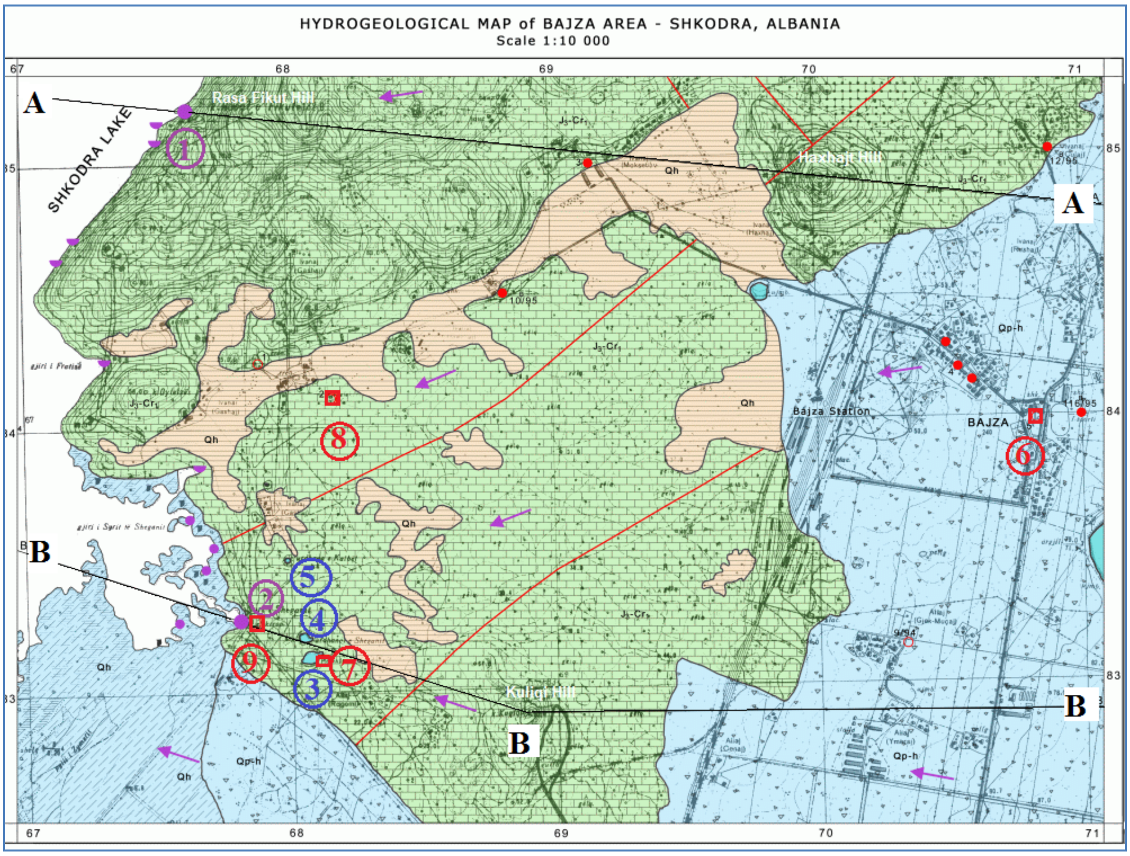
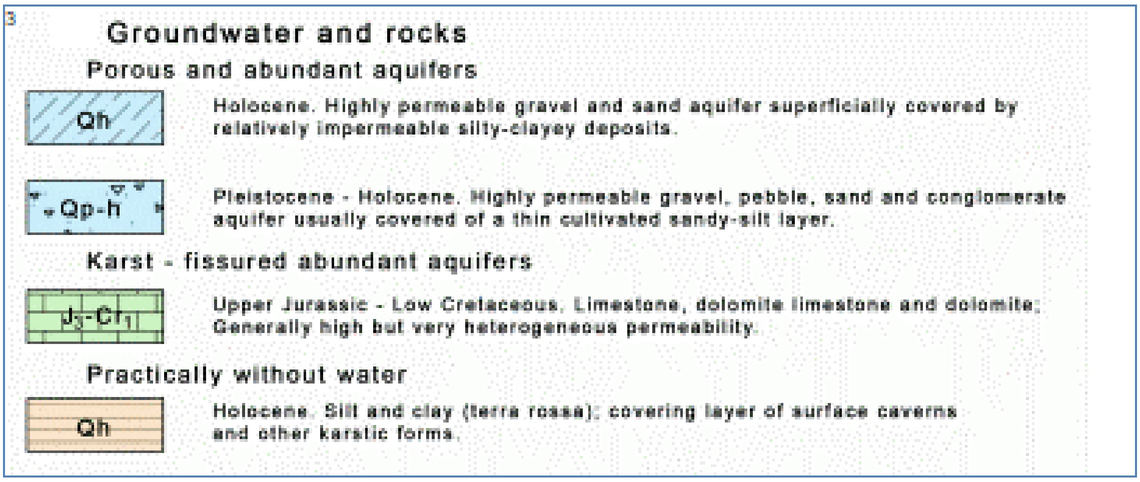


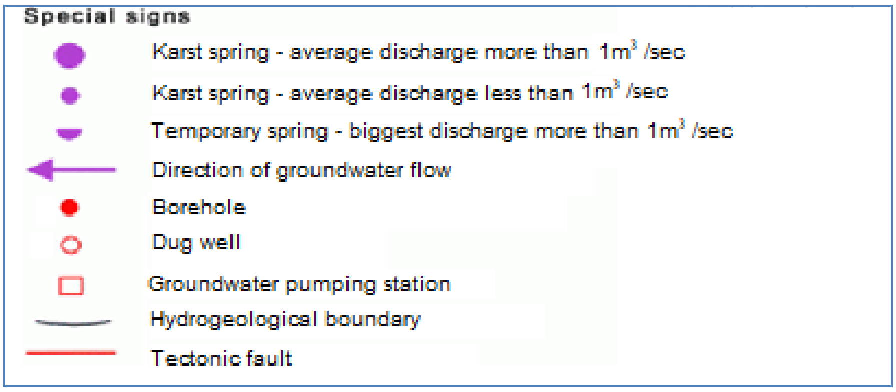
Figure 5-74_Hydrogeological Map of Bajze area (Eftimi R., 2008)

Source: Based on Eftimi R. in "Preliminary Environmental Assessment, Risk Assessment and Preparation of Bidding Documents and Action Plan for Repackaging and Temporary Store of Hazardous Chemicals - Bajze Hot-Spot" (Mon Tec, Tirana, 2008).

Note: 1-Syri Zi Karst Spring; 2-Syri Sheganit Karst Spring (NM); 3-Hurdhana 1 Karst Lake; 4-Hurdhana 2 Karst Lake; 5-Hurdhana Kalbet karst Lake; 6,8-Dug wells and pumping stations; 7,9-Pumping stations.

Legend





The indicative hydrogeological cross-section B-B of the above hydrogeological map (Figure 5-74) shows the hydraulic connections between Shkoder Lake and the Karst Springs and Karst Lakes in the karst plain of Bajze that is crossed by the railway line.

Hydro monuments:

Syri Sheganit Spring is a Nature Monument (category III of IUCN protection status). The indicative sketch below shows the hydraulic connections between the Syri Sheganit Karst Spring and Hurdhana 1 and 2 Karst Lakes122.

122 *Source: Kalaja & Rudi, 1996; and Eftimi R., 2008*

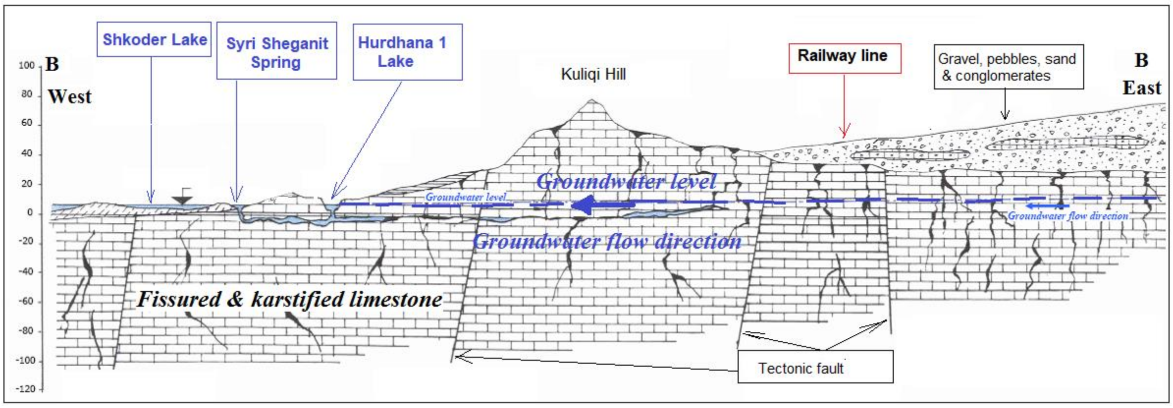


Figure 5-75_ Indicative hydrogeological cross-section (B-B) and indicative hydraulic connections between the Quaternary loose deposits, dug wells, karst lakes, karst springs, and Shkoder Lake

Water quality: The water qualities are very good. The Albanian Geological Survey monitor regularly the water quality of the Syri Sheganit Spring, although this water is used only for irrigation purposes.

Water quality monitoring of Syri Sheganit Spring

The monitoring was performed in the period 2014-2018. The monitoring results are extracted from SoER 2018123.

Table 5-55_Physical parameters of the Water quality – Syri Sheganit Spring

Parameter		Value	National standards				EU	Comment
Name	Unit		STASH 97		DCM 379/2016		98/83/EC	
			Limit value	Max. accept	Limit value	Max. accept	Max. accept	
Temperature	Degrees Celsius	-	5-15	20	15	20	20	5-years period; Dobrac wells
Acidity (pH)	unit	-	6.5-8.5	9.5	≥ 6,5 ≤9,5	9.5	9.5	5-years period; Class II- neutral waters
Total hardness	German degrees	8-9	10-15	20	10-20	25	25	Lower than required standard
Mp - Total mineralization	mg/l	200-320	700	1200	n/a	2000	n/a	5-years period; Within the standards
Mth – Total Dissolved Solid (TDS)	mg/l	-	500	1000	500	1000	1000	-

The chemical parameters are shown in the table below.

123 Albania State of Environment Report, 2018 (in Albanian). NEA, 2019

Table 5-56_Chemical parameters of the water quality – Syri Sheganit Spring

Parameter		Value	National and EU norm			EU	Comment
Name	**Unit**		**STASH 97**		**DCM 379/2016**	**98/83/EC**	
			Limit value	Max. accept	Limit value	Max. accept	
Sodium (Na)	(mg/l)	10 – 15	20	100	200	200	Lower than the required standards
Calcium (Ca)	(mg/l)	30-65	75	200	200	200	Within the standards
Magnesium	(mg/l)	30 – 38	20	50	50	50	Within the standards
Iron (Fe)	(µg/l)	10 – 32	50	300	300	200	Within the standards
Ammonia (Nh4)	(mg/l)	0.01 – 0.03	0	0.05	0.01	0.05[124]	Within the standards;
Chloride (Cl^-)	(mg/l)	1.8 ne 5.5	25	200	250	250	Within the standards
Sulphate (SO_4)	(mg/l)	4.1 - 28.5	25	250	250	250	Within the standards
Nitrate (NO_3)	(mg/l)	n/a	25	50	50	50	No data
Nitrite (NO_2)	(mg/l)	# 0	0	0.05	0.05	0. 5	Within the standards; There is no pollution
Dissolved oxygen (O_2)	(mg/l)	11	> 8.0	n/a	> 8.0	>8.0	Within the standards

Water supply: Although of good quality, the water of the springs is not used for drinking purposes. In the past, the water of Syri Sheganit Spring (1.000 l/sec) was extracted for irrigation purposes.

The railway line and the aquifer: The karst springs within this area are located more than 1.5 km far from the railway line. However, it is suggested to take routine mitigation measures related to soil, wastewater, and surface, and groundwater. These measures are described in the chapter 6 that deals with the impacts and mitigation measures (see sections 6.2.7, 6.1.1, 6.2.11 and 6.2.17).

5.2.7.3. Finding related to the ground waters

The railway line runs over six aquifers that are important for drinking water supply, as follows:

- Tirana-Ishmi Quaternary gravel aquifer, which has national importance for the water supply of the local population and further on;
- Mati Quaternary gravel aquifer, which has national importance for the water supply of the local population and further on. Mati River Aquifer is split into Fushe Kuqe and Lezhë aquifers;
- Lower Shkoder Quaternary gravel aquifer, which has local importance for the water supply of the local population;
- Upper Shkoder Quaternary gravel aquifer that has national importance, because of the high number of the population supplied with drinking water;
- Koplik Quaternary Aquifer, which is important at the local level for the drinking water supply; and
- The karst aquifer of Malësia Madhe, from where waters drain to the Shkoder Lake This aquifer serves to supply drinking water to the local population.

124 0.05 mg/l whether the ammonium comes from the waterbearing layer

The most sensitive railway line sections concerning ground waters are as follows:

Km 55+500 to km 56+620: Crossing of Mari Riverbed.

The Mati Riverbed at the crossing of the railway line represents a recharge area, where the river's water penetrates down into the Quaternary deposits and feeds the ground waters. The pollution of the soil and surface waters at this location could affect the quality of the ground waters.

Mati River feeds the Quaternary gravel aquifer of Fushe Kuqe, where are located the wells that supply drinking water Durres city and other small inhabited areas.

Km 107 to km 108: Passing in the northeast of Shkoder.

From km 103 to km 113, the railway line runs over the Upper Shkoder Quaternary Gravel Aquifer, in which water-bearing layers are overlaid mostly by a permeable cover layer. The pollution of the soil and the surface waters may affect the quality of the ground waters.

This aquifer supplies drinking water Shkoder city and its neighbourhoods.

Km 130 to km 140: Passing over the Malësia Madhe Karst aquifer

The pollution of the soil and the surface waters may affect the quality of the ground waters, which in turn finish in the Shkoder Lake and therefore the quality of the Lake's waters could be affected.

From km 130 to km 135 the railway line runs over the karst aquifer of Malësia Madhe, from which are feed the karst springs located close to Shkoder Lake, including the Syri Sheganit Nature Monument.

The pollution of the soil and the surface waters may affect the quality of the ground waters, which raise to the surface in the form of vauclusian springs that have natural values. Besides, some of these springs (e.g. Syri Sheganit Spring) are discharged into the Shkoder Lake.

5.2.8. Surface waters

The purpose of the surface water assessment in the project area is to show the potential impacts on the quantity and quality of these waters. Special attention has been paid to the rivers' crossings where new bridges are planned to be built.

5.2.8.1. Materials and method

The assessment of the surface waters crossed by the railway line or located close to this line is based on the following:

- Topographic map of Albania;
- Hydrological report prepared for the Project;
- Hydro-geological map of Albania, scale 1:200,000, Albanian Geological Survey, 2015;
- State of Environment Report, published yearly by the National Environmental Agency;
- Scientific articles on the hydrology on the wide project area;
- Field investigations in the project area

5.2.8.2. Baseline information

Surface waters along the whole railway line

The table below shows the crossed main watercourses and their main characteristics.

Table 5-57_Main watercourses crossed by the railway line and their main characteristics

No	Name	Crossing location (km)	Area km²	Q 1% 100 years	Q 1‰ 1000 years	Q 0.333%[125] 300 years	Method
1	Ishmi River	35+100	603	1060	1423	1170	Lognormal
4	Droja River	41+750	69	273	406	313	Rational
5	Mati River	56 to 57	2430	3360	4500	3700	Pirson III
6	Lezhë's Drini River 1	67+700	323	710	1170	848	Rational
7	Lezhë' Drini River 1	69+600	215	450	675	518	Rational
8	Drini River	94 to 95	15000	6530	-		Vau Dejes HPP discharges
9	Kiri River	102.8 to 103	267	1505	2016	1660	Lognormal

Within the territory of Malësia Madhe Municipality, the railway line runs close to the Shkoder Lake.

New bridges will be built on the crossing of these rivers. From km 139 to km 140, the railway line runs close to Shkoder Lake.

The hydrogeological map (see Map 4_Hydrogeological map - separate file in pdf format) shows the railway line and the surface waters.

125 According the Albanian Law the hydraulic of the bridge will be design for 1:100 years and will be controlled for 1:333 years

The figure below shows a general view of the crossed rivers and their watersheds.

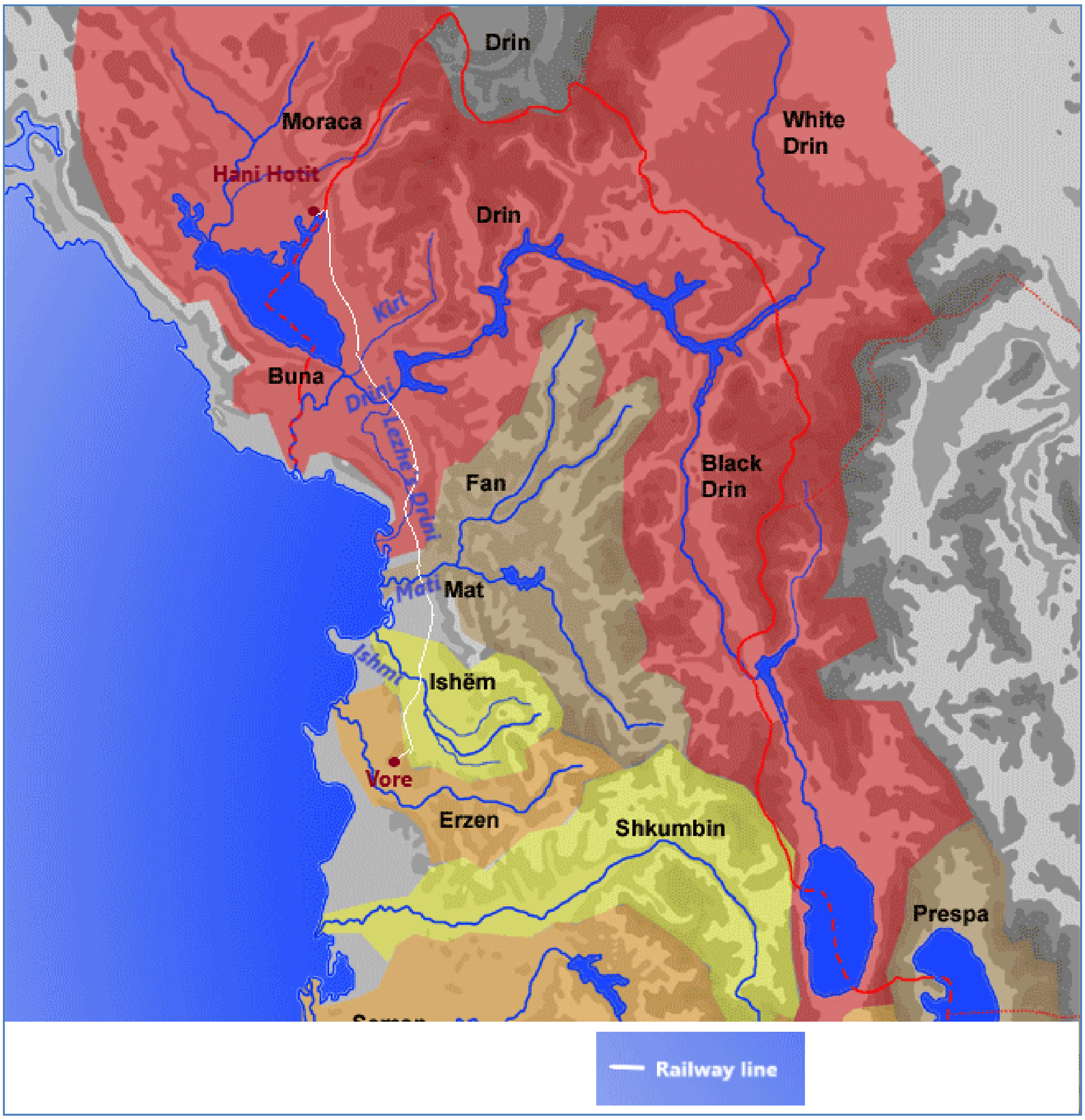


Figure 5-76_Railway line and the main rivers and their watersheds

Hereinafter follows a short outline of the crossed rivers and the Shkoder Lake.

Ishmi River

The Ishmi River is located in Central Albania. The surface of the watershed of the River Ishmi is F = 673 km^2, the average elevation is 357 m above sea level, and the length of the riverbed is 79.2 km. The average discharge is about 20.9 m^3/s. The boundary of the Ishmi watershed lies between the Mat River in the north and the Erzeni River basin in the south. In the watershed of the Ishmi River, altitudes from 0 to 200 m above sea level occupy 54.4% of the total surface of this basin, followed by less frequent elevations of 200 to 600 m with 25.1% of surface area, and those of 600 to 1200 m with 16.7% and altitude 1200 - 1500 m with 4.8% of the surface. The dominant elevation of the Ishmi watershed is between elevation 0 and 200 m a.s.l. indicating the hilly nature of this river.

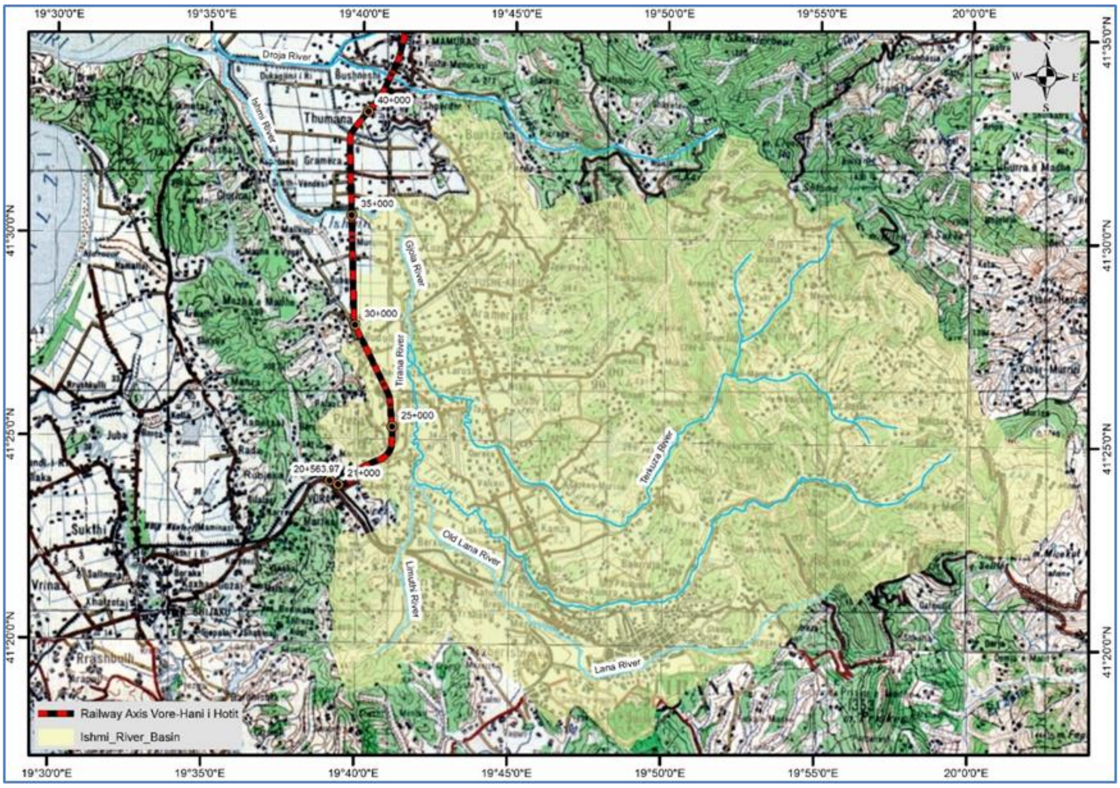


Figure 5-77_Railway line and Ishmi River and its catchment

Ishmi River is formed by the confluence of Tirana, Tërkuza, and the Zeza Rivers. The main tributary of Ishmi is considered the river of Tirana that constitutes its longest tributary. In general, the three main tributaries that form the Ishim River retain the characteristics of mountain streams with the torrential regime and short concentration times. Tirana River joins Tërkuza River forming thus the Gjolë River. Zeza is the lower tributary of the Ishmi River, with a catchment area of F = 71.3 km^2. After the confluence of the waters of the Zeza River with the Gjolë River (the confluence of Tirana and Tërkuza River) is formed Ishmi River near the village of Derven.

The basic characteristics of this river are as follows[126]:

- Watershed surface: 673 km^2;
- Average annual discharge: 20.9 m^3/sec;
- Maximum discharge: 1,980 m^3/sec;
- Minimum discharge: 3.77 m^3/sec (on August);
- Specific discharge: 31.5 l/s.km^2;
- Ratio wettest month (January-February) to driest month (August): 9 to 10;
- One in 10-year high discharge: about 55 times the river module.

Droja River

Droja is the smallest River in Albania located in central Albania. Droja originates on the western side of Skanderbeg Mountain. At the beginning of Droja River, there are few small springs, which feed this river all over the year. It flows in the East-West direction and after passing the

126 Source: Hydro meteorological bulletin, 1968-1992

Vaja Gorge, it flows in hilly terrain, and after Fushe –Mamurras village it joins with Mamuras drainage channel.

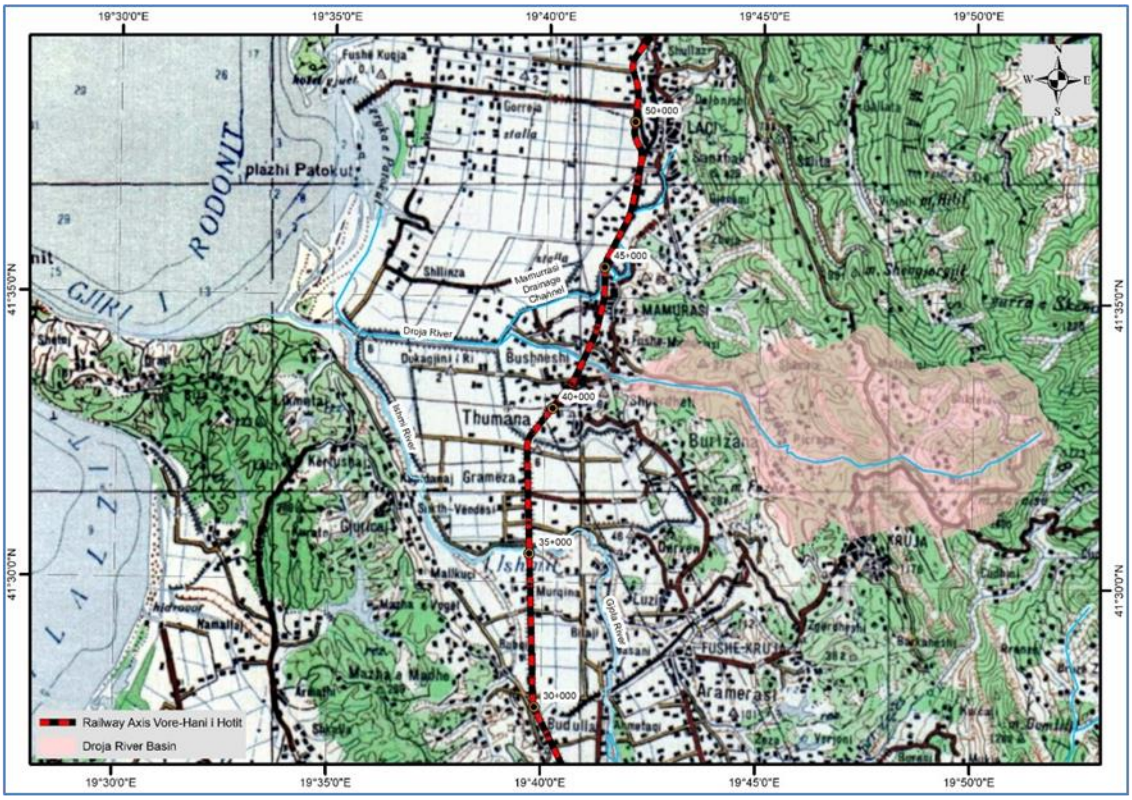


Figure 5-78_Railway line Droja River and its catchment

Its overall length is 30 km, while its catchment surface is 67.2 km^2. During the period 1959-1965, the Thumane field was structured with irrigation and drainage channels systems. Droja River, which discharges in Ishmi River, was rehabilitated and nowadays derives directly in Adriatic Sea.

Mati River

The Mati River springs from the mountainous region of Kaptina- Martanesh, well known as a karst zone, with an altitude of 1,873 m above sea level. Several streams along the river nourish the Mati water flow. Some of them are permanent and the others only seasonal. The water basin is covered mainly by pine and oak wood. Mati is composed of two main branches, Mati and Fani, which have approximately equal catchment areas and inflow. This hydrographic basin is of significant economic importance due to its energetic and irrigation advantages. The relief of the watershed is mountainous and fractured with valleys and deep gorges. The Mati catchment area, before it joins the Fani River, is 1,329.8 km^2 and the total area is 2,488.2 km^2. The Fani River has a catchment area of 1,075.6 km^2. After the construction of the artificial Lake of Ulza (1957) and the hydropower facility of Shkopeti, the natural water regime of this river is mostly affected by energy plans for water usage. After the confluence of the two rivers near Miloti Bridge, the Mati River reaches a width of 484 m representing a typical plain river with low relief. The long-term average discharge of the Mati River is Q = 87.4 m^3/s.

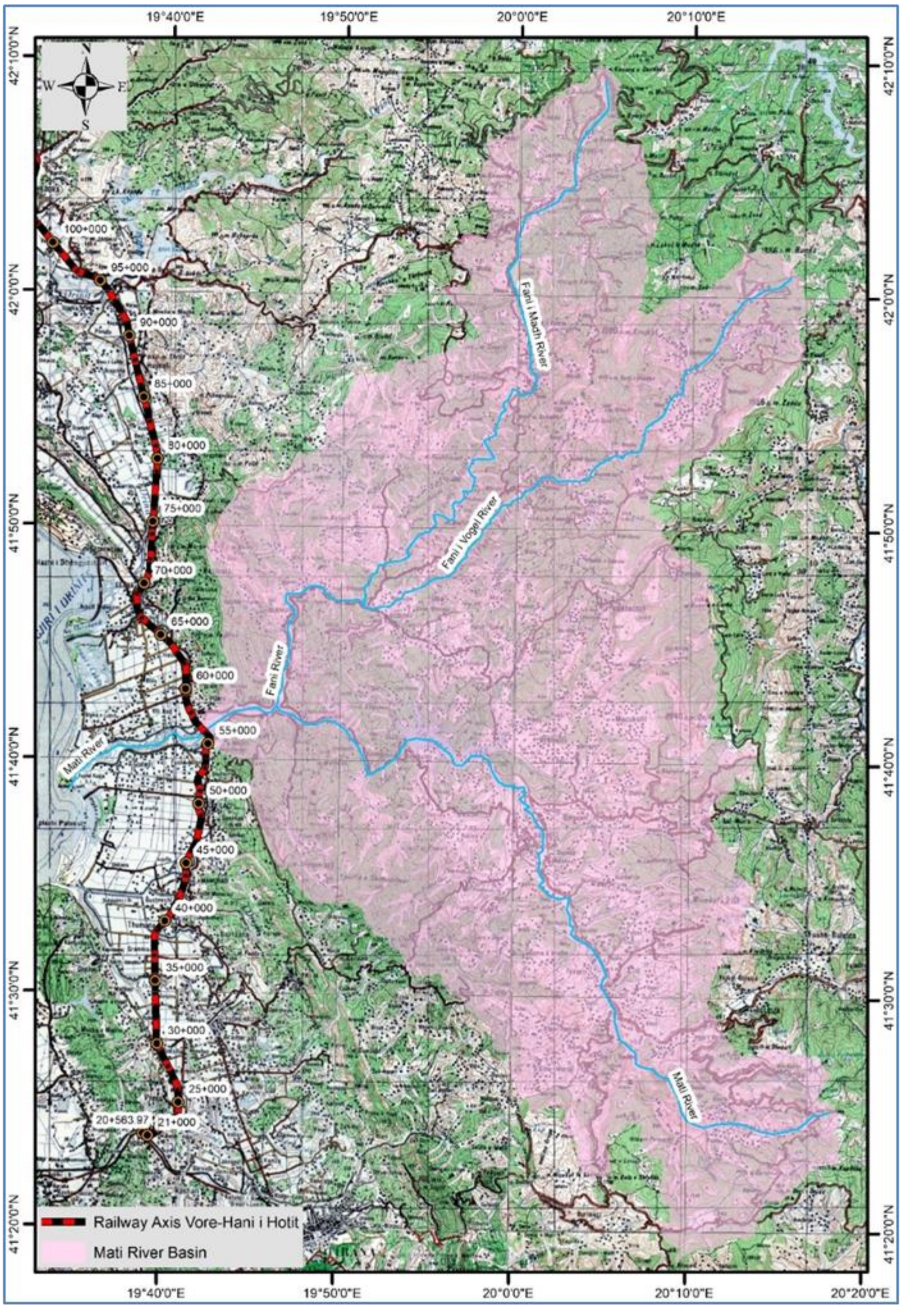


Figure 5-79_Railway line and Mati River and its catchment

Lezhë's Drini River

In 1846, after a flood, the Drini formed a new bed that passed through Shkoder area called Drinasa. This branch over the years was expanded and the capacity of this branch increased, while after floods of 1858 and 1859 all the water passed to this bed and joins Buna 1.5 km from its exit from Lake Shkoder, in Baçallëk. The same happens also with Gjadër River which discharges now all the water in Buna River.

In the old bed of Drini that now is called Lezhë's Drini and Gjadër River, in the direction of Lezhë, the water passed only in the case of extraordinary plots.

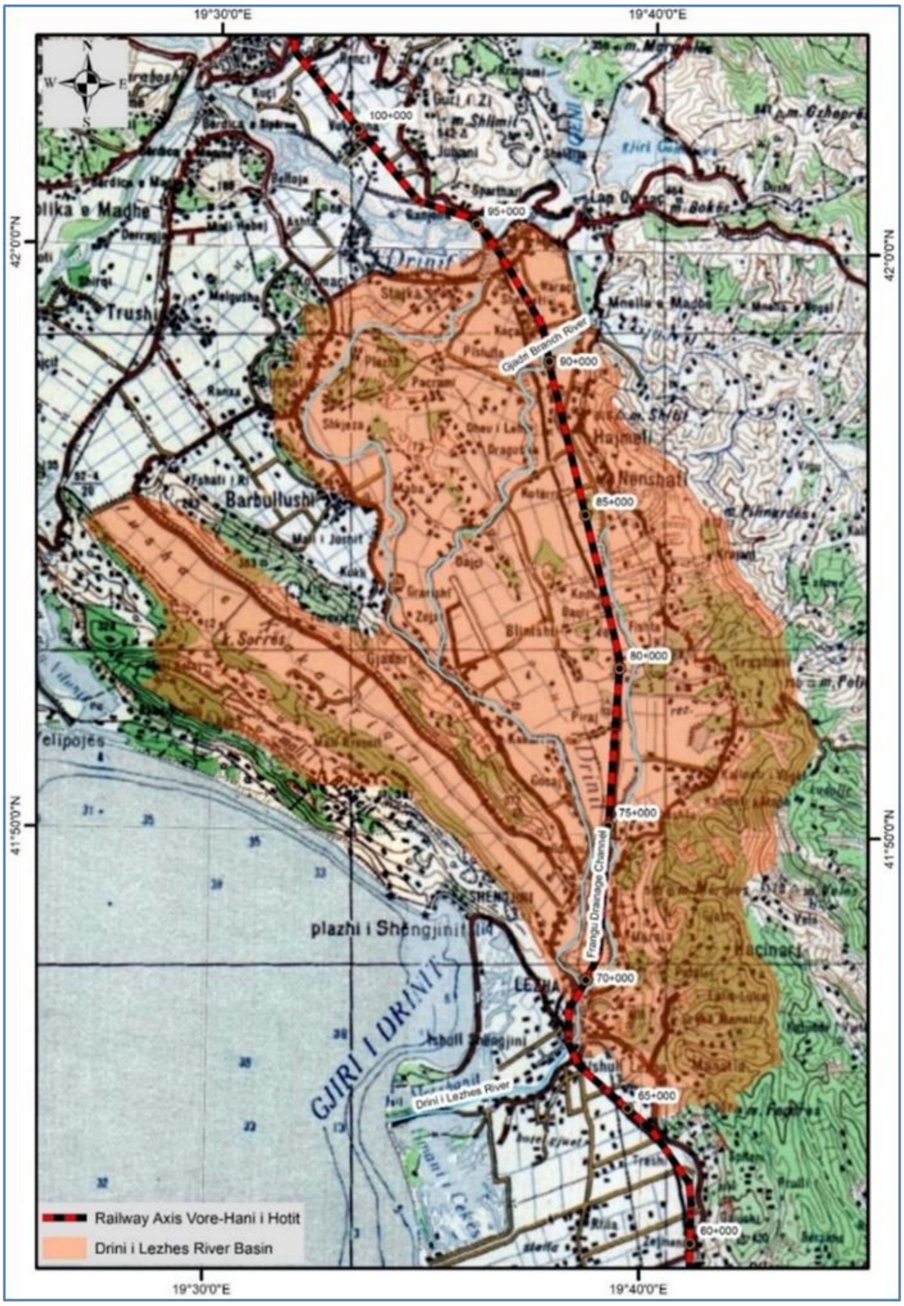


Figure 5-80_Railway line and Lezhë's Drini River and its catchment

Lezhë's Drini River is composed of two remained rivers of Drini and Gjadër. Lezhë's Drini River starts from Shelqet village and ends at Adriatic Sea at Kune Vain Marsh. Gjadër River Starts from Kovaç village and joins with Lezhë's Drini at Gjadër village. Both these rivers drain the fields in between villages of Kovaç, Naraç, Shelqet, Stajkë, Kosmaç, Melgushe, Bushat, Rranxë, Barbullush, Torrovicë, Kakariq, Hajmel, Krajnë, Fishtë, Troshan, Kallmet i Vogël, Raboshtë, Patalej, and at the end Lezhë City. The length of Lezhë's Drini River is about 43 km, and its watershed area is 312 km^2.

Buna and Drini Rivers

Buna River is composed of two branches one is Buna River coming from Lake Shkoder and the other is Drini River. Both branches join after Bahçallëk Bridge.

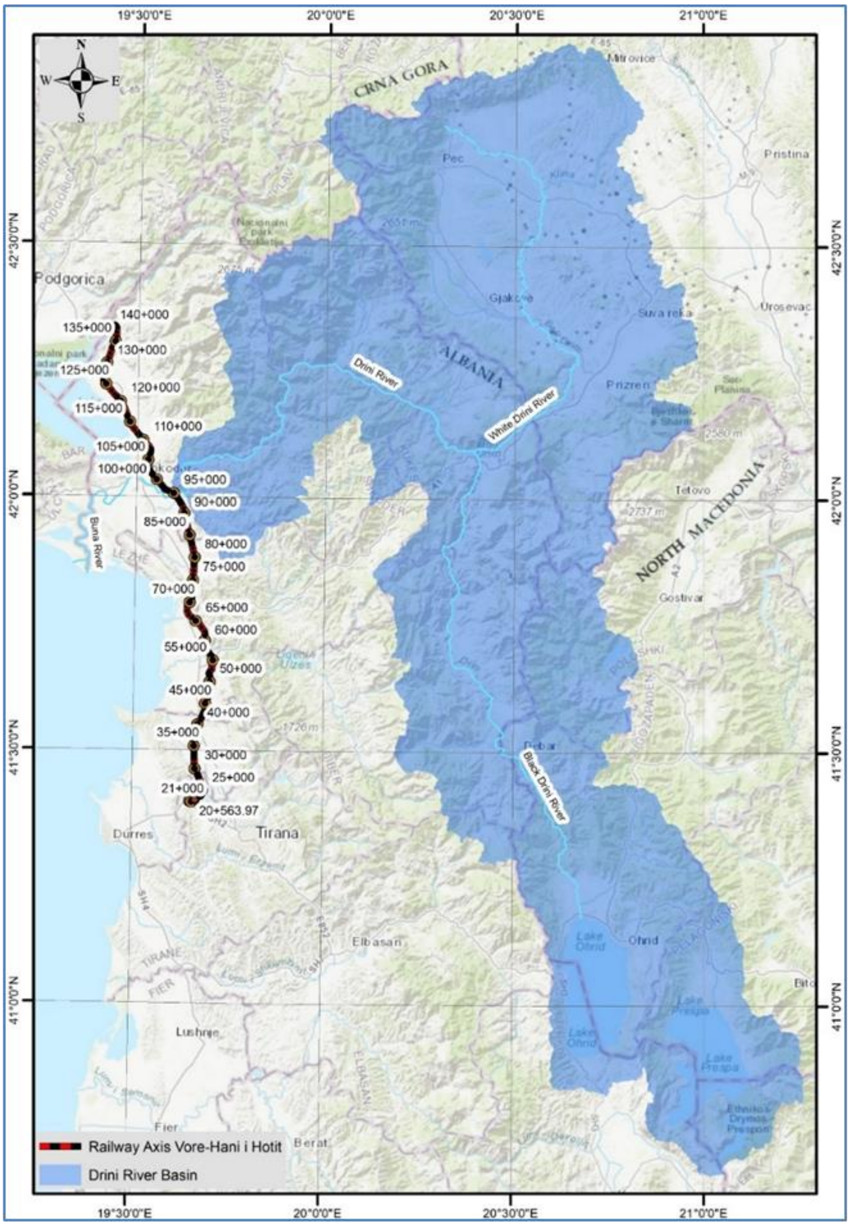


Figure 5-81_Railway line and Drini River and its catchment

Lake Shkoder is a water body shared between Albania (about 35 % of the water surface area) and Montenegro (about 65 % of the water surface area). It has a catchment area of about 5,500 km². The biggest inflows into the Lake are the Moraca (MQ of about 200 m³/s, equals 66% of the inflows), followed by the inflows to Malo Blato (about 12 m³/s), Karuç Bay, and River Crnojevica. Several minor additional surface inflows (among others: Rivers Rjolli and Vraka in Albania) are accompanied by high subterranean inflows of roughly 55 m³/s of the yearly average.

The Buna drains the lake into the Adriatic Sea with an MQ of approximately 340 m³/s at the lake outflow. The Drini River joins the Buna 3.5 km downstream of Lake Shkoder (MQ of 345 m³/s). The total catchment area of the Buna River is about 19,580 km^2.

Albania, North Macedonia, Serbia, Kosovo, and Montenegro share the catchment of the Drini River basin. The catchment area is estimated to be 14,170 km^2 with a length of 285 km. The river originates from Lake Ohrid and Lake Prespa e Madhe in North Macedonia where it is called Black Drini. The upper catchment of Black Drini drains areas in Greece, Albania, and North Macedonia.

Black Drini River leaves Lake Ohrid and crosses into Albania between Dibra and Peshkopia. Further downstream White Drini River, which originates in Kosovo, converges with the Drini River on the west of Prizren. White Drini River rises in Kosovo. It has a length of about 136 km and drains a karst region of nearly 4,960 km^2 within Albania and 4,360 km^2 in Kosovo with a mean elevation of 862 m.

The Gjadër and Kiri rivers join at the Drini downstream of Vau Dejes HPP and have catchment areas of 200 km^2 and 264 km^2 respectively.

About 160 years ago, the paths of the River Buna and River Drini differed. The original channel of the Drini, leading south to the city of Lezhë, now carries only a relatively small discharge. Instead, the Drini now joins the Buna just downstream of Shkoder and continues as a single river along the border with Montenegro until it enters the Adriatic Sea.

Kiri River

Kiri River basin with a surface area of 263.9 km^2 is located in the western section of the Albanian Alps. Kiri River derives from three initial branches: the central branch flows out from mount Biga e Shalës 2230 m a.s.l., the right branch from Gjuraj-Boksi, and the left branch from mount Boshi 1637.6m a.s.l. The three branches merge at Pogu village.

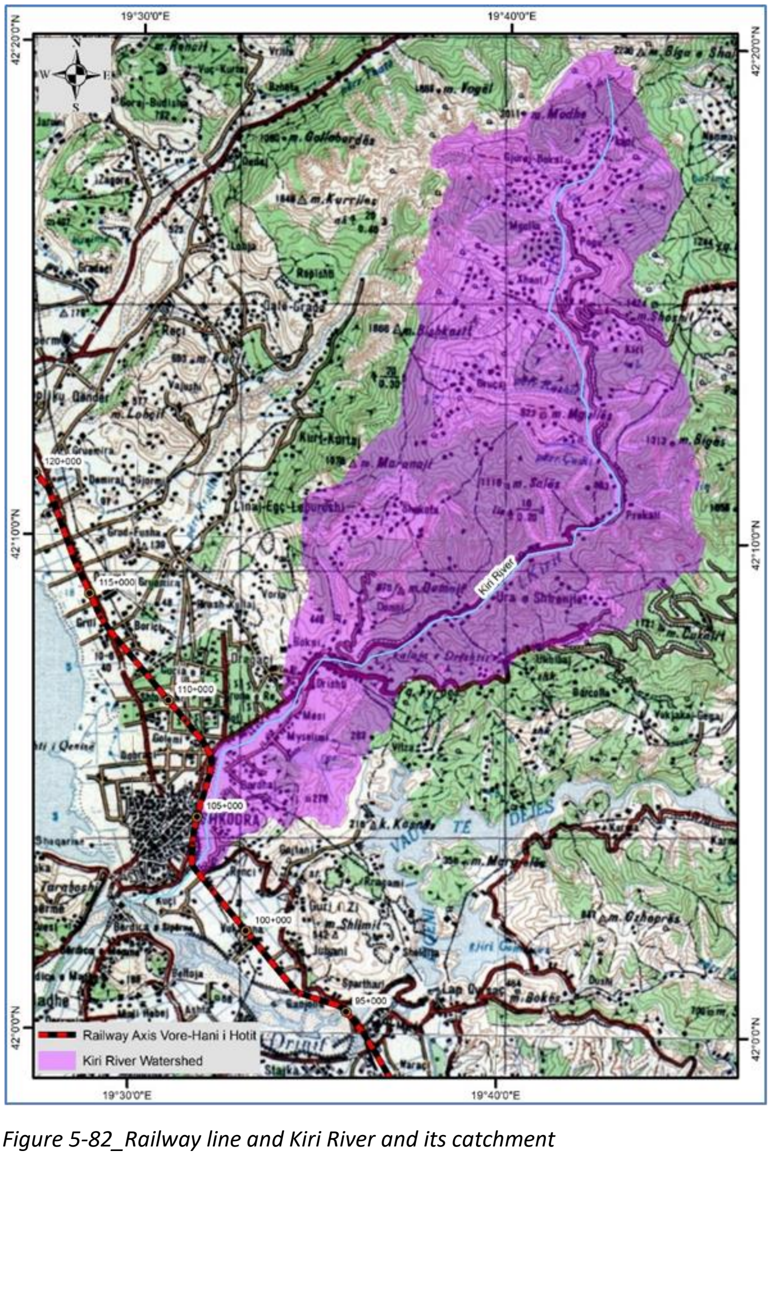


Figure 5-82_Railway line and Kiri River and its catchment

Kiri River is characterized by high flows during the spring season because of snowmelt on the upstream sector of Kiri basin, but it has a smaller influence compared to other Alpine rivers of that region. It has an average flow of about 13.6 m^3/s.

There are some underground water springs in the upstream sector of the Kiri basin, particularly in Gjuraj-Boks and in Pogu village which have a considerable flow (up to 1m^3/s) during the whole year.

Kiri River is distinguished for its rapid changes in water levels.

In addition to the above-mentioned rivers, the railway line crosses several streams, the biggest of which and their main characteristics are given in the table below.

Table 5-58_The main streams crossed by the railway line and their characteristics.

No	Name	Crossing location (km)	Area km^2	Q 1% 100 years	Q 1‰ 1000 years	Q 0.333%127 300 years	Method
10	Vraka stream	111+470	36.0	276	408	316	Rational
11	Rrjolli stream	118	99.1	406	609	467	Rational
12	Banushi stream	121	46.8	302	450	346	Rational
13	Dry stream (Përroi Thatë)	127	233	540	750	600	Rational

Shkoder Lake

Lake Shkoder is the largest lake in the Balkan Peninsula in terms of water surface area. The lake is a shared water body between Albania (about 35 % of the water surface area) and Montenegro (about 65 % of the water surface area). Lake Shkoder has an average altitude of 5.00 m above sea level, a maximum depth of 8.3 m, and a mean depth of 5.01 m. Water levels fluctuate from a minimum of 4.5 m to a maximum of 9.9 m above sea level, and as a result, the lake surface varies from 353 to 530 km^2. The amount of water during the year changes by more than 2.22 km^3 that is more than 50% of the water reserves of the Lake. About 81% of water is collected from the watershed of Montenegro and about 19% from Albania[128]. However, these published data are not exact concerning the maximum water level, which can reach roughly 11m, as it occurred during the exceptional floods of winter 2010 when this figure was 10.55m (see section 5.2.9 below).

The railway line runs close to the north eastern shore of this Lake, from km 139 to km 140 (see Map 1_General plan view at 1:25.000 scale – separate file in pdf format).

127 According the Albania low the hydraulic of the bridge will be design for 1:100 years and will be controlled for 1:333 years

128 http://www.bibliotekaShkoder.com/doc/liqeni_shkodres_2016.pdf

5.2.8.3. Surface waters (rivers and lakes) quality

Materials and methods

The assessment of the water quality for rivers and lakes is based on the ecological and physic-chemical parameters, which values are compared to the EU norms, as defined by the EU Water Framework Directive (WFD). The definition of ecological status consists of the abundance of aquatic flora and fauna, the availability of nutrients, and parameters like salinity, temperature, and pollution by chemical pollutants.

The EU Water Framework Directive (Directive 2000/60) classification scheme for surface water ecological status includes five categories129: high or very good, good, moderate, poor, and bad. "High status" means no or very low human pressure. "Good status" means a "slight" deviation from this condition, "moderate status" means "moderate" deviation, and so on.

Law 111/2012 "On integrated management of the water sources", as amended, fully complies with the Water Framework Directive.

The Guidance No 10 of the EU Water Framework Directive (Rivers and Lakes – Typology, Reference Conditions, and Classification Systems130) provides for the relative roles of biological, hydro morphological and physicochemical quality elements in ecological status classification according to the normative definitions in Annex V (1.2) of this Directive.

The State of Environment Report (SoER), published yearly by the National Environmental Agency, gives the monitoring results on the surface water quality. This monitoring is based on the DCM 1189/2009 "On the rules and procedures on the preparation and application of the national monitoring program", as well as on the DCM 246/2014 "On the environmental norms for the surface waters".

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129 https://ec.europa.eu/environment/pubs/pdf/factsheets/water-framework-directive.pdf

130 Water Framework Directive (2000/60/EC). Guidance document no 10. River and lakes -Typology, reference conditions and classification systems

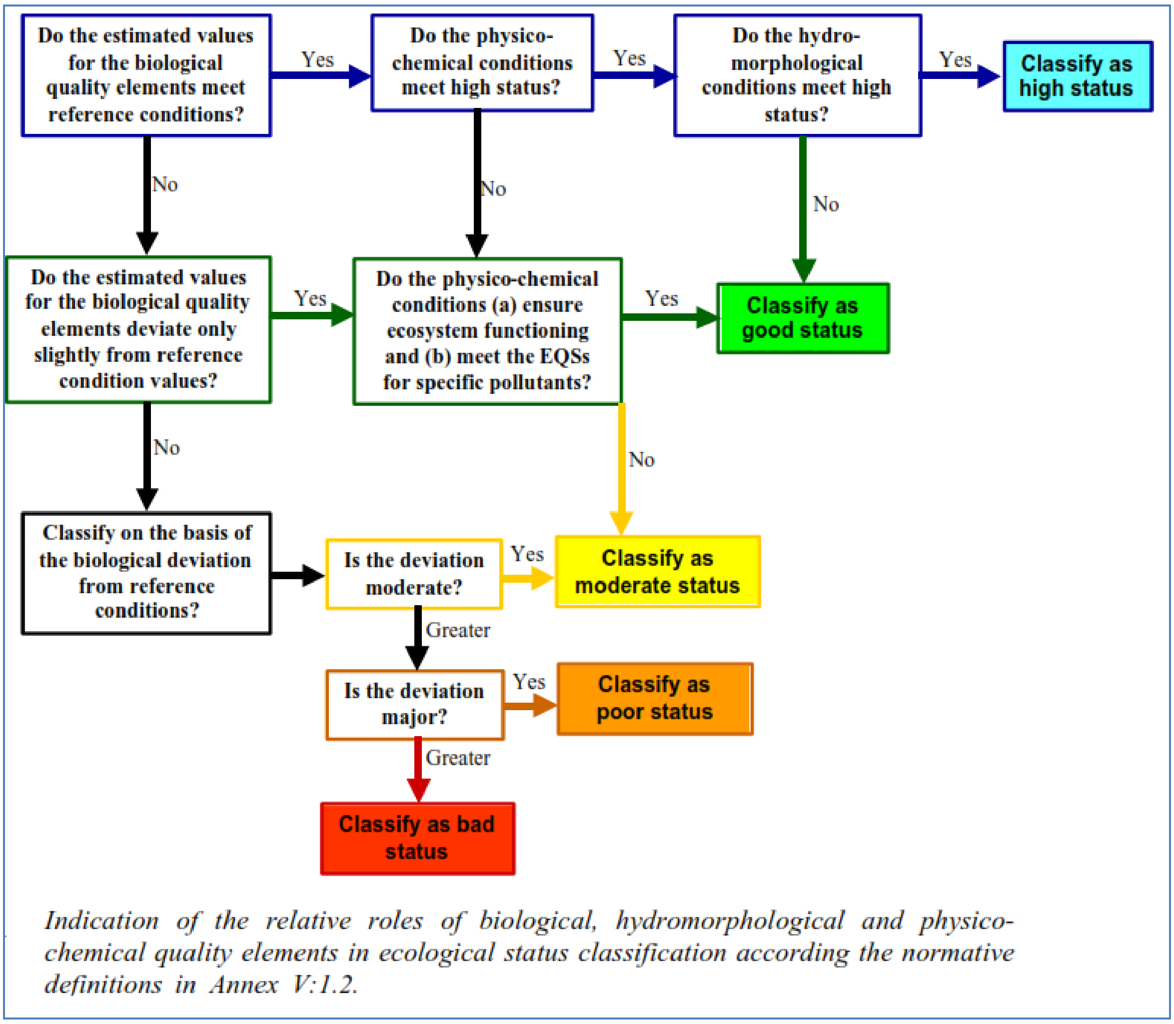


Figure 5-83_Relative roles of the biological, hydro morphological and physic-chemical factors in the classification of the ecological status of rivers and lakes

The figure below gives the basic principles for the classification of ecological status based on Ecological Quality Ratios (EQR).

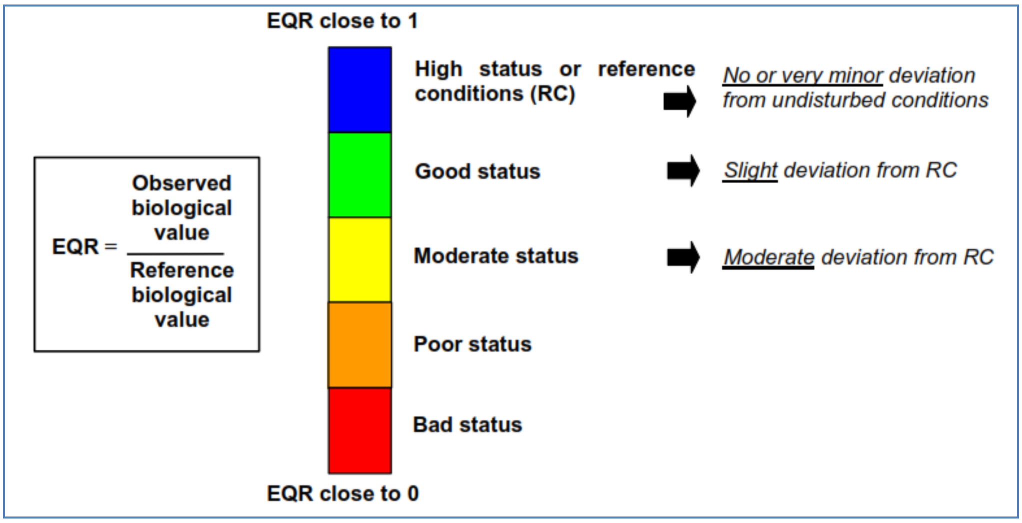


Figure 5-84_ Basic principles for the classification of ecological status based on Ecological Quality Ratios

According to the EU Water Framework Directive[131], the chemical and physicochemical elements supporting the biological elements, for both rivers and lakes, are thermal conditions, acidification status, salinity, oxygenation conditions, nutrient conditions, and specific pollutants, as well as the water transparency (only for lakes).

The monitored related parameters are temperature, pH, conductivity, dissolved oxygen, chemical oxygen demand, biochemical oxygen demand, nitrites, nitrates, ammonia, phosphorous, total phosphorous, and transparency (only for lakes).

Hereinafter follows a short description of the importance of each of these parameters for aquatic life and water quality[132].

- Water temperature influences the biological activity and growth, water chemistry, and the types of organisms living in water bodies.
- pH affects the number of nutrients and chemicals that are soluble in water, and therefore the number of nutrients available to aquatic life. Water with a very low or high pH can be a sign of chemical or heavy metal pollution.
- Conductivity indicates the dissolved chemical substances in the water
- Dissolved oxygen (DO) is an important indicator of water quality. It is essential for the survival of aquatic organisms, including fish. Oxygen dissolves in surface water due to the aerating action of winds. Oxygen is also introduced into the water as a by-product of aquatic plant photosynthesis.
- The Chemical Oxygen Demand (COD) determines the amount of oxygen required for the chemical oxidation of organic matter. It is an indicator of organic and chemical pollution.
- Biological Oxygen Demand (BOD) is the amount of dissolved oxygen required by aerobic organisms to decompose the organic material present in the water. It indicates the amount of organic pollution present in an aquatic ecosystem.
- Ammonia is one of several forms of nitrogen that exist in aquatic environments. Unlike other forms of nitrogen, which can cause nutrient over-enrichment of a water body at elevated concentrations and indirect effects on aquatic life, ammonia causes direct toxic effects on aquatic life[133]. The concentration of Ammonia is one of the main parameters for classifying the water quality according to the Water Framework Directive.
- Nitrites and nitrates in the water bodies come from fertilizers through run-off water, sewage, etc. They can cause the grown of bacteria when introduced at high levels into a water body.
- Too much Phosphorus in water can cause eutrophication (a reduction in dissolved oxygen in water bodies caused by an increase of mineral and organic nutrients) of rivers and lakes.
- The total phosphorus (organic and inorganic phosphorus compounds) in water is an essential nutrient for flora and fauna.

131 Guidance document no 10. River and lakes -Typology, reference conditions and classification systems

132 https://www.usgs.gov/special-topic/water-science-school/science

133 https://www.epa.gov/wqc/aquatic-life-criteria-ammonia

The monitoring of the surface waters quality has been based on the DCM 1189/2009 "On the rules and procedures on the preparation and application of the national monitoring program", as well as on the DCM 246/2014 "On the environmental norms for the surface waters".

The qualitative classification of the water quality is based on the concentration of the Total Organic Carbon (TOC) and Total Nitrogen (TN). The Total Organic Carbon is the amount of carbon found in an organic compound and is often used as a non-specific indicator of water quality. While the Total Nitrogen is the sum of total Kjeldahl nitrogen (ammonia and organic nitrogen) and nitrate-nitrite.

In Albania, TOC and TN are based on the following standards:

- Total Organic Carbon: International standard ISO 8245; and
- Total Nitrogen: National standard SSH EN 12260: 2003

The table below shows the qualitative classification of the water quality based on the concentration of the Total Organic Carbon and Total Nitrogen134.

Table 5-59_Qualitative classification of the surface water quality based on the TN and TOC content

Class	I	II	III	IV	V
Water quality	Very good	Good	Moderate	Poor	Bad
Total Nitrogen (µg/l)	< 300	300-400	400-600	600-1200	1200+
Total Organic Carbon (mgC/l)	< 2.5	2.5 – 3.5	3.5 - 6.5	6.5 - 15	15+

The symbols and colours showing the ecological status of the surface water are given in the figure below.

134 Albania State of Environment Report, 2018 (in Albanian). NEA, 2019

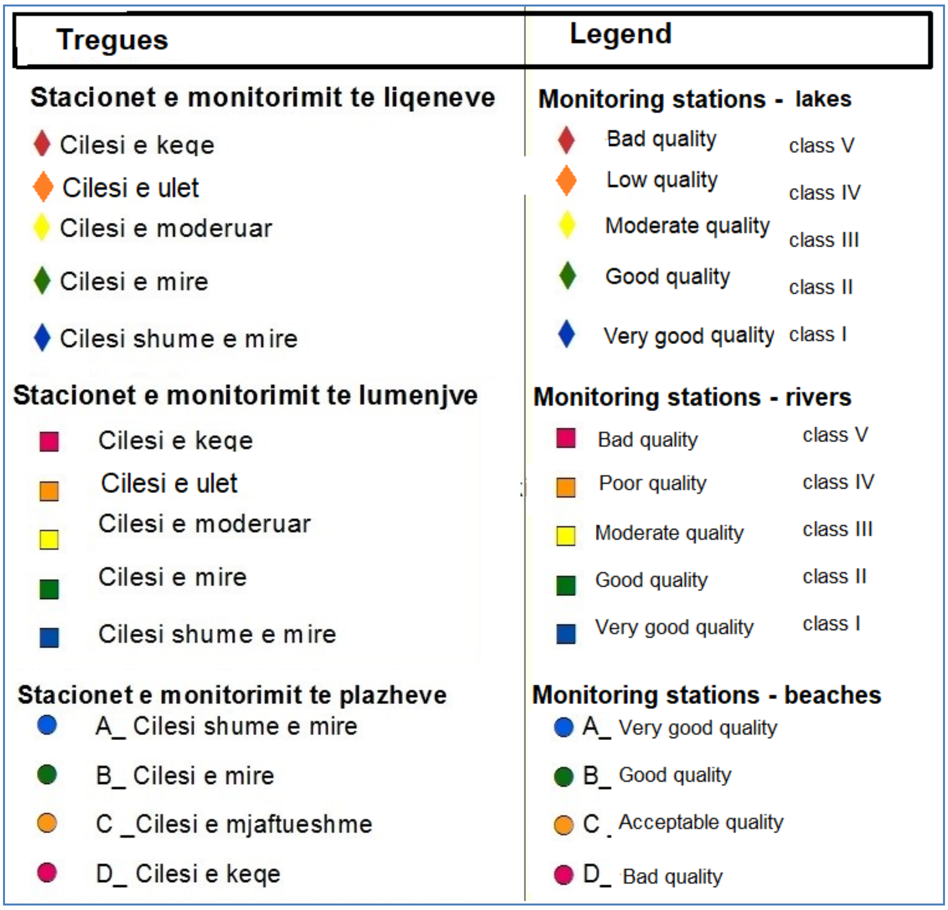


Figure 5-85_Symbols of the ecological classification of the surface water quality according to the WFD and Albanian standards

Rivers waters quality related to the proposed project

The data/information on the quality of the surface waters has been based on the Albania State of Environment Reports (SoER), 2018 and 2019. This report is published yearly by the National Environmental Agency.

Selection of the monitoring stations

The selected monitoring stations are located close and downstream of the railway line crossings with the water bodies. Among the country surface waters' monitoring stations, those that are related to the proposed project are as follows:

- Ishmi River: Station Ish3, at Sallme-Shete road bridge, downstream km 35 of the railway line;
- Mati River: Station M4, at Shënkoll highway bridge, downstream km 56 of the railway line;
- Drini's of Lezhë River: Station DLe, at the railway bridge, km 69+600; and
- Drini River: Station D2, at Bahçallëk road bridge, downstream km 95 of the railway line (Spathari Bridge) and downstream km 102+800 (Kiri River Bridge)

In addition to the SoER, the Albanian geoportal135 gives also the location of the sampling points.

135 https://geoportal.asig.gov.al/map/?auto=true

The map below shows the geographical location of the monitoring stations for surface waters. The detailed geographical location of the monitoring stations is shown in a separate map (see Map 5: Environmental Monitoring map – separate file in pdf format).

Figure 5-86_Railway line and the monitoring stations for lakes and rivers that are relevant to the project136

Monitoring results

Hereinafter follows the monitoring results of the rivers crossed by the railway line, as well as of the Shkoder Lake, which is located close to the northern section of this line. The data/information is extracted from the State of Environment Report, 2018, and 2019. The water quality has been analysed twice, in April and October of 2018 and 2019.

Drini and Drini Lezhë's Rivers: River waters within the Drini River Basin are monitored in six stations, only two of which are relevant to the proposed project. These stations are **D2**, located

136 Source: National Environmental Agency, 2019

at Bahçallëk, downstream Spathari Bridge (km 95 of the railway line), and **DLe**, located at Lezhë railway bridge (km 102+800 of the railway line).

Dissolved Oxygen (DO) and Biological Oxygen Demand (BOD): In 2018, Station D2 was classified in class I, while station DLe in class III.

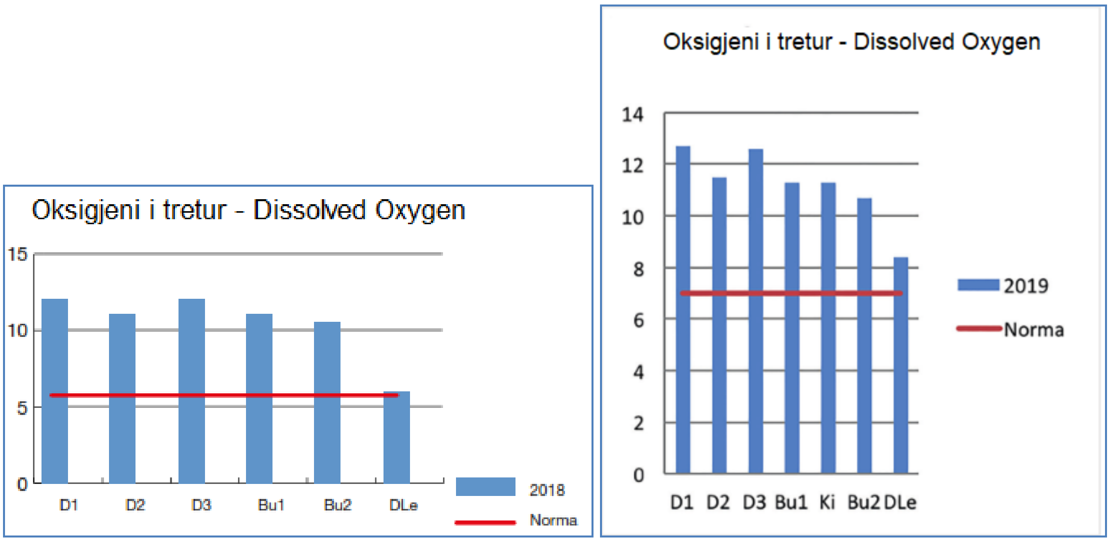


Figure 5-87_Drini and Lezhë's Drini Rivers: Concentration of dissolved Oxygen (mg/l) – years 2018 and 2019

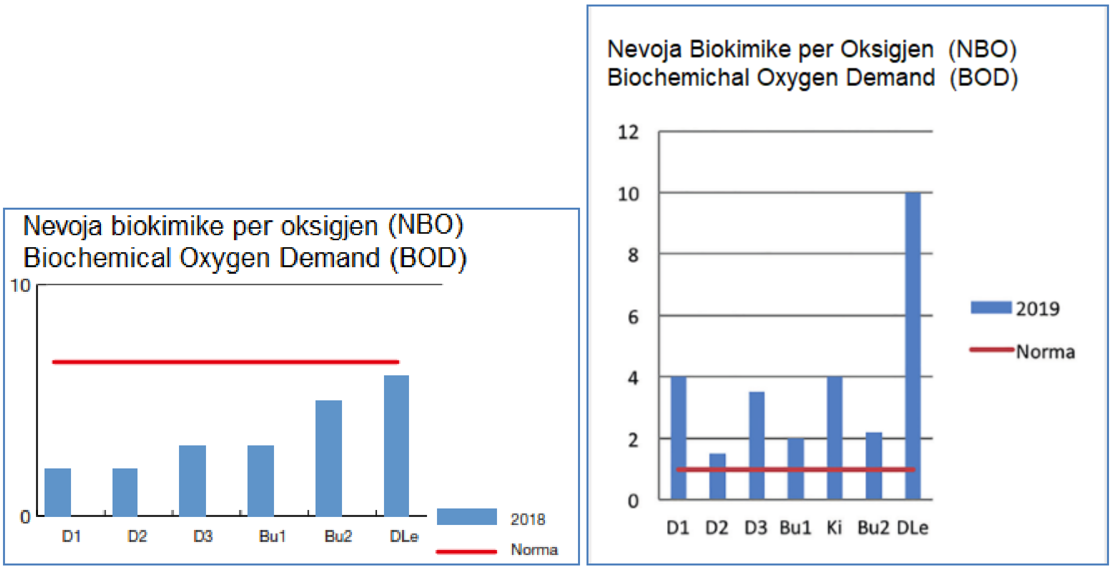


Figure 5-88_Drini and Lezhë's Drini Rivers: Concentration of BOD (mg/l) – years 2018 and 2019

The annual average concentration of Ammonia show that stations D2 and DLe are included in class II (good quality (< 0.3mg/l) although the values at DLe station are slightly inferior to the permitted norm.

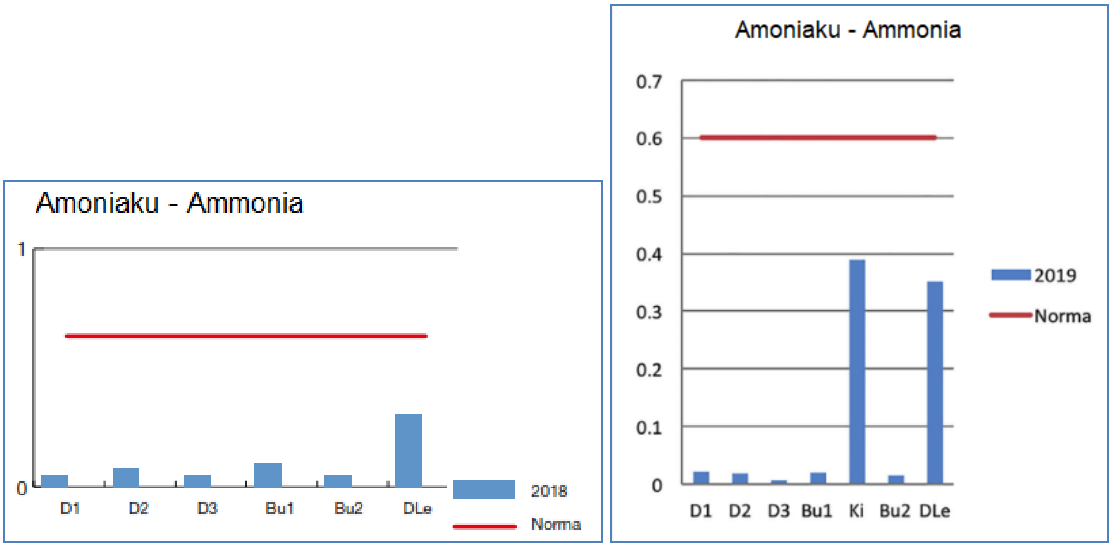


Figure 5-89_Drini and Lezhë's Drini Rivers: Concentration of dissolved Ammonia (mg/l) – years 2018 and 2019

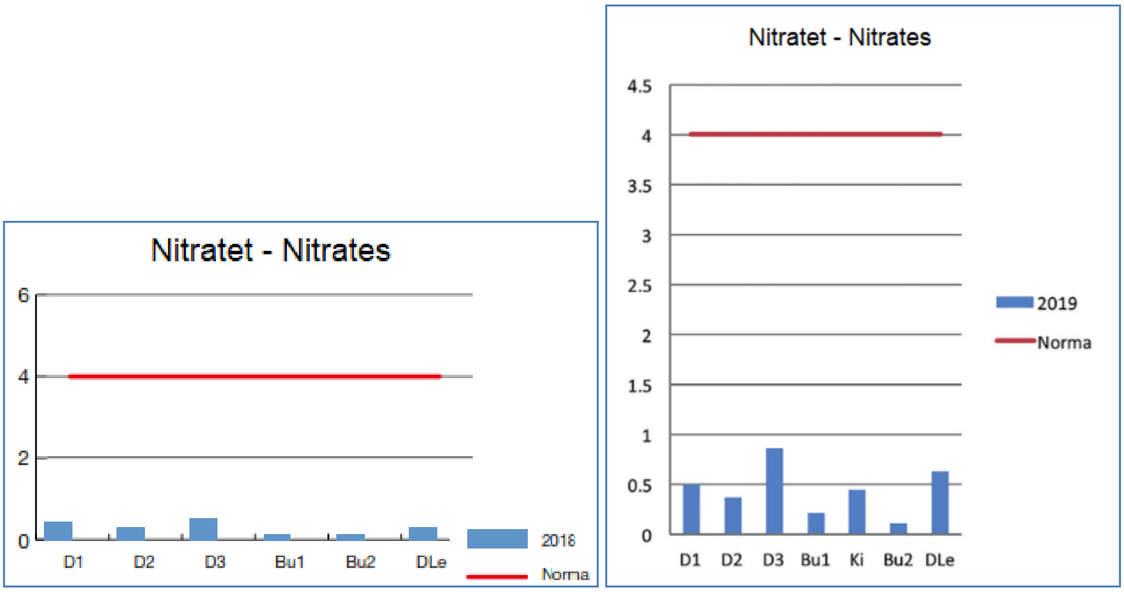
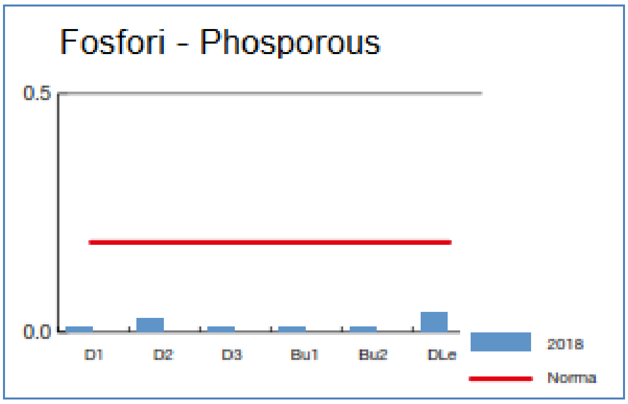


Figure 5-90_Drini and Lezhë's Drini Rivers: Concentration of Nitrates (mg/l) – years 2018 and 2019

According to SoER 2018 and 2019, the concentration of nitrites for 2018 and 2019, respectively, is within the permitted norms for all stations of Drini, and therefore all stations are included in class I (very good water quality).

The content of Phosphorous and Total Phosphorous is within the permitted norms. The values monitored at station D2 show a class I (very good) water quality, while at DLe station a class III (moderate quality).



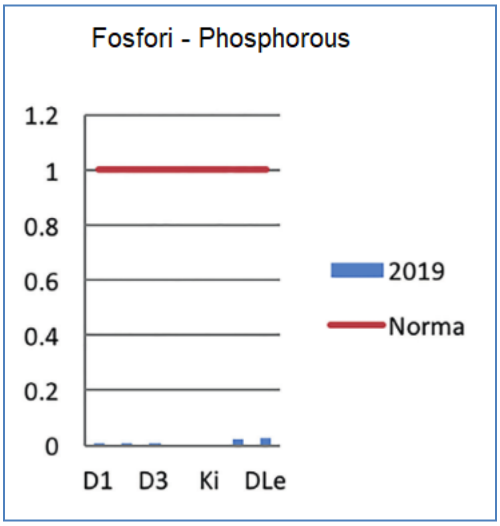
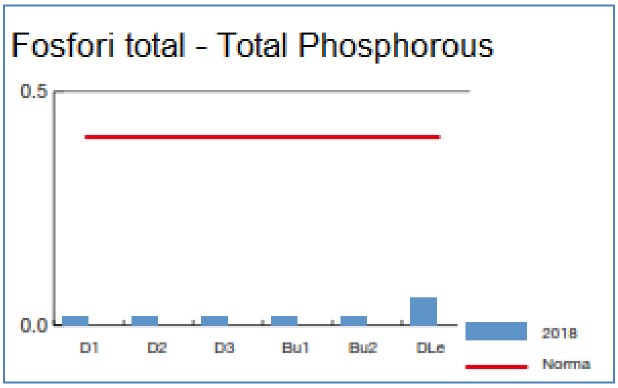


Figure 5-91_Drini and Lezhë's Drini Rivers: Concentration of Phosphorus and total phosphorous (mg/l) - years 2018 and 2019



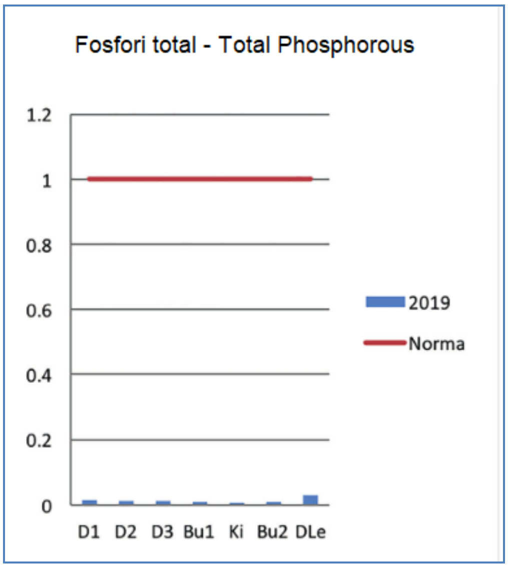


Figure 5-92_Drini and Lezhë's Drini Rivers: Concentration of Phosphorus and total phosphorous (mg/l) - years 2018 and 2019

Mati River: River waters within the Mati River Basin are monitored in four stations, only one of which is relevant to the proposed project. Station **M4** is located at Shënkoll village, approximately 2.6 km downstream of the Mati Bridge (km 55+500 of the railway line).

Monitored dissolved Oxygen concentration at all the stations shows that all the collected water samples are saturated and therefore are within the required norms. While BOD concentration at M4 station classifies the water of this river as of Class II (good quality).

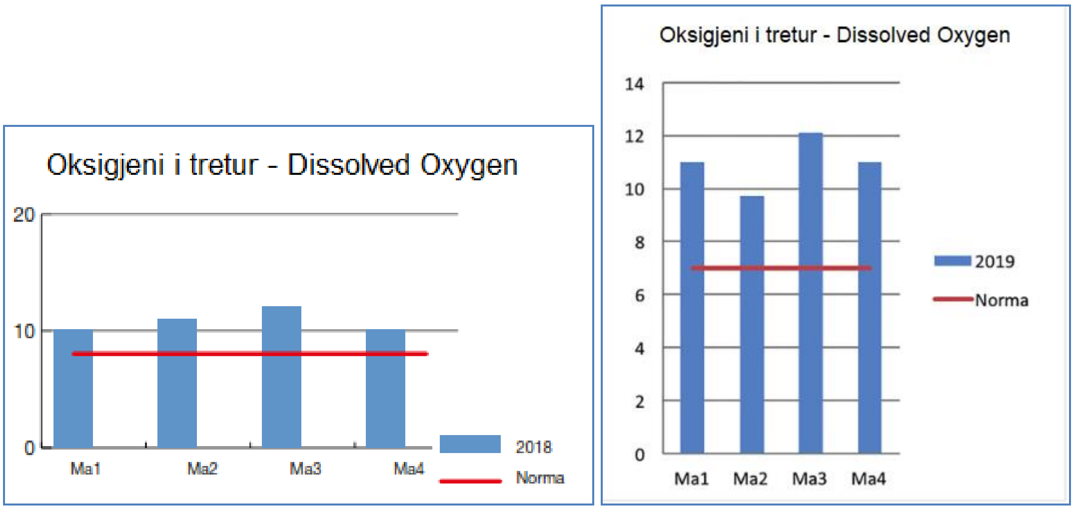


Figure 5-93_Mati River: Concentration of dissolved Oxygen (mg/l) - Years 2018 and 2019

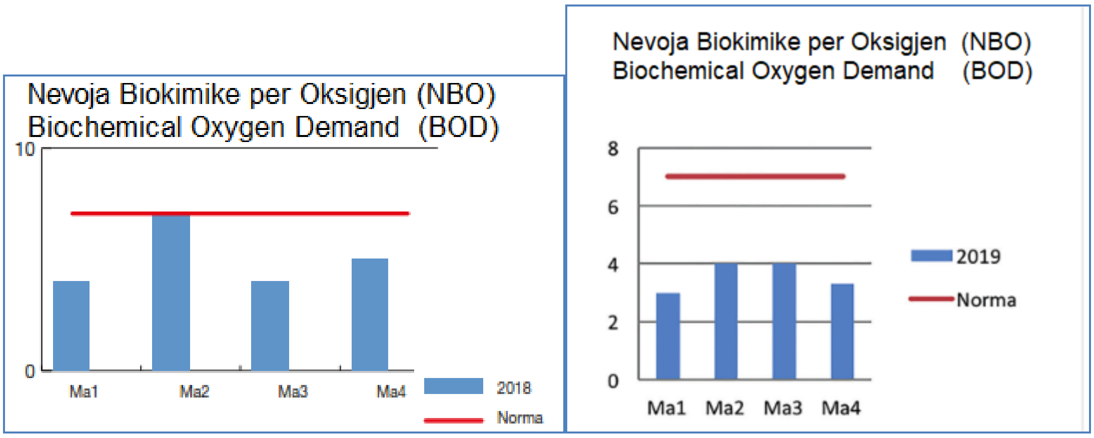


Figure 5-94_Mati River: Concentration of BOD (mg/l) - Years 2018 and 2019

As per the content of Ammonia, all stations, excepting M2, are included in class I (very good quality). M2 is included in class II (good quality).

The content of nitrates and nitrites is below the permitted norm, classifying thus all these stations as of class I (very good water quality).

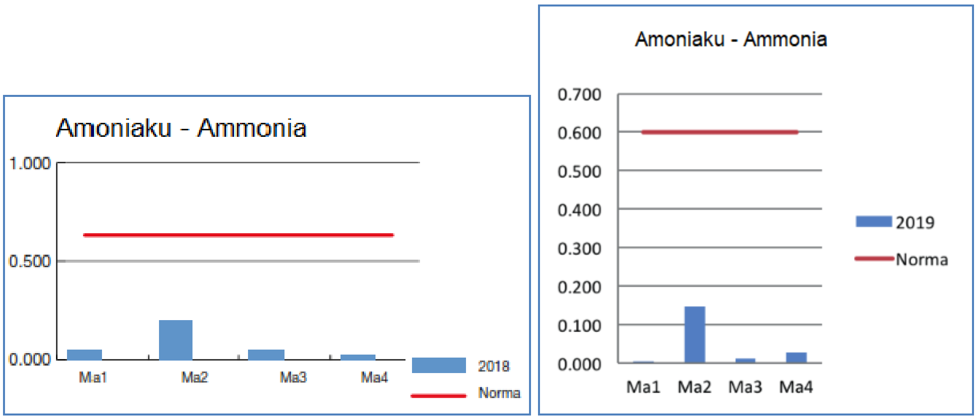


Figure 5-95_Mati River: Concentration of Ammonia (mg/l) - Years 2018 and 2019

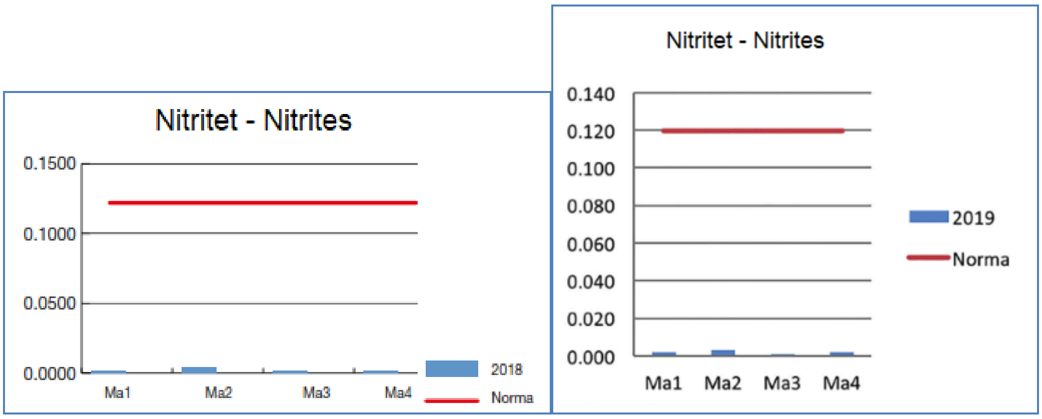


Figure 5-96_Mati River: Concentration of Nitrites (mg/l) - Years 2018 and 2019

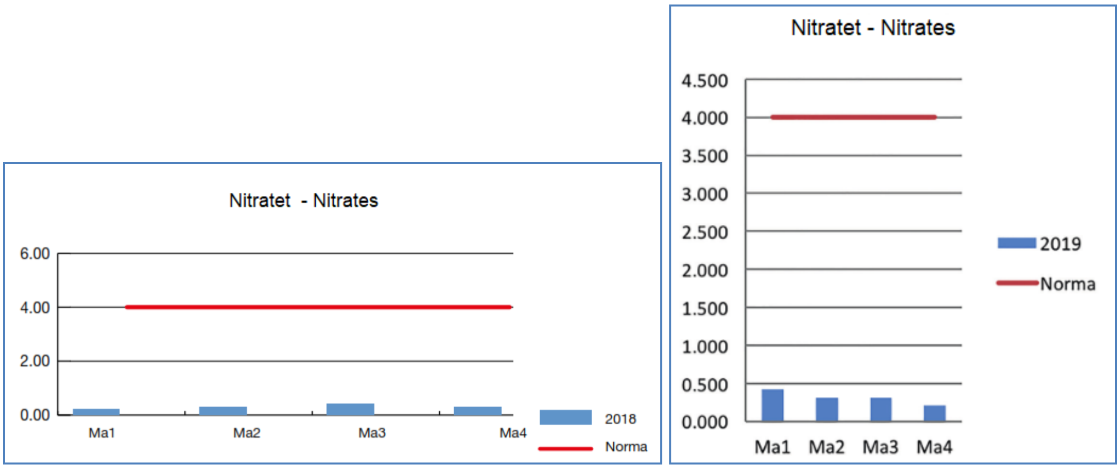


Figure 5-97_Mati River: Concentration of Nitrates (mg/l) in 2018 and 2019

As per the phosphorous and total phosphorous, the station M4 is included in class I (very good quality).

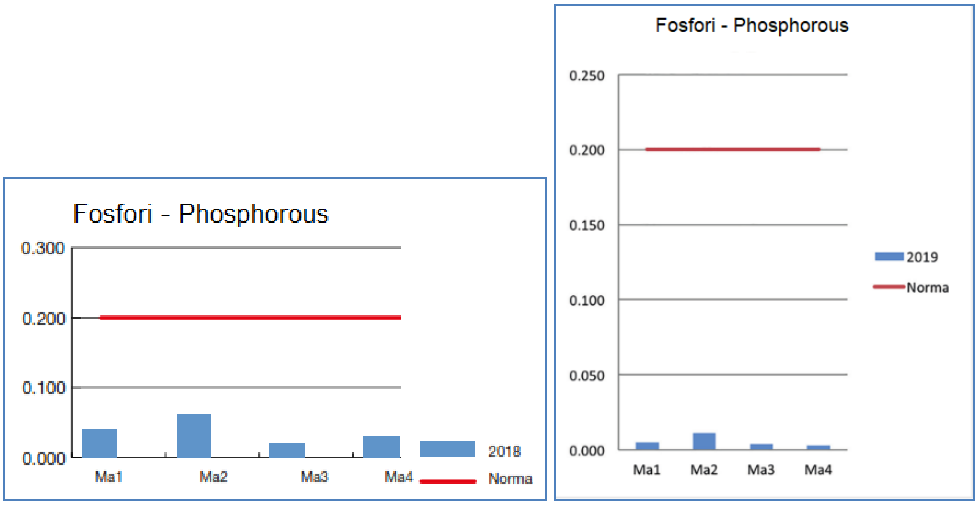


Figure 5-98_Mati River: Concentration of Phosphorous (mg/l) - Years 2018 and 2019

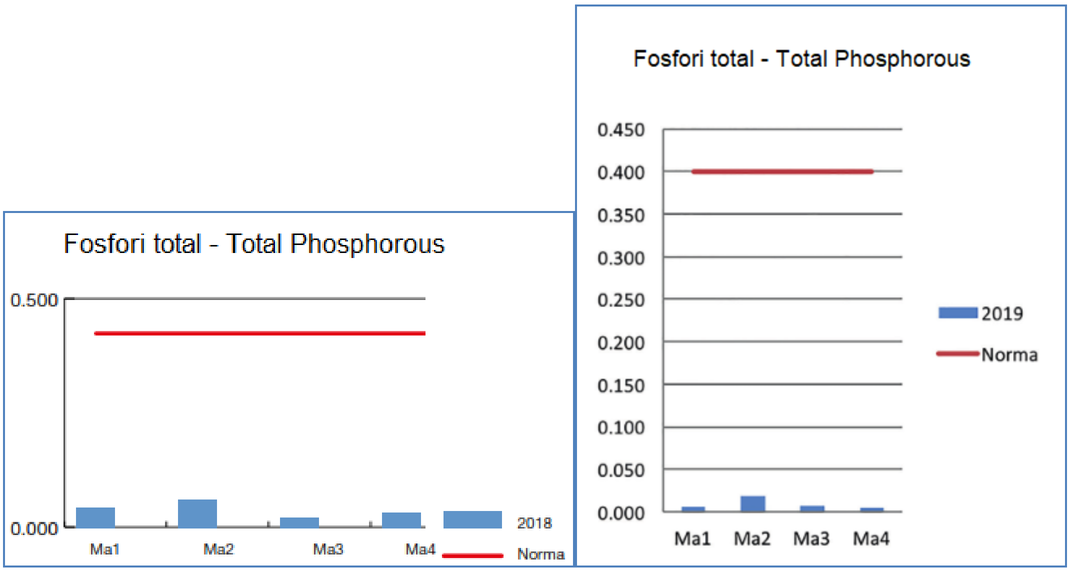


Figure 5-99_Mati River: Concentration of total Phosphorous (mg/l) in 2018 and 2019

Ishmi River: River waters within the Erzeni-Ishmi Rivers Basins are monitored in ten stations, from which the only **Ish3** is relevant to the proposed project. The station Ish3 is located downstream km 35 of the Railway Bridge, at the road bridge of Sallmë-Shetaj (see Figure 5-86 above and Map 5 -Environmental monitoring map – separate file in pdf format).

The Dissolved Oxygen at Ish3 station is within the permitted norms. However, it should be underlined that the water quality analysis of April 2018 is almost equal to these norms (class III).

While the BOD analyses show that the station Ish3 belongs to class IV (poor water quality).

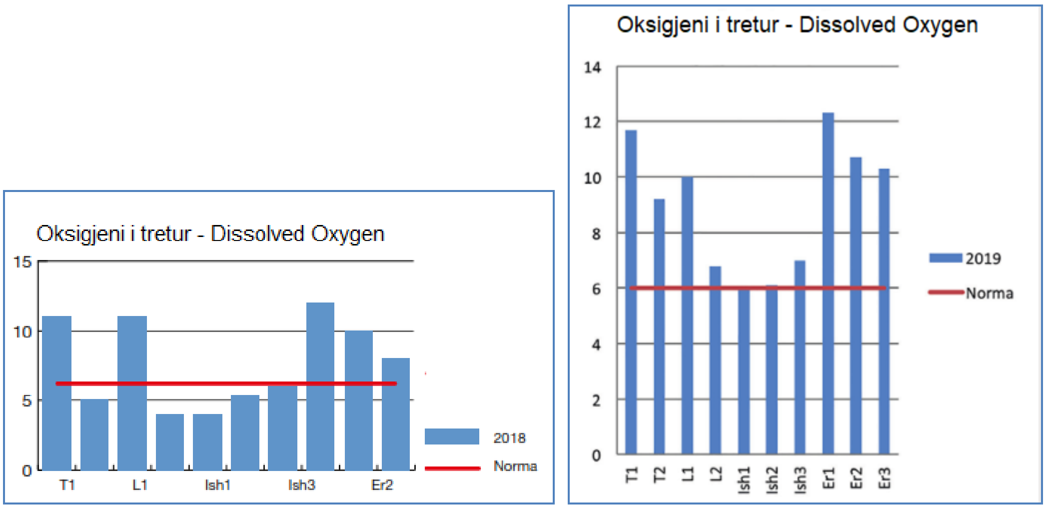


Figure 5-100_Ishmi River: Concentration of dissolved Oxygen (mg/l) Years 2018 and 2019

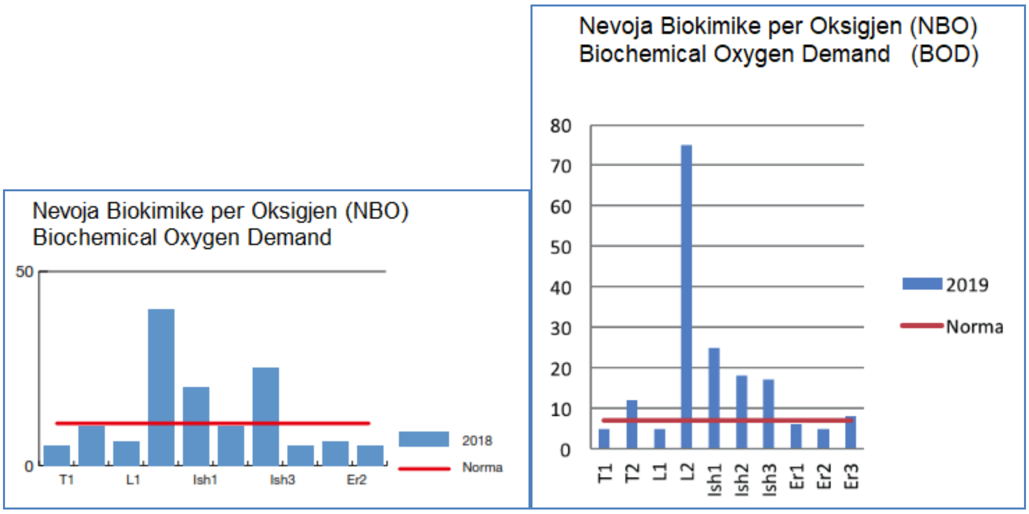


Figure 5-101_Ishmi River: Concentration of BOD (mg/l) - Years 2018 and 2019

As per the Ammonia concentration, all the Mati River monitoring stations show higher values than the permitted norm, classifying thus these stations in class V (bad quality).

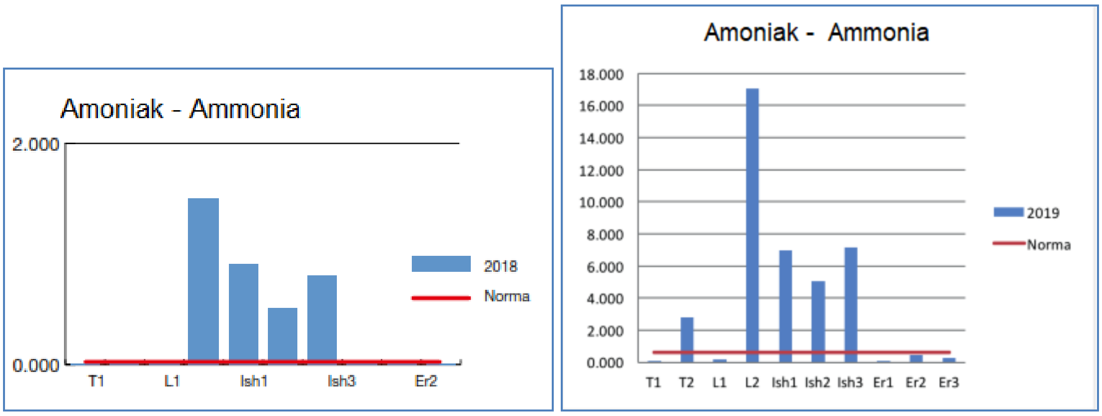


Figure 5-102_Ishmi River: Concentration of Ammonia (mg/l) – years 2018 and 2019

The content of nitrates and nitrites is below the permitted norm, showing thus a very good water quality (class I).

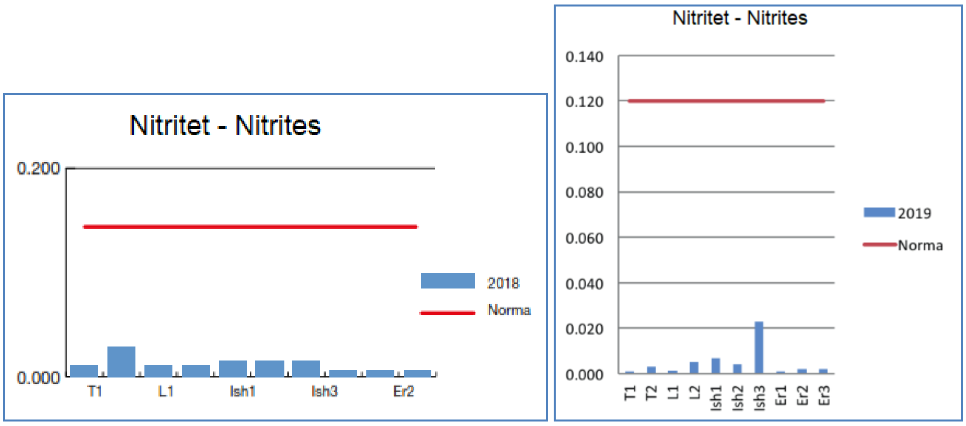


Figure 5-103_Ishmi River: Concentration of Nitrites (mg/l) – years 2018 and 2019

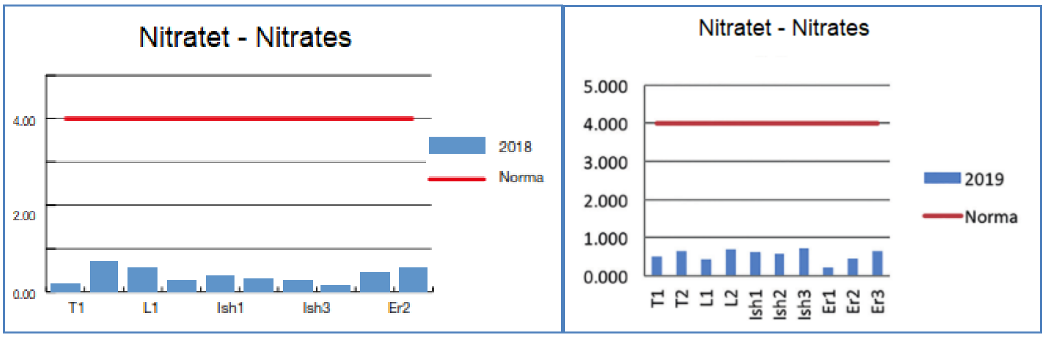


Figure 5-104_Ishmi River: Concentration of Nitrites (mg/l) and Nitrates (mg/l) – years 2018 and 2019

The concentration of Phosphorous classifies Ish3 station in class V (bad water quality), while the concentration of the Total Phosphorous in class IV (poor water quality).

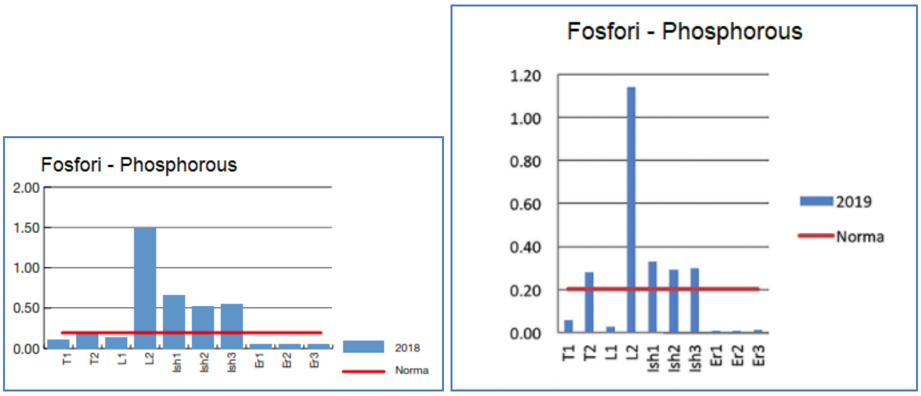


Figure 5-105_Ishmi River: Concentration of Phosphorous and total Phosphorous (mg/l) - years 2018 and 2019

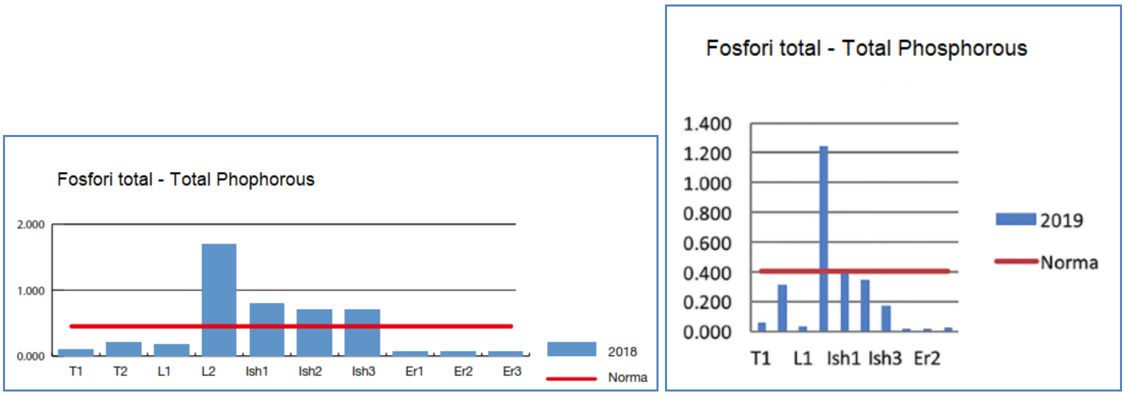


Figure 5-106_Ishmi River: Concentration of Phosphorous and total Phosphorous (mg/l) - years 2018 and 2019

Findings on the rivers water monitoring results

Drini River: Monitoring station **D2** shows a very good water quality (class I);

Lezhë's Drini: Monitoring station **DLe** shows a moderate water quality (class III), because of the BOD value (see Figure 5-88 above);

Mati River: Monitoring station **Ma4** shows a moderate water quality (class III), because of the BOD value;

Ishmi River: Monitoring station **Ish3** shows a bad water quality (class V), because of the BOD value;

Shkoder Lake waters quality related to the proposed project

The only lake that can be affected by the proposed project is Shkoder Lake. Map 1 (General Plan view at 1:25.000 scale – separate file in pdf format) shows the location of the Shkoder Lake and the railway line. The data/information on the quality of this lake waters has been based on the Albania State of Environment Report (SoER), 2018, as well as on the data/information published by the National Agency of Protected Areas.

Selection of the monitoring stations

The water quality is monitored in three stations (Shirokë, Zogaj, and Sterbeq). The water samples are taken in two different depths: 0.0 and 10.0 m. Only the Sterbeq (Koplik) station is relevant to the proposed project because the others are located far from the Project area.

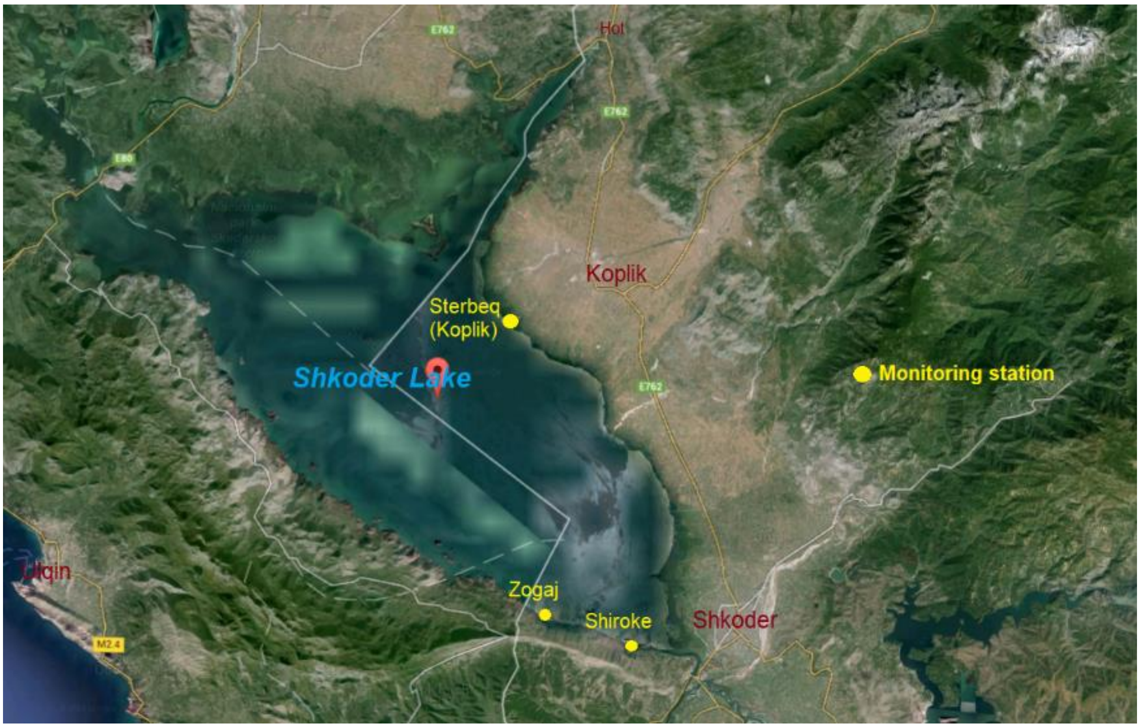


Figure 5-107_Location of the monitoring stations for the water of Shkoder Lake

Water quality and aquatic life

The quality of the lakes' waters is associated with aquatic life. The box below categorizes the quality of the lake's waters concerning aquatic life support137.

Box 1: Lakes trophic states
Trophic State (TS) Eutrophication is the process by which lakes are enriched with nutrients, increasing the production of rooted aquatic plants and algae. This process is reflected in a lake's trophic classification or state: **oligotrophic** - nutrient-poor and low productivity; high transparency (deep Secchi depth), low chlorophyll-a, low phosphorus; **mesotrophic** - moderate productivity; intermediate transparency, chlorophyll-a, and phosphorus concentration; **eutrophic** - very productive and fertile; low clarity/low Secchi; high chlorophyll-a and phosphorus concentrations;

137 https://www.lakeaccess.org/lakedata/datainfotsi.html

Box 1: Lakes trophic states
hyper eutrophic - extremely productive with noxious surface scums of algae.

The concentration of chlorophyll is an indicator of phytoplankton abundance and biomass in coastal and estuarine waters.

The Trophic State Index (TSI) of a water body is rated on a scale from zero to one hundred. The table below shows the typical relationships between the trophic class and the TSI values138.

Table 5-60_Relationships between Trophic State Index, chlorophyll, phosphorus, Secchi depth, and Trophic Class

Trophic State Index (TSI)	Chlorophyll (Chl) mg/l	Phosphorous (P) mg/l	Secchi depth (SD) metres	Trophic Class
<30-40	0-2.6	0-12	> 8-4	Oligotrophic
40-50	2.6-20	12-24	4-2	Mesotrophic
50-70	20-56	24-96	2-0.5	Eutrophic
70-100+	56-155+	96-384+	0.5- < 0.25	Hyper eutrophic

The relationships between water quality and the TSI values are as follows139:

Table 5-61_ Relationships between Trophic State Index, Trophic Class and water quality

Trophic State Index (TSI)	Trophic Class	Water quality
<30-40	Oligotrophic	Good
40-50	Mesotrophic	Moderate
50-70	Eutrophic	Poor
70-100+	Hyper eutrophic	Bad

Shkoder Lake water quality and aquatic life

Table hereinafter provides for the quality of the lake's water measured yearly in Sterbeq station, as given on the web page of the National Agency of Protected Areas140. The monitoring results show that Lake's waters are classified as mesotrophic, thereby having a medium level of nutrients.

138 Carlson R.E. and J. Simpson (1996) A Coordinator's Guide to Volunteer Lake Monitoring Methods. North American Lake Management Society.

139 Carlson R.E. and J. Simpson (1996) A Coordinator's Guide to Volunteer Lake Monitoring Methods. North American Lake Management Society.

140 http://akm.gov.al/liqene.html

Table 5-62_Quality of Shkoder Lake water at Sterbeq monitoring station

No	Indicator	Classification	Value	Standard
1	COD (mg/l)	Mesotrophic	3.65	8 - 9
2	BOD_5 (mg/l)	Oligotrophic	2.00	< 3
3	$N\text{-}NO_3$ (mg/l)	Oligotrophic	0.16	< 1
4	P-Total (mg/l)	Oligotrophic	0.011	0.04 – 0.01
5	Transparency/clarity (m)	Mesotrophic	4	5 - 10
6	Station's classification	Mesotrophic		

Hereinafter are given other data provided by the State of Environmental Report, 2018[141].

The water transparency or clarity is 3.0 m at Sterbeq (2018). The values of COD and BOD show that Lake's water is classified as mesotrophic. The BOD is 2.0 mg/l.

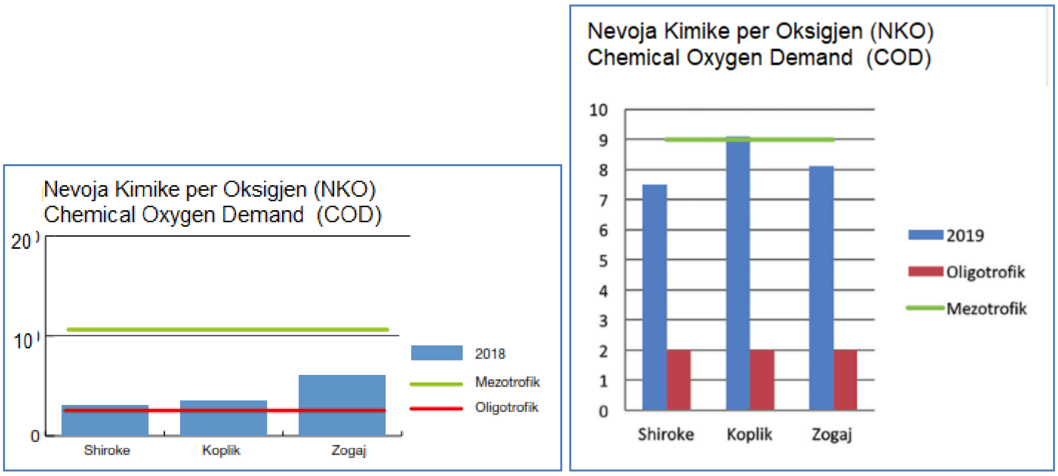


Figure 5-108_Measured concentration (mg/l) of COD at Shkoder Lake- years 2018 and 2019

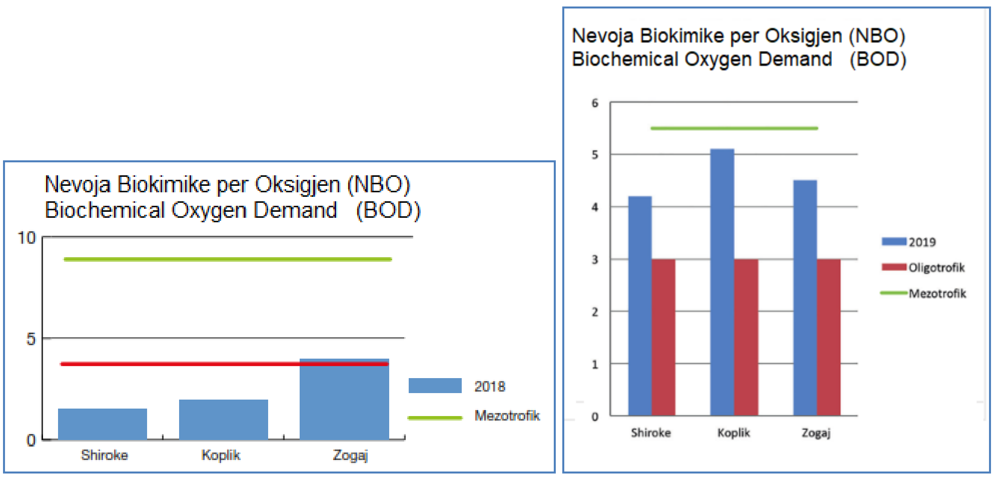


Figure 5-109 Measured concentration (mg/l) of BOD (mg/l) values at Shkoder Lake- years 2018 and 2019

141 Albania State of Environment Report, for 2017, NEA, 2018

The concentration of nitrates is less than 1.0 mg/l, and therefore this parameter satisfies the standards of the oligotrophic water. While the concentration of the total phosphorous is between 0.015 and 0.02 mg/l, that satisfies the standards of the mesotrophic water.

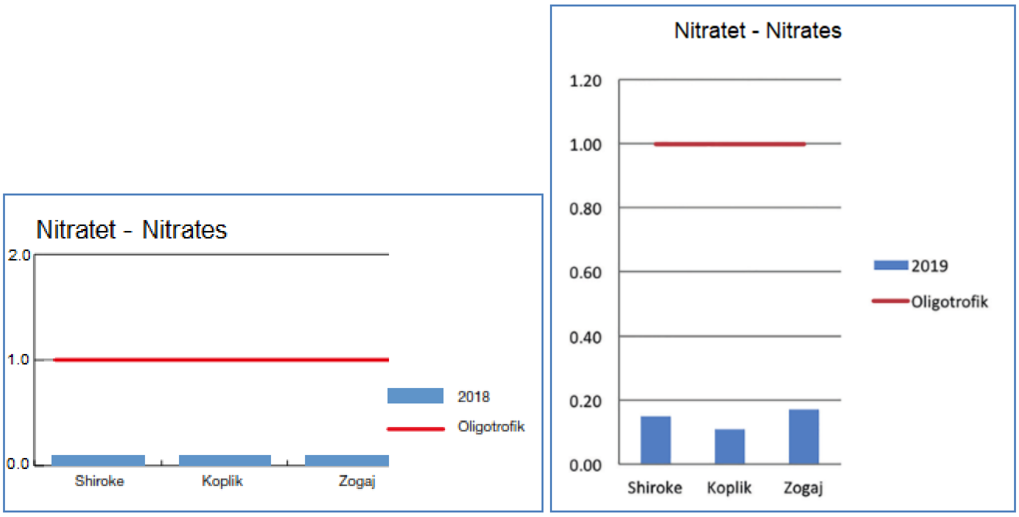


Figure 5-110_Concentration (mg/l) of Nitrates values at Shkoder Lake- years 2018 and 2019

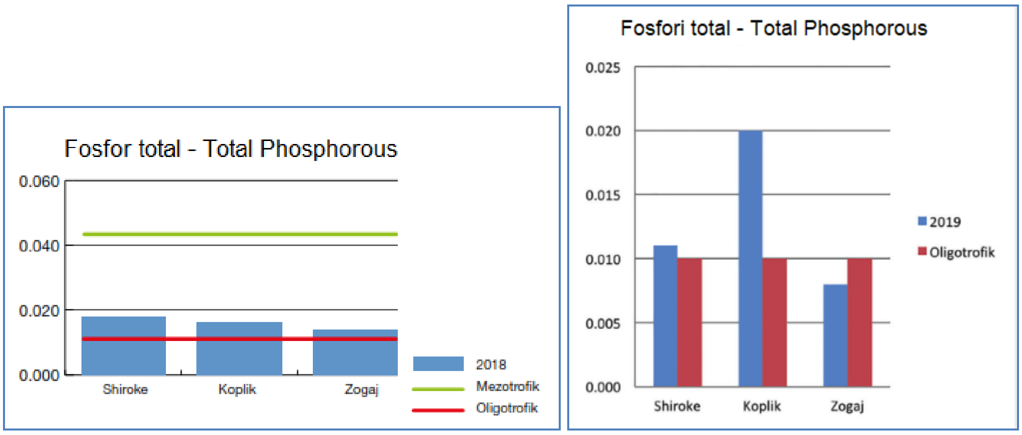


Figure 5-111_Concentration of total phosphorus (mg/l) values at Shkoder Lake- years 2018 and 2019

The content of the chlorophyll, at Koplik (Sterbeq) station, has low values.

Table 5-63_Content of the chlorophyll an at Sterbeq station

Year	Chlorophyll-a (mg/l)
2017[142]	3.04
2018[143]	2.39
2019[144]	6.62

While the Trophic index, in 2017 and 2018, is as follows:

142 Albania State of Environment Report, 2017

143 Albania State of Environment Report, 2018

144 Albania State of Environment Report, 2019

Table 5-64_Trophic index for Sterbeq station

Year	TSIC (Carlson index145)
2017	41.5
2018	38.71
2019	49.15

Findings on the Shkoder Lake waters monitoring

The values of TSI show that the lake's water at Koplik (Sterbeq) station can be classified between the oligotrophic and mesotrophic classes, with a mesotrophic tendency (see Table 5-61 above). The waters are rather of good quality with a slight tendency to moderate quality. The content of the nutrients and algae is moderate.

As the Lake waters may be polluted from the surface and (overall) groundwater flowing from the project area, it is important that the Project's activities avoid the pollution of the lake's waters and to enhance as much as possible the existing situation. In order to achieve these objectives, the relevant mitigation measures are described in the sections on ground waters and surface waters (6.2.7 and 6.2.8)

5.2.9. Flooding

5.2.9.1. Materials and method

The assessment of the inundation issues of the project area was based on the following:

- Hydro-geological map of Albania, scale 1:200,000, Albanian Geological Survey, 2015;
- Flood map of Albania with 100 years return period (UNDP, Albania, 2003);
- Geological hazards Map of Albania (Shkupi et al., 2000);
- The assessment of the results from earlier geological and/or hydro-geological reports carried out by the Albanian Geological Survey for the infrastructure projects around the project area;
- Hydrological study on the proposed Project;
- Scientific articles on hydrology and flood events, etc., regarding the wide project area;
- Earlier ESIA reports on similar projects, where the project team members have contributed; and
- Field investigations in the project area and its surroundings.

The purpose of the flood assessment in the project area is to demonstrate the potential impacts of the Project on this issue and vice-versa.

The factors that were considered relevant to the railway line rehabilitation include:

- Inundation of the land on both sides of the railway;
- Any eventual inundation of the railway;
- Cause of the inundation;

145 https://www.lakeaccess.org/lakedata/datainfotsi.html

- Any suggestion regarding the mitigation of the flood events

5.2.9.2. Baseline information

Floods generally occur usually from November to March, when the country receives approximately 80 to 85 percent of its annual precipitation. The risk of flood-related hazards in Albania is high, with on average, one event occurring every six years146. According to historic data, the floods of November 1962 - January 1963 were the largest ones. The table below gives the biggest flood events that occurred during the last 70 years, as well as the land surface inundated.

Table 5-65_The biggest flood events occurred during the 70 last years in Albania (Source: FAO, 2018)

No	Flood event	Affected area	Agricultural land flooded (ha)
1	Nov. 1962-Jan. 1963	Shkoder, Lezhë, Berat, etc.	70,000
2	Dec. 1970 – Jan. 1971	Vjosë River area	14,000
3	Sept.- Oct. 2002	Lezhë, Shkoder, Berat, etc. (11 districts in total)	33,000
4	Dec. 2009 – Jan. 2010	Shkoder	10,500
5	Winter 2015	Vjosë, Devoll, Osum, and Seman Rivers areas	6,880

The Project area is often prone to floods from Ishmi, Mati, Lezhë's Drini, Drini, and Kiri Rivers, which have flooded the Western Lowland up to Adriatic Sea. Among flood events, the worst recorded episodes that affected the Project area were those of the years 1962-1963, 2002, and 2009-2010.

In December 2009 and January 2010, for instance, floods in the northwestern part of Albania were the result of increased rainfall as well as due to higher temperatures, the snow melted and water levels rose to result in the overflowing of the Buna River. Many rivers discharge into this river, including the Drini, Gjadër, and Kiri rivers, which in turn raised the water level of the Shkoder Lake. The coastal areas around Lezhë were also inundated because of heavy precipitation, high tide along with strong winds and high waves.

Hereinafter are described the railway sections that are sensitive to rivers' flooding.

Section Vorë – Gjorm

This railway section crosses Ishmi and Droja Rivers as well as some drainage channels. The only surface water body that causes inundation is the Ishmi River.

Ishmi River's floods

Vorë-Mamurras is the most sensitive section concerning flooding. Although the lowland crossed by Ishmi, Droja, and Gjola Rivers is drained, often, during intense rainfalls the fields are inundated. However, the railroad itself is not inundated. The lack of maintenance of the drainage system of agricultural fields could in some cases create a potential risk to the railway. The area where the confluence of Gjola and Zeza rivers form Ishmi River is often flooded.

146 Comprehensive analysis of disaster risk reduction and management system for agriculture in Albania. FAO, 2018

However, the railway track is never inundated. Meanwhile, it is reported that Tirana -Shkoder national road in this section is sometimes flooded.

Ishmi River has overflowed many times the area around the Ishmi Bridge. The biggest flood event occurred on November 1962 – February 1963, during which the lowland on both sides of Ishmi, Gjola, and Zeza Rivers was inundated. Recent flood events are recorded during 2015, 2016, and 2017. The last one occurred in December 2017.

The figure below shows the flood registered from the Copernicus satellite in December 2017147.

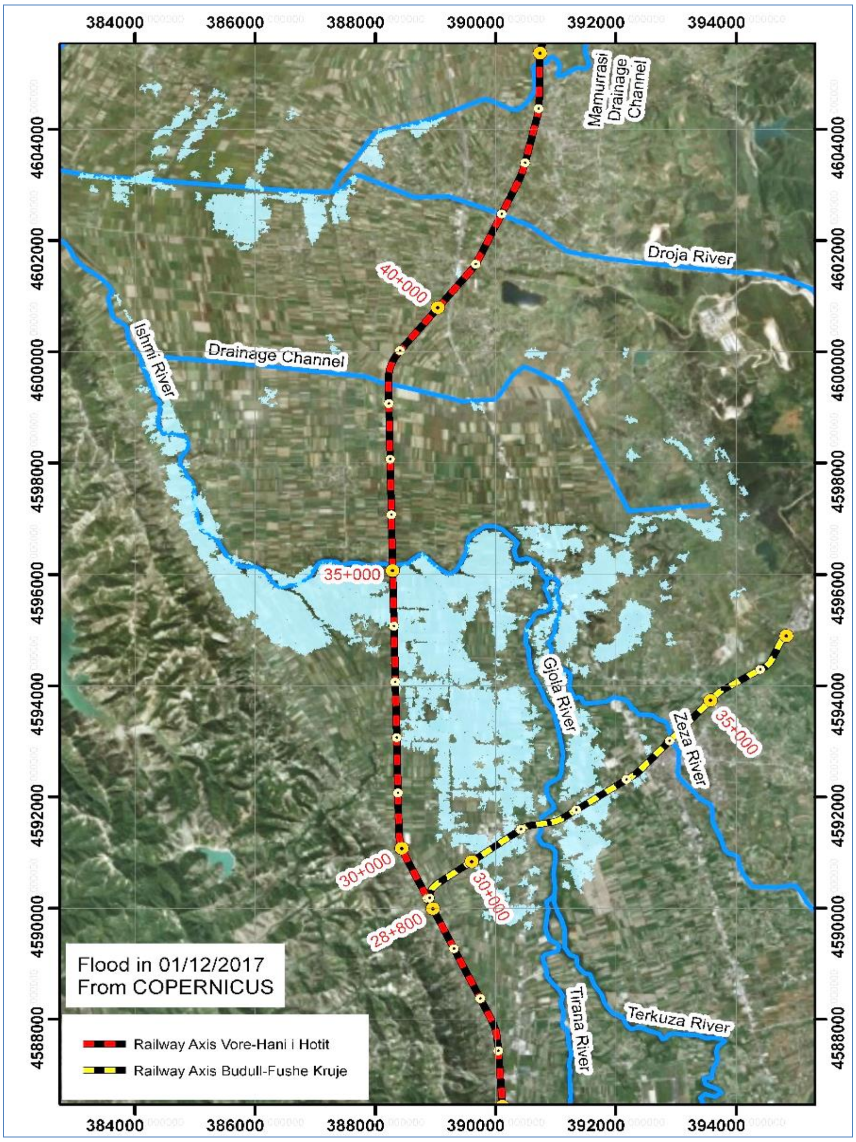


Figure 5-112_Flooded area by Ishmi River on December 12, 2017[148]

Although the railroad has not been inundated, from the above figure it results that the railroad often serves as an embankment (see the section from km 32+000 to km 35+000), which does

147 https://emergency.copernicus.eu/mapping/ems/copernicus-emergency-management-service-monitors-impact-floods-albania

148 https://emergency.copernicus.eu/mapping/ems/copernicus-emergency-management-service-monitors-impact-floods-albania

not allow the water to spread on the lowland. Thus, the lands on the east of the railroad stay for a long time inundated.

Section Gjorm – Lezhe

This railway section crosses Mati and Lezhë's Drini Rivers.

The area where the railway crosses Mati River (km 55+500 to km 56+600), presents a medium risk against flooding. However, due to the topography of the terrain at the crossing of this river, even the biggest flood even registered in Albania (that of 1962-63) affected only the downstream part of the railroad up to the river mouth.

The Lezhë's Drini River is crossed at km 67+800. There is no any recorded information on the flood events at this crossing.

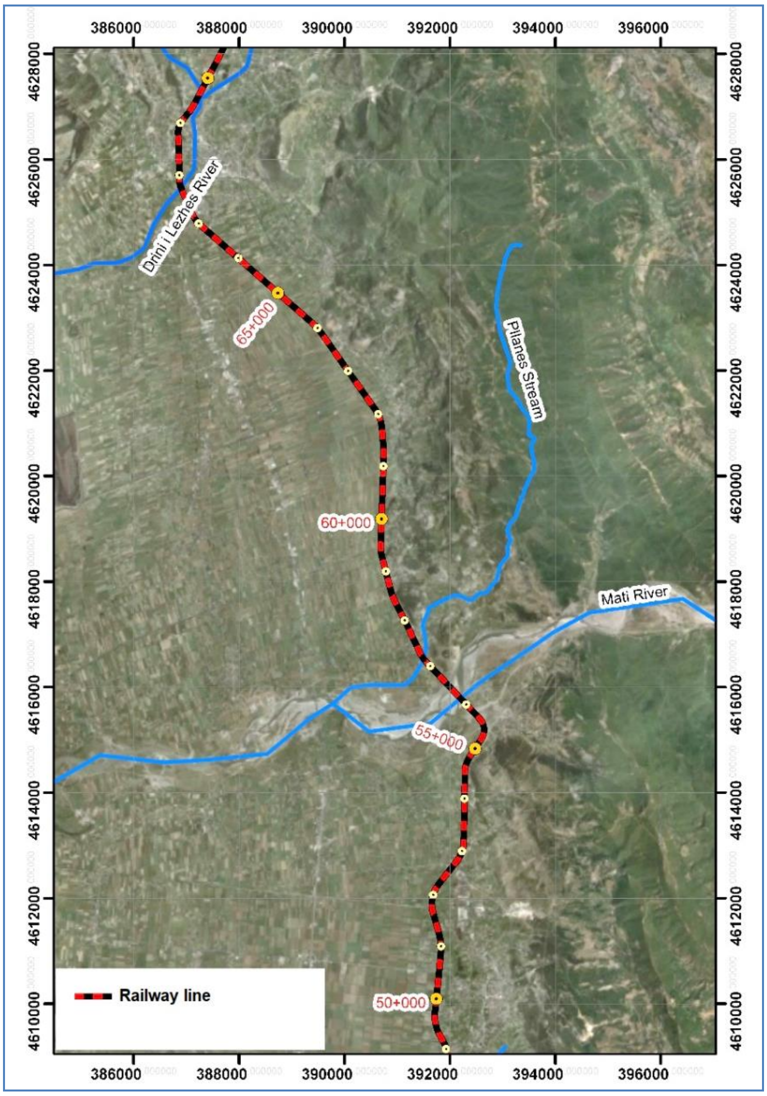


Figure 5-113_Mati and Lezhë's Drini Rivers crossing during the flood event of December 2017149

The railway line crosses the Lezhë's Drini River several times. The first crossing is located at km 67+800. There is no recorded information on the flood events at this crossing.

149 https://emergency.copernicus.eu/mapping/ems/copernicus-emergency-management-service-monitors-impact-floods-albania

Section Lezhe - Shkoder

This railway section crosses once Lezhë's Drini and Gjadër Rivers. The Fangu Drainage Channel, which runs on the east of this section, is one of the causes of the railway flooding.

Lezhë's Drini and Fangu Drainage Channel

Lezhë's Drini originates from Drini River, at Mjedë. Fangu Channel was built for collecting the rainy water of the western side of the hilly and mountainous terrain that borders from the East, the Mërqia, and Zadrima Plains. That is why it is called also "a channel of high waters".

The section from km 69+000 to 74+000 is often prone to floods from Lezhë's Drini River and Fangu drainage channel.

From the findings of the draft Hydrological Report on the Project, it results that the Fangu channel often overflows during heavy rainfalls and consequently flood protection measures are required alongside this channel. In the past, the flood streams have crashed the protective embankment and have eroded the rail basement, leaving the rail line exposed and in the air in some segments.

The figure below gives the railway section flooded in winter 2002. This inundation was amongst the worst of this area because:

- The drainage pumping stations were out of work because of a blackout;
- The weir of Kakarriq was not yet built. This weir was built for avoiding the inundation within the Kakarriq Plain and downstream area, including Mërqia Plain.

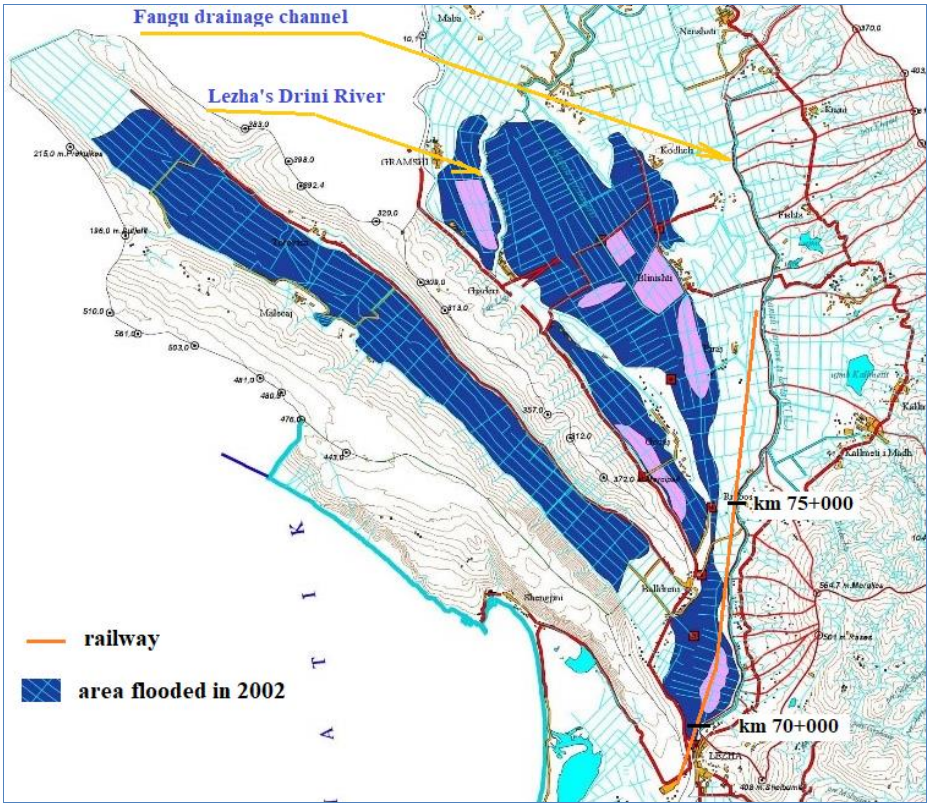


Figure 5-114_Railway section flooded in 2002 (source IHM)

Figure hereinafter shows a flood event of 2018 when all the drainage pumping stations were working. The flood was caused by Gjadër River and Fangu drainage channel.

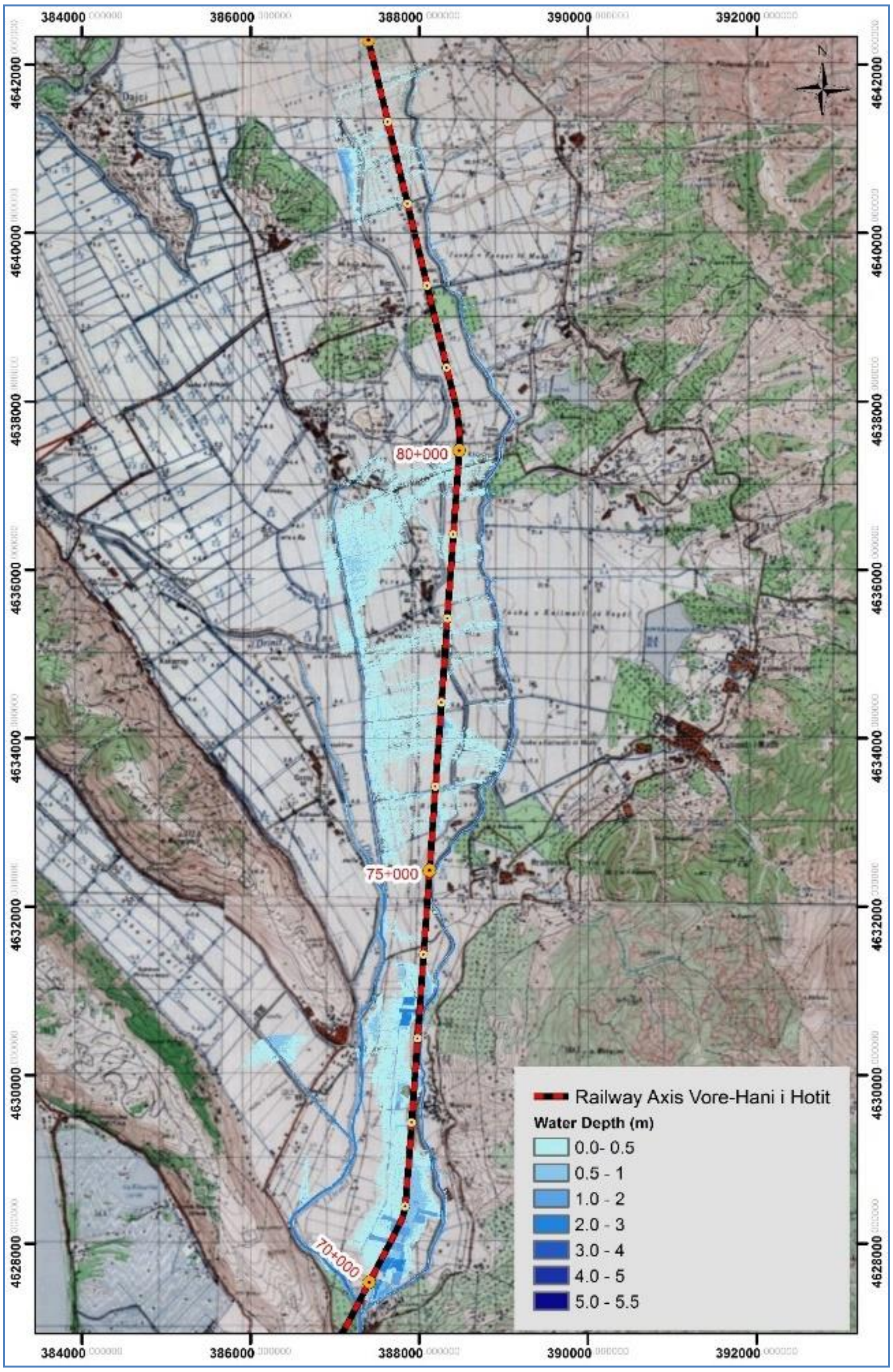


Figure 5-115_Flooded railway line section in the North of Lezhë

The Hydrological Study prepared for the project purposes provides the water depth in the map above. From this map, it results that the railway section from km 69+800 to km 80+000 is affected by flash floods.

Drini and Kiri Rivers

The railway crosses Drini River from km 94 to km 95 and Kiri River at km 102.8 to km 103. Even though the Shkoder Lowland is often prone to exceptional inundations (the last biggest one occurred in 2010 – see Figure 5-117 and Figure 5-118), the railroad has not yet been affected by this phenomenon, because it has been built high enough compared to the lowland on both sides (see Figure 5-118 below). However, alongside some short sections, the land on both sides of the railway is often inundated during exceptional floods. As shown in Figure 5-112 above, the railroad often serves as an embankment (see the section from km 106+000 to km 108+000), which does not allow the water to spread on the lowland.

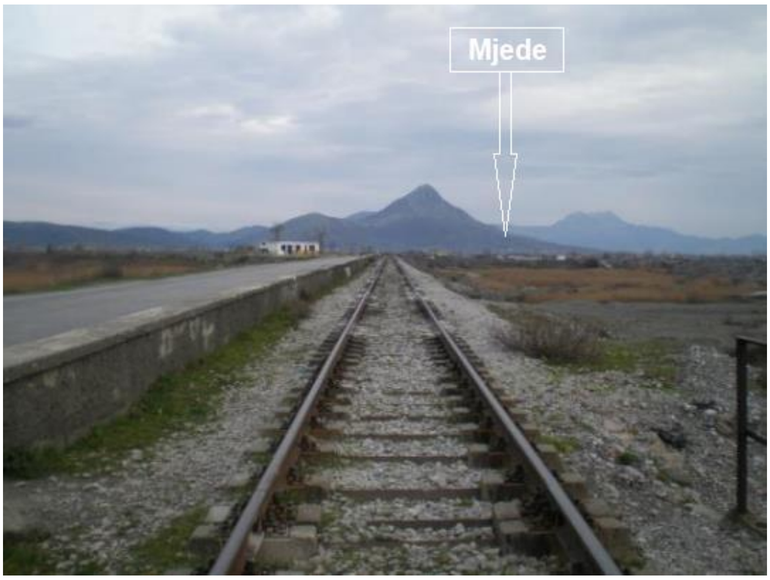


Figure 5-116_Railway in the south of Spathari Bridge (over Drini River)

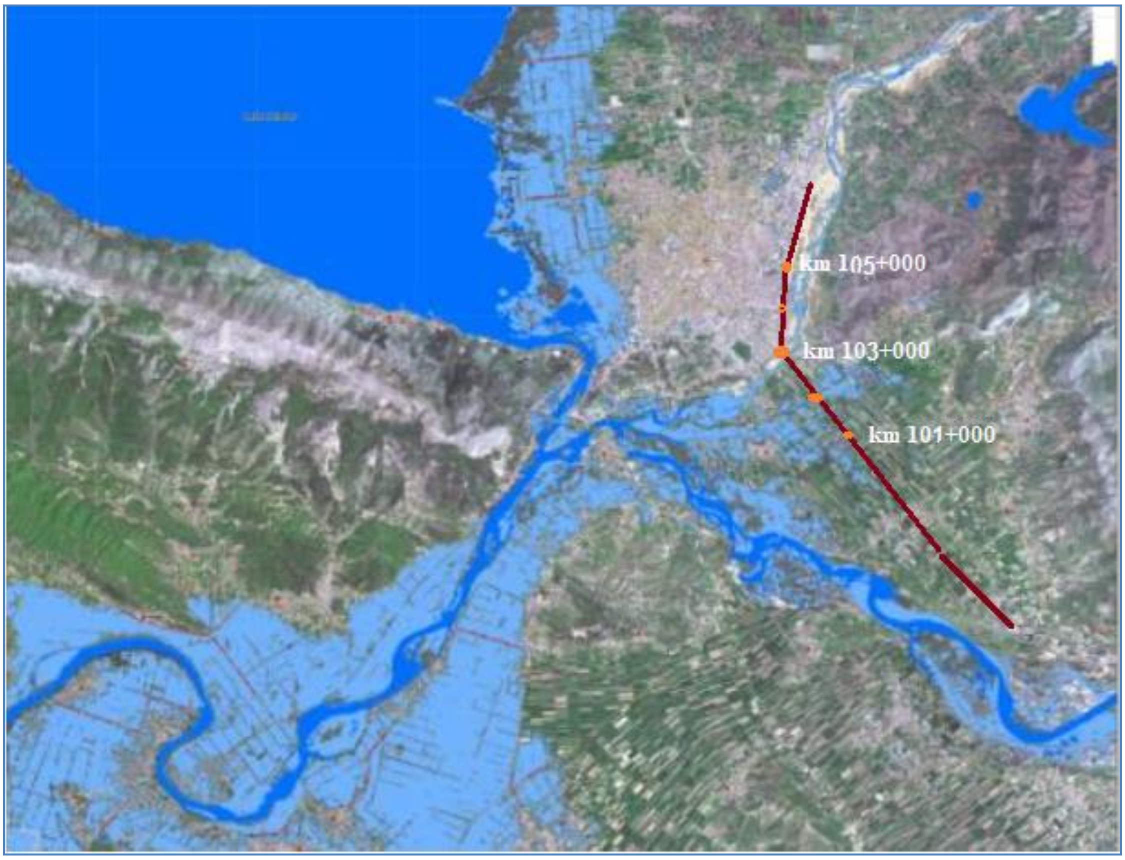


Figure 5-117_Satellite Image of flood extent in December 2010150

150 German Aerospace Center - TerraSAR and Radarsat - DLR, 2010

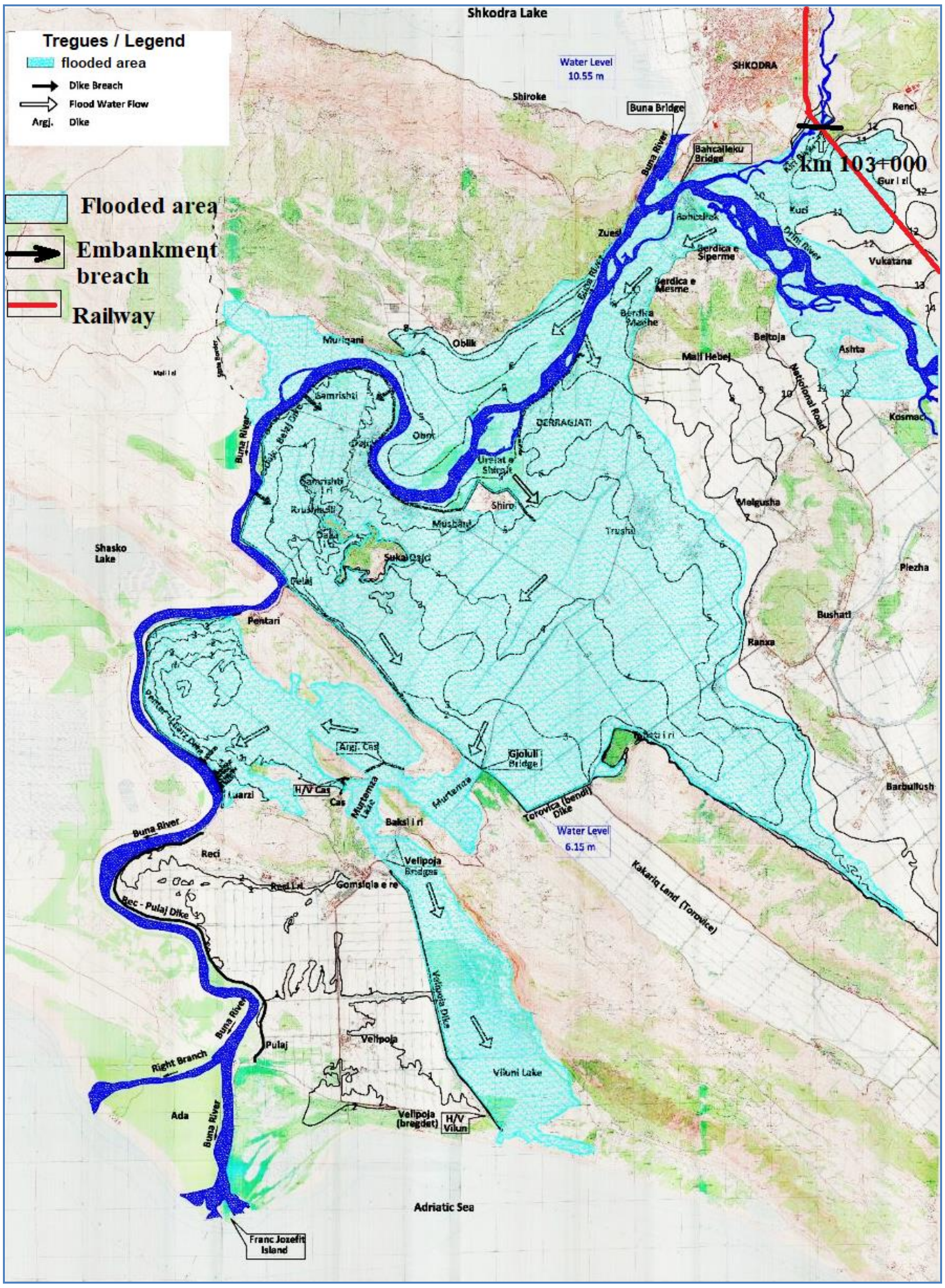


Figure 5-118_Exceptional floods of December 2010 in Shkoder area[151]

Section Shkoder – Hani Hotit

The area crossed by this railway line section is characterized by heavy and incredibly high-intensity rainfall that goes up to about 3000 mm per year. The streams of the area are generally dry during the year because of the high rate of infiltration. However, during heavy rainfalls within the Mountain area lying on the east of the railway line, those streams overflow. The greatest risk of these streams is not only the amount of water they discharge but also the erosion they create by changing often the morphology of the riverbed and posing a threat to the railway bridges. The most dangerous of them is the Përroi Thatë (Dry Stream - see Figure 5-133).

151 Flood Risk Management Plan for Shkoder Region, MoE, 2015

5.2.9.3. Finding relevant to the proposed project

The sensitive railway sections to the flood events by exceptional rivers discharge are as follows:

- **Km 32+000 to Km 35+000**
  - The railway itself is not inundated, but the land on both sides of the railway is inundated by Ishmi River. The railway serves as an embankment (section from km 32+000 to km 35+000), which does not allow the water to spread on the lowland. Thus, the lands on the east of the railroad stay for a long time inundated, causing thus damage to the agricultural land and agricultural plants;
  - It is necessary to improve the drainage system on both sides of the railway to reduce the extent and duration of the inundation of the agricultural lands.
- **Km 69+800 to Km 80+000**
  - This railway section is flooded by both Lezhë's Drini River and Fangu drainage Channel. The flood may overflow the railway and inundate the area on both sides of the railway. The railway plays the role of an embankment that does not allow the water circulation between both railway sides;
  - The railroad elevation should be high enough so that it allows the hydro-technical structures to connect the two sides and avoid inundation. That is why the hydro-technical experts suggest increasing the elevation of the railway line for the area from Lezhë to Baqel (approximately from km 70 to km 80);
  - In parallel with the railway line raise, it is necessary to improve the drainage system on both sides of the railway to reduce the extent and duration of the inundation of the agricultural lands
- **Km 101+000 to Km 103+000**
  - The railway perse is not inundated but the land on both sides of the railway is inundated by Kiri River;
  - The railway serves as an embankment (section from km 101+000 to km 103+000), which does not allow the water to spread on the lowland. Thus, the lands on the east of the railroad stay for a long time inundated, causing thus damage to the agricultural land and agricultural plants;
  - It is necessary to improve the drainage channels on both sides of the railway to reduce the extent and duration of the inundation of the agricultural lands.
- **Km 113 to Km 140**
  - The streams crossed by the railway line generally have no water because of the high infiltration in permeable terrain. However, during heavy rainfalls within the western Albanian Alps, they overflow. The high liquid discharge combined with the terrain conditions (the topography decrease from the mountain foot towards the railway line) and the lithological composition of the cover layer can change the morphology of the riverbed and therefore posing a risk to bridges stability. The most dangerous of these streams is the Përroi Thatë one.
  - The design of the bridges crossing these streams should take into consideration the morphological changes and the erosion of the streambeds in the period of heavy rainfalls.

5.2.10. Biodiversity and ecological resources

5.2.10.1. Materials and method

The preparation of this section is based on a combination of desk-based research, consultation, and field investigations. The desk-based research gathered a range of information to identify potential environmental constraints of interest for the study area and to identify areas of interest for the field survey. Scientific work, scientific articles, monographs, ecological surveys, inventory reports on flora and fauna, etc., must be considered an important source of information and reliable data. Information on overall biodiversity, habitat types, land use, protected species, and species of conservation concern has been obtained through desk-based reviews of available studies as well as from information from the professional local biologists, Mr Taulant Bino and Mr. Sajmir Beqiraj, part of the ESIA team for this project.

The reviewed information includes:

- Information from the Ministry of Tourism and Environment and the National Agency of Protected Areas and the Regional Agency of Protected Areas, Shkoder on important wildlife areas, and information on why such areas are regarded important,
- EBRD PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources,
- EBRD Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (v. January 1, 2020),
- Red list of flora and fauna[152];
- Flora of Albania, vol. 1- 4[153];
- Red Book - Threatened and rare plants species of Albania[154];
- IUCN Red list[155]
- EU Habitats Directive (Annex I Habitats, Annex II and Annex IV Species)
- EU Birds Directive (Annexes 1)
- IUCN Red List of Globally Threatened Species (IUCN 2020)
- Species of European Conservation Concern
- Species of Annex 1 of the Resolution 6 of Bern Convention
- The forests Map of Albania[156];
- Identification of any previous or current research activities being undertaken by local/national NGOs and universities; and
- Studies on the NMR of Shkoder Lake, including its Management Plan[157].

The explanation and clarification on any eventual need for any wild fauna passage were based on the "Habitat Fragmentation due to Transportation Infrastructure – Wildlife and traffic - A

152 Order of the Minister of Environment No. 1280, dated 20.10.2013 "On the approval of red list of flora and fauna"

153 Flora of Albania, vol. 1- 4, Paparisto K. et al. 2000

154 Threatened and rare plants species of Albania – Red book. Vangjeli J. et al, Tirana, 1995

155 https://www.iucnredlist.org/resources/grid

156 The forests Map of Albania, Llubani F. et al. Tirana, 1988

157 https://www.iucn.org/sites/dev/files/content/documents/Shkoder_managing_plan_en_final.pdf

European Handbook for Identifying Conflicts and Designing Solutions[158]" – see section 6.2.9 below.

Field Surveys

Considering the extensive information that exist on the biota of the area, the main objective of the field survey was to confirm the information gathered during the desk-based research and to gather more site-specific information on habitats and species presence. Two biologist experts were involved in the surveys, one expert on aquatic ecology (Mr Sajmir Beqiraj) and another expert on terrestrial ecology (Mr Taulant Bino). Field surveys were undertaken in the period October 2020 – April 2021. They have covered mostly the aquatic habitats such railway crossing in Ishmi river, Thumana reservoir, Droja river, Mati river, Drini river, Kiri river and Shkoder lake including the crossing of four different streams of Perroi i Thate, Rrjoll, Banush and Vrraka. During the field surveys in the area, numerous locations affected by the project were visited and the features of the landscape and environment including the dominant habitats and species were carefully recorded. Photographs and notes were made at survey points in order to record the habitats and species present. Following the reconnaissance visit and preliminary desk-based review of available information, the following ecological features have been identified as in need for further surveys, namely:

- Natural habitats in Ishmi River, Drini River and Nature Managed Reserve of Lake Shkoder
- Species present in Ishmi River, Drini River and Lake Shkoder

The above features were assessed in terms of EBRD PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. The results of these surveys are provided in 5.2.10.2.1 Identification of Priority Biodiversity Features and Critical Habitats.

To evaluate and assess EBRD's criteria 2 for PBFs, EBRD recommend using the threshold values as defined by *Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (v. January 1, 2020)*. These EBRD criteria are presented in the table below while the thresholds are presented in Table 5-68.

Table 5-66_ Criteria for the Identification of Priority Biodiversity Features

Priority Biodiversity Features (PBFs)	Criteria
Threatened habitats	Habitats considered under pressure by national, regional or international assessments. These include natural and priority habitats identified under the EU Habitats Directive (Annex I)
Threatened species	Species listed by the International Union for Conservation of Nature (IUCN) as Vulnerable (VU) or equivalent. Animal and plant species of community interest identified under the EU Habitats Directive (Annex II)., Annex I of Birds Directive (Annex I) and Resolution 6 of Bern Convention IUCN Red List EN or CR species whose EAAA[159] supports < 0.5% of global population OR < 5 reproductive units of a CR or EN species EAAA for regularly occurring nationally or regionally (e.g., Europe) listed EN or CR species EAAA for regularly occurring range-restricted species EAAA identified per Birds Directive or recognized national or international process

158 http://www.iene.info/wp-content/uploads/COST341_Handbook.pdf

159 EAAA = ecologically appropriate area of analysis

Priority Biodiversity Features (PBFs)	Criteria
	as important for migratory birds (esp. wetlands)
Significant biodiversity features identified by a broad set of stakeholders or governments	Key Biodiversity Areas (KBA) and Important Bird and Biodiversity Areas (IBA); nationally and internationally important species or sites for conservation of biodiversity; many areas meeting natural habitat definitions of other international financial institutions.
Ecological structure and functions needed to maintain the viability of priority biodiversity features	Where essential for priority biodiversity features, riparian zones and rivers, dispersal or migration corridors, hydrological regimes, seasonal refuges or food sources, keystone or habitat-forming species.

The most sensitive biodiversity features are defined as critical habitat. Critical habitats are areas of the highest biodiversity value and are thought to be irreplaceable. Critical habitats are independent of the state of the habitat type as far as the area shelters:

- highly threatened or unique ecosystems;
- habitats of significant importance to endangered or critically endangered species;
- habitats of significant importance to endemic or geographically restricted species;
- habitats supporting globally significant migratory or congregatory species;
- areas associated with key evolutionary processes; or
- ecological functions that are vital to maintaining the viability of biodiversity features described in this paragraph

EBRD PR6 provides a more detailed explanation of these criteria, as presented in the table below.

Table 5-67_ EBRD criteria for Critical Habitats

No.	Criteria	Definition
	Highly threatened or unique ecosystems	Ecosystems that are at risk of significantly decreasing in area or quality; have a small spatial extent; and/or contain concentrations of biome-restricted species. For example: Ecosystems listed as, or meeting criteria for, Endangered or Critically Endangered by the IUCN Red List of Ecosystems Areas recognised as priorities in official regional or national plans, such as National Biodiversity Strategy and Action Plans Areas determined to be of high priority/significance based on systematic conservation planning carried out by government bodies, recognised academic institutions and/or other relevant qualified organisations (including internationally-recognised NGOs).
	Habitats of significant importance to endangered or critically endangered species	Areas supporting species at high risk of extinction (Critically Endangered or Endangered) on the IUCN Red List of Threatened species (or equivalent national/regional systems). For example: Alliance for Zero Extinction sites Animal and plant species of community interest in need of strict protection as

No.	Criteria	Definition
		listed in EU Habitats Directive (Annex IV).
	Habitats of significant importance to endemic or geographically restricted species	Areas holding a significant proportion of the global range or population of species qualifying as restricted-range under Birdlife or IUCN criteria. For example: Alliance for Zero Extinction sites Global-level Key Biodiversity Areas and Important Bird and Biodiversity Areas identified for restricted-range species.
	Habitats supporting globally significant (concentrations of) migratory or congregatory species	Areas that support a significant proportion of a species' population, where that species cyclically and predictably moves from one geographical area to another (including within the same ecosystem), or areas that support large groups of a species' population that gather on a cyclical 5or otherwise regular and/or predictable basis. For example: Global-level Key Biodiversity Areas (KBA) and Important Bird and Biodiversity Areas (IBA) identified for congregatory species Wetlands of International Importance designated under criteria 5 or 6 of the Ramsar Convention.
	Areas associated with key evolutionary processes	Areas with landscape features that might be associated with particular evolutionary processes or populations of species that are especially distinct and may be of special conservation concern given their distinct evolutionary history. For example: Isolated lakes or mountaintops Populations of species listed as priorities by the Edge of Existence programme.
	Ecological functions that are vital to maintaining the viability of biodiversity features described (as critical habitat features)	Ecological functions without which critical biodiversity features could not persist. For example: Where essential for critical biodiversity features, riparian zones and rivers, dispersal or migration corridors, hydrological regimes, seasonal refuges or food sources, keystone or habitat-forming species.

To evaluate and assess EBRD's criteria 2 for CHs, EBRD recommend using the threshold values as defined by *Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (v. January 1, 2020)*. These EBRD criteria are presented in the previous table , while the thresholds are presented in the table below.

Table 5-68_ Criteria and conditions for identifying priority biodiversity features and critical habitats

No	Criterion	Priority Biodiversity Feature	Critical Habitat
	Priority ecosystems		
1	*Threatened ecosystems* Habitats listed in Annex 1 of EU Habitats Directive IUCN Red-List EN or CR ecosystems	(PR6 para. 12-i) EAAA is habitat type listed in Annex 1 of EU Habitats Directive EAAA** < 5% of the global extent of an *ecosystem* type with IUCN status of CR or EN	(PR6 para. 14-i) EAAA is habitat type listed in Annex 1 of EU Habitats Directive marked as "priority habitat type" EAAA ≥5% of global extent of an ecosystem type with IUCN status of CR or EN EAAA is ecosystem determined to be of high

No	Criterion	Priority Biodiversity Feature	Critical Habitat
			priority for conservation by national systematic conservation planning
	Priority Species and their Habitats		
2	*Threatened species* Species and their habitats listed in EU Habitats Directive and Birds Directive / Bern Convention IUCN Red List EN or CR species IUCN Red List VU species Nationally or regionally (e.g., Europe) listed EN or CR species	(PR6 para. 12-ii) EAAA for species and their habitats listed in Annex II of Habitats Directive, Annex I of Birds Directive, Resolution 6 of Bern Convention EAAA supports < 0.5% of global population OR < 5 reproductive units of a CR or EN species. EAAA supports VU species EAAA for regularly occurring nationally or regionally listed EN or CR species	(PR6 para. 14-ii) EAAA for species and their habitats listed in Annex IV of the Habitats Directive EAAA supports ≥ 0.5% of the global population AND ≥ 5 reproductive units of a CR or EN species EAAA supports globally significant population of VU species necessary to prevent a change of IUCN Red List status to EN or CR, and satisfies threshold (b) EAAA for important concentrations of a nationally or regionally listed EN or CR species
3	*Range-restricted species*	(PR6 para. 12-ii) EAAA for regularly occurring range-restricted species	(PR6 para. 14-iii) EAAA regularly holds ≥ 10% of global population AND ≥ 10 reproductive units of the species***
4	*Migratory and congregatory species*	(PR6 para. 12-ii) EAAA identified per Birds Directive or recognized national or international process as important for migratory birds (esp. wetlands)	(PR6 para. 14-iv) EAAA sustains, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population at any point of the species' lifecycle EAAA predictably supports ≥10 percent of global population during periods of environmental stress

*Quantitative thresholds derived from IUCN Key Biodiversity Area Standard and aligned with International Finance Corporation's (IFC) Guidance Note 6 (rev. 2019)

**EAAA = *ecologically appropriate area of analysis*, as defined above

***The IUCN Key Biodiversity Areas standard cites the following definition for reproductive unit: "the minimum number and combination of mature individuals necessary to trigger a successful reproductive event at a site. Examples of five reproductive units include five pairs, five reproducing females in one harem, and five reproductive individuals of a plant species." Eisenberg, 1977. The Evolution of the Reproductive Unit in the Class Mammalia.

The screening for CH and PBFs features was preceded by:

- literature and data review about the biodiversity features of the project area;
- ecological surveys on terrestrial and aquatic plants and habitats, mammals, birds, reptiles and macroinvertbrates.

Besides, the screening has taken in account the existence of habitats and ecosystems of national and international conservation concerns in the Areas of potential Project Influence (API) or in the nearest identified areas of conservation importance; this area includes four protected areas namely:

- Nature Managed Reserve of Lake Shkoder in the northern part of the railway Vore-Hani i Hotit,
- Landscape Protected Area of Bune-Velipoje located circa 1 km west of the railway,
- Nature Managed Reserve of Kune-Vain-Tale situated circa 1 km west of the railway and
- Nature Managed Reserve of Patok-Fushekuqe-Ishe, some 4.9 km west of the railway.

Some of the above sites, have also other international designations such as Ramsar Sites, Candidate Emerald Sites, IBA, KBA etc.

Following the above approach, the analysis has taken the following steps:

1. Preparation of a list of habitats and species present within the project area;
2. Identification of threatened habitats and species;
3. Definition of the EAAA for threatened habitats and species;
4. Assessment of habitats and species against the PBF criteria in order to define PBF habitats and species *and*
5. Assessment of habitats and species against the CH criteria in order to define CH.

All the above analysis has been undertaken for different biota groups (see the Annexes) including:

- Habitats and plants
- Mammals
- Birds
- Reptiles
- Amphibians
- Fish *and*
- Aquatic Invertebrates.

As the EAAA could be different for different groups of biotas, we opted to consider two different EAAAs: one for aquatic species and another one for terrestrial species. The EAAA for aquatic species covers Shkoder Lake, the river basin of Shkoder Lake, Drin River, Mati River, Droja River and Ishmi River.

For terrestrial species, the EAAA is considered the northern coastal area of Albania, from Lake Shkoder until Tirana. This area covers the project footprint, area of project influence as well as surrounding areas that might be impacted directly or indirectly, including the cumulative impacts.

Splitting the crossed area into sections that have the same biological and ecological characteristics.

The whole area crossed by the railway line was split into two sections, as follows:

- Vorë to Shkoder (km 20+560 to km 111+500); and
- Shkoder to Hani Hotit (km 111+500 to km 140)

The section Vorë - Shkoder is characterized more or less by the same biological and ecological characteristics as a result of the climate characteristics, the composition of the outcropped geological layers, and the topsoil, the ground and surface waters, the flat terrain and the intense urban and agricultural development.

The section from Shkoder – Hani Hotit (km 111+500 to km 140) is partly included within the eastern edge of the terrestrial part of the Managed Nature Reserve of Shkoder Lake. As already mentioned in section 0, this Protected Area has been proclaimed in 2005, whereas the railway line was built in 1985. From km 111+500 to km 119+200, the railway line borders from the east the traditional use zone of the NMR. Details on the railway line and the NMR of Shkoder Lake are already provided in section 3.2.1 above. While from km 119+200 to km 140 the railway line runs parallel to the motor road connecting Albania to Montenegro.

5.2.10.2. Baseline information

The following paragraphs provide a short description of the main vegetation types and habitats occurring along the proposed railway line, listing key species, abundance, and distribution within the study area and its sensitivity.

Meanwhile, detailed information on habitats and species of conservation concern is provided in Appendix 5.3 of this report (Appendix 5.3: Baseline information in habitats and species of conservation concern – see Appendices on ESIA report – separate document).

Section Vorë – Shkoder (km 20+560 to km 111+500)

This section of the railway line runs entirely in flat terrain, which is dominated by mixed mosaic agricultural lands. Besides, during the last 30 years, a part of agricultural lands along this segment has been transformed into suburban and industrial areas, which biodiversity values are low due to the low diversity of species and the drastic human intervention. Numerous drainage and irrigation channels characterize the crossed area. The Ishmi, Mati, Drini Lezhës, Drini, and Kiri Rivers are the site of some poor riparian habitats.

The following sections provide a short description of the main vegetation types and habitats occurring along the proposed railway line, listing key species, abundance, and distribution within the study area and its sensitivity. The main habitats are of two types, as follows:

- Mixed mosaic agricultural areas (all the flat area); and
- Stream/river habitat (running water): Rivers Ishmi, Mati, Drin (Lezhe), Drin (Shkoder) Kiri, and Stream Perroi i Thate.

<u>Mixed mosaic agricultural areas</u> dominate also much of the railway line along this section of the railway line (Fig. 5_88 and 5-89). The most important crops cultivated in these areas are vegetables, Corn, Barley, Alfa-Alfa, etc. The botanical value of these areas is generally low due to the intense human intervention, and the low diversity of plant species.

Arable lands and their associated irrigation systems constitute the majority of the habitats present within this section. The most important crops cultivated in these areas are Vegetables, Corn, Barley, and Alfa-Alfa. Olive trees, vineyards, and other fruit trees mostly present horticulture in the study area. Olive trees close to the railway line are cultivated within the territory of Vorë Municipality, on the left of the railway line, from Km 20+560 to Km 30.

Herbaceous plants are a common element of these arable lands. The participation of species: *Cichorium intybus, Centaurea cyanus, Agrostemma githago, Ranunculus arvensis, Papaver rhoeas, Buglossoides arvensis, Legousia speculum-veneris, Scandix australis, Capsella bursa-pastoris* is more constant in winter cultivations. Nitrophilous elements as the species: *Polygonum arenaria, Amaranthus hybridus, Atriplex patula, Chamomilla recutita, Chenopodium vulvaria* are mostly present in summer cultivations.

Meanwhile, the abandoned agricultural areas now support a semi-natural assemblage of species such as *Dittrichia viscosa, Bromus hordeaceus, Centaurea cyanus, Agrostemma githago, Hieracium sp., Potentilla micrantha, Plantago lanceolata, Taraxacum sp., Ranunculus arvensis, Papaver rhoeas, Malva sylvestris, Cirsium vulgare, Capsella bursa-pastoris*, etc.

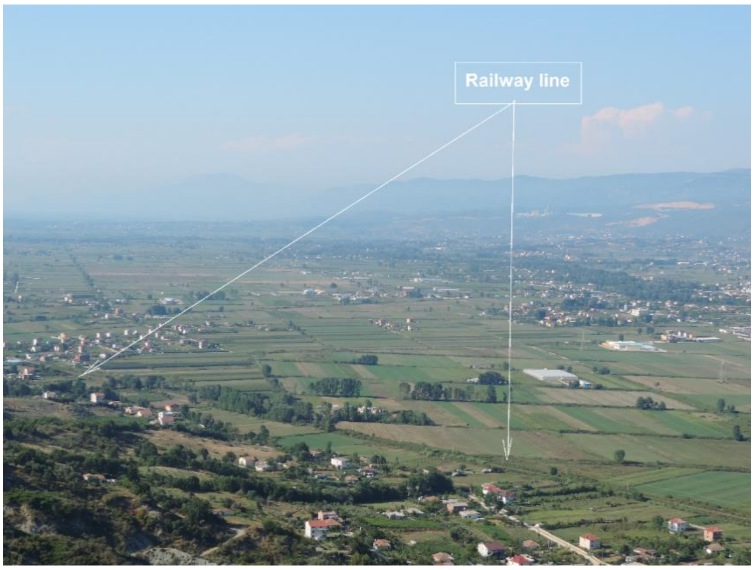


Figure 5-119_ Mosaic agricltural habitats along the railway section Vore to Lezhe

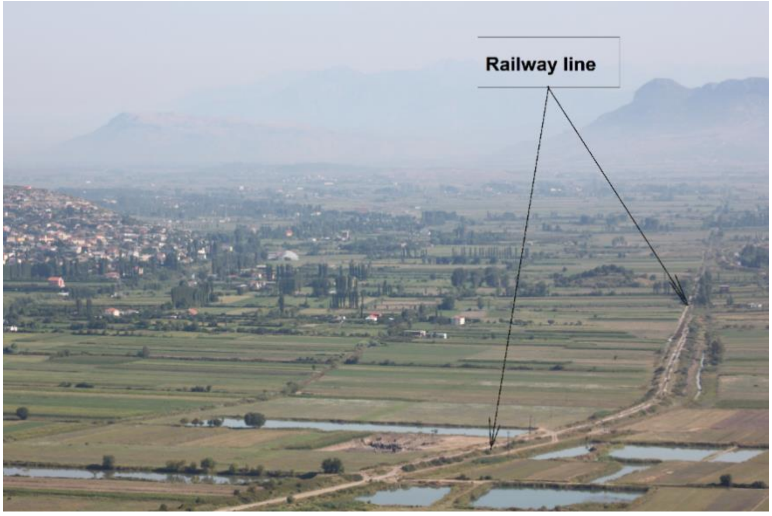


Figure 5-120_Mosaic agricultural habitats along the railway section Lezhe to Shkoder

Arable lands and abandoned agricultural areas, located near the villages of the area support a high presence of wildlife including insects, reptiles, birds, and small and medium mammals. Among birds, the best-represented group belongs to passerine species of the Order Passeriformes. In the winter period, flocks of finches in the company of other small passerines use the open fields. In summer, the open fields provide breeding grounds for the common quail (*Coturnix coturnix*) and other ground-nesting birds.

Hedges and various fruit trees of the open terrains are visited by robin (*Erithacus rubecula*), house sparrow (*Passer domesticus*), wren (*Troglodytes troglodytes*), larks (Alaudidae), and many species of finches. The most characteristic mammal species are rodents, voles, and mice, such as Thomas's pine vole (*Microtus thomasi*), the Macedonian mouse (*Mus macedonicus*), and the common house mouse (*Mus domesticus*). The most common insectiVorës are the white-toothed shrew (Crocidura suaveolens), and blind mole (*Talpa stankovici*).

The study area is characterized by a dense network of drainage and irrigation channels, which are covered by typical higrophylic vegetation such as *Phragmites australis, Typha angustifolia, Scirpus lacustris*. These are more frequently accompanied by the species such *Sparganium erectum, Alisma plantago-aquatica, Eleocharis palustris, Lythrum salicaria, Veronica anagallis-aquatica, Mentha aquatica*. The vegetation of these habitats is dominated by common plant species typical of the fresh water.

The drainage and irrigation channels represent a specific type of slow running/almost stagnant water habitat that is characteristic of the flat agricultural lands. They provide suitable conditions for a number of freshwater insects (dragonflies), amphibians (*Rana temporaria, Bufo bufo, Bufo viridis, Bombina variegata*), reptiles (*Natrix natrix, N. tessellata, Emys orbicularis*), and birds (*Alcedo atthis, Motacilla alba, M. flava, Rallus aquaticus, Gallinula chloropus*).

The biodiversity value of the habitat represented by the drainage and irrigation channels is generally limited as the species recorded in this habitat are considered relatively common.

The railway crosses through several river sections that are generally impacted by human activities in terms of pollution, diversions and embankments. Except Ishmi River, the other rivers lack the riparian habitat at sections close to railway.

Photos below show the crossings of the rivers from Vore to Shkoder:

Figure 5-121_Left: the crossing of Ishmi River; Right: the crossing of Droja River

Figure 5-122_Left: Crossing of Mati River –downstream; Right: upstream;

Figure 5-123_Left: crossing 1 of Lezhë's Drini River; Right: Crossing 2 of Lezhë's Drini River


Figure 5-124_Left: Crossing of Drini River at Spathari Bridge; Right: crossing of Kiri River

Ishmi River is one of the more polluted rivers in Albania as several main urban areas including Tirana, Kamza, Fushe-Kruje, etc., are discharging their used and sewage waters in the river tributaries without any sort of treatment. At the same time, the river collects the solid waste discharged from several dumpsites occurring along the river tributaries.

Despite the above, Ishmi river has an extensive riparian forest which covers also the section where the railway crosses the river. The riparian forest of the Ishmi river is characterised by the presence of *Populus alba, Alnus glutinosa*, and *Platanus orientalis*. The open vegetation, colonizing poorly stabilized alluvial deposits periodically flooded, include *Salix fragilis, Salix purpurea, Alnus glutinosa, Cercis siliquastrum, Celtis australis, Fraxinus ornus, Crataegus monogyna, Vitex agnus-castus, Rubus spp., Rosa sempervirens, Hedera helix, Clematis vitalba, Vitis vinifera ssp. sylvestris, Ranunculus ficaria, Aristolochia rotunda, Saponaria officinalis, Brachypodium sylvaticum, Dactylis glomerata*.

The bird species recorded in the riparian vegetation of the Ishmi riverbed breed regularly or incidentally in this area, others appear during migrations or in wintertime. Bird species recorded in this habitat are represented mainly by Herons (*Ardea cinerea* and *Egretta garzetta*), Cormorants (*Phalacrocorax carbo* and *Mycrocarbo pygmaeus*), Waders (*Actitis hypoleucos* and *Tringa ochropus*), Gulls (*Larus michahellis* and *Croicocephalus ridibundus*) as well as numerous Passerines including *Passer domesticus*, *Carduelis carduelis*, *Carduelis chloris*, *Emberiza calandra*, *Serinus serinus*, *Sturnus vulgaris*, *Cyanistes caeruleus*, *Hirundo rustica*, *Cecropis daurica* etc. None of these bird species is Globally Endangered.

While the encountered amphibian species are *Bombina variegata, Rana temporaria, Bufo bufo, Bufo viridis*. Except *Rana temporaria*, the three other amphibian species have the LR/nt national status. Based on the IUCN classification, the LR/nt is close to qualifying for or is likely to qualify for a threatened category in the near future. The reptiles are represented by *Natrix natrix, N. tessellata, Emys orbicularis*. The mammal species are *Erinaceus concolor, Talpa caeca, Crocidura leucodon, Mus musculus, Mus spicilegu, Rattus rattus, Rattus norvegicus*. All the mammals recorded in the riparian habitat of the Ishmi riverbed belong to the common species and are not included in either national or international Red Lists.

Findings: Along this railway section are no recorded rare or endangered species and habitats. The biodiversity values are low because of the numerous farmhouses built without any urban plan within the whole flat land and of the industrial and commercial activities on both sides of the railway line.

Section Shkoder to Hani Hotit (km 111+500 to km 140)

From km 111+500 (administrative border Shkoder/Malesia Madhe Municipalities) to 132+500 (Aliaj Village), the overlaid sediments are composed of sub clays and sub sands, while from Aliaj to Hani Hotit (km 132 +500 to km 140+000), the railway line runs mostly over limestone formations.

The main vegetation types and habitats occurring along this section of the railway line include the following.

- Mixed mosaic agricultural area;
- Mediterranean maquis;
- Forest formations dominated by a mix of deciduous oak species; and
- Aquatic habitats of the Shkoder Lake

From km 111+500 to km 132+620, the railway line crosses agricultural lands. From km 132+620 to km 137+750 it runs across an area covered mostly by forest formations dominated by a mix of deciduous oak species and shrubs composed of Mediterranean Maquis. Plots of agricultural land split the forest formations. From km 137+750 to km 139+000, the railway traverse a man-made environment characterized by an industrial object (on the left) and inhabited area (on the right). While from km 139+000 to km 140 the line crosses an area covered with Mediterranean Maquis.

The closest distance of the railway line to the Shkoder Lake is located from km 139+000 to km 140+000, where this distance varies approximately from 50 to 70m. However, it should be underlined that the motorway is located between the railway line and the Lake.

Description of habitats and plants in Shkoder-Hani i Hotit.

Mixed mosaic agricultural areas. From km 111+500 to km 132+620 (North of Bajze station), the railway line crosses arable land and many other more or less transformed areas used mainly for vegetables, beans, tobacco, animal fodder, fruit trees, vineyards, etc.

The botanical value of these areas is generally limited due to the low diversity of plant species and the absence of species that are considered to be rare in a local or national context.

Figure 5-125_Mixed mosaic agricultural areas

Mediterranean maquis vegetation. The maquis vegetation and all other derived degradation stages within this series occupy a small surface in the study area mostly in Bajze-Hani Hotit segment, especially from km 139 to km 140, on the mountain foot on the north of the railway line. The human impact in this area is significant, mainly through agriculture development, illegal forest logging, construction of local roads, etc. Besides the above damages, the erosion of the land at the crossing of the small streams affects the Macchia vegetation. In some areas, the soil is eroded so much as bedrock is almost visible. Therefore, the degradation process had started quite a long time ago, as featured by various types of vegetation that appear. The maquis is representing a stage of degraded evergreen Mediterranean forest or old forests of *Quercus ilex*.

The most important species that give the physiognomy to this formation are the evergreen shrubs such as *Phillyrea angustifolia, Punica granatum, Juniperus oxycedrus, Spartium junceum, Cercis siliquastrum, Paliurus spina-christi, Pyrus amygdaliformis, Cotinus coggygria. Quercus ilex* adapted to grow for a long period in hot weather and lacking rain.

Figure 5-126_Mediterranean Maquis at km 139+400

In Albania, the Mediterranean maquis has a broader extent, in almost half the country's surface. Nevertheless, generally, this type of vegetation is very damaged by exploitation. The value of the vegetation and habitats encountered close to the railway line is generally medium, due to the presence of species that are considered to be threatened in a local or national context, such as *Quercus ilex*, *Salvia officinalis* (an important medicinal plant harvested in the area).

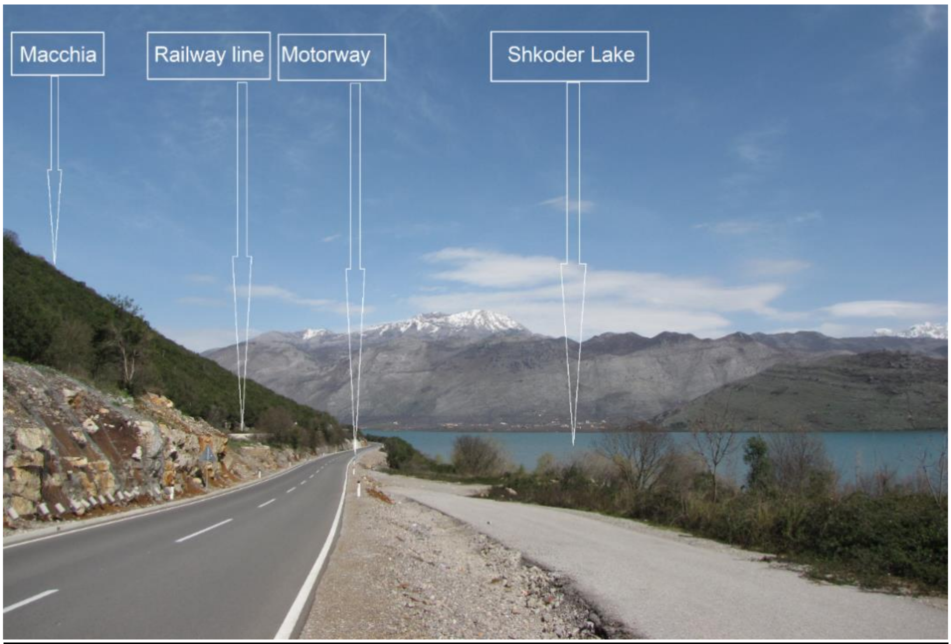


Figure 5-127_Railway line and Mediterranean Maquis at the section from km 139 to km 140

Forest formations dominated by a mix of deciduous oak species. Forest formations mostly dominated by *Quercus pubescens*, *Quercus cerris,* and *Quercus frainetto* are found across small parts of the study area in the hilly areas of the segment between Aliaj and Hoti village (km 132+620 to km 137+750 – see Figure 6-194 to Figure 6-203). The main elements of these forests are *Quercus pubescens*, *Quercus frainetto*, *Fraxinus ornus*, *Juniperus oxycedrus*, etc. They represent degraded forest treated as coppice, used by the local population for firewood and grazing (especially goats) and branch cutting for livestock food basis during the winter.

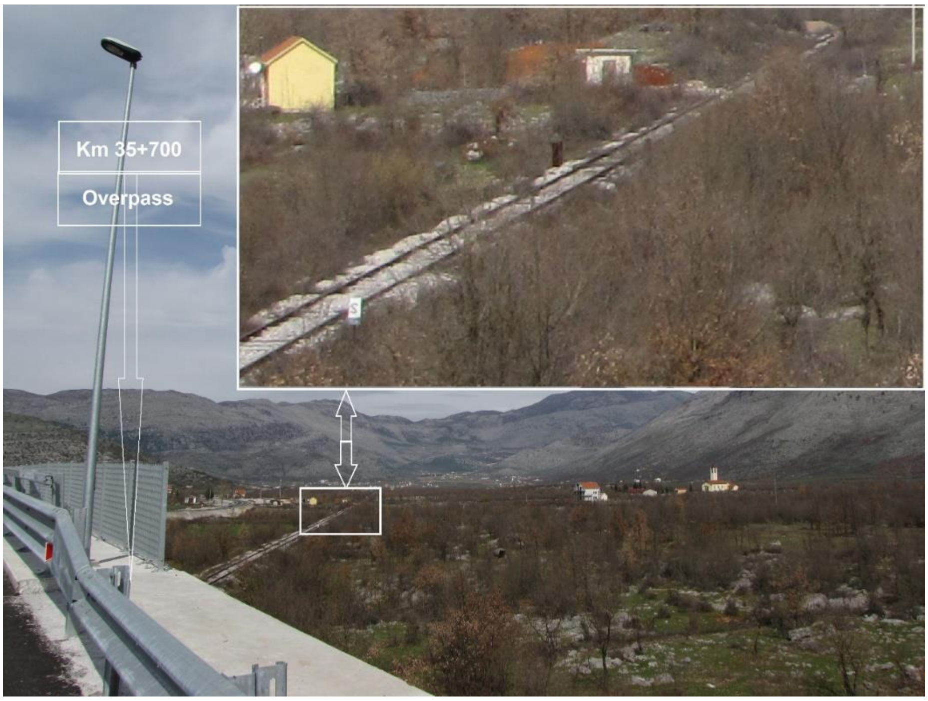


Figure 5-128_Forest formations dominated by a mix of deciduous oaks species (km35+700 to 37+750)

Plant species present in this habitat type are for the most part commonly occurring throughout the country. The value of the vegetation and habitats encountered within the railway line is generally medium.

Figure 5-129_Degraded deciduous oak forest at km 139+000

Figure 5-130_Forest formations dominated by a mix of deciduous oaks species – km 35+700 to km 37+750

Figure 5-131_Degraded forest formations dominated by a mix of deciduous oak along Përroi Thatë stream

Despite the presence of some temporary streams, there is no any riparian vegetation at the streambeds crossing from Shkoder to Hani Hotit. In total, the railway line crosses four streams alongside this section including Rrjolli, Perroi i Thate, Banushi and Vraka.

Figure 5-132_Left: Crossing of Vraka Channel; Right: crossing of Rrjolli Stream

Figure 5-133_Left: Crossing of Banushi Stream; Right: crossing of Perroi Thate Stream

The shoreline of Shkoder Lake. The railway line is located close to the shore of the trans-boundary Shkoder Lake - the largest lake on the Balkan Peninsula that both Albania and Montenegro have officially designated as a cross-border protected area. In Albania, the actual protection status of the Albanian part of Shkoder Lake is "Managed Nature Reserve"[160] (IUCN Category IV). Besides, the Albanian part of the Lake has been declared a Ramsar site[161] by the Ramsar Secretariat[162] and the Albanian Government[163].

Shkoder Lake and its watershed represent the complexity of habitats with a high diversity of living organisms. It encompasses several types, subtypes, and many smaller classification units of habitats, such as lacustrine, palustrine, riverine, limnetic, littoral, open water areas, vegetated and unvegetated, floating, emergent and submerging vegetation, hard and soft bottom, forest, shrub and herb vegetation, etc. This diversity of habitats shelters a high diversity of plants and animals.

Figure 5-134_Shoreline of Shkoder Lake near Flake, 3.5 km west of the railway line

The total number of aquatic macrophytes for the whole area of Shkoder Lake is 164 species belonging to 66 genera and 43 families. At the northern shore of the lake dominant plant species include *Phragmites communis*, *Scirpus lacuster*, *Typha angustipholia*, *Nuphar lutea*, *Nymphaea alba*, *Ceratophyllum demersum*, *Trapa natans,* and *Potamogeton spp*. are represented. Around the lake stands of white willow (*Salix alba*) are the most abundant forests, mainly in the flooding area.

Besides biodiversity values, reed beds and other macrophytes are also important for their purification capacities through nutrient retention and transformation (nitrogen, phosphor), and binding of pollutants.

Twenty vascular plant species, most of them macrophytes, are endangered in the Shkoder Lake and its coasts. The most threatened are considered *Marsilea quadrifolia*, *Hydrocotile vulgaris*, *Hidrocharis morsus – ranae*, *Butomus umbellatus*, *Cladium mariscus*, *Nuphar luteum*, *Nymphaea alba*, *Nymphoides peltata*, *Sagittaria sagittifolia,* and *Trapa natans*.

160 DCM No. 684, of November 02, 2005

161 Ramsar Convention "On internationally important wetlands, especially as waterfowl habitats"

162 https://www.ramsar.org/news/world-wetlands-day-2006-in-albania

163 DCM No. 683/2005

Several aquatic and wetland habitats of the Albanian part of Shkoder Lake are considered as endangered. These include Syri Sheganit and Hurdhana Kosanit; Forest areas of Shegan, Kamica, Vraka, etc., The most important areas in biodiversity aspect, such as Shegani coast (north-east of the Albanian part).

One hundred and thirty-three European threatened habitats (from the EU Habitat Directive and the Bern Convention annexes) are found in Albania and have been used alongside threatened species to identify Albania Important Plant Areas (IPA) under criterion C. The NMR of Shkoder Lake has been categorized as an IPA.

Plant species of conservation concern

The national and/or international conservation status of plant species and plant communities in the area of Shkoder Lake has been a subject of several assessments. Table 5-19 below represents a list of 6 plant species of special conservation concern, referring to species part of Annex II and IV of EU Habitat Directive

Table 5-69_List of plant species of special conservation concern

Name of taxa	Habitat Directive Annex
Edraianthus dalmaticus	II, IV
Anacamptis pyramidalis	II, IV
Himantoglossum caprinum	II, IV
Caldesia parnassifolia	II, IV
Najas flexilis	II, IV
Ramonda serbica	IV

Description of fauna species in Shkoder-Hani i Hotit

The ecosystem of Shkoder Lake is extremely complex, sub-Mediterranean type, with dominantly freshwater and wetland biotopes, but also by the presence of forests, bushes and rocks in karsts slopes. The area of Lake Shkoder Nature Reserve (26, 535 ha) in Albania and National Park (40,000 ha) in Montenegro, includes different biotopes: water biotope, wetland biotope, vegetation biotope, flood forests and meadows, forest, bushes and rocks biotopes, what indicates the floristic, vegetation diversity and richness. The specific biogeography setting of Western Balkan Countries, including PDA (*Detailed Design for the Rehabilitation of the Railway Line Vorë –Hani Hotit, Albania*) from one side makes quite complicated the current spatial analyses of its biodiversity assemblage, while from the other side give advantage of having high diversity. Following Abell *et al.,* (2008)164 and the project area belong to *Southeast Adriatic Drainage* biogeographic units, bordering on the north with *Dalmatian* and on the south with *Ionian Drainage*.

Shkoder Lake is a biodiversity hotspot, with for example 34 native species of fish, 282 birds, 39 snails (Pešić & Glöer 2013), and 147 species of aquatic plants (Weiss *et al*., 2018)165. Together with the two other ancient lakes of the Drin system, Lake Ohrid and Lake Prespa, Shkoder Lake

164 Abell *et al*. 2008. Freshwater Ecoregions of the World: A New Map of Biogeographic Units for Freshwater Biodiversity Conservation. BioScience, 58 (5): 403-414.

165 Sekulić, G., Ivković, M., Ćiparnić, I. (2017). Modellling of hydrolgical processes in the catchment area of Lake Skadar/Shkoder. *Tehnički vjesnik* 24(2): 427-434.

is a center of endemism, with e.g. 13 endemic fishes (Talevski *et al*. 2009) and 15 endemic snails (Pešić & Glöer 2018)166.

Aside from an abundance of sub lacustrine springs, one of the lake's most prominent features is its extensive wetlands and large seasonal fluctuations in surface area, which is tightly connected to the seasonal flow regime of the Rivers and karstic springs. Mean monthly flows of the Morača River vary by an order of magnitude, with a high mean in November of 284 m^3/s to a low in August of 26 m^3/s (Sekulić et al. 2017)167. These variable flows result in large-scale wetland dynamics involving up to 12,000 ha whereby the lake's surface area increases on average to 459 km^2 in winter months with an average minimum of 359 km^2 in summer. These seasonably predictable fluctuations and above all the extensive areas of submerged and emergent plants provide both spawning and rearing areas for many of the lake's phytophilous cyprinid fishes as well as aquatic birds (over 140 species).

Molluscs: They represent the group with the highest number of endemism from the animal groups of the Shkoder Lake catchment. Different publications have stated different numbers for the endemic species. The highest number of endemic molluscs has been published by Dhora (2016), mentioning 28 endemic species from the whole lake watershed. The recent review of Pešić & Glöer, (2018) that is based on the very recent taxonomic validations, molecular approaches and new species description report for 15 endemic species.

Hydrobiid gastropods are the mollusc group with the highest endemism. Around 82% of the hydrobiid species that inhabit the Shkoder Lake catchment area are known only from the type localities in this area. Only two endemics, *Radomaniola (Orientalina) lacustris* and *Vinodolia (Anagastina) scutarica*, are considered as typically lacustrine forms, while the rest of species belong to the water bodies in the Lake catchment and coastal carstic springs. The considered 28 species of endemic molluscs (Dhora (2016) of the Lake watershed belong to **the Red List of Fauna of Albania** (2013) and 15 molluscs species have a threatened status after **the IUCN Red List at Global Scale**, as in the Table 5-20 here below:

Table 5-70_Number of threatened molluscs species from Shkoder Lake watershed

IUCN category		Nr. of species
Critically endangered	CR	5
Endangered	EN	9
Vulnerable	VU	1
Threatened mollusks in total		**15**

Oligochaetes, although with a relatively high number of species found in the lake (35 in total) represent a low rate of endemism, with species only: *Spirosperma scodraensis, Tubificidarum hrabei*, and *Trichodrilus montenegrinus*.

Malacostraca crustaceans are the second known animal group with respect to the number of local endemics at the morphological species level, after the gastropod molluscs. The definitive majority of this endemic diversity is associated with the subterranean karst habitats and represented by various *Niphargus* species. It is important to mention that recent molecular studies on Balkan malacostracans have revealed substantial cryptic diversity within the

166 Pešić, V., Glöer P. (2018). The Diversity and Conservation Status of the Molluscs of Shkoder Lake/Skadar. In: V. Pešić et al. (eds.), The Skadar/Shkoder Lake Environment,Hdb Env Chem, DOI 10.1007/698_2017_235, © Springer International Publishing AG 2018

167 Sekulić, G., Ivković, M., Ćiparnić, I. (2017). Modellling of hydrolgical processes in the catchment area of Lake Skadar/Shkoder. *Tehnički vjesnik* 24(2): 427-434.

conventionally described morphospecies. Thus, the diversity and endemism of the Shkoder Lake malacostracans may be even higher that is currently believed.

Amphipoda is the group with the highest number of endemic species among malacostracans, with 10 species, of which eight belong to the genus *Niphargus (N. asper, N. brevicuspis sketi, N. inclinatus, N. maximus vulgaris, N. podgoricensis, N. vranjine, N. zorae, N. kusceri).* The two other endemic amphipods are *Laurogammarus scutarensis* and *Bogidiella montenegrina*.

From the other malacostracans, mysids (Mysidacea) are represented by one endemic species only, *Diamysis lacustris*, and isopods with one endemic species, too, *Sphaeromides virei montenegrina*.

Endemic copepods are represented mainly by harpacticoids that inhabit underground water habitats, such as *Nitocrella longa, Moraria jana, Ceuthonectes petkovskii, Elaphoidella montenegrina, Elaphoidella gordani* and *Elaphoidella uva*, as well as the calanoid *Stygodiaptomus ferus* that have been reported from several caves and springs, most of them as stygobiotic species.

Ostracods are represented by several endemic forms, mainly stygobiotic species, too, of which four species are endemic known only from its *locus typicus*: *Pseudocypridopsis petkovskii, Trajancandona particular, Trajancandona natura* and *Typhlocypris skadari.* Four other endemic species *Pseudocandona regisnikolai, Leptocythere pseudoproboscidea, Candona forma* and *Candonopsis mareza* have been reported from various habitats around the Shkoder Lake watershed.

From water mites (Acarina: Hydrachnidia), *Trichothyas jadrankae* is endemic to the Shkoder Lake basin, while three other species are endemic to Montenegro: *Torrenticola lukai, Atractides longisetus* and *Stygohydracarus karanovici*. The last one is a typical inhabitant of hyporheic interstitial, although the interstitial fauna of the Shkoder Lake catchment does not exhibit marked endemism.

Insects are supposed to include endemic and sub endemic forms, encompassing more than 100 species, most of them terrestrial adults, for the whole Shkoder Lake catchment area, whereas aquatic insects represent a very low rate of endemism for the Lake itself. However, several insect groups are poorly studied, especially in the Albanian part of the Lake, and considerations about endemic forms should be treated very carefully. More than half of the stonefly species (Plecoptera) of the Shkoder Lake catchment area are Balkan endemic or sub endemic taxa, with the others showing European or Euro Siberian distribution. *Capnioneura balkanica balkanica* is an endemic species that inhabits spring habitats. It seems to be a winter-emerging endemic of the Morača valley and was found in different crenal habitats from karst spring outlets to small forest brooks. *Brachyptera tristis* is a Balkan endemic species, restricted mostly to the Dinaric ranges and found exclusively in huge karst springs at low to moderate elevations. *Leuctra jahorinensis* and *Leutra malcor* are narrow endemics of the Dinaric Mountains, both restricted to mountain crenal habitats. *Protonemura auberti* and *Protonemura aestiva* belong to a Central European and Balkan species complex of crenal taxa. In the Balkans, they seem to be connected to karst springs. *Nemoura asceta* is a widespread Balkan endemic species, connected to small, temporary spring brooks of low to high elevations. *Isoperla pesici* is a widely distributed crenal species of the Central Balkans, which occurs in both small and large springs at different elevations. Water beetles (Coleoptera) are relatively common in the surrounding streams of the Lake, especially the Elmidae and Hydraenidae families that are also represented with endemic forms, such as *Ochthebius insidiosus* (Hydraenidae) described from Rijeka Crnojevića. However, the endemic status of some of their species has been considered as questionable.

Among the insects, dragon flies (Odonata) are among the groups, for which the threatened status in international scale has been assessed. Table 5-21 here below represents the list of the dragonfly species from the Shkoder Lake basin that are of conservation concern referring to the EU Habitat Directive and the European Red List.

Table 5-71_List of dragonfly species (Odonota) of conservation concern from the Shkoder Lake basin

Species	EU Habitats Directive, Annexes	European Red List
Lestes macrostiogma		VU
Coenagrion ornatum	II	
Gomphus flavipes	IV	
Lindenia tetraphylla	II, IV	VU
Cordulegaster heros	II, IV	

As seen from the table, all the listed five Odonata species are of conservation concern. Four species belong to the EU Habitats Directive and one species *Lestes macrostiogma* is Vulnerable at European level.

Fish species: The ichthyofauna of Shkoder Lake consists of 59 species. Of these, 44 are native to the watershed, whereas 15 are introduced. Thirteen species are Balkan Endemic, while seven species are Near Endemic:*, Knipowitschia montenegrina, Barbatula zetensis, Rutilus albus, Gobio skadarensis, Salmo zetensis,* Salmothymus zetensis, and *Chondrostoma scodrense* – extinct (EW).

Regarding their conservation status (after the IUCN categories), one-third of the species are in a certain category of threat (33.3%), and those are mainly those species endemic to the Adriatic watershed.

Three species (5.1%) are classified as critically endangered (CR), and three others (5.1%) are endangered species (EN), while four (6.8%) are vulnerable (VU).

Amphibians: 15 amphibian species have been reported from Shkoder Lake and its tributaries. From these species, nine have been found in the Lake, while the other six species have been reported from the lake watershed. Four of them (*Triturus macedonicus, Pelophylax kurtmuelleri, Pelophylax shqiperica* and *Rana graeca*) are endemic to the entire or south eastern part of the Balkan Peninsula Concerning their endangered status at European level, one species, namely *Pelophylax shqiperica* has the EN status. Nine species are included in the EU Habitat Directive (Annex II, Annex IV).

Reptiles: 36 species of reptiles have been reported from Shkoder Lake and its catchment area. Four species have been found within the lake while the others in the lake catchment. 28 species are included in **the EU Habitat Directive (Annex II and Annex IV)** – see Table 4.2.6 for more details.

Figure 5-135_Grass snake (Natrix natrix) photographed during field investigations at Hurdhana 1 Karst Lake

Birds: In Shkoder Lake and its catchment area a number of 282 bird species have been reported, which count for 55 % of the total number of bird species in Europe. 189 species (67 %) are nesting species, of which 46 species are aquatic (16.3 % of the total number of species). Shkoder Lake is especially important concerning the bird colonies, with the most important being: the colony of Dalmatian Pelican (*Pelecanus crispus*) in Montenegro and the colonies of Whiskered Terns (*Chlidonias hybrida*).

Due to high species richness and high number of nesting birds, the Shkoder Lake has been designated a Ramsar site (Ramsar Convention on Wetlands of International Importance especially as Waterbirds Habitat).

Mammals: 57 species of mammals have been reported from Shkoder Lake and its catchment area. Only three species are semi-aquatic species, from which the Eurasian otter *(Lutra lutra)* is the most important, as a Near Threatened species. The two other semi-aquatic mammal species are the Eurasian Water Shrew (*Neomys fodiens)* and the European water vole *(Arvicola terrestris)*.

5.2.10.2.1. Identification of Priority Biodiversity Features and Critical Habitats

Identification of Priority Biodiversity Features

EBRD PR6 defines Priority Biodiversity Features (PBFs) as features that are particularly irreplaceable or vulnerable, albeit a lower priority than critical habitats2). PR6 identifies the following as likely PBFs:

- Threatened habitats
- Threatened species
- Significant biodiversity features identified by a broad set of stakeholders or governments (such as Key Biodiversity Areas (KBA) or Important Bird Areas (IBA))
- Ecological structure and functions needed to maintain the viability of the above features (habitats, species and areas of conservation importance).

5.2.10.2.2. Threatened Habitats identified as Priority Biodiversity Features

Threatened habitats are those considered under pressure by regional or international assessments. These include natural habitats identified under the EU Habitats Directive (Annex I) as well as those belonging to IUCN Red-List EN or CR ecosystems.

The analysis on natural habitats within the Project areas of influence has identified ten habitats types that are included in Annex 1 of Habitats Directive:

Table 5-72_Habitats of Annex 1 of Habitats Directive

Code	Natura 2000 habitat types
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea
3150	Natural eutrophic lakes with Magnopotamion and Hydrocharition type vegetation
3260	Water courses of plain to mountainous levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
3290	Intermittently flowing Mediterranean rivers of the Paspalo-Agrostidion
62A0	East Sub-Mediterranean dry grasslands (Scorzoneretalia villosae)
6420	Mediterranean tall humid herb grasslands of the Molinio-Holoschoenion
8130	Western Mediterranean and thermophilous scree
8210	Calcareous rocky slopes with chasmophytic vegetation
91AA	Eastern white oak woods
92A0	*Salix alba* and *Populus alba* galleries

5.2.10.2.3. Threatened species identified as Priority Biodiversity Features in the Project Area

The research for threatened species was based on literature review and field surveys for habitats, plants, mammals, birds, reptiles, amphibians and invertebrates. This research identified a list of threatened species fulfilling the criteria for PBF that may be present within the Project Area of Influence; these are presented below:

Mollusc species identified as Priority Biodiversity Features

Mollusc species are present in several water currents and table. Nevertheless, the majority of them occurs in Lake Shkoder. The lake is well recognised for the presence of many molluscs' species, the majority of which has a restricted geographical range and therefore trigger the Critical Habitats' criteria. However, four species of molluscs are recognised as Priority Biodiversity Features (PBFs). Information on their status and ecology is provided in Table 5-45.

Table 5-73_Molusc species identified as Priority Biodiversity Features

No.	Species	Status	Comments
	Bivalvia		
1	*Unio crassus* Philipsson, 1788	Endangered	Threaten by water pollution, drainage, regulation activities/construction of running waters.
2	*Unio mancus* Lamarck, 1819 (syn. *U. elongatulus* Pfeiffer, 1825)	Near Threatened	The presence is threaten by similar factors as *Unio crassus*.
3	*Microcondylaea bonellii* (Ferussac, 1827)	Vulnerable	Present in River Gjadri, Drini and Lake Shkoder. Species is facing different impacts

			leading to population decrease.
4	*Dreissena carinata* (Dunker, 1853) (syn. *D. presbensis* Kobelt, 1915, *D. stankovici* Lvova and Starobogatov, 1982)	Near Threaten	Beside molecular approaches towards taxonomic status definition, there are still different interpretation on the species, but it is present in Lake Shkoder and location downstream the Vaux I Dees dam.

Fish Species identified as Priority Biodiversity Features

From thirteen fish species present in wetland areas, 12 of them trigger the Critical Habitat criteria. Only one species, the Scalar nasse is considered as PBF species.

Table 5-74_Fish species identified as Priority Biodiversity Features

No.	Species	Status	Comments
1	Shkoder nasse (*Chondrostoma scodrensis* Elvira, 1987)	Extint	

Mammal species identified as Priority Biodiversity Features

Two species of mammals, the Badger (*Meles meles*) and the Western Polecat (*Mustela putorius*), fulfil the criteria of PBFs.

Table 5-75_Mammal species identified as Priority Biodiversity Features

No.	Species	Status	Comments
1	Badger *Meles meles*	EN in Albania	Present in deciduous and mixed woods, coniferous, hedges, scrub, agriculture, suburban areas.
2	Western Polecat *Mustela putorius*	EN in Albania	Present in lowland habitats, sand dunes, forest fringes and river valleys.

Bird species identified as Priority Biodiversity Features

The analysis of the species observed during the field surveys as well as those reported in literature, demonstrates that the project area holds 39 species fulfilling the criteria for PBFs.

All the species enlisted in Table 5-76 below should be subject of specific focus aiming to assess the direct, indirect, and cumulative impacts and to ensure the avoidance and mitigation of potential impacts due to construction and operation.

Table 5-76_Bird species identified as Priority Biodiversity Features

No	Species	Status	Comment
1	Levant Sparrowhawk *Accipiter brevipes*	CR in Albania Annex I Birds Directive Res 6 Bern Convention	It inhabits woody plains, often near water, and usually ranges up to 1,000 m. Lizards and large insects (the latter especially in Africa) make up the majority of its diet. It nests in tree branches, preferring deciduous trees. Deciduous forests in riparian zones appear to be the optimal habitat for this species.
2	Eurasian Sparrowhawk *Accipiter nisus*	EN in Albania	It mainly inhabits forest interspersed with open areas. Small birds make up the vast majority of its diet. In Albania is seen mostly in the coastal and lowland areas during winter. It is present all over the project area and particularly along the

No	Species	Status	Comment
			transmission line
3	Moustached Warbler *Acrocephalus melanopogon*	EN in Albania Annex I Birds Directive Res 6 Bern Convention	The species occupies low aquatic vegetation, especially reedbeds, but also rush stands, sedges, reedmace (*Typha*) and others, often with admixture of bushes or tamarisks (*Tamarix*). Its optimal habitat appears to be old reedbeds containing a high proportion of dead material and a complex lower stratum, with tall reeds above. It is also found along lake margins, ditches, beside freshwater and brackish marshes, and in very small reed marshes in steppe zone. The diet is almost entirely small arthropods, especially small beetles. Fruits of cherry (*Prunus*) and elder (*Sambucus*) are also taken. The species is sedentary, partially migratory or migratory in Europe, with birds from the north of the range wintering within the species's southern breeding range.
4	Sedge Warbler *Acrocephalus schoenobaenus*	EN in Albania	During the breeding season this species is found in a variety of low dense vegetation, often near water or in moist depressions, including shore vegetation around freshwater pools, along rivers and canals, and lowland swamps and marshes with reed and bush thickets. The diet is mainly insects and their larvae but it also takes spiders (Araneae), harvestmen (Opiliones), small slugs and snails.
5	Eurasian Skylark *Alauda arvensis*	Annex 1 Birds Directive	It is found in most open habitats and has a strong association with farmland throughout its range. The species does not breed in coastal Albania while flocks of hundreds of individuals visit the coastal area during migration and wintering season. It is present all over the project area during migration and wintering period.
6	Common Kingfisher *Alcedo atthis*	Annex 1 Birds Directive	It prefers still or gently flowing water with plenty of small fish, and with reeds, rushes or shrubs on the banks for perches. Streams, small rivers, canals and ditches are favoured to open waterbodies, but it also uses lakes, ponds and flooded gravel pits. In winter it becomes more coastal, also using estuaries, harbours and rocky seashores. It is present in water bodies including lakes, channels and ponds.
7	Tawny Pipit *Anthus campestris*	Annex 1 Birds Directive	This ground nesting bird is found in open dry habitats, from sand dunes, sandy heaths, dry grassland and clear-felled areas to artificial habitats such as gravel pits, steppe and semi-deserts in central and eastern parts of the range. It favors areas with dwarf shrubs and low-growing trees for song posts.
8	Meadow Pipit *Anthus pratensis*	Resolution 6 Bern Convention	It occurs in open areas including dry habits, arable land, abandoned arable land, during migration and winter. Present in open habitats all over the area.
9	Great Egret *Ardea alba*	EN in Albania Annex 1 Birds Directive Resolution 6 Bern Convention	It is considered as endangered in Albania due to its limited number in breeding season. The Great White Egret inhabits all kinds of inland and coastal wetlands although it is mainly found along the coast in the winter or during droughts.
10	Grey Heron *Ardea cinerea*	VU in Albania Resolution 6 Bern Convention	In Albania the species has been designated as vulnerable due to the decrease of the number of breeding pairs. The Grey Heron is a generalist in its habitat use, although shallow water, relatively large prey, and four or five months of ice-free breeding season are among the essential characteristics of its habitat.
11	Purple Heron *Ardea purpurea*	EN in Albania Annex 1 Birds Directive Resolution 6 Bern	The species inhabits wetlands, showing a preference for dense, flooded, freshwater reedbeds (*Phragmites* spp.) in temperate areas. It also utilises lake shores, river margins, ditches, canals, brackish water lagoons, rice-fields, mangroves and coastal mudflats.

No	Species	Status	Comment
		Convention	Its diet consists of fish 5-15 cm long (occasionally up to 55 cm), salamanders, frogs, insects (e.g. beetles, dragonflies, hemiptera and locusts), crustaceans, spiders and molluscs, as well as small birds and mammals, snakes and lizards.
12	Squacco Heron *Ardeola ralloides*	EN in Albania Annex 1 Birds Directive	In Albania the species has been designated as vulnerable due to the decrease of the number of breeding pairs. It inhabits permanent or temporary wetlands showing a preference for fresh waters with abundant marsh vegetation, reedbeds, nearby bushes, trees and scrub.
13	Ferruginous Duck *Aythya nyroca*	CR in Albania Annex I Birds Directive Resolution 6 Bern Convention	It is is chiefly migratory. It breeds from April or May until late June in single pairs or loose groups. The species shows a strong preference for fresh standing water and is very rarely found on flowing streams or rivers. It requires shallow water 30-100 cm deep close to littoral vegetation for feeding and generally avoids large open areas. Shallow eutrophic freshwater pools and marshes with dense abundant submergent, floating, emergent and shoreline vegetation (e.g. reedbeds) are the major breeding habitats. Shallow banks with flooded vegetation and mudflats are particularly used for foraging during this season. Although the species is omnivorous, plant material such as seeds, roots and vegetative parts of aquatic plants (*Potamogeton* spp., *Ceratophyllum* spp., *Scirpus* spp., *Carex* spp. and macroalgae *Chara* spp.) dominates its diet. Animal matter taken includes worms, molluscs (snails), crustaceans, adult and larval insects (beetles, chironomids, dragonflies, waterbugs, caddisflies, flies), amphibians (frogs, tadpoles and spawn) and small fish up to 3 cm long. The nest is a low platform of reeds and other vegetation placed on the ground or on an islet or hummock in thick vegetation close to water. Alternatively, nests may be placed over water on floating mats of vegetation or in dense reedbeds along the shoreline.
14	Eurasian Stone-curlew *Burhinus oedicnemus*	Resolution 6 Bern Convention	The species inhabits lowland heath, semi-natural dry grassland, infertile agricultural grassland, steppe on poor soil, desert and extensive sand-dunes. It breeds on the ground, on open, bare ground or areas with little vegetation, and has adapted to arable land but only where crops are short or have an open structure during the breeding season.
15	Greater Short-toed Lark *Calandrella brachydactyla*	Annex 1 Birds Directive Resolution 6 Bern Convention	It prefers dry areas with low and sparse vegetation cover, on level or undulating terrain, with sandy or stony soils. In the Mediterranean basin it breeds mostly in fallow lands but also on dry pastures, tobacco fields, dirt tracks and olive groves In south-east Europe it lays eggs from mid-April.
16	Black Tern *Chlidonias niger*	Annex 1 Birds Directive Resolution 6 Bern Convention	This species is strongly migratory and travels both over land and over sea. It breeds between May and June in colonies, usually of less than 20 pairs (rarely more than 100 pairs) and often close to other species. After breeding, it departs for its wintering grounds from July onwards, returning north again from late-March. On passage, the species frequents inland wetlands including pools, ditches, reservoirs, lakes and sewage farms, as well as coastal habitats and estuaries. The species's diet consists largely of marine fish, although insects and crustaceans may also be taken.
17	White Stork	CR in Albania	It inhabits open areas, shallow marshes, lakesides, lagoons, flood-

No	Species	Status	Comment
	Ciconia ciconia	Annex I Birds Directive Resolution 6 Bern Convention	plains, rice-fields and arable land especially where there are scattered trees for roosting. The species is carnivorous and has a varied and opportunistic diet. It takes small mammals (e.g. voles, water voles, mice, shrews, young rats), large insects (e.g. beetles, grasshoppers, crickets and locusts), adult and juvenile amphibians, snakes, lizards, earthworms, fish, eggs and nestlings of ground-nesting birds, molluscs and crustaceans. The nest is constructed of sticks and is commonly positioned in trees or on the roofs of buildings, as well as on pylons, telegraph poles, stacks of straw and other anthropogenic sites (including specially erected nesting structures), cliffs and occasionally among rushes on the ground. The species nests solitarily or in loose colonies, often using traditional nesting sites. Nesting sites are usually situated near foraging areas, but may be up to 2-3 km away.
	Short-toed Snake Eagle *Circaetus gallicus*	Annex I Birds Directive Resolution 6 Bern Convention	Birds breeding in the Palearctic are migratory. Most migrants winter in tropical North Africa. Migrants move south between August and November, and north between February and May. Birds are usually observed singly or in pairs, even on migration, though migrants will sometimes form groups of up to 12. It uses a variety of habitats within warm temperate and tropical environments, and is recorded up to 2,300 m. It specialises in feeding on reptiles, particularly snakes. The nest is almost always built relatively low in a tree. Although occurring in many habitats, the species always requires some degree of tree cover.
18	Western Marsh Harrier *Circus aeruginosus*	VU in Albania Annex 1 Birds Directive Resolution 6 Bern Convention	It is present all over the year in the project area and mainly in aquatic habitats. Present also in arable land but in fewer numbers. The species inhabits extensive areas of dense marsh vegetation, in fresh or brackish water, generally in lowlands
19	Hen Harrier *Circus cyaneus*	EN in Albania Annex 1 Birds Directive Resolution 6 Bern Convention	It is present during winter and migration period. It occurs mostly in open habitats including arable land, abandoned arable land as well as open grounds covered by halophytic vegetation.
20	Montagu's Harrier *Circus pygargus*	EN in Albania Annex 1 Birds Directive Resolution 6 Bern Convention	It is a migratory species, wintering in sub-Saharan Africa and southern Asia. It leaves its breeding grounds in August and September, beginning their return in March and April.
21	Long-tailed Duck *Clangula hyemalis*	Globally Vulnerable	The species winters at sea, generally far offshore in waters 10-35 m deep, as well as in saline, brackish or fresh estuarine waters, brackish lagoons , and inland (very rarely) on large, deep freshwater lakes. The species shows a preference for marine foods during both the breeding and non-breeding seasons, its diet consisting predominantly of animal matter such as crustaceans (e.g. amphipods and cladocerans), molluscs, other marine invertebrates (e.g. echinoderms, worms) and fish. The species also takes freshwater insects and insect larvae ands well as plant material such as algae, grasses, and the seeds and fruits of tundra plants.
22	Corn Crake *Crex crex*	Annex I Birds Directive Resolution 6 Bern Convention	

No	Species	Status	Comment
23	Syrian Woodpecker *Dendrocopos syriacus*	Annex 1 Birds Directive	It occurs in open country with wooded areas. It is often found in plantations of all kinds. It is also seen in roadside trees and groups of trees, mainly near habitations, as well as forest edges, parks and gardens. It occurs along the TL in gardens and forested areas.
24	Little Egret *Egretta garzetta*	VU in Albania Annex 1 Birds Directive Resolution 6 Bern Convention	It inhabits fresh, brackish or saline wetlands and shows a preference for shallow waters (10-15 cm deep) in open, unvegetated sites where water levels and dissolved oxygen levels fluctuate daily, tidally or seasonally, and where fish are concentrated in pools or at the water's surface.
25	Eurasian Hobby *Falco subbuteo*	VU in Albania	In Albania was considered as decreasing and Vulnerable due to persecution. It occurs in open wooded areas. Flying insects form the main part of its diet, although birds are often taken in the breeding season. Birds almost always nest in trees, using abandoned nests of other raptors or corvids.
26	Common Kestrel *Falco tinnunculus*	VU in Albania Annex 1 Birds Directive	In Albania the species was designated as Vulnerable due to persecution. The species tolerates a wide range of open and partially forested habitats. The locations of nests are variable, with rock ledges, buildings and abandoned corvid nests being commonly reported sites.
27	Black-winged Stilt *Himantopus himantopus*	EN in Albania Annex 1 Birds Directive Resolution 6 Bern Convention	It breeds in shallow freshwater and brackish wetlands with sand, mud or clay substrates and open margins, islets or spits near water level. Suitable habitats include marshes and swamps, shallow lake edges, riverbeds, flooded fields, irrigated areas, sewage ponds and fish-ponds. The species may also breed in more saline environments such as river deltas, estuaries, coastal lagoons and shallow coastal pools with extensive areas of mudflats, salt meadows, saltpans, coastal marshes and swamps.
28	Little Bittern *Ixobrychus minutus*	Annex 1 Birds Directive	The species is most common in freshwater marshes with beds of bulrushes Typha spp., reeds Phragmites spp. or other dense aquatic vegetation, preferably also with deciduous bushes and trees such as willow Salix spp. or alder Alnus spp. It may also occupy the margins of lakes, pools and reservoirs, wooded and marshy banks of streams and rivers and the margins of saline lagoons and saltmarshes.
29	Red-backed Shrike *Lanius collurio*	Annex 1 Birds Directive Resolution 6 Bern Convention	The species breeds in temperate and Mediterranean climates. It requires sunny, warm, usually dry, and level or gently sloping terrain, with scattered bushes, shrubs or low trees providing hunting posts overlooking areas of short grass, heath or bare soil. The species is migratory, wintering in eastern and southern Africa.
30	Lesser Grey Shrike *Lanius minor*	Annex 1 Birds Directive Resolution 6 Bern Convention	This species occurs in open habitat with plenty of scattered or grouped trees and fewer bushes. It uses open lowlands and hills in steppe and forest-steppe and Mediterranean zones. Suitable breeding habitats in Europe include orchards, groves, parks, woodland edges and overgrown ditches even if close to human settlement or cultivation. Tall trees are necessary for nesting.
31	Woodlark *Lullula arborea*	Resolution 6 Bern Convention	This species inhabits a variety of open and semi-open habitats on well-drained soils, with a preference for acidic, sandy soils. It favours unmanaged or poorly managed habitats such as low-intensity or abandoned farmland, heathland, young forestry plantations, recently

No	Species	Status	Comment
			felled woodland, open woodland and scrub, orchards, steppes, woodland edges and clearings, wooded coastal dunes and parkland.
32	Velvet Scotter *Melanitta fusca*	VU Globally	The species breeds on wooded coastlines, small freshwater lakes, pools and rivers in northern coniferous forests. The majority of birds winter at sea on shallow inshore coastal waters, especially in estuaries or inlets where there are large mussel-beds. It may also occur on freshwater lakes and estuaries during migration. Its diet consists predominantly of molluscs, as well as crustaceans, worms, echinoderms, amphipods, isopods, small fish, and (in freshwater habitats) adult and larval insects.
33	Calandra Lark *Melanocorypha calandra*	Resolution 6 Bern Convention	This species occupies open plains, from steppes and pastures to extensive dry cereal cultivations and true steppe with dense grass cover. In the Mediterranean Basin it is mainly found in dry pastures and dry cultivations. In cultivated areas, it prefers fallows, long-fallows and field edges and to a lesser extent sown fields, selecting unirrigated legumes and barley fields. It is a resident bird present in plots of extensively used arable land all over the project area.
34	Honey Buzzard *Pernis apivorus*	EN in Albania Annex 1 Birds Directive Resolution 6 Bern Convention	This is a migratory species, wintering in in tropical Africa. It leaves its breeding grounds in August and September, returning between April and June. Birds are mostly solitary except on migration. It is a forest species, breeding in temperate and boreal woods. Nests are built in woods, preferentially in deciduous trees. It feeds mainly on wasps and hornets.
35	Spoonbill *Platalea leucorodia*	EN in Albania Annex 1 Birds Directive Resolution 6 Bern Convention	The species shows a preference for extensive shallow wetlands with mud, clay or fine sand substrates. It inhabits either fresh, brackish or saline marshes, rivers, lakes, flooded areas and mangrove swamps, especially those with islands for nesting or dense emergent vegetation (e.g. reedbeds) and scattered trees or srubs (preferably willow *Salix* spp., oak *Quercus* spp. or poplar *Populus* spp.). It may also frequent sheltered marine habitats during the winter such as deltas, estuaries, tidal creeks and coastal lagoons. Its diet consists of adult and larval insects (e.g. waterbeetles, dragonflies, caddisflies, locusts and flies), molluscs, crustaceans, worms, leeches, frogs, tadpoles and small fish up to 10-15 cm long. It may also take algae or small fragments of aquatic plants (although these are possibly ingested accidentally with animal matter).
36	Glossy Ibis *Plegadis falcinellus*	EN in Albania Annex 1 Birds Directive Resolution 6 Bern Convention	The species feeds in very shallow water and nests in freshwater or brackish wetlands with tall dense stands of emergent vegetation (e.g. reeds or rushes) and low trees or bushes. It shows a preference for marshes at the edges of lakes and rivers, as well as lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and irrigated cultivation. It less often occurs in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons. Roosting sites are often large trees that may be far from water. The diet of the species varies seasonally depending on what is available. It takes adult and larval insects (e.g. aquatic beetles, dragonflies, grasshoppers, crickets, flies and caddisflies), worms, leeches, molluscs (e.g. snails and mussels), crustaceans (e.g. crabs and crayfish) and occasionally fish, frogs, tadpoles, lizards, small snakes and nestling birds. The nest is a platform of twigs and vegetation usually positioned less than 1 m above water (occasionally up to 7 m) in tall dense stands of

No	Species	Status	Comment
			emergent vegetation (e.g. reeds or rushes), low trees or bushes over water.
37	Slavonian Grebe *Podiceps auritus*	VU Globally	The species breeds on small, shallow fresh, brackish or slightly alkaline waters between 0.5 and 2 m deep and between 1 and 20 ha in area with rich floating, submergent and emergent vegetation. Habitats include small pools, marshes with patches of open water and secluded sections of larger lakes and rivers. In its wintering range, the species frequents coastal inshore waters up to 10-20 m in depth including sheltered bays, lagoons and estuaries. It may also occur on large lake and river systems south of its breeding range.
38	Common Tern *Sterna hirundo*	Annex 1 Birds Directive	The species breeds in a wide variety of habitats in coastal and inland areas. Along the coast, it shows a preference for nesting on flat rock surfaces on inshore islands, open shingle and sandy beaches, dunes and spits, vegetated inter-dune areas, sandy, rocky, shell-strewn or well-vegetated islands in estuaries and coastal lagoons, saltmarshes, mainland peninsulas and grassy plateaus atop coastal cliffs. In Albania, the majority of the breeding population breeds in sandy islands situated at coastal wetlands. Present in drainage ditches at PDA as well as in project area of influence including Karavasta lagoon and Keneta e Osmanit and Myzeqeja channel. The habitats where the species occurs does not fulfil the criteria to be considered as a Critical Habitat.
39	European Turtle Dove *Streptopelia turtur*	VU Globally	The species uses a wide variety of woodland types, as well as steppe and semi-desert, frequently relying on agricultural land for feeding. It may use hedges, borders of forest, groves, spinneys, coppices, young tree plantations, scrubby wasteland, woody marshes, scrub and garigue. It tolerates humans but does not breed close to towns or villages. Summer breeder present all over the project area. The habitats where the species occurs does not fulfill the criteria to be considered as a Critical Habitat.

All the above species have to be considered as Priority Biodiversity Features. None of the species triggers the Critical Habitat criteria. Therefore, the habitats where those species are distributed could not be considered as a Critical Habitat for the above-mentioned species.

5.2.10.2.4. Significant biodiversity features

The railway line goes through and nearby areas of conservation concern already part of the network of Protected Areas. The figure below gives an overview of the protected areas in Albania, while Map 6 (Map 6_Map of Protected Areas- separate file in pdf format) shows the closest protected areas on both sides of the railway line.

The list of the protected areas, located on both sides of the railway line, includes some sites within the wide study area, which are given in the table below.

Table 5-77_The closest protected areas to the railway line

No	Name and type of the protected area	National and international protection status	IUCN category	Minimum distance from the railway line

No	Name and type of the protected area	National and international protection status	IUCN category	Minimum distance from the railway line
1	Shkoder Lake (Albanian part), (49.758 ha)	Nature Managed Reserve (DCM 684/2005); Wetland of International Importance (Ramsar site), (DCM 683/2005); Management Plan of the NMR approved by Minister Order 815/2012 Important Bird Area (recognized by Birdlife International) Key Biodiversity Area (recognized by IUCN)	IV	The eastern edge of the terrestrial part (Traditional and Sustainable Use Subzone and Recreational Subzone) is crossed by the railway line
2	Nature Monument of Syri I Sheganit karst spring	Hydro Monument (DCM 676/2002);	III	1.85 km West
3	Nature Monument of Syri I Gjonit karst spring	Hydro Monument (DCM 676/2002);	III	2.5 km East
4	Buna River Mouth-Velipoje (23.027 ha)	Landscape Protected Area (DCM 682/2005); Wetland of International Importance (Ramsar site), (DCM 683/2005); Important Bird Area (recognized by BirdLife International) Key Biodiversity Area (recognized by IUCN)	V	3.5 km West (Shkoder)
5	Kune Vain - Tale (4393 ha)	Nature Managed Reserve (DCM 432/2010); Important Bird Area (recognized by BirdLife International) Key Biodiversity Area (recognized by IUCN)	IV	1.3 km West (Lezhë)
6	Patok-Fushe Kuqe-Ishem (5001 ha)	Managed Nature Reserve / Nature Park (DCM 995/2010); Important Bird Area (recognized by BirdLife International) Key Biodiversity Area (recognized by IUCN)	IV	2.7 km West (Kurbin)
7	Berzane (880 ha)	Nature Managed Reserve (Order No 1, 27.07.1997)	IV	2.5 km East (Lezhë)

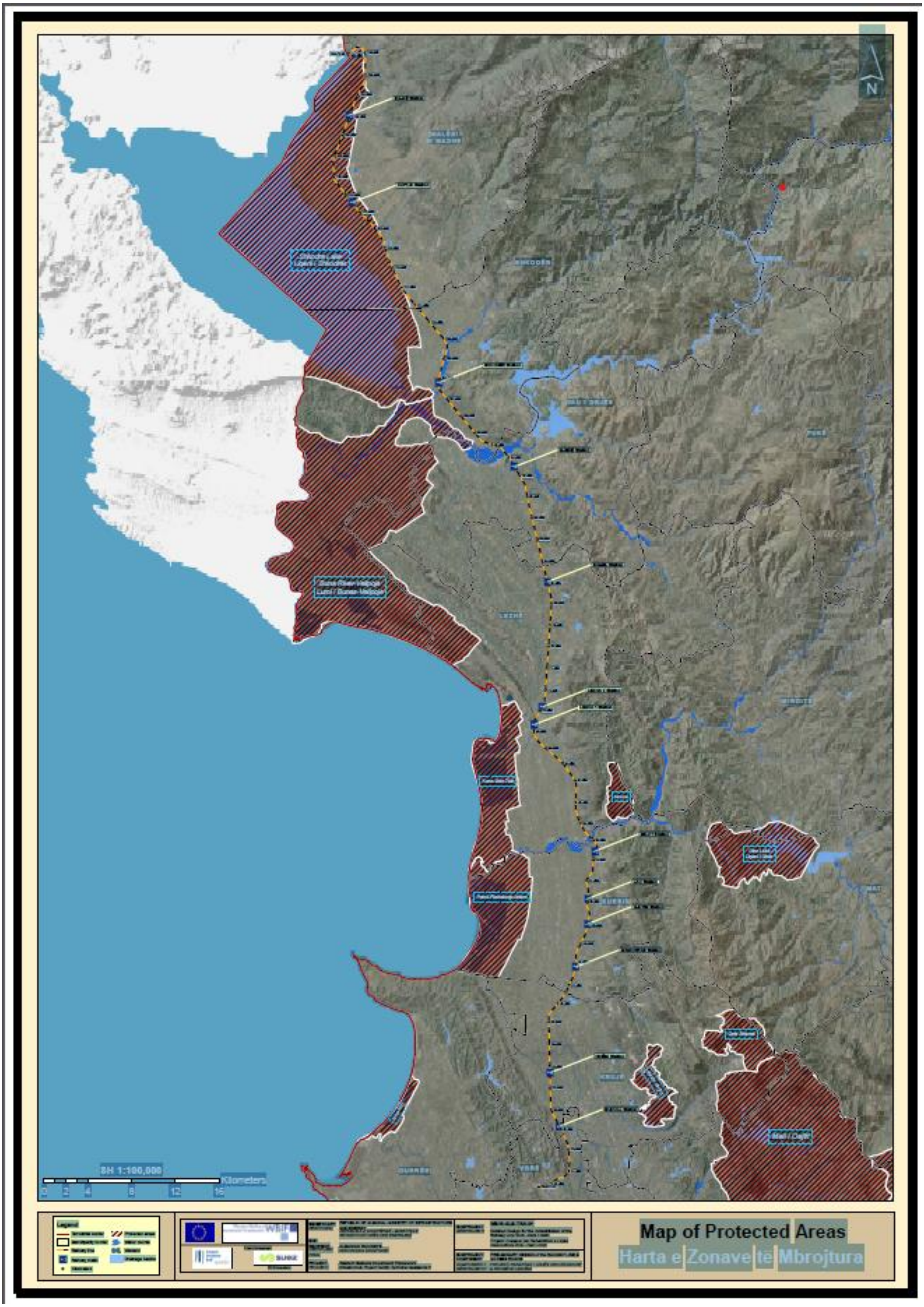


Figure 5-136_Map of Protected Areas along Vore-Hani i Hotit, Albania

5.2.10.2.5. Nature Managed Reserve of Lake Shkoder

Description of the protected area

Lake Shkoder is a large freshwater lake in northeastern part of Albania, on the border with Montenegro. The lake is oligotrophic and generally shallow except for a few very deep parts. Approximately one third of the lake lies within Albania, the remainder lies in Montenegro. The main human activities are fisheries, extensive agriculture, hunting and tourism. Fisheries are the most important activity and in places are very intensive. The reserve is 26 535 ha.

The figure below shows the protected area in the northern part of the project area. These are the Nature Managed Reserve of Lake Shkoder and the Protected Landscape of Buna River – Velipoje.

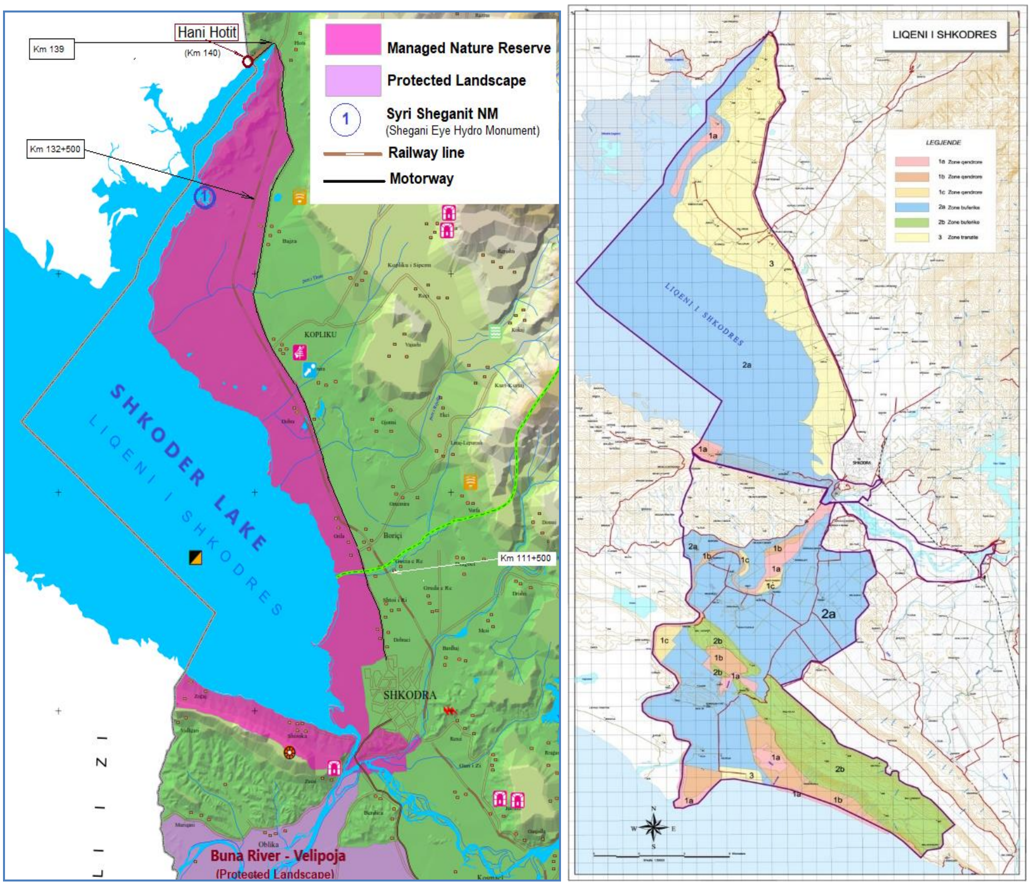


Figure 5-137_Managed Nature Reserve of Shkoder Lake and Landscape Protected Area Bune-Velipoje

The lake hosts about 50 fish species, 37 of which are native, about 280 species of birds including many rare and threatened species as well as diverse habitats and abundant fish populations. Lake Shkoder is also an important breeding, wintering and resting area for hundreds of thousands of migratory birds on the Eastern Adriatic.

International designations of Shkoder area

Shkoder Lake has several international designations. It is part of the Ramsar Site “Lake Shkoder and River Buna” as well as part of the Key Biodiversity Area of "Shkoder Lake – Buna River – Velipoje - Vau i Dejes". The area is also part of the Important Bird Area of Lake Shkoder and it is a Candidate Emerald Site too.

Conservation objectives

The main goal of the designation of the protected area is to ensure the protection and sustainable use of the lake's ecosystem and natural resources. In accordance with the Management Plan the conservation objectives of the Nature Managed Reserve are:

- Guaranteeing the water quality and fluctuation levels, suitable for aquatic communities and for public use.
- Protecting biodiversity and improve wildlife management, especially important habitats and species.
- Improving protection and management of landscape, cultural resources and heritage.
- Supporting the sustainable use of the lake area: fishery, forestry, organic agriculture, stock breeding, eco-tourism, medicinal plants, handicrafts and other traditional products.
- Enhancing information, promotion and education and strengthen community relationships for lake management.

Syri Sheganit Nature Monument

Syri Sheganit is a vauclusian karst spring of discharge 1000 litres/sec. Although it is located 1.85 km from the railway line (see Figure 5-74_Hydrogeological Map of Bajze area (Eftimi R., 2008) in section 5.2.10 above), the Consultant has included this hydro monument in the list of the protected areas located on both sides of the railway line. However, the presence of this hydro monument 1.85 km from the railway line does not constitute any legal obstacle to the project's design and implementation.

Hurdhana 1 and Hurdhana 2 karst lakes

Similar to Syri Sheganit, Hurdhana 1 and 2 are vauclusian karst springs of particular interest. They are located roughly 1.5 km from the railway line (see Figure 5-75 in section 5.2.10 above). Because of the permeable karst terrain, both of them communicate with the Syri Sheganit Spring (see Figure 5-75 in section 5.2.7 of baseline information). Therefore, their water and consequently their aquatic life could be affected by pollution from the project's activities.

The presence of these karst lakes does not constitute any legal obstacle to the project's design and implementation.

5.2.10.2.6. Landscape Protected Area of Bune-Velipoje

This protected area is 23,027 ha and it includes two coastal areas: the Viluni (or Velipoje lagoon) (390 ha) and the former Velipoje Reserve (694 ha); and the inland Domni wetland (Keneta e Domnit) comprising a large reedbed. The railway does not traverse the protected area. Furthermore, the railway rehabilitation does not foresee any infrastructural works inside the protected area.

International designations of Bune-Velipoje

Buna River has several international designations. It is part of the Ramsar Site "Lake Shkoder and River Buna" as well as part of the Key Biodiversity Are of Shkoder Lake – Buna River – Velioja - Vau i Dejes. The area is also part of the Important Bird Area of Velipoje and it is a Candidate Emerald Site too.

The figure below shows all the protected areas located on both sides of the railway line from Vorë to Vau Dejës.

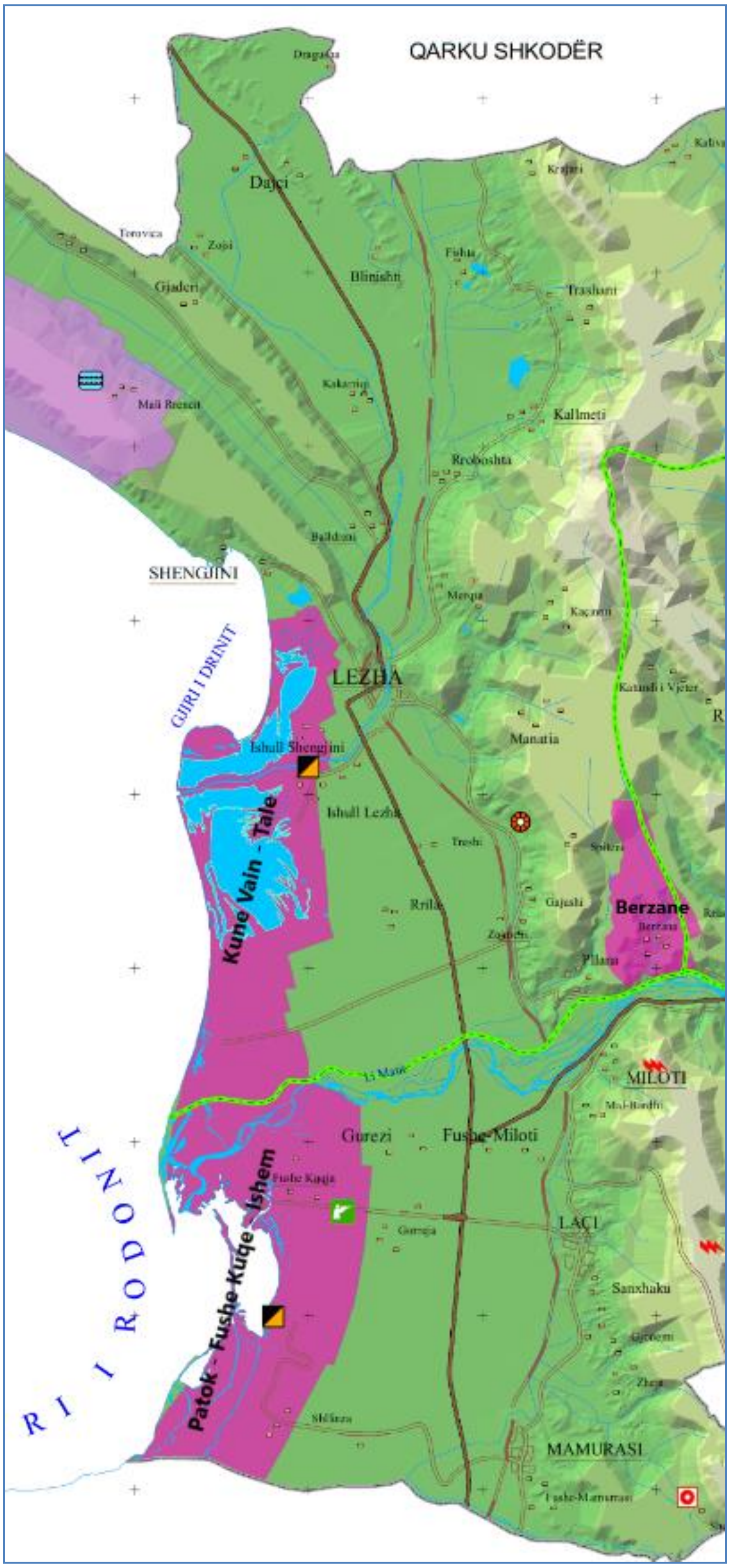


Figure 5-138_Protected areas from Vorë to Vau Dejës

Conservation objectives

In accordance with the management plan of the Landscape Protected Area of Buna River, the main goal of this designated protected area is the preservation of the ecological and cultural values of the protected area while developing potentials of socio-economic activities directly linked to the sustainable use of the services granted by the Protected Landscape's ecosystem. Consistently, the management authorities have defined two main objectives:

- Conservation of ecological and cultural values meaning the conservation of rangelands, the conservation of wildlife and the conservation of water resources.
- Development of livelihoods based on sustainable use of ecosystem services such as agriculture and livestock sectors, tourism sector and safe supplies of drinking water.

The Ramsar site and the IBA are focused on birds' protection.

The trigger species for the Candidate Emerald Site are not publicly known: the list was initially prepared some 10 years ago in the frame of a grant from Bern Convention and was not made publicly available. The contour of the Emerald Site overlaps with the project footprint on *km 93 + 200 to km 95 + 600*.

The Important Bird and Biodiversity Area of Velipoje and the Key Biodiversity Area of Shkoder Lake – Buna River – Velipoje - Vau i Dejes overlap again with the Project footprint. The area is recognized as a Key Biodiversity Area classified as "IBAT for Research and Conservation Planning", namely it is identified as a potential area of conservation interest through a partnership among BirdLife International, Conservation International, International Union for Conservation of Nature and United Nations Environment Programme World Conservation Monitoring Centre.

5.2.10.2.7. Nature Managed Reserve of Kune-Vain

The total surface of the protected area is considered about 4,400 ha and it is located circa 1,7 km west of the railway line.

Ecological features, focused mostly at biological ones, are the most important part of the area and designating it as important at national and international level. The main habitats of the protected area include marine, estuarine, palustrine and riverine

The higher number of species in Kune Vain is that of *Graminaceae* family represented by 35 species. The second are *Composiates* families with 24 species, followed by *Leguminosae* family with 20 species, *Gyperaceaes* with 16 species, and *Chenopodiacea* with 16 species.

The main vegetation types of Kune Vain Marshland include aquatic, hydro-hygrofil, halophytic, psamophylic vegetation as well as forests and shrubs. The main species that forms vegetation of aquatic bed are *Zosterra noltii* and *Ruppia cirrhosa*. Hydro-hygrophylic vegetation covers a relatively big part of the Kune Vain Marshland. They are represented by the plant community of *Phragmites australis*, spread mostly in the shore of lagoons (mostly in Ceka Lagoon). Halophile vegetation is spread in the sites with the highest salinity. The main communities identified in the area are those with predominant species of *Arthrocnemum* genera. Those with predominant species of *Juncus* genera, are represented by *Juncus acutus* and *Juncus maritimus*, that often forms a continuous belt and sometime are altered with other communities of *Arthrocnemum* sp.

The forests communities cover a surface of about 200 ha of Kune Vain Marshland, and are concentrated mostly at Kune Island. The communities with predominant species of *Alnus glutinosa* and *Fraxinus angustifolia* is one of the most important community. Also *Ulmus minor*, *Qurcus robur*, *Populus alba*. Etc., are developed in the same area.

The diversity of fauna is conditioned not only by physical proprieties of the area, but also from high diversity of the flora. Entomo-fauna of Kune Vain is dominated by coastal species, combined with lagoon and forest ones. The fish community in Kune Vain Protected Area have a high diversity. It is related to three typical and different water bodies: Shallow waters of Lagoons, seawaters and running (Drini River) waters. 26 species of fish are observed in Kune Vain Marshland. 12 of them are met in Drini River and 14 fish species are counted in lagoon waters. 10 species of amphibians and 29 species of reptiles are registered in Kune-Vain. Sometime, *Caretta caretta* is trapped in fishing nets on the sea. The area is rich in bird species with a lot of them present during wintering seasons. Up to 20,000 water birds have been recorded in the area a few years ago.

5.2.10.2.8. Nature Managed Reserve of Patok-Fushe-Kuqe-Ishem

The site is designated as Nature Managed Reserve of Patok-Fushekuqe-Ishem by the Decision of the Council of Ministers nr. 995 dated 03.11.2010.

Patoku Lagoon and the outlet of Ishmi River compose a coastal wetland located in the northwestern part of Albania. This wetland complex is well known for its rich biodiversity and as such, it is considered as a Key Biodiversity Area, part of the Southwest Balkan Corridor (cf. Mediterranean Basin Biodiversity Hotspot Ecosystem Profile). The site is an Important Bird Area (Heath and Evans 2000) as well as a Specially Protected Area under the Barcelona Convention.

The lagoon of Patoku and the surrounded area covers about 400 ha and is separated in two parts by a dyke on which is built a road. The northern part named “Patok i vjeter” resembles more a gulf, almost closed by a sand bar. The southern part is artificially communicating with the sea. The recent offshore sand bank of alluvial deposits is exceptionally rich in terms of biomass and hosts a great number of waders. The halophyte vegetation of the lagoon of Patoku encompasses the following associations: *Cakilo-Xanthietum italici, Salicornietum europeae, Arthrocnemetum glauci, Agropyretummediterraneum, Juncetum maritini, Scirpetum maritini* and *Phragmitetum communis.* The algae found in the lagoon are mainly *Zostera noltii*. The main crustacean decapods sampled in the area are *Gennadas elegans, Solenocera membranacea, Penaeus trisulcatus, Sicyonia carinata, Sergestes arcticus, Lucifer typus*. The fish found in the lagoon are flathead mullet, thin lip mullet, leaping mullet, European sea bass, scald fish and imperial scald fish. The high biodiversity of the saltmarshes in this area represents a reservoir for migratory waterfowl and waders. Herons, pelicans and cormorants and other species have been seen. Fox and marten have also been reported in Fushe Kuqe Reserve.

Patok is one of the most important coastal wetlands of Albania, an area on considerable interest for wintering water birds and migratory waders. Its shallow waters offer foraging ground for many water birds where is worth mentioning the presence in several occasions (1993 and 2006) of the Critically Endangered Species of Slender-billed Curley *Numenius tenuirostris*. At the same time, Patok and its surroundings offer a migrating ground for Globally Threatened species of Loggerhead *Caretta caretta* and Green turtle *Chelonia mydas*, The surrounding rivers of Ishmi and Mati are available habitats for the Nationally Vulnerable species of Otter *Lutra lutra* while the wetland forestry habitats offer the southernmost distribution area for the Pedunculate oak *Quercus robur*.

The protected area is located 2.7 km from the railway and impact of the railway reconstruction on the nature managed reserve is considered as inexistent.

5.2.10.3. Ecological structure and functions needed to maintain viability

The consultation with the stakeholders has confirmed that the proposed project is adjacent to some significant biodiversity feature already identified by the project team. This includes all the protected areas described above as well as:

- Lake Shkoder and River Buna Ramsar site (No. 1598),
- The Important Bird and Biodiversity Area of Lake Shkoder (AL001),
- the Important Bird and Biodiversity Area of Velipoje (AL013),
- the Important Bird and Biodiversity Area of Drini Delta (AL007),
- the Important Bird and Biodiversity Area of Patoku Lagoon (AL014)
- the Key Biodiversity Area of Lake Shkoder-Bune-Velipoje-Vau i Dejes (AL010),
- the Key Biodiversity Area of Patoku lagoon (ALB07),
- the Candidate Emerald Site of Shkoder (AL0000009),
- the Candidate Emerald Site of Bune-Velipoje (AL0000021),
- the Candidate Emerald Site of Shengjin-Ishem (AL0000017),
- the Candidate Emerald Site of Berzane (AL0000025).

The Emerald Network is an ecological network of Areas of Special Conservation Interest (ASCIs), which was established to conserve the species and habitats of the Bern Convention requiring specific protection measures.

The table below gives the list of the nearest emerald sites to the railway line.

Table 5-78_ Candidate Emerald Sites in the wide project area

No	Candidate Emerald Sites in Albania	Site Code	Type of site	Distance from the railway line
1	Shkoder Lake Managed Nature Reserve (Albanian part)	AL0000009	IBA; IPA; Cross-border; Ramsar	The transit/traditional use subzone (Terrestrial part of the NMR) is crossed by the railway line. (Malesia Madhe Municipality)
2	Buna River Mouth-Velipoje (Protected Landscape)	AL0000021	IBA; IPA; Cross-border	3.5 km West (Shkoder Municipality)
3	Shengjin-Ishem (Managed Nature Reserve): Includes PAs of Kune Vain-Tale and Patok-Fushe Kuqe-Ishem	AL0000017	IBA; IPA	1.3 km West (Lezhë & Kurbin municipalities)
4	Berzane (Managed Nature Reserve)	AL0000025	IPA	2.5 km East (Lezhë Municipality)

Lake Shkoder and River Buna Ramsar site (No. 1598)

Lake Shkoder and River Buna has been designated in 02/02/06. It covers the eastern side of the lake and the River Buna with its near natural delta on the East Adriatic coast. The area comprises a variety of habitats: freshwater, brackish water, woodland, freshwater marshes, wet pastures, sandy shore and rocky habitats supporting about 900-1000 plant species. Connection with the River Drin ensures the migration of mainly fish species from the Adriatic via Shkoder Lake to and from Ohrid and Prespa Lakes, such as the Endangered European Eel *Anguilla*

anguilla. The site hosts about 25,000 wintering water birds, amongst them the endangered *Oxyura leucocephala* and the Critically Endangered *Numenius tenuirostris*.

Important Bird and Biodiversity Areas and Key Biodiversity Areas

The concept of Important Bird and Biodiversity Areas (IBAs) was developed by BirdLife International as a network of places or sites of international significance for the conservation of birds and other biodiversity features. BirdLife International has, to date, identified and documented more than 13,000 sites in over 200 countries and territories worldwide, as well as in the marine environment

These sites provide the BirdLife Partnership and planning or decision-making authorities of different countries with a focus for conservation action, planning, and advocacy. IBAs are large enough to safeguard a viable population of a species, group of species, or entire avian community during at least part of its life-cycle, but are small enough to be conserved in their entirety.

Key Biodiversity Areas (KBA) focus on safeguarding global biodiversity and are recognised as vital land, freshwater, and marine sites for threatened plants and animals. They are currently identified using the "Global Standard for the Identification of KBAs" set out by the IUCN in 2016. These criteria have quantitative thresholds devised over years of planning. KBAs extend the IBA concept to other taxonomic groups and are now being identified in many parts of the world, by a range of organisations. All IBAs are KBAs, but some KBAs are not IBAs (i.e. they are significant for the conservation of other taxa, but not birds). Nevertheless, the IBA network has proved a good approximation to the overall network of KBAs, as it includes the bulk of other target species and the most significant sites.

The Important Bird and Biodiversity Area of Lake Shkoder (AL001) and Key Biodiversity Area of Lake Shkoder-Bune-Velipoje-Vau I Dejes (AL010)

This is an important site for wintering water birds. An average number of circa 27,600 water birds has been counted in the Albanian part of the lake during the International Water bird Census 1993-2020. The site is particularly important for the wintering Pygmy Cormorant *Microcarbo pygmeus* and Great Cormorant *Phalacrocorax carbo*.

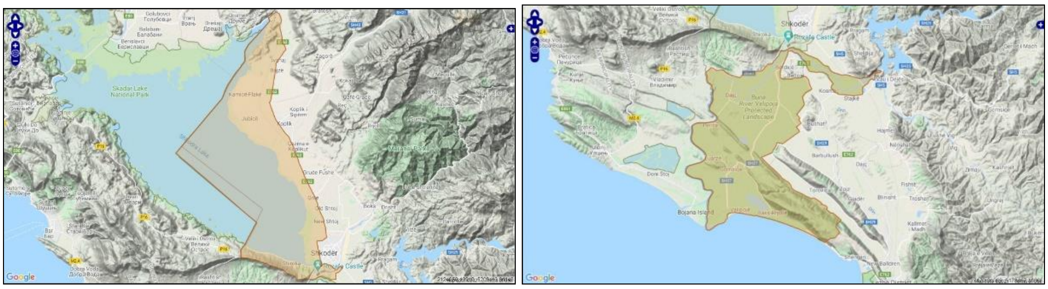


Figure 5-139_Left: IBA Lake Shkoder (AL001); Right: IBA Velipoje (AL013)

The Important Bird and Biodiversity Area of Velipoje (AL013) and Key Biodiversity Area of Lake Shkoder-Bune-Velipoje-Vau i Dejes (ALB10)

Herons, *Platalea leucorodia* and *Phalacrocorax pygmeus* used to breed inside the reserve, close to the mouth of the Buna River. The site is also important for wintering waterfowl (max. 8,000 individuals in 1993) and for migratory water birds.

The Important Bird and Biodiversity Area of Drini Delta (AL007) and Key Biodiversity Area of Drini Delta

Drini delta is a complex of relatively intact coastal lakes, marshes and forests. The main habitats are brackish lagoons, sandbars and beaches, marshes, reed beds and scattered woodland areas and pine plantations. The area is important for several water birds; winter water bird censuses recorded 17,000 individuals in January 1995 and 9,000 individuals in January 1996.

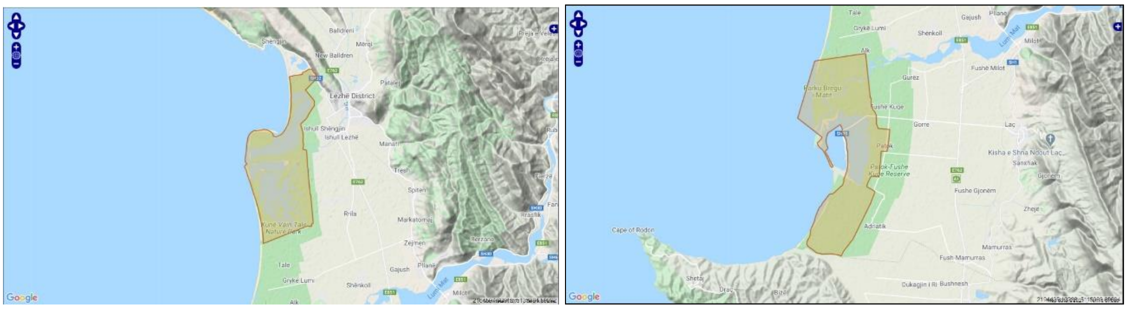


Figure 5-140_Left: IBA of Drini Delta (AL007); Right: IBA of Patoku Lagoon (AL014)

*The Important Bird and Biodiversity Area of Patoku Lagoon (AL014) and Key Biodiversity Area of Patoku Lagoon (ALB07***)**

The site includes two brackish, shallow, coastal lagoons, separated from the sea by two sandbars, with an outlet to the Adriatic Sea in the centre. At low tide, several hectares of mudflats are exposed. The area is particularly important for migratory and wintering waders (c.4,000 water birds present each year), including the globally endangered *Numenius tenuirostris*. Formerly a colony of 20-30 pairs of *Pelecanus crispus* bred on Cabok island.

5.2.10.4. Identification of Critical Habitats

Critical habitats are the most sensitive biodiversity features and are defined by EBRD PR6 as:

- Highly threatened or unique ecosystems
- Habitats of significant importance to endangered or critically endangered species
- Habitats of significant importance to endemic or geographically restricted species
- Habitats supporting globally significant (concentrations of) migratory or congregatory species
- Areas associated with key evolutionary processes
- Ecological functions that are vital to maintaining the viability of biodiversity features described (as critical habitat features)

5.2.10.4.1. Highly threatened or unique ecosystems

As the EAAA could be different for different groups of biotas, we opted to consider two different EAAAs: one for aquatic species and another one for terrestrial species. The EAAA for aquatic species covers Shkoder Lake, the river basin of Shkoder lake, Drin River, Mati River, Dora River and Ishmi River.

For terrestrial species, the EAAA is considered the northern coastal area of Albania, from Lake Shkoder until Tirana. This area covers the project footprint, area of project influence as well as surrounding areas that might be impacted directly or indirectly, including the cumulative impacts.

(a) Criteria 1.a "EAAA is habitat type listed in Annex 1 of EU Habitats Directive marked as "priority habitat type""

Despite the presence of several habitats part of Annex I of Habitats Directive, none of the habitats occurring along or close the railway and its infrastrural facilities is considered as a Priority Habitat.

(b) Criteria 1.c "EAAA is ecosystem determined to be of high priority for conservation by national systematic conservation planning"

The National Biodiversity Strategy of Albania (2012-2020) recognises that wetlands, lagoons, sand dunes and river deltas in Albania (among other habitats) are of importance for biodiversity and ecosystem services. Wetlands in Albania are reportedly under severe threat by unsustainable developments related to massive tourism and natural resource use. Therefore, this assessments considers as Criticla Habitats the following protected areas:

1) Nature Managed Reserve of Lake Shkoder,
2) Landscape Protected Area of Bune-Velipoje,
3) Nature Managed Reserve of of Kune-Vain,
4) Nature Managed Reserve of Patok-Fushe-Kuqe-Ishem

5.2.10.4.2. Habitats of significant importance to endangered or critically endangered species

(a) Criteria 2.a "EAAA for species and their habitats listed in Annex IV of the Habitats Directive"

The Habitats Directive ensures the conservation of a wide range of rare, threatened or endemic animal and plant species. Some 200 rare and characteristic habitat types are also targeted for conservation in their own right.

Articles 12 and 16 of the Habitats Directive are aimed at the establishment and implementation of a strict protection regime for animal species listed in Annex IV(a) of the Habitats Directive. In accordance with the criteria for the identification of critical habitats summarised in Table 5-39, all species part of Annex IV of Habitats Directive are immeditely fulfilling the criteria for their habitat to be assessed as Critical Habitat.

The analysis shows that 36 species of fauna, are part as Annex IV of habitats Directive. The habitats where those species are present are therefore considered as Critical Habitats (Table 5-51).

Table 5-79_Species and their habitats listed in Annex IV of the Habitats Directive

Nr.	Species	Habitats
1	*Caldesia parnassifolia* (Bassi) Parl.	Species recorded in Shkoder Lake on both sides of the Lake (Albania and Montenegro). Species on the observed location is connecetd with edges of islands of peatlands dominated by species *Phragmites australis*. In addition to the *Ph. australis*, at this site, following species occur the edges of islands: *Hydrocharis morsus ranae*, *Bidens cernua*, *Cladium marsicus*, *Thelypteris palustris*, *Calystegia sepium*, *Scutellaia galericulata*, *Ludwigia palustris*, *Utricularia vulgaris*, *Polygonum maculatum*,

Nr.	Species	Habitats
		Ceratophyllum demersum etc.
2	European waterclover (*Marsilea quadrifolia* L.)	Species recorded in Shkoder Lake on both sides of the Lake (Albania and Montenegro). Presnece of this species is reported for the sites of the littoral area of the lake.
3	Mediterranean Horseshoe bat *Rhinolophus euryale*	Present in coastal area of Albania although not observed in the project area during the surveys.
4	Greater horseshoe bat *Rhinolophus ferrumequinum*	Warm caves, mines, permanent pastures and deciduous woodlands. Widespread in Albania, but in decline. including the c.oastal area
5	Lesser horseshoe bat *Rhinolophus hipposideros*	Widespread in Albania although not observed in the project area during the surveys. It uses caves and riparian vegetation. Very likely present in the area of Shkoder.
6	Greater mouse-eared bat *Myotis myotis*	Present in coastal area of Albania although not observed in the project area during the surveys. Very likely present in the area of Shkoder.
7	Kuhl's pipistrelle *Pipistrellus kuhlii*	Present in coastal area of Albania although not observed in the project area during the surveys. Very likely present in the area of Shkoder.
8	Nathusius pipistrelle *Pipistrellus nathusii*	Present in coastal area of Albania although not observed in the project area during the surveys. Very likely present in the area of Shkoder.
9	Common pipistrelle *Pipistrellus pipistrellus*	Widespread in whole project area.
10	Soprano pipistrelle *Pipistrellus pygmaeus*	Present in coastal area of Albania although not observed in the project area during the surveys.
11	Common dormouse *Muscardinius avellanarius*	Mixed deciduous forest. It has been recorded in few localities so far in Albania.It could be present in the area.
12	Otter *Lutra lutra*	All over the project area. The presence of the species in the project area has been confirmed by previus field survey as well as litterature review.
13	Four-lined snake *Elaphe quatuorlineata*	The presence of the species in the project area has been confirmed by previus field survey as well as litterature review.
14	The Balkan terrapin *Mauremys rivulata*	The presence of the species in the project area has been confirmed by previus field survey as well as litterature

Nr.	Species	Habitats
		review.
15	Aesculapian Rat snake *Zamenis longissimus*	The presence of the species in the project area has been confirmed by previus field survey as well as litterature review.
16	Leopard snake *Zamenis situla*	Present in coastal area of Albania although not observed in the project area during the surveys.
17	European pond turtle *Emys orbicularis*	The presence of the species has been confirmed in the project area in ditches at the Project Area.
18	European cat snake *Telescopus fallax*	Present in coastal area of Albania although not observed in the project area during the surveys.
19	Hermann's tortoise *Testudo hermanni*	Species present along the terretrial habitats at lowland areas of Albania.
20	Balkan green lizard *Lacerta trilineata*	Present in coastal area of Albania although not observed in the project area during the surveys.
21	European green lizard *Lacerta viridis*	It has been observed at the terrestrial habitats along the railway line.
22	Dahl's whip snake *Platyceps najadum*	Present in coastal area of Albania although not observed in the project area during the surveys.
23	Balkan wall lizard *Podarcis tauricus/ionicus*	It has been observed at the terrestrial habitats along the railway line.
24	Giant glass lizard *Pseudopus apodus*	Present in coastal area of Albania although not observed in the project area during the surveys.
25	Horned viper *Vipera ammodytes*	Present in coastal area of Albania although not observed in the project area during the surveys.
26	Albanian water frog *Pelophylax shqipericus*	Present in coastal area of Albania although not observed in the project area during the surveys. Nevertheless, the presence of this species, endemic to Albania and Montenegro, and a species of restricted geographical distribution, is very likely in the project area.
27	Agile frog *Rana dalmatina*	It has been observed in the coastal area of Albania.
28	European tree frog *Hyla arborea*	Presence of this species has been confirmed in the deciduous forest along the riparian habitats.
29	Unio crassus	Threaten by water pollution, drainage, regulation activities/construction of running waters.
30	The Adriatic sturgeon *Acepenser naccarii*	Adriatic sturgeon historically occurred to the Buna drainage in Albania (Kottelat & Freyhof 2007). Naturally

Nr.	Species	Habitats
		reproducing populations along the Balkan coast are believed to be extinct with the last record coming from the Buna River, Albania in 1997.
31	European sea sturgeon *Acipenser sturio*	Similarly to Adriatic sturgeon historically occurred to the Buna drainage in Albania (Kottelat & Freyhof 2007). Naturally reproducing populations along the Balkan coast are believed to be extinct with the last record coming from the Buna River.
32	Twait shad *Alosa fallax*	Following different records seems that they have become very rare in the Shkoder Lake/Shkoder in Montenegro, but presence is River Buna is still satisfactory.
33	*Alosa sp*. nov.'Shkoder'	
34	Bitterling (*Rhodeus amarus*, Bloch, 1782)	Occurs most abundantly in still or slow-flowing water with dense aquatic vegetation and sand-silt bottom as lowland ponds, canals, slow-flowing rivers, backwaters and oxbows, where mussels are present.
35	Adriatic trout *Salmo obturostris*	Soft mouth trout are the most intriguing member of the genus Salmo; previously known as *Salmothymus*. Five distinct populations exist, one of them in Shkoder Lake Basin.
36	Montenegrin ukleva *Telestes montenegrinus*	Endemic Balkans. Present in Lake Shkoder basin (Montenegro, Albania). Occurs in a wide range of habitats from small mountain streams to lakeshores. Reported to feed on plankton and bottom fauna.

For all the above species, the Biodiversity Management Plan should foresee specific mitigation and net gain measures.

5.2.10.4.3. Habitats of significant importance to endemic or geographically restricted species

The survey of the project area and the literature review could provide evidences on the presence of seven species either endemic or geographically restricted (Table 5-53).

Table 5-80_Endemic or geographically restricted species

No.	Species	Habitats
1	*Radomaniola callosa*	The species is subendemic. Present only in Albania and Montenegro. It is connected to freshwater systems including Drin river, Buna river and Lake Shkoder.
2	*Radomaniola elongate*	This species is recorded in Lake Shkoder, in spring, on the island of Vranjina in the Montenegrin side. Neverthelesss, it is thought that the species has a wider distribution.

No.	Species	Habitats
3	Lakes radomaniola *Radomaniola lacustris*	Present mostly in the spring, in areas located in Lake Shkoder and firstly described on Montengrinian side of the lake. Following those records, it seems that *Radomaniola lacustris* inhabits the southwestern part of the lake, which is an area known to harbor many sublacustrine springs. It seems probably that these two hydrobid species require the specific environment associated with sublacustrine springs, a patchy system of porous stones or rocks, called “litoral interlithon”.
	Bithynia zeta Glor & Pesic, 2007	This species is considered as a most common together with *Bithynia skadarski* among other species of this genus recorded in Lake Shkoder, both in Montenegro and Albania.
	Bithynia skadarskii Glöer & Pešić, 2007	This species is considered as a most common together with *Bithynia zeta* among other species of this genus recorded in Lake Shkoder, both Montenegro and Albania.
	Vinodolia scutarica (Radoman, 1973)	Gastropod species located in Montenegro and Albania. In Lake Shkoder it is recorded in drainage areas.
	Vinodolia matjasici (Bole, 1961)	Gastropod species located in Lake Shkoder drainage aream, both in Montenegro and Albania.
	Plagigeyeria zetaprotogona Schütt, 1960	This speices has been recorded on Montenegrin side of Lake Shkoder.
	Plagigeyeria zetaprotogona vitoja Reischütz & Reischütz, 2008	This speices has been recorded in the Montenegrin side of Lake Shkoder.
	Valvata montenegrina Glöer & Pešić, 2008	This speices ha sbeen recorded on both sides of Lake Shkoder (Albania and Montenegro) and it ingabits subterranean springs located in the littoral zone of the lake.
	Stagnicola montenegrinus Glöer and Pešić, 2009	Lives in emergent (*Phragmites communis*) and floating (*Nymphaea alba, Nuphar luteum*) vegetation in the littoral zone together with *G. ioanis* (Lake Shkoder)
	Radix skutaris Glöer & Pešić, 2007	Lives in emergent (*Phragmites communis*) and fl oating (*Nymphaea alba, Nuphar luteum*) vegetation in the littoral zone together with *Gyraulus ioanis* (Lake Shkoder)
	Gyraulus ioanis Glöer & Pešić, 2007	Lives in emergent (*Phragmites communis*) and floating (*Nymphaea alba, Nuphar luteum*) vegetation in the littoral zone together with Gyraulus shasi (Lake Shkoder)
	Gyraulus meierbrooki Glöer & Pešić, 2007	Lives in emergent (*Phragmites communis*) and floating (*Nymphaea alba, Nuphar luteum*) vegetation in the littoral zone in Shkoder Lake

No.	Species	Habitats
	Gyraulus shasi Glöer & Pešić, 2007	Lives in emergent (*Phragmites communis*) and floating (*Nymphaea alba, Nuphar luteum*) vegetation in the littoral zone together with *Gyraulus ioanis* (Lake Shkoder)
4	Ohrid loach *Cobitis ohridana*	Ohrid loach occurs in rivers and lakes, over fine to muddy sand and among algae. As explained in Table 7, the River Semani is suitable and important habitat. Present also along the TL in Semani river, and channels of Hoxhara and Vjose-Levan-Fier. This is strictly freshwater species and not present in the PDA. Its natural habitats are Lake Ohrid and Lake Shkoder, and the adjacent Drim River and Moraca River basins. In last decade is been revealed in Rivers Vjosa, Semani, etc.
5	Scadar gudgeon *Gobio skadarensis*	As explained in Table 7, this species is present along the TL in Semani river, and channels of Hoxhara and Vjose-Levan-Fier. This is strictly freshwater species and not present in the PDA. Its geographical home range includes Lake Shkoder, River Drini system, Vlosa River, Semani River (both Devolli and Osumi). The river itself is suitable habitat for this species, but abundance rate is expected to be low.
6	Pindus stone loach *Oxynoemacheilus pindus*	As explained in Table 7. It is present along the TL in Semani river, and channels of Hoxhara and Vjose-Levan-Fier. It is freshwater species and not present in the PDA. This species typically occurs in creeks and streams with stone bottom and in riffles. It seems that they prefer clean and clear water with stony, gravely or sandy bottoms, with quite fast current. Meanwhile it is also found in stream sections characterized by quieter and shallow areas, including River Semani River. So, it might be concluded the low rate of abundance and fact that River Semani with high presence of sediments and glide mode of flow is not suitable habitat for Pindus stone loach. From the other side based on the limited geographical distribution (Rivers Vjosa, and Semani –Devolli & Osumi) the area shows importance for this species.
7	Albanian water frog *Pelophylax shqipericus*	Present in coastal area of Albania although not observed in the project area during the surveys of August and November. Nevertheless, the presence of this species, endemic to Albania and Montenegro, and a species of restricted geographical distribution, is very likely in the project area. Further field investigation is needed in spring 2021, corresponding to the breeding season for this species and other sibling species, such as *Pelophylax kurtmuelleri*, that

No.	Species	Habitats
		are easily distinguished from each other by mating calls.

5.2.10.4.4. Habitats supporting globally significant (concentrations of) migratory or congregatory species

We understand as migratory species as those species where a significant proportion of its members move, cyclically and predictably, from one geographical area to another (including within the same ecosystem). Meanwhile, congregatory species are defined as species whose individuals gather in large groups on a cyclical or otherwise regular and/or predictable basis (IFC, 2018).

(a) Criteria 2a. "EAAA sustains, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population at any point of the species' lifecycle"

The surveys and the literature review have identified the presence or potential presence of more than 300 migratory or congregatory species within the project area and project area of influence. The majority of those species, 250 of them, belong to the group of avifauna while the rest is composed by fish species and bats.

Despite the potential presence of a high number of migratory species, there is no evidence to suggest that habitats in the project area sustain on a cyclical or regular basis ≥ 1 % of the global population of a certain species.

Nevertheless, the project area is adjacent to Lake Shkoder, a wetland area and an important site for birds and fish and designated as Ramsar site, Candidate Emerald Site, Important Bird and Biodiversity Area and Key Biodiversity Area. Data on bird populations confirm the presence of two species whose population pass the 1% threshold of the regional population:

- Dalmatian Pelican (*Pelecanus crispus*) > 2% of the regional resident population and 1% of the global population
- Pygmy Cormorant (*Microcarbo pygmaeus*) > 1 % of the global population
- Common Pochard (*Aythya ferina*) >

The Pygmy Cormorant *Microcarbo pygmeus* is present in large numbers in Lake Shkoder, particularly during wntering seasons. Data collecteed during 1993-2020 show that the average number of wintering individuals only in the Albanian part of the lake is circa 1320 individuals. In the whole lake the number of wintering Pygmy Cormorants is larger than 1400 individuals. Considering that the global population is estimated at 45,000-139,999 individuals, the number of Pygmy Cormorant regularly wintering in Lake Shkoder is ≥ 1 % of the global population.

The Dalmatian Pelican *Pelecanus crispus* breeds in the Montenegrin side of Lake Shkoder. In 2020, the colony registered approximately 75 breeding pairs. This equates in 150 mature individuals. Considering that the global population is estimated at 11,400-13,400 mature individuals, the number of the Dalmatian Pelicans in Lake Shkoder is already ≥ 1.3-1.5 % of the global population.

5.2.10.4.5. Areas associated with key evolutionary processes

An area associated to key evolutionary processes should represent the following features (IFC PS6)

- the physical features of a landscape that might be associated with particular evolutionary processes; and/or
- sub-populations of species that are phylogenetically or morphogenetically distinct and may be of special conservation concern given their distinct evolutionary history."

For the purposes of this assessment, the Proposed Project Area has been screened against the following factors:

- Level of isolation (e.g. islands, mountaintops, lakes are associated with populations that are phylogenetically distinct);
- Extent of endemism (areas of high endemism often contain flora and/or fauna with unique evolutionary histories);
- Spatial heterogeneity;
- Presence of environmental gradients (ecotones produce transitional habitat which has been associated with the process of speciation and high species and genetic diversity);
- Edaphic interfaces; *and*
- Connectivity between habitats (e.g. biological corridors).

Based on the findings of the literature review and publicly available research and reports, the area of **Lake Shkoder**, could be considered to be associated with key evolutionary processes as the habitats located within the area of analysis are characterized by a high extent of endemism, particularly for the invertebrate species.

5.2.10.4.6. Ecological functions that are vital to maintaining the viability of biodiversity features described (as critical habitat features)

Field surveys and literature review shows that the majority of critical habitat qualifying species are related to the fresh water wetland of Lake Shkoder. This area is a designated Ramsar Site, an IBA, KBA, Candidate Emerald Site, Important Plant Area etc. It holds important concentrations for the Dalmatian Pelican, Pygmy Cormorant as well as specimen of several species that are in need of strict protection.

5.2.10.4.7. Summary of the findings of the Critical Habitat Screening

A summary of the key findings of the critical habitat assessment is shown below in Table 5-81. Five ecosystems and 60 species represent qualifying features for being assessed as Critical

Habitats (CH). Nevertheless, the approach has been somehow conservative as some of the qualifying species have not been supported by quantitave data due to the lack of bibliographical information on habitats and species.

The majority of the habitats and species triggering the Critical Habitat criteria occur in the protected area of Lake Shkoder.

The proposed project goes inside the Nature Managed Reserve of Lake Shkoder and reasonably close to the Lanscape Protected Area of Bune-Velipoje, Nature Managed Reserve of Kune-Vain, Nature Managed Reserve of Patok-Fushe-Kuqe-Ishem and Nature Managed Reserve of Berzane.

Furthermore, the above areas have several international designations sush as Ramsar Site (Shkoder and Bune-Velipoje), Candidate Emerald Sites, Important Bird and Biodiversity Areas, Key Biodiversity Areas etc.

Table 5-81_Critical Habitat Qualifying Features

EBRD Criterion	Qualifying Criterion according to tables 5.39 and 5.40 above	Critical Habitats qualifying Features	Justification
Highly threatened or unique ecosystems	1c (Table 5-39)	Nature Managed Reserve of Lake Shkoder	Protected Area
	1c (Table 5-39)	Landscape Protected Area Bune-Velipoje	Protected Area
	1c (Table 5-39)	Nature Managed Reserve Kune-Vain-Tale	Protected Area
	1c (Table 5-39)	Nature Managed Reserve Patok-Fushekuqe-Ishem	Protected Area
	1c (Table 5-39)	Nature Managed Reserve Berzane	Protected Area
Habitats of significant importance to species of conservation concern	2b (Table 5-39)	Mediterranean Horseshoe bat *Rhinolophus euryale*	Annex IV Habitats Directive
	2b (Table 5-39)	Greater horseshoe bat *Rhinolophus ferrumequinum*	Annex IV Habitats Directive
	2b (Table 5-39)	Lesser horseshoe bat *Rhinolophus hipposideros*	Annex IV Habitats Directive
	2b (Table 5-39)	Greater mouse-eared bat *Myotis myotis*	Annex IV Habitats Directive
	2b (Table 5-39)	Kuhl's pipistrelle *Pipistrellus kuhlii*	Annex IV Habitats Directive
	2b (Table 5-39)	Nathusius pipistrelle *Pipistrellus nathusii*	Annex IV Habitats Directive
	2b (Table 5-39)	Common pipistrelle *Pipistrellus pipistrellus*	Annex IV Habitats Directive
	2b (Table 5-39)	Soprano pipistrelle *Pipistrellus pygmaeus*	Annex IV Habitats Directive
	2b (Table 5-39)	Common dormouse *Muscardinius avellanarius*	Annex IV Habitats Directive
	2b (Table 5-39)	Otter *Lutra lutra*	Annex IV Habitats Directive
	2b (Table 5-39)	Four-lined snake *Elaphe*	Annex IV Habitats Directive

EBRD Criterion	Qualifying Criterion according to tables 5.39 and 5.40 above	Critical Habitats qualifying Features	Justification
		quatuorlineata	
	2b (Table 5-39)	The Balkan terrapin *Mauremys rivulata*	Annex IV Habitats Directive
	2b (Table 5-39)	Aesculapian Rat snake *Zamenis longissimus*	Annex IV Habitats Directive
	2b (Table 5-39)	Leopard snake *Zamenis situla*	Annex IV Habitats Directive
	2b (Table 5-39)	European cat snake *Telescopus fallax*	Annex IV Habitats Directive
	2b (Table 5-39)	Hermann's tortoise *Testudo hermanni*	Annex IV Habitats Directive
	2b (Table 5-39)	Balkan green lizard *Lacerta trilineata*	Annex IV Habitats Directive
	2b (Table 5-39)	European green lizard *Lacerta viridis*	Annex IV Habitats Directive
	2b (Table 5-39)	Dahl's whip snake *Platyceps najadum*	Annex IV Habitats Directive
	2b (Table 5-39)	Balkan wall lizard *Podarcis tauricus/ionicus*	Annex IV Habitats Directive
	2b (Table 5-39)	Giant glass lizard *Pseudopus apodus*	Annex IV Habitats Directive
	2b (Table 5-39)	Horned viper *Vipera ammodytes*	Annex IV Habitats Directive
	2b (Table 5-39)	Albanian water frog *Pelophylax shqipericus*	Annex IV Habitats Directive
	2b (Table 5-39)	Agile frog *Rana dalmatina*	Annex IV Habitats Directive
	2b (Table 5-39)	European tree frog *Hyla arborea*	Annex IV Habitats Directive
	2d (Table 5-40)	Atlantic sturgeon *Accipenser sturio*	IUCN Red List CR National Red List EN
	2d (Table 5-40)	Adriatic sturgeon *Accipenser naccarii*	IUCN Red List CR National Red List EN
	2a (Table 5-40)	Europen eel *Anguilla anguilla*	IUCN Red List CR
	2a (Table 5-40)	Twait shad (*Alosa fallax* (Lacepède, 1803)	Annex I Habitats Directive Bern Convention III
	2a (Table 5-40)	Ohrid spirlin (*Alburnoides ohridanus* Karaman, 1928)	IUCN Red List VU Bern Convention III
	2a (Table 5-40)	Alosa sp. nov.'Shkoder'	IUCN Red List VU Annex II, V Habitats Directive
	2a (Table 5-40)	Western Balkan barbel (*Barbus rebeli* Koller, 1926)	Bern Convention V
	2a (Table 5-40)	Minow nasse (Chondrostoma phoxinus Karaman, 1928)	IUCN Red List VU Annex II, Habitats Directive Bern Convention III

EBRD Criterion	Qualifying Criterion according to tables 5.39 and 5.40 above	Critical Habitats qualifying Features	Justification
	2a (Table 5-40)	Bitterling (Rhodeus amarus, Bloch, 1782)	Annex II, Habitats Directive
	2a (Table 5-40)	Shkoder gudgeon (Gobio skadarensis Karaman, 1937	IUCN Red List EN
	2a (Table 5-40)	Adriatic trout (Salmthymus zetensis, Heckel, 1851)	IUCN Red List EN Annex II, Habitats Directive
	2a (Table 5-40	Telestes montenegrinus , Vuković, 1965)	Annex II, Habitats Directive Bern Convention III
Habitats of significant importance to endemic or geographically restricted species	3a (Table 5-40)	Radiomaniola *Radomaniola callosa*	IUCN Red List CR Restricted geographical range
		Radiomaniola *Radomaniola elongate*	IUCN Red List CR Restricted geographical range
		Bithynia zeta	IUCN Red List EN Restricted geographical range
		Bithynia skadarskii	IUCN Red List EN Restricted geographical range
		Vinodolia scutarica	IUCN Red List EN Restricted geographical range
		Vinodolia matjasici	IUCN Red List EN Restricted geographical range
		Plagigeyeria zetaprotogona	IUCN Red List EN Restricted geographical range
		Plagigeyeria zetaprotogona vitoja	IUCN Red List EN Restricted geographical range
		Valvata montenegrina	IUCN Red List EN Restricted geographical range
		Stagnicola montenegrinus	IUCN Red List NT Restricted geographical range
		Radix skutaris	IUCN Red List EN Restricted geographical

EBRD Criterion	Qualifying Criterion according to tables 5.39 and 5.40 above	Critical Habitats qualifying Features	Justification
			range
		Gyraulus ioanis	IUCN Red List CE Restricted geographical range
		Gyraulus meierbrooki	IUCN Red List EN Restricted geographical range
		Gyraulus shasi	IUCN Red List CE Restricted geographical range
		Microcondylaea bonellii	Restricted geographical range
		Horatia novoselensis	Restricted geographical range
		Astacus astacus	Bern Convention III
		Austropotamobius pallipes	Restricted geographical range
		Spirosperma scodraensis	Restricted geographical range
		Tubificidarum hrabei	Restricted geographical range
		Trichodrilus montenegrinus	Restricted geographical range
		Niphargus asper	Restricted geographical range
		Niphargus brevicuspis sketi	Restricted geographical range
		Niphargus inclinatus	Restricted geographical range
		Niphargus maximus vulgaris	Restricted geographical range
		Niphargus podgoricensis	Restricted geographical range
		Niphargus vranjine	Restricted geographical range
		Niphargus zorae	Restricted geographical range
		Niphargus kusceri	Restricted geographical range
		Laurogammarus scutarensis	Restricted geographical range
		Bogidiella montenegrina	Restricted geographical range

EBRD Criterion	Qualifying Criterion according to tables 5.39 and 5.40 above	Critical Habitats qualifying Features	Justification
		Albanian water frog Pelophylax shqipericus	Restricted geographical range
Habitats supporting globally significant (concentrations of) migratory or congregatory species	4a (Table 5-39)	Pygmy Cormorant *Microcarbo pygmaeus*	Nature Managed Reserve of Lake Shkoder holds regularly ≥ 1400 individuals or ≥ 1-3.1 % of the global population
	4a (Table 5-39)	Dalmatian Pelican *Pelecanus crispus*	Nature Managed Reserve of Lake Shkoder holds regularly ≥ 150 specimen of the Dalmatian Pelican ore ≥ 1% of the global population
	4b (Table 5-39)	Whiskered Tern	Nature Managed Reserve of Lake Shkoder holds regularly ≥ 1% of the regional population for the Whiskered Tern
	4a (Table 5-39)	Common Pochard (Aythya ferina)	Lake Shkoder holds regularly ≥ 2 % of the regional population for the Common Pochard
Areas associated with key evolutionary processes	N/A	Lake Shkoder	As one of the oldest lakes in the Balkans, Shkoder lake is wellknownn for the high rate of endemic species. As such the area is associated with key evolutionary processess
Ecological functions that are vital to maintaining the viability of biodiversity features described (as critical habitat features)	N/A	Lake-Shkoder-Bune-Velipoje a Ramsar Site, Important Bird and Biodiversity Areas and a Candidate Emerald Site	

As the railway rehabilitation project crosses throught a small part of the Protected Area of Lake Shkoder the impacts of the project would concern mostly this area and the Ramsar Site Lake Shkoder-Bune-Velipoje, the Candidate Emerald Sites of Shkoder and Bune-Velipoje, the Important Bird and Biodiversity Areas and the Key Biodiversity Area of Shkoder and Bune-Velipoje. Nevertheless, it is believed that the rehabitlitation would have only minor effects on those areas and the impacts on biodiversity would be insignificant in case the mitigation and compensation measures are foreseen and implemented correctly.

5.2.11. Land use

5.2.11.1. Material and method

The Corine Land cover Map, which is officially published by a governmental portal168, shows the land use within the project area.

The land use description is based also on the maps of the Protected Areas and Cultural heritage, as well as on the watercourses across the railway line.

Besides, a practical description of the land use on both sides of the railway line is described hereinafter.

5.2.11.2. Baseline information

Map 8 (Corine Land Cover Map – separate file in pdf format) shows the land use within the Project area, while the table below provides short information on the land use within the area crossed by the railway line.

Table 5-82_Land use summary within the area crossed by the railway line

No	Railway line segment (km ... to km ...)	Land use
1	**Vorë Municipality**	
2	20+563 to 23+000	-Left side (Marqinet Village): hilly agricultural land; -Right side (Old Vorë): industrial and service buildings, intercalated with agricultural land
3	23+000 to 24+100	-Left side (Gjec Kodër Village): hilly agricultural land intercalated with farmhouses; -Right side (Old Vorë): industrial buildings, interacted with agricultural land; -Left: Need for improving the railway line radius. The required land for line radius increase is partly a state (Albanian Roads Authority) property and partly private. No need for any building demolition.
4	24 +100 to 28+500 (Budull station)	Left: hilly land covered by olive trees and farmhouses; Right: industrial buildings, and houses intercalated with low arable land.
5	**Kruje Municipality**	
6	28+500 (Budull station) to 35+100 (Ishmi Bridge)	-Railway crosses low arable land and some farmhouses of Budull and Murqinë villages; -Ishmi River bed is covered with poor vegetation of low biodiversity values and therefore there is no riparian area.
7	35+100 to 41+ 900 (Ishmi River to Droja River)	-Railway crosses low arable land and some farmhouses of Gramëz, Thumanë, and Fushe Mamurras villages; -Droja River bed is narrow. No riparian vegetation within the riverbed.
8	**Kurbin Municipality**	

168 https://geoportal.asig.gov.al/

No	Railway line segment (km ... to km ...)	Land use
9	41+ 9000 to 44+400	-Railway runs through low arable land and Fushe Mamurras and Mamurras settlements
10	44+400 to 55 +500	-Railway crosses low arable land and some farm houses of Fushe Gjorm, Sanxhak, Mali Bardhë, and Fushe Milot villages; -Right side of the railway line: Need for improving the railway line radius at km 55. The required land for the line radius increase is available and is Albanian Railways property, and therefore there is no need for any building demolition.
11	55 +500 to 56+ 620	-Railway crosses Mati River bed; -Km 55+500 5+000 the river bed is covered by low vegetation of low biodiversity values; -Km 55+700 to 56+600 the river bed is covered by gravel, sand and the water body
12	**Lezhë Municipality**	
13	56+550 to 57+300	-Right: the old asphalted road, on the right of which the terrain is covered by rare shrubs; -Left: arable land of Pllanë Village
14	57+300 to 64+000	-Right: hilly arable land intercalated with inhabited areas of Pllanë, Zejmen, Markatomaj, Spiten, and Tresh Villages; -Left: -Railway runs in low land across arable lands intercalated with inhabited areas of Pllanë, Zejmen, Markatomaj, Spiten, and Tresh Villages; -Right side of the railway line: Need for improving the railway line radius at km 57+400. The required land for the line radius increase is available and is Albanian Railways property, and therefore there is no need for any building demolition
15	64+000 to 67+000	Railway runs in low land across arable lands and some farmhouses of Manati and Ishull Lezhë settlements.
16	67+000 to 68+800	Railway runs in low land across arable lands and houses of the southwest and west neighborhood of Lezhë town.
17	68+800 to 69+050	Lezhë tunnel
18	69+050 to 69+750	-Railway crosses the northwest neighborhood of Lezhë town; -Lezhë's Drini River is crossed at 69+700 to 69+750. There is no riparian area within the river bed.
19	69+750 to 84+100	-Railway runs across arable land in the Mërqi and Zadrima fields; -The site location for Lezhë 2 freight station lies entirely in arable land that is private property.
20	**Vau Dejës Municipality**	

No	Railway line segment (km ... to km ...)	Land use
21	84+100 to 87+800	Railway runs across arable land within the Zadrima field.
22	87+800 to 94+200	Railway runs in low land across arable lands and houses of the villages of Nënshat, Hajmel, Kaç, and Mjedë
23	94+200 to 95+100	The crossing of the Drini River. The riverbed is characterized by gravel and sand deposits and therefore no riparian areas are present. A barrage (Ashta HPP) is located jointly to the river crossing.
24	95+100 to 95+300	The railway runs across arable and scarce lands and houses Spathari Village.
25	**Shkoder Municipality**	
26	95+300 to 102+850	Railway runs in low land across arable lands and few houses within the villages of Ganjollë, Juban, Vukatanë and Kuç
27	102+850 to 103+150	The crossing of the Kiri River. The riverbed is characterized by gravel and sand deposits and therefore no riparian areas are present. Protection works (gabions) against erosion are built on both sides of the river bed.
28	103+150 to 107+300	-Railway line crosses the eastern neighborhood of Shkoder town, where new houses and unauthorized car and pedestrian crossings are present; -At km 104+700 the railway line passes 20m from the Historical cemetery of Rrmaji (culture monument).
29	107+300 to 111+500	Railway runs in low land across arable lands and fruit trees and numerous houses within the villages of Golem and Old Shtoj, where new houses and unauthorized car and pedestrian crossings are present.
30	**Malësia Madhe Municipality**	
31	111+000 to 117+900	Railway runs in low land across arable lands and fruit trees and numerous houses within the villages of Boric, Grilë, Omaraj, Grudë Fushe and Ktosh
32	117+900 to 118+100	The crossing of the Rrjolli stream bed, which is characterized by gravel and therefore no riparian vegetation is present
33	118+100 to 127+000	Railway runs in low land across arable lands and fruit trees and numerous houses within the villages of Kcar, Dobër, and Culaj. The agricultural land is of low to medium quality. At km 123+000 the railway line runs on the west of Koplik town.
34	127+000 to 127+100	The crossing of the Përroi Thatë (Dry Stream) Stream. The stream bed is characterized by gravel and therefore no riparian vegetation is present
35	127+100 to 130+800	Railway runs in low land across arable lands within the Aliaj village. The agricultural land is of low quality. From km 130+400 to 130+500

No	Railway line segment (km ... to km ...)	Land use
		there are some houses on both sides of the railway line.
36	130+800 to130+950	The railway line runs in low terrain, across the shrubby area that is part of the Protected area of Shkoder Lake.
37	130+950 to 132+300	Crossing the Bajzë station
38	132+300 to 135+600	-Railway line runs in low karst terrain, across the degraded forested and shrubby area that is part of the terrestrial part of the Protected area of Shkoder Lake; -At km 135+600 the railway line runs under the motorway
39	135+600 to 138+600	The railway line runs in low karst terrain, across a forested and shrubby area
40	138+600 to 139+000	Mixed industrial-inhabited area, almost parallel to the motorway, close to Hoti Village
41	139+000 to 140+000	The railway line runs in the mountainous foot through limestone terrain, parallel to the highway, which lies alongside the Shkoder Lake (protected area). The terrain is covered with rare shrubs (Mediterranean Maquis).

5.2.11.3. Findings related to the proposed project

The types of land use on both sides of the railway line are as follows:

- Agricultural lands (almost arable lands);
- Inhabited rural areas;
- Service and industrial buildings;
- Train stations;
- Urban areas (towns of Lezhë and Shkoder);
- River and stream beds (Ishmi, Mati, Drini, Kiri, etc,); and
- Forest and shrubs (terrestrial part of the Nature Managed Reserve of Shkoder Lake).

The permanent land acquisition for the project purposes is needed for the service and connectivity roads, which total length is approximately 112 km, and for the Lezhe 2 freight station. The total need for permanent land surface is approximately 7.5 ha. Details on the required permanent land surface are given in the section 6.2.10.

5.2.12. Soil and soil quality

This section deals with the pedologic type of the soils and their quality from the agricultural point of view.

5.2.12.1. Material and method

Soils alongside the railway line route are assessed from the pedologic and agricultural production.

The pedologic assessment is based on the "World Reference Base for Soil Resources Classification169". The pedologic assessment of the soils in Albania is carried out within the framework of the project "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project)170.

According to this classification, there are eight types of soil groups and sub-groups of soils that are the groups of Fluvisols and Cambisols and the sub-groups of Vertisols, Arenosols, Gleysols, Luvisols, Phaeozems, and Regosols171.

Whereas the agro production land assessment depends on the particle, size, nutritional elements, and soil depth.

The quality of the land from the agriculture production point of view can be classified as very good, good, average, low, and scarce land.

Appendix 5.3 of this report (see Appendices – separate document) provides a short description of the main characteristics of the soil groups and sub-groups as defined in the "World Reference Base for Soil Resources Classification".

5.2.12.2. Baseline information

The table below shows the pedologic composition of the soil within the railway line corridor and the quality of the land from the agricultural point of view.

Table 5-83_Type of soils alongside the railway line

No	Location (municipality)	Type of soil and WRB symbol	Comment/ quality of the agricultural land
1	Starting point	Fluvic Cambisol (CMfv)	Good
2	Vorë	Calcaric Cambisol (CMca)	Good
3	Administrative border Vorë/Kruje	Haplic Luvisol (LVha)	Good
4	Kruje	Gleyic Cambisol (CMgl)	Very good quality
5	Kruje	Gleyic Fluvisol (FLgl)	Very good quality
6	Kruje	Gleyic Cambisol (CMgl)	Very good quality
7	Administrative border Kruje /Kurbin	Vertic Luvisol (LVvr)	Good quality
8	Kurbin	Gleyic Cambisol (CMgl)	Very good quality
9	Kurbin	Gleyic Fluvisol (FLgl)	Very good quality
10	Kurbin	Gleyic Cambisol (CMgl)	Very good quality
11	Kurbin	Gleyic Fluvisol (FLgl)	Good quality
12	Administrative border Kurbin/Lezhë	Eutric Fluvisol (FLeu)	Good quality
13	Lezhë	Gleyic Fluvisol (FLgl)	Good quality
14	Lezhë	Mollic Cambisol (CMmo)	Very good quality

169 http://www.fao.org/3/i3794en/I3794en.pdf

170 Albania map of soil classification (World Reference Base for Soil Resources). Zdruli et al., 2001

171 http://www.fao.org/3/i3794en/I3794en.pdf

No	Location (municipality)	Type of soil and WRB symbol	Comment/ quality of the agricultural land
15	Lezhë	Vertic Cambisol (CMfv)	Very good quality
16	Lezhë	Calcaric Regosol (RGca)	-Scarce land; -Not appropriate for agriculture; -Lezhë tunnel
17	Lezhë	Vertic Cambisol (CMfv)	Very good quality
18	Lezhë	Luvic Phaezoem (PHlv)	-Very good quality; -Location of the site for Lezhë 2 station
19	Lezhë	Calcaric Regosol (RGca)	Good quality
20	Lezhë	Vertic Cambisol (CMfv)	Very good
21	Lezhë	Gleyic Fluvisol (FLgl)	Very good
22	Lezhë	Haplic Cambisol (CMha)	Very good
23	Administrative border Lezhë /Vau Dejës	Haplic Luvisol (LVha)	Very good quality
24	Vau Dejës	Eutric Gleysol (Gleu)	Very good quality
25	Vau Dejës	Haplic Luvisol (LVha)	Very good quality
26	Vau Dejës	Gleyic Fluvisol (FLgl)	Very good quality
27	Vau Dejës	Vertic Cambisol (CMfv)	Good quality
28	Administrative border Vau Dejës /Shkoder	Mollic Cambisol (CMmo)	Good quality
29	Shkoder	Vertic Cambisol (CMfv)	Good quality
30	Shkoder	Eutric Fluvisol (FLeu)	Good quality
31	Shkoder	Vertic Cambisol (CMfv)	Good quality
32	Shkoder	n/a	Shkoder town
33	Shkoder	Luvic Phaezoem (PHlv)	Average land quality
34	Shkoder	Haplic Luvisol (LVha)	Average land quality
35	Shkoder	Mollic Cambisol (CMmo)	Average land quality
36	Administrative border Shkoder/Malësi Madhe	Gleyic Cambisol (CMgl)	Average land quality
37	Malësi Madhe	Mollic Cambisol (CMmo)	Average land quality
38	Malësi e Madhe	Luvic Paezoem (PHlv)	Average land quality
39	Malësi e Madhe	Calcaric Phaezoem (PHca)	Average quality
40	Malësi e Madhe	Calcaric Cambisol (CMca)	-Low quality; -Colluvial deposits; -Shallow soil
41	Malësi e Madhe	Vertic Cambisol (CMvr)	-Low quality; -Colluvial deposits; -Shallow soil
42	Malësi e Madhe (Bajzë to Hani Hotit)	Calcaric Regosol (RGca)	-Scarce land; -Not appropriate for agriculture;

No	Location (municipality)	Type of soil and WRB symbol	Comment/ quality of the agricultural land
			-Covered by shrubs & degraded deciduous oak forest

Map 9 (Map 9_Map of soil types – separate file in pdf format) shows the soil types alongside of the whole railway line.

From Bubq to Milot the railway line runs mostly through Fluvisols and Cambisols, which are divided geographically into the following sub-groups:

- Fluvic Cambisols soil sub-group dominates the lowland in Murqinë and Gramëz villages' area up to Fushe Milot. This subgroup is characterized by fluvic material of fluviatile, marine, or lacustrine origin. The stratification shows stratification in at least 25 percent of the soil volume over a specified depth; stratification may also be evident from an organic carbon content decreasing irregularly with depth or remaining above 0.2 percent to a depth of 100 cm from the mineral soil surface. Thin strata of sand may have less organic carbon if the finer sediments below meet the latter requirement.
- In Fushe Milot dominates the subgroup of Calcaric Fluvisol, which is characterized by the presence of calcium carbonate, has high natural fertility but with a potential for alkalinity.

After crossing the Mati River, the railway line runs in a hilly foot terrain that is included within the territories of the villages of Zejmen, Markatomaj, Spiten, and Tresh. In the section from Mati Bridge to Tresh, the dominant subgroup is Eutric Vertisol, which is characterized by fine clay.

Within the lowland from Tresh to Ishull Lezhë to Lezhë dominates the subgroup of Eutric Fluvisols that is characterized by saturation 50% or more with bases in layers of 20-100 cm.

From Lezhë to Rroboshtë to Baqel dominates the Gleyic Cambisols sub-group. This soil type is characterized by the presence of water under 50 cm deep.

From Baqel to Hajmel to Mjedë the main subgroup is Eutric Fluvisols. The soil saturation is evaluated at 50% or more with bases in layers of 20-100 cm.

From Mjedë to Shkoder the dominant sub-soil type is the Calcaric Fluvisols that is characterized calcareous, at least 20 - 50 cm below the surface.

5.2.12.3. Findings related to the proposed project

For the proposed project it should be taken into consideration the following:

- The soil of good quality is found within the territories of Kruje, Kurbin, Lezhë, and Vau Dejës Municipalities. These soils are encountered approximately from km 30 to km 93;
- Shallow soils are encountered within the territory of Malësia e Madhe Municipality, mainly from km 130 to km 140. These soils are mostly inappropriate for agricultural purposes.

5.2.13. Infrastructure

Infrastructure includes all utilities that cross or run very close to the railway line, and therefore constitute a risk for the Project's implementation and vice-versa can be adversely affected by the construction of the railway line.

5.2.13.1. Material and method

The road infrastructure that can influence the project design and vice-versa can be influenced by the project implementation is studied in detail by the Consultant as part of the service roads, level crossings,, and underpasses and overpasses. Whereas the drainage system is taken into consideration in the hydraulic study of the project.

After careful site visits, the Consultant identified the municipalities and the institutions/ companies /operators that can provide information on the infrastructure facilities located within the fingerprint of the railway line.

The infrastructure to be identified included gas pipelines, water supply pipelines, power and telecommunication lines (underground cables and overhead lines), and power substations and cabins.

5.2.13.2. Baseline information

The infrastructure facilities identified by the Consultant include power lines (110, 220, and 400

kV), power substations and cabins, telecommunication lines (including underground cables), and water supply pipelines. Neither gas pipeline nor optical fibre system exists currently within the fingerprint of the Project's area.

The responsible institutions/ companies /operators of the facilities that can be affected by the Project's implementation are as follows:

- OSHEE (State company for Power Distribution): power lines 110 and 220 kV, power substation, power cabins;
- KESH (Albanian Power Corporation – state-owned company): power lines 400 kV;
- Municipalities: water supply facilities;
- Telecom: telecommunication cables and lines
- The infrastructure utilities identified by the Consultant include the water supply pipelines and the power lines.

Water supply lines: During the site visits, the designing team together with topographic engineers have controlled for any existing old intersection with the existing railway line Vorë-Hani Hotit.

In addition to these site visits, the designing team has realized many meetings with the water utility companies' representatives and administrators of the administrative units where the railway line passes. Table below shows the crossed water supply pipelines.

Table 5-84_List of water supply pipelines that cross the railway line

No	Location	Water supply pipe diameter (mm)
1	Km 68+410	22
2	Km 68+460	40
3	Km 93+600	200
4	Km 122+560	75
5	Km 112+600	50
6	Km 113+300	90
7	Km 114+560	65
8	Km 116+025	75
9	Km 116+565	90
10	Km 117+150	110
11	Km 118+455	50
12	Km 122+820	90
13	Km 132+290	80
14	Km 136+170	50

Power lines: During site visits and consultations with the affected municipalities, and the power operators (OSHEE and KESH), the Consultant has identified 110, 220, and 400 kV power lines, which are shown in the scheme below.

Figure 5-141_Powerline of low voltage alongside Ishmi Bridge (km 35+100)

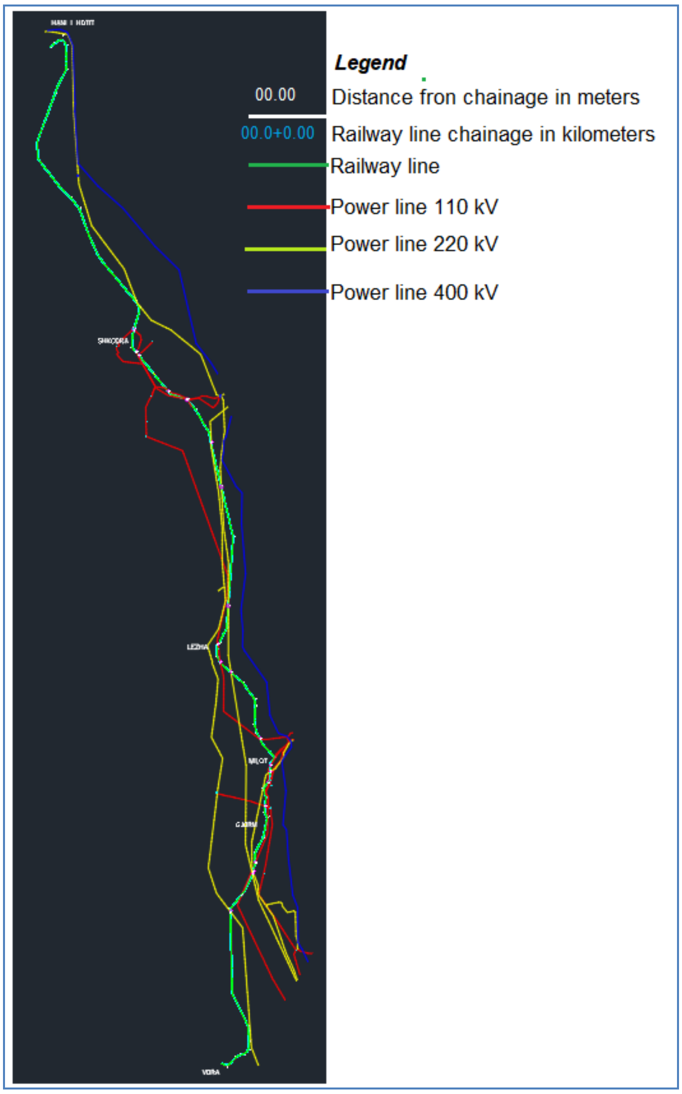


Figure 5-142_Power lines 110, 220, and 400 kV within the project area

Gas pipelines: At km 38+800, the railway line crosses the track of the planned Ionian - Adriatic Gas Pipeline (IAP). Details on the crossing of this gas pipeline are provided in the section 6.2.12.

Drainage and irrigation system: As per Detail Design Report, the crossing of the railway line with the drainage and irrigation system is taken into consideration in the Hydrologic Study of the project. New ones will replace all the existing culverts and small bridges. The same with the drainage channels that are located parallel to the railway line.

As the railway line will be rehabilitated mostly in the existing path, no new crossing with any drainage or irrigation work will be occur. The improvement of the railway line radius near Vore does not affect any drainage or irrigation work or other infrastructure facility.

5.2.13.3. Findings related to the proposed project

The infrastructure utilities that should be taken into consideration during the Project's implementation stages include power lines, water supply pipelines, the planned Ionian Adriatic Gas Pipeline (IAP) and any drainage and irrigation channel. The impacts and mitigation related to the crossed infrastructure are described in the chapter on impact and mitigation, section on infrastructure (section 6.2.13).

5.2.14. Landscape and visual issues

The landscape character consists of particular landforms and land cover of an area. While the visual amenity refers to particular visual panoramas or particular views associated with an area. The areas of high visual values consist of landscapes of special value where inappropriate development may cause a significant decrease in these values.

5.2.14.1. Material and method

The key landscape and visual elements that are considered as relevant by the EU directives, the international guidelines, the environmental national legislation, as well as by the best international practice, include topography, surface waters, vegetation, agricultural areas; infrastructure, settlements, protected areas, emerald network (Natura 2000), natural heritage and sites of particular interest, cultural heritage sites/objects, tourist sites/objects, etc.

Due to the lack of a national landscape classification, considerations on the landscape and visual amenities are based on the following issues:

- General Local Development Plans of all the crossed municipalities.
- Geological and topographical particularities of the study area; and
- Protected Areas, including nature monuments;
- Natural heritage and sites of particular interest;
- Cultural/historical heritage sites/objects/ICH;
- Tourist values and trends of the study area;
- Recreational areas;
- Map of land use;
- Site visits.

The landscape and the visual issues may be affected by the project components, including new stations, horizontal and vertical railway line improvement, new service roads and overpasses and underpasses.

5.2.14.2. Baseline information

The landscape characteristics are described section by section, from Vorë to Hani Hotit.

Section Vore - Gjorm

This section of the railway line is split into some subsections.

From Km 20+600 to km 23+500, the railway line runs in a hilly foot that borders from the north a narrow hilly valley, which lies in a southwest-northeast direction, between the hilly range of Prezë and Vorë. The hills are oriented in a north-northwest direction.

Arable lands and farmhouses of Marqinet and Kodër Gjeç villages are located on the left (north) of the railway line. Between these villages is located the abandoned clay quarry of the former brick factory of Vorë. The site of the quarry has not been reinstated.

Industrial and service buildings characterize the landscape on the right (south) of the railway line. Farmhouses are located overall around the low hill of Mukaj. The low terrain on the east of this village is covered by arable lands, while the hill is covered mostly by olive trees and, on a lesser scale by degraded shrubs. Low riverine shrubs border a small stream that runs to the right of the railway line. The railway runs in parallel with the old national road, as well as with the new one (road Sh 52). Both these roads run on the right of the railway line until km 21+900, where they merge.

As a result, there is no any particular landscape value within this subsection.

From Km 23+500 to km 30+300, the railway line runs along the eastern foot of a hilly terrain covered by olive trees and shrubs. Farmhouses within the villages of Gjeç Kodër, Prezë, Gjeç Fushe, Budull, and Fushe Prezë are located on both sides of the railway line. The landscape on the right on the line is characterized by an open field covered mostly by agricultural land and numerous farmhouses. The National Airport "Mother Teresa" is located 2.5 km on the east of the line. The farmhouses are placed without any urban plan within the agricultural plots, where are cultivated arable plants, vegetables, and fruit trees. The riverine trees of a stream are visible from the railway line. The stream runs in a south-north direction, at a distance of 1km to 2.8 km from the line. The closest cultural monument is the castle of Prezë that is located more than 1 km on the left (west) of the railway line. At km 23+300, the railway line crosses the national road (Sh 62) Bubq-Fushe Kuqe

Figure 5-143_SW-NE view; typical landscape after Budull station

From Km 30+300 to km 40+000, flat agricultural terrain cultivated mainly with crops characterizes the landscape. There are a few farmhouses on both sides of the line within the territories of Murqinë and Gramëz villages. Drainage and irrigation channels split the flat land into agricultural plots. The vegetation of these channels is low and without any biodiversity value.

At km 35+100, the railway crosses the Ishmi River. Gravel, low vegetation, and some poplar trees (*populous alba*) cover the riverbed. However, the demolition of the Ishmi Bridge and the construction of a new one in the same location may require some vegetation cleaning during the preconstruction stage.

*From Km 40+000 to km 44+400***,** agricultural lands and sparse farmlands determine the landscape character. The land is cultivated with crops and fruit trees. At km 40+350, the railway line crosses the highway. On the east of the railway line lies two low hills, in between of which is built a water reservoir that is located more than 500m far from the line.

The small river of Droja is crossed at km 41+800. The riverbed is roughly 80m wide. Gravel, poplar trees, willows, shrubs, and low vegetation of common biodiversity values cover the riverbed.

From km 42+000 to km 42+300 and km 43+500 to km 43+900, the railway line crosses the rural settlements of Fushe Mamurras and Mamurras, respectively. Densely low buildings separated by small agricultural plots characterize these subsections.

Section Gjorm - Lezhe

This section is split into some subsections.

From Km 44+400 to km 55+400, the railway line runs in low land along the western foot of a mountainous terrain that is oriented mostly in a southeast-northwest direction and is covered with forests and bushes. The villages of Zhejë, Sanxhak, and Mali Bardhë and the towns of Laç and Milot spread on the mountain foot, on the right on the railway line. A drainage channel that collects the waters of the hilly and mountainous areas runs to the right of the railway line. From km 49+800 to km 50+300, there are land parcels cultivated with fruit trees on both sides of the railway. From km 51+300 to km 52+700 lies the former industrial area of Laç that can be considered as a “ghost area”, because of the presence of the abandoned and partly demolished buildings. Whereas the landscape on the left (west) on the line is characterized by an open field covered mostly by agricultural land and farmhouses. The coastal area (Adriatic Sea) is located approximately 10 km on the west of this subsection.

From km 55+400 to km 56+600 the railway line crossed the Mati riverbed, the half of which is covered with gravel and sand, while the other half (the southern one) is covered with riverine shrubs and low vegetation.

From Mati River to Tresh Village (km 56+600 to km 64+000), the railway runs in low land that is bordered from the east by a mountainous terrain that lies in a south-north direction. The villages of Pllanë, Zejmen, Markatomaj, Spiten, and Tresh lie on the right of the railway. The western foot of the mountainous area is covered with forest, shrubs, as well as some parcels cultivated with fruit trees. A small beautiful forest (called the forest of antennas) of the circular shape is located at the top of the hill bordering the right side of the river. Whereas the landscape on the left (west) on the line is characterized by an open field covered mostly by agricultural land and a limited number of farmhouses. The coastal area (Adriatic Sea) is located more than 10 km on the west of this subsection.

From Tresh to the first crossing of Lezhë’s Drini River (km 64+000 to km 67+800) the landscape is characterized by open fields cultivated with crops, and farmhouses on both sides of the railway line. At the place called Ishull Lezhë there are industrial and service buildings on the right of the line. At the railway bridge, the riverbed is narrow and without riparian vegetation.

The railway segment located between the two crossings of Lezhë’s Drini River (km 67+800 to km 69+700) runs across the western neighbourhood of Lezhë town, on the right (west) on this river. The landscape is dominated by constructions developed without any structured urban plan, despite the efforts of the local government to discipline the new constructions and to build new infrastructure (roads, green spaces, etc.). Lezhë town and its archaeological park are located on the right of this section. The distance of the archaeological park is more than 200m from the railway line. It should be underlined that the horizontal and the vertical railway line alignment in this section will not change. The railway line within this section is visible from the Lezhë castle, which is part of the archaeological park.

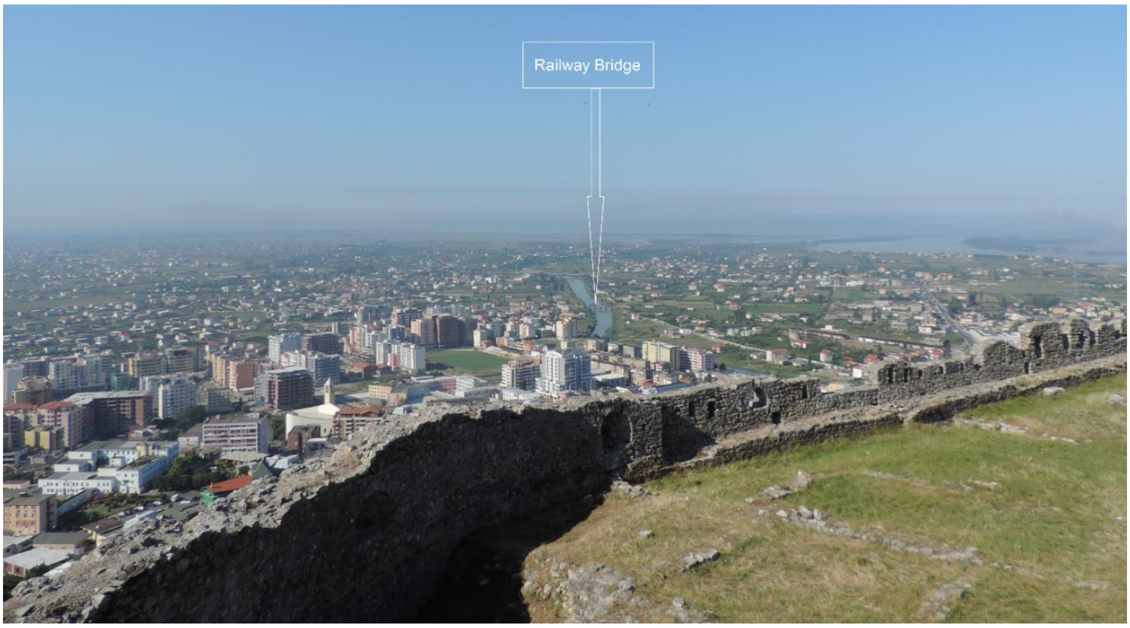


Figure 5-144_View of the railway line from the castle of Lezhë

Section Lezhe - Shkoder

This section lies within the territories of the municipalities of Lezhë (km 67+800 to km 85+350), Vau Dejës (km 85+350 to km 95+500), and Shkoder (km 95+500 to km 103+340).

From km 67+800 to km 80+800 the railway line runs across a typical flat agricultural terrain of the Mërqia field (km 67+800 to km 73+500) and the Zadrima Plain (km 73+500 to km 80+800) until the administrative border Lezhë/Vau Dejës Municipalities. The terrain on the right (east) of the line is mountainous or hilly. A drainage channel that collects the waters of this terrain runs almost parallel to the line. The distance of the line from the hilly/mountainous area varies from 100m (Mërqia Village) to 3km (Kallmet Village). While the terrain on the left is dominated by open flat agricultural lands and the limestone hill of Kakarriqi, which has a southeast to northwest direction. The minimal distance of this limestone hill to the railway is 800m.

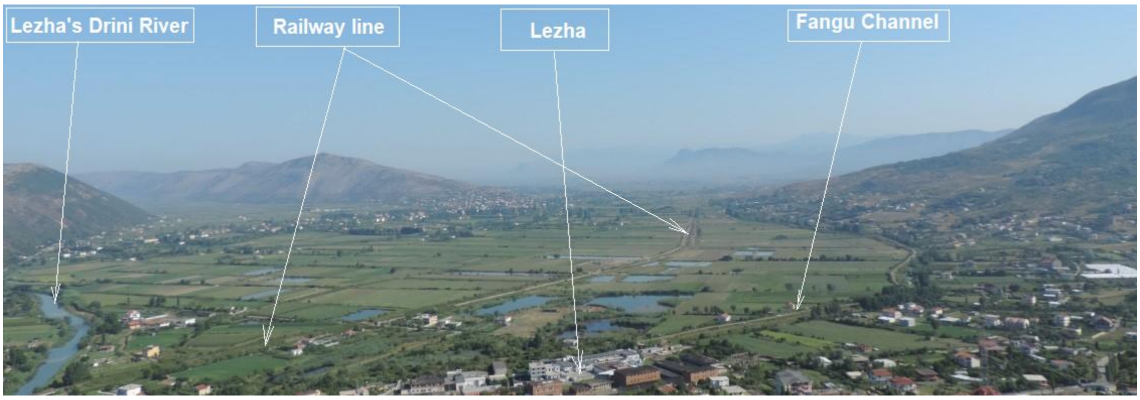


Figure 5-145_S-N view; Landscape across Merqia field, north of Lezhë town

Lezhë's Drini River runs on the left (west of the railway line), from 0.4 to 4.4 km to the line. The riverbed is narrow. On both sides of the river, rare poplars and low riverine vegetation are present.

Within this section, the vertical alignment of the railway line will be increased to avoid line inundation in case of exceptional flash floods. Close to km 71+000, Lezhë 2 station (freight station) will be located. The distance of this planned station to the closest farmhouses is approximately 500m

From km 80+800 to km 94+000, the railway line runs across a typical flat agricultural terrain of the northern part of Zadrima Plain until the village of Mjedë where the railway line crosses Drini River. The terrain on the right (east) of the line is hilly. On the left, some low hills lie in a southeast-northwest direction. The closest distance of these hills is 1km at Baqel Village. At km 90+200, the line crosses the Gjadër River, which runs in a north to south direction on the left of the line. On both sides of the river, there is low riverine vegetation.

At Baqel (km 88+000), Hajmel (km 91+000), and Mjedë (km 94+000) the railway splits the inhabited areas of these villages.

The Drini River is crossed from km 94+150 to km 95+050. The floating dam of Ashta HPP is located jointly to the Drini Bridge. The HPP reservoir (on the east) and gravel and sand and the transformed riverbed on the west dominate the landscape at the crossing of this river. It should be underlined that the Drini Riverbed has no particular riverine vegetation because of the Ashta HPP construction.

From km 95+050 to km 97+000 the railway runs in low land that is bordered from the right (east) by a mountainous terrain that lies in a southeast-northwest direction. The Ganjollë village lies on the right of the railway. The western foot of the mountainous area is almost scarce or covered by rare shrubs. Whereas the landscape on the left (south) on the line is characterized by an open field covered mostly by agricultural land and a limited number of farmhouses. The Drini Riverbed is located more than 700m on the southwest of the line.

From km 97+000 to km 103+000 the railway line runs across a typical flat agricultural terrain cultivated mainly with crops. On the right, there are some villages (Juban, Gur i Zi, and Renc) that lie at the foot of a mountainous area that lies in a southeast-northwest direction. Within the low land, there are farmhouses and some greenhouses. At km 99+500, the railway line runs across the houses of the village of Vukatanë.

Kiri Riverbed is crossed from km 102+850 to km 103+050. On both sides of the riverbed, there are protection works in gabion against the river erosion. The riverbed is covered mainly from gravel. The riverine vegetation is poor and therefore without any visual value.

Section Shkoder – Hani i Hotit

From km 103+050 to km 107+400, the railway line crosses the eastern neighbourhood of Shkoder town, where numerous new 2-3 floors buildings have been constructed on both sides of the railway line during the last 30 years. The Shkoder station will be rehabilitated and adopted to the urban characteristics of the town. The right side of Kiri Riverbed is located from 50 to 200m to the line. Within this segment, there is an embankment in gabions along the whole right side of the Kiri Riverbed.

At km 104+700, the railway line runs 100 m from the historic cemetery of Rrmaji (culture monument). From km 106+600 to km 107+200, the line runs close and in parallel to the embankment of Kiri Riverbed.

From km 107+400 to km 113+00 the landscape is dominated by flat agricultural lands and farmhouses spread everywhere in the agricultural land. The railway crosses the villages Golem, Old Shtoj, and Boriç. The shoreline of Shkoder Lake is located from 5.5 km to 150m from the railway line. The land is cultivated with crops, fruit trees, and vineyards.

From km 113+000 to km 140+000, the landscape is dominated by three main elements, as follows:

- Flat agricultural lands crossed by the railway line;
- Shkoder Lake on the left of the railway line; and
- The mountain area of the Albanian Alps on the right (east) of the railway line.

A detailed description flows hereinafter.

From km 113+000 to km 123+500, the landscape is typically agricultural. Within the territory of some villages (Omaraj, Grudë Fushe, Lower Kcar, and Culaj), there are houses on both sides of the railway line. The dominating agricultural plants are crops, fruit trees, and vineyards. The eastern shoreline of Shkoder Lake is located from 150m to 4.1km from the railway line. From km 113+900 to km 119+300, the railway line runs joint to the highway. The streambed of Rrjolli (crossed at km 118+050) has practically no vegetation. At km 119+500 a water reservoir is located 400m on the right of the railway line. This reservoir, which is filled in water from the groundwater that comes from the mountainous area on the east, gives high visual values to the landscape.

Figure 5-146_Typical landscape from Shkoder to Koplik

From km 123+500 to km 129+000, the landscape is typically agricultural, without any farmhouses close to the railway line. This landscape is dominated by the presence of Shkoder Lake that lies on the left of the railway line. The cultivated plants are mostly crops, fruit trees, and vineyards.

Përroi Thatë (Dry Stream) stream, which is crossed at km 127+100, is almost dry during the year because of the permeable land cover that allows the water to circulate under the surface. The vegetation of the streambed is poor and therefore without any significant visual value.

From km 129+00 to km 140+000, the railway line runs over a karst plain of high landscape values. The railway crosses mostly forested and shrubby areas that are included within the terrestrial part of the Protected Area of Shkoder Lake. The distance of the railway from the lake is from 3km (Aliaj village) to 100 m (close to Hani Hotit), while the distance of the mountain area is from 5 to 1 km from Aliaj to Hoti Village. Whereas from km 138+800 to km 14+000 the line runs on alongside a mountain foot.

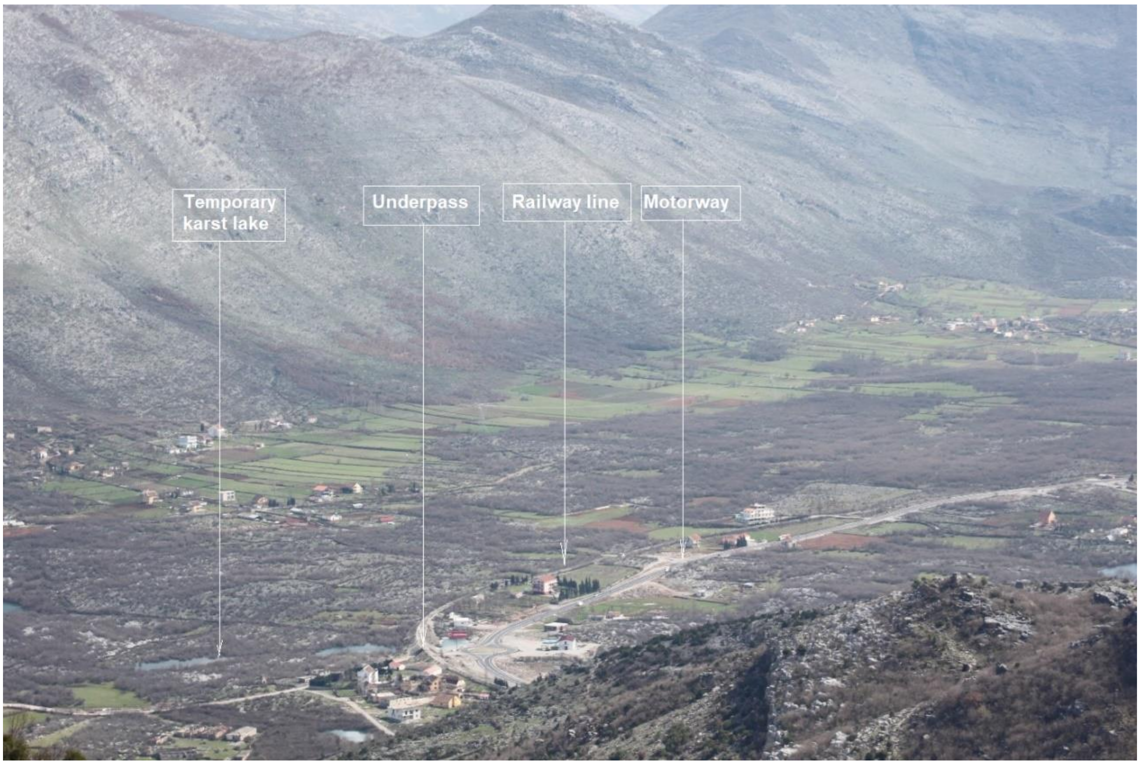


Figure 5-147_Landscape from km 138 to km 139

The landscape alongside section 4 of the railway line is dominated by the following elements:

- Shkoder Lake (Protected Area - Ramsar site) from the west;
- The steep western slopes of Albanian Alps Mountains;
- The karst plain in the territories of Bajze, Ivanaj, and Hot villages. In the territory of Bajze village, close to the lakeshore, numerous karst springs come on the surface. One of these springs (Syri Sheganit) is Nature Monument (hydro monument);
- The vegetation habitats of the shoreline of Shkoder Lake (Nature Managed Reserve);
- Numerous farmhouses dispersed in the flat land without any criterion of spatial planning.

Because of unplanned internal migration during the last 20 years, many arable lands are converted into residential lands. Many rural roads, transmission and telecommunication lines, and poorly maintained irrigation and drainage channels crisscross now the agricultural plots.

The most scenic landscapes, along with and near section 4 (km 113+000 to km 140+000) are:

- Shkoder Lake and its shoreline (Nature Managed Reserve and Ramsar site);
- The flat karst area in the segment Aliaj to Hoti Village (km 129+000 to km 138+800);
- Numerous karst lakes and karst springs, among which the Syri Sheganit (Nature Monument); and
- Many landforms in karst area;

5.2.14.3. Findings related to the proposed project

From km 23+000 to km 23+500, the railway line radius will be improved. Roughly a half of the new alignment (km 23+000 to km 23+300) will lie on an abandoned road, while the other half (km 23+300 to km 23+600) lies in a hilly foot, on agricultural land. The improvement will require a retaining wall, which will slightly affect the landscape.

At km 35+100, the railway crosses the Ishmi River. The riverbed has low and high vegetation without any special biodiversity value. However, the demolition of the Ishmi Bridge and the construction of a new one in the same location may require some vegetation cleaning during the pre-construction stage.

Both sides of Mati River crossing the landscape could be affected by earthworks for the improvement of the horizontal railway line alignment.

In the North of Lezhë the typically flat agricultural landscape could be affected by the improvement of the vertical alignment of the railway line (to avoid the line inundation), as well as from the construction of a new station (Lezhë 2) within the agricultural area.

Within the section km, 103+050 to km 107+400 (Shkoder town) the landscape could be affected by the rehabilitated Shkoder station (positive impact), the rehabilitated embankment (small positive impact), and from the construction of any protection works against rolling noise (negative impact).

The most scenic landscapes, along with and near section 4 (km 113+000 to km 140+000) are:

- Shkoder Lake and its shoreline (Nature Managed Reserve and Ramsar site);
- The flat karst area in the segment Aliaj to Hoti Village (km 129+000 to km 138+800);
- Numerous karst lakes and karst springs, among which the Syri Sheganit (Nature Monument); and
- Many landforms in karst area.

5.2.15. Cultural heritage

This section addresses cultural heritage baseline conditions for the project.

The types of cultural heritage considered in the ESIA baseline include:

- Archaeological sites, defined as physical remains of ancient or historic human activity or occupation, most often including subsurface resources, and often indicated by the presence of surface artefacts or structural remains. These include ancient cist or tumulus graves, ancient settlements, and surface ceramic scatters, among others;
- Monuments, defined as above-ground structures of public interest and/or historical significance such as historic churches, bridges, war memorials, and WWII era military facilities, among others;
- Sites with Intangible Cultural Heritage (ICH) value, defined as sites that form part of the spiritual or cultural lives of modern populations such as roadside shrines, places of worship, and modern cemeteries, among others. ICH refers to customs, traditions and beliefs that make a people or a region distinctive and socially cohesive. Sites with ICH value often include the traditional forms of cultural heritage such as historic monuments, archaeological sites, and historic landscapes, but they may also include natural features such as flora, fauna and particular ecological zones. Sites with ICH value are not specifically protected by Albanian national legislation. However, Albania has ratified the UNESCO Convention on ICH of 2003, which means that those principles are adopted automatically in Albanian Law.

- Overview of Baseline Studies:

In accordance with Albanian national laws, international best practice and Lender standard EBRD PR8 and IFC PS8, the cultural heritage baseline data collection will be undertaken in two phases to minimize risk of impacts on cultural heritage: desk study and fieldwork.

The cultural heritage baseline was compiled from the following sources:

- Desk-based research;
- Consultation with experts and knowledgeable individuals.

5.2.15.1. Material and method

The information on cultural heritage is extracted from the following sources:

- The database of the Institute of Cultural Monuments, Ministry of Culture, Albania;
- Web pages of the affected municipalities;
- Consultations with the affected municipalities;
- Scientific articles on the historical/cultural heritage; and
- Site visits

The location of the cultural heritage sites/objects is defined through the official source maps (https://geoportal.asig.gov.al/map/?themeId=3319877&auto=true).

A map of the railway line and the location of the cultural heritage sites/objects is provided as a separate document (see Map 10_Cultural Heritage Monuments – separate file in pdf format), which gives also the distance from the railway line to the closest of these sites/objects.

The cultural heritage issues should be dealt with in compliance with the provisions of the law "On Cultural Heritage and the museums"[172]. Local governments collaborate with the Ministry of Culture to preserve and protect this heritage.

Investigations focused on three general categories of cultural heritage: archaeological sites, monuments, and sites with ICH value. The work assessed the likely quality/importance level of any identified CH site as high, medium or low. It should be noted, however, that establishing the definitive cultural and scientific value of sites is the prerogative of the Ministry of Culture and local stakeholders.

The results of the studies and surveys will be used to assess potential impacts and provide recommendations for further work and appropriate mitigation and monitoring.

Table 5.58 lists the types of heritage sites considered, their characteristics and aspects of their quality and importance.

172 Law 27/2018

Table 5-85 Characteristics of Cultural Heritage Sites

Type of Heritage Site	Definition / Examples	Quality/ Importance
Archaeological Site	Ruined and/or buried occupation sites, fortifications, mosques and churches, prehistoric refuse or storage pits, villages and ancient burials.	Sites contain scientific, cultural and historic information which also has public value as the information base and public validation of national history and identity. Value should be formally recognized and validated by government authorities
Historic Monument	Standing structure with historic aesthetic or monumental value. Examples are castles, fortifications, churches and graveyards.	Sites contain cultural, artistic, historical and aesthetic value based on their appearance and contribution to the look and feel of a particular location. Value should be recognized formally and validated by government authorities.
Site with Intangible Cultural Heritage Value	A structure, place or landscape feature with special, often unexpected importance to a community or larger stakeholder group. (example: informal or modern place of worship; location or landscape feature associated with an important event; informal accident shrine; informal marked and unmarked burials and reputed burial locations).	Sites embody the local cultural and historical traditions contributing to community and local group identity and cohesion. Value may not be validated or recognized but. as with archaeological sites and monuments, is recognized by international academic and heritage preservation standards.

5.2.15.2. Desk Review

Desk-based research will be carried out to identify both cultural heritage sites and areas of archaeological potential within and near the project footprint, as well as to ascertain the treatment of cultural heritage under Albanian national legislation. The desk study will involve the collection and analysis of relevant data from government agencies, databases, archaeological and historical literature, historic and topographic maps as well as consultation with experts and other knowledgeable individuals in Albania and internationally. The data from any previous study surveys will also be incorporated into the desk review and will be used to plan further field work.

The overall objective of the desktop study was to identify the known cultural heritage sites and areas of high archaeological potential[1], to be confirmed and further investigated by fieldwork. The specific tasks of the desk study can be summarized as follows:

- Review of literature of prehistoric and historic period cultural patterns for Albania, with the goal of understanding the context and setting of the area where the Project will be implemented;
- Compilation of a list of known sites through literature review and expert consultation; and
- Identification of areas of the corridor with a high potential to contain unknown archaeological sites (often sites which were favorable to agriculture in ancient times);Sites visits to assess potential impacts from the project including visual impacts;
- Consultations were held with Ministry of Culture and National Institute of Cultural Heritage (IKTK) - Ministry of Culture and the Institute of Archaeology.

5.2.15.3. Baseline information

The area crossed by the railway line is rich in historical and archaeological heritage, especially the areas around the towns of Lezhë and Shkoder. Both the areas around the castles of these towns have the status of an archaeological park. While in the lowland of the Vorë, Kruje, Kurbin, and Lezhë Municipalities there is no known cultural heritage site. In the past, this lowland was prone to frequent floods.

Hereinafter follows a short description of some of the known historical and cultural heritage monuments/sites within the seven municipalities crossed by the railway line (see figure below) that have a formal protection status.

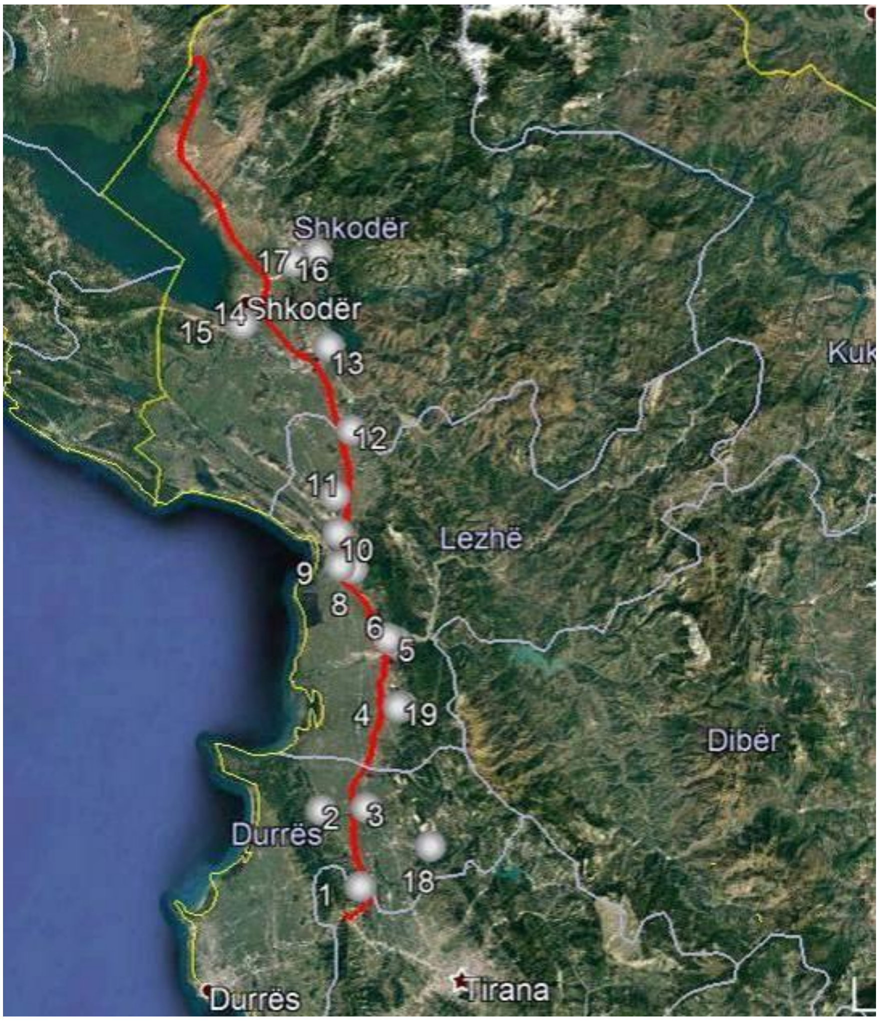


Figure 5-148_Cultural heritage sites/monuments close to the railway line

The most important cultural monument within the territory of **Vorë Municipality** is the medieval castle of Preze, which is located on the top of a hill, 900m from the railway line that runs on the lowland. Thus, this monument is not affected by the proposed project. Preza castle is no 1 in the map above.

Within the territory of **Kruje Municipality**, there are very old cultural monuments. The ancient city of Albanopolis (village of Zgerdhesh) has been founded between the 7th and 6th century BC. Albanopolis was the centre of the tribe of Albanoi. Nowadays this site is an archaeological park. Excavations inside the walls of Kruje castle show the track of an Illyrian settlement of the 3rd century BC. The distance from the railway line is roughly 9.3km (see no 18 in the map above).

Figure 5-149_Left: Preza Castle; Right: View from Albanonopolis City

Close to the town of Fushe Kruje, in Arrameras Village territory there are the ruins of the ancient settlement of Pistuli, as well as a monument of the Roman period (Roman Therms). Within Kruje Municipality, there are also some old churches such as the churches of Gjuricaj and Derven, which are built between the VI – XIV centuries AC. The Basilica of Gjuricaj is the bigger church in Albania and is localized in the west of the railway line in the village with some name. The distance from the railway line is roughly 1.7 km (no 2 in the map above).

The closest known historical and cultural heritage monument nearby the railway line is the medieval church of St. John Baptist at Derven, Kruje (built-in VIII-IX century), which is located 1.7 km on the east of km 36+000 of the railway line (no 3 in the in the map above).

The territory of **Kurbin Municipality** is known for its old city Castle of Sebasta and churches (XII-XIII centuries AC). Archaeologists have been able to identify its roots as early as the IV-III centuries BC. The fortification walls of the Castle of Sebasta served as a checkpoint on the road Durres-Lezhë-Shkoder (Dyrrhachium-Lissus-Scodrae), based on the technique of building with square stones and fragments of black varnish ceramics found inside it, which date it as a fortress of late 4th century and early 3rd century BC. The distance from the railway line is 2.0 km (no 4 in in the map above).

The Church of Saint Anthony (XII century AC), which is internationally known as a holy church and therefore visited by thousands of people each year as a pilgrimage site. The distance from the railway line is roughly 2.6 km (no 19 in in the map above).

It should be underlined that within the territory of this municipality no historical/archaeological site located close to the railway line are present.

Figure 5-150_Left: Sebasta Castle: Right: Church of Shna Ndou, Lac

The Municipality of Lezhë, especially Lezhë town, is very rich in ancient and medieval historical and archaeological heritage. That is partly due to its geographical position and the favourable terrain. The Illyrian city of Lissus (nowadays Lezhë) is thought to be the first organized settlement (IV century BC) in the territory of Lezhë municipality. The Illyrian tribe of Pirust, who were masters in navigation and metal works, built this settlement.

The most important cultural sites/objects along the railway line lie within the territory of Lezhë district and especially within the Lezhë town and its neighbouring, where is located the Archaeological Park of Lezhë173 The distance from the railway line is 380 m (no 7 in the in the map above) and therefore cannot be affected by the Project.

173 DCM 82/2000

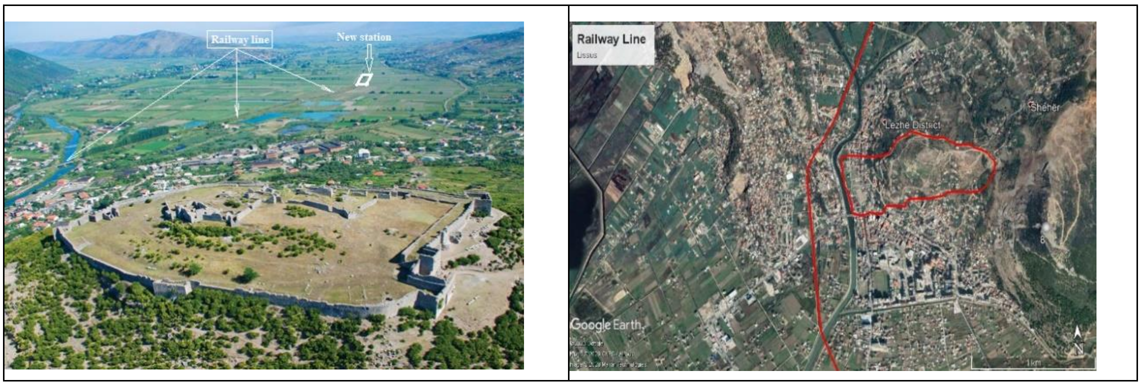


Figure 5-151_Archaeological park of Lezhë

In 2004, the Albanian Institute of Archaeology and the University of Graz, Austria, carried out a detailed archaeological study in Lezhë174. This study was preceded by a detailed review of the previous archaeological and historical documents/studies. The conclusions of this study are shortly described hereinafter.

The city of Lezhë, known as Lissus in ancient times, was built along the banks of the Lezhë's Drini river including a small hill (Acropolis, 172 m a.s.l.), which was used as a fortress. Lissus was an Illyrian settlement. Ceramics from the hill Mali e Shelbuenit (Acrolissus, 410 m a.s.l.), which lies east of Lissus suggest an Early Iron Age date (8th century BC) It is located 1.9 km from the railway line (no 8 in in the map above).

The fortification system of Lissus with its towers and walls, which enclose the Acropolis and the Lower town, was built in the 4th century BC, incorporating earlier walls of the 6th century. The city seems to have had an important seaport (Nymphaeum, today Shëngjin), as proofed by Caesar. In Byzantine and Ottoman times, the Acropolis continued to be used as a fortress.

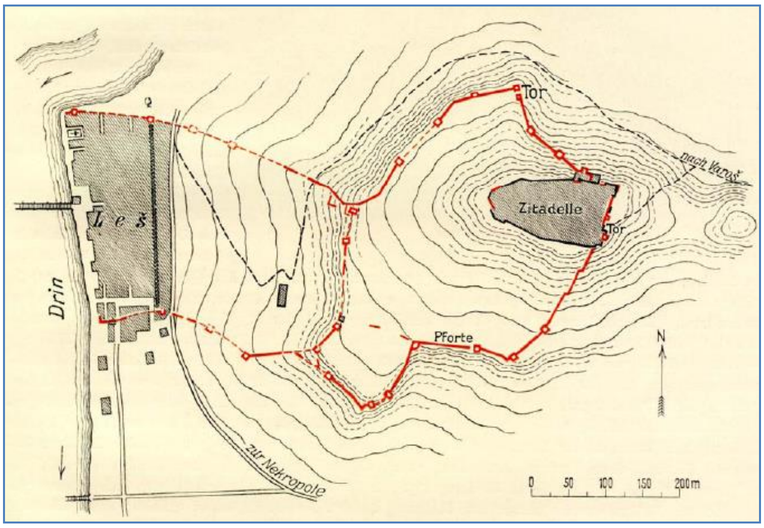


Figure 5-152_Ancient fortifications of Lezhë according to Praschniker and Schober, 1916[175]

Lezhë city territory also has significant historical values. The so-called Lower town includes the memorial place of the Albanian national hero Gjergj Kastrioti – Skanderbeg, who was buried in Lezhë in 1468. Lezhë was an important fortress for him, who formed the Albanian League here

174 https://antike.uni-graz.at/de/forschen/projekte/abgeschlossene-projekte/lissos-albanien/

175 Camillo Praschniker and Arnold Schober, Archäologische Forschungen in Albanien und Montenegro, Schriften der Balkankommission der Akademie der Wissenschaften in Wien, Antiquarische Abteilung 8 (1919).

on March 1444. The memorial place, a protective building in the form of an ancient temple, encloses the ruins of the former church of St. Nicholas (later turned into a mosque by Ottomans), which was believed to contain Skanderbeg´s grave. The distance from the railway line is 400 m, and therefore this monument cannot be affected by the Project (no 9 in in the map above).

Figure 5-153_Memorial of Skanderbeg and the ruins of the ancient city of Lissus

The closest historical/archaeological objects from the railway line are the ruins of the walls of this ancient city (see figure below), which are located roughly 350m from this line. However, the borders of the archaeological zone of Lezhë as defined by the DCM 728/2010176, are located roughly 160m from the railway line, as shown in the Map 10.2 (Map 10.2: Cultural heritage zones – separate file in pdf format).

176 On the proclamation of archaeological zones A and B of Lezhë city and the approval of their management

Figure 5-154_Castle of Lezhë -part of Lezhë Archaeological Park

Other cultural/historical sites in Lezhë municipality include the King Zog Bridge built-in 1927, which has a particular architectural structure. It is located 2.3 km upstream of Mati Bridge, on the right of the road leading to the Mirdita region (no 9 in in the map above).

Figure 5-155_The Bridge of King Zog

The church of Shna Prenda (Saint Prenda) is located in hilly terrain in the east of Pllana Village (Lezhë Municipality). It is a large one-nave church (19.2x7x5m) and is complemented by the nave and narthex. The monument is a 14th-century Benedictine-style building. The distance from the railway line is 1.7km (no 6 in in the map above).

The churches of Lezhë were of the Benedictine rite. The Church of Saint Friday is located in the village of Balldren, built on the rocky hill of a medieval settlement. The architecture of the church dates back to the centuries XIV-XV. The distance from the railway line is roughly 900 m (no 10 in in the map above). Therefore, this monument cannot be affected by the Project.

Figure 5-156_Left: Church of Saint Prenda; Right: Church of Balldren

The ruins of the Bishopric of Sapa are located at the foot of Mount St. Michael, today Nenshat Mountain, next to the monastery of the Carmelite sisters. This is a cultural heritage monument of category I.[177] The distance from the railway line is 1.6 km (no 12 in in the map above).

Shkina Bridge, which is located in the village of Blinisht, was built in the 12th century. The distance from the railway line is roughly 1.5km (no 11 in in the map above).

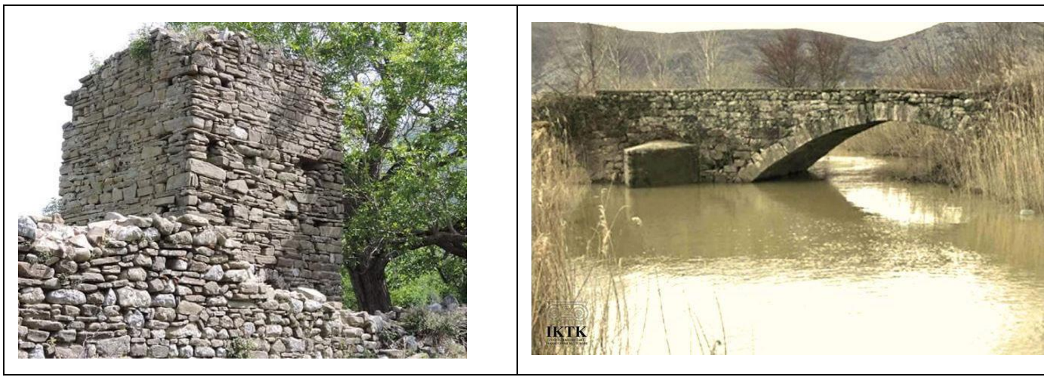


Figure 5-157_Right: Ruins of Sapa; Left: Shkina Bridge

Due to the favourable geographic position between the lowland in the West and the mountainous area in the East, the territory of **Vau i Dejës Municipality** is rich in cultural heritage assets. One of the most known of them, which is distinguished by its historic and archaeological heritage is "the culture of Koman", which preserves a rich autochthonous patrimonial heritage that proves the continuation from the Illyrian to the Albanian cultural heritage. It should be underlined also the ruins of the ancient city of Delmace, which dates from the period of the Slavic invasions in the early middle age (VI to VIIIth century AD). Other medieval assets are the old town of Deja (XII century AC) and the town of Sarda, today the fortress of Shurdhah. The most ancient known archaeological heritage of the Municipality of Vau Dejës is the Palaeolithic settlement of Gajtan as well as the Cave of Gajtan.

The closest monument to the railway line is the medieval city of Danja, built in the XI-XII century at the location where the Drini River emerges from the mountains. Inside the walls are the ruins of some churches. The distance from the railway line is 1.8 km (no 13 in in the map above).

Drishti Castle. The ancient town of Drivastium was founded during the Illyrian or Roman times to protect the Kosovo trade route. The large castle from the 12th century was part of a chain of fortifications around Shkoder. The distance from the railway line is 14 km (no 17 in in the map above)

177 DCM 242/2016

None of the cultural heritage sites of Vau Dejës municipality is located in the close vicinity of the railway line.

Within the territory of **Shkoder Municipality**, there are traces of human activity since the middle Palaeolithic age. Some of the most known cultural heritage sites are the castle of Shkoder and that of Beltojë. The late dates from the XII-X centuries BC. Other cultural heritage sites are those of Belan (Belaj), Grude, Mes, Boks, Shtoj (Burial mounds), and the ancient town of Drivastum (nowadays Drishti), which includes also a castle. A short description of these sites/objects would include:

- Gruda village territory, which archaeological findings date from the first millennium BC until the first century AD (Galaty et. Al., 2008178);
- The tumuli burials of Shtoj. On the plain of Shtoj, which is situated about 5 km to the northeast of the city of Shkoder, between the villages of Boks, Dragoc, and the Bridge of Mesi, on the western side of the Kiri River, are located 160 tumuli. The excavated tumuli date from the Early Bronze Age until the Late Iron Age. The most representative period of funerary activities dates in the Iron Age, especially between the 7th – 5th centuries B.C (Galaty et. Al., 2008);
- Boks village territory, where is located the Kratul fortification, which is situated on the homonymous hill, 143 m above the sea level, 6 km to the northeast of Shkoder and 600 m distant from the Mesi Bridge, a cultural monument of the middle age. The archaeological material indicates that life at the settlement is active from the Early Iron Age until the 1st century A.D. (Galaty et al., 2008);
- Drishti Castle. The ancient town of Drivastum was founded during the Illyrian or Roman times to protect the Kosovo trade route. The large castle from the 12th century was part of a chain of fortifications around Shkoder.
- Furthermore, the area around the Archaeological Park of Shkoder that is located around the Rozafa castle (4th century BC) is very rich in cultural heritage sites/objects.

The Mesi Bridge (Middle Bridge), built-in 1768 served to connect Drishti with Shkoder. This bridge attracts many visitors. With a length of 108 meters, a width of 3.40 meters, and 13 asymmetrical arches, hewn stones were used for its construction, while the route was made of stone slabs. The distance from the railway line is roughly 8.0km (no 16 in in the map above).

The Lead Mosque is a historical mosque and cultural monument of the first category that was 1773/1774. The domes were covered with layers of lead. It is the largest Ottoman mosque in Albania. The distance from the railway line is 2.6 km (no 14 in in the map above).

To the above cultural assets should be added the historical catholic cemetery of Rrmaji, which is located only 10 meters far from the railway line. However, it should be mentioned that a parallel local road lies between the railway line and the cemetery.

The name of Shkoder city seems to derive from the River Drini that runs joint to Shkoder castle (Shko Drin means where Drini runs), as shown in many coins of the Illyrian period. The alphabet is identical to Etruscan one, which is older than the Latin alphabet.

178 Michael Galaty et al, in "L'Illyrie Meridionale et L'epire dans l'Antiquite", 5^{e} colloque internationale, 10-12 Octobre 2008, Grenoble, France

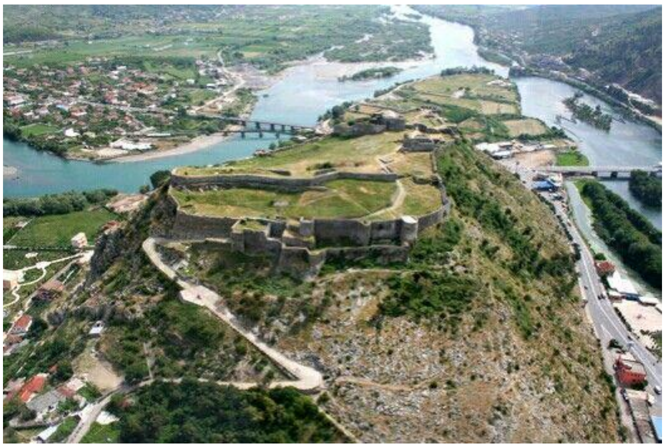


Figure 5-158_Left: Coin of Shkoder of the Illyrian Period; Right: The Castle and the Drini River

Among the cultural heritage sites of Shkoder Municipality, the closest to the railway line is as follows:

- The historical catholic cemetery of Rrmaji, which is located only 10 meters from the railway line; and
- The Catholic Cathedral of Shkoder, which is located 600m from the railway line

Within the territory of **Malësia e Madhe Municipality**, there are traces of human activity since the early ages, because of the favourable terrain, climate, and the presence of the Shkoder Lake. Among the sites shown in the above sketch map, proximate to the railway line, from south to north, are Kaldrun, Sterbeq, Koplik, Marshej, Zagore, and Mokset. A sketch of the location of these sites that date from 1000 BC until AD 0 (Galaty et. al, 2008179) is provided in the following sketch map.

179 Michael Galaty et al, in "L'Illyrie Meridionale et L'epire dans l'Antiquite", 5e colloque internationale, 10-12 Octobre 2008, Grenoble, France

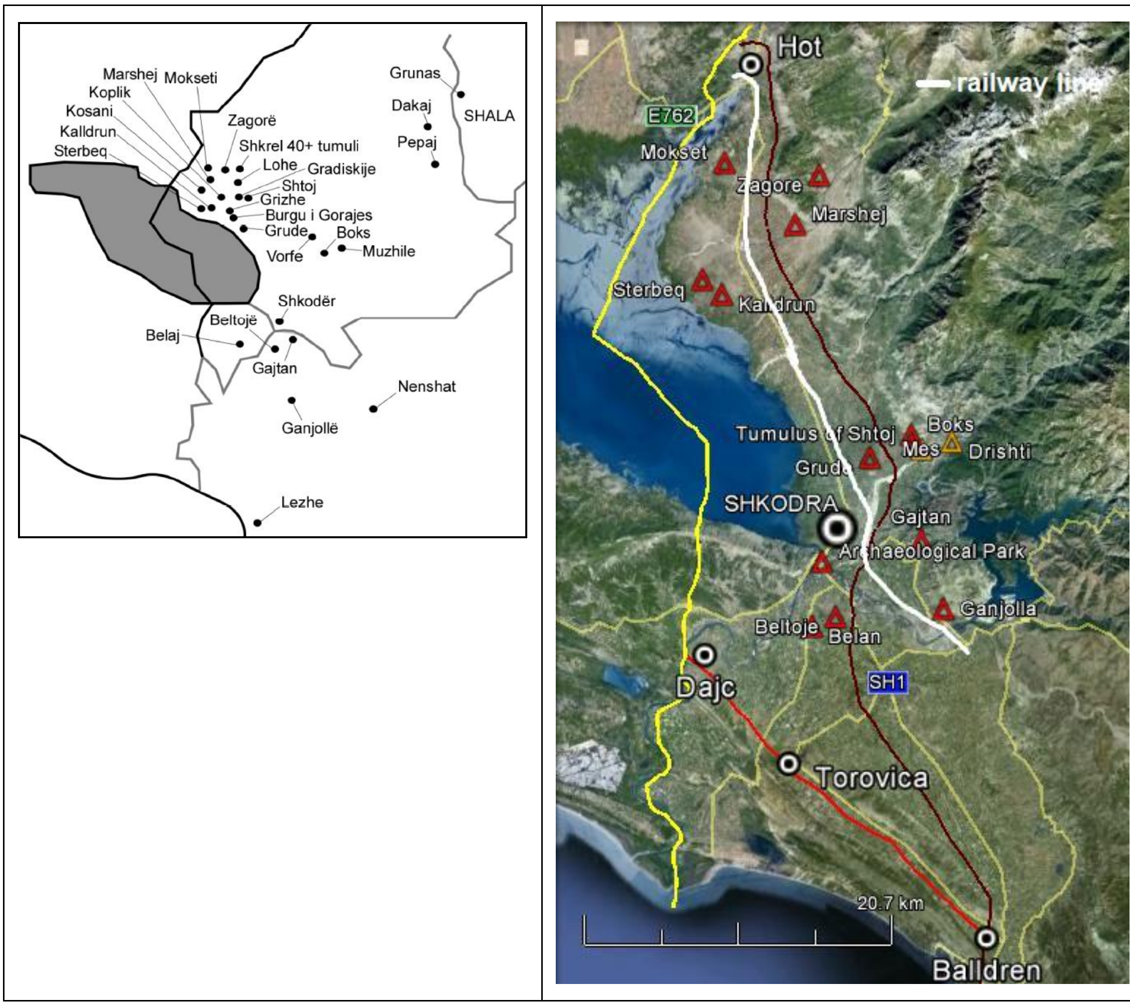


Figure 5-159_ Map of northern Albania with sites 1000 BC-AD 0 (Galaty, 20008).

As shown in the map above (Google map), all the above-mentioned sites (red triangles) are located more than one kilometre from the railway line.

The figure below shows the burial mounds of Shkoder Region. The practice of tumulus burial appears to have emerged suddenly, beginning in the Early Bronze Age (ca. 3100 B.C.E.)180

180 https://anthrosource.onlinelibrary.wiley.com/doi/full/10.1111/apaa.12090?scrollTo=references

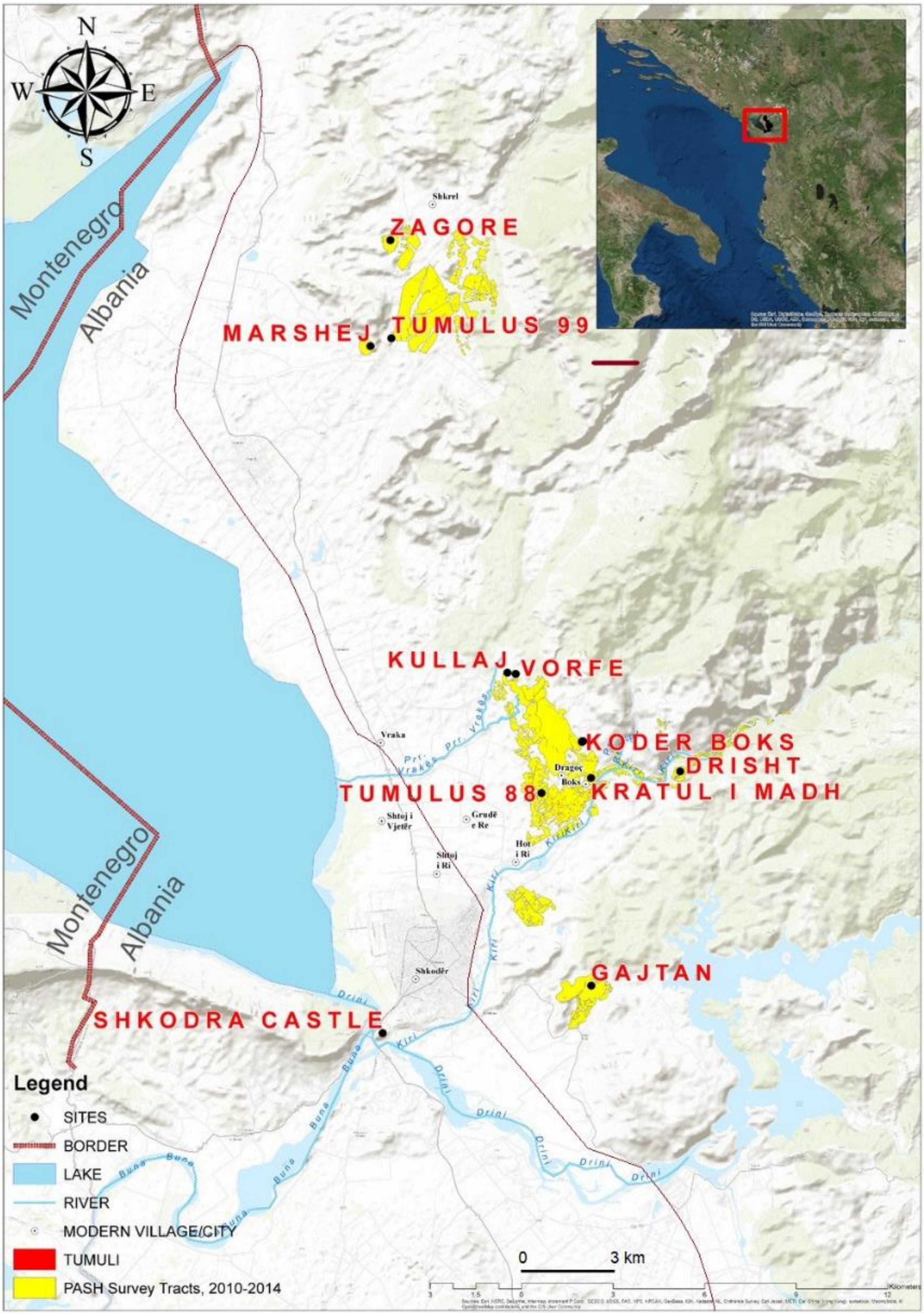


Figure 5-160_Location of the burial mounds and prehistoric archaeological sites - Shkoder region

The figure above shows that all to date known burial mounds within Shkoder region are located far from the railway line. The closest of them is the tumulus of Shtoj (early Bronze Age to late Iron Age), which is located roughly 4km from the railway line.

Map 10.1 (Map 10.1_Cultural Heritage Monuments) and Map 10.2 (Cultural heritage zones) – separate files in pdf format, show the location of the railway line and the designated cultural heritage monuments and zones/sites.

An integral part of the baseline investigation of these cultural heritage sites was an assessment of their importance/quality. Evaluations of quality/importance will inform the impact assessment portion of the ESIA. Importance/quality ratings were judged by different criteria for each of the 3 site types. Identified cultural heritage sites were assigned ratings based on the criteria shown in Table 5.59

Table 5-86 Cultural Heritage Site Importance/Quality Criteria

	Low	Moderate	High
Archaeological Site	Limited informational value and/or cultural significance based on content and condition of site.	Moderate informational value and/or cultural significance based on content and condition of site.	high informational value and/or cultural significance based on content and condition of site.
Historic Monument	limited visual, commemorative or art historical interest based on architectural style or degree of preservation.	Moderate visual, commemorative or art historical interest based on architectural style or degree of preservation.	High visual, commemorative or art historical interest based architectural style or degree of preservation.
Site with Intangible Cultural Heritage Value	Limited cultural or religious significance to site users based on user criteria.	Moderate cultural or religious significance to site users based on user criteria.	High cultural or religious significance to site users based on user criteria.

5.2.15.4. Findings related to the proposed project

The wide Project's area is very rich in cultural heritage monuments and sites. Especially Lezhë and Shkoder regions include a high number of historical and archaeological sites. However, the number of cultural monuments and sites close to the railway line is very restrained. That is because in the past the lowland was prone to frequent inundations and, besides, did not provide security for the inhabitants.

The closest cultural heritage objects/sites to the railway line are as follows:

- Historical Catholic cemetery of Rmaji, Shkoder,ICH, that is located 10m from the railway line;
- The ancient town of Lissus (Lezhë), which archaeological area is located 160 m from the railway line AHAP Area of High Archaeological Potential, on the opposite side of

Lezhë's Drini River (see Maps 10. 1 and 10.2 on Cultural heritage Monuments and zones – separate files in pdf format).

5.2.16. Waste

5.2.16.1. Material and method

The information on the existing situation regarding waste and waste management within the fingerprint of the proposed project is extracted from the following sources:

- The web page of the Ministry of Tourism and Environment; and
- Consultations with the affected municipalities (Vorë, Kruje, Kurbin, Lezhë, Vau Dejes, Shkoder and Malësia Madhe);
- Consultations with the Albanian Railways;
- Site visits;
- Strategic Policies Document and National Plan on Integrated Management of Waste181

5.2.16.2. Baseline information

The neglected existing building facilities in the passengers and (overall) the freight train stations contain solid waste such as pieces of bricks, stones, etc.

The neglected drainage system (culverts and drainage channels) are filled with sediments and often covered with vegetation that needs to be removed.

Within the train stations, there are rare small spots of pollution from oils released from the locomotives.

Currently, there is no significant environmental hot spot within the fingerprint of the Project's area. In the territory of Bajzë station during 1991 – 1992 were deposited approximately 80 tons of pesticides (sodium fluorosilicate) imported from Germany, as well as some tons of animal leathers. The last ones were impregnated with liquid pesticides. Because of the unfavourable political situation, these wastes were deposited in inappropriate conditions, and consequently, they constituted an environmental hot spot at the national level because of the proximity of Shkoder Lake and the permeability of the cover geological formations. Thanks to a UNDP (United Nation Development Programme) project these dangerous waste were removed in the period July 29 – September 10, 2009.

Consultation with municipalities' representatives indicated that apart Municipality of Kurbin, the other municipalities do not have a dedicated area for solid waste collection. Municipality of Kurbin, with a Decision of the Municipal Council, has assigned a transit point where to collect and process construction waste. This transit point, located on the road to Patok after crossing the highway Tirana to Lezhë, has a processing capacity of about 100,000 tons of waste per year. The Municipality for its needs, such as rural road maintenance, then uses processed construction waste.

Two other municipalities, Shkoder and Vau Dejës are in the process of designating dedicated areas for solid waste collection. Shkoder Municipality has foreseen the establishment of the solid waste collection side in Renc administrative unit, on the left side of Kiri River. Whereas, Vau Dejës Municipality is planning to extend the existing Bushat landfill (only functional for urban waste) to include also solid waste disposal.

181 http://turizmi.gov.al/wp-content/uploads/2020/07/Dokumenti-i-Politikave-Strategjike_AL.pdf

Nevertheless, the November 26, 2019 earthquake affected municipalities (Vorë, Kruje, Kurbin, and Lezhë) managed the disposal of solid waste caused by the process of buildings' reconstruction damaged by the earthquake by filling degraded areas in the Municipalities territories, as well as for private property needs.

In terms of urban waste disposal Municipalities of Malësia e Madhe, Shkoder and Lezhë use Bushat landfill. Kurbin Municipality so far has disposed of urban waste in Laç landfill, but this will not be more the case due to lack of capacity and required standards of this landfill. Officially, the Municipality should dispose of its urban waste in the Bushat landfill. Municipality of Kruje, disposes its urban waste in Halit landfill (on the way reaching Kruje town)

5.2.16.3. Findings related to the proposed project

There is no environmental hot spot within the fingerprint of the Project's area. The only waste found within this area is constituted as follows:

- The neglected drainage system (culverts and drainage channels) are filled with sediments and often covered with vegetation that needs to be removed.
- The neglected existing building facilities within the passengers and (overall) the freight train stations contain solid waste such as pieces of bricks, stones, etc.
- Within the train' stations, there are rare small spots of pollution from oils released from the locomotives.
- Urban waste disposal is regulated in all the affected municipalities; solid waste disposal is being considered with disposal sides proposed and under approval process by the respective government agencies.

5.2.17. Railway Accidents and Incidents

5.2.17.1. Material and method

Under the Ministry of Infrastructure and Energy operates the Directorate of Railways Inspecting[182] (DRI), which aim is to ensure the implementation of the national regulations on railway maintenance and safety issues.

The Directorate of Railways Inspecting publishes a yearly report, which provides data/information on any eventual accidents and incidents situation related to the railway system. The data in the table below are extracted from the reports of the 2016 to 2019[183] period.

5.2.17.2. Baseline information

The unauthorized crossings present a permanent risk to the safety of trains, passengers, cars, goods, pedestrians, and domestic animals. The table below shows the recent statistics on level crossings' accidents at the country level.

Table 5-87_ Rail/Road accidents recorded in recent years in Albania

No	Place of incident	No of accidents				No of injured persons				No fatal accidents				No damaged vehicles			
		year															
		2016	2017	2018	2019	2016	2017	2018	2019	2016	2017	2018	2019	2016	2017	2018	2019
1	Authorized level crossing with barriers	4	0	0	0	4	0	0	0	0	0	0	0	1	0	0	0
2	Authorized level crossing without barriers	9	2	3	2	5	2	2	2	0	0	0	0	9	2	2	4
3	Non-authorized level crossing	9	6	16	18	8	7	5	2	1	1	2	0	8	7	12	11
4	Open line	2	1	3	2	0	0	2	2	2	1	1	1	0	0	1	2
5	Total	24	9	22	22	17	9	9	6	3	2	3	1	18	9	13	17

From the table above it results:

- There are no fatal accidents in the authorized and secured level crossings;
- There are some incidents in the unsecured, but authorized level crossings;
- The higher number of incidents occur at the non-authorized level crossings;

182 http://dih.gov.al/

183 http://dih.gov.al/attachments/article/633/ANALIZA%20P%C3%ABr%20vitin%20%202019.pdf

- There are also some incidents related to the situation on the open line

Besides, the monitoring results during the last years show a slight reduction of the incidents184, because of the following:

- The number of trains has decreased from ear to year as a result of the decrease in freight transport and the increase in road transport;
- The reduction of the number of trains for passengers as a result of the reduced number of passengers that makes this transport not viable from the financial point of view; and
- Low speed of the trains.

According to the Directorate of Railways Inspecting, the railway incidents derive mainly from the deterioration of the condition of the main lines, the poor technical conditions of the railway vehicles, the insecure railway switches, and on a lesser scale to the human errors of the railway staff185.

It should be underlined that currently the Vorë – Hani Hotit railway line is not functioning because of the damaged Ishmi Bridge because of the Earthquake that occurred on November 26, 2019. That is why the statistics for 2020 are incomplete.

5.2.17.3. Findings related to the proposed project

The accidents are associated overall with the unauthorized level crossings and on a lower scale to the crossing of the open line.

5.2.18. Compliance with other plans/programs/projects

This section includes other existing plans/programs/projects within the same project area and/or the same sector (infrastructure and transport), in combination with which the proposed project may cause cumulative impacts.

5.2.18.1. Material and method

The information on existing and planned plans/programs/projects within the same and/or nearby area along the railway alignment is extracted from the following sources:

- General Local Development Plans and web pages of the affected municipalities; and
- Consultations with the affected municipalities (Vorë, Kruje, Kurbin, Lezhë, Vau Dejës, Shkoder and Malësia Madhe);
- Consultations with stakeholders, i.e. Prime Minister Office, National Territorial Planning Agency (NTPA), Albanian Road Authority (ARA), Ministry of Energy and Infrastructure (MEI) that are running the planning of the key infrastructure projects, etc.;
- ESIA project team experience in other infrastructure projects.

Planning documents regarding territory planning determine the organization, use, and purpose of sustainable territory development, as well as guidelines and measures for biodiversity, natural resources, and environmental protection, and the construction and development of national public infrastructure. Planning documents are made at the national and local levels.

184 http://dih.gov.al/attachments/article/2/DIH-Raporti%20Vjetor%202017.pdf

185 http://dih.gov.al/attachments/article/633/DIH%20%20%20ANNUAL%20REPORT%20%202019.pdf

5.2.18.2. Baseline information

The project does not contradict any other plan at a national, municipal, or local level. Reconstruction of the existing railway line is included in the key national planning instruments as follows:

- National General Territorial Plan "Albania 2030", as approved by Decision of Council of Ministers (DCM) on 14.12.2016[186]. The Plan covers the entire territory of the Republic of Albania and sets general mandatory conditions for all plans prepared for the territory planning in Albania. Among others, the plan includes proposals for strategic infrastructure projects, and the Vorë – Hani Hotit railway line is one of that;
- National Transport Strategy and Action Plan 2016-2020, as approved by DCM no. 811, dated 16.11.2016.[187] The railway Vorë – Hani Hotit is foreseen as one of priority railway corridors under the strategic priority on "Positioning of Albania within the European railway market as a player in South-East Europe transport corridors and Rail Freight Corridors";
- Second Review of Albanian National Transport Plan (ANTP3) 2019-2024, as approved by Order of the Minister of Infrastructure and Energy no. 40, dated 21.01.2020;

As per the consultation with the National Territory Planning Agency, Albanian Road Authority, and crossed municipalities all these projects are included in the National General Local Development Plans of the crossed municipalities.

At the local level, the railway line, as well as the existing stations, are part of the overall territorial development of the Municipalities, planned for the upcoming 15 years, 2015 – 2030. Vorë – Hani Hotit railway alignment is part of the completed and approved local development plans of the affected Municipalities, as follows:

- The General Local Government Plan of the Municipality of Vorë, 2015 – 2030, approved by the Decision of the National Territorial Council no. 3, dated 17.05.2019;
- The General Local Government Plan of the Municipality of Kruje, approved by the Decision of the National Territorial Council no. 5, dated 08.02.2017;
- The General Local Government Plan of the Municipality of Kurbin, approved by the Decision of the National Territorial Council no. 6, dated 08.02.2017;
- The General Local Government Plan of the Municipality of Lezhë, approved by the Decision of the National Territorial Council no. 5, dated 16.10.2017;
- The General Local Government Plan of the Municipality of Vau Dejës, approved by the Decision of the National Territorial Council no. 3, dated 27.04.2018;
- The General Local Government Plan of the Municipality of Shkoder, approved by the Decision of the National Territorial Council no. 5, dated 16.10.2017;
- The General Local Government Plan of the Municipality of Malësia e Madhe, approved by the Decision of the National Territorial Council no. 3, dated 09.12.2017;

The railway line and the railway stations are included and published in the infrastructure network of e-Harta, a WebGIS platform[188] run by the National Agency for Territorial Planning

186 available at http://planifikimi.gov.al/sites/default/files/pictures/ppk%20anglisht_120Mega.pdf

187 Published in Official Journal no. 230, page 23877, available at http://80.78.70.231/pls/kuv/f?p=201:Vendim%20i%20KM:811:16.11.2016

188 https://akpt.maps.arcgis.com/apps/webappviewer/index.html?id=ff270e99f5be45f19c7b7a1e3e618b27

where data of approved general development plans, as well as detailed development plans, are published.

In these plans, the service roads along the railway alignment are foreseen as part of the planned road network of the crossed municipalities.

The National Territory Planning Agency (NTPA) has provided to the Consultant the General Local Development Plans of the crossed municipalities (Vorë, Kruje, Kurbin, Lezhë, Vau Dejës, Shkoder, and Malësia Madhe).

It should be mentioned that the land surface required for the planned new freight station of Lezhë is already included in the General Local Development Plan of Lezhë Municipality.

Rehabilitation of the stations is another important issue taken into consideration while preparing the overall project. Large municipalities, like Shkoder and Lezhë have prepared also Passenger Transport Terminal studies. These passengers (bus) terminals are foreseen nearby Lezhë and Shkoder railway stations to allow for better individual mobility of passengers and intercity transport. Rehabilitation of the railway stations does not directly influence these local projects. Indirectly, it allows them to be more functional due to the combination of different transport modes, including personal cars, buses, and trains.

Figure 5-161_Meeting at the National Territory Planning Agency offices (June 27, 2019)

The Consultant has also taken into consideration the Managing Plan of the NMR of Shkoder Lake, as the railway line crosses the eastern edge of the terrestrial part of this NMR.

The Management Plan of the NMR of Shkoder Lake189 provides for the activities that are prohibited and/or allowed within this Protected Area. Details on these activities are provided in Table 3-14 and section 3.2.1 above, where it is clarified that the rehabilitation of the railway line is included in the category of the allowed activities.

Other national major infrastructure projects that can interfere with the rehabilitation of the railway line include as follows:

- Adriatic – Ionian Corridor (AIC) a major road transport project on the territories of Albania and Montenegro. The entire AIC in Albania is divided into 13 road sections according to their development status. The study is in the phase of feasibility study

189 Approved by Minister order 815/2012

preparation, to be completed within 2020; the AIC alignment and its typical cross-sections have been approved by ARA Technical Council in April 2019. ARA is committed that any upcoming project go along this alignment;

- Ionian Adriatic Pipeline (IAP) a major gas transmission pipeline approximately 511 km long, connecting Montenegro with Albania. The pipeline is approximately 168 km in the Albanian section. The route starts at a compressor station on the TAP system near Fier and runs north towards Shkoder, passing to Montenegro nearby Murriqan border point;
- Shkoder Eastern Bypass, a national transport project prepared by Albanian Road Authority with the state budget. The project, which DD has been completed, intersects the existing railway line approximately at km 102 +500 and km 105+100. Following consultation with ARA, and revision of the alignment and intersections, it is confirmed that the planned overpasses over the railway line allow the necessary vertical clearance for the future electrification of the line.

According to the National Territory Planning Agency, all these projects are included in the development plans at the national and municipality level.

The planned Adriatic Ionian highway will cross the railway line only once, close to the Gjola River Bridge, at km 40+343 (see figure below[190]), at the existing overpass with the national road E-762. While the planned Ionian-Adriatic pipeline will be crossed approximately at km 38+800.

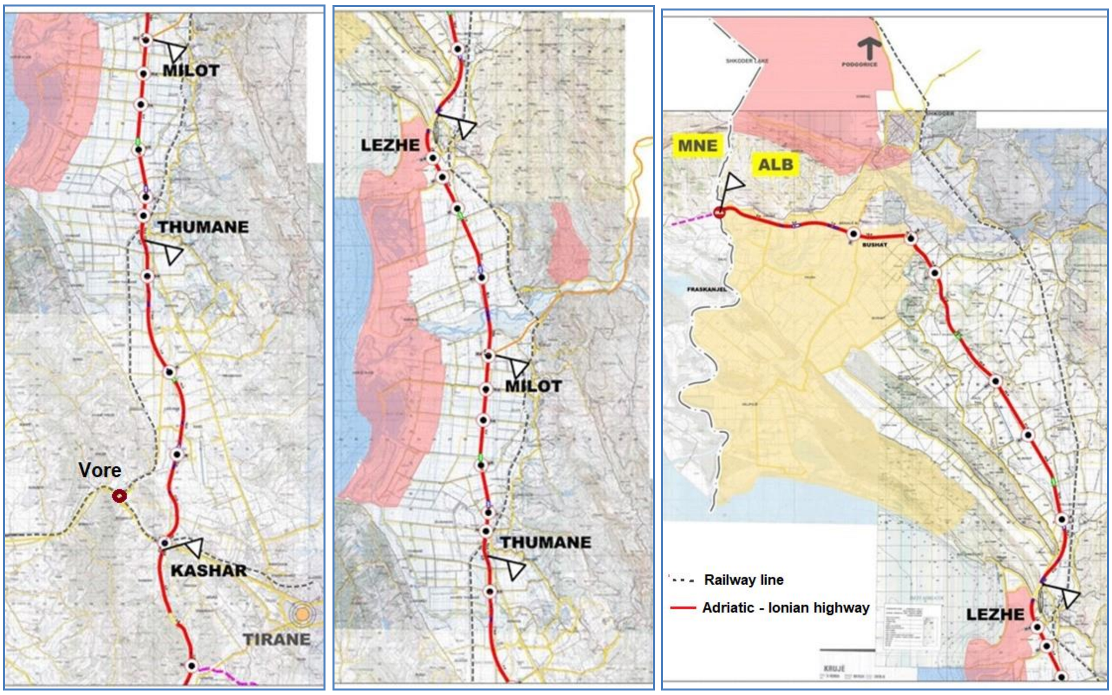


Figure 5-162_The railway line and the planned highway Adriatic-Ionia Corridor

The planned eastern bypass of Shkoder town will cross the railway line approximately at km 102 +500 and km 105+100 (see figure below)

190 WB14-REG-TRA-01: Adriatic – Ionian Road Corridor – Options Analysis Report

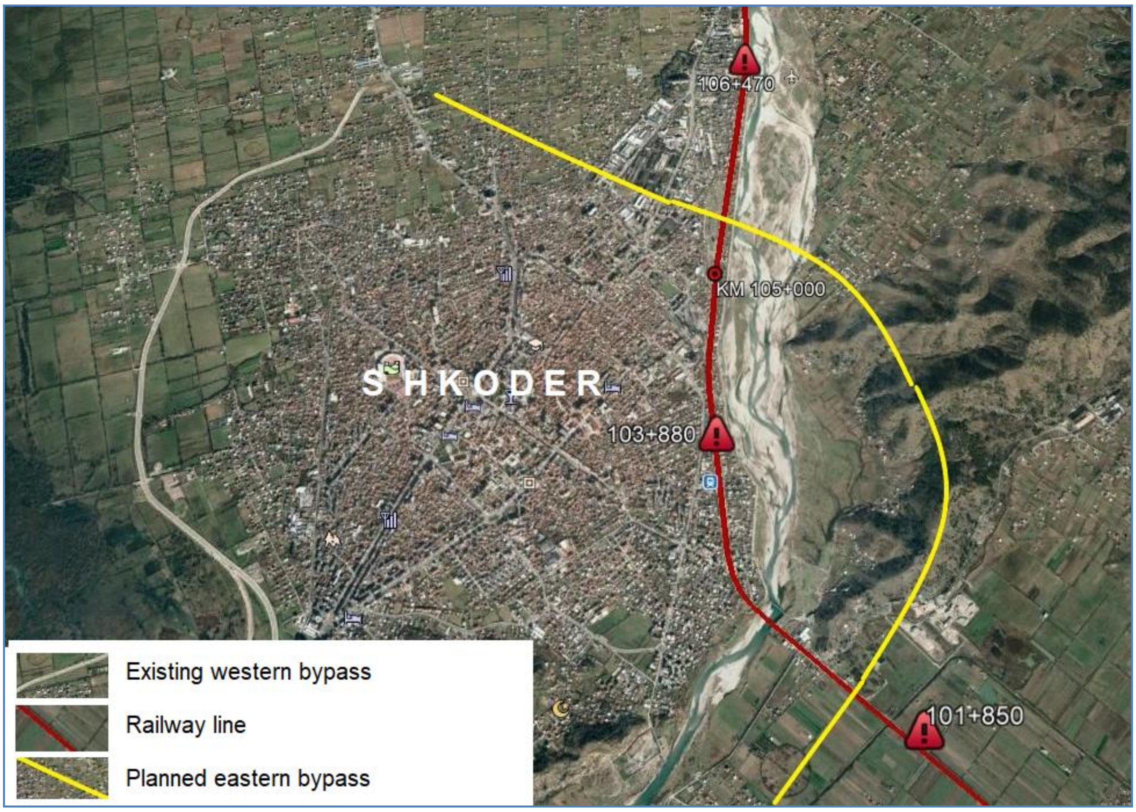


Figure 5-163_Sketch of the planned Shkoder bypass (yellow line)191

5.2.18.3. Findings related to the proposed project

The rehabilitation of the railway line is part of all the existing urban and transport national and municipal development plans, and therefore does not contradict any of these plans. Consequently, no significant adverse cumulative impacts are expected to occur.

The rehabilitation of the railway line is included in the category of activities that are allowed by the Managing Plan of Shkoder Lake Nature Managed Reserve.

The rehabilitation of the railway line may interfere with the following projects:

- Adriatic – Ionian Corridor (AIC), at km 40+343. ;
- Ionian Adriatic gas Pipeline (IAP), at km 38+800; and
- The planned eastern bypass of Shkoder, at 102 +500 and km 105+100.

5.3. Baseline information on Socio-economic environment

The socio-economic baseline described in the report serves to determine the current social and economic conditions of the inhabited settlements along the railway alignment and to evaluate how these conditions will change from project development.

The socio-economic baseline data are gathered for the seven municipalities along the railway alignment with a length of 120 km.

5.3.1. Material and method

191 https://www.skyscrapercity.com/threads/al-rrug%C3%AB-komb%C3%ABtare-dhe-autostrada-national-roads-and-highways.464164/page-482

The information on the socio-economic situation in the nearby settlements along the railway alignment is extracted from primary and secondary sources being:

- National Geographical Institute, INSTAT database and annual reports for population data, households' size, business register;
- Ministry of Education, Youth and Sports and Ministry of Health and Social Protection web pages; various donors web pages and prepared studies;
- General Local Development Plans and web pages of the affected municipalities;
- Meetings and correspondences with various departments of local government units including Social Services and Economic Aid Departments in Municipality of Vore, Kruje, Kurbin, Lezhe, Vau Dejes, Shkoder and Malesia e Madhe responsible for implementing the Roma and Egyptian action plans in their respective municipalities and the economic aid scheme;
- Meetings with railway technician responsible for monitoring of the railway line, CSOs and other key informants (elderly, heads of Administrative Units);
- Railway line alignment walk through and site visits

5.3.2. Study limitations

There were several limitations to this study, which relate mainly to:

- contested local elections which took place in June 30, 2019 and the post-election situation[192] particularly in Vore Municipality where Mayor and staff changes have continued as of July 2019 to January 2021, affecting the data collection process and counterparts' continuity and availability
- the devastating earthquake of November 26, 2019 which heavily affected 4 out of 7 municipalities [193] along the alignment and unavailability of counterparts (key informants) in these municipalities (November 2020 to March 2021);
- outbreak of Covid-19 pandemic situation as of March 2020 which adversely affected contacting and meetings with key informants. Often it was challenging or even impossible to reach key informants due to Covid 19 situation.
- lack of disaggregated (at the level of villages/settlements), comparative and updated statistical socio-economic data for the project area. Census 2011 data are too old and not updated. Reports available online, provide general data at the municipalities level, which are not broken down at villages/settlements level to allow for better analysis of the affected communities. Websites of affected Municipalities were not up to date with information on socio-economic aspects, with websites of Kurbin and Vore municipalities not functional during the implementation of this study. This limits a proper analysis of the project area.

192 ODIHR Election Observation Mission Final Report states that *"… the 30 June local elections were held with little regard for the interests of the electorate. The opposition decided not to participate, and the government determined to hold the elections without it. In the climate of a political standoff and polarisation, voters did not have a meaningful choice between political options. In 31 of the 61 municipalities mayoral candidates ran unopposed. Political confrontation led to legal uncertainty, and many decisions of the election administration were taken with the political objective of ensuring the conduct of elections.."* available at https://www.osce.org/files/f/documents/1/f/429230_0.pdf

193 https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/albania_post-disaster_recovery_a_v9.0.pdf

A substantial amount of household-level socio-economic data will be collected during the census and inventories of assets. The socio-economic survey and census will be prepared during the proposal for expropriation. The socio-economic survey should be linked closely with the census and inventory of assets to provide comprehensive information on households' economic resources, including common property resources. The affected properties will be defined based on the expropriation study along with maps and properties ownership information from the cadastre. This information is not available to date.

5.3.3. Baseline information

5.3.3.1. Administrative organisation

In 2014, the Albania Government undertook the territorial reform, adopted by Law no. 115/2014 "On administrative-territorial division of local government units in Albania"194. As per this territorial organisation, the municipality is the basic unit of local government. There are 61 municipalities in Albania, further subdivided into 373 administrative units. Cities and/or villages compose administrative units, but still to date their administrative boundaries have not been confirmed.

Law no. 139/2015 on Local Self-Government[195] regulates the organization and functioning of the local self-government units in the Republic of Albania, as well as defines their functions, powers, rights and duties and the respective bodies. The mayor and a municipal council, elected every four years, run municipalities; similarly, an administrator appointed by the mayor of municipalities runs administrative units. Each village has its own head/elderly elected by the community members.

Vorë – Hani Hotit Railway alignment passes through the territory of seven municipalities consisting of 46 administrative units. There are 22 administrative units and 60 settlements (four cities and 56 villages) indirectly affected by the project196, a part of them crossed, bypassed, or located close to the railway alignment. The table below provides the affected municipalities and the number of administrative units and settlements affected by the project. The municipalities with the highest number of affected settlements are the municipality of Lezhë and Malësia e Madhe. This mainly of the railway line length running through these municipalities (30km in Lezhe and 28.5km in Malesia e Madhe. The number of settlements is quite large as the railway line often serves as an administrative division between different administrative units, thus affecting more settlements.

Table 5-88_Administrative organization of the territory crossed by Vorë-Hani Hotit railway

Municipality	Geographical area km^{2}197	No of the Administrative Units within the municipality	No of the Administrative Units affected by the project	No of the settlements within the municipality	No. of affected settlements
Vorë	83	3	2	19 (1 city and 18 villages)	4 (4 villages)

194 http://planifikimi.gov.al/index.php?eID=dumpFile&t=f&f=2351&token=e1489ea11f8d18037852cb4cb17949ffcf4baf7e
195https://shtetiweb.org/wp-content/uploads/2016/03/LIGJI_139_2015_PER_VETEQEVERISJEN_VENDORE1.pdf
196 Vorë – Hani Hotit is an existing railway line, therefore presence of settlements has been considered mainly in terms of the impact that the railway rehabilitation will bring to the movement of people, vehicles and livestock.
197 Geographical area per each municipality (and administrative unit) is retrieved from "Relation to the draft law "On the Administrative-Territorial Division the Local Government Units in the Republic of Albania", Annex 2 available at https://reformaterritoriale.qeverisjavendore.gov.al/wp-content/uploads/2018/03/Raporti_i_zonave_funksionale.pdf

Municipality	Geographical area km²197	No of the Administrative Units within the municipality	No of the Administrative Units affected by the project	No of the settlements within the municipality	No. of affected settlements
Kruje	336	6	2	52 (2 cities and 50 villages)	9 (9 villages)
Kurbin	159	4	3	30 (3 cities and 27 villages)	6 (1 citiy, 5 villages)
Lezhë	495	10	6	67 (2 cities and 65 villages)	12 (1 city, 11 villages)
Vau Dejës	469	6	2	48 (1 city and 47 villages)	8 (8 villages)
Shkoder	865	11	3	94 (1 city and 93 villages)	9 (1 city, 8 villages)
Malësia e Madhe	980	6	4	58 (2 cities and 56 villages)	12 (1 city, 11 villages)
Total	3387	46	22	368	60 (4 cities 56 villages)

Source: Law no. 115/2014, own calculations

5.3.3.2. Demography

The population figures in Albania are often controversial due to the large discrepancies among census and the civil registry predictions. The population data comparison in years becomes even more difficult due to territorial administrative reform in 2014, when the local administrative units were organised from 375 into 61 municipalities. Data aggregation and segregation is not periodic, and thus difficult to be interpreted.

The overall population in the project area of interest is 265,008 inhabitants, which counts for 74 % of the total population of the affected municipalities, and 9 % of the country resident population as per 2011 census data. The population density is much higher than the nation average of 97.4 inhabitants per km², mainly due to the railway passing through the country lowlands. In the project area, there are 67,102 households of which 11.8 % women head of households lower to the country level of 14.2 %. The average number of household members is 3.97, with the largest size in Hajmel 4.41 and lowest in Shkoder 3.56.

Table 5-89_Demographic data of seven municipalities along the railway alignment

Municipality	Administrative unit	Resident population 2011	Geographical area km²	Population density inhab/km²	Households	Women Head of Households	Average household size
Vorë	Vorë	10,901	38	286.87	2,646	339	4.12
	Prezë	4,727	29	163.00	1,110	141	4.26
Kruje	Bubq	5,951	49	121.45	1,499	227	3.97
	Thumanë	12,335	69	178.77	2,862	329	4.31
Kurbin	Mamurras	15,284	72	212.28	3,546	279	4.31
	Laç	17,086	14	1,220.43	4,167	313	4.1
	Milot	8,461	143	59.17	1,959	187	4.32
Lezhë	Zejmen	5,660	35	161.71	1,348	115	4.2
	Kolsh	4,228	45	94	1,039	128	4.07
	Shëngjin	8,091	56	144.48	2,038	173	3.97
	Lezhë	15,510	5	3,102.00	4,169	300	3.72
	Kallmet	4,118	38	108.37	1,027	86	4.01
	Balldren i Ri	6,142	77	79.77	1,480	142	4.15
	Blinisht	3,361	48	70.02	847	107	3.97
Vau-Dejës	Hajmel	4,430	31	142.90	1,005	67	4.41
	Vau-Dejës	8,117	99	81.99	1,975	217	4.11

Municipality	Administrative unit	Resident population 2011	Geographical area km²	Population density inhab/km²	Households	Women Head of Households	Average household size
Shkoder	Guri i Zi	8,085	82	98.60	1,911	236	4.23
	Shkoder	77,075	16	4,817.19	21,650	1067	3.56
	Rrethinat	21,199	47	451.04	4,919	512	4.31
Malësi e Madhe	Gruemirë	8,890	114	77.98	2,117	258	4.2
	Qendër	4,740	47	100.85	1,159	157	4.09
	Koplik	3,734	9	414.89	917	107	4.07
	Kastrat	6,883	129	53.36	1,712	180	4.02
	Total	265,008	1,292.0	205.11	67,102	5,667	3.95

Source: INSTAT Population and Housing Census (2011)198, own calculations

The number of population in the project area is 203,744 as per the following data gathered from the Municipalities. The data on women head of households were difficult to be collected in some settlements.

Table 5-90_Demographic data at the settlement level in the seven municipalities along the railway alignment

Municipality	Administrative unit	Settlement	Settlements Population	Households	Women Head of Households
Vorë	Vorë	Shargë	570	215	1
	Prezë	Gjeç- Kodër	1,817	401	2
		Fushë Prezë	974	264	3
		Ahmetaq	1,619	587	6
Kruje	Bubq	Budull	2,400	579	1
		Murqine	786	218	0
		Bubq	1,494	397	2
	Thumanë	Gramëz	2,480	780	n/a
		Derven	2,952	1,080	n/a
		Thumanë	4,570	1,700	n/a
Kurbin	Mamurras	Fushë-Mamurras	3,082	796	7
		Fushe-Gjorëm	2,893	739	11
		Gjorëm	3,456	876	9
	Laç	Lagjia 4 Laç	17,086	4,167	313
	Milot	Fushë Milot	2,561	671	13
		Mal i Bardhë	976	258	0
Lezhë	Zejmen	Pllanë	464	197	2
		Zejmen	1458	378	7
		Spiten	1,083	293	4
		Tresh	962	217	2
	Shëngjin	Ishull- Lezhë	5,456	1,606	n/a
		Ishull-Shëngjin	7,891	2,322	n/a
	Lezhë	Lezhe city	31,885	9,922	13
	Kallmet	Mërqi	1,498	329	8
		Rraboshtë	1,984	597	11
		Kallmet	3,946	1,076	17
	Balldren	Gocaj	973	307	7
	Blinisht	Piraj	600	153	17
		Baqel	646	122	9
Vau-Dejës	Hajmel	Nënshatë	1,805	503	8
		Dheu i Lehtë	745	200	3
		Hajmel	2,440	706	9
	Vau-Dejës	Kaç	1,213	338	5

198 Available at https://instatgis.gov.al/

Municipality	Administrative unit	Settlement	Settlements	Households	Women
		Naraç	964	245	2
		Shelqet	1,327	357	4
		Mjedë	2,984	863	16
		Spatharë	483	130	2
Shkoder	Guri i Zi	Ganjollë	608	156	n/a
		Vukatanë	1167	290	n/a
		Juban	2353	631	n/a
		Rrencë	1369	380	n/a
	Shkoder	Rajoni 5	24,081	6,761	n/a
		Rajoni 2	20,736	5,908	n/a
	Rrethinat	Golem	2,531	582	n/a
		Shtoj i Ri	2,380	649	n/a
		Shtoj i Vjetër	1,552	436	n/a
		Grudë e Re	3392	787	n/a
Malësi e Madhe	Gruemirë	Grilë	1438	280	25
		Boriç i Vogel	727	195	7
		Boriç i Madh	2054	400	42
		Omaraj	921	195	15
		Grudë-Fushë	807	255	32
		Ktosh	1193	496	49
		Demiraj	505	287	27
	Qendër	Dobër	740	176	11
		Kamicë-Flakë	967	146	13
	Koplik	Qyteti Koplik	9152	2,452	14
	Kastrat	Pjetroshan	730	188	n/a
		Aliaj	620	162	n/a
		Bajzë	1380	331	n/a
		Ivanaj	474	116	n/a
		Vukpalaj	460	132	n/a
		Hot	884	232	n/a
Total			203,744	57,211	-

Source: Social Services and Economic Aid Units in Municipality of Vore, Kruje, Kurbin, Lezhe, Vau Dejes, Shkoder and Malesia e Madhe

As per INSTAT data, Albania's population on January 01. 2020 is 2,845,955. Albania's population, although is shifting of population age structures towards older populations over time is still one of the youngest in Europe; median age is 32.8 years, compared to 42.2 in 2018 in EU28 countries.199

Administrative units, according to the degree of urbanization, are classified as high, intermediate and low-density areas. As per 2011 census, the railway line runs through one high-density area (Shkoder Municipality), 7 intermediate density areas and 15 low-density areas.200 The population living in the affected administrative units is classified 61% urban and 39% as rural.

199 https://en.wikipedia.org/wiki/Demographics_of_Albania

200 A new urban-rural classification of the Albanian population, INSTAT, May 2014, pp 49 – 69, available at http://www.instat.gov.al/media/2817/nj__klasifikim_i_ri_rural-urban_i_popullsis__shqiptare.pdf

As per 2019 data, the women population accounts for 50.1 %201. The breakdown of population by age is: 0-14 years old are 17.5%, 15-64 are 68.6% and over 65 years old are 13,9%202. The official breakdown for population age at the administrative unit level is available only as per 2011 INSTAT data and as provided in the following table.

Table 5-91_Population structure of the administrative units along the railway alignment

Municipality	Administrative unit	Resident population 2011	Urban population	Rural population	Population structure		
					0 – 14	15 – 64	65+
Vorë	Vorë	10,901	7,587	3,314	2,410	7,434	1,058
	Prezë	4,727	0	4,727	1,046	3,106	576
Kruje	Bubq	5,951	0	5,951	1,250	4,008	693
	Thumanë	12,335	3,417	8,918	2,955	8,183	1,196
Kurbin	Mamurras	15,284	10,913	4,371	3,654	10,066	1,564
	Laç	17,086	15,702	1,384	3,926	11,432	1,727
	Milot	8,461	1,058	7,403	1,975	5,532	954
Lezhë	Zejmen	5,660	70	5,592	1,278	3,679	703
	Kolsh	4,228	2,655	1,573	882	2,834	512
	Shëngjin	8,091	4,426	3,665	1,788	5,358	945
	Lezhë	15,510	15,401	109	3,314	10,702	1,494
	Kallmet	4,118	181	3,937	817	2,685	616
	Balldren	6,142	0	6,142	1,355	4,087	700
	Blinisht	3,361	0	3,361	634	2,232	495
Vau-Dejës	Hajmel	4,430	0	4,430	921	2,940	569
	Vau-Dejës	8,117	5,227	2,890	1,852	5,332	933
Shkoder	Guri i Zi	8,085	89	7,996	1,898	5,244	943
	Shkoder	77,075	75,611	1,464	14,906	52,103	10,066
	Rrethinat	21,199	19,079	2,120	5,501	13,544	2,154
Malësi e Madhe	Gruemirë	8,890	533	8,357	2,060	5,709	1,121
	Qendër	4,740	0	4,740	1,021	3,023	696
	Koplik	3,734	3,734	0	838	2,456	440
	Kastrat	6,883	0	6,883	1,415	4,438	1,027
Total		265,008	165,683	99,327	57,696	176,127	31,182
in %			63%	37%	22%	66%	12%

Source: INSTAT Population and Housing Census (2011)203, own calculations204

5.3.3.3. Ethnicity, language and religion

According to Population and Housing Census 2011, 82.58 % of the population are Albanian by ethnicity. Other groups, Greek, Aromanian and Roma are in smaller percentage. Albanian is the official language. 98.8 % of the population speaks Albanian language, whereas Greek, Macedonian, Aromanian and Roma are native language of minorities group.

Ethnic Albanian population has the largest share of 83 % while other ethnic groups represent only 1.3 % of the total population. Ethnic and cultural composition of Albania is provided in the table below.

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201 Women and men in Albania, Instat (2020); pg 17 available at http://www.instat.gov.al/media/7270/_burra-the-gra-2020_.pdf

202 Ibid, pg 22, Data for 2019 refer to average population 2019

203 Available at https://instatgis.gov.al/

204 Calculation and interpretation of available data for the affected administrative units is based on the data available on INSTAT GIS platform, where the current administrative units refer to ex-communes

Table 5-92_Resident population in Albania as per ethnic and cultural affiliation

Ethnic and cultural affiliation	Resident population	% of resident population
Albanian	2, 312, 356	82.58
Greek	24,243	0.87
Aromanian	8, 266	0.30
Roma	8, 301	0.30
Macedonian	5, 512	0.20
Egyptian	3, 368	0.12
Montenegrin	366	0.01
Other	2, 644	0.09
Prefer not to answer	390, 938	13.96
Not relevant/not stated	44, 144	1.58
Total	2, 800, 138	100

Source: INSTAT Population and Housing Census (2011)

According to INSTAT and based on the Census of 2011, in the municipalities along the railway alignment about 93% of the population are Albanians, 13% did not answer/declare their ethnicity 205 and the remaining 0.28% Roma, 0.27% Ashkali and Balkan Egyptians, 0.08 Montenegrins. In the project area, there is no presence of Greek and Macedonian ethnic groups. The least affected ethnic group are Aromanian and Montenegrin. Data show that Montenegrins live mainly in Shkoder and Malësi e Madhe municipalities. They do count also for 0.01% of overall resident population in the country.

Table 5-93_Resident population in the Municipalities along the alignment, as per ethnic and cultural affiliation

Municipality	Population 206	Ethnic structure					
		Albanian	Roma	Aromanian	Egyptian	Montenegrin	No answer
Vorë	25,511	24,269	-	-	-	-	1,242
Kruje	59,814	42,378	473	6	-	-	16,957
Kurbin	46,291	38,199	74	5	-	-	8,013
Lezhë	65,633	57,534	112	7	210	-	7,771
Vau-Dejës	30,438	24,496	-	-	-	-	2,200
Shkoder	135,612	150,126	465	17	847	249	14,347
Malësi e Madhe	30,823	29,448	-	6	-	83	1,285
Total	394,122	366,450	1,123	40	1,057	332	51,815
%		92.98 %	0.28 %	0.01 %	0.27 %	0.08 %	13.15 %

Source: INSTAT Population and Housing Census (2011), own calculations

At the national level, Roma and Egyptians are currently the poorest and the most marginalized ethno-linguistic groups. Both groups in general suffer from the same issues; lack of skills, low educational levels and discrimination. Nowadays, they have issues on access health care, sanitation, infrastructure, education and poor living conditions (inadequate housing, no assess to water and sewage facilities and no access to electricity). The unemployment rate is very high for Roma, where women have the highest unemployment rate compared to male. Egyptians also face more economic and social problems, mainly because of anthropological specifications, rites, customs, mentality, and lifestyles different from other groups.

As per Roma Census completed in 2015207, at the national level the largest Roma population is located in the city of Tirana with about 26%, followed by the city of Elbasan with about 17%,

205 Prefer not to answer and/or their answers were not relevant/not stated

206 Population data at municipality level is retrieved and calculated from "Relation to the draft law "On the Administrative Territorial Division the Local Government Units in the Republic of Albania", Annex 2 available at https://reformaterritoriale.qeverisjavendore.gov.al/wp-content/uploads/2018/03/Raporti_i_zonave_funksionale.pdf

207 https://www.osfa.al/sites/default/files/roma_census_albanian.pdf

and in third place Korça with 11% population. As per this census data, only 11.1% of Roma population lives in the project areas, distributed in each municipality as follows:

Table 5-94_Roma population in the project area

Municipality	Roma population living in affected municipalities in %
Vorë	0
Kruje	3.2
Kurbin	1.6
Lezhë	2.3
Vau-Dejës	0
Shkoder	4
Malësi e Madhe	0
Total	**11.1**

Source: Roma Census (2015)

In the project area, Roma ethnic groups are located in Shkoder, Kruje, Lezhe and Kurbin Municipalities. In Shkoder Municipality, the registered Roma and Egyptian population are located in Shkoder city. The Roma population living is Shkoder city is assessed around 423 persons (81 families) and Egyptians 1,189 inhabitants (269 families). They do live in the areas nearby the Prosecution Office, Tophane, behind the Buna bridge, Iliria neighbourhood, Zalli i Kirit, Berdice etc.208 These neighbourhoods are western of Shkoder city, whereas the railway enters and passes through the eastern neighbourhood of Shkoder city. There are no Roma and Egyptian families living and/or accommodated (including temporary structures) nearby the track of the railway line. This information was discussed and confirmed by the municipalities' employees (Regional Development and Social Services Department During) the consultation meetings held with them.

The Roma and Egyptian in Kruje Municipality are located in Fushe-Kruje administrative unit. Vore – Hani i Hotit railway line does not pass through/nearby any of the settlements of this administrative unit. This information has been discussed and confirmed by the Municipality employees during the meeting held in April 2019.

There are around 500 Roma population (83 families) and 830 Egyptians (314 families) living in the Municipality of Lezhe. As per municipality data, 5% of the population of the city of Lezhe consists of members of the Roma and Egyptian communities. The Roma and Egyptian communities in Lezhe city are mainly situated in "Skanderbeg" neighbourhood (about 90%). While the remaining 10% of them are living in "Besëlidhja", "Spitali" and "Gurra" neighbourhoods.209 These neighbourhoods are located on the eastern part of the railway line and divided from it by Drini of Lezhe River. This information was confirmed during the meetings with the municipality employees.

In Kurbin Municipality, Roma population lives in Laç city, Mamurras administrative unit and Zheje village. The data show that in Mamurras live 143 persons (23 families) and in Zheje 110 Roma (18 families)210. As per the meeting with Municipality employees, the Roma people in

208 Action Plan for the Development of the Roma and Egyptian Local Community in the Municipality of Shkoder (2017-2020). The Plan aims to increase the participation of the Roma and Egyptian community on issues directly affecting them. Social Issues Directorates in the Municipality of Shkoder oversees the implementation and monitoring of this Plan available at http://www.bashkiashkoder.gov.al/web/plan_veprimi_per_komunitetin_rom_egjiptian_1447.pdf

209 Local Action Plan of the Municipality of Lezhe for the Integration of Roma and Egyptians (2013-2015) available at https://Lezhe.gov.al/wp-content/uploads/2021/06/plani_alb_opt_1_283.pdf

210 4th Report submitted by Albania pursuant to Article 25, paragraph 2 of the Framework Convention for the Protection of National Minorities (18 November 2016)

Laç and Mamurras administrative units live far from the existing railway line. Similarly, the railway does not pass through and/or nearby Zheje settlement.

In addition to primary and secondary data sources, Consultant's railway line alignment walk through and discussions with the railway technician responsible for daily monitoring of the railway line showed no presence of Roma and Egyptian communities representatives living nearby the railway alignment.

In terms of religion, Muslims are the most represented group followed by Catholics. The representation of other religious groups in Albania is presented on the table below.

Table 5-95_Resident population in Albania as per religious affiliation

Religious affiliation	Resident population	% of resident population
Muslims	1,587,608	56.70
Catholics	280,921	10.03
Orthodox	188,992	6.75
Bektashi	58,628	2.09
Evangelists	3,797	0.14
Other Christians	1,919	0.07
Believers without denomination	153,630	5.49
Atheists	69,995	2.50
Others	602	0.02
Prefer not to answer	386,024	13.79
Not relevant/not stated	68,022	2.43

Source: INSTAT Population and Housing Census (2011)

Regarding the project areas, religion affiliation data are available only at the level of municipalities. Data show that the largest affected religion communities are Muslims (44.17%) and Catholics (43.68%). The largest number of Muslims community is present in Vorë (89%), followed by Kruje (66%) and Shkoder (52%) municipalities. The largest number of Catholic communities is present in Lezhë (82%) and Vau-Dejës (78.3%).

Table 5-96_Resident population in Municipalities along the alignment, as per religious affiliation

Municipality	Population	Religion affiliation				
		Muslims	Catholic	Orthodox	Bektashi	No answer[211]
Vorë	25,511	22,756	281	51	179	2,755
Kruje	59,814	39,716	6,520	-	299	13,279
Kurbin	46,291	13,748	22,683	185	-	9,675
Lezhë	65,633	5,644	53,819	-	-	6,170
Vau-Dejës	30,438	6,818	22,159	-	-	1,461
Shkoder	135,612	70,925	52,346	678	-	11,663
Malësi e Madhe	30,823	14,456	14,333	123	-	1,911
Total	394,122	174,064	172,140	1,038	478	46,913
%		44.17%	43.68%	0.26%	0.12%	11.90%

Source: INSTAT Population and Housing Census (2011), own calculations

The railway passes through the cities of Laç and Shkoder, both important cities in terms of religion worship. The city of Shkoder was one of the most important centres for Islamic scholars and cultural and literary activity in Albania. Here stands the site of the only institution in Albania that provides high-level education in Arabic, Turkish and Islamic Studies, but Shkoder is also the centre of Roman Catholicism in Albania. The Roman Catholic Church is represented in Shkoder

211 Prefer not to answer and/or their answers were not relevant/not stated

by the episcopal seat of the Metropolitan Roman Catholic Archdiocese of Shkoder-Pult in Shkoder Cathedral, with the current seat of the prelacy.

Another very important religious place is Saint Anthony Church of Laç, located on the hilly heights around the town of Laç212. This is a worship place visited by thousands of believers during the year. In the meetings with municipality employees responsible for urban development, proper railway infrastructure was considered very important in enabling believers to reach this holy place.

5.3.3.4. Economic activity

At the end of year 2019 there are 162,342 active enterprises in Albania. Albanian economy is focused mainly in trade activity with 63 % of all active enterprises involved in provision of services. In 2019, the structure of active enterprises of producers of goods and producers of services is 37.0 % and 63.0 %, compared to 35.0 % and 65.0 % in 2018.

Based on data of the year 2019, the total number of enterprises in the project area is 18,103 representing 11 % of the total number of active enterprises in Albania. The highest share of 60 % active enterprises is registered for provision of services. Under this category retail trade counts for the largest share 49 % of active enterprises. Under producers of goods category, agriculture, forestry and fishing active enterprises count for 77 %, leaving for labor-intensive enterprises (industry and construction) with lower share. Data regarding the total number of active enterprises by economic activity, municipality and the main economic sector are presented in the following table.

Table 5-97_Active enterprises by economic activity in Municipalities along the alignment

Municipality	Total	Produ-cers of goods	Agricul-ture, forestry & fishing	Industry	Construc-ction	Provision of services	Trade	Transport and storage	Accommo-dation and food service activities	Informa tion & communi-cation	Other Services
Vorë	1,095	223	51	127	45	872	449	60	124	23	216
Kruje	1,823	530	169	305	56	1,293	632	78	239	25	319
Kurbin	1,311	317	180	95	42	994	504	53	214	15	208
Lezhë	3,260	1,161	857	172	132	2,099	998	94	462	25	520
Vau-Dejës	1,263	781	698	67	16	482	227	33	116	12	94
Shkoder	6,718	2,072	1,518	405	149	4,646	2318	143	941	96	1148
Malësi e Madhe	2,633	2,144	2,089	38	17	489	208	44	144	6	87
Project area	18,103	7,228	5,562	1,209	457	10,875	5336	505	2240	202	2592
in %	100%	40%	77%	17%	6%	60%	49%	5%	21%	2%	24%

Source: INSTAT 2019 Business Register (2020), own calculations

The higher number of active enterprises is in Shkoder Municipality with 37 %, followed by Lezhe with 18 % of the overall active enterprises in the project area. The number of active enterprises in Shkoder count for 4 % of the total country active enterprises.

In 2019 women as owners /administrators, cover 25.4 % of total active enterprises, similar figures are present also in the affected municipalities. Enterprises leaded by women are mainly micro enterprises with 1-4 employed and represent 90.5 % of this group. In the Municipalities along the alignment, the lowest figures of women administrators are in Vau-Dejës (16 %) and Malësia e Madhe (19 %). These two municipalities have also the lowest percentage of farmers

212 https://www.intoalbania.com/attraction/saint-anthony-church-of-lac/

as active enterprises Malësia e Madhe (16 %) and Vau-Dejës (37 %) and highest figures for juridical persons213.

Table 5-98_Active enterprises by ownership, gender and legal form in Municipalities along the railway alignment

Municipality	Total	Active enterprises as per ownership		Active enterprises as per gender of administrator/owner		Active enterprises as per legal form		
		Albanian	Foreigners and Joint	Male	Female	Farmers	Physical persons	Juridical persons
Vorë	1,095	994	101	835	260	631	421	43
Kruje	1,823	1,778	45	1,386	437	1,310	364	149
Kurbin	1,311	1,297	14	931	380	910	232	169
Lezhë	3,260	3,152	108	2,327	933	1,974	492	794
Vau-Dejës	1,263	1,250	13	1,061	202	463	115	685
Shkoder	6,718	6,577	141	5,043	1,675	4,209	1,029	1,480
Malësi e Madhe	2,633	2,627	6	2,124	509	426	136	2,071
Total project area	18,103	17,675	428	13,707	4,396	9,923	2,789	5,391
in %	100%	98%	2%	76%	24%	55%	15%	30%

Source: INSTAT 2019 Business Register (2020), own calculations

In 2019, at the national level, approximately 89.2 % of enterprises are enterprises with 1-4 employed that contribute 26.2 % on the total employment214. In the Municipalities along the alignment, the total number of active enterprises counts for only 11 % of the overall country active enterprises and 90% of them employ 1 to 4 persons, figures similar to the national level. Among municipalities along the alignment, the ones geographically near to the capital, Vorë and Kruje, have active enterprises that employ five employees + with highest figure in Vorë (23 %) and Kruje (16 %). All the other municipalities have more than 90 % of their active enterprises with less than five employees with Malësi e Madhe having the highest percentage (97 %).

Table 5-99_Active enterprises by size of enterprises in Municipalities along the railway alignment

Municipality	Total	Size of enterprises		
		1-4 employed	5-9 employed	10-49 employed
Vorë	1,095	839	114	142
Kruje	1,823	1,538	134	151
Kurbin	1,311	1,187	63	61
Lezhë	3,260	2,912	171	177
Vau-Dejës	1,263	1,198	36	29
Shkoder	6,718	6,078	272	368
Malësi e Madhe	2,633	2,559	35	39
Project area	18,103	16,311	825	967
in %	100%	90%	5%	5%

Source: INSTAT 2019 Business Register (2020), own calculations

5.3.3.5. Employment

As per INSTAT data, at the country level by end of 2019 there were 683,162 employed, of which 72 % employed in provision of services and only 28 % in production of goods.

In the project area, as per the General Directorate of Taxes, social contributors are 70,097 that count for only 10 % of the country level. The highest figures of employed in production of goods

213 As per INSTAT, under juridical persons legal form are included i) Limited Liability Companies, ii) Joint Stock Companies, iii) Public entities, iv) NGO, International Organisations, v) Other Companies

214 INSTAT Business Register, 2020, available at http://www.instat.gov.al/media/7172/regjistri-i-ndermarrjeve-2020.pdf

are in Kruje (39 %), Shkoder (38 %) and Lezhë (29 %). The figures are particularly high for women employed in the industry sector in these three municipalities which relates to clothing industry, fish processing factories Rozafa and Poseidon (in Lezhe).

Provision of services is the main source of employment for 68 % of the employed, with women counting for 30 % and men for 38 %. Trade remains the sector with the highest number of employed (21 %) following the processing industry (22 %). Employment in the public sector continues to count for a high percentage in the overall employment of the area with 29 % of the working population employed in education, health, public administration etc. More detailed data per employed as per each economic activity is provided below.

Table 5-100_Employes by economic activities in Municipalities along the railway alignment

Municipality		Total	Producers of goods	Agricul-ture, forestry & fishing	Extraction Industry	Processing Industry	Electricity, gas supply, steam & air conditioning	Water supply, waste treatment & management activities,	Construc-ction	Provision of services	Trade	Transport and storage	Accommo-dation and food service activities	Informa tion & communi-cation	Financial and insurance activities	Real estate activities	Professional, scientific and technical activities	Administrative and support services	Public administration and protection;	Education	Health and social work activities	Arts, fun and relaxation	Other services	CSOs activities
Vorë	Total	15,339	4,056	178	90	2,480	38	450	820	11,284	3,858	632	1,780	228	57	67	347	621	1,372	1,047	803	139	328	5
	Female	6,714	1,603	46	10	1,306	7	93	141	5,110	1,601	107	695	89	17	23	131	208	635	793	581	47	180	3
	Male	8,625	2,453	132	80	1,174	31	357	679	6,172	2,257	525	1,085	139	40	44	216	413	737	254	222	92	148	...
Krujë	Total	14,848	5,862	75	211	4,912	40	104	520	8,986	2,615	315	1,128	71	42	16	198	667	1,678	1,003	825	88	340	-
	Female	6,915	3,206	21	21	3,091	5	23	45	3,709	965	34	403	20	12	4	77	129	614	695	551	29	176	-
	Male	7,933	2,656	54	190	1,821	35	81	475	5,277	1,650	281	725	51	30	12	121	538	1,064	308	274	59	164	-
Kurbin	Total	5,123	1,118	13	176	435	41	136	317	4,005	1,090	103	355	26	27	-	38	111	935	710	492	30	88	-
	Female	2,255	381	3	12	254	8	38	66	1,874	424	11	127	11	8	-	16	22	365	477	369	...	44	-
	Male	2,868	737	10	164	181	33	98	251	2,129	666	92	228	15	19	-	22	89	570	233	123	28	44	-
Lezhë	Total	8,907	2,565	148	33	1,371	19	205	789	6,344	1,820	245	901	45	27	11	130	325	1,261	733	520	59	267	-
	Female	4,031	1,172	26	...	894	...	59	193	2,858	742	30	356	20	14	3	55	57	499	530	383	8	161	-
	Male	4,876	1,390	122	31	477	18	146	596	3,486	1,078	215	545	25	13	8	75	268	762	203	137	51	106	-
Vau-Dejës	Total	2,709	608	37	39	392	14	42	84	2,102	638	79	156	18	5	-	10	36	857	27	218	3	55	-
	Female	1,014	270	13	...	238	3	10	6	739	182	6	51	4	...	-	3	...	304	11	154	...	24	-
	Male	1,695	336	24	37	154	11	32	78	1,356	456	73	105	14	3	-	7	34	553	16	64	...	31	-
Shkodër	Total	16,442	6,167	140	60	4,753	6	255	953	10,274	3,156	231	1,263	189	56	35	336	683	1,271	1,432	841	153	616	12
	Female	8,247	3,569	35	12	3,327	...	60	135	4,676	1,184	20	381	68	19	8	95	329	551	1,042	587	38	344	10
	Male	8,195	2,596	105	48	1,426	4	195	818	5,596	1,972	211	882	121	37	27	241	354	720	390	254	115	272	...
Malësi e Madhe	Total	6,729	1,895	109	7	1,041	10	179	549	4,835	1,695	133	527	42	50	3	69	52	668	928	463	69	136	...
	Female	2,776	565	33	...	425	...	29	78	2,208	643	15	179	11	20	...	25	19	215	676	322	21	62	...
	Male	3,953	1,327	76	6	616	8	150	471	2,624	1,052	118	348	31	30	...	44	33	453	252	141	48	74	...
Project area		70,097	22,271	700	616	15,384	168	1,371	4,032	47,830	14,872	1,738	6,110	619	264	132	1,128	2,495	8,042	5,880	4,162	541	1,830	17
in %		100%	32%	1%	1%	22%	0%	2%	6%	68%	21%	2%	9%	1%	0%	0%	2%	4%	11%	8%	6%	1%	3%	0%

Source: General Directorate of Taxes, Social Security contributors 2019; INSTAT calculations

In meetings with heads of administrative units, it is noted that employment opportunities in rural areas are limited mainly to self-employment, with agriculture being the main employment source. The cultivated crops are mainly to fulfil their needs nor to be sold. Access to markets (mainly Lezhe city) is difficult as no organised infrastructure to access the market.

Remittances from agricultural activity are insufficient for the majority of households in order to meet daily living needs. That is why households look for other sources of income. The most significant alternative source for households of the project area is the income from long-term and short-term migration abroad, mainly in Greece, Germany and less in Italy, as indicated in the discussions with Lezhe and Malesia e Madhe administrators/elderly and railway track technicians. As noted by the economic aid specialist in Zejmen Administrative Unit "young married people face difficulties to start a living due to lack of land and access to employment";

As per gender data at the national level, 54 % of the employed are men and 46 % women. These figures are the same for the project area also. Regarding age group employment at the national level, +50 years is the largest group of employed counting for 26 % of the total employed, with men for this age group 30 % and women 20 %. Similarly, in the project area the 50+ age group is the largest employed with 28 %, with the highest percentage in Malësi e Madhe Municipality with this age group counting for 31 % of the total employed. Gender data indicate that men of the 50+ age group have the largest percentages compared to women for the same age group.

Table 5-101_Employes by age group in Municipalities along the railway alignment

Source: General Directorate of Taxes, Social Security contributors 2019; INSTAT calculations

Age group		National level	Project area	Krujë	Kurbin	Lezhë	Malësi e Madhe	Shkodër	Vau-Dejës	Vorë
Total employed	-24 years	68,505	6,526	1,258	353	788	462	1,681	234	1,750
	25-29 years	96,087	8,836	1,774	624	1,134	844	2,106	389	1,965
	30-34 years	97,863	9,130	1,980	627	1,071	893	2,123	377	2,059
	35-39 years	81,778	8,025	1,860	562	963	735	1,861	287	1,757
	40-44 years	73,162	7,641	1,746	581	934	725	1,802	278	1,575
	45-50 years	90,951	10,235	2,169	891	1,376	962	2,389	395	2,053
	+50 years	174,816	19,705	4,061	1,485	2,643	2,106	4,481	750	4,179
	Total	**683,162**	**70,097**	**14,848**	**5,123**	**8,907**	**6,729**	**16,442**	**2,709**	**15,339**
Male	-24 years	35,552	3,657	669	198	447	321	816	180	1,026
	25-29 years	47,452	4,685	945	302	561	498	1,059	258	1,062
	30-34 years	51,673	4,938	1,086	331	552	516	1,106	231	1,116
	35-39 years	41,364	4,030	931	294	490	401	843	159	912
	40-44 years	35,983	3,592	807	305	452	373	740	155	760
	45-50 years	46,425	5,010	1,046	486	694	485	1,027	212	1,060
	+50 years	112,331	12,238	2,450	952	1,682	1,359	2,605	501	2,689
	Total	**370,781**	**38,145**	**7,933**	**2,868**	**4,876**	**3,953**	**8,195**	**1,695**	**8,625**
Female	-24 years	32,953	2,869	589	155	341	141	865	54	724
	25-29 years	48,635	4,151	829	322	573	346	1,047	131	903
	30-34 years	46,190	4,192	894	296	519	377	1,017	146	943
	35-39 years	40,414	3,995	929	268	473	334	1,018	128	845
	40-44 years	37,179	4,049	939	276	482	352	1,062	123	815
	45-50 years	44,526	5,225	1,123	405	682	477	1,362	183	993
	+50 years	62,485	7,467	1,611	533	961	747	1,876	249	1,490
	Total	**312,381**	**31,952**	**6,915**	**2,255**	**4,031**	**2,776**	**8,247**	**1,014**	**6,714**

In discussions held with employees of the Social Services Directorates in the affected municipalities and the villages' elderly, the high figures for employment of in this age group are linked mainly to pensions contributions and to high youth migration levels. On the other side, women employment face challenges and this is more present in rural area as noted in the words of the Zejmen Administrative Unit social administrator *"… women in Zejmen and its nearby settlements face difficulties to be employed; some women are employed in a small* *clothing company and an olive processing plant in Lezhe city; inter-city transport is missing which makes difficult employment of women outside the area. In addition, women access to employment is hampered also by lack of child care facilities; the only one existing in Zejmen is running for only 4 hrs per day with a limited number of kids; women in rural areas have to rely on relatives for child care if they are to be employed…".*

Similarly, in terms of education attainment, 55 % of the employed in the affected municipalities have a high school degree and only 33 % have a university degree.

Table 5-102_Employes by education attainment in Municipalities along the railway alignment

Municipality	Total	Total			Male			Female		
		Primary	High school	University	Primary	High school	University	Primary	High school	University
Vorë	15,339	2,020	8,323	4,996	1,289	4,910	2,426	731	3,413	2,570
Kruje	14,848	1,772	8,890	4,186	1,079	4,750	2,104	693	4,140	2,082
Kurbin	5,123	589	2,271	2,263	380	1,446	1,042	209	825	1,221
Lezhë	8,907	1,130	4,948	2,829	688	2,906	1,282	442	2,042	1,547
Vau-Dejës	2,709	310	1,236	1,163	208	774	713	102	462	450
Shkoder	16,442	1,761	9,618	5,063	1,046	4,905	2,244	715	4,713	2,819
Malësi e Madhe	6,729	1,051	3,303	2,375	707	2,189	1,057	344	1,114	1,318
Project area	70,097	8,633	38,589	22,875	5,397	21,880	10,868	3,236	16,709	12,007
in %	100%	12%	55%	33%	8%	31%	16%	5%	24%	17%

Source: General Directorate of Taxes, Social Security contributors 2019; INSTAT calculations

5.3.3.6. Vulnerable groups and social exclusion

Steady economic growth over the past decade has not been associated with the same level of human progress and it has not benefitted equally different segments of Albanian society. The latest official poverty figures for Albania date to 2012, when the poverty headcount increased from 12.4% in 2008 to 14.3% in 2012, reaching 18% among women and 20.1% – among children[215]. The level of poverty among Roma and Egyptian population is twice as high as the majority population[216]. The number of persons living under the national poverty line is 400,000. Among them, there are 200,000 persons with disabilities (adults and children).[217]

As per WB poverty projections based on GDP, consumption growth and other data sources suggest there has been a slow decline in poverty. Recent events, including the 6.3 Richter-scale-magnitude earthquake that hit the country at the end of 2019, causing 51 fatalities, and the recent coronavirus pandemic have hampered poverty reduction. Monetary poverty and material deprivation increased in the seven most affected municipalities in 2019, and overall poverty is expected to increase in 2020 breaking a downward trend.[218]

Albania's population is divided in many respects and differentiate in terms of wealth, education, urban and rural habitat, sex, age, family-based solidarity groups, political affiliations, ethnicity and other criteria. The access of individuals and groups to economic, social and political resources is by far not equal. The inclusion of specific groups therefore requires specific attention and support: the marginalised and vulnerable, the poor, and, as important parts of these groups, the Roma and Egyptians and the persons with disabilities.

215 Living Conditions Measurement Survey – LSMS, 2012

216 The income for about 54% of Roma families is less than ALL 10,000/month (approximately EUR 80), while 34% of households reported a monthly income of less than ALL 20,000 – Roma Census (2015), pp 27-28

217 UN Support to Social Inclusion in Albania Programme (2015): Roma and Egyptians in Albania: A socio-demographic and economic profile based on the 2011 census.

218 WB "Poverty & Equity Brief Albania", April 2020 available at https://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global_POVEQ_ALB.pdf

There is no single national definition of a "vulnerable group" in Albania, although the term is used in a different context to denote various categories and degrees of social and economic vulnerability. A definition of vulnerable groups is used in article 2/20 of Law no. 7995/1995 "On Promoting Employment"[219], which includes jobseekers of the following categories;

- Mothers with many children
- Persons aged over 50 years;
- Young people under the age of 18;
- Long-term unemployed jobseekers;
- Family below to the poverty line of Albania;
- Victims of trafficking;
- Person who benefit from income support programs;
- Person emerging from unemployment by enterprises and institutions in the process of reform, restructuring and privatization;
- Girls/mothers unemployed;
- Divorced women with social problems;
- Returners from economic migration;
- Newly graduated unemployed in the labor market; person who have served the sentence of imprisonment;
- Person with disabilities;
- Roma and Egyptian community;
- Orphans unemployed.

In addition, in Albania a Social Assistance and Social Care Services system allow disadvantaged persons, groups or families to cope financially with the consequences of social risks. Despite the recent reform of the social protection system, a vital minimum is missing in Albania that would guarantee or provide the sources of basic livelihood of citizens. As per recent discussions, a vital minimum of 17,875 Lek[220] is being discussed and pushed forward by the Ombudsman. Still, this value is 9.9% higher than the minimum pension for urban areas, 37.5% higher than the unemployment allowance and about two times higher than economic assistance, while it is 45.5% lower than the minimum wage.

Social Assistance and Social Care Services in Albania consist of three programs, as follows:

1. Ndihma Ekonomike "Economic Assistance" Program, which is a social assistance program conditioned by the standard of living, through which support in cash or goods, for families and individuals in need is provided;
2. Disability Support Program that provides monthly payments to persons with disabilities who cannot legally benefit from contribution schemes; and
3. The Social Care Services Program, which includes i-Economic Assistance; ii-Disability Support Program; and Social Care Services that are described hereinafter.

219 As amended by the Law no. 9570, dated 3.07.2006

220 Draft Report on Vital Minimum in Albania, UNDP (2021)

Economic Assistance

The number of families benefiting from economic aid at country level has changes in the last five years, as provided in the below table, due to the reform of the Social Services. In first quarter of 2021, the number of families benefiting economic social assistance was 63,007 households, a slight increase with 2020 data. Families with four members have the largest share in families receiving social assistance (34,9%), followed by families with five members (25,4%).

Table 5-103_Average number of families and protection fund (2016 – 2020)

Years	Total families (no.)	Total Fund (in thousands leks)
2016	80,147	4,115,224
2017	80,945	4,088,491
2018	53,982	3,330,631
2019	60,496	3,603,003
2020	61,445	3,829,204

Source: INSTAT 2020, State Social Services[221]

Average monthly economic aid per family has been stable during 2018 to 2020 at the amount of 5,178 lek. During the first quarter of 2021, it has increased to 8,552 lek, still far below of the assessed vital minimum of in Albania for 2019 of 17,875 Lek[222] and of the minimum wage of 30,000 lek (EUR 240).[223]

As per the discussion and data collect from the Directors of Social Services and Economic Aid and social administrators nearby the Administrative Units, beneficiaries of the cash assistance scheme in the project area are provided in the table below.

Table 5-104_Beneficiaries of Ndihma Ekonomike (economic assistance) in the project area

Municipality	Administrative unit	Settlement	Families with social assistance	Individuals with social assistance	Work invalids with social assistance
Vorë	Vorë	Shargë	0	0	5
	Prezë	Gjeç- Kodër	3	8	17
		Fushë Prezë	1	3	11
		Ahmetaq	1	3	18
Kruje	Bubq	Budull	4	19	36
		Murqine	2	9	11
		Bubq	7	26	33
	Thumanë	Gramëz	11	44	24
		Derven	15	69	44
		Thumanë	53	217	97
Kurbin	Mamurras	Fushë-Mamurras	0	0	3
		Fushe-Gjorëm	0	0	2
		Gjorëm	0	0	0
	Laç	Lagjia 4 Laç	14	56	2
	Milot	Fushë Milot	11	33	0
		Mal i Bardhë	1	7	0
Lezhë	Zejmen	Pllanë	2	0	1
		Zejmen	32	6	23

221 http://www.instat.gov.al/al/temat/kushtet-sociale/mbrojtja-sociale/#tab2

222 Draft Report on Vital Minimum in Albania, UNDP (2021)

223 As per January 1,2021 the minimum wage in Albania is set at 30,000 lek/month - https://www.tatime.gov.al/d/8/45/0/1498/njoftim-per-pagen-minimale-dhe-maksimale-nga-periudha-janar-2021

Municipality	Administrative	Settlement	Families with	Individuals	Work invalids
		Spiten	21	7	16
		Tresh	8	3	2
	Shëngjin	Ishull- Lezhë	15	0	87
		Ishull-Shëngjin	27	0	132
	Lezhë	Lezhe city	117	21	698
	Kallmet	Mërqi	14	0	29
		Rraboshtë	24	6	16
		Kallmet	28	0	54
	Balldren	Gocaj	23	0	19
	Blinisht	Piraj	1	0	8
		Baqel	3	0	9
Vau-Dejës	Hajmel	Nënshat	32	194	15
		Dheu i Lehtë	22	84	5
		Hajmel	85	341	25
	Vau-Dejës	Kaç	25	107	9
		Naraç	38	150	7
		Shelqet	19	70	5
		Mjedë	74	278	18
		Spatharë	18	70	6
Shkoder	Guri i Zi	Ganjollë	10	43	2
		Vukatanë	11	43	5
		Juban	22	87	19
		Rrencë	17	65	14
	Shkoder	Rajoni 5 / Rajoni 2	447	1,356	2,390
	Rrethinat	Golem	48	240	30
		Shtoj i Ri	37	185	38
		Shtoj i Vjetër	24	120	10
		Grudë e Re	95	475	65
Malësi e Madhe	Gruemirë	Grilë	14	62	3
		Boriç i Vogël	7	34	3
		Boriç i Madh	21	90	42
		Omaraj	6	26	5
		Grudë-Fushë	6	25	4
		Ktosh	2	10	2
		Demiraj	13	57	2
	Qendër	Dobër	17	56	3
		Kamicë-Flakë	24	68	7
	Koplik	Qyteti Koplik	110	431	35
	Kastrat	Pjetroshan	42	27	2
		Aliaj	40	27	3
		Bajzë	91	52	6
		Ivanaj	24	16	2
		Vukpalaj	32	18	1
		Hot	53	25	3
Total			1964	5469	4183

Source: Social Services and Economic Aid Units in Municipality of Vore, Kruje, Kurbin, Lezhe, Vau Dejes, Shkoder and Malesia e Madhe

Of the seven municipalities, the lowest numbers of beneficiaries of social assistance are in Kurbin Municipality, one of the poorest. Discussion with Milot Administrator and Director of the Social Service in Kurbin Municipality indicated that the application process and eligibility criteria have changed and often the interested people for this aid, fail to be selected due to the lack of documentation and knowledge on the process. Nevertheless, they noted that families on social assistance do benefit from free health services (free family doctor, free basic health check-up, reimbursable medicines, vaccination bonus), other transfers such as subsidies for energy bills, water consumption, free school meals and free textbooks for children from poor or vulnerable families, and free public transportation for the disabled and the elderly. However, these transfers are not regular and not accounted in the social protection budget, and the municipality can provide no information about their coverage, efficiency and the impact they have on achieving equity.

Disability Support Program

Disability allowance (DA) for people with mental and physical disability, amount to 9,900 lek/month (EUR 70). According to the data provided by the social services departments in each municipality, in the project area disability financial support is provided to 4,573 individual. As per the provided data, the highest number of beneficiaries are in urban areas mainly in Shkoder and Lezhe city and their nearby settlement. Figures provided by Kurbin municipality indicate that this is not the trend in Laç city.

Table 5-105_Beneficiaries of Ndihma Ekonomike (economic assistance-disabled persons) in the project area

Munici-pality	Admini-strative unit	Settlement	Economic Assistance (disability allowances)					Total
			incapable of work (mentally disabled)	disability caregiver	pre-tetraplegic (physical disabled)	blind people	blind caregiver	
Vorë	Vorë	Shargë	5	2	2	0	0	10
	Prezë	Gjeç- Kodër	0	2	2	9	5	26
		Fushë Prezë	8	1	2	1	1	13
		Ahmetaq	15	4	2	0	0	21
Kruje	Bubq	Budull	27	0	3	16	4	50
		Murqine	5	0	1	1	0	7
		Bubq	10	0	4	9	2	25
	Thumanë	Gramëz	16	2	0	7	3	28
		Derven	53	3	6	9	4	75
		Thumanë	39	5	9	13	7	73
Kurbin	Mamurras	Fushë-Mamurras	3	0	0	0	1	4
		Fushe-Gjorëm	2	0	0	0	0	2
		Gjorëm	0	0	0	2	0	2
	Laç	Lagjia 4 Laç	4	0	0	0	0	4
	Milot	Fushë Milot	0	0	0	0	0	0
		Mal i Bardhë	2	0	0	0	0	0
Lezhë	Zejmen	Pllanë	9	2	0	4	1	16
		Zejmen	37	5	6	11	3	62
		Spiten	16	3	2	6	2	29
		Tresh	18	6	1	2	0	27
	Shëngjin	Ishull- Lezhë	38	4	11	12	5	70
		Ishull-Shëngjin	84	21	19	16	7	147
	Lezhë	Lezhe city	437	88	59	78	30	692
	Kallmet	Mërqi	20	3	3	4	1	31
		Rraboshtë	29	7	3	0	0	39
		Kallmet	52	12	4	10	3	81
	Balldren	Gocaj	137	21	21	14	5	198
	Blinisht	Piraj	0	0	0	2	2	4
		Baqel	72	2	0	2	2	78
Vau-Dejës	Hajmel	Nënshatë	21	5	3	4	1	34
		Dheu i Lehtë	7	0	0	3	1	11
		Hajmel	31	10	0	6	2	49
	Vau-Dejës	Kaç	8	3	2	0	0	13

Munici-pality	Admini-strative unit	Settlement	Economic Assistance (disability allowances)					Total
			incapable of work (mentally disabled)	disability caregiver	pre-tetraplegic (physical disabled)	blind people	blind caregiver	
		Naraç	13	3	4	2	1	23
		Shelqet	18	3	2	0	0	23
		Mjedë	26	2	1	6	3	38
		Spatharë	3	1	0	0	0	4
Shkoder	Guri i Zi	Ganjollë	2	1	1	1	0	5
		Vukatanë	10	1	3	2	0	16
		Juban	43	3	3	7	2	58
		Rrencë	22	3	2	4	1	32
	Shkoder	Rajoni 5 dhe 2	1,156	204	154	286	82	1,882
	Rrethinat	Golem	41	2	5	6	2	56
		Shtoj i Ri	48	7	2	8	1	66
		Shtoj i Vjetër	13	6	4	0	0	23
		Grudë e Re	81	19	7	15	3	125
Malësi e Madhe	Gruemirë	Grilë	7	0	0	0	0	7
		Boriç i Vogël	4	0	0	0	0	4
		Boriç i Madh	48	11	3	4	1	67
		Omaraj	2	0	1	0	0	3
		Grudë-Fushë	5	0	0	0	0	5
		Ktosh	8	2	0	0	0	10
		Demiraj	3	1	0	0	0	4
	Qendër	Dobër	13	5	4	1	0	23
		Kamicë-Flakë	11	2	0	0	0	13
	Koplik	Qyteti Koplik	56	8	10	35	5	114
	Kastrat	Pjetroshan	3	1	2	0	0	6
		Aliaj	1	0	0	1	0	2
		Bajzë	8	3	2	2	1	16
		Ivanaj	4	1	0	0	0	5
		Vukpalaj	5	2	0	1	0	8
		Hot	7	3	1	2	1	14
Total			**2,866**	**505**	**376**	**624**	**195**	**4,573**

Source: Social Services and Economic Aid Departments in Municipality of Vore, Kruje, Kurbin, Lezhe, Vau Dejes, Shkoder and Malesia e Madhe

People with disabilities are much less likely to participate in the labour market than their nondisabled peers. Eight in 10 disabled working-age adults are neither working nor looking for work. Consequently, disabled adults are five times less likely to be working than the non-disabled population.[224]

As per the meeting with "DOORS" CSOs[225], it was noted that "*… even though, persons with disabilities are entitled to free health care services, often they face difficulties to access the healthcare centres and hospitals. Rehabilitation and treatment services for persons with disabilities are almost inexistent in Shkoder region; most of the public spaces are inaccessible to the majority of people with a disability, and in particular for children with disabilities. The same situation applies to the station's infrastructure, even though they are not being used nowadays. Accessibility to them remains in issues to be addressed by the project...*"

224 Census 2011: Profiles of Disabled Population, January 2015, available under https://www.al.undp.org/content/albania/en/home/library/profile-of-the-disabled-population-in-albania.html

225 DOORs CSOs is located in Shkoder and provides support, mainly to people with physical disabilities in northern Albania (Shkoder qark). If provides equipment to disabled persons (free of charge) that help them be more independent to better integrate themselves into the socio-economic life of the community to which they belong.

Social Care Services

Social Care Services have been very limited in Albania, largely provided by CSOs and other non-state agencies. Existing social services are fragmented, rudimentary and ad-hoc in nature. The need for Social Care Services is growing, nevertheless there is there is still only very limited planning to ensure an appropriate matching of supply of services with demand for services.[226]

Publicly funded non-financial social care services (other than limited institutional services) are very limited in Albania. Specialised services are mainly to be found in larger urban areas (where 90% of service providers are active), and 75% are offered in the western and central areas of the country, with the mountain regions being underserviced. This can be noticed in figure below, which provides the distribution of existing social care services in the project area.

The existing social care services in the project area cover mainly social services for i) children 0-3 years old and 3-14 years old, ii) families with social problems and for the community, iii) people with disabilities, iv) elderly, v) young people over 16 years old and vi) women and girls.

226 UNICEF (2016) "Supporting Planning of Social Care Services, Proposal on Establishing a Package of Services in Albania and Financing Mechanisms", available at https://www.unicef.org/albania/reports/basket-social-care-services

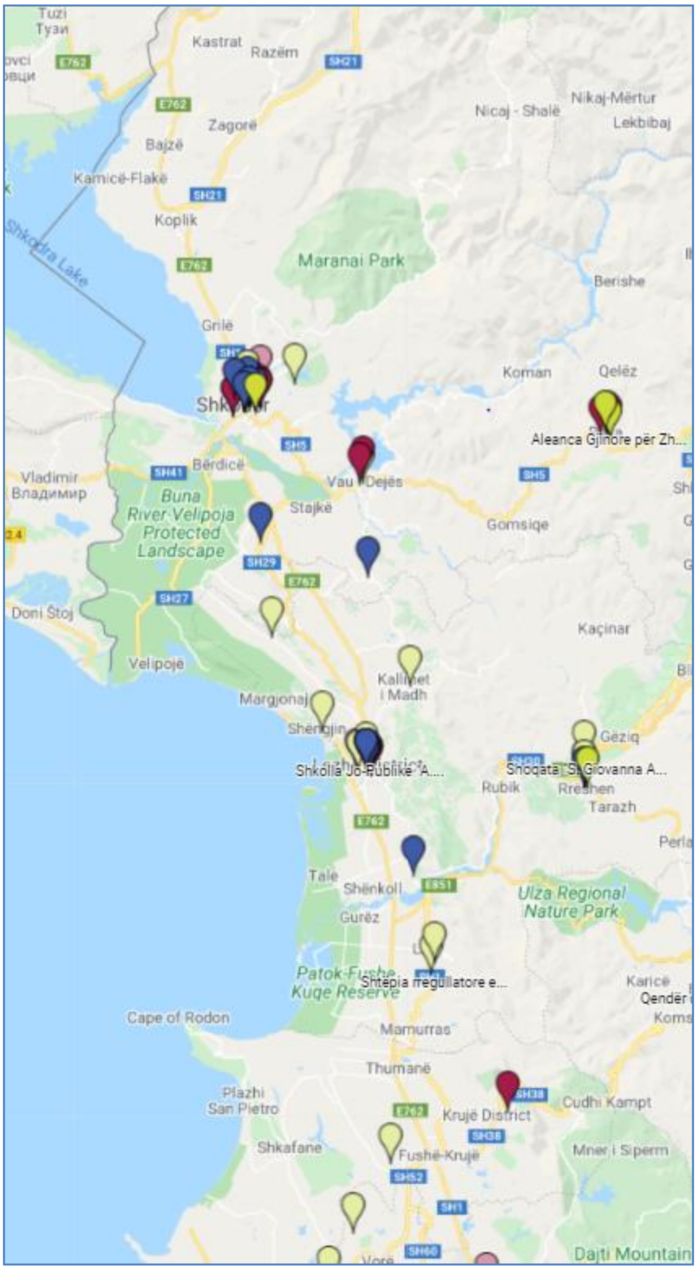


Figure 5-164_ Social care services presence and providers in the project area

Legend

- Social services for children 0-3 years old and 3-14 years old
- Multidisciplinary services for families with social problems and for the community
- Services for people with disabilities
- Social services for the elderly
- Multidisciplinary services for young people over 16 years old
- Social services for women and girls

Source: Electronic map of the social services in Albania[227]

227 Available at https://www.google.com/maps/d/viewer?mid=1z08nm5AInCyJnbEoBaUQAJir 2K4&ll=41.226302281182015%2C20.06138514619135&z=8

The largest number of the social care centers is located in the Municipality of Shkoder, 25 ones. In the municipality of Lezhe, social care is provided in nine social care centers, mainly located in the city of Lezhe. In the territory of Vau i Dejes Municipality there are three social care centers. In the municipality of Kurbin, there are only two social care centers located in the city of Laç. In the municipality of Kruje there are three social care facilities and in the municipality of Vore there are two social care centers. No social care centers are located at Municipality of Kurbin.

A closer revision of the location of the social care services indicates that the number of these facilities in the settlements nearby the railway track is rather limited with only eight of them providing services to the nearby communities. This means that the other part of the territory through which the railway passes through is uncovered with this service. This remains true particularly for the Municipality of Malesia e Madhe, where no social care facilities are registered.

A summary of the social care services nearby the railway line is provided in the table below.

Table 5-106_Social Care Services located in the settlements, cities by passed and/or passed through by the railway line

Municipality	Social Care Center	Services provided	Location
Vorë	n/a	n/a	n/a
Kruje	Fshati Betania - Kruje	Residential services for ages 0-18	Fushë Kruje, Administrative Unit Bubq, nearby Llixhave
Kurbin	n/a	n/a	n/a
Lezhë	Shkolla Jo-Publike "EFFATA" - Lezhë	Residential care for deaf-mute persons aged 6-14 years	Shkolla EFFATA, Pllanë, Lezhë
	Fondacioni "Shenjta Mari" - Lezhë	Social services for children 0-3 years old and 3-14 years old and counselling services	Lagjia SMT, Fondacioni "Shën Mari", rr vellezërit Coku, godina nr 163
	Shën Eufemia - Lezhë	Social services for children 0-3 years old and 3-14 years old	Shkolla "Shën Eufemia" Kallmet, Lezhë
Vau-Dejës	Papa Gjovani XXIII "Patrizia"	Services for people with disabilities	Hajmel, Nenshtatë, near to the kindergarden
Shkoder	Qendra Rinore "Trokitje"	Multidisciplinary services for young people over 16 years old	Eastern neghbourhood of Shkoder
	Projekti Shpresa	Services for people with disabilities	Eastern neghbourhood of Shkoder
	Elderly Home	Social services for the elderly	Eastern neghbourhood of Shkoder
Malësi e Madhe	n/a	n/a	n/a

Source: State Social Services[228]

The main categories that benefit from social services are children and youth, followed by person with disabilities, and elderly.

5.3.3.7. Gender Analysis and GBVH

In Albania, gender discrimination is linked with the lack of harmonization between laws promoting gender equality and other legislation such as the Labour Code and Criminal Code, and Family Code. Unequal treatment of women, including harassment and social marginalization, exists throughout the country and are fundamental problems that can influence such infrastructure projects. Hereupon, in these conditions, women may be less able than men to enjoy their right to non-discrimination.

228 http://www.instat.gov.al/al/temat/kushtet-sociale/mbrojtja-sociale/#tab2

Education

The educational participation by gender in the education cycles indicates the existence of gender differences at various education levels.

Participation in upper secondary education is higher for men than women, namely 96.8 % and 90.1 %, whereas the ratio for higher education is rather reversed, as the participation scores higher for women 71.9 % than men 46.7 %. The ratio of men attending pre-university education is higher compared to women, whereas 60.4 % of students in higher education are women. The number of graduates from higher education in the academic year 2019-20 amounted to 33 thousand students, of whom 65.3% were women. Fields of study women graduate the most are business, administration, and law (28.4%); health and wellbeing (16.3 %); arts, and humanities (13.0 %)[1]. These data indicate that women attend and frequent higher education more than men, which tend to start working after completion of the second degree.

Employment and Economy

Due to cultural and religious reasons, women were usually considered 'those who have to take care of the family" but this is gradually changing. At the household level, women tend to contribute more to income sources from pension and social protection funds, while their male counterparts tend to contribute more to income sources from agriculture, self-employment, and salaried employment. Women's status in Albania remains somewhat marginalized. The primary issue facing rural women is a lack of economic empowerment, resulting from traditional custom, and having limited access to employment and income-generating opportunities, a lack of skills training, and a general detachment from economic development.

According to the INSTAT's labour force survey in 2021, women are less likely to participate in the labour market. In terms of the population aged 15-64, the participation of women in the labor force has decreased in 2020, to 61.2 % from 61.6 % compared in 2019. According to the causes of inactivity, women remain out of the labour force mostly because they are busy with unpaid work at home (18.8 %), or are attending school (20.9 %)[1].

Gender based violence and harassment (GBVH)

Violence against women and girls is a human right violation. It occurs in various forms, such as physical, sexual, psychological, and economic.

GBVH disproportionately affects women and girls across their lifespan and takes many forms, including sexual, physical, and psychological abuse.

GBVH risks can intensify within local communities when there are large influxes of male workers from outside the area. During the construction phase, workers are also vulnerable to various forms of harassment, exploitation, and abuse, aggravated by traditionally-male working environments.

The risk of GBVH is higher for sectors dominated by male workers, such as railways, during the construction and operational phases of the projects.

Albania's legal framework for addressing violence against women and girls has undergone significant changes over the past two years in line with legal developments around the world. The most important changes were made in 2018 to the Law on Measures against Violence in Family Relations.

Starting in 2015, the Albanian Labor Code has included the notion of sexual harassment in the workplace as "every unwanted form of behaviour expressed by words or physical/symbolic actions of a sexual nature, which claim to damage the employee's personal dignity, especially when it creates a threatening, hostile, degrading, insulting work environment, and it's committed by the employer against an employee, employ seeker, or in between employers ".

Also, regarding gender issues in general and sexual harassment in particular, Law no. 9970, dated 24.07.2008 "On Gender Equality" is one of the main legal measures that our country possesses in order to guarantee fair and equal working conditions for every employee regardless of gender. Specifically, Article 4/10 provides a definition of sexual harassment in the workplace in full compliance with EU-Directive 2006/54/EC.

5.3.3.8. Education

The responsible institution for the education system is the Ministry of Education, Sports and Youth. Education is provided by public and private institutions, and is organised in[229]:

- Pre-school education, which starts as of age 0 to 5 years old and provided in nurseries and kindergartens. It is not obligatory.
- 9 year education, which is called also basic education, is obligatory and consists of:
  - Primary education, which starts as of age 6 to 10 years old
  - Lower secondary education, which starts as of age 11 to 15 years old
- Upper secondary education, is provided in high schools, which can be general (gymnasium), vocational school and oriented.
- Higher education that includes Universities, Academies, Professional Colleges and Inter-University Centres. Institutions of higher education may be public, non-public and public independent. Albania started reforming the higher education system by joining the Bologna Process in 2003.

In 2019-2020 academic year, there were enrolled 447,108 pupils at kindergarten, basic education and upper secondary formal education, both in public and private education institutions. As per 2017-2018 school year data, pupils per class ratio is 21 in basic education and 27.6 in upper secondary education; pupils per teacher ratio is 13.5 in basic education and 13.1 in upper secondary education. These figures are lower in rural areas.[230]

In the project area there are overall 199 public education institutions and 48 private ones, which count only for 43 % of the overall number of education institution. The number of pupils/kids frequenting the education facilities in the settlements along the alignment is 59 % of the overall registered kids/pupils in the project municipalities.

As per Ministry of Education data, education institutions are present in all the administrative units and in most of the settlements (apart Blinisht) nearby the railway line. Often kindergartens are part of the 9-year schools infrastructures. The number of schools and enrolment level is higher in urban areas compared to rural ones. Total number of enrolled pupils in the project area is 37,940 for the academic year 2019-2020, of these 31,103 study in public institutions and 6,837 in private ones.

As shown in the following table, public education facilities are present in all the municipalities, whereas there is no presence of private institutions in municipalities of Vorë, Kruje and Vau Dejës. As per affected settlements, there is no presence for secondary upper education facilities in several nearby settlements. In these cases, careful consideration is given to the travel routes of kids/pupils to nearby facilities, found usually at the centre of the administrative unit.

Education facilities suffered significant damage from November 26, 2019 earthquake with municipalities of Vorë, Kruje, Kurbin and Lezhë most affected in the project area. Overall, 143

229 Ministry of Education, Youth and Sports, Statistical Annual Report of Education, Sports and Youth 2017-2018, (2019) pg 6, available at https://arsimi.gov.al/wp-content/uploads/2020/06/Vjetari-statistikor-2017-2018-i-botuar.pdf

230 Ibid, pg. 43

education facilities are part of the earthquake reconstruction programme. Thus, in Vorë most of the education facilities have been damaged; in Kurbin 7 education facilities, among which the kindergarten and high school in Mamurras, 9 years school in Gjorm, 9 years school in Sanxhak are to be reconstructed[231].

Table 5-107_Education institutions and enrolment for academic year 2019-2020 as per each administrative units and nearby settlements, in the respective Municipalities along the railway alignment

Municipality	Administrative Units	Nearby settlements (city + village)	Public						Private					
			kindergarden	kids	9-year schools	pupils	high schools	pupils	kindergarden	kids	9-year schools	pupils	high schools	pupils
Vorë	**Municipality**	**1 + 18**	**7**	**374**	**13**	**3,344**	**3**	**847**						
	Vorë	2	2	95	1	285								
	Prezë	4			2	309								
Krujë	**Municipality**	**2 + 50**	**30**	**1,623**	**37**	**6,814**	**7**	**2,006**						
	Bubq	5	5	125	4	473	1	94						
	Thumanë	4	4	168	4	736	1	86						
Kurbin	**Municipality**	**3 + 27**	**23**	**1,429**	**27**	**4,873**	**4**	**1,505**	**1**	**16**	**2**	**199**	**2**	**65**
	Mamurras	1 + 4	8	483	7	1,563	1	453			1	61		
	Laç	1 + 1	4	550	7	1,784	1	727			1	138		
	Milot	1 + 3	4	191	4	661	1	166					2	65
Lezhë	**Municipality**	**2 + 65**	**44**	**1,573**	**37**	**6,339**	**13**	**2,375**	**8**	**422**	**4**	**787**	**2**	**400**
	Zejmen	5	5	167	5	608	1	127	1	29	1	205		
	Kolsh	1	1	30	1	39								
	Shëngjin	2	3	210	2	436	1	130						
	Lezhë	1	6	575	5	2,581	4	1,617	4	308	2	508	2	400
	Kallmet	3	4	53	3	178	1	18	1	30	1	74		
	Balldren i Ri	1	1	9										
	Blinisht	2												
Vau-Dejës	**Municipality**	**1 + 47**	**24**	**616**	**27**	**2,306**	**6**	**671**						
	Hajmel	3	4	218	4	341	1	57						
	Vau-Dejës	5	4	126	3	383	2	123						
Shkodër	**Municipality**	**1 + 93**	**56**	**1,920**	**79**	**10,582**	**16**	**4,786**	**9**	**552**	**12**	**2,872**	**9**	**1,566**
	Guri i Zi	4	2	70	3	374			1	86				
	Shkodër	1	21	1,074	21	6,243	9	4,089	7	421	11	2,818	9	1,566
	Rrethinat	4	4	126	4	667								
Malësi e Madhe	**Municipality**	**2 + 56**	**29**	**549**	**35**	**2,236**	**7**	**776**	**3**	**124**	**1**	**16**	**1**	**18**
	Gruemirë	5	2	23										
	Qendër	2	2	41										
	Koplik	1	1	107	1	462	1	329	1	22	1	16	1	18
	Kastrat	1 + 3	3	67	2	313	1	143	1	72				

Source: Ministry of Education, Sport and Youth (2019)

The only university in the project area is University "Luigj Gurakuqi", in the city of Shkoder. It is the only university in the northern region of Albania. This university has 6 faculties, 26 branches and more than 190 professors. 11,988 students attend full-time studies, 2,153 students are registered as part-time, 1,885 students continue their master studies (second cycle) and 12 students enrolled in the third cycle of PhD studies[232].

5.3.3.9. Health

The responsible institution regarding health care service in Albania is the Ministry of Health and Social Protection. The health system in Albania is largely public and it is organized in three main levels: primary health care, secondary hospital service, and tertiary hospital. Primary health care service is the first point where basic service is provided to the population. As per 2019 data the health institutions that provide primary health care service at the country level count 413

231 https://portavendore.al/2020/06/22rindertimi-i-shkollave--kostot-e-shtuara-nga-projektet/

232 www.unishk.edu.al

health centres, 2053 ambulances and 46 polyclinics.[233] Within the primary health care service, operate also the specific services for the care of mother and child, who provide services for this group of the population.

Secondary health care is provided by regional hospitals with basic and specialized services, in 42 public hospitals with 8,185 beds counted in 2018. On average there are 29 beds/10,000 inhabitants, a number unchanged in the recent years.[234] The private sector covers most of pharmaceutical service, dental service and some specialist diagnostic clinics and private hospitals mainly located in Tirana.

In all the administrative units along the alignment, there is at least one health centre (HC)[235] (in Shkoder Municipalities there are 4) and presence of ambulances almost in all the settlements along the alignment. Overall, the figures of the existing health care facilities are as follows.

Table 5-108_Health care facilities in the municipalities along the railway alignment

Municipality	Health centers	Ambulances	Hospitals
Vorë	3	6	0
Kruje	6	38	1
Kurbin	4	23	1
Lezhë	10	82	1
Vau-Dejës	6	22	0
Shkoder	14	95	1
Malësi e Madhe	6	42	0
Project area	49	308	4
in % to national level	12%	15%	10%

Source: Meetings with municipalities, Ministry of Health and Social Protection, own calculations

Usually, the services are accessible to the resident population, and in walking distance and in are located at the centre of the administrative units. The ambulances in rural areas usually are in need of an extreme renovation and improvement in terms of infrastructure and service. The buildings are old and often in lack of minimal services. Usually, residents of rural settlements go for complete health care services in the cities where hospitals are located. This is the case for Vau – Dejës and Malësi e Madhe Municipalities, where secondary health care is offered by Shkoder Regional Hospital. Similarly, Vorë residents for secondary health care services access Tirana hospital facilities.

Targeted HCs provide services for children, pregnant women, senior health care such as injections, blood pressure check, vaccinations, mild wound and fever care, anti-allergic injections. Human resources are also another concern for these areas. Mostly there is only one nurse working at HCs and a doctor who works two or three times per week per HC.

This information was validated during the meetings with Administrators and technicians of the railway line. They noted that access to health service and education is satisfying in general. The majority of the families get access to health centre and doctor in 10 to 20 minutes as the the both education and health facilities and are situated in the centres of the settlements and local road infrastructure is available (the old national road does pass by all the settlements nearby the railway line).

233 INSTAT 2019 Statistical Yearbook (2019), pg 30, available at http://www.instat.gov.al/media/6560/sv-2019.pdf

234 Ibid

235 https://www.fsdksh.com.al/qendrat-shendetesore

Kruje regional hospital and Bubq HC were severely hit by the November 26, 2019 earthquake and are part of the earthquake reconstruction programme, which targets 10 health facilities to be reconstructed in the affected areas.

5.3.3.10. Ecosystem Services

This section presents the identification and screening of ecosystem services associated with the project area.

The ESIA team has identified the ecosystem services that could be impacted, directly or indirectly, by the project. The team also has identified the ecosystems on which project-related restrictions (e.g., land acquisition, change in land use) could prevent the users from deriving benefits from these ecosystems.

Protected areas

The National Biodiversity Strategy of Albania (2012-2020) recognises that wetlands, lagoons, sand dunes and river deltas in Albania (among other habitats) are of importance for biodiversity and ecosystem services. Wetlands in Albania are reportedly under severe threat by unsustainable developments related to massive tourism and natural resource use. Therefore, this assessment considers Critical Habitats as the following protected areas classified as Highly threatened or unique ecosystems according to the EBRD Criterion:

1) Nature Managed Reserve of Lake Shkoder;
2) Landscape Protected Area of Bune-Velipoje;
3) Nature Managed Reserve of Kune-Vain;
4) Nature Managed Reserve of Patok-Fushe-Kuqe-Ishem;
5) Nature Managed Reserve of Berzane.

Referring to the analysis of the WWF report of 2019 for the protected area benefit assessment (PA-BAT) in Albania, the top activities that generate economic benefits (primarily minor economic benefits) within protected areas are livestock grazing, honey production, the collection of medicinal herbs and tourism. Nature conservation is listed as an income-generating activity because stakeholders perceive PAs as places where natural values, culture, and specific site values are key elements for the promotion of tourism. The majority of income comes from the provisioning services such as food production, raw materials, water, and medicinal resources. Regulating services, climate change mitigation, flood prevention, and soil stabilization – were not recognized as of economic value in any protected area. Below are some indicators referred to in the above-mentioned report:

- 77% of PAs generate major economic benefits from the use of water, mainly for the business sector.
- The annual fish harvest in Lake of Shkodra is around 124 tons per year.
- More than 90% of electric energy in Albania is produced in hydropower plants.
- Medicinal and aromatic plants are one of Albania's most important exported products, estimated to account for between 30-33 million $ annually.
- Honey production and wild food gathering play a significant role in the economy of local communities in Albania.
- Economic potential from tourism is perceived in 92% of assessed PAs, medicinal herbs in 69% and livestock grazing in 62%.

Before an impact assessment process takes place, the baseline information should be analysed to determine the *priority* ecosystem services. Prioritization is based on two key questions:

a) Could the project affect ES that benefit project stakeholders?
b) Is the ES important to the stakeholders' livelihoods, health, safety, or culture?

- The railway project may affect the ecosystem services in the Lake Shkoder area, as the railway traverses the Nature Managed Reserves, and their habitats. The working strip may reduce the forest and shrub habitats (loss of biomass as economic value), and other natural habitats used by the local communities. Degraded Forest formations dominated by a mix of deciduous oak species (km 132+500 to km 137+750); In the working strip area, all vegetation will be removed and the terrain will be flattened. That will affect the change and degradation of habitats.
- The project may affect the quality of water resources, lake's ecosystem and natural resources:
  - water quality and fluctuation levels, are suitable for aquatic communities and for public use.
  - biodiversity and wildlife management, especially important habitats and species.
  - management of landscape, cultural resources and heritage.
  - sustainable use of the lake area: fishery, forestry, organic agriculture, stock breeding, eco-tourism, medicinal plants, handicrafts and other traditional products.
- The project may affect the preservation of the ecological and cultural values of the protected areas:
  - Wildlife, cultural assets and water resources.
  - livelihoods based on sustainable use of ecosystem services such as agriculture and livestock sectors, tourism sector and safe supplies of drinking water.

The baseline study has identified some of the ecosystem services supplied by the potentially impacted ecosystems, as well as the individuals, communities, institutions, etc. that could be negatively affected as a result of the project impacts on ecosystem services.

5.3.3.11. Findings related to the proposed project

Vorë – Hani Hotit Railway alignment passes through the territory of seven municipalities where 22 administrative units and 60 settlements (four cities and 56 villages) are indirectly affected by the project, a part of them crossed, bypassed, or located close to the railway alignment.

- The main categories that benefit from social services are children and youth, followed by person with disabilities, and elderly.
- No representatives of Roma and Egyptian communities live nearby or are affected by the rehabilitation of the railway alignment.
- A limited number of social care facilities are found in the project area, with no ones in the Municipality of Malesia e Madhe, leaving the vulnerable people with no access to their services;
- The authorized level crossing and parallel service roads have already considered the population movement to reach centres of administrative units, secondary education facilities, and health centres.

- Access of disabled persons to stations has been considered and new building stations and the ones to be reconstructed foresee access and parking spaces for disabled;
- Recent events, including the 6.3 Richter-scale-magnitude earthquake that hit the country at the end of 2019, and the recent coronavirus pandemic have hampered poverty reduction. Monetary poverty and material deprivation increased in the seven most affected municipalities in 2019.

6. Impacts and Mitigation

This chapter describes the likely impacts that may arise from the development stages of the proposed project. The selected impacts derive mainly from the scoping matrix, which has been prepared during the scoping stage, as well as on the detailed description of the baseline information and the project's elements and activities.

The followed approach is following the national environmental legislation, as well as with the environmental and social requirements of EBRD. The characterization of the likely impacts is described in chapter 4 (Impacts Assessment Methodology).

The identification and the assessment of the potential impacts include the selected option (the basic option) and the existing situation (the "do-nothing" option). A comparison of both these options from the environmental point of view is provided in chapter **Error! Reference source not found.** of this document).

As the project's requirements and activities during the construction works are different from those during the operational stage, the sources of impacts during these stages are described separately.

6.1. Project requirements, activities and sources of impacts

6.1.1. Design, preconstruction, and construction stage

6.1.1.1. Sources of the likely impacts

The preconstruction and construction stages include mainly the following activities:

- Demolition of the existing bridges and culverts;
- Demolition of the existing railway stations;
- Removal of the concrete structures of Lezhë's tunnel to increase the tunnel cross-section to allow the electrification of the railway line;
- Removal of the existing rails and slippers;
- Removal of the existing ballast and whether necessary of the sub-ballast;
- Whether necessary, removal of the subgrade layer;
- Earthworks and vegetation clearing for the working strip on both sides of the railway, as well as for the construction of the new service roads, the new Lezhë 2 station, and the rehabilitation of the stations;
- Construction of eventual work camps including storage and parking areas, administration buildings, areas for equipment repair and maintenance, etc.;
- Construction of any eventual temporary access road;
- Earthworks for cleaning the drainage channels and retaining walls;
- Construction of the new railway stations;
- Construction of bridges and culverts;
- Construction of Lezhë tunnel;

- Construction of underpasses;
- Construction of the new service roads;
- Construction of railway line fencing;

The above activities may affect the biophysical and socio-economic environment through their following requirements:

- Permanent land take for the service roads and Lezhë 2 station;
- Temporary land take for the working strip;
- Extraction of raw material for the railway body;
- Use of construction materials (bricks, cement, concrete, asphalt, metal, etc.);
- Use of construction machinery and transport vehicles;
- Fuel usage during construction;
- Water Consumption;
- Waste handling and disposal;
- Traffic disturbance; etc.

6.1.1.2. Environmental references for the resources used

Permanent and Temporary Land Take

The permanent land take includes the land required for service and connectivity roads, Lezhë 2 station, the improvement of the railway line horizontal alignment, any underpass, and any pedestrian overpass. The temporary land take includes the working strip area, the work camps, and any eventual access roads. Special attention should be paid to avoidance or reduction of potential impacts upon the valuable areas from the environmental and social point of view.

Materials usage during Construction

Filling material and aggregate will be obtained from local designated and approved quarries. The following options should be considered for the supply of the filling material: preferably existing quarries and gravel and sand pits. The proposed new quarries for ballast material that contain basaltic material should avoid as practical as possible the new access roads.

The ballast will be in basalt rock, which has excellent qualities to be used in the railway construction. The basalt quarry is located in Mirdita region, at Spac area, near Reps town, some 30 km from the Nature Managed Reserve. The total surface of the quarry is 47 ha, while the geological reserves are roughly 20 million cubic metres. Therefore, it is a huge quarry, which can supply all the needed amount of ballast.

This quarry is used since 2015 by Balkan Basalt Shpk[236], which currently is the only licensed company for the basalt extraction in Albania. As a subsidiary of the Dutch Phoenik's group[237], Balkan Basalt Company operates in full accordance with the EU and Dutch standards[238]. It has all the necessary permits and certificates for the mines, mineral extraction and transport. Therefore, the environmental aspects and permits of the basalt quarry, including basalt

236 https://balkan-basalt.com/en/

237 Phoeniks group – expert in commodity extraction (phoeniksgroep.nl)

238 https://www.linkedin.com/company/balkan-basalt

extraction and transport, and quarry rehabilitation are under the responsibility of the supplier (Balkan Basalt Shpk).

The same quarry will supply in basalt the construction of the railway line Durres-Tirana239, which construction will start in September 2021 and will be financed by EBRD240.

All the licensed quarries of the country have the permit for the extraction and transport of the raw material. Their environmental permit includes also the quarry rehabilitation. Therefore, the quarry rehabilitation is under the tasks of the raw material supplier.

The topsoil within the land surface planned for the new service roads, Lezhë 2 station, etc. should be removed and used for agricultural purposes in other places, which location should be found in collaboration with the local governments.

The topsoil disturbed temporarily by construction and transport activities should be excavated and stored separately to be replaced on the same surface when the disturbed areas are rehabilitated.

The necessary materials for construction purposes are of natural origin (crushed stone, gravel, sand) or a mixture of above (concrete) that are not harmful to the environment in the close vicinity of the railway line. Other ones (oil, grease, paints, etc.) may adversely affect the environment.

The responsible authorities and relevant institutions will approve all the material that will be used during the preconstruction and construction stage.

Fuel Usage

Heavy construction and transport equipment used during the preconstruction and construction phase will be fuelled with diesel fuel, which quality should fulfil the national standards.

Water Consumption

The water consumption during the construction phase is related to the production of concrete (in case that concrete is produced on-site), mortar, to the watering of the construction sites to reduce dust emissions, as well as for sanitary uses, etc.

Air Emissions

During the construction activities, the air quality will be affected by the heavy equipment and vehicles due to the fuel combustion, as well as from dust particles from soil movement due to the traffic, construction engines, etc. The main pollutants will be dust, NO_X, CO, and SO_X.

Noise Emissions

During the construction, heavy construction equipment and vehicles generate noise emissions. The typical construction engines include excavator, backhoe loader, crane, pay-welder, etc.

Handling and Disposal of Waste Generation

Waste management must be carried out following the national and EU regulations, the EBRD standards, especially PR3, and the best practice principles.

All waste materials will be collected, stored, and transported separately in appropriate and approved containers. Companies certified by the relevant authorities will be used for the transportation, recycling, and disposal of waste.

239 ESIA on the "Railway line Durres-Tirana public terminal of transport (ptt) and new railway line to the international airport Saint Teresa", MIE, February 2021

240 https://www.ebrd.com/news/2021/ebrd-and-eu-support-rehabilitation-of-albanian-railway.html

The design and construction company should aim firstly at the reuse of the solid waste extracted from earthworks.

6.1.2. Operation and Maintenance impacts

6.1.2.1. Sources of the likely impacts

The operational and maintenance activities include the train's movement and the maintenance of the railway line, as well as the fuel consumption for the locomotives.

6.1.2.2. Environmental references for the resources used

During the operation of the railway line, the rolling noise is the main noise source along the whole railway line. All the equipment will comply with the applicable limit values and, where necessary, noise reduction measures will be applied.

6.2. Impacts and mitigation during design, construction, and operation

In this section are described the likely impacts and the suggested mitigation strategies and measures during the whole project life cycle.

Hereinafter are described the impacts and mitigation measures related to the environmental and social topics taken into consideration during the ESIA scoping report, as shown in the scoping matrix (see Appendix 3.3 of this ESIA report – separate document).

6.2.1. Air quality

6.2.1.1. Design, preconstruction, and construction stages

Potential impacts and sources of impacts: The construction activities will generate dust and particulate matter from the construction works (work camp, eventual road access, vegetation clearing, demolition of the existing stations, bridges and culverts, removal of filling material in some sections of the railway line, construction of new stations and new bridges and culverts, improvement of the vertical and horizontal railway line alignments, construction of retaining walls, rehabilitation of Lezhë tunnel, etc.), transport trucks, etc. Gas emissions will be generated from transport vehicles and construction equipment.

Dust, particulate matter, and gas emissions may adversely affect the biodiversity, water resources and the health of workers and the local population.

Dust and particulate matter: Dust emissions can be divided into dust and particulate matter (PM_{10}). Most of the dust emissions are likely to occur during the working hours of construction activity. Dust does not cause long-term or widespread changes to local air quality, but its deposition on the crossed inhabited areas causes temporary nuisances.

Particulate matter (suspended particles) is released by the aggregate material in the same manner as dust. However, it remains suspended in the atmosphere for a longer period and can be transported by wind over a wider area than dust. Particulate matter is also released from the construction machinery, etc. As the magnitude of the PM_{10} emissions is relatively small, any adverse effects resulting from them are likely to be relatively short-term with no significant effects outside the construction sites. PM_{10} is small enough to be drawn into the lung during breathing. Because of this potential impact on health, the limit value for PM_{10} is defined in the Albanian legislation on air quality. It should be underlined that the Albanian norms on air quality are slightly more stringent than those of the Directive 2004/107 "On air quality", as amended, (see table 5.1 in the section 5.2.1.2).

Gas emissions: The main pollutants that are associated with working machinery and transport vehicles are NO_2, PM_{10}, CO, benzene (C_6H_6), and benzo[a]pyrene ($C_{20}H_{12}$). Amongst them, NO_2 and PM_{10} are the most likely to result in exceeding relevant air quality standards or objectives.

In construction zones, the dust generated by vehicle movements and local air pollutant emissions from vehicles may be temporarily elevated during the busiest periods of construction activity. However, no significant local air quality effects are expected.

Suggested mitigation measures. The suggested mitigations measures include:

- Watering the working area during the demolition of the stations and bridges;
- Establish camps
- as far away as possible from inhabited areas, water resources, and areas of high biodiversity values. All the Work Camps will be established within the existing Railway Stations, where there is free space and the needed infrastructure (electricity, water supply & sewerage, impermeable places in concrete, etc.), without disturbing inhabited areas, water resources, and areas of high biodiversity values. The nearest station to the watercourses is Shkoder station, which is located 100m from Kiri Riverbed. While the nearest station to Shkoder Lake is the Bajze one, which is located 2.7 km from the Lake and 600m from the nearest parcel covered of shrubs dominated by *carpinus orientalis*;
- Cover the transport trucks and the stockpiles;
- Sprinkle the stockpiles, and access roads with water, during the dry season to minimize dust;
- Watering the working area during earthworks for the construction of service roads to minimize dust;
- Take appropriate measures, including personal protective equipment (PPE) to protect the health of the workers from the dust and polluting substances;
- Perform earthwork close to Shkoder Lake (especially from km 139 to km 140) out of the period when the migratory birds stay within the Lake. This period extends approximately from April to the end of July;
- Respect the deadlines for technical control of the vehicles;
- Use fuels, which comply with official standards (as per Ordinance No. 6, of 09.10.2007; the content of the sulphur in diesel fuel, starting from 01.01.2011 must be 10mg/kg);
- Monitor the air quality based on the provisions of the relevant regulations, including the DCM 352/2015 "On the assessment of environmental air quality and the requirements related to some pollutants".

Sensitive railway line sections. The most sensitive railway line sections sensitive to air pollution during the preconstruction and construction activities are as follows:

Urban areas crossed by the railway line (Shkoder, Lezhë and Mamurras towns);

The terrestrial part of the NMR of Shkoder Lake is covered with degraded deciduous oak forest (km 132+500 to km 137+550) and Mediterranean Maquis (km 139 to km 140).

Conclusion: The likely impacts on the air quality are limited to the working areas and last only during the working activities. They can be significantly reduced by routine mitigation measures.

If appropriate mitigation measures are undertaken, the Project's impact on air quality can be evaluated as insignificant.

6.2.1.2. Operation and maintenance

During operation, the main source of air pollution is the fuel combustion from locomotives. The related pollutants released into the atmosphere are NO_2, PM10, CO, benzene (C_6H_6), and benzo[a]pyrene ($C_{20}H_{12}$). Amongst them, NO_2 and PM10 are the most likely to result in exceeding relevant air quality standards or objectives.

Air pollution can be mitigated by applying the best international mitigation practices related to the operation and maintenance of locomotives. Fuel quality should fulfil the relevant standards.

The air pollution can be mitigated by using fuel quality that fulfils the relevant standards. Therefore, the impact on air quality can be evaluated as insignificant.

Conclusion: If appropriate routine mitigation measures are undertaken, the impact on air quality during operation can be evaluated as insignificant.

6.2.2. Noise and vibrations

6.2.2.1. Design, preconstruction, and construction stages

The noise and vibrations will be generated mainly from the demolition of stations, bridges, culverts, etc., and construction activities and transport vehicles, which are going to be generally heavy trucks and various machinery like excavators, diggers, scrapers, cranes, etc. It is not planned to use blasting for demolishing the existing bridges.

Noise

The table below shows the noise level generated by some vehicles and machinery, which are used in the construction works.

Table 6-109_Construction machinery and the related noise levels.

No.	Type/model	Noise level dB(A)
1	Digger	111
2	Excavator	108
3	Roller truck	112
4	Vibrating roller truck	116
5	Driller	118
6	Dozer	113
7	Other machinery	103
8	Truck on gravel road	64
9	Truck on asphalt road	61

Taking into account that the trucks and machinery in the above table will be working on a large area, the specific level of noises will be 64 dBA/ m^2.

The Albanian Law No.9774, of 12.7.2007; "On evaluation and administration of noises in the environment", article 10 provides that the measures for protection from noises apply depending on the time when noises are generated. For this purpose, the 24 hours are divided as follows:

- The day lasts 13 hours, from 06^{00} to 19^{00};
- The evening lasts 4 hours, from 19^{00} to 23^{00}; and
- The night lasts 7 hours, from 23^{00} to 06^{00}.

The limits for the acceptable noise levels in the residential areas are provided for in the joint Ordinance of the MoEFWA and the MH, No.8, of 27.11.2007 "On the limits for noises in specific environments", presented in the table below.

Table 6-110_ Noise generation levels depending on the environment

Environment	Critical impact on health	LA_{eq} (dBA)	Basic time (hours)	LAmax Fast (dB)
Residential area				
Outside residential building	Serious annoyance during the day and the evening	55	16	-
	Moderate annoyance during the day and the evening	50	16	-
Inside residential buildings	Talks clearly heard, and annoyance during the day and the evening	35	16	-
Inside sleeping room	Sleep disturbed at night	30	8	-
Outside sleeping room	Disturbed sleep, open window	45	8	-

Environment	Critical impact on health	LA_{eq} (dBA)	Basic time (hours)	LAmax Fast (dB)
	(measured outside)			
Area of social-economic activity				
Industrial, trade zone, street traffic (inner and outer environment)	Hearing damage	70	24	110
Urban environment				
Inside & outside public environment	Hearing damage	85	1	110

Note:

-LA_{eq} (dBA) = equivalent to a level measured at scale A

-LAmax Fast (dB) = Measured level at scale A in "Fast" mode (fast)

Vibrations

The response of people to vibrations on the ground is influenced by many factors. Some of those factors are physical, like amplitude, duration and frequency content of vibrations, while other factors like the type of population, age, gender and expectations are physiological. This means that people's reaction to vibrations is subjective and differs from person to person. It is generally accepted that for the majority of people, vibration levels in excess of between 0.15 and 0.3 mm/s peak particle velocity are just perceptible.

The table below presents distances at which vibration may be perceptible type of construction activity. These figures are based on historical field measurements and information available in literature.

Table 6-111_Distances at which vibrations may be perceptible

Construction activity	Distances at which vibration may be perceptible [m]
Excavation	10-15
Vibratory compaction	10-15
Heavy vehicles	5-10

The highest vibrations will be generated in case of any eventual use of blasting for demolishing any bridge (e.g. Ishmi Bridge at approximately km 35+000). Although this impact is of very short duration, it can cause damages to the windows of the closest buildings and their inhabitants (e.g. Lezhë's Drini Bridge).

Vibration from the construction activities would be perceptible overall within the urban areas crossed by the railway line (Shkoder, Lezhë).

Potential Impacts: Temporary adverse impacts on the fauna, and the health of workers and local population.

Suggested mitigation measures

The suggested mitigations measures include:

- Establish the work camps as far away as possible from inhabited areas, and areas of high fauna values;
- Avoid the construction activities during the reproduction periods of the fauna, especially across the forested and shrubby areas along the railway line section Bajzë to Hoti Village (km 132+500 to km 137+550). This section is included in the terrestrial part of the NMR of Shkoder Lake;
- Apply the best standards and practices in case of use of blasting for demolishing the existing bridges;
- Limit the working hours of machinery that generate high noise /or and vibration;
- Ensure that workers are provided with earpieces as protection from noise;
- Place appropriate traffic signs close to construction sites;
- Inform the local population whether any blasting will be applied;
- Conduct regularly the technical control of construction engines and transport vehicles;
- Respect the deadlines for technical control of the vehicles;
- Respect the official standards on noise and vibrations as provided for in the Albanian Law 9774/2007; "On evaluation and administration of noises in the environment"; and
- Monitor the noises and vibrations from project activities as provided by the MoE Ordinance 1037/1, dated 12.04.2011 "On the assessment and management of environmental noise**".**

Conclusion: The adverse impacts from noises and vibrations generated during preconstruction and construction works are temporary and of local extent. They can be evaluated as probable and of moderate to low significance and can be mitigated by taking the appropriate mitigation measures.

6.2.2.2. Operation and maintenance

This section aims to summarize the sources of noise and vibrations and the ways to reduce them at the source and the propagation path.

Methodology and used materials

The methodology includes:

- EU and WHO norms on noise and vibrations;
- the mechanism of noise and vibrations generation;
- the propagations paths; and
- the ways to reduce noise and vibrations

The principal used materials include:

- Railway Noise and Vibration: Mechanisms, Modelling, and Means of Control, David Thompson, 2009;
- Railway noise in Europe – State of the art report, UIC, 2016
- Railway induced vibration – state of the art report. UIC, 2017

- European Commission. Science for Environment Policy. Noise abatement approaches. April 2017;
- State of the art in managing road traffic noise: noise barriers. Technical Report 2017-02. Conference of European Directors of Roads.
- Publications/2017/CEDR-TR2017-02-noise-barriers.pdf;
- Environmental Noise Guidelines for the European Region. WHO, Office for Europe. 2018

Source of noise and vibrations

The main source of noise and vibration is the interaction between the train's wheels and rails, which leads to a vibration that is perceived as noise[241]. The trains' noise and vibrations are proportional to their speed[242]. The railway noise is a concern, overall when it is caused by freight trains and/or trains containing older wagons or engines, especially during the night[243].

The source of noise and vibrations during operation can be split into two main groups, as follows:

- A source associated with the railway components (structure and substructure) and configuration (curves, etc.).
- Sources associated with the railway line maintenance and routine activities.

A source associated with the railway components and configuration

The noise sources associated with the railway components and configuration include244:

a. Rolling noise, which is caused by wheel and rail vibrations induced at the wheel/rail contact. Rolling noise is the most important source of noise from railways.
b. Curve squeal noise, which is caused by the interaction between wheel and rail. It is associated with the contact occurring during curving.
c. Bridge noise, which depends on the type of bridge. Dynamic forces acting on it excite the bridge.
d. Aerodynamic noise, which is caused by air flow over various parts of the train.
e. Ground noise and vibrations, which occur in two ways: a-low frequency, vibration, which is associated mostly with heavy freight trains at particular sites; and high-frequency vibration that is associated mostly with tunnels in urban areas. This vibration can be significant also for surface trains when noise barriers block out the direct airborne sound[245].
f. Engine noise, which is associated with lower speeds up to about 30 km/h.

The presence of the rolling noise is associated with speed above 30 km/h, while the aerodynamic noise is dominant for speed above 200 km/h. The most important source of noise is the rolling noise, which affects all kinds of train.

241 European Commission. Science for Environment Policy. Noise abatement approaches. April 2017

242 Rail Transit: Addressing Wheel/Rail Noise at the Source

243 "Reducing Railway Noise Pollution". A Study requested by the European Parliament. 2012

244 Railway Noise and Vibration: Mechanisms, Modelling and Means of Control, David Thompson, 2009

245 Railway Noise and Vibration: Mechanisms, Modelling and Means of Control, David Thompson, 2009

As the aerodynamic noise is relevant only for high-speed trains, this type of noise is not discussed in this ESIA. Therefore, hereinafter are (shortly) discussed only the other above-mentioned issues.

Both rail noise and ground vibration can cause disturbance to the area around the railway. The roughness of the wheel and rail running surfaces, between wheels and rails, is an additional noise and vibration source. Tracks deteriorated by oxidation from the presence of water are often rougher, which causes wheel noise at levels up to 20 decibels (dB). Ground vibration from trains in extreme cases can damage structures close to the railway. The background vibration level in residential areas is usually 50 dB or lower, which is below the threshold for tolerance for humans (65 dB).

The basic concept of the ground-borne vibration is presented in the following figure. The train wheels rolling on the rails create vibration energy that is transmitted through the track support system into the transit structure. The vibration of the transit structure excites the adjacent ground, creating vibration waves that propagate through the various soil and rock strata to the foundations of nearby buildings. The maximum vibration amplitudes of the floors and walls of a building often will be at the resonance frequencies of various components of the building. The ground-borne vibration is perceptible for people who are found inside buildings, but never annoying to people who are outdoors.

The train-induced ground-borne vibration's accelerations are different for different soil types. The maximum acceleration occurs in soft soil, while the minimum in hard soil[246]. Thus, the attenuation speed of the ground vibrations caused by the trains' crossing of the Lezhe tunnel is maximal because the soil is hard (limestone).

246 https://www.mdpi.com/2071-1050/12/3/937

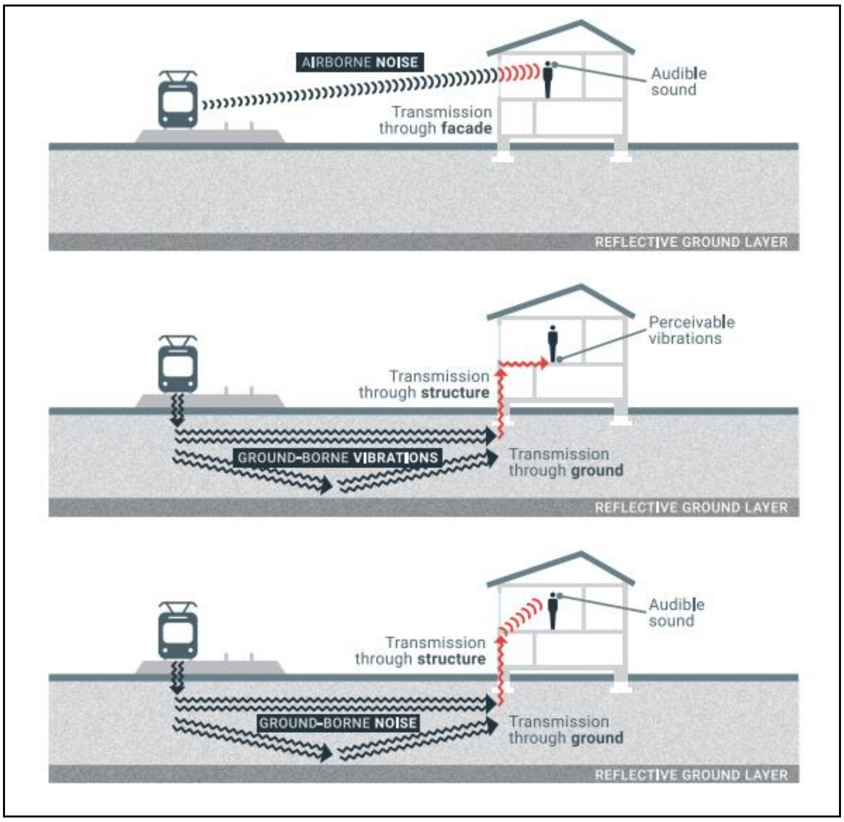


Figure 6-165_Air borne noise and vibration[247]

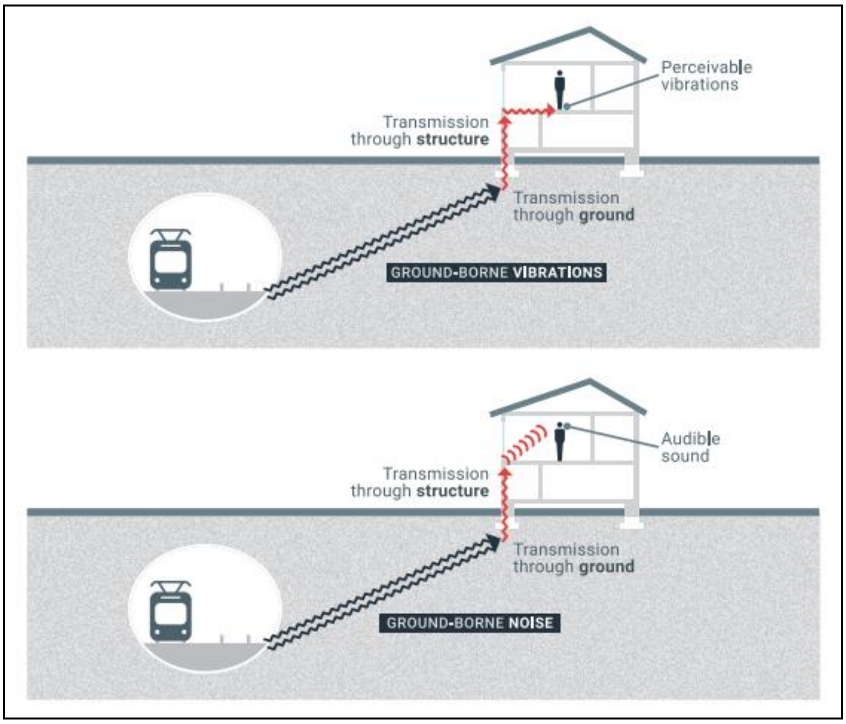


Figure 6-166_Ground borne vibration and ground-borne noise[248]

247 Railway induced vibration – state of the art report. UIC, 2017

248 Railway induced vibration – state of the art report. UIC, 2017

As shown in the sketch below, the trains' noise and vibrations result, firstly, from the roughness of the surface of wheel and rail and secondly, from the type of tracks the wagon is rolling on.

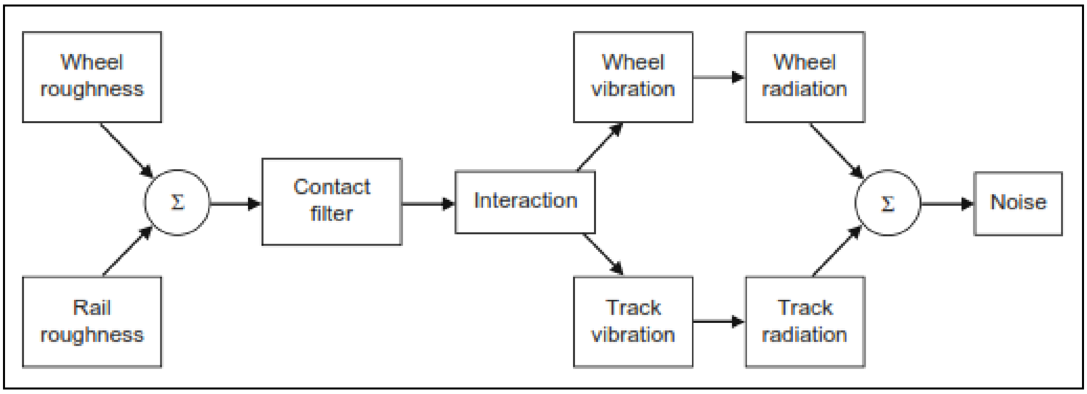


Figure 6-167_Model for rolling noise generation[249]

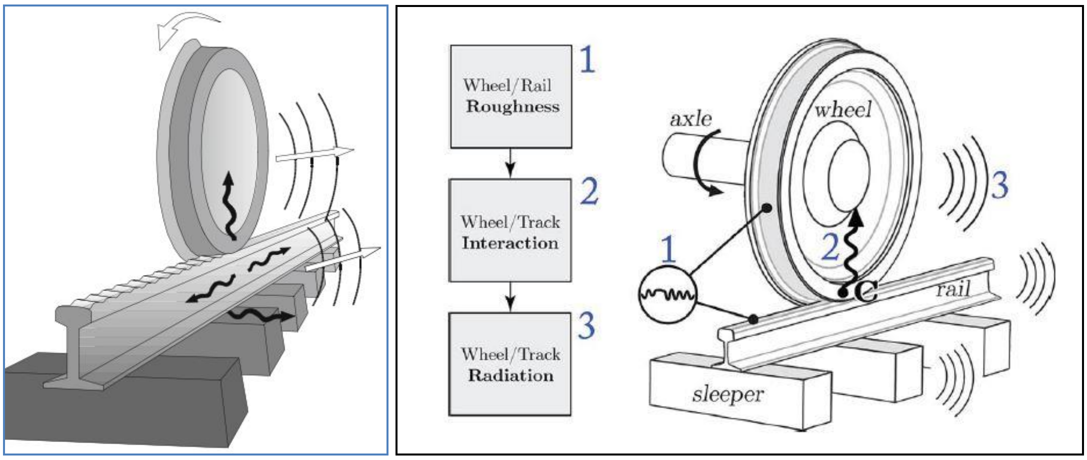


Figure 6-168_Illustration of the mechanism of noise generation (David Thompson, 2009)

While the schema below illustrates the mechanism of the overall rolling noise generation.

249 Railway Noise and Vibration: Mechanisms, Modelling and Means of Control, David Thompson, 2009

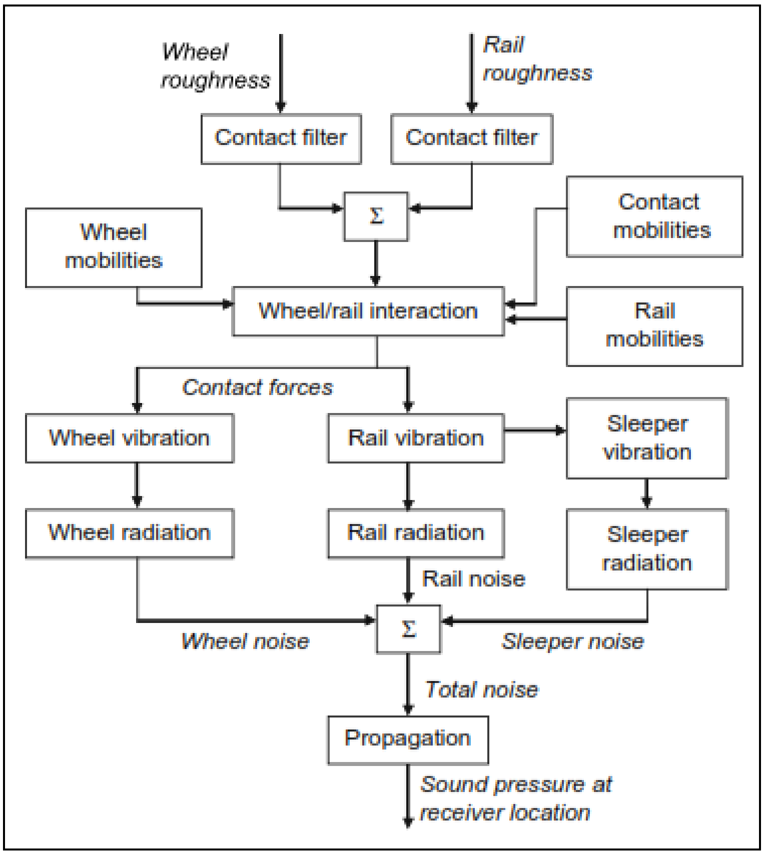


Figure 6-169_Schematic diagram of wheel/rail rolling noise generation mechanism[250]

This schematic diagram is illustrated in the figure below.

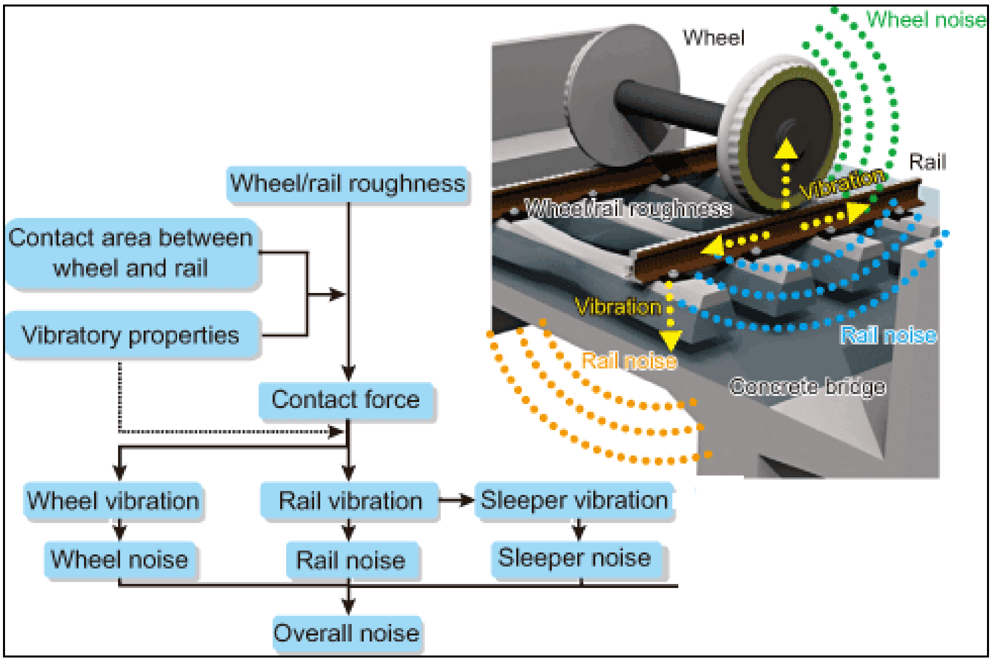


Figure 6-170_Generation mechanism of the bridge noise induced by wheels and rails (Remington, 1976)

250 Railway Noise and Vibration: Mechanisms, Modelling and Means of Control, David Thompson, 2009

The noise and vibrations generated from the above-mentioned sources can increase because of other factors associated with the design of the horizontal alignment and of the rails that include:

- Train movements on curved track sections which can generate wheel squeal;
- Passage of trains over rail track discontinuities such as switches, frogs, special track work, hotboxes, dragging equipment, wheel impact detectors, joints for signalization, and at-grade intersections with roads and other rail infrastructure.

Sources associated with the railway lines and station activities.

The typical noise sources associated with the daily activity of the railway lines and stations during the operation stage include[251]:

- Traction noise from diesel locomotives;
- Trains' horn, warning signals at level crossings, etc.;
- Stations operations involving trains stopping and starting, assembling of trains, shunting of cars (switching), retarders, use of signalling devices, repair work;
- Extended idling of locomotives on railway lines, rail sidings, or in yards;
- Audible warning devices, whether mounted on the train or near at-grade road crossings;
- Intermodal stations operations, including the transfer of containers;
- Repairing works (loose joints, rough rail, and ground settlements); etc.

Potential impacts and suggested noise exposure limits

The World Health Organization (WHO) has classified traffic noise, including road, rail, and air traffic, as the second most important cause of ill health in Western Europe, behind only air pollution caused by very fine particulate matter[252]

The WHO Environmental Noise Guidelines for the European Region[253] (2018) recommends reducing average noise levels produced by railway traffic below 54 dB, as railway noise above this level is associated with adverse health effects.

For night noise exposure, the guideline recommends reducing noise levels produced by railway traffic during nighttime below 44 dB, as nighttime railway noise above this level is associated with adverse effects on sleep.

To reduce health effects, the guideline recommends that policy-makers implement suitable measures to reduce noise exposure from railways for the population exposed to levels above the guideline values, for both average and night noise exposure values. There is, however, insufficient evidence to recommend one type of intervention over another.

Options for reducing the rolling noise and vibration

Three options are possible for reducing the rolling noise and vibration, as follows:

1. Mitigation at the source;
2. Mitigation at the propagation path; and

251 https://otc-cta.gc.ca/eng/railway_noise_measurement

252 https://www.eea.europa.eu/themes/human/noise

253 https://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf

3. Mitigation at the receiver.

As the main source of trains' noise and the vibration is the interface wheel/track (see figure 5 above), the options for reducing the rolling noise intend the reduction at source, as illustrated in the figure below.

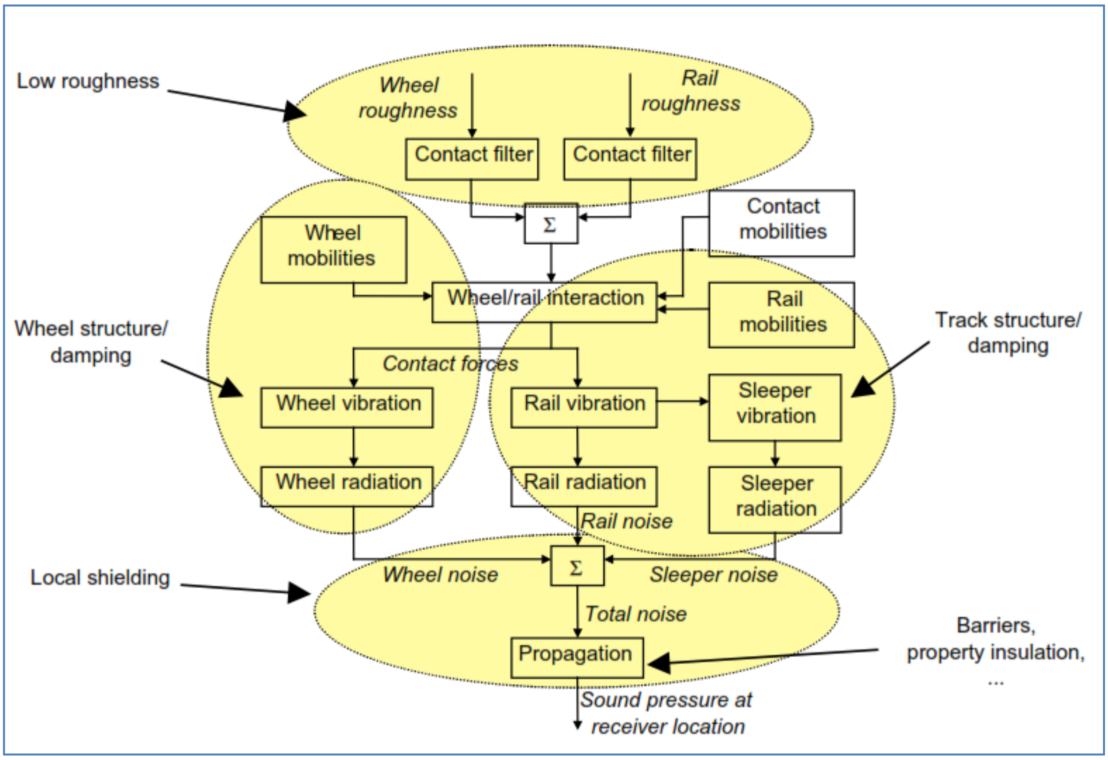


Figure 6-171_Rrolling noise sources and main potential means for reducing it (Thompson D, 2009)

1-Mitigation at the source

As mentioned above, the sources of noise are linked: 1.a-to to the railway configuration and components; and 1.b- to the operational activities.

1. a-Railway configuration and components

The curved track sections generate additional noise because of the wheel squeal from the increased friction between the wheel and the rail. The bigger the curve radius, the lower the wheel squeal. The design of railway line curves is confined by the local conditions (terrain, urbanization, etc.) and railway standards. As per the Vore-Hani Hotit railway rehabilitation, the Project design has increased the curves' radius where possible (see the section hereinafter on the noise and vibrations related to the proposed project).

The rail track discontinuities (switches, frogs, special track work, hotboxes, dragging equipment, wheel impact detectors, joints for signalization, and at-grade intersections with roads and other rail infrastructure) are a source of noise and vibrations.

Effective noise reduction can be achieved by addressing both sources of noise in parallel. Core measures include "silent brakes" (composite brake blocks) and acoustic grinding of tracks.[254]

Slab track is typically noisier than ballasted track. The most effective strategy to reduce wheel roughness is to replace the cast iron brake blocks with low noise ones that can reduce the

254 https://ec.europa.eu/transport/modes/rail/environment_en

rolling noise up to 12dB. While the roughness of the rails can be reduced from 2.5 to 5 dB, by grinding tracks to remove corrugated edges and by lubricating tracks. Ground conditions, including the materials that provide the base of the railways, are a major source of vibration disturbance. Sleeper soffits, fixed to sleepers, and ballast mats, which restrain the movement of the track, can both reduce ground vibration. Ballast mats are much more expensive to install than sleeper soffits due to their size[255].

1. b-Railway line operational activities

The noise and vibrations are mitigated through the design and management of passengers and freight activities.

The design measures include locating freight stations outside the densely inhabited areas, design and construction of insulating walls around the stations, design, and construction of covered yards for locomotives repairing works, etc. Other measures include appropriate signalization systems, etc.

The mitigation measures related to the management of the operational activities are associated with the number of tracks, the management of the trains' circulation and stations, etc. These measures usually require a qualified managing staff.

2-Mitigation at the propagation path.

The following sketch shows the propagation of the airborne noise waves. Noise affects the areas on both sides of the railway line. The commonly used mitigation measures are noise barriers. The sketch below shows a noise barrier, which can reflect, diffract, and reduce noise levels at the propagation path. The noise barrier attenuates the direct wave.

AS the dominant noise-source (the wheel/rail contact surface) is close to the track, a noise barrier is effective as long as the receiver is in the shadow zone (i.e. there is no direct sight from the receiver to the source)256.

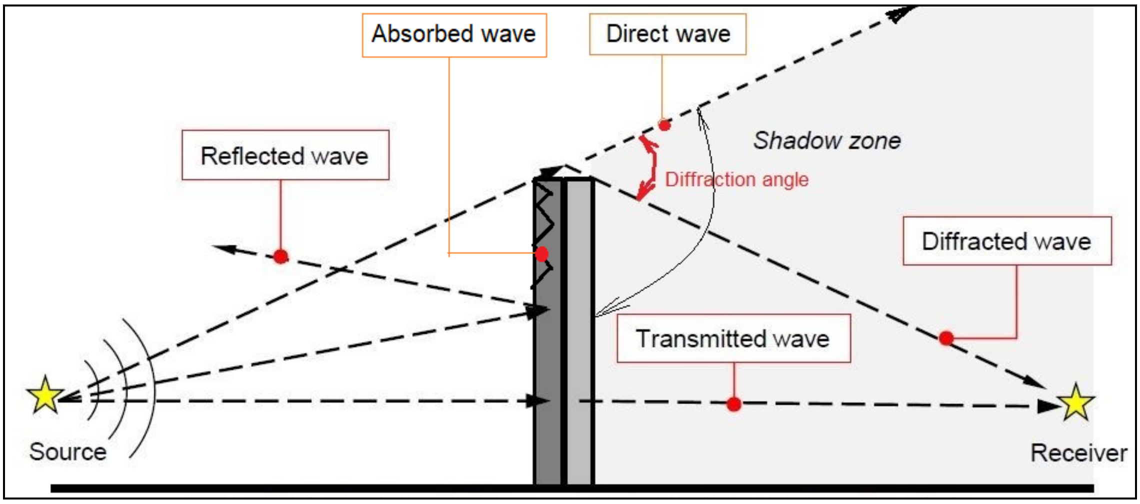


Figure 6-172_Mechanism affecting noise barrier performance (Questim, 2014)[257]

The main characteristics of a noise barrier are:

- The geometry, including the high and the inclination;

255 European Commission. Science for Environment Policy. Reducing railway noise and vibration. 27 July 2017

256 Railway noise in Europe – State of the art report, UIC, 2016

257 https://www.cedr.eu/download/Publications/2017/CEDR-TR2017-02-noise-barriers.pdf

- The insulating capacity; and
- The visual aspect, which should fit as practical as possible to the local environment.

The noise barrier designer should always take into consideration the so-called "canyon effect", which is the sound reflection between the train body and the barrier. This effect can be avoided through a lining of high absorption coefficient on the railway side.

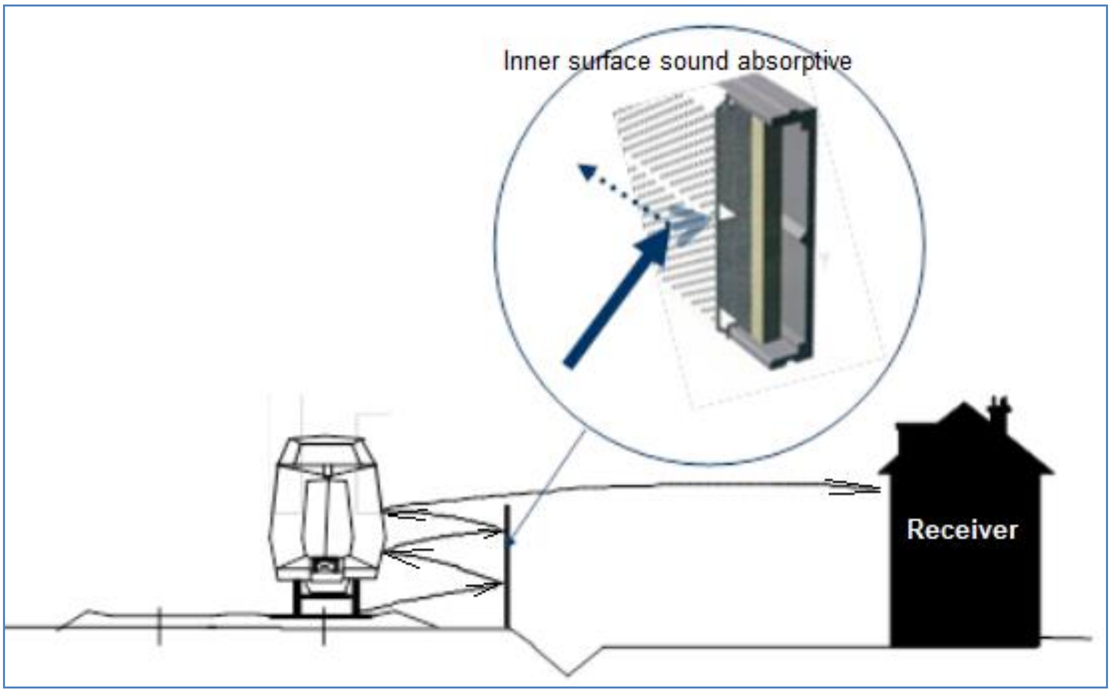


Figure 6-173_Scheme of a "canyon effect" and how an absorptive lining can prevent it258

Alternatively, the barrier can be inclined to direct the reflection toward the sky (barrier inclined backward) or toward the ballast (barrier inclined to the track). The inclined position is applied overall with the transparent barriers, which cannot achieve absorption on the railway side.

Figure 6-174_Example of inclined noise barrier259

The most efficient noise insulation barriers are soil berms, which are also environmentally friendly. Their weak point is the excessive thickness compared to the other types of barriers (walls in stone, wood, steel, glass, plastic, etc.).

258 Railway noise in Europe – State of the art report, UIC, 2016

259 Source: Highway Sound barrier: What is The Best Material (exceliteplas.com)

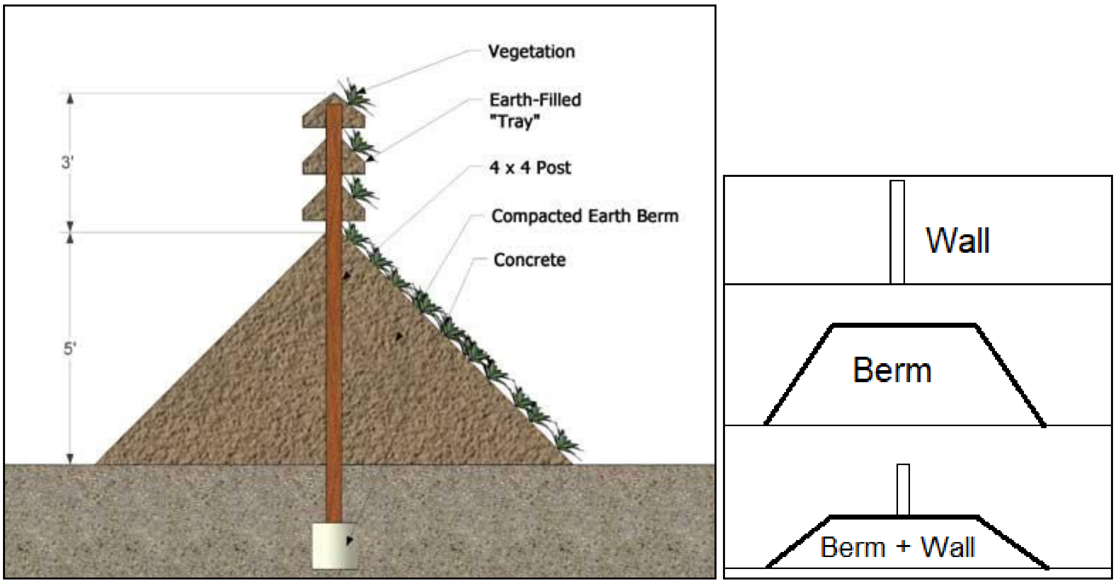


Figure 6-175_Scheme of a soil berm260

This requires the use of noise barriers that can reduce the noise from 5 to 15 dB. This solution is often of high cost, which on transit systems is not an effective or feasible solution. Although they can significantly reduce road noise for residents, one of the most disliked aspects of the barriers is that they block the view[261] (see figure below).

Figure 6-176_Left: Example of noise barrier blocking the view262; Right: Example of transparent noise barrier263

The low types of noise barriers (see figure on the left below) aim to absorb and reduce the noise at the source. Other types are a combination of high and absorptive barriers, including transparent ones, as shown in the right of the figure below.

260 https://www.acousticsciences.com/products/earthwall

261 European Commission. Science for Environment Policy. Environmental sound barriers. 28 Oct. 2008

262 https://www.forster.at/en/noise-control/rail/referenz/hannov-muenden-55/rel/27/

263 https://www.multivario.co.uk/transparent-noise-barrier-panels

Figure 6-177_Left: Low and absorptive noise barrier264; Right: Mixed type of noise barrier265

3-Mitigation at the receiver (e.g. houses close to the railway), which is not within the control of the railway institutional system.

That requires the insulation of walls and windows against noise that can be applied to the buildings close to the railway line. However, this insulation is not within the control of the railway authority.

Good International Practice for reducing noise and vibrations

All the studies commissioned by UIC and EU, as well as by different states (European countries, Japan, USA and Canada) agree that the best way to reduce railway noise is the reduction at the source.

Quantitative results of the noise protection measures

This section summarized the noise sources, the related mitigation measures and the expected quantitative effects, which are extracted from the study "Reducing Railway Noise Pollution" (2012), based on the experience of some European countries266.

Table below, which is extracted from this study, provides for the quantitative results of the noise reduction measures.

Table 6-112_Noise sources, mitigation measures and expected noise reduction

No	Source of noise	Mitigation measure	Impact (local, network wide)	Expected noise reduction	Costs / unit[267]
1		Mitigation at source			
2	Rolling noise	K-blocks	Network wide	Up to 8 - 10 dB(A)	4,000 – 10,000 € per wagon[268]

264 https://www.strail.de/noise-protection-systems/?lang=en

265 https://kokosystems.co.uk/kokohusk-rail-noise-barrier-b/

266 https://www.europarl.europa.eu/RegData/etudes/etudes/join/2012/474533/IPOL-TRAN_ET(2012)474533_EN.pdf

267 Cost information comes from [UIC 2008] page 25.

268 Retrofit, for new wagons there are no additional costs; additional operating cost still to be analysed.

No	Source of noise	Mitigation measure	Impact (local, network wide)	Expected noise reduction	Costs / unit[267]
3	Rolling noise	LL-blocks	Network wide	Up to 8 -10 dB(A)	500 – 2,000 € per wagon[269]
4	Rolling noise	General grinding of bad track	Local	10 - 12 dB(A) (up to 20 dB(A) at very bad tracks)	Shall be established in normal maintenance
5	Rolling noise	Special acoustic grinding	Local	1 - 4 dB(A) (depending on local rail roughness conditions), mostly around 2 dB(A)	
6	Rolling noise	Disc brakes	Network wide	10 dB(A)	Mostly in passenger cars
7	Wheel noise	Wheel-tuned absorbers	Network wide	2 – 7 dB(A)	3,000 – 8,000 € per wheel (24,000 –64,000 per 4-axle wagon)
8	Wheel noise	Bogie Shrouds together with low height barriers	Local	8 – 10 dB(A)	
9	Rail Noise	Rail dampers	Local	3 -7 dB(A) (mostly around 3 dB(A))	300 - 400 € per metre (two rails)
10	Rail noise	Slab tracks	Local	5 dB(A)	
11	Rail Noise	Rail pads	Local	3 – 4 dB(A)	
12	Squeal noise	Different measures to lower squeal noise	Local	Up to 20 dB(A) depending on local conditions	
13		**Mitigation related to high speed trains**			
14	High speed trains	Shielding of pantographs	Global but only at high speed up from 200 km/h	5 – 10 dB(A)	
15		**Mitigation at the propagation path**			
16	All sources	Barrier 2 m high	Local	Up to 10 dB(A)	1,000 €/m
17	All sources	Barrier 3 -4 m high	Local	Up to 15 dB(A)	1,350 €/m (3 m high); 1,700 €/m (4 m high)
18		**Mitigation at the receiver**			
19	All sources	Insulated windows	In buildings only	10 – 30 dB(A)	Depending on local cost

269 Retrofit, for new wagons there are no additional costs; additional operating cost still to be analysed.

Note: the Consultant has modified the table above by adding the rows 1, 13, 15 and 18.

Good International Practice on the best ways to reduce the railway noise

The above-mentioned study ("Reducing Railway Noise Pollution", European Parliament, 2012) recommends that the train-related noise emissions should be measured at critical points in densely populated areas and/or low distances to residential zones.

The noise protection barriers (protection at the propagation path) and insulating windows (protection at the receiver) are only locally effective and often require high investments to protect wider parts of railway networks. In contrast, noise should ideally be reduced at the source because these measures have a network-wide effect.

As shown in the table below[270], most of the noise is generated at the source and therefore noise reduction at the source should be taken into account primarily.

As shown in the table below[271], most of the noise is generated at the source and therefore noise reduction at the source should be taken into account primarily.

Table 6-113_Range of noise reduction measures

No	Mitigation measure	Min reduction	Max. reduction
1	Composite brake blocks on freight wagons	8 dB(A)	10 dB(A)
2	Noise barriers (2m high)	5 dB(A)	10 dB(A)
3	Wheel absorbers	2 dB(A)	7 dB(A)
4	Rail tuned absorbers	3 dB(A)	7 dB(A)

On the infrastructure side, friction modifiers, rail dampers and slab track are cost-effective measures to reduce noise. In densely populated areas and highly trafficked railway sections, usage of noise barriers or coverings cannot be avoided. However, if there is a comprehensive introduction of noise reduction measures at the source, the number of noise barriers and covering can be reduced significantly.

Wheels and rails need frequent monitoring and maintenance to reduce noise. Rretrofitting of existing rail freight cars with composite K- or LL-brake blocks is the most cost-effective measure on the vehicle side.

Noise and vibrations related to the proposed project

The urban centres crossed by the railway line from Voreë to Hani Hotit are Lezhë and Shodër. The railway line runs across the western neighboring of Lezhë, as well as across the eastern edge of the eastern neighboring of Shodër.

Options for reducing the rolling noise and vibration

As underlined at the beginning of this this section, the mitigation options include:

- Mitigation at the source;

270ttps://www.europarl.europa.eu/RegData/etudes/etudes/join/2012/474533/IPOL-TRAN_ET(2012)474533_EN.pdf

271ttps://www.europarl.europa.eu/RegData/etudes/etudes/join/2012/474533/IPOL-TRAN_ET(2012)474533_EN.pdf

- Mitigation at the propagation path; and
- Mitigation at the receiver.

Hereinafter are outlined the mitigation measures taken into consideration by the Project's design. It should be underlined that the design has not considered the mitigation measures at the receiver that consist mainly of insulating the windows of the isolated private house close to the railway line.

1-Mitigation at the source (i.e., the wheel/rail interface).

Compared to the existing situation, the designed railway line will generate less noise at the source, because of the following:

- The line radius will be bigger than in the existing line. Because of the horizontal improvement, the radius of the railway line will be superior to 500m and will create less friction between the wheels and the rails compared to the existing alignment, which includes some section of line radius 300 to 500m;
- The rails will be longer and well joint to each other and therefore the eventual spaces between two successive rails will generate much less noise and vibration;
- New locomotives and new wheels will reduce the vibrations in the interface wheel/rail;

It is not expected to install slippers soffits and ballast mats in the whole length of the open line to reduce the vibrations created at the contact surface between the rails and the slippers. The slippers' soffits and ballast mats are expensive. However, slipper soffits and ballast mats must be installed within the stations' areas and across the urbanized areas (neighborhoods of Lezhe and Shkoder towns).

Lezhë tunnel (190m long) runs through hard rocks (limestone) that have a high coefficient of vibrations' attenuation. However, slipper soffits are recommended to be installed in this tunnel because there are houses on the top of the hill crossed by this tunnel.

According to the internal zoning of the Shkoder Lake Nature Managed Reserve – Nature Park (DCM 864/2005), the nearest distance to the nearest core zone of this Nature Park is roughly 2.7km. The whole railway line section crossing this Nature Park runs through the transit/traditional use subzone. The highest biodiversity values within this Transit zone are found from km 132+600 to km 135+100, where the railway line crosses a shrubby and forested area covered mostly of Oriental hornbeam and Turkey oak. Small arable lands and pastures split the shrubby and forested area. Within this section (km 132+600 to km 135+100), slipper soffits can be installed. As the ground/subsoil is hard (limestone formation– category I of ground/subsoil), there is no need for ballast mats because of the high coefficient of the vibration attenuation.

2-Mitigation at the propagation path

2. a -Location of the sensitive objects/facilities

The Consultant has considered the urban infrastructure on both sides of the railway line, from Vorë to Hani Hotit. In addition to the crossed settlements, the Consultant considered all the educational and health facilities, as well as the cultural heritage and religious sites/objects considered as ICH nearby the railway line.

<u>Location of the educational facilities</u>

The locations schools and kindergarten are provided by official sources[272].

272 https://geoportal.asig.gov.al/

Table below shows all the schools and kindergartens that are located less than 500 m from the railway line. While Map 12 (Map 12: Location of the educational facilities – separate file in pdf format) shows the location of these facilities from Vore – Hani Hotit.

Table 6-114_List of educational facilities located less than 500m from the railway

No	School / kindergarten	Distance from the railway (m)	Comment
	Vorë Municipality		
1	Kindergarten, Shargë Village	185 (L)	The road runs between the railway line and the kindergarten building
2	Kindergarten, Gjeç Koder Village	95 (L)	There is an industrial building between the railway line and the kindergarten;
3	Ahmetaq 9 years-school, Ahmetaq Village	105 (L)	The road runs between the railway line and the school building
	Kruje Municipality		
4	9 years-school “Sherif Dervishi”, Budull Village	85 (L)	There is an industrial building between the railway line and the school building;
5	9 years-school, Murqine Village	94 (L)	There are houses between the railway line and the school building; A road runs between the railway line and the school building; as per 2019 – 2020 Ministry of Education data no pupils have been registered in this school
	Kurbin Municipality		
6	9 years-school, Mamurras	330 (L)	There are houses between the railway line and the school building
7	Kindergarten “Besnik Syla”, Mamurras	275 (R)	The road runs between the railway line and the kindergarten building
8	High school “Besnik Syla”, Mamurras	280 (R)	There are houses between the railway line and the school building
9	9 years-school “Migjeni”, Mamurras	250 (R)	There are houses between the railway line and the school building
10	Kindergarten, Milot	420 (R)	The road runs between the railway line and the kindergarten building
11	High School, Milot	390 (R)	The road runs between the railway line and the school building
	Lezhe Municipality		
	9 years-school and high school, Zejmen Village	78 (R)	The national road runs between the railway line and the school building
12	Kindergarten, Markatomaj Village	125 (R)	The national road runs between the railway line and the kindergarten building
13	9 years-school, Spiten Village	450(R)	There are houses between the railway line and the school building
14	Kindergarten, Spiten Village	375 (R)	There are houses between the railway line and the kindergarten building
15	9 years-school, Tresh Village	220(R)	There are houses between the railway line and the school building
16	9 years-school and high school Ishull Lezhë, Shëngjin	440m (L)	
17	High school “Gjergj Kastrioti”, Lezhë City	500 m (R)	510m from Lezhe 1 station
18	9 years-school Kodër Marlekaj, Lezhë Municipality j	130 (L)	There are houses between the railway line and the school building
19	Kindergarten and 9 years-school “At	15 (L)	The school building lies alongside the railway

No	School / kindergarten	Distance from the railway (m)	Comment
	Shtjefen Gjecovi", Lezhe (private educational institution)		line; There is also a kindergarten within the same complex of buildings.
20	Kinder garten No 3 – Lezhë City	260 (R)	There are houses between the railway line and the kindergarten building
21	9 years-school, Merqi Village	290 (R)	
22	Kindergarten, Merqi Village	280 (R)	There are houses between the railway line and the kindergarten building
23	9 years-school and high school "Karl Gega", Balldren Village	460 (L)	
24	9 years-school, Rraboshtë Village	340 (R)	
25	9-years School and high school "Pjetër Zarishi", Blinisht Village	170 (L)	
26	9-years School – Baqel Village	410 (L)	
	Vau Dejës Municipality		
27	9-years School – Hajmel Village	470 (R)	
28	High School – Hajmel Village	380 (R)	
29	9 years-school, Spathari Village	210(R)	The road runs between the railway line and the school; There are houses between the railway line and the school building
	Shkoder Municipality		
30	Kindergarten, Vukatanë Village	160 (L)	There are houses between the railway line and the kindergarten building
31	High technical school "Kolë Margjini", Shkoder	380m (L)	
32	9 years-school "Mati Logoreci"	530 (L)	
33	High technical school "Arben Broci"-Shkoder	440 (L)	
34	9 years-school "Haxhi Hajdari"	510 (L)	
	Malësi e Madhe Municipality		
35	Kindergarten – Grile Village	175 (L)	Wall already designed at this location
36	9 years-school "Vasil Shanto", Vrakë Village	220 (R)	
37	9 years-school, Demiraj Village	320 (L)	
38	9 years-school, Gruemirë Village	420 (R)	
40	9 years-school, Dober Village	290 (L)	
41	9 years-school, Vukpalaj Village	300 (L)	The motorway runs between the railway line and the school

From the table above it results that only one educational facility is sited near the railway line, from 69+250 to km 69+350. The 9-years private school "Father Shtjefen Gjecovi" is located only 15 m from the rail track. The Project design has taken into consideration the construction of a noise barrier alongside this railway segment. As per the other educational facilities both sides of the line, no special mitigation measures against rolling noise are needed because they are located enough far from the line.

<u>Location of the health facilities</u>

The health facilities were provided by governmental sources[273]. Their locations in the Google map were found through the portal https://vymaps.com/AL/Lezhe/health/.

The following table shows the health facilities located less than 1.5 km from the railway line.

Table 6-115_List of health facilities located nearby the railway

No	Health facility	Distance from the railway line (m) (Left / Right)
	Vorë Municipality	
1	Health centre, Vorë	600 m - Right
	Kruje Municipality	
2	Health centre, Fushë Kruje	5 km - Right
	Kurbin	
3	Health centre, Milot	550 m - Right
4	Hospital, Laç	1.1 km - Right
5	Health centre, Laç	1.3 km - Right
	Lezhë	
6	Maternity Hospital, Lezhë	400 m - Right from Lezhë 1 station
7	Regional Hospital, Lezhë	1.0 km - Right
8	Polyclinic, Lezhë	450 m - Right
9	Medical centre, Balldren	800 m - Left
10	Medical centre – Manati	1.0 km - Right
	Vau Dejës Municipality	
11	Health centre – Laç Village, Vau Dejës	270m - Right
	Shkoder Municipality	
12	Regional Hospital, Shkoder	430m - Left
13	Maternity Hospital, Shkoder	470 m - Left
14	Polyclinic, Shkoder	600m - Left
15	Community Centre of Public Health, Shkoder	1.4 km - Left
16	Psychiatric Hospital, Shkoder	350m - Left
17	Infectious Diseases Hospital, Shkoder	340m - Left
	Malësi e Madhe Municipality	
18	Koplik Hospital	1.3 km - Right

Table above shows that there are no health facilities located close to the railway line and therefore no special mitigation measures are to be undertaken for these facilities.

Location of the cultural heritage and historical and religious sites/objects

The only cultural heritage object nearby the railway line is the Historical Catholic Cemetery of Rrmaji, which is located close to the Shkoder station. While the closest religious object is a small church in Grile Village, Shkoder municipality. Within the location of both these objects noise barriers will be designed. Consideration will be for community engagement for any access restrctions, as impacts from noise, dust and vibrations and iCH.

Location of the infrastructure buildings

The location of the infrastructure buildings on both sides of the railway was based on the site visits and the orthophotos prepared for the Projects' purposes.

Appendix 6.1 of this document (see Appendices – separate document) shows the orthophotos of the railway line sections that were extracted from the following maps:

- Map 11.1_PD_Layout_S.1 (Vorë-Gjorm) – separate file;

273 https://srvd.e-albania.al/sherbimetxml/dokumentasherbimi/7178-informacion_qsh.pdf

- Map 11.2_PD_Layout_S.2 (Gjorm-Lezhe) – separate file;
- Map 11.3_PD_Layout_S.e (Lezhe-Shkoder) – separate file;
- Map 11.4_PD_Layout_S.4 (Shkoder – Hani Hotit) – separate file

Both the site visits and the orthophotos show that some inhabited buildings are located nearby the railway line. The railway line sections where they are located are included in the table below, which shows the railway line sections where noise barriers will be designed.

2.b -Recommended location and type of noise barriers

Based on the location of the sensitive objects (educational and health facilities, cultural heritage and historical and religious objects) and the inhabited buildings, the Consultant suggests taking into account the possibility to study the installation of noise protections works in the sections included in the table below. This suggestion is already taken into account by the Project's design and in the ESAP (section 4.6).

Table 6-116_ Sections recommended for installing noise barriers

No	Railway line section		Barrier location	Comment / suggestions
	Start (km)	End (km)		
1	49+800	49+880	Right	Agricultural area in the Left of Laç town; Farmhouses; Suggestion: a-Avoid sound waves refraction and reflection; b-Insulating barrier is the preferred solution
2	50+620	50+670	Right	Agricultural area in the Left of Laç town; Farmhouses; Suggestion: a-Avoid sound waves refraction and reflection; b-Insulating barrier is the preferred solution
3	51+970	52+030	Left	Agricultural area in the Left of Laç town; Two farmhouses; Suggestion: a-Avoid sound waves refraction; b-Insulating barrier is the preferred solution. Otherwise, inclined barrier should be applied
4	66+930	67+470	Left	Western neighbouring of Lezhë town; Low buildings (houses); Suggestion: a-Avoid sound waves refraction and reflection; b-Insulating barrier is the preferred solution; c-Transparent barrier is preferred
5	67+550	67+700	Right	Lezhë town neighbouring; Low buildings (houses); Suggestion: a-Avoid sound waves refraction; b-Insulating barrier is the preferred solution; c-Transparent barrier is preferred.
6	68+680	68+800	L + R	Lezhë town neighbouring; Low buildings; Suggestion: a-Avoid sound waves refraction and reflection; b-Insulating barrier is the preferred solution; c-Transparent barrier is preferred

No	Railway line section		Barrier location	Comment / suggestions
7	69+250	69+350	Left	9 years – school "Ate Shtjefen Gjecovi", Lezhe City; the school is located 15 m from the railway line; Suggestion: a-Avoid sound waves refraction. b-Insulating barrier is the preferred solution.
8	90+800	90+925	Left	Kaç Village: Farmhouses on the Left and agricultural land on the Right; Suggestion: a-Avoid sound waves refraction; b-Insulating barrier is the preferred solution
9	91+000	91+250	L + R	Kaç Village: Farmhouses; Suggestion: a-avoid sound waves refraction and reflection; b-Insulating barrier is the preferred solution; c-Transparent barrier is preferred
10	103 +120	105+050	L + R	Shkoder town, Eastern neighbouring; Houses; Suggestion: a-Avoid sound waves refraction and reflection; b-Insulating barrier is the preferred solution; c-Transparent barrier is preferred to allow the view of Kiri River
11	105+850	106+550	L + R	Shkoder town, Eastern neighbouring; Houses; Kiri River runs on the Right; Suggestion: a-Avoid sound waves refraction and reflection; b-Insulating barrier is the preferred solution; c-Transparent barrier is preferred to allow the view of Kiri River
12	106+680	107+200	Left	Shkoder town, Eastern neighbouring; Houses; Kiri River borders from the Right the railway line. Suggestion: a-avoid sound waves refraction and reflection; b-Insulating barrier is the preferred solution; c-Transparent barrier is preferred to allow the view of Kiri River
13	107+400	107+500	Right	Shkoder town, north-Rightern neighbouring; Low buildings on the Right; Agricultural land on the Left; Suggestion: a-avoid sound waves refraction; b-Insulating barrier is the preferred solution
14	113+220	113+500	Left	Grilë Village: Low buildings and a church on the Left. Agricultural land on the Right. A wall is planned to be built; Suggestion: a-the wall should avoid sound waves refraction; b- insulating wall is preferred; c-whether possible use transparent material in front of the church to not block its view

2.c –Recommendations on the type of noise barriers in function of the types of crossed areas.

The railway line runs mostly across rural areas. It crosses only two urban areas: Lezhë and Shkoder. The cities of Lezhë and Shkoder are crossed in the outskirts of their neighborhoods, as explained hereinafter.

Hereinafter follows a short analysis of the existing situation with regard to the type of noise barriers suggested for the urban and rural areas.

<u>Crossing of Lezhë neighborhood: km 66+600 to km 69+900</u>

Noise levels at Lezhë city are yearly measured by the National Environmental Agency. Amongst two monitoring stations, the closest one is located roughly 600m from the railway line (see Figure 5-37 in chapter 5). Table below gives the annual average of the noise measured in this station, as well as the WHO standards.

Table 6-117_ Average annual noise values, in Lezhë in 2018 and 2019, compared to WHO standards

No	City / standard	Monitoring Station	Closest distance from the railway	Laeq (dB) - day time	Laeq (dB) - night time
1	Lezhë - 2018	11 Janari	600m from the railway; 600 m from Lezhe 1 station	61.23	49.38
2	Lezhë- 2019			60.18	49.20
3	WHO standard (before 2018)	n/a	n/a	55	45
4	WHO standard (2018)	n/a	n/a	54	44

Table above shows that the noise levels in Lezhë are higher than allowed by WHO standards because the monitoring station is located in a place with heavy traffic (see Figure 5-37). Across the neighbourhood crossed by the railway line the traffic is less dense and therefore the noise value is expected to be lower. It should be underlined that the noise generated by the railway is included in the measurements of the table above.

15 noise levels measurements have been performed for the Project's purposes. The measuring points were located near the railway line, across the western neighborhood of Lezhe City (see separate document on noise and vibrations). Measurements results show that this railway line section is dominated noise levels generated by the road traffic. Within the short railway segments where there is no roads the noise level is within the required EU and national standards. However, the noise levels are in general slightly higher than the permitted values, excepting the vicinity of the national road.

Based on the current urban situation, the following can be said:

- The center of the city is located far from the railway line;
- There is no enough available space for soil berms, which are the most effective noise insulation measures;
- The existing Lezhe tunnel crosses through a part of the neighborhood of the city. There are houses on the top of the hill above the tunnel and therefore vibrations across the tunnel should be mitigated. Slipper soffits will be taken into consideration to reduce the vibrations at source. However the tunnel runs through hard limestone rocks, which have an high speed of the vibrations' attenuation;
- Double service roads are planned across the neighborhood of the city. The installation of noise protection barriers would create a source of car accidents in the planned service

roads, as the car drivers' visibility will be reduced. To avoid that, it is suggested as follows:

- Wherever possible, installing of low barriers;
- The protection barriers between the railway line and the parallel roads must be transparent to avoid reduction of the car drivers' visibility. In this case, it is recommended to install mixed barriers (see on the right of the *Figure 6-177* above), which absorb the noise and at the same ensure a certain visibility;
- The height or medium height protection barriers installed between the railway line and the parallel roads must be transparent to avoid the reduction of the car drivers' visibility. In this case, it is recommended to install mixed barriers (see on the right of *Figure 6-177* above), which absorb the noise and at the same time serves as fence and ensure a certain visibility;

- Wherever possible, the best solutions are the sound absorbing barriers. The barriers that reflect or refract the sound waves are not recommended.

Conclusion: Based on the above, within the section from km 66+600 to km 68+800, it is recommended to install mixed barriers (see on the right of the *Figure 6-177* above), that absorb the noise and allow for a certain visibility. This conclusion derives from the fact that in this section the rails are at the level of the surrounding terrain.

Crossing of Shkoder neighborhood: km 103+100 to km 107+500

Noise levels at Shkoder city are yearly measured by the National Environmental Agency. Amongst two monitoring stations, the closest one is located roughly 1.4km from the railway line (see Figure 5-32 in chapter 5). Table below gives the annual average of the noise measured in this station, as well as the WHO standards.

Table 6-118_Average annual noise values, in Shkoder and Lezhë in 2018 and 2019, compared to WHO standards

No	City / standard	Monitoring Station	Closest distance from the railway	Laeq (dB) - day time	Laeq (dB) - night time
1	Shkoder - 2018	Hotel Rozafa	1400m - railway line; 1600m - railway station	63.47	51.50
2	Shkoder - 2019			60.00	51.60
3	WHO standard (before 2018)	n/a	n/a	55	45
4	WHO standard (2018)	n/a	n/a	54	44

Table above shows that the noise levels in Shkoder are higher than allowed by WHO standards because the monitoring station is located in a place with heavy traffic (see Figure 5-32). Across the neighbourhood crossed by the railway line the traffic is not dense because there are neither national roads nor industrial activities. The only source of noise is the railway and the local roads connecting this neighbourhood with the centre of the city. Therefore, it is expected the noise value to be lower.

18 noise levels measurements have been performed for the Project's purposes. The measuring points were located near the railway line, across the eastern neighborhood of Shkoder City (see separate document on noise and vibrations). Measurements results show that this railway line section is dominated by noise levels generated by the road traffic. Within the railway line

segments where there is no roads the noise level is within the required EU and national standards. However, these levels are in general within the permitted values, excepting near the roads, where they are slightly higher than the permitted values.

A short summary of the current situation in this railway line section would be as follows:

- This section lies on the west side and alongside of Kiri riverbed;
- The center of the town is located far from the railway line;
- There are no high buildings or densely populated areas on both sides of the railway line;
- There is no enough available space for soil berms, which are the most effective noise insulation measures;
- There are planned double service roads from km103+200 to km 107+500;
- It is planned to build a double wall (on both sides of the railway line) at km 103+500, where the urban objects are located very close to the railway line;
- Double service roads are planned across this neighborhood. The installation of noise protection barriers would create a source of car accidents in the planned service roads, because car drivers' visibility will be reduced. To avoid that, it is suggested as follows:
    - Wherever possible, installing of low and absorptive barriers;
    - The protection barriers installed between the railway line and the parallel roads must be transparent to avoid reduction of the car drivers' visibility. In this case it is recommended to install mixed barriers (see on the right of the *Figure 6-177* above), which absorb the noise and at the same ensure a certain visibility;
    - Wherever possible, installing transparent barriers are recommended to not block the view of Kiri River running on the eastern side of the railway.
- Generally, the best solution are the sound absorbing barriers. The barriers that reflect or refract the sound waves are not recommended.

At km 104+650, where the railway line passes close to the historical cemetery of Rrmaji (culture monument), it is compulsory to reduce the rolling noise .

Conclusion: Based on the above, across the neighbouring of Shkoder city, it is recommended to install mixed barriers (see on the right of the Figure 6-177 above), that absorb the noise and allow for a certain visibility.

In the section from km 106+680 to km 107+200, where Kiri Riverbed lies nearby and along the eastern side of the railway line, the absorbing components could be applied only on the western side of the railway line where there are houses.

Crossing of agricultural settlements

It is recommended to apply as much as practicable low and/or transparent noise barriers, in order not to block the view and thus affect as less as possible the typical agricultural landscape. In any case, the noise barriers should be as absorbing as practicable.

3-Mitigation at the receiver

The mitigation at the receiver (e.g. houses close to the railway) is not within the control of the railway institutional system. The Albanian Railways could apply this kind of mitigation only for the buildings of the stations that are the property of the Albanian Railways.

Findings and suggestions

The railway line Vorë – Hani Hotit runs mostly through rural areas. It do not traverse any highly populated zone. The railway crosses only the neighborhoods of two cities (Lezhë and Shkoder). Based on the urban features of the crossed areas, the most feasible option for reducing the rolling noise is mitigation at the source. This means that the interface of rail/wheels and the appropriate ground conditions must reduce the noise and vibration generation.

According to EU transport policy and Good International Practice[274], the preferred strategy for reducing the trains' noise, is as follows:

- New railway lines: mitigation at the source that includes appropriate railway superstructure, substructure, and vehicles and wagons.
- Existing railway line: mitigation at the propagation path (noise barriers) and at the source (reducing wheel and rail roughness)

As the railway line Vore-Hani Hotit is a new one, the following mitigation measures are suggested.

During design and construction stage

The mitigation measures taken into consideration in the Project design include:

1. **Mitigation at the source**

    a. Appropriate ground conditions, including the materials that provide for the base of the railway, can reduce the vibration disturbance. It should be underlined that the project design includes also the installation of two layers of geotextile, which help to improve the ground conditions. In addition, all the existing subgrade will be removed, reused after mixing it with other appropriate material (e.g. crushed limestone), in order to improve the ground conditions. Furthermore, from km 20+620 to roughly Km 90+000, 50 cm of the natural soil will be dredged, removed and replaced with appropriate material. The first geotextile layer will be installed at 50cm depth;

    b. Improving the horizontal railway line alignment. The horizontal alignment has been improved in three short sections. The line radius has been increased from

274 Study on "Reducing Railway Noise Pollution". European Parliament, 2012

300 to 500m or more. Bigger is the line radius, smaller is the friction between the wells and the rail and therefore smaller is the generated rolling noise;

c. Sleeper soffits, fixed to sleepers restrain the movement of the track, and therefore reduce the ground vibration. These elements must be installed in the following sections:

- Lezhë tunnel, which is roughly 190m long;
- Western neighboring of Lezhe town;
- Eastern neighboring of Shkoder town;
- All the passengers stations; and
- The shrubby area from km 132+600 to km 135+100

d. Installing low noise cast iron brake blocs, which can reduce the rolling noise up to 12dB.

2. Mitigation at the propagation path

The Project's design has already taken into consideration the construction of noise barriers within 13 short segments of the railway line. Table 6-116 above shows the list of these barriers, including their location. In addition, the Consultant has suggested the appropriate type of noise barrier for each segment, in function of the local features. Hereinafter follows a short description on how the types of noise barriers have been selected.

- Generally, the best solution are the sound absorbing barriers. The barriers that reflect or refract the sound waves are not recommended. Otherwise other buildings located at a certain distance from the railway line would be affected from noise because of the reflected and refracted sound waves (see Table 6-116 above);
- High noise barriers affect the landscape; therefore, installation of the low ones is preferred, wherever allowed by the local conditions;
- Wherever possible, installation of transparent barriers along service roads is preferable to opaque ones, as they help car drivers' visibility and allow for landscape visibility;
- Whether possible, installation of transparent barriers across agricultural settlements is preferable, as to not affect the landscape.

Before deciding where to install noise barriers, the Consultant took into consideration the location of the sensitive sites/objects/facilities, including cultural heritage and historical/religious sites/objects/ICH, and educational and health facilities.

During operation and maintenance

a. Reducing the roughness of the rails by grinding tracks to remove corrugated edges and by lubricating tracks. That can reduce the rolling noise from 2.5 to 5 dB;

b. Reducing the roughness of the wheels by grinding them to remove corrugated edges and by lubricating wheels. That can reduce the rolling noise from 2.5 to 5 dB;

c. Good maintenance of the whole railway components (superstructure, substructure and superstructure);

d. Good maintenance of the noise barriers.

Note: With respect to the proposed project, in Table 6-116 above are provided some general recommendations on the type of noise barriers and the location where they will be installed. Currently (at the design stage), there is no rail traffic in the Vorë – Hani Hotit line. Due to the November 26, 2019 earthquake, the Ishmi Bridge (at km 35+100) has suffered severe structural damage. Since then the rail traffic has been interrupted. Only a very limited number of freight trains circulate from Lac to Hani Hotit and further on.

In these conditions, it seems premature to estimate the real levels of noise and vibrations that can be generated by trains that will circulate in normal conditions from Vore to Hani Hotit. This lack of accuracy may influence the detailed design of the noises barriers, including their type and material.

However, even before this date, the traffic was not intense because of the bad conditions of the railway components and the rolling stock. Thus, in these conditions, the measure of the noise background close to the railway line will not reflect the real situation once the railway line will be rehabilitated and the number of trains that will circulate in this line will considerable increase.

When the railway line will be rehabilitated, the trains will initially run slowly until the railway components will function under full load. When the trains will start running with the planned speed, then an acoustic study should be performed, based on which it will be decided where exactly to install the noise barriers and which type of barrier is appropriate in different sections of the railway line. Their type and height will be designed in function of the acoustic study, taking also in consideration the location and height of the inhabited buildings on both sides of the railway line. The noise propagation is also affected by the topography and the height of the railway body versus the eventual receivers.

Another factor to be taken into consideration is the noise generated by cars when parallel national roads are located between the railway line and the receivers. If the noise generated by trains is negligible compared to that generated by cars, then the Promoter should take into account to install firstly noise barriers against road noise.

Based on the above, it is recommended that the acoustic study is performed at the beginning of the operation stage, once the railway line is rehabilitated and the background noise sources are defined[275]. Then, the exact type and other characteristics of the noise barriers will be designed and installed.

Conclusion: Noise and vibration effects during the operation stage are evaluated as probable, of low significance, and of local extent. Their impacts can be mitigated by taking the appropriate mitigation measures. The reduction of the noise and vibration is firstly performed during the railway design, through reducing them at the source, including the design of the railway line radius curves, and structure and substructure elements. Secondly, they are reduced at the propagation path through the installation of noise barriers.

275 https://otc-cta.gc.ca/eng/railway_noise_measurement

A specific Annex developed as a stand-alone report has been enclosed in the ESIA package to provide additional information on the impacts related to Noise and Vibration (Noise and Vibration Report (Appendix to ESIA).

6.2.3. Climatic conditions

6.2.3.1. Design, preconstruction, and construction

Impact of the climatic conditions on the project activities: There are no noticeable differences in climate characteristics along the whole area crossed by the railway line. The project area is part of the Mediterranean Plains Climatic Zone, which is characterized by mild and wet winters and hot and dry summers. These moderate climatic characteristics are suitable for all the project development phases. Thus, the construction works will be able to take place almost all year round. However, it is suggested to take into account the following:

- Schedule the construction of the bridges and the protection works against erosion outside the rainy periods. These works are performed within the rivers and streambeds, which in rainy period may be affected by any sudden flooding that is risky for the workforce and the construction machinery. Besides, working within the rivers and stream beds in the rainy period may increase the erosion within these beds, as well as the turbidity of the water bodies;
- Schedule the earthworks for the railway body and the drainage system outside the rainy periods to avoid erosion and sedimentation.

As the above scheduling of the construction activities is probable, it is no expected that the current climatic conditions will affect the project's activities.

In a conclusion, the impact of the climatic characteristics on the project's activities is expected to be insignificant.

Impact of the project's elements on climatic conditions: The likely impacts of the project components and activities on climate conditions are described in the section on climate change.

6.2.3.2. Operation and maintenance

Impact of the climatic conditions on the project activities: The moderate climatic characteristics within the whole project area are suitable for the operation phase. The likely changes of these characteristics are outlined hereinafter, in the section on climate change.

Impact of the project's elements on climatic conditions: The only likely impact of the project activities during operation is the release of GHG emissions from fuel combustion by the locomotives. Although insignificant, this impact is mentioned in the section on climate change hereinafter.

6.2.4. Climate change

6.2.4.1. Design, preconstruction, and construction stages

Impacts of the project on climate change

The preconstruction and construction activities may affect the climate through the increase of CO_2 concentration by the diminution of vegetation from earthworks for preconstruction and construction purposes (work camps, any eventual access road, vegetation clearing alongside the working strip both sides of the railway line, vegetation clearing for the new Lezhë 2 station, etc.), as well as in a direct way by a generation of gaseous effluents generated from construction machinery and transport vehicles.

From km 20+560 to km 130+880, the railway line runs mainly throughout flat agricultural areas, which vegetation can be reinstalled after the construction works. The only forested and shrubby areas crossed by the railway line lie in the section Bajzë- Hani Hotit from km 130+880 to km 140+000. Any eventual vegetation removal from km 132+500 to km 137+550 may adversely affect the climatic conditions through the reduction of CO_2 capture, where the shrubs are represented by Maquis vegetation, (km 132+500 to km 137+550). While from km 139 to km 140 the railway line runs across an area covered with rare and degraded Mediterranean Maquis.

The table below shows the existing natural vegetation on both sides of the railway line belt.

Table 6-119_Natural vegetation on both sides of the railway line

No	Length	Segment (km)	Exiting land use	Comment
1	320m	Km 30+880 to 131+200	-Pastures on the west; -Forest on the east; -8.0 to 8.0m available space on the east	-Located within the traditional use zone of the Shkoder Lake NMR; -Located south of Bajzë station -Existing access road, parallel and joint to the railway line on the west; -Hard terrain (limestone)
2	1600m	Km 133+550 to 135+150	Shrubs and forest on both side of the railway line	-Located within the traditional use zone of the Shkoder Lake NMR; -Local roads cross this section; -Need for vegetation clearing; -Hard terrain (limestone); -Two agricultural plots cross the railway line at two different places
3	350m	Km 135+150 to 135+ 500	Agricultural land on both side of the railway line	-Located within the traditional use zone of the Shkoder Lake NMR; There are access roads
4	200m	Km 135+500 to 135+700	Rare shrubs and scarce land on both side of the railway line	-Located within the traditional use zone of the Shkoder Lake NMR; There are access roads; -Hard terrain (limestone);
5	1400m	Km 135+700 to 137+100	Rare shrubs and scarce land on both side of the railway line	Located outside the Shkoder Lake NMR; There are access roads; -Hard terrain (limestone); Located parallel to the motorway, which is 50m far. No need for an access road
6	600m	Km 137+100 to 137+700	Shrubs on the right (east); Motorway and pastures on the left (west);	Located outside the Shkoder Lake NMR; There are access roads; -Hard terrain (limestone); Located parallel to the motorway, 10 to 50m from it. No need for an access road
n/a	n/a	Km 137+700 to 137+930	Arable land	Located outside the Shkoder Lake NMR; No need for an access road
7	100m	137+930 to 138+030	Pastures and low buildings and other available space on the west: Forest on the	Located outside the Shkoder Lake NMR; located joint to a rural road, and therefore there is no need for an access road

No	Length	Segment (km)	Exiting land use	Comment
			east – 100 m long;	
8	240m	138+310 to 138+550	Pastures and low buildings and other available space on the west: Forest on the east – 240 m long	Located outside the Shkoder Lake NMR; Low trees; No need for an access road
9	1000m	Km 139+000 to 140+000	Rare shrubs on both sides of the railway	Located outside the Shkoder Lake NMR; Motorway runs parallel to the railway. The motorway is located between the lake and the railway line. Distance from the motorway from 5 to 20m

It should be underlined that the railway line Milot –Shkoder is built in the 1980' years and started to operate in 1985. Whereas the Protected Area of Shkoder Lake NMR was proclaimed in 2005. Thus, all the components of the railway line, including the railway line belt already existed when the protected area was proclaimed. This means, there is no vegetation within the railway line belt on both parts of the railway line. Furthermore, the railway line, including the railway line belt is included within the traditional use zone (see Figure 3-30) where the reconstruction of the existing roads (including railroads, bridges, and culverts) and buildings (including train stations) is permitted by the Managing Plan of the Shkoder Lake NMR (see Table 3-14).

As there are no service roads planned within the section running across the shrubby and degraded forest area (km 132+500 to km 137+550), the vegetation removal within this area will be insignificant. Besides, the filling material of the railway body within this section is of good quality, the vertical alignment is optimal and the geotechnical conditions are very good. Consequently, the rehabilitation works will be performed quickly and there is no need for cutting trees and/or shrubs on both sides of the railway line. As a result, no reduction of the CO_2 capture from the existing vegetation is expected.

Proposed mitigation measures*:* Although no project's impacts on climate change are expected, the construction company should take a set of mitigation measures. The location of the work camps, any eventual temporary access roads should be selected, as practical as possible, in areas of poor vegetation values. The local roads should be used as access roads. The working strip should be minimized as much as possible. Besides, it is suggested to apply the practices for mitigation related mainly to air quality, biodiversity, and land use.

The generation of gaseous effluents from construction machinery and transport vehicles can be mitigated by applying the mitigation measures related to air quality.

Impacts of the climate changes on the project elements.

The likely impacts of climate change on the project's elements include mainly the following:

- the erosion of the bridge's pylons and foundations in case of increase of rivers and streams discharge (Ishmi, Droja, Mati, Lezhë's Drini, Gjadër, Drini and Kiri rivers, and Rrjolli and Përroi Thatë streams). The damages to any bridge could lead to the interruption of the railway traffic;

- any eventual railway line inundation during flash floods, especially in the sections from km 32+00 to km 35+ 000 (see section 5.2.9.2 of the baseline information), km 69+500 to km 74+000 (north of Lezhë) and km 100+000 to km 102+00 (east of Kiri River Bridge).

Proposed mitigation measures. The mitigation measures suggested during the design and construction stage relate overall to the erosion and inundation phenomena that could affect the railway line components (railway line body, bridges, protection works against erosion, etc.) and the watercourses beds during maximal discharges that can derive from the projected climate change.

- The suggested mitigations measures to avoid/reduce the erosion include:
    - The design of the bridges should take into account the potential erosion from rivers and streams, including depth of pylons, space under bridges, quality of concrete, etc.;
    - Design and construct appropriately the protection works on both sides of the rivers and streambeds at the crossings of the railway line. Special attention should be paid to the protection works against erosion at the right side of Kiri Riverbed from km 102+900 to km 107+400, where the railway line runs almost parallel and close to the riverbed.
    - It is important to prohibit the extraction of gravel and sand in rivers areas on both sides of the bridges, in compliance with the relevant standards and the local features. Special attention should be paid to prohibiting the gravel extraction activities at the Mati Riverbed close to the river crossing (km 56+000);
- The mitigation measures to avoid the railway line inundation, including
    - The design has already taken into consideration the vertical alignment within the section from 69+500 to km 74+000, where the railway line has been inundated, in the past. The flood events are caused by the cumulative effect of the Lezhë's Drini River and Fangu channel. To avoid any potential inundation, the railway line vertical alignment from km 69+000 to km 80+000 will be increased from 30 to 100 cm;
    - Rehabilitation of the Fangu channel to avoid any overflow in case of heavy rainfalls. Consequently, only the water of Lezhë's Drini River may cause inundation in case of heavy rainfalls periods (see Figure 5-114);
    - Increase of vertical alignment up to 70cm from km 30+000 to km 41+000. That is necessary to increase the height of Ishmi and Droja Rivers Bridges and therefore to increase their conveyance capacity. Thus, these bridges will not serve as obstacles that can cause the inundation of the lowlands on both sides of the railway line, especially from km 32+000 to km 35+000 (see Figure 5-112_Flooded area by Ishmi River on December 12, 2017).
    - Improve the drainage channels alongside the whole railway line. Special attention should be paid to the sections from km 32+000 to km 35+ 000 (south of Ishmi River crossing) and 100+000 to km 102+000 (east of Kiri River Bridge), where the railway line serves as an embankment that impedes the water circulation on both sides of the railway line in case of heavy rainfalls (see Figure 5-112). The railway design has already taken into consideration the improvement of the drainage system within these two sections;
    - Design additional culverts alongside the sections that can be affected by inundation, especially in the sections from km 32+000 to km 35+000. The flood

within this section is not dangerous for the railway, but it is dangerous for the surrounding flat agricultural area. The Consultant added three new culverts (3x2m) at km 32+920, 33+475, and 33+920. Also, the dimensions of the existing culvert at km 34+515 are increased which helps to drain faster the fields during and after the flooding events. It should be underlined that the railway in section km 32+000 to km 35+000 is enough high (almost 3.0m) and therefore the railway line is never inundated, even in the most pessimistic scenarios;

- Generally, an increase in the size of the hydraulic structures.

All the above-mentioned mitigation are already taken into consideration in the Project's design.

Conclusion: The above-mentioned mitigation measures are already taken into consideration in the Project's design. Therefore:

- The likely adverse impacts of the project on climate change can be evaluated on low probability and significance. They can be mitigated by applying the mitigation practices related mainly to air quality, biodiversity, and land use.
- The likely impacts of the climate changes on the project's components and activities are evaluated of low probability and significance, and national extent. They can be mitigated by applying the mitigation practices related mainly to erosion, flooding, and drainage system. The bridges' design has already taken into account the likely erosion from rivers, streams, and the exceptional watercourses' discharges. It is also important to prohibit the extraction of gravel and sand in the rivers' area on both sides of the bridges.

6.2.4.2. Operation and maintenance

Impacts and mitigations of the expected climate changes on the project's elements.

According to *Albania's Third National Communication on the Climate Change* (Albanian Ministry of Tourism and Environment, 2016276) and the fifth synthesis report of the *Intergovernmental Panel on Climate Change* (IPCC), 2014277, the climate change parameters that are of concern for the Project include the temperature, rainfalls, sea-level rise and GHG generation.

Climate change projections for the coastal zone of Albania show an increase in temperatures and frequency and intensity of floods, as projected by IPCC[278]. The latest figures of the European Environmental Agency predict an increase of about 5-15% of the heavy precipitation in the winter period. While summer periods will be dryer.

The projections show that the expected increase in the maximum temperatures in the summer period could reach 6ºC. Besides, it is projected a drastic decrease in the return periods of maximum absolute temperatures over the Albanian coastal area. The expected simultaneous increase of the minimum and maximum temperatures would cause an increase in the heat waves.

All the scenarios reveal a likely decrease in annual precipitation compared to 1990'. The annual precipitation is likely to decrease by up to -8.5% by 2050, by up to -14.4% by 2080, and by up to -18.1% by 2100. Summer periods will be dryer and winter periods will be wetter, affecting thus both the magnitude and frequency of floods.

276 https://unfccc.int/sites/default/files/resource/Albania%20NC3_13%20October%202016.pdf

277 https://www.ipcc.ch/report/ar5/wg2/europe/

278 Climate Change. *Synthesis Report, IPCC, 2014*

During the 20th century, the level of the Adriatic Sea has raised by roughly 15cm. It should be stressed that the Albanian coastal area from Vlorë to Shkoder is prone to subsidence that might intensify the impact of sea-level rise. The expected average sea level rise is roughly 30 cm by 2080 and 40cm by 2100. While the respective maximum values are 50 and 70cm.

Based on these figures, it can be concluded that no impact of the sea level increase on the project is expected. The projected sea-level increase for the year 2100 (worst scenario) is approximately 70cm. Given that the lowest terrain alongside the railway line (Lezhë area) is located approximately 4.0m asl (at Lezhë), this predicted sea level increase is not expected to affect the railway line.

Based on the hydrological report, the Project has taken into consideration the scenario when the sea level will rise at a maximum (70 cm) and the rainfalls will be very intense. In this case, the lowlands on both sides of the railway line section from km 30+000 to km 41+000 (please refer to baseline information on climate change – section 5.2.4, Figure 5-42) is expected to be inundated, and therefore raising the height of the railway body is needed. The Project's design has already taken into consideration this suggestion and therefore the railway line body will be raised to 70 cm (km 30+000 to km 41+000).

Based on the above, it can be said that the likely significant impacts linked to climate change are as follows:

- Impact on the functioning of the rails in case of an increase of the maximum temperature. As the maximum temperature recorded within the project area is 41.5 ^oC, based on the projected climate change this parameter could reach 47.5^oC;
- Inundation of the railway line because of the flash floods;
- Inundation of the railway line because of the inundation caused by the combined effect of the predicted sea-level rise, heavy precipitations, and low terrain; and
- Erosion of the bridge's foundations in case of increase of rivers and streams discharge;

These potential impacts can be mitigated by taking the following measures:

- Select proper railway components such as rails and other materials and facilities that can function normally in high temperatures (up to 48^oC);
- The design has already taken into consideration the increase of the vertical alignment of the railway line within the section where the line has been inundated, in the past (km 69+500 to km 74+000). That is why the railway line vertical alignment will be increased from 30 to 100 cm in the section from km 69+000 to km 80+000, and up to 70 cm in the section from km 30+000 to km 42+000. It should be underlined that the existing railway line body in the section from km 32+000 to km 35+000 is enough high (almost 6.0m) and therefore the railway line is never inundated, even in the most pessimistic scenarios projected by 2100;
- The design has taken into consideration the improvement of the drainage system, especially in sections from km 32+000 to km 35+000 (close to Ishmi River Bridge) and from km 100+000 to km 102+000 (on the left of Kiri River Bridge);
- The design of the bridges and culverts should take into account the likely erosion from rivers and streams in case of discharge increase; and
- Prohibit the extraction of gravel and sand on both sides of the bridges, in compliance with the relevant national standards and the local features.

Based on the above, no adverse impact of the climate changes on the project's activities and components would be expected during the operation and maintenance phase.

Conclusion: During operation, the likely impacts of the climate changes on the project's components and activities are evaluated of low to moderate probability and of local extent. They are already taken into consideration by the Project's design by applying the best international mitigation practices related to the bridges and culverts design and construction and to the vertical improvement of the railway line.

Impacts and mitigations of the project on climate change: During operation, the main source of air pollution is the fuel combustion from locomotives. The related pollutants released into the atmosphere are NO_2, PM_{10}, CO, benzene (C_6H_6), and benzo[a]pyrene ($C_{20}H_{12}$). Amongst them, NO_2 and PM_{10} are the most likely to result in exceeding relevant air quality standards or objectives.

The GHG emissions at the country level are low due to low industrial and intensive agriculture activities, and lack of any thermo power plants. Currently, the contribution of the transport sector and railway transport to the total GHG emissions at the country level is 26.31% and 0.108%, respectively279. The last figure could be reduced by using fuels within the required standards.

Another source of GHG is associated with the carbon capture from the existing vegetation that could be cleaned for the project's purposes.

As shown in the Table 6-119 above, the quantity of the vegetation to be removed permanently (mainly for the construction of service roads and Lezhë 2 station) is less than insignificant. It should be noted that any trees or shrubs that could be affected by vegetation removal for construction purposes, will be replaced.

Conclusion: During operation and maintenance, the likely impacts of the project on the climate changes are evaluated of moderate probability, almost insignificant, and national extent. They can be mitigated by applying the required fuel quality standards.

6.2.5. Geological issues

Based on the baseline information (see section 5.2.5.3), the main geological risks that can affect the railway line are linked to the lithology, the tectonics and seismicity, the water table, and the running waters. These risks are erosion and earthquakes. The railway line section that is most vulnerable to the earthquakes lies approximately from km 90+000 to km 103+000.

The subsidence is encountered along the railway line sections that run over marshy deposits (from km 25+000 to km 50 +000, km 60+000 to km 68+000, and km 70+000 to km 90+000).

The lithological composition and the shallow water table, together with the tectonic and seismic features of the project area can affect the railway line during earthquake events.

Both the lithological composition and the running waters play an important role in the erosion of the river and streambeds. This erosion might affect the stability of the bridges and the railway embankments. The railway line section which is most sensitive to erosion lies from km 103+000 to km 107+000, where the railway line runs on the right of Kiri Riverbed where protection works in gabions against erosion already exist.

Given the importance of the seismic activity in the stability of the railway line bridges, the potential effects deriving from tectonic and seismicity are described separately in section 0 hereinafter.

279 https://unfccc.int/sites/default/files/resource/Albania%20NC3_13%20October%202016.pdf

6.2.5.1. Design, preconstruction, and construction stages

Potential impacts: As mentioned above, the geological risks that may occur during construction activities include mainly erosion and subsidence.

Demolition works of the existing bridges and the construction works of the new ones, as well as the construction of protection, works against erosion within the river and streambeds (e.g. Kiri Riverbed from km 103+000 to km 107+000) may affect the rivers and streambeds' erosion. The vegetation clearing and the earthworks for drainage channels and retaining walls, as well as the construction of underpasses (e.g. km 95+700 at Spathari Village), constitute other sources of erosion and sedimentation.

The subsidence phenomenon occurs overall within the areas where the upper geological layers are composed of unconsolidated marshy deposits (e.g. lowland between Budull and Thumanë – km 30+000 to 50+000, lowland in the south of Lezhë - km 60+000 to km 68+000, and Mërqia and Zadrima lowlands – km 69+500 to km 90+000). The subsidence may affect the stability of the bridges and the railway body, which may be lowered because of the weight of the trains.

Proposed mitigation measures: The mitigation measures include measures against erosion and subsidence, as follows:

- Mitigation measures to avoid/reduce erosion and sedimentation, include:
  - Minimize the working areas within the rivers and stream beds;
  - Choose an appropriate design for protection works against rivers and streams erosion;
  - Avoid/minimize any eventual construction of new access roads, and make usage as much as possible of the existing communal and rural roads;
  - Minimize the vegetation clearing;
  - Wherever possible, minimize work on soft ground in wet weather;
  - Compact as soon as practicable the filling material of the railway line body to prevent the run-off to surface waters.
- Mitigation measures to avoid subsidence, include:
  - Prepare a detailed and well-studied geotechnical model of railway line track;
  - Choose appropriate material for the railway line body;
  - Wherever necessary, remove the existing filling material and replace it with an appropriate one;
  - Select the appropriate design and depth for the bridge's foundations

Based on the above, no adverse impact of the climate changes on the project's activities and components would be expected during the operation and maintenance phase.

Conclusion: During preconstruction and construction stages, the likely impacts associated with the geological features can be evaluated of medium probability, of local extent, and of low to moderate magnitude. It is expected to result in an overall low significance because of the appropriate mitigation measures already undertaken during the design stage. These measures should be strictly applied by the construction company.

6.2.5.2. Operation and maintenance

The Project's components and activities are not a source of erosion, sedimentation, and subsidence during the operational phase. However, just after the preconstruction and construction phase, the construction company must rehabilitate the vegetation that had been cleared for retaining walls and drainage system. The protection works against erosion within the river and streambeds must be maintained appropriately and remediated whether necessary.

Conclusion: The adverse impacts associated with the geological features during the operation phase can be evaluated as of low probability, of local extent and low magnitude. It is expected they to result in an overall low significance to insignificant.

6.2.6. Tectonic and seismicity

The railway line runs across the seismic zone sources of Preadriatic Lowland and the Lezhë-Ulqin (see Figure 5-50 in section 5.2.6 of the baseline information) that are seismically active.

According to the map of the recorded earthquakes, the expected maximum magnitude (in Richter scale) within the Preadriatic Lowland is Mx=7.0, while within the Lezhë-Ulqin is Mx=7.2.

Based on the seismotectonic map of Albania (see Figure 5-50 above) and seismic zonation map of Albania, the railway line passes through areas where potential expected earthquakes could have an intensity (in the epicentre) of VIII degree (MSK-64).

From Vorë to Bajzë the PGA values (see Figure 5-51 above) are from 0.25 to 0.3, for a return period of 475 years. According to the Albanian norms (KPT-89), the section from Bajzë to Hani Hotit, where these values vary from 0.1 to 0.2, runs over hard limestone formations of category I of subsoil (see t and Table 5-43 above). From Vorë to Bajzë the railway runs through loose formations that can be classified as category III of subsoil (see t and Table 5-43 above).

To calculate the right values of PGA along the railway line, it is necessary to know in detail, especially for each bridge's location, the local parameters including the regional and local tectonics, the geotechnical model of the soil/ground, and the water table level.

Based on the lithological composition of the crossed geological formations (category III of subsoil), as well as on the shallow water table, the section from Vorë to Bajzë can be affected by the soil liquefaction phenomenon during strong earthquakes.

From Baqel to Shkoder (# km 90+000 to km 103+000), the railway runs close to an area where the expected intensity is IX degree MSK-64 (see Figure 5-52 in section 5.2.6 above). That conditions the bridges' design to take into consideration this high seismic risk. Such a seismic risk should be calculated by taking into consideration the regional and local tectonic and the geotechnical characteristics of the subsoil/soil/ground. The water table level at the crossings of Gjadër, Drini, and Kiri Rivers is at the level of the river's surface. Therefore, the bridges' design must take into consideration any eventual soil liquefaction in case of a strong earthquake.

In any case, it is compulsory to understand the geotechnical model of the soil through geotechnical studies, including the information collected by the borehole logs. The evaluation of the seismic risk is made based on the geotechnical model.

6.2.6.1. Design, preconstruction, and construction stages

Sources of impacts and potential impacts: The railway line runs over an area affected by active post-Pliocene thrust faults. Besides, the lithological composition of the crossed geological formations (category III of subsoil), as well as the shallow water table in the railway line section from Vorë to Bajzë favour the soil liquefaction phenomenon during strong earthquakes. The local soil conditions play a crucial role in the amplification of the earth shaking during earthquakes.

The earthquake of November 26, 2019, caused structural damage to the Ishmi Bridge (see Figure 5-55 above), which is currently (October 2020) out of work. Consequently, the whole railway line from Vorë to Hani Hotit is not functioning. As a result, the whole railway freight transport from Tirana and Durrës to northern Albania and further on to Montenegro is interrupted.

Proposed mitigation measures: The whole railway line components design, especially the bridges and stations, must take into consideration the seismic risk, which has been calculated by taking into consideration the regional and local tectonic, and the geotechnical characteristics of the subsoil/soil/ground and the water table level. These measures are already taken into consideration in the Project's design.

A detailed seismic report was prepared by the Consultant as part of the technical reports package. The report was based on the seismic refraction method. The report fulfils the Eurocode 8[280] (Seismic Design of Buildings) requirements, which are more stringent than the national ones on the "Technical Conditions on the Design of the Anti-Seismic Structures" (KTP-No2, 1989), as provided in the DCM 350/1995.

It fulfils also the national requirements on the seismic and geological risks on the design of such construction structures, as provided in the DCM 1162/2020.

According to this DCM, a statement on the fulfilling of the seismic risk is provided by the responsible governmental agency (Albanian Institute of Geosciences, Energy, Water and Environment – IGJEUM, Department of Seismology) before the starting of the construction stage. This statement is based on the geological and seismic evaluation report (Annex 2 of DCM 1162/2020) prepared by an accredited company. The company ALTEA GEOSTUDIO that has prepared both the seismic and geotechnical studies on the Vore-Hani Hotit railway rehabilitation project is licensed fur such studies.

Conclusion: During preconstruction and construction stages, the likely impacts associated with the seismic features of the Project area can be evaluated as probable, of the national extent, and moderate magnitude. As the design has taken into consideration the appropriate mitigation measures, it is expected the likely impacts to result in an overall low significance.

6.2.6.2. Operation and maintenance

The Project area is characterized by a high seismic risk. However, theoretically, it can be assumed that there is no expected risk from earthquakes during operation because the Project's components, especially the railway bridges, are designed and built by taking into consideration the seismic intensity of the Project's area and the local geotechnical conditions. This finding is based on the following:

- There is no any evidence of surface rupture hazard within the Project area. The tectonic faults within the Western Lowland of Albania do not appear on surface because thick Quaternary sediments overlay the geological formations affected by active faults.
- Any potential damage to infrastructure objects is caused by earth shaking, which depends on the seismotectonic features of the whole area and on local conditions, which depends on the geotechnical model (detailed soil/subsoil category, alternation of different layers and water table level). Bigger is the soil/subsoil category, bigger is the earth shaking potential and lower is the vibration attenuation. Soil/subsoil/ground of

280 https://eurocodes.jrc.ec.europa.eu/doc/WS_335/report/EC8_Seismic_Design_of_Buildings-Worked_examples.pdf

category I (e.g. limestone formations across Lezhe tunnel or in the northern part of the Project's area from km 129 to km 140) have a good coefficient of vibration attenuation.

- The liquefaction occurs from the combination of:
  - earth shaking;
  - local geotechnical conditions; and
  - underground water table level.
- Closer to the surface is the water table level, bigger is the earth shaking potential of the loose deposits (e.g. gravel and sand within the crossed rivers and streambeds).
- The estimated seismic risk for the whole project area (see fig. 5.20) is general because it is based on firm rock conditions (category II of soil/subsoil/ground – see tables 5.15 and 5.16 above). This estimation does not take into account looser soils/subsoil, for which the shaking is bigger. Therefore, lower is the soil/subsoil category, lower is the shaking. E.g., soil/subsoil of category I is hard and has a good coefficient of vibration attenuation, while loose deposits (category III of soil/subsoil) has a low coefficient of vibration attenuation. Consequently, it is compulsory to be based also on the soil/subsoil category at site construction scale.
- A detailed geotechnical study has been carried out by the Project. This study started by drilling boreholes, especially at the rivers and streams crossings. At least, four boreholes have been drilled in each main river and streambed to study in detail the lithological cross-section at the sites where the bridges (and stations, too) will be built.
- So, for the construction of the sensitive components (especially bridges), soils/subsoil/grounds of category III (loose deposits - see tables 5.15 and 5.16 above) were considered in the design. In addition to the soil category, the water table level has been taken into consideration, too.
- The soil/subsoil category and the water table were taken into consideration also for the construction of the open line (through the selection of the appropriate raw material for the ballast, sub-ballast and subgrade), in order to avoid any eventual subsidence. Furthermore, two layers of geotextile will be applied within the sections where the railway line runs over loose Quaternary deposits of lacustrine origin.

As a conclusion, the bridges are designed with more severe anti-seismic norms than those suggested for soil/subsoil of category II (firm rock conditions). Besides, a statement on the fulfilling of the seismic risk is provided by the responsible governmental agency (IGJEUM, Department of Seismology) before the starting of the construction stage. This statement is based on the geological and seismic evaluation report (Annex 2 of DCM 1162/2020) that has been prepared by the Consultant.

6.2.6.3. Operation and maintenance

The Project area is characterized by a high seismic risk. However, theoretically, it can be assumed that there is no expected risk from earthquakes during operation because the Project's components, especially the railway bridges, are designed and built by taking into consideration the seismic intensity of the Project's area and the local geotechnical conditions. This finding is based on the following:

- There is no any evidence of surface rupture hazard within the Project area. The tectonic faults within the Western Lowland of Albania do not appear on surface because the geological formations affected by active faults are overlaid by thick Quaternary sediments.

- Any potential damage to infrastructure objects is caused by earth shaking, which depends on the seismotectonic features of the whole area and on local conditions, which depends on the geotechnical model (detailed soil/subsoil category, alternation of different layers and water table level). Bigger is the soil/subsoil category, bigger is the earth shaking potential and lower is the vibration attenuation. Soil/subsoil/ground of category I (e.g. limestone formations across Lezhe tunnel or in the northern part of the Project's area from km 129 to km 140) have a good coefficient of vibration attenuation.
- The liquefaction occurs from the combination of:
    - earth shaking;
    - local geotechnical conditions; and
    - underground water table level.
- Closer to the surface is the water table level, bigger is the earth shaking potential of the loose deposits (e.g. gravel and sand within the crossed rivers and streambeds).
- The estimated seismic risk for the whole project area (see fig. 5.20) is general because it is based on firm rock conditions (category II of soil/subsoil/ground – see tables 5.15 and 5.16 above). This estimation does not take into account looser soils/subsoil, for which the shaking is bigger. Therefore, lower is the soil/subsoil category, lower is the shaking. E.g., soil/subsoil of category I is hard and has a good coefficient of vibration attenuation, while loose deposits (category III of soil/subsoil) has a low coefficient of vibration attenuation. Consequently, it is compulsory to be based also on the soil/subsoil category at site construction scale.
- A detailed geotechnical study has been carried out by the Project. This study started by drilling boreholes, especially at the rivers and streams crossings. At least, four boreholes have been drilled in each main river and streambed to study in detail the lithological cross-section at the sites where the bridges (and stations, too) will be built.
- So, for the construction of the sensitive components (especially bridges), soils/subsoil/grounds of category III (loose deposits - see tables 5.15 and 5.16 above) were considerate in the design. In addition to the soil category, the water table level has been taken into consideration, too.
- The soil/subsoil category and the water table were taken into consideration also for the construction of the open line (through the selection of the appropriate raw material for the ballast, sub-ballast and subgrade), in order to avoid any eventual subsidence. Furthermore, two layers of geotextile will be applied within the sections where the railway line runs over loose Quaternary deposits of lacustrine origin.

As a conclusion, the bridges are designed with more severe antiseismic norms than those suggested for soil/subsoil of category II (firm rock conditions).

6.2.7. Groundwater

Relevant baseline information

The railway line runs over six aquifers that are important for drinking water supply, as follows:

- Tirana-Ishmi Quaternary gravel aquifer, which has national importance for the water supply of the local population and further on;

- Mati Quaternary gravel aquifer, which has national importance for the water supply of the local population and further on. Mati River Aquifer is split into Fushe Kuqe Aquifer (located in the south of Mati River) and Lezhë Aquifer (located in the north of the river);
- Lower Shkoder Quaternary gravel aquifer, which has local importance for the water supply of the local population;
- Upper Shkoder Quaternary gravel aquifer that has national importance, because of the high number of the population supplied with drinking water;
- Koplik Quaternary Aquifer, which is important at a local level for the drinking water supply; and
- The karst aquifer of Malësia e Madhe, from where waters drain to the Shkoder Lake This aquifer serves to supply drinking water to the local population.

Besides, the northern part of the railway line runs partly close to the Shkoder Lake, which has the status of a Nature Managed Reserve.

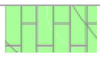
The likely impacts on the groundwater are based on the baseline information (groundwater and aquifers used for drinking water purposes) and the location of the Project's components (railway lines, bridges, etc.).

The table below shows a short analysis of the relevance of the expected impacts on the ground waters, from Vorë to Hani Hotit.

Table 6-120_Water-bearing formations and their relevance to the Project

No	Geographic location	Symbol	Name and characteristics of the water-bearing formation	Relevance to the project
1	Vorë	Qh	Holocene age; Unconsolidated rocks; Clays, silts, sand; Formation practically without water bearing and permeability.	-Not relevant; Formation practically without water-bearing and permeability
2	Vorë		Consolidated rocks: Claystone, sandstone, conglomerates; Low water-bearing and permeability	-Not relevant; Low water-bearing and permeability
3	Budull - Bubq	Qp-h	Palaeocene - Holocene age deposits; Unconsolidated rocks; Clays, silts, sand; Formation practically without water-bearing and permeability.	-Not relevant; -Formation practically without water-bearing and permeability
4	Bubq-Mamurras		Unconsolidated rocks; sand, gravel, clays; -High to medium porosity &permeability; Tirana-Ishem Quaternary Gravel Aquifer	-Not relevant; -Impermeable cover deposits are thick
5	Mamurras to North of Lac	Qp-h	Palaeocene - Holocene age deposits; Unconsolidated rocks; Clays, silts, sand; Formation practically without water-bearing and permeability.	-Not relevant; -Formation practically without water-bearing and permeability.
6	North of Lac – Mati River		Unconsolidated rocks; sand, gravel, clays; -High to medium porosity & permeability; -Fushe Kuqe Quaternary Gravel Aquifer	-Little relevance; -Impermeable cover deposits are relatively thick; -No bridges are planned within this section; -No water well is located close to the railway line
7	Mati		Unconsolidated rocks; sand and gravel; -High to medium porosity &	-Relevant;

No	Geographic location	Symbol	Name and characteristics of the water-bearing formation	Relevance to the project
	Riverbed		permeability	-Mati Riverbed constitute a recharge area; -Relevant to any eventual pollution of groundwater from surface water and soil pollution, which in turn could pollute the groundwater; -Sensitive location: Mati River Bridge
8	Mati River-Lezhë		-Lezhë Quaternary Gravel Aquifer; -High to medium porosity and permeability	-Little relevance; -Impermeable cover deposits are relatively thick; -No bridges are planned within this section; -No water well is located close to the railway line
9	Lezhë tunnel		Karst aquifer; Low to medium to high porosity and permeability; Carbonate Aquifer of Rrenci	-Not relevant; -The ground waters drain in Lezhë's Drini River; -The groundwater of the karst aquifer is not used for drinking purpose
10	Lezhë - Rrabosht e	Qp-h	Palaeocene - Holocene age deposits; Unconsolidated rocks; Clays, silts, sand; Formation practically without water-bearing and permeability.	-Not relevant; -Formation practically without water-bearing and permeability
11	Rrabosht e -North of Hajmel		Unconsolidated rocks; clays, sand, gravel; Medium to low water-bearing and permeability; (Zadrima Aquifer)	-Not relevant; -Low water-bearing alongside the railway line; -Groundwater quality is not good; -Groundwater is not used for drinking purpose
12	North of Hajmel - Shkoder (Kiri River)		Unconsolidated rocks; sand, gravel, clays; -High to medium porosity & permeability; -Lower Shkoder Quaternary Gravel Aquifer	-Little relevance; -Local relevance from the use of groundwater for drinking purpose; -The water-bearing layers used for extracting drinking water are 29m depth; -The ground waters drain into Drini River; -Sensitive locations: Drini and Kiri Bridges, and the planned new underpass at Spathari.
13	Shkoder		Unconsolidated rocks; sand, gravel, clays; High to medium porosity & permeability; -Upper Shkoder Quaternary Gravel Aquifer	-Relevant; -The cover deposits are almost permeable; -Relevant to any eventual pollution of groundwater from wastewater and soil pollution, which in turn could pollute the groundwater; -Shkoder is supplied in drinking water from the wells drilled in Dobrac area; -Sensitive location: Northeast of Shkoder
14	Dober Village	Qp-h	Palaeocene - Holocene age deposits; Unconsolidated rocks; Clays, silts, sand; Formation practically without water-bearing and permeability.	-Not relevant; -Formation practically without water-bearing and permeability.
15	North Dober-Aliaj		Unconsolidated rocks; sand, gravel, clays; High to medium porosity & permeability; -Upper Shkoder Quaternary Gravel	-Relevant to any eventual pollution of groundwater from surface water and soil pollution, which in turn could pollute the Shkoder Lake's water;

No	Geographic location	Symbol	Name and characteristics of the water-bearing formation	Relevance to the project
			Aquifer (Koplik Aquifer)	-Sensitive location: Perroi Thate Bridge
16	Aliaj-Hani Hotit		Karst aquifer; Low to medium to high porosity and permeability; -Carbonate Aquifer of Albanian Alps	-Relevant to any eventual pollution of groundwater from surface water and soil pollution, which in turn could pollute the Shkoder Lake's water; -Relevant to any eventual pollution of groundwater from surface water and soil pollution, which in turn could affect the water quality of the karst springs (Syri Sheganit), which in turn could pollute the Shkoder Lake's water; -Sensitive location: Bajze station

From the table above results that the ground waters relevant to the proposed project can be classified into three groups, as follows:

- Group 1: Not relevant to potential groundwater pollution.

No significant impact on ground waters is expected. However, mitigation strategies and impacts related to wastewater and soil should be undertaken;

- Group 2: Little relevance to significant potential groundwater pollution.

No significant impact on ground waters is expected. However, mitigation strategies and impacts related to surface water, wastewater, and soil should be undertaken. The sensitivity of the groundwater can be evaluated as low.

- Group 3: Relevant to significant potential groundwater pollution.

No significant impact on ground waters is expected. However, mitigation strategies and impacts related to surface water, wastewater, and soil should be undertaken. The sensitivity of the groundwater can be evaluated as moderate to high, in the function of the use of the ground waters.

6.2.7.1. Design, preconstruction, and construction stages

Potential impacts on groundwater

The potential impacts on the groundwater associated with different preconstruction and construction activities (demolition of bridges and culverts, construction of substructure, service roads, work camps, stations, bridges and culverts, drainage system, protection works against erosion, fencing, underpasses, Lezhë's tunnel, etc.), include:

- Pollution risk from paints, grease, fuel and oil spillage, wastewater, etc.; and
- Risk of adverse impact to groundwater used for drinking purposes

The distances of the water wells or group of wells drilled within the above-mentioned aquifers from the railway line are provided in the section on the baseline information of groundwater, as well as in Appendix 6.2 of this document (see Appendix 6.2 in the separate document on appendices).

From the above table it results that the characterization of the railway line sections that are sensitive concerning groundwater quality is as follows:

- Low sensitivity areas:
  - North of Laç – Mati River (km 53 to km 55):
  - Mati River – Lezhë (km 56 to km 67):
  - North of Hajmel – Kiri River (km 90 to km 103):
- Moderate sensitivity areas:
  - Kiri River - Northeast of Shkoder (km 103 to km 107):
  - Northeast of Shkoder – Dobër (km 108 to km 120):
  - North of Dobër - Aliaj: (km 122 to km 130):
  - Aliaj – Hani Hotit: (km 130 to km 140):
- High sensitivity areas:
  - Mati Riverbed: (km 55 to km 56):
  - Northeast of Shkoder: (km 107 to km 108):

Hereinafter follows a short analysis of the likely adverse impacts on ground waters for each of the above-mentioned sensitive sections of the railway line.

- Low sensitivity areas

The likely impacts on ground waters are evaluated as follows:

  - *Km 53+000 to km 55+000:* Potential impacts from construction activities on the quality of the Fushe Kuqe Aquifer, which supplies drinking water Durrës city and several small-inhabited areas. The impermeable cover layer from km 53+000 to km 55+000 decreases from south to north. However, no in-depth earthworks (bridges, underpasses) are planned within this section and therefore no significant potential adverse impacts on groundwater quality and the regime are expected.
  - *Km 56+000 to km 67+000:* Potential impacts from construction activities on the quality of the Lezhë Aquifer, which supplies drinking water Lezhë city and several villages of the area. The cover layer is sufficiently thick, but not enough impermeable. However, no in-depth earthworks (bridges, underpasses) are planned within this section and the distance of the railway line from the nearest water wells (water wells of Barbullojë) is at least 300m. This distance is bigger than the sanitary protection zone/belt[281], as defined by the Albanian Law[282], which is in full compliance with the EU Water Framework Directive[283]. Therefore, no significant potential adverse impact on groundwater quality and the regime are expected.
  - *Km 90+000 to km 103+000:* Potential impacts from construction activities on the quality of the Lower Shkoder Aquifer, which supplies drinking water to some of the villages of the area. The in-depth earthworks (Drini and Kiri bridges; and Spathari underpass) that are planned within this section may affect the quality

281 DCM 379/2016

282 Law 111/2012 “On the integrated management of the water sources”

283 https://ec.europa.eu/environment/water/water-framework/index_en.html

of the groundwater. The water-bearing layers are located approximately at 30m depth and therefore the impermeable clayey cover layers are sufficiently thick to not allow the pollution of the water-bearing zones. Therefore, no significant potential adverse impacts are expected on groundwater quality and regime.

- Moderate sensitivity areas

The likely impacts on groundwater are evaluated as follows:

- o *Km 103+000 to km 107+000:* This section runs alongside the Kiri Riverbed. The railway line runs over the Upper Shkoder Quaternary Gravel Aquifer, in which water-bearing layers are overlaid mostly by a permeable cover layer. The pollution of the soil and the surface waters may affect the quality of the groundwater. However, the groundwater within this section drain mostly in Kiri Riverbed, and therefore no significant impacts are expected on the quality of the water wells that supply drinking water Shkoder city. The distance of the railway line from the water wells is roughly 3.2 km. Besides, Shkoder station is located close to Kiri River. Nevertheless, the rehabilitation works of this station are not expected to affect the water wells, as no in-depth works are planned to be performed.
- o *Km 108+000 to km 120+000 and km 122+000 to km 130+000:* These sections runs roughly from 1.3 to 4km from the Shkoder Lake. The railway line runs over the Upper Shkoder Quaternary Gravel Aquifer, in which water-bearing layers are overlaid mostly by a permeable cover layer. The ground waters drain into Shkoder Lake. The pollution of the soil and the surface waters may affect the quality of the ground waters, which in turn may pollute the Lake's water.
- o *Km 130+000 to km 140+000:* This section runs over the karst Aquifer of Malësia e Madhe. The pollution of the soil and the surface waters may affect the quality of the ground waters, which in turn drain into the Shkoder Lake and therefore the quality of the Lake's waters could be affected. Besides, there are some karst springs close to the lake. The ground waters raise to the surface in the form of vauclusian springs that have natural values. Also, some of these springs (e.g. Syri Sheganit Spring – 1000l/sec) discharge into the Shkoder Lake. Two other ones, namely Hurdhana 1 and 2, flow underground to Syri Sheganit Spring. The distance of Syri Sheganit from the railway line is 1.85 km, while that of Hurdhana 1 and 2 is roughly 1.5km. As there are no planned in-depth earthworks (bridges and underpasses) within this section, it is not expected any significant impact on groundwater' quality and regime.

- High sensitivity areas

These areas are of high sensitivity because of the high number of people that are supplied in drinking water and the high permeability of the cover layers. The likely impacts on groundwater are evaluated as follows:

- o *Km 55+000 to km 56+000:* Crossing of Mati Riverbed, which, at this location, constitutes a recharge area, where the river's water penetrates down into the Quaternary deposits and feeds the groundwater. The pollution of the soil and surface waters at this location could affect the quality of the groundwater. Mati River water at this place feeds the Quaternary gravel aquifer of Fushe Kuqe, where are located the wells that supply in drinking water Durrës city and some small, inhabited areas. In total, about 200,000 people are supplied with drinking water from Fushe Kuqe Aquifer. Although the wells of Fushe Kuqe are located more than 7 km from the railway bridge, it is suggested to undertake the due strategies and mitigation measures to avoid the pollution of the groundwater from the Project's implementation.

- *Km 107+000 to km 108+000:* This railway line section runs on the northeast of Shkoder city, over the Upper Shkoder Quaternary Gravel Aquifer, which water-bearing layers are overlaid mostly by an almost impermeable cover layer composed of sub-clays, clays and sub sands. The pollution of the soil and the surface waters may affect the quality of the ground waters. The Quaternary Gravel Aquifer supplies drinking water Shkoder city and its neighbourhoods. The water wells are located in the area of Dobraç, which is located roughly 3km from the railway line. In total, about 150,000 people are supplied with drinking water from these wells. No bridge and/or underpass is planned within this section, thus no in-depth dredging works are planned. However, it is suggested to undertake the due strategies and mitigation measures to avoid the pollution of the groundwater from the Project's implementation.

Proposed mitigation measures

In general, good construction practice for the reduction of potential impacts of discharges into the soil and the surface waters, during the demolition of the existing bridges and culverts and construction of the proposed railway line components is required. They include mitigation measures related to the protection from erosion and sedimentation, from wastewater, and solid and hazardous waste, including:

- Regular maintenance of all machinery to prevent engine oil and fuel leaks;
- Provision of equipment for the evacuation of leakages;
- Keep vehicles and machinery as far as practicable from watercourses and Shkoder Lake;
- Work camps to be located at the appropriate distance from surface waters. All the Work Camps will be established within the existing Railway Stations, where there is free space and the needed infrastructure (electricity, water supply & sewerage, impermeable places in concrete, etc.), without disturbing inhabited areas, water resources, and areas of high biodiversity values. The nearest station to the watercourses is Shkoder station, which is located 100m from Kiri Riverbed. While the nearest station to Shkoder Lake is the Bajze one, which is located 2.7 km from the Lake and 600m from the nearest parcel covered of shrubs dominated by the Oriental hornbeam;
- Avoid the pollution of surface water from waste generated from work camps' activities, including wastewater, food, plastic, etc.;
- Work camps to be located outside the areas that can be affected by flooding;
- Use the existing local roads' network and avoid the opening of any new access road to avoid soil erosion and run-off sediments to surface waters (Shkoder Lake and rivers and streams);
- Stockpiling out of the construction sites will be prohibited and areas close to water bodies will be avoided;
- Wherever possible, minimize work on soft ground in wet weather;
- Avoid wastewater discharge directly to surface waters (rivers and stream) or ground waters (permeable cover layers);

- Avoid wastewater discharge on the ground within the rivers and streambeds during the construction of bridges and culverts;
- Avoid wastewater discharge on the ground, especially from Bajze to Hani Hotit (km 132 to km 140) because of the high permeability of the limestone formations.

Additional mitigation measures related to the sensitive areas: The crossing of high sensitivity areas [km 55 +000 to km 56+000 (crossing of Mati Riverbed); and km 107+000 to km 108+000 (crossing of Northeast of Shkoder city)] and moderate sensitivity areas [km 103+000 to km 107+000 (the railway runs parallel and close to Kiri Riverbed); km 108+000 to km 120+000 and km 122+000 to km 130+000 (the railway runs over a cover layer composed of almost permeable gravelly-sandy deposits; the groundwater is not used for supplying drinking water to urban areas; the groundwater drain to Shkoder Lake, which water quality could be affected); km 130+000 to km 140+000 (the railway line runs over the karst Aquifer of Malësia e Madhe. The pollution of the soil and the surface waters may affect the quality of the groundwater, which in turn drain into the Shkoder Lake and therefore the quality of the Lake's waters could be affected.

A set of general mitigation measures includes:

- No oil deposits or oil changing service facilities for transport and working engines will be located close the railway line alongside these sections. Whether necessary, special impermeable places should be prepared for oil changing and supplying in fuel the working engines. The transport trucks will change oil and will be supplied in fuel in the existing formal stations. As the railway line runs across urban, semi urban and rural areas where there are sufficiently fuel stations, there is no need for such an additional station;
- No repairing or washing service facilities for transport and working machinery will be located close the railway line across these sensitive areas. All these services will be carried out in the designated formal facilities.
- The Environmental and Social Managing Plan (ESMP – separate document) includes the main lines of a Pollution Prevention and Response Plan (see section 2.3.3.16 of the ESMP), which will be prepared in detail by the Construction and Operation Companies;
- The ESMP includes also the main lines of an Emergency Response Plan (see section 2.3.3.20 of the ESMP), which will be further developed in detail by the Construction and Operation Companies

A short analyse on the specific mitigation measures taken into account during the Project design and other measures to be taken during the preconstruction and construction activities include:

- **The section from km 55+000 to km 56+000** (crossing of Mati Riverbed – high sensitive section): A new bridge will be built joint to the existing one, which will be maintained. The construction works at the riverbed include the installation of piers, construction of abutments and rehabilitation of the existing protection works (in gabions) against erosion; the ground water turbidity may increase because of the dredging works and other construction activities. As the water wells fed by Mati River water are located seven kilometres from the Mati Bridge, there is no possibility the water extracted by these wells to be affected by suspended solids because of the self epuration of the ground water while traversing this distance through gravelly and sandy deposits; The groundwater may be polluted from waste water and/or from any accidental leakage of fuel and/or oil by the transport trucks and the working machinery. The associated mitigation measures that are described hereinabove (see the general mitigation measures above), relate to the pollution of surface water, soil and ground water from waste water and hazardous waste (fuel, oil, etc.); Therefore, the pollution of the groundwater at the crossing of Mati Riverbed can be avoided/reduced to insignificant. However, it is suggested the installation of the piers, the construction of the abutments and the construction/installation of the gabions to be performed in dry period when the Mati River discharge is small.

- **The section from km 103+000 to km 107+000** (medium sensitive section) runs across an urbanized area alongside the Kiri Riverbed. This section includes the Shkoder railway station. The man-made environment includes the railway station, houses, roads and industrial and service facilities. The closest distance of the railway line from the Shkoder city water wells is 3.2 kilometres. No surface waters cross this section; a pedestrian underpass is planned by the Project's design at the Shkoder station. The depth of the dredging works will reach 4-5 metres at maximum. The impermeable cover layer composed of silty-clayey deposits will not be affected; the groundwater may be polluted from waste water and/or from any accidental leakage of fuel and/or oil by the transport trucks and the working machinery. The associated mitigation measures described hereinabove (see the general mitigation measures above), relate to the pollution of soil and ground water from waste water and hazardous waste (fuel, oil, etc.); Therefore, the pollution of the groundwater at this section can be avoided/reduced to insignificant. Anyway, it is suggested the dredging works to be performed in dry period when the water table is deep. In addition, it is suggested the pedestrian underpass to be impermeable to prevent any penetration of shallow groundwater during heavy rainfalls when the Kiri River discharge is maximal.
- **The section from km 107+000 to km 108+000** (high sensitive section) runs in open line across a semi-urban area. The railway line crosses a semi-urban area, which man-made environment includes houses, roads and industrial and service facilities. The closest distance of the railway line from the Shkoder city water wells is three kilometres. No surface waters cross this section; No underpasses or bridges have been planned by the Project's design at this section. Therefore, there are not planned dredging works in depth that may affect the ground water quality; the impermeable cover layer composed of silty-clayey deposits will not be affected. The groundwater may be polluted from wastewater and/or from any accidental leakage of fuel and/or oil by the transport trucks and the working machinery. The associated mitigation measures described hereinabove (see the general mitigation measures above), relate to the pollution of soil and ground water from waste water and hazardous waste (fuel, oil, etc.); Therefore, the pollution of the groundwater at this section can be avoided/reduced to insignificant.
- **The sections from km 108+000 to km 120+000 and km 122+000 to km 130+000** (medium sensitive section): These sections runs roughly from 1.3 to 4.0 km from the Shkoder Lake. The railway line runs over the Upper Shkoder Quaternary Gravel Aquifer, in which water-bearing layers are overlaid mostly by a permeable cover layer composed of unpolished gravels and other smaller-size clastic sediments. The groundwater drain into Shkoder Lake. Because of the permeability of the Quaternary geological formations the groundwater flow into Shkoder Lake at the bottom of the Quaternary layer; within this section will be built the new bridges of Vraka, Rrjolli, Banushi and Perroi Thate Streams, which are dry during almost the year. They have water only during heavy rainfalls. Because the railway body is high, the culverts generally do not lie under the land surface, excepting any small streambed; The groundwater is of local importance and therefore no important urban centre is supplied in drinking water; The pollution of the soil and the surface waters may affect the quality of the groundwater, which in turn

may pollute the Lake's water; The increased turbidity of the groundwater can be avoided by performing the construction works [piers, abutments and protections works against erosion (gabions)] during the dry period of the year. Anyway, due to the railway distance from the Lake, it is not expected the turbidity to reach the Shkoder Lake; the groundwater may be polluted from wastewater and/or from any accidental leakage of fuel and/or oil by the transport trucks and the working machinery. The associated mitigation measures described hereinabove (see the general mitigation measures above), relate to the pollution of soil and ground water from wastewater and hazardous waste (fuel, oil, etc.). Therefore, it not expected any significant impact neither on Shkoder Lake water, nor on the groundwater.

- **The section from km 130+000 to km 140+000 (medium sensitivity section):** This section runs over the karst Aquifer of Malësia e Madhe. The groundwater is of local importance and therefore neither important urban centre, nor any village is supplied in drinking water from this aquifer. Near the Lakeshore, there are some vauclusian karst springs, which discharge into the Shkoder Lake. The closest of them is located 1.5 km from the railway line; As there are no planned in-depth earthworks (bridges and underpasses) within this section, it is not expected any significant impact on groundwater regime. Due to the height of the railway line body (2-3m) the rehabilitation of the existing culverts and the construction of any new ones do not require deep dredging works; The pollution of the soil and the surface waters may affect the quality of the groundwater, which in turn drains into the Shkoder Lake and therefore the quality of the Lake's waters could be affected. The soil, and surface and groundwater may be polluted from wastewater and/or from any accidental leakage of fuel and/or oil by the transport trucks and the working machinery. The associated mitigation measures described hereinabove (see the general mitigation measures above), relate to the pollution of soil and ground water from wastewater and hazardous waste (fuel, oil, etc.). The groundwater may be polluted from waste water and/or from any accidental leakage of fuel and/or oil by the transport trucks and the working machinery. Therefore, it not expected any impact neither on the groundwater, nor on Shkoder Lake water; The section 6.2.8.1 below provides additional information concerning the mitigation measures for avoiding the pollution of the of the Shkoder Lake from km 139+000 to km 140+000.

Findings

If the due mitigation measures are taken, the likely adverse impacts on ground waters can be evaluated of low probability and magnitude and local extent. They can be reduced to insignificant if appropriate mitigation measures are undertaken.

Conclusion: The likely adverse impacts on the groundwater are evaluated of low probability and magnitude. They can be reduced to insignificant if appropriate mitigation measures are undertaken.

6.2.7.2. Operation and maintenance

No significant impacts are expected during the operation stage. The only expected impacts that could occur is any accidental leakage of oil from the locomotives. The mitigation measures related to such types of waste (oil, grease, paints, etc.) include:

- No repairing area for locomotive and wagons, etc., will be located neither close to the sensitive groundwater areas, nor close to surface waters or in their vicinity;

- The new railway signalling system, superstructure, substructure infrastructure and secured level crossings will avoid any eventual incident resulting in the soil and surface and groundwater pollution;
- The ESMP includes the main lines of a Pollution Prevention and Response Plan (see section 2.3.3.16 of the ESMP), which will be prepared in detail by the Construction and Operation Companies;
- The ESMP includes also the main lines of an Emergency Response Plan (see section 2.3.3.20 of the ESMP), which will be further developed in detail by the Construction and Operation Companies

The electrification of the railway line will avoid the oil leakage.

Conclusion: No adverse impacts on groundwater are expected during operation if the required maintenance standards are applied.

6.1.1 Surface waters

The crossed rivers are Ishmi, Droja, Mati, Lezhë's Drini, Drini, and Kiri. The main streams are the Vraka, Rrjolli, Banushi and Perroi Thate ones. All these streams are dry the most of the year.

6.2.7.3. Relevant baseline information

All the crossed rivers (Ishmi, Droja, Mati, Lezhe's Drini, Drini and Kiri) flow to the Adriatic Sea;

Section 5.2.10.2 (see paragraph on stream/river habitat (running water)) of the baseline information outlines the existing situation at the crossing of the main rivers and streams and include photos of each of them. Hereinafter follows a short outline:

- **Ishmi River crossing:** Bridge 210m long; two abutments and 9 piers; in dry season the flow occupies only one bridge' span; poor riparian vegetation of low biodiversity values; the lowland both sides of the river crossing is inundated during heavy rainfalls; the riverbed is composed mostly of small diameter size deposits (sand and silt).
- **Droja River crossing:** Bridge 70m long; two abutments and three piers; in dry season the flow occupies only one bridge' span; no riparian vegetation at the riverbed; poor and low biodiversity value of the vegetation at the riverbanks; no inundation is recorded both sides of the river crossing; the riverbed is composed mostly of small diameter size deposits (gravel, sand and silt); 50 m downstream the bridge it is built a concrete bank to protect the riverbed and riverbanks from vertical erosion.

  The existing bridge will be demolished and a new one will be built in the same location. The new bridge will have one pier and two abutments. The riverbanks will be protected from erosion with gabion-mattress.
- **Mati River crossing:** Bridge 800m long; Two abutments and 33 piers; in dry season the flow occupies 1-2 bridge' spans; very poor and rare riparian vegetation; no inundation is recorded both sides of the river crossing; the riverbed is composed of gravel and sand. Mati River has a wide bed. Nowadays the river water flows mainly on the right side of the riverbed, occupying only 2-3 spans of the bridge, while in dry period the flow occupies only one span.
- **Lezhe's Drini River crossing 1:** Bridge 140m long; two abutments and seven piers; in dry season the flow occupies 1-2 bridge' spans; No inundation is recorded both sides of the river crossings. No riparian vegetation; the bridge in located within the urbanized territory of Lezhe town.

- **Lezhe's Drini River crossing 2:** Bridge 90m long; two abutments and two piers; in dry season the flow occupies 1-2 bridge' spans; No inundation is recorded both sides of the river crossings. No riparian vegetation at the riverbed; Poor riparian vegetation of low biodiversity values at the riverbanks; The Bridge in located within the northern neighborhood of the urbanized territory of Lezhe town.
- **Drini River crossing:** Bridge 360m long; Two abutments and 14 piers; the flow occupies almost all the bridge's spans because of a concrete check dam under the bridge; No inundation is recorded both sides of the river crossings; Total lack of riparian vegetation; this bridge is not included in the scope of the proposed project.
- **Kiri River crossing:** Bridge 145m long; Two abutments and seven piers; the flow occupies one bridge's spans in dry period; No inundation is recorded both sides of the river crossings. No riparian vegetation; the riverbed is composed of gravel and sand.
- **Vraka, Rrjolli, Banushi and Perroi Thate Streams crossings:** Bridges 120, 70 and 70 m long respectively; No inundation is recorded both sides of the streams crossings; Total lack of riparian vegetation; the streambeds are composed of almost angular gravel deposits; the streams are dry most of the year. They have water only during heavy rainfalls periods; there is no riparian vegetation within these streambeds.

Appendix 6.2 (see Appendices associated to the ESIA report – separate document) shows the bridges and/or the crossed rivers and streams.

- No surface water body that serves for drinking water supply purposes is present within the fingerprint of the Project area.

Planned interventions at the crossing of each watercourse:

Mati, Kiri and Drini Bridges are the only ones that will be relocated, because they serve for both the railway and the road. The new bridges will be built downstream, parallel and close to the existing ones, which will not be demolished.

- Ishmi River crossing: The existing Ishmi Bridge will be demolished and a new one will be built in the same location. The new bridge will have nine piers and two abutments. The riverbanks will be protected from erosion with gabion-mattress.
- Droja River crossing: The existing bridge will be demolished and a new one will be built in the same location. The new bridge will have one pier and two abutments. The riverbanks will be protected from erosion with gabion-mattress.

Mati, Kiri and Drini Bridges are the only ones that will be relocated, because they serve for both the railway and the road. The new bridges will be built downstream, parallel and close to the existing ones, which will not be demolished;

- Mati River has a wide bed (roughly one km) at the crossing of the railway line. The new bridge will have 32 piers and two abutments. Side slopes and the area around pile cups will be protected from erosion with gabion mattress. Nowadays the water is flowing mainly on the right side (occupying 3 spans of bridge);

  The existing bridge, which serves for both the road and the railway, will not be demolished. A new bridge will be built close (7-8m) and parallel to the existing one. It will have 32 piers and two abutments. Side slopes and the area around the pile-cups will be protected from erosion with gabion-mattress.

- Lezhe 1 Bridge that crosses the Drin of Lezhe will be demolished and a new one will be built in the same location. It will four two piers and two abutments. Side slopes will be lined with R/C concrete that will be supported by vertical retaining walls. The riverbed will remain in natural conditions.

- Lezhe 2 Bridge that crosses the Drin of Lezhe will be demolished and a new one will be built in the same location. It will three two piers and two abutments. Side slopes will be supported by vertical retaining walls. The riverbed will remain in natural conditions.
- Drini Bridges (Spathari Bridges) will not be demolished. They serve for both the road and the rail. The new bridges will be built downstream, parallel and close to the existing ones. The side slopes will be protected from erosion with gabion mattress.
- Kiri Bridge will not be demolished. It serves for both the road and the rail. The new bridge will be built downstream, parallel and close to the existing ones. It will have seven piers and two abutments. The existing gabion mattresses that protect the side slopes from erosion will be maintained.
- The existing bridges at Vraka, Rrjolli, Banushi and Perroi Thate Streams, which flow to the Shkoder Lake, will be demolished and new ones will be built in the same location. There is no need for protection works against erosion on these streams, which are dry most of the year;
- All the new bridges are designed to safely convey the liquid discharge with return period 1 in 100 years. That is why they all will be raised to increase their conveyance capacity and therefore to avoid them to serve as obstacles that cause inundation of the lowland. The increase of the conveyance capacity will also reduce the speed of the flow that will reduce the erosion of the rivers banks.

6.2.7.4. Design, preconstruction and construction stages

6.2.7.4.1. Hydrological regime

Rivers and streams have seasonally variable patterns in their flows of water, sediment and nutrients, often termed a “**hydrological regime**”. Hydrological alterations can cause a range of pressures, including: changes to the quantity, quality, velocity and temperature of water flows, changes to channel and bed erosion and deposition processes, intermittent or temporary river flows, flash floods, and alterations in water availability to riparian and floodplain environments adjacent to water bodies284. The potential impacts on the surface waters have been described under the concept of the hydrological regime.

Impacts and mitigation:

The demolition of bridges and culverts, the activity of transport trucks and working machinery, the construction of abutments, the installation of piers and the construction / rehabilitation of the works for protecting the rivers/streams banks from erosion, may affect the surface waters hydrology and channel morphology, the surface waters quality and the aquatic ecology.

Table below summarizes the impacts and mitigation measures related to the surface waters within the project area.

Table 6-121_Impacts and mitigation related to the hydrological regime

Potential impact	Mitigation measures
Environmental receptor: surface water hydrology and channel morphology	
Change in flow velocity,	The construction/installation of the abutments and piers, the protection of the

284 http://fis.freshwatertools.eu/index.php/infolib/pressures/hydrological-alterations.html

Potential impact	Mitigation measures
increased erosion and subsequent changes in rivers/stream banks stability and increased flood risk, increased sedimentation downstream the bridges.	side slopes, and the diversion of the rivers/streams flows will be performed during the dry season when all the rivers and streams have a little water. The diversion channel to be located within the river/stream bed; Wherever possible, avoiding the opening of narrow diversion channel to avoid changes to flow velocity. That is possible wherever the riverbeds are enough wide (Ishmi, Mati and Kiri Rivers);
	The new bridges of Ishmi and Droja Rivers will be elevated to increase their conveyance capacity. Consequently, the flow velocity under the bridges, in case of maximum discharge during operation stage, will not be increased. As a result, the bridges will not serve as obstacles that cause inundation of the lowland and erosion of the riverbed and riverbanks (e.g. Ishmi and Droja Rivers Bridges);
	The installation/rehabilitation of gabion mattresses will avoid the erosion of the rivers banks and subsequently the change to riverbed morphology (e.g. Ishmi, Droja, Mati, Kiri Rivers Bridges);
	As all the streams flowing to Shkoder Lake are dry most of the year, the demolition of the existing bridges and the construction of the new ones will be performed when the streams are dry and therefore there is no need for any diverting stream flow for Vraka, Rrjolli, Banushi and Perroi Thate Streams.
	No need for slopes protection at the crossing of Vraka, Rrjolli, Banushi and Perroi Thate Streams.
	The rivers of Ishmi, Mati and Kiri have wide riverbeds and therefore they are not impacted whether the construction works are performed in dry period when the flow occupies only a small part of the riverbed.
	The piers, abutments and the protection of the side slopes will be installed during the dry season when all the rivers have a little water. That will avoid/ reduce the potential change to hydrological regime of the rivers.
	The protection works against erosion of the streams/rivers banks at the crossing of the railway line already exists (e.g. Ishmi, Droja, Mati, Drini and Kiri Riverbeds. The Project aims at the reinforcing of the protection works in the close vicinity of the bridges. Otherwise, the erosion will affect the riverbanks, the bridges' shoulders, the railway body both sides of the bridges and the roads and other infrastructure.
	The protection works against erosion at the riverbeds close to the bridges will be as ecological as possible. That is why the Consultant will mostly apply gabions, which are much more environmentally acceptable than the stonewalls or the concrete. Besides, the protection works in gabions attenuate the speed of the water current and therefore attenuate the potential erosion of the rivers' banks. The installation of the gabions will only cause temporary increase of suspended sediments, which cannot be avoided. Otherwise, the amount of the suspended solid will increase from the erosion of the rivers/streams banks every time there are heavy rainfalls and the rivers/streams discharge is maximal.
	Avoid the vegetation clearing upstream and downstream of the location of the side slopes protection works. Whether this vegetation is affected, reinstall it immediately once the construction works are performed.
	The culverts will be prepared far away from the Project area and then transported and installed. Therefore, the pollution of the watercourses from the construction of the culverts will be avoided or reduced to insignificant.
	The only expected significant impact on surface waters is the improvement of

Potential impact	Mitigation measures
	the drainage system. As the Project's design has taken into account the increase of the number and the size of the culverts, the water circulation in the drainage system will increase. Thus, it is expected that the drainage system to work normally, avoiding/reducing thus the inundation of the lowland on both sides of the railway line (e.g. km 32 to km 35 and km 69 to km 74).
	Avoid the deepening and widening of the streams/channels beds upstream or downstream during the installation of the culverts.
	Avoid the transport trucks to cross the watercourses
	Revegetate all disturbed areas with native species. Apply seed and mulch in phases throughout construction. This will help stabilize the disturbed areas upon completion of the project.
	Temporarily stabilize disturbed areas, including areas where permanent seeding operations are not feasible due to seasonal constraints (e.g., summer months), and use best practice to prevent erosion.
	Use erosion control blankets or other suitable methods on steep and newly seeded slopes to control erosion and to promote the establishment of vegetation. Use erosion control blankets with natural fibers and bio-photodegradable mesh.
Environmental receptor: Surface water quality	
Pollution from suspended sediments, construction materials and from transport and working machinery leaks of fuel and oil.	The earthworks, temporary flow diversion and other construction activities will be performed during the dry season when all the rivers and streams have a little water or have no water (streams from Shkoder to Hani i Hotit)
	Use erosion logs, silt fence, diversion ditches, temporary berms, sediment traps, temporary detention ponds, and other sediment control devices to divert, control, and filter sediment-impacted water in order to protect the surface water quality
	The preconstruction and construction activities could affect the quality of Shkoder Lake waters, too. That can occur almost in the section from km 139+000 to km 140+000 where the distance of the railway line from the waterline of the Lake varies from 40 to 70m. A motorway runs between the Lakeshore and the railway line. There is a drainage channel paved in concrete between the motorway and the railway. This channel collect the surface waters and do not allow them to flow from the railway line towards the motorway and the Lake. The Projects has already taken into consideration to clean and rehabilitate this channel prior the construction works. Consequently, no water will flow from the railway to the motorway and the Lake; A sediment fence will be installed between the railway and the drainage channel to not allow the sediments to affect this channel. Therefore, the drainage channel will not be filled and blocked by sediments, which will not flow towards the Lake. As a result, there is no expected any pollution of the Lake's water from suspended sediments; similarly, this drainage channel avoid the pollution of the Lake's water from any accidental pollution from oil spillage by construction machinery and transport trucks. However, the Project design has planned to use as access road an existing local road located between the mountain foot and the railway line. Therefore, the transport and construction machinery will not use the motorway as an access road; No transport or working engine repairing, washing or oil changing facilities will be located close the railway line within this section; As this section runs through hard limestone, no erosion phenomenon is expected to be caused by the preconstruction and construction works; Furthermore, as no underpasses or bridges construction or rehabilitation works

Potential impact	Mitigation measures
	are planned within this section the solid waste (excluding the material removed from the railway - filling material, slippers and metallic elements) will be minimal and will be collected and transported at the collection point of the closest village (Hoti Village).
	Work camps will be located at the train stations, and therefore in an appropriate distance from surface waters. All the Work Camps will be established within the existing Railway Stations, where there is free space and the needed infrastructure (electricity, water supply & sewerage, impermeable places in concrete, etc.), without disturbing inhabited areas, water resources, and areas of high biodiversity values. The nearest station to the watercourses is Shkoder station, which is located 100m from Kiri Riverbed. While the nearest station to Shkoder Lake is the Bajze one, which is located 2.7 km from the Lake.
	Avoid the transport trucks to cross the watercourses
	Work camps to be located outside the areas that can be affected by flooding. All the Work Camps will be established within the existing Railway Stations, which are not affected by floods.
	Minimize as much as practicable the vegetation clearing to avoid soil erosion and therefore the increase of turbidity in the closest surface waters.
	Use the existing local roads and avoid the opening of any new access road to avoid soil erosion and run-off sediments to surface waters (Shkoder Lake and rivers and streams).
	Stockpiling out of the construction sites will be prohibited and areas close to water bodies will be avoided.
	Wherever possible, minimize work on soft ground in wet weather
	Compact as soon as practicable the railway body filling material to prevent the run-off to surface waters
	Measures to prevent the run-off of sediment from the working areas to surface waters (rivers and streams and Shkoder Lake)
	Avoid water discharge directly to surface waters (rivers and stream) or groundwater
	Avoid water discharge on the ground within the rivers and streambeds during the construction of bridges and culverts
	Avoid water discharge on the ground, especially from Bajze to Hani Hotit (km 132+500 to km 140) because of the high permeability of the limestone formations.
	Regular maintenance of all machinery to prevent engine oil and fuel leaks
	Provision of equipment for the evacuation of leakages;
	Keep vehicles and machinery as far as practicable from the shoreline of Shkoder Lake
	No oil deposits for transport and working engines will be located close the railway line and the watercourses.
	Oil interceptors or drip trays are used in vehicle parking areas, and are inspected and cleaned regularly
	No repairing, washing or oil changing service facilities for transport and working machinery will be located close the watercourses. All these services will be carried out in the designated formal facilities.

Potential impact	Mitigation measures
	Minimize the working area on the rivers and stream beds
	Use erosion logs, silt fence, diversion ditches, temporary berms, sediment traps, temporary detention ponds, and other sediment control devices to divert, control, and filter sediment-impacted water in order to protect surface water.
	Use best management practices and containment structures for work conducted within and adjacent to the floodplain and the crossed watercourses to prevent the water pollution from the concrete washout and other potential pollutants.
	In case of any equipment malfunctions, any release that may affect the waters quality must be reported. Measures of containment will be followed in accordance with the spill prevention and response plan. An outline of this plan is included in the ESMP, while a detailed plan will be prepared by the Contractor as part of the management plans that will be included in the bidding process.
Environmental receptor: Aquatic ecology	
Negative impact on flora and fauna from increased turbidity, increased sedimentation downstream, dredging works, rivers/streams beds and banks erosion and pollution from oil and fuel leaks, waste and construction materials (cement, etc.); Potential barrier to fish circulation in the rivers, etc.	The construction works within the rivers/stream beds, and the diversion of the water flows will be performed during the dry season when all the rivers and streams have a little water.
	Avoid the transport trucks to cross the watercourses.
	Wherever possible, the diversion channel to be an open channel located within the river/stream bed in order to allow the fish circulation on both upstream and downstream the bridge; Avoid the water diversion through pipes to avoid any increase of flow speed and therefore the erosion increase downstream the pipe. That is possible wherever the riverbeds are enough wide (Ishmi, Mati and Kiri Rivers); some of the new bridges (Ishmi, Droja, Lezhe's Drini 2 Bridges) will be elevated to increase their conveyance capacity. Consequently, the flow velocity under the bridges during operation stage will not be increased.
	Avoid erosion and changes to river/stream morphology. The installation of gabion mattresses will avoid the erosion of the rivers banks and subsequently the change to riverbed morphology (e.g. Ishmi, Droja, Mati, Kiri Rivers Bridges and Vraka, Rrjolli, Banushi and Perroi Thate Streams Bridges); As the streams flowing to Shkoder Lake are dry most of the year, the abutments and the installation of piers within their streambeds will be performed when the streams are dry and therefore there is no need for any diversion channel (Vraka, Rrjolli, Banushi and Perroi Thate Streams).
	The piers, abutments and the protection of the side slopes will be installed during the dry season when all the rivers have a little water. That will avoid/ reduce the potential change to aquatic ecology.
	As the streams that flow to Shkoder Lake are dry most of the year, the piers and abutments will be installed when the streams are dry and therefore it is not expected any change to their hydrological regime (Vraka, Rrjolli, Banushi and Perroi Thate Streams).
	No repairing, washing or oil changing service facilities for transport and working machinery will be located close the watercourses. These services will be done at the licensed placed and the work camps.
	Apply all the measures necessary to avoid the surface water pollution (see above the mitigation measures related to the protection of the surface water quality).
	Revegetate all disturbed areas with native species, or appropriate landscaping

Potential impact	Mitigation measures
	as required. Apply seed and mulch in phases throughout construction. This will help stabilize the disturbed areas upon completion of the project.
	Protect riparian areas during construction activities through placement of temporary and/or construction-limit fencing
	Limit disturbed areas as much as possible to minimize the impacts to water quality and vegetation.
	The culverts should be inserted below an existing stream/channel bed level to allow for bed formation within the culvert. Consequently, the culvert may incorporate a low flow channel within its base to retain sufficient water depth for aquatic life.

If the due mitigation measures are taken, the likely adverse impacts on surface waters can be evaluated of low probability and magnitude and local extent. They can be reduced to insignificant if appropriate mitigation measures are undertaken.

Conclusion: The likely adverse impacts on the surface waters are evaluated of low probability and magnitude. They can be reduced to insignificant if appropriate mitigation measures are undertaken.

6.2.8.1 Operation and maintenance

No significant impacts are expected during the operation stage. The following mitigation measures are foreseen:

- No railway station, repairing area for locomotive and wagons, etc., will be located close to the surface waters or in its vicinity;
- The new railway signalling system, superstructure, substructure infrastructure and secured level crossings will avoid any eventual incident resulting in the soil and surface and groundwater pollution;
- The ESMP includes the main lines of a Pollution Prevention and Response Plan (see section 2.3.3.16 of the ESMP), which will be prepared in detail by the Construction and Operation Companies;
- The ESMP includes also the main lines of an Emergency Response Plan (see section 2.3.3.20 of the ESMP), which will be further developed in detail by the Construction and Operation Companies;
- Both the Pollution Prevention and Response Plan and the Emergency Response Plan will be part of the tasks of the Contractor. The preparation of these plans will be included in the bidding process.

The only expected impacts that could occur is any accidental leakage of oil from the locomotives. Mitigation measures are related to such types of waste (oil, grease, paints, etc.). The electrification of the railway line will completely avoid such a pollution.

Conclusion: It is not expected any adverse impact on surface waters during operation if the required maintenance standards are applied.

The crossed rivers are Ishmi, Droja, Mati, Lezhë's Drini, Drini, and Kiri. The main streams are the Vraka, Rrjolli, Banushi and Perroi Thate ones. All these streams are dry the most of the year.

6.2.7.4.2. General mitigation measures

Proposed mitigation measures: A set of general measures of good construction practice for the reduction of potential impacts of discharges into the soil and the surface waters, during the demolition of the existing bridges and culverts and construction of the proposed railway line components, is required. They include mitigation measures related to the protection from erosion and sedimentation, from wastewater, and solid and hazardous waste, including:

- Regular maintenance of all machinery to prevent engine oil and fuel leaks;
- Provision of equipment for the evacuation of leakages;
- Keep vehicles and machinery as far as practicable from Shkoder Lake;
- Work camps will be located at the train stations, and therefore in an appropriate distance from surface waters. All the Work Camps will be established within the existing Railway Stations, where there is free space and the needed infrastructure (electricity, water supply & sewerage, impermeable places in concrete, etc.), without disturbing inhabited areas, water resources, and areas of high biodiversity values. The nearest station to the watercourses is Shkoder station, which is located 100m from Kiri Riverbed. While the nearest station to Shkoder Lake is the Bajze one, which is located 2.7 km from the Lake;
- Avoid the pollution of surface water from waste generated from works camps activities, including wastewater, food, plastic, etc.;
- Work camps to be located outside the areas that can be affected by flooding. All the Work Camps will be established within the existing Railway Stations, which are not affected by floods;
- Minimize as much as practicable the vegetation clearing to avoid soil erosion and therefore the increase of turbidity in the closest surface waters;
- Use the existing local roads and avoid the opening of any new access road to avoid soil erosion and run-off sediments to surface waters (Shkoder Lake and rivers and streams);
- Stockpiling out of the construction sites will be prohibited and areas close to water bodies will be avoided;
- Wherever possible, minimize work on soft ground in wet weather;
- Compact as soon as practicable the railway body filling material to prevent the run-off to surface waters;
- Measures to prevent the run-off of sediment from the working areas to surface waters (rivers and streams and Shkoder Lake);
- Avoid water discharge directly to surface waters (rivers and stream) or ground waters;
- Avoid water discharge on the ground within the rivers and streambeds during the construction of bridges and culverts;
- Avoid water discharge on the ground, especially from Bajze to Hani Hotit (km 132+500 to km 140) because of the high permeability of the limestone formations.
- No oil deposits for transport and working engines will be located close the railway line and the watercourses;
- No repairing, washing or oil changing service facilities for transport and working machinery will be located close the watercourses. All these services will be carried out in the designated formal facilities.

If the due mitigation measures are taken, the likely adverse impacts on surface waters can be evaluated of low probability and magnitude and local extent. They can be reduced to insignificant if appropriate mitigation measures are undertaken.

Conclusion: The likely adverse impacts on the surface waters are evaluated of low probability and magnitude. They can be reduced to insignificant if appropriate mitigation measures are undertaken.

6.2.7.4.3. General mitigation measures – Shkoder Lake waters

The Railway line runs close to the lakeshore of the Shkoder Lake from km 139 to km 140. In the other sections, the distance of the line from the Lake varies from 0.5 to 5.0 km. Whereas the minimal distance of the line from the core zones of the NMR of Shkoder Lake is roughly 2.5 km.

Potential impacts:

The potential impacts include the surface water quality that in turn may affect the aquatic biodiversity of Shkoder Lake.

Suspended sediments, construction materials and any accidental leak of fuel or oil from the transport and working machinery may pollute the Lake's water. The pollution of the Lake may occur through transportation of pollution through surface waters during rainfalls.

Mitigation measures:

Hereinafter are described the suggested mitigation measures concerning any eventual Lake's water pollution from the hazardous waste (any eventual fuel and oils leakage from working and transport machinery).

The work camps will be installed in the existing railway stations, where there is the necessary infrastructure for the following:

- Sewage;
- Electricity;
- Water supply; and
- Waste

In addition, within the railway stations there are impermeable areas (paved in concrete or asphalt) where the needed fuel containers and oil cans for the working machinery can be stored.

Figure 6-178_Left: Asphalted area within the Bajze station

There are two railway stations within or near the NMR of Shkoder Lake

- Koplik station, located at km 123+400 through arable land; and
- Bajze station, located at km 131+800 through arable lands

Koplik and Bajze stations are located 3.0 and 2.7 km from the Lakeshore, respectively. Therefore, the nearest distance of the railway line from the Lake is from km 139 to km 140, where the line runs from 40 to 70m from the Lakeshore.

The nearest station to the section from km 139 to km 140, is Bajze station.

The change of oil, fuel supply, washing or other maintenance services to transport trucks will be performed in the existing facilities of the licensed companies in Shkoder and Malesia Madhe Municipalities.

Any accidental fuel or oil leakage will be collected and transported regularly at the nearest collection facility in compliance with the DCM 765 /2012 " On the rules on the differentiated collection and treatment of the used oils", the EU Waste Framework Directive 2008/98, and the EBRD PR3. The Waste framework Directive requires acting appropriately to:

- treat waste oils in accordance with the waste hierarchy to protect human health and the environment;
- ensure waste oils are collected separately;
- ensure that waste oils with different characteristics are not mixed, and that waste oils are not mixed with other kinds of waste or substances that would impede their treatment

The EBRD PR3 (Resource Efficiency and Pollution Prevention and Control) provides for the Safe Use and Management of Hazardous Substances and Materials through applying "appropriate risk management measures in order to minimise or control the release of such substances/materials into air, water and/or land resulting from their production, transportation, handling, storage, use and disposal relating to project activities".

The ESMP includes the main lines of the following topic-specific management plans:

- Waste management Plan; and
- Pollution Prevention and Response Plan

The objectives of the waste management plan include the storage and transfer of the hazardous waste to appropriate facilities, in coordination with the responsible local/national institutions, and in compliance with the EU, national, EBRD, and best practice regulations.

The Pollution Prevention Plan (PPP) will take into account all the relevant national regulations and EBRD requirements related to the pollution prevention. Concerning the hazardous the materials that include fuels, oils, greases, etc., the PPP provides measures for good material handling practices.

Both the Waste Management Plan and the Pollution Prevention and Response Plan will be prepared in details by the Constructor and will be taken into account in the bidding process

Hereinafter are described the suggested mitigation measures concerning any eventual Lake's water pollution from the wastewater that can be generated during the construction stage.

There are two drainage channels on both sides of the railway line from km 139 to km 140. Both these channels are paved in concrete and discharge to a streambed in the territory of Hot Village.

Figure 6-179_Railway from km 139 to 140; Left: Drainage channel on the left; Right: Drainage channel on the right

No bridge, culvert, underpass, or overpass is planned in this section. The ground is hard limestone and therefore no dredging works are planned within this section. As mentioned above, no work camp is located close to this section.

The specific measures concerning any eventual pollution of the Lake's water from the wastewater include:

- No water charged of sediments will flow to the Lake because of the above-mentioned drainage channels are impermeable. The drainage channel located between the mountain slope and the railway will be cleaned and, if necessary, repaired before the construction works.
- No concrete or mortar will be prepared near the railway line. Concrete or mortar will be used only for the rehabilitation of the retaining wall once the construction works are performed.
- Sediments barriers will be installed between the railway belt and the motorway.

Other general measures are described above in the section on the running waters.

Conclusion: It is not expected any adverse impact on surface waters during operation if the required maintenance standards are applied.

6.2.8. Flooding

6.2.8.1. Relevant baseline information

In general, the watercourses it crosses do not flood the railway line Vorë-Hani Hotit. None of the major railway bridges has ever been threatened to date by the water levels of these watercourses.

The base of the railway is elevated at least 2-3 m from the ground. The culverts and small bridges have guaranteed the stability of the railway line.

The most sensitive area concerning flooding is section Vorë-Gjorm. However, the lowland crossed by Ishmi, Droja, and Gjola Rivers, is drained and often, during intensive rains, flooding occurs in the fields, but they do not endanger the railroad itself. It is understood that the lack of maintenance of the drainage system of agricultural fields could in some cases create a potential risk to the railway. The river that often creates flooding in this area is the Ishmi River, which is formed by the two main tributaries, Gjola and the Zeza Rivers. The flooding of the lowland starts at the confluence of Gjola and Zeza rivers. However, the railway line is never inundated.

According to the baseline information (see section 5.2.9 above), some agricultural areas on both sides of the railway line are often inundated during exceptional flood events. In term of railway line length, these sections are as follows:

- *Km 32+000 to km 35+000:* The railway is not inundated but the land on both parts of the railway is inundated by Ishmi River. The railway serves as an embankment (section from km 32+000 to km 35+000), which does not allow the water to spread on the lowland. Thus, the lands on the east of the railroad stay for a long time inundated, causing thus damage to the agricultural land and plants. It should be underlined that the railway line in the section from km 32+000 to km 35+000 is enough high (almost 3.0m) and therefore the railway line is never inundated, even in the most pessimistic scenario projected by 2100;
- *Km 69+800 to km 80+000:* This railway line section is flooded by both Lezhë's Drini River and Fangu drainage Channel. The flood may overflow the railway and inundate the area on both parts of the railway. Besides, the railway line plays the role of an embankment that does not allow the water circulation between both sides of the railway line;
- *Km 100 +000 to km 102+000:* The railway is not inundated but the land on both parts of the railway is inundated by Kiri River. Besides, the railway line serves as an embankment, which does not allow the water to spread on the lowland, causing damage to the agricultural land agricultural plants. This happens only during exceptional flood events (e.g. flood of 2010 – see Figure 5-118). According to the representatives of Shkoder and Vau Dejës Municipalities,[285] the inundation does not last for a long time and the depth of the water is low and therefore there is no risk for the railway line.

Other causes that influence the inundation of the agricultural land include:

- Sedimentation deposits in almost all the box culverts and ditches, particularly at the plain area of the railway line.
- Streambeds have not been cleaned recently, so trash and flora prevent water flow at most of the stream passages along the line.
- Some of the culvert openings are full of railway ballast and therefore they do not function appropriately.

6.2.8.2. Design, preconstruction and construction stages

Sources of impacts and potential impacts: Construction works performed in the period of heavy rainfalls may cause an inundation of the land on both parts of the railway line within the section where the railway line runs in low terrains crossed by rivers. That occurs because of the temporary demolition of the existing culverts and drainage channels and the blockage of the drainage system because of earthworks. Impacts are more pronounced within the railway line sections mentioned above (km 32+000 to 35+000, km 69+000 to 74+000, and from km 100+000 to km 102+000). The inundation of the agricultural land will damage the agricultural plants.

Proposed mitigation measures: A set of general measures of good design and construction practices are foreseen by the Consultant, as follows:

- ***Preconstruction and construction:*** The general measures of good construction practice for the reduction of potential impacts of any eventual inundation during the demolition

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of the existing culverts and construction of the new ones and the increase of the vertical railway line alignment include the following:

- Work camps to be located at the appropriate distance from the areas likely to be affected by inundation;
- Schedule earthworks and culverts' demolition works in the dry period;
- Schedule construction works in the sections likely to be affected by inundation (e.g. km 32 to 35 and km 70 to 80) in dry and short periods;
- Schedule construction works of the railway line in parallel with the improvement of the drainage channels.

- ***Design phase:*** In general, the Project's design has taken into account the increase of the conveyance capacity for all the new bridges and culverts, as well as the increase in number and size of the new culverts to reduce the extent and duration of the inundation of the agricultural lands. Taking into account those railway line sections that are sensitive to the inundation phenomenon, specific mitigations measures have been already considered by the Project's design, as follows.
  - *Km 32+000 to km 35+000:* The design has already taken into consideration the vertical alignment increase of the railway line in the section from km 30+000 to km 42+000. The railway line height in this section will be increased up to 70cm. Three new culverts (3x2m) have been added by the Project's design at km 32+920, 33+475, and 33+920. Besides, the dimensions of the existing culvert at km 34+515 are increased to help drain faster the agricultural land during and after the flood. The design has taken into consideration the increase in the conveyance capacity of the planned new Ishmi and Droja Bridges (located at km 35+100 and 41+780 respectively) to avoid the spread of the water upstream of this bridge in case of exceptional river discharge.
  - *Km 69+500 to km 74+000:* The design has already taken into consideration the vertical alignment increase of the railway line in the section from km 72+000 to 84+500. The railway line height in this section will be increased up to 80cm. The higher increase (80 cm) is planned at km 74+800. All the box culverts will be over-dimensioned. Two additional box culverts are designed at km 73+658 and km 74+076. In total, nine-box culverts are designed from km 73+ 460 to km 78+616. In parallel with the railway line elevation and the increase of the number and size of the box culverts, the design has considered the improvement of the drainage channels at both sides of the railway line to reduce the extent and duration of the inundation of the agricultural lands in case of any flash floods;
  - *Km 100+000 to km 102+000:* The design has already taken into consideration the improvement of the drainage system within this section to reduce the extent and duration of the inundation of the agricultural lands.

Conclusion:

Design: The above-mentioned mitigation measures are already taken into consideration in the Project's design. Consequently, the expected adverse effects of the project on the flooding can be evaluated on low probability and magnitude and of local extent. On the contrary, it is expected an enhancement compared to the existing situation.

Preconstruction and construction: If the above-mentioned mitigation measures are taken into consideration, the likely adverse effects on flooding can be evaluated on low probability and magnitude and of local extent.

6.2.8.3. Operation and maintenance

No adverse effects of the Project on flooding during the operation phase are expected. The design has already taken into consideration all the mitigation measures to avoid the eventual impacts of the Project's components on the flooding phenomenon. Therefore, is expected an enhancement compared to the existing situation.

The only mitigation measures to be undertaken are related to the maintenance of the drainage system (drainage channels and culverts) and the cleaning of any eventual vegetation under the bridges.

6.2.9. Biological and ecological resources

From km 20+780 to km 132+600 the railway line crosses agricultural lands and rural and urban inhabited areas and therefore the biodiversity values of the crossed areas are limited due to the heavy anthropogenic intervention and the homogeneity of the agricultural habitats.

The river and stream beds crossings at km 20+780 to km 132+600 are of limited biodiversity value as a result of the water pollution (e.g. Ishmi River), the extraction of gravel and sand (e.g. Mati River), the continuous presence of human activity, the construction of HPP barrages (e.g. Drini River) or the protection works against erosion (Kiri riverbed).

From km 132+600 to km 137+750, the railway line crosses an area covered with degraded forest formations dominated by a mix of deciduous oak species (Italian oak *Quercus fraineto*) and shrubs (Oriental Hornbeam *Carpinus orientalis*). The shrubby and forested area is often degraded and split by agricultural plots. The biodiversity values of this habitat are generally limited to moderate.

From km 137+750 to km 139+000, the railway line traverses an urban settlement with rather limited biodiversity values due to the presence of industrial objects on the left and inhabited areas on the right of the railway line.

From km 139+000 to km 140+000, the railway line runs in between a mountain foot and the shoreline of Shkoder Lake. The mountain foot is covered by sparsely and degraded Mediterranean maquis composed by Kermes oak *Quercus coccifera* and Pomegranate *Punica granatum*. The biodiversity values of this habitat are generally limited to moderate.

6.2.9.1. 6.2.10.1 Design, preconstruction, and construction stages

6.2.9.1.1. General

The impact on the biological environment during the preconstruction and construction period of the railway line is reflected in a permanent and temporary loss of limited surfaces of predominantly agricultural habitats except for sections where the railway crosses through degraded riparian habitats (Ishmi riverbed) or semi-natural habitats in km 132+600 to km 137+750 (shrubs and mixed deciduous oak forests) and Mediterranean maquis from km 139 to km 140. The latter km goes very close to the shoreline of Shkoder Lake where a motorway separates the lake and the railway.

The working strip clearance, the construction of temporary access roads, the construction of stations, other earthworks and transport of materials, noise and vibrations generated from construction activities, etc., constitute the main sources of impacts on the biodiversity in the project area. Working camps, to be located within the existing railway stations, were not considered as having an impact during the construction phase.

Potential impacts: The main adverse potential impacts on the ecological resources and biodiversity during the construction phase include:

- Degradation of certain plant communities and removal of vegetation;
- Degradation of some animal communities by reducing habitats areas as a result of the working strip on both sides of the railway line (reduction of habitats);
- Fragmentation of habitats due to the railway fencing
- Wildlife disturbance and/or (temporary) migration caused by noise, and the presence of humans and mechanization;
- Disruption of reproductive activities (birds, mammals, etc.) due to disturbance and noise during preconstruction and construction activities;
- Habitats pollution from dust and emission of polluting substances;
- Pollution of habitats from wastewater and solid and hazardous waste generated during the construction activities;
- Risk of fire in vicinity to construction sites;
- Potential erosion processes on inclined habitats (mountainous and hilly slopes) leading to the degradation of conditions needed to support biodiversity.

The permanent loss is related to the construction of new freight Lezhë 2 station and the new service and connectivity roads. The increase of the line radius do not affect any area of valuable biodiversity value. Lezhë 2 station site is located on arable land with rather limited values in terms of biodiversity (absence of endemic, rare or endangered species, protected area, etc.). Consequently, it is not expected any significant impact on the biodiversity from the construction activities of this station.

The planned service and connectivity roads will be located within the existing local roads, arable lands and the railway line belt. No service and connectivity roads fall within the railway line belt in the line sections crossing the shrubby and forested areas. The expected impacts across the shrubby and forest area will be caused by the vegetation clearing within the working strip.

The main expected potential impacts on the biological environment from the preconstruction and construction activities are described below.

6.2.9.1.2. Impacts on Natural Habitats

The railway goes mostly through agricultural land. Nevertheless, in some parts, the railway crosses through some natural habitats presented in the form of rivers and riparian vegetation as well as deciduous forests or Mediterranean maquis alongside the railway.

6.2.9.1.3. Riparian Habitats

From km 35 to km 35 +200, the railway crosses through riparian forest of Annex I Habitat *92A0 Salix alba* and *Populus alba* galleries*.*

The riparian habitats play a key role in the purification of the water. Through their roots, aquatic plants can absorb polluting inorganic materials such as phosphates and nitrates and fertilizers used in agriculture. Roots from these plants preserve the riverbanks from erosion caused by flowing water. As well, the variety of vegetation gives refuge and sustenance to many species of animals, insects, birds, reptiles, and amphibians.

The railway line traverses the main rivers of Ishmi, Mati, Lezhë's Drini, Drini, and Kiri. Each of these rivers is crossed once, except for Lezhë's Drini, which is crossed twice within the territory of Lezhë town. As mentioned in section 5.2.8.3 of the baseline information, Ishmi River is one of the more polluted rivers in Albania while there is no more riparian forest in the crossings of Mati, Drini, and Kiri riverbeds. Mati riverbed at the crossing of the railway line is used for extracting gravel and sand. At the crossing of Drini River is build the Ashta hydropower plant. Embankments against erosion have been built on both sides of Kiri River. As a result, the river habitats are heavily affected by the above anthropogenic interventions.

Between Shkoder and Hani Hotit the railway line crosses the streams of Vraka, Rrjolli, Banushi, and Perroi Thate. At the railway line crossing these streams run over permeable deposits, composed mainly of big size particles diameter. The quality of the land is poor that is reflected in a poor vegetation cover. During the dry period of the year, these streams have a reduced water discharge or are completely dry. All these natural conditions added to the human intervention have led to a lack of riparian areas at the crossing of these streambeds.

The table below summarizes the existing situation of the riparian habitats at the crossing of the main watercourses, as well as the planned interventions.

Table 6-122_The situation of the riparian habitats at the crossings of the main watercourses

No	River name	Intervention	Exiting situation
1	Ishmi	New bridge	Degraded riparian habitat of 92A0 *Salix alba* and *Populus alba* galleries (see Figure 6-180). High BOD value (see Figure 5-101).
2	Droja	New Bridge	No riparian habitat; Polluted river's water (see Figure 5-121). The existing bridge will be demolished and a new one will be built in the same location.
3	Mati	New bridge	Insignificant presence of riparian vegetation (see Figure 5-122) because of the gravel and sand extraction); However, it is not expected the riparian habitats to be affected because no new bridge will be built. A new railway bridge will be built parallel and joint to the existing one.
4	Drin in Lezhe	2 new bridges	No riparian habitat (see Figure 5-123). The river's water is polluted and therefore the BOD value is high (see Figure 5-88). The existing bridges will be demolished and a new ones will be built in the same locations.
5	Drini	No new bridge	No riparian habitat because of an HPP barrage joint to the bridge; Concrete protection works against erosion is built on both sides of the riverbed (see Figure 5-124).

No	River name	Intervention	Exiting situation
6	Kiri	New bridge	No riparian habitat because of the gravel and sand extraction and of protection works against erosion on both sides of the riverbed (Figure 5-124). A new railway bridge will be built parallel and joint to the existing one.
7	Vraka	New bridge	No riparian habitat (see Figure 5-132). The stream bed is dry during the main part of the year. The existing bridge will be demolished and a new one will be built in the same location.
8	Rrjolli Stream	New bridge	No riparian habitat (see Figure 5-132). The stream bed is dry during the main part of the year. The existing bridge will be demolished and a new one will be built in the same location.
9	Banushi Stream	New bridge	No riparian habitat (see Figure 5-133). The stream bed is dry during the main part of the year. The existing bridge will be demolished and a new one will be built in the same location.
10	Perroi Thate Stream	New bridge	No riparian habitat (see Figure 5-133). The stream bed is dry during the main part of the year. The existing bridge will be demolished and a new one will be built in the same location.

Based on the above, the most interesting riparian vegetation crossed by the railway line is the Ishmi Riverbed. *From km 35 to km 35 +100,* the railway at Ishmi Riverbed goes through degraded riparian forest of Annex I Habitat *92A0 Salix alba* and *Populus alba* galleries.

No other Annex I habitats are crossed during construction and operation activities. Since a railway bridge will be constructed at Ishmi river, it is recommended that the amount of habitat being lost due to construction to be compensated through plantation or supported forest growth in parts not covered by the riparian forest.

Figure 6-180_The crossing of Ishmi Riverbed

Potential Impacts: The riverbanks and riverbed riparian vegetation will be affected by the construction of the bridges. The construction works will temporarily affect the physical and chemical properties of river water, downstream from the working area. Firstly, digging and similar construction works will affect the sediment and affect the physical properties of water (mudding). The impact will be reduced downstream from the construction work area and it will not cause a significan along the whole length of the watercourse. The mudding of water flow might locally affect some freshwater species and their distribution. Since the construction work period is short, the impact is acceptable in case of the application of the environmental protection measures. Accidental release of chemicals and fuel during the construction work can deteriorate habitat quality.

Proposed mitigation measures: Reducing the working area will reduce the impact on the riparian habitats; The construction works on watercourses should be conducted during the periods of low water level (works during dry season); The duration of any necessary flow diversion should be minimized as much as possible; With the application of environmental management plan during the construction period (i.e. usual environmental protection precautionary measures for the construction sites, appropriate waste and soil management, use of approved equipment, etc.) any eventual accident will be significantly reduced.

Finally, it is recommended that the amount of habitat being lost due to construction to be rehabilitated once the bridges are built. In addition, to enhance the existing situation, after the compensated through plantation or supported forest growth within the parts of the rivers or streambeds that are not directly affected by the construction activities. The rehabilitation of the riparian vegetation and the enhancement of the forests in other parts of the riverbeds or river valleys will be performed under the supervision of the Regional Agency for Protected Areas. Details on the areas that will be rehabilitated and on those where the riparian forest will be enhanced will be described in the Biodiversity Action Plan (BAP). The main lines of BAP are already provided in the ESMP. The Contractor will prepare a detailed BAP, which will be part of the tendering process.

Conclusion: The likely impacts on the riparian habitats are evaluated as probable, of low magnitude, and local extent. They are limited only to the crossing of Ishmi River, which has already poor riparian habitats. These effects can be mitigated by undertaking appropriate mitigation measures.

6.2.10.1.2.2 Deciduous forests and scrubs

From km 132+500 to km 137+750, the railway line runs across an area covered mostly by degraded forest formations dominated by a mix of deciduous oak species (*Quercus fraineto*) and shrubs of Hornbeam (*Carpinus orientalis*) and Jerusalem thorn (*Paliurus spina-christi*). Small plots of agricultural land and pastures split the degraded forest and shrubby formations. The terrain is karstic.

Planned interventions

No new service and connectivity road or bridge and culvert will be built in the railway line section crossing shrubs and forest areas. The only intervention that will affect the shrubs and forest is the vegetation clearing for the working strip within the railway line belt. The motorway Shkoder – Hani Hotit and the local roads serve as access roads.

From km 132+280 to km 135+700, the vegetation on the left side of the railway line belt is already cleaned because of the recent construction works for a water supply pipeline.

Figure 6-181_Vegetation cleared in the working strip on the left of the railway line (km 132+600 to km 135+200)

Table below summarizes the existing land use and the planned service and connectivity roads from the starting of the NMR of Shkoder Lake (km 113+300) to the end of the Project (km 140+000).

Table 6-123_Land use and the planned service and connectivity roads from km 113 to km 140

Start-End	Left or right	Length	Planned road type	Current land use		Service road and railway belt
Km		m		Comment	Section	
114+040 to 117+966	L	3926	Non paved; 4 m wide	Local road at the railway belt	114+040 to 114+200	The improved service road falls in the railway belt
				Arable land	114+200 to 115+260	The required service road falls in the railway line belt
				Local road at the railway belt	115+260 to 115+550	The improved service road falls in the railway belt
				Arable land	115+550 to 115+780	The required service road falls in the railway line belt
				Local road at the railway belt	115+780 to 115+880	The improved service road falls in the railway belt
				Arable land	115+880 to 116+850	The required service road falls in the railway line belt
				Local road	116+850 to 116+990	The improved service road falls in the railway belt
				Arable land	116+990 to 117+190	The required service road falls

Start-End	Left or right	Length	Planned road type	Current land use		Service road and railway belt
						in the railway line belt
				Local road	117+190 to 117+310	The improved service road falls in the railway belt
				Arable land	117+310 to 117+996	The required service road falls in the railway line belt
120+200 to 120+550	L	350	Non paved; 4 m wide	Arable land		The required service road falls in the railway line belt
123+424 to 123+454	L	30	Non paved; 4 m wide	Local road	Existing non paved road through agricultural area	The improved service road is located 10m from the railway line
131+820 to 132+272	L	370	Non paved; 4 m wide	Local road	Existing non paved road through agricultural area	The improved service road is located 80 to 100m from the railway line
119+522 to 120+202	R	680	Non paved; 4 m wide	Local road	119+522 to 119+760=238	The improved service road falls in the railway belt
				Arable land	119+760 to 120+202=442	The required service road falls in the railway line belt
130+522 to 131+173	R	631	Non paved; 4 m wide	Arable land	130+522 to 130+800=278	The required service road falls in the railway line belt
				Pastures	130+800 to 130+930=**130 m**	
				Shrubs and forest	130+930 to 131+010=**80 m**	
				Local road	131+010 to 131+173=163 Existing non paved road through pastures	The improved service road falls in the railway belt
135+120 to 135+210	R	**148**	Non paved; 4 m wide	Pastures	Houses both parts of the railway line	The required service road falls in the railway line belt
137+764 to 138+542	R	778	Non paved; 4 m wide	Arable land	137+764 to 137+930	The required service road falls in the railway line belt
				Shrubs and forest	137+930 to 138+030=**100 m**	
				Arable land	138+030 to 138+300	
				Shrubs and forest	138+300 to 138+540=**240 m**	

The new service and connectivity roads that cross deciduous oak forest and shrubs, and pastures are as follows:

From km 113 to km 140, all the new service and connectivity roads that cross deciduous oak forest and shrubs, fall within the railway line belt. The total length of these roads is 80 + 100 + 240 = 420 m. Their permanent land surface requirement is circa 0.21 ha (420 m x 5 m wide).

- The total length of the planned new service roads across pastures that falls within the railway belt is 130 + 148 = 278 m. While the total permanent land surface is 248 m x 5 m (width) = 1,240 m^2 = 0.124 ha.

Meanwhile the total length of the working strip that falls within the railway line belt across deciduous oak forest, shrubs and pastures is as follows:

- Approximately 2,050 m on the left side of the railway line; and
- Approximately 2,900 m on the right side of the railway line.

Therefore, the total length of the working strip across forest, shrubs and pastures is approximately 4,950 m. The minimal width of this strip is 4 m. Therefore, the total land surface occupied by the working strip across natural habitats is 4,950 x 4.0 = 19,800 m^2 = 19.8 ha.

Potential impacts**:** Within the railway line section across the forest and shrubs, the following likely significant impacts were recognized: vegetation clearing, temporary habitat loss, migration of animal populations due to disturbance, introduction of invasive species, etc. The main impacts on the local ecosystems occur during the construction period.

The main source of impacts during the construction stage is the working strip through shrubs and degraded forest. The main adverse impact on shrubs and forests is the loss of biomass (economic value).

The working strip may reduce the following degraded forest and shrub habitats:

- Degraded forest formations dominated by a mix of deciduous oak species (km 132+500 to km 137+750); and

In the working strip area, all vegetation will be removed and the terrain will be flattened. That will affect the change and degradation of habitats.

Total area to be lost permanently or temporarily as a consequence of the project

Permanent habitat loss in Nature Managed Reserve of Lake Shkoder

New service roads will be constructed only in and around the Nature Managed Reserve of Lake Shkoder. As a result, habitat loss during the construction and operation of the service roads will be permanent.

The total length of the service roads is circa 5.4 km. The majority of it, circa 4.7 km falls in arable land, i.e. in non-natural habitats. The rest, circa 0.7 km falls in natural habitats composed of deciduous oak forest. From this length, only 358 m fall within the Nature Managed Reserve. Therefore, the permanent habitat loss in the Nature Managed Reserve is 0.14 ha (360 m x 4 m = 1,440 m^2 or 0.14 ha). Meanwhile, the permanent loss outside the protected area would be 0.14 ha (345 m x 4 m = 1,380 m^2 or circa 0.14 ha).

Temporary habitat loss in Nature Managed Reserve of Lake Shkoder

A working strip called the railway belt and situated on both sides of the railway line, will be used during construction and operation activities. This surface will be rehabilitated after the construction works.

No natural vegetation is found from Vore to Bajze station as the railway line runs across agricultural land and urbanised areas. Therefore, there will be no natural habitat loss in this section of the railway because of the activities in the working strip.

The project is expected to affect the natural habitats extending from Bajze until Hani I Hotit. Thus, from km 132 to km 140 or circa 8 km of railway.

Meanwhile, the railway belt on the left of the railway line from km 132+280 to km 135+700 has been recently cleaned from vegetation because of the installation of a water pipeline. The remaining part of left railway belt (from km 113+700 to km 132+280) falls in arable land. Thus, it is not expected any vegetation clearing within the left side of whole railway line crossing the NMR of Shkoder Lake.

Total length of the working strip that will be temporarily affected from construction activities is about 5000 m. It is composed of 2,900 m of shrubs and oak trees on the right and 2,050 m on the left. Considering that the working strip is 4 m wide, the total surface of the working strip is 20.000 m^2 (5000 m length x 4 m wide) or **2.0 hectares**

Animal species will lose parts of their habitat; most of them will move to other parts of similar habitats that will not be affected by the construction of the railway line.

As the railway already exists since 1985, it is not expected any further habitat fragmentation.

The disturbance of habitats of animals during the construction period will take place within a narrow strip of land. The mechanical impact on the vegetative cover will result in the partial or complete destruction of vegetation within the working strip and therefore the development of negative exogenous processes may occur.

Other impacts related to animal disturbance, noise, dust, traffic, and increased incidents of animal killing are temporary and considered to be of minor consideration.

Proposed mitigation measures: Avoid or minimize as much as possible the working strip and the vegetation clearing; Avoid/minimize the eventual construction of new access road through using as much as possible the existing motorway and rural roads; Whether possible, avoid the working strip both sides of the railway line, to reduce damages only to one side. In this case, the working strip should be selected on the side where the vegetation is less developed.

After the completion of works, the natural habitats and arable land shall be restored to their original state. It is expected that after finalization of the construction works the forested and shrubby area will be restored. The period of vegetation and habitat recovery will depend on the micro-sitting of the soil type and habitat type, respectively. Authoctonous species should be selected for vegetation restoration. The areas to be recovered will be fenced and the vegetation recovery will be regularly monitored.

Offset measures are foreseen for deciduous forest along the railway line within the Nature Managed Reserve of Lake Shkoder.

A Biodiversity Action Plan (BAP) and a Biodiversity Offset Strategy (BOS) are outlined in the ESMP. They are included also in ESAP. Both BAP and BOS will be further detailed by the Contractor as part of the bidding procedure. BAP and BOS shall have the EBRD approval before implementation.

Conclusion: The likely impacts on the degraded forest and shrub area are evaluated as probable, of low magnitude, and local extent. They can be mitigated by taking the appropriate mitigation measures.

6.2.10.1.2.3 Mediterranean maquis

*From km 139+000 to km 140, the railway line runs between a motorway and a mountain foot, which is covered with rare Mediterranean maquis. The motorway runs joint and parallel to the railway line (*see Figure 6-183below*).*

Baseline information: The motorway runs joint and parallel to the railway line (see the figure below). A retaining wall separates the left side of the railway belt from the motorway.

The railway belt on the right side is situated between a mountain foot and the railway line. The Mediterranean maquis is found in a steep mountain terrain on the right. The terrain is composed of hard limestone formations. There is no Maquis vegetation within the railway belt, where are found only wild pomegranate (*punica granatum*) shrubs that are widespread in the whole northern Albanian territory. A natural hard limestone "wall" separate the Mediterranean Maquis habitat from the railway belt, within which there are only wild pomegranate shrubs.

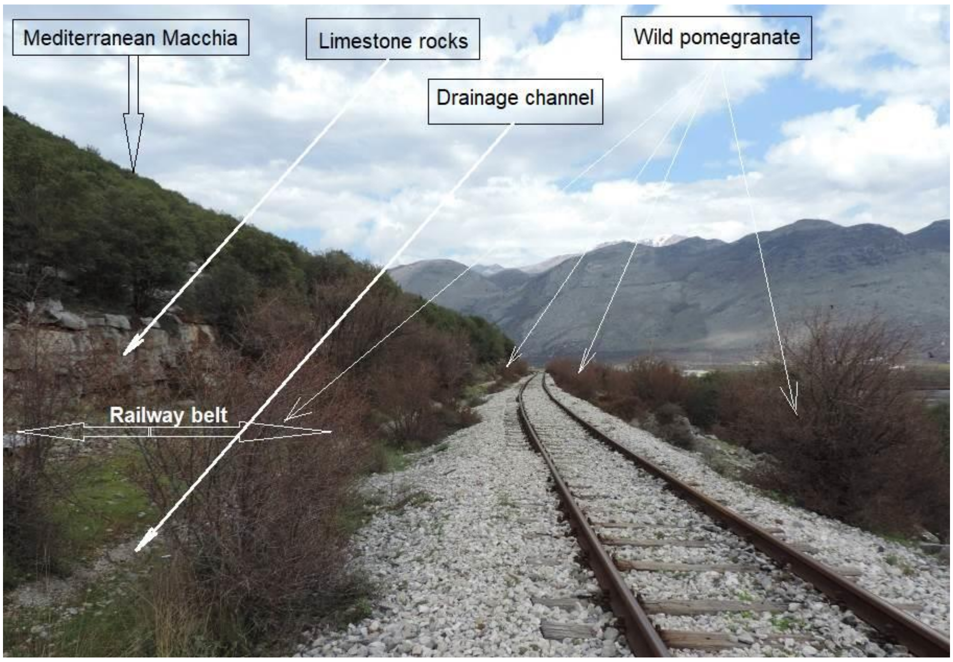

Figure 6-182_ The railway line and the Mediterranean Maquis from km 139+000 to Km 140+000

Figure 6-183_The railway line and the motorway from km 139 to km 140

Planned interventions

No permanent or temporary service road are planned between the mountain foot and the railway line. The design has planned to use only the motorway for transporting construction materials. The retaining wall will be demolished in 2-3 locations to allow the passage of the working machinery on the working strip on the left of the railway line. Only the left railway belt will be used as a working strip. The retaining wall will be rehabilitated once the construction activities will be finished.

Besides, no railway station, underpass or overpass and bridge or culvert will be built within railway line section. The railway line has a slight pendency, thanks to which there is no need for culverts. A drainage channel located between the mountain foot and the railway collects the rainy water. Another drainage channel runs on the right of the motorway. Both these channels discharge at the territory of Hoti Village, where it joins a small streambed.

Potential impacts and mitigation measures

It is not expected that the Mediterranean maquis will be directly affected from construction activities, because a-the working strip will be located on the opposite side of the mountain foot; b-there is no Maquis within the railway belt situated between the railway line and the mountain area; c-the presence of hard limestone rocks avoid the erosion of the steep terrain covered with Maquis.

The only area to be affected from the construction activities is the working strip situated between the retaining wall and the rails, on the left of the railway line. Only wild pomegranate shrubs are found within this left working strip, which will be cleaned during preconstruction works. The vegetation within this strip will be rehabilitated once the construction activities, including the rehabilitation of the retaining wall will be finished. The vegetation rehabilitation within this working strip (railway belt on the left of the railway line) will be included in the Biodiversity Action Plan (BAP), which main lines are included in the ESMP. The BAP concerning this railway line section (km 139 to km 140) will be detailed by the Construction Company before the start of the construction stage. The detailed BAP will be included in the tendering process. The plant species for rehabilitating this working strip in this section (km 139 to km 140) will be defined by a flora expert under the supervision of the environmental institutions.

Findings

It is not expected the Mediterranean Maquis habitat, which is found only on the steep terrain, to be affected by the construction activities.

Introduction of invasive species

Potential Impacts: During construction works, the invasive species could spread within the working strip. The new disturbing soil structure could be beneficial for some invasive species and suppress the development of original vegetation. Besides, the spread of invasive species along the working strip could affect the structure of surrounding habitats.

Proposed mitigation measures: Reducing the working strip area; Whether possible reduce the working strip only on one side of the railway line; Monitor and control the invasion of alien species. Consequently, the impact is assessed of low probability and magnitude and local extent.

Conclusion: The likely impacts of invasive species are evaluated of low probability and magnitude, and local extent. They can be mitigated partly by taking the appropriate mitigation measures.

6.2.10.1.3 Potential impacts upon Critical Habitats

The railway traverses through the transit or traditional use subzone the Nature Managed Reserve of Lake Shkoder, the Ramsar site of Shkoder lake, the Important Bird and Biodiversity Area of Lake Shkoder, the Candidate Emerald Site of Shkoder lake, the Candidate Emerald Site of Buna River-Velipoje, the Important Bird and Biodiversity Area of Velipoje, the Key Biodiversity area of Shkoder and Key Biodiversity Area of Bune-Velipoje.

The above areas have been considered as Critical Habitats in accordance with the EBRD PR 6.

Based on the baseline information, a rapid assessment of the impact upon the protected areas would give the following results.

Table 6-124_Rapid assessment of the protected areas on both sides of the railway line

No	Protected Area	Distance	Comment
1	NMR of Shkoder Lake (49,758 ha) Additional designations: Ramsar Site, Candidate Emerald Site, IBA, KBA.	Crossed by the railway line; Important for aquatic flora and fauna and particularly for water birds	The railway crosses through the Transit/Traditional use Subzone (eastern edge of the terrestrial part) of the Protected Area; The railway traverses within the Nature Managed Reserve. The same area holds different international designations. The Project will therefore have direct impact on the Nature managed Reserve of Shkoder lake as a result of permanent and temporary habitat loss, disturbance, noise, and air pollution during construction and operation. The permanent losses extend to 0.28 ha. The other natural habitat losses would be temporary and not significant because the current project it a rehabilitation project and the accompanying infrastructure will be more or less similar to the one previously used by the current railway infrastructure. Furthermore, the impacted natural habitats will be restored after the end of construction activities. Finally, the impacted areas lay at the eastern boundary of the protected area, thus far from the core areas in terms of biodiversity. Some circa 2 ha will be lost temporarily due to project activities during construction and operation. Some 0.28 ha will be permanently lost because of the construction of new service roads. This same amount of habitat will be compensated through habitat rehabilitation efforts in: • open areas created by changes on the curves; • rehabilitation of forested parts in areas today covered by extensive grazing
2	Nature Monument of Syri Sheganit karst Spring	1.85 km West	Far enough from the railway line; Could be affected by water pollution due to the permeability of the geological formations between the railway and Syri Sheganit.

No	Protected Area	Distance	Comment
3	Nature Monument of Syri Gjonit karst Spring	2.5 km East	Far enough from the railway line; It is not expected to be affected by construction and operation activities.
4	Buna River Mouth-Velipoje (23,027 ha) Additional designations: Ramsar Site, Candidate Emerald Site, IBA, KBA.	3.5 km West; Important for migratory birds	Far enough from the railway line; The Project footprint is close (almost adjacent) to the protected areas and to the established internationally recognized areas. It encroaches with the prospective KBA, whose conservation goals and exact boundaries are not yet defined. The established conservation areas are located further downstream of the railway passage. The Project will therefore not have any direct impact on the conservation established areas.
5	Kune Vain - Tale (4,393 ha) Additional designations: Candidate Emerald Site, IBA, KBA.	1.3 km West; Important for migratory birds	Far enough from the railway line; It is not expected to be affected by project activities.
6	Patok-Fushe Kuqe-Ishem (5,001 ha) Additional designations: Candidate Emerald Site, IBA, KBA.	2.7 km West; Important for migratory birds	Far enough from the railway line; It is not expected to be affected by project activities.
7	Berzane (880 ha) Additional designations: Candidate Emerald Site	2.5 km East	Located in a hilly area enough far from the railway line and therefore it is not expected to be affected by the Project.

As shown in the figure above, the road Shkoder to Hani Hotit constitutes the eastern border of the Shkoder Lake NMR. The exact location of the railway line concerning this NMR is provided in the map below that has been extracted from an official source[286].

286 https://geoportal.asig.gov.al/

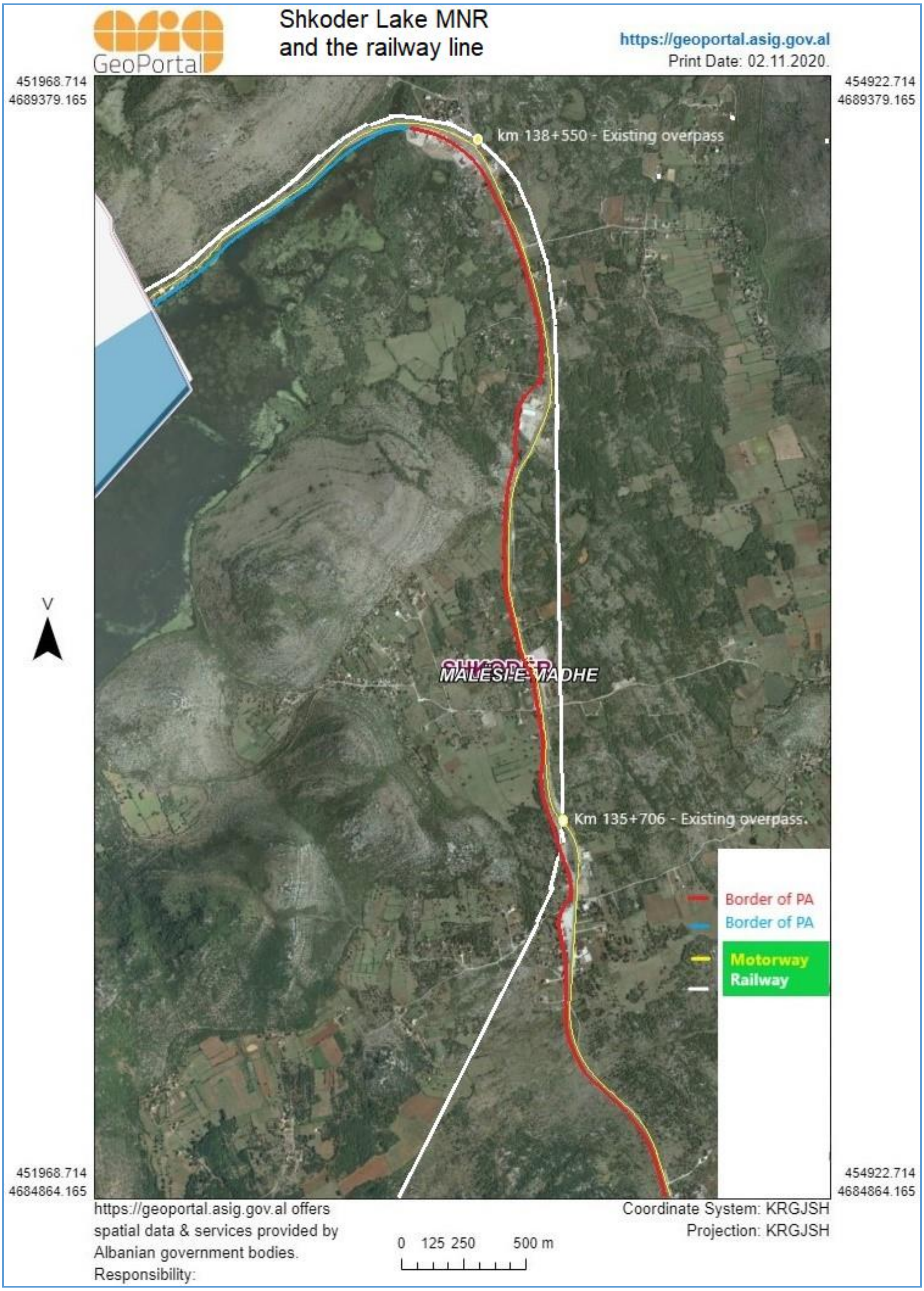

Figure 6-184_Eastern border of Shkoder Lake NMR and the railway line

From the map above and the map of protected areas within the wide project area (see Map 6: Protected Areas – separate file in pdf format), the location of the railway line concerning the Shkoder Lake NMR is as follows:

- Km 113+700 to km 119+300: the railway line runs close to the eastern border of the traditional subzone of the NMR that is characterized by agricultural land and farmhouses lying in flat terrain.
- Km 119+500 to km 135+700: the railway line crosses the traditional use subzone of the protected area;
- Km 135+700 to km 140+000, the railway line runs almost parallel to the eastern border of the NMR, but outside this border.

Photos hereinafter shows the main characteristics of the area crossed in the whole NMR

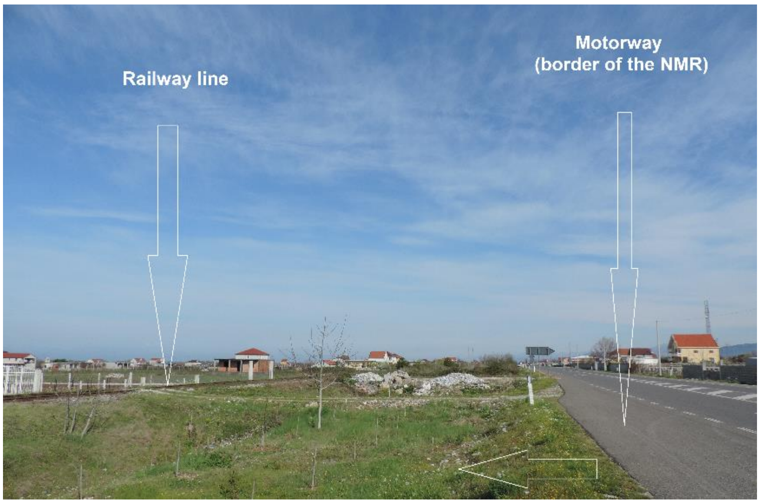

Figure 6-185_Typical landscape at km 114+400 across the Transit/Traditional use subzone from km 113+700 to km *119+300 (northward view)*

Figure 6-186_ Rrjolli Stream Bridge; Sustainable use zone; Northward view; km 118+000; The sustainable use zone lies on the left of the motorway bridge; the railway runs 40m from the NMR border and 2.7km from the lakeshore

Figure 6-187_The Transit/Traditional use Subzone lies on the left of the motorway; Northward view; km 118+900; the railway runs 30m from the NMR border and 2.35 km from the lakeshore

Figure 6-188_Transit/Traditional Use Subzone; Cultivation of medicinal plants (common sage - salvia officinalis); Eastward view; km 120+700; 500m inside the eastern border of the NMR; the railway runs 500m from the NMR border and 2.0 km from the lakeshore

Figure 6-189_Banushi Stream Bridge; Arable lands across the Transit/Traditional Use Subzone; Km 121+000; 600m inside the eastern border of the RMN; Southward view; the railway runs 600m from the NMR border and 2.0 km from the lakeshore

Figure 6-190_Transit/Traditional Use Subzone; km 127+000; Southward view; 1.4 km inside the eastern border of the NMR; the railway runs 1.4 km from the NMR border and 3.5 km from the lakeshore

Figure 6-191_Perroi Thate Bridge; Arable lands across the Transit/Traditional Use Subzone; Km 127+100; 1.4 km inside the eastern border of the RMN; Northward view; the railway runs 1.4 km from the NMR border and 3.5 km from the lakeshore

Figure 6-192_Bajze station; northward view; km 131+400; the railway runs 1.0 km from the NMR border and 2.5 km from the lakeshore; a hilly terrain separates the railway line from the lakeshore

Figure 6-193_Bajze level crossing; northward view; km 132+280 to km 132+620; Arable land on both sides of the railway; the railway runs 1.0 km from the NMR border and 2.5 km from the lakeshore; a hilly terrain separates the railway line from the lakeshore

Figure 6-194_Km 132+620 to km 133+370 (Skac level crossing); Northward view; Left vegetation cleaned (7-8m wide) for installing a new water pipeline; Right: plot of pasture; the vegetation is represented mainly from shrubs dominated by the Oriental hornbeam; the railway runs 800m from the NMR border and 2.7 km from the lakeshore; A hilly terrain separates the railway line from the lakeshore

Figure 6-195_Km 132+620 to km 133+370 (Skac level crossing); Northward view; Left vegetation cleaned (7-8m wide) for installing a new water pipeline; Right: shrubs dominated by the Oriental hornbeam. There are rare trees of oak species dominated by the Turkey oak; the railway runs 900m from the NMR border and 2.15 km from the lakeshore; a hilly terrain separates the railway line from the lakeshore

Figure 6-196_Km 132+620 to km 133+370 (Skac level crossing); Turkey oak and pastures on the right of the railway line; the railway runs 900m from the NMR border and 2.15 km from the lakeshore; A hilly terrain separates the railway line from the lakeshore

Figure 6-197_Km 132+900; North-westward view; Pastures on the left of the railway line the railway runs 800m from the NMR border and 2.25 km from the lakeshore; A hilly terrain separates the railway line from the lakeshore

Figure 6-198_Skac level crossing (km 133+370); Northward view; Left: vegetation cleaned for installing a water pipeline; the railway runs across shrubs and plots of pastures. The shrubs are represented mainly by the Oriental hornbeam. The vertical alignment is very low; the railway runs 950m from the NMR border and 2.1 km from the lakeshore; a hilly terrain separates the railway line from the lakeshore

Figure 6-199_From Skac level crossing (km 133+370) to Popaj level crossing (km 135+210); Northward view; Left: vegetation cleaned for installing a water pipeline; the railway runs across shrubs, plots of pastures and rare trees. Mainly the Oriental hornbeam represents the shrubs. The trees are oak species. The vertical alignment is very low; the railway runs 1.0 km from the NMR border and 2.1 km from the lakeshore; a hilly terrain separates the railway line from the lakeshore

Figure 6-200_Km 134+400 to km 134+670 = 270m; Northward view; Arable land on both sides of the railway line; the railway vertical alignment is low; the railway runs 500m from the NMR border and 2.1 km from the lakeshore; a hilly terrain separates the railway line from the lakeshore

Figure 6-201_Km 135+210 (Popaj level crossing; Northward view; the railway runs 170m from the NMR border and 1.95 km from the lakeshore; a hilly terrain separates the railway line from the lakeshore

Figure 6-202_Km 135+210 to km 135+700 (end of the protected area); Northward view; Left: vegetation cleaned for installing a water pipeline. Turkey oaks both sides of the railway line; the railway runs 90m from the NMR border and 1.9 km from the lakeshore; a hilly terrain separates the railway line from the lakeshore

Figure 6-203_Km 135+700 (end of the protected area); Northward view; the railway runs 50 m from the NMR border and 1.85 km from the lakeshore; a hilly terrain separates the railway line from the lakeshore

6.2.9.1.4. Impacts on Biodiversity during construction

The likely main impacts on biodiversity from the construction works can be classified as:

a. Habitat loss, fragmentation and degradation due to clearance activities

Temporary habitat loss might happen due to the construction activities that will be accompanied with vegetation clearance. This will occur mainly within the Nature Managed Reserve of Lake Shkoder, railway stations, worker camps and the new 500 m curves. These activities might affect certain habitat available to small nesting birds including passerines, reptiles, amphibians, and small mammals.

However, the habitat loss would be temporary, during the construction activities. Considering the limited amount of habits loss, the temporary patterns of the loss and the availability of similar habitats in the surroundings of the construction sites, the impact would be of minor to moderate significance.

b. Increased mortality due to excavation work and increased traffic load

Some increased mortality might be expected on nesting grounding birds, reptiles and amphibians if the construction activities will start and continue during the breeding season. This might result in destruction of nests and killing of off springs. Increased traffic load in and out of the construction areas may result in increased incidents of killing animals along and crossing the access roads. This type of impacts is considered to be of minor to moderate significance.

c. Air pollution

The activities taken during construction could cause air pollution. Traffic load will certainly result in emissions release. Meanwhile construction works such as digging etc. could increase the amount of dust in the air. Both could influence mostly the insectivorous species of birds, mammals, reptiles and amphibians. This type of impacts is considered to be of minor to moderate significance.

d. Water pollution

The activities taken during construction could cause water pollution. Activities, service roads, working camps etc., close to water tables could result in pollution of surface waters due to release of oil and other liquid pollutants. Water pollution affects all the species and particularly the aquatic species. This type of impacts is considered to be of minor to moderate significance.

e. Noise and light pollution

Machineries will cause increased noise that apart disturbance could cause abandoning of breeding activities. Noise during the breeding season could be very disruptive to breeding birds' activity with the group of songbirds suffering the most as they rely on calls and songs for communicating with each other.

Light pollution could also be a factor of influence as light could increase disturbance and change insect distribution due to the interaction of the latter with light.

Both impacts could be of minor to major significance.

f. Disturbance

Construction work (dumping and road construction) and human presence could be very disruptive to shy animals such as birds of prey and other large birds, mammals etc. In reaction, those animals tend to abandon the project area. This could be problematic for breeding animals with some of them abandoning the breeding activity. The significance of this type of impact is considered to be minor to moderate.

6.2.10.1.5 Impacts on biodiversity during operation

a. Habitat loss

The construction service roads, new curves, railway stations etc. will result in some permanent habitat loss. Nevertheless, this loss would have very limited impact on natural habitats. The loss of foraging habitat will affect several animal species. The group of amphibians, reptiles, ground-nesting bird species, small mammals will be affected the most.

Ground nesting birds and priority biodiversity features such as Tawny Pipit (*Anthus campestris*), Eurasian Thick-knee (*Burhinus oedicnemus*) etc will lose their nesting habitat.

For the above species, the impacts will be minor to moderate.

b. Habitat fragmentation

During the operational phase there is not expected a major adverse impact on Flora and Fauna apart from the fencing of the railway that could cause a fragmentation of habitats for terrestrial fauna except birds and bats.

Other impacts, including the eventual temporary access roads and the working strip area are already rehabilitated through the mitigation measures related mainly to biodiversity and land use.

Conclusion: The likely adverse impacts on Flora and Fauna are evaluated of low probability and magnitude and local extent. These impacts can be avoided/mitigated.

6.2.10.1.6 Biodiversity mitigation measures

Mitigation measures follow a hierarchical approach commencing with avoidance measures and continuing with measures aiming restoration, compensation and minimization of residual impacts.

a. Avoidance measures

Avoidance measures below, will aim to avoid any possible impact occurring during construction and operation. The avoidance measures include:

- Develop a Biodiversity Monitoring and Management Plan for biodiversity features qualifying as PBF and CH. This will allow the monitoring of project impacts, the avoidance and reduction of impact where possible and foresee for more specific restoration measures.
- Avoid clearance of vegetation during breeding season (March - August) in order to not disturb the breeding animals and to not destroy nests and offspring's. Undertake the vegetation clearance outside of the breeding season to allow breeding animals to occupy other habitats.
- Avoid blasting during the breeding season (March - August) in order to reduce the disturbance of breeding animals.
- Avoid working at night, where possible, in order to reduce light pollution for animals active at night.
- Avoid discharge of solid waste into the river, streams, along the riverbanks, in ponds and water reservoirs and whatever natural or human made watercourse.
- Avoid discharge of wastewaters and into natural or human made watercourses, ponds and reservoirs.
- Apart from those measures foreseen for avoiding the pollution of surface and underground waters, respectively in **6.2.7.2.2** and **6.2.8.2.1**, an emergency plan should be in place to control the pollution in case there are emergencies involving leaked oil and other water pollutants.
- Avoid storage of large quantities/volume of waste by removing frequently/regularly any food waste or similar attractants for animals, especially carnivores.
- Avoid creating dumpsites that would attract omnivorous species and scavengers.
- Avoid/minimize any eventual access roads during the design stage; the design has already taken into consideration the increase of the number and cross-section size of the culverts.

b. Restoration and mitigation measures

- Significant noise and human activity should be limited as much as possible to reduce disruption terrestrial and riparian vertebrates' movement.
- Employees must be restricted from engaging in hunting while on duty.

- Create wildlife passages to reduce the effects of habitat fragmentation (See the clarification below for further technical provisions on wildlife passages)
- Restore the riparian habitats in those sections of the railway that will be affected by the construction of the railway bridges. This measure will mitigate the impact for plants and animals present in riparian forests.
- Conduct a training program for the employees on the code of conduct and care for the wildlife prior to start-up of construction work.
- Reduce at maximum tree falling during the breeding season (March-August). This period is considered as construction restriction period, as most of the terrestrial and riparian vertebrate species do breed in the respective period.
- Blasting will not be used.
- Employ qualified expertise for preconstruction surveys in order to avoid direct impact (destruction of nest, killing of offspring's) if construction works will have to take place during the breeding season.
- Employ qualified expertise for preconstruction surveys in order to avoid project activities in areas of high density for breeding birds.
- Limit/regulate the public access, where possible, to roads built in the railway to minimize public access to sensitive areas, such as riparian forests, old riparian trees.
- Increase the number of culverts and the culverts' cross-section to ensure the crossing of the railway line by mammals and other non-flying animals. Box 1 above clarifies that there is no need for any wild fauna passages across the railway line.

c. Compensation measures

Develop and implement a Biodiversity Offset Strategy (BOS). This document will explain how the offset will be developed to compensate for the critical habitat loss and ensure "no net loss" occurs.

- Create and rehabilitate, wherever possible, the riparian forest
- Create and rehabilitate, wherever possible, the deciduous forest impacted during construction

Box 1: Eventual need for wild fauna passages
The suggested minimum distance between two successive underpasses for different animal species was based on the "Habitat Fragmentation due to Transportation Infrastructure – Wildlife and traffic - A European Handbook for Identifying Conflicts and Designing Solutions[287]"   The biggest mammals within the wide project area from Bajze to Hani Hotit (especially from km 132+600 to 135 +100; and 135+700 to 137+200 – forested and shrubby area) is the Red Fox (*Vulpes vulpes*), the European Badger (*Meles meles*), and the Golden jackal (*Canis aureus*). The railway does not represent an obstacle for these mammals. It should be underlined that all these three mammal species have the IUCN status of Least Concern (LC) and therefore they are not classified as threatened. However, the Consultant has analyzed whether it is necessary to design wild fauna passages under the railway line.

287 http://www.iene.info/wp-content/uploads/COST341_Handbook.pdf

Box 1: Eventual need for wild fauna passages

The European Handbook "Habitat Fragmentation due to Transportation Infrastructure – Wildlife and traffic" suggests a distance from 1.0 to 3.0 km between two successive underpasses for these animal species.

The cost of a wild fauna passage for the animal species hereinabove mentioned is roughly 15,000 Euro, which is the cost of a box culvert of 2x2m diameter size.

The sensitive railway line sections concerning any eventual need for fauna passage are those where the railway line runs across shrubby and forested areas. These railway line sections are as follows:

- From km 132+600 to km 135+100;
- From km 135+700 to km 137+730; and
- From km 139+200 to km 140+000

The section from km 132 +600 to km 135+100 crosses the only shrubby and forested area on the Shkoder Lake Nature Managed Reserve. While the other sections hereinabove mentioned are located outside this Nature Park. It should be underlined that both the sections from km 132+600 to km 135+100 and km 135+700 km 137+200 runs almost near and parallel to the motorway, which traffic is heavier than that of the railway. Besides, the motorway serves as a terrestrial border of the protected area.

A short analysis of the situation regarding any eventual need for wild fauna passage would be as follows:

1-Railway line section from km 132+600 to km 135+100

The existing situation is as follows:

- There are no existing service roads at this location;
- The shrubby and forest area lies both sides of the railway line;
- No other road infrastructure is present between the railway line and the Shkoder Lake shoreline;
- There are three level crossings that will be maintained at km 132+288, km 133+360 and km 135+210

The project foresees:

- Planned new box culverts (2x2m diameter size) at km 132+ 593, km 132+788, and km 133+132 (pipe culvert – 1.2m diameter size); and km 133+697.
- No service roads are planned in this section

Form the above it results that:

The longest distance between two successive box culverts that serve as wildlife fauna passages is approximately 2.0 km [(box culvert 2x2m) at km 133+697 and underpass at km 135+700];

The biggest distance between two successive level crossings that will be maintained is 1850m. These level crossings, especially those of km 133+360 and 135+210 are located in areas with insignificant human circulation and activity.

As a conclusion, there is no need for any additional wild fauna passage in this section

2- Railway line section from km 135+700 to km 137+730

Furthermore, from km 135+700 to the border Al/Mne (km 140+000), the motorway runs parallel to the railway line. Thus after crossing the railway line, the wild fauna must traverse the motorway, which is characterized by denser traffic than the railway. As a result, the construction of any eventual

Box 1: Eventual need for wild fauna passages

wild fauna passage is devaluated by the lack of such a passage under the road, and therefore the construction of any fauna passage under the railway is not recommended within this section.

Two small bridges at km 136+030 and km 136+738 are planned by the Project, and an underpass exists at km 138+550. Besides, the project has foreseen an additional box culvert (2x2m diameter size) at km 137+090.

It must be stressed that the national road Shkoder to the state border Al/Mne runs between the railway and the shoreline of Shkoder Lake. Under this road, there is no wild fauna passage. As the road traffic is much denser than the railway one, the construction of any wild fauna passage under the railway would be devaluated by the lack of existing passages under the road. Consequently, the construction of any fauna passage under the railway is not recommended within the railway line section from km 135+700 to km 137+ 730.

Thus, there is no need for any additional wild fauna passage in this section

3- Railway line section from km 139+200 to km 140+000

From km 137+730 to km 139+200 the railway line crosses arable land and other are affected by the human activity. Therefore, there is no need for any wild fauna passage.

The railway line section from km 139+200 to km 140+000 runs between the motorway Al/Mne on the south and a mountainous area in the north. Mediterranean Maquis cover the mountain area close to the railway line. The railway belt on the mountainside is covered of wild pomegranate (*punica granatum*), which is very spread within the whole Northern Albania.

The project foresees a new box culvert (2x2m diameter size) at km 138+844, and therefore there is no need for any additional wild fauna passage under the railway line. Besides, there is no wild fauna passage under the motorway.

Thus, there is no need for any additional wild fauna passage in this section.

Conclusion

Based on the above, there is no need for any additional wildlife passage under the railway line.

The existing underpasses, bridges, and road culverts, as well as the additional box culverts designed by the Project play the role of wild fauna passages.

Moreover, the Shkoder Lake has been proclaimed a Nature Managed Reserve and Ramsar area because of its aquatic biodiversity and the migratory birds that are not affected by the lack of any wild terrestrial fauna passage under the railway line.

The road underpasses, bridges, and pipe and box culverts serve also as passages for the small-sized fauna. Compared to the existing situation, the project plans to add the number of culverts and to increase their diameter size. Therefore, the small fauna will have more possibilities to safely pass under the railway line.

6.2.9.1.5. No Net Loss and Net Positive Impact strategy

a. The Priority Biodiversity Features (PBF) in the project area are identified in chapter *5.2.10.2.1.1 Identification of Priority Biodiversity Features*. Those PBF are classified in :

- Threatened Habitats – 10 different habitats (*Table 5-44*)
- Threatened Species – 4 Molluscs (*Table 5-45*), 1 Fish species (*Table 5-46*), 2 Mammals (*Table 5-47)* and 39 Bird species (Table 5-48).

None of the Priority Biodiversity Features will face a loss if mitigation measures, are put in place, as required by this report and ESAP.

92A0 Salix alba and *Populus alba* galleries (Annex I EU Habitats Directive) are the only PBF directly impacted by project activities during construction and operation. Nevertheless, mitigation measures foreseen under Chapter 6.2.10. "Biological and ecologial resources" have been developed. **The Consultant recommends primarily the use of these species during the vegetation rehabilitation activities in the vinicity of Ishmi bridge** in order for the project implementation to lead to a No Net Loss (NNL) and even a Net Positive Impact (NPI) at this location**.** This result can be achieved as the current biodersisty status of this location (from *km 35 to km 35+200)* is "degraded riparian habitat". Therefore, adequate replanting activities of *Salix alba* and *Populus alba,* under the supervision of a qualified appointed biologist and following the guidelines of the Biodiversity Action Plan, will ensure an increase of the biodiversity value in this project zone. The White Poplar saplings of 2 years old and at about 2 m height will be planted in 2.5 m distance from each other while the White Willow saplings of 2 years old and at about 2 m height will be plated in 3 m distance. The above distances ensure the best growth of both plant species. Considering that White Poplar and White Willow have a very rapid growth it is recommended to have a supervision period of two years after the planting.

None of the fish and molluscs or waterbird species are directly impacted by the project as the majority of project activities during construction are undertaken far from water tables. In the areas where the railway goes close to the lake, the mitigation measures foreseen under section 6.2.8.2. "General mitigation measures" and section 6.2.10. "Biological and ecologial resources" will be applied in order to ensure no significant impact from water pollution.

Impact on terrestrial mammals and birds is mitigated through the measures foreseen for:

- Air quality (section 6.2.1.);
- Noise and vibrations (section 6.2.2.);
- Climatic conditions (section 6.2.3.);
- Climate change (section 6.2.4 and Table 6-11. Natural vegetation);
- Geological issues (section 6.2.5);
- Tectonic and seismicity (section 6.2.6.);
- Groundwater (section 6.2.7.);
- Surface water (section 6.2.8.);
- Biological and ecologial resources (section 6.2.10.)

b. The Critical Habitat (CH) qualifying features are identified in section *5.2.10.2.2. Significant biodiversity Features* and information on them is summarised in 5.2.10.4.7. Based on the above analysis, the railway project will only have an impact on the ecosystem of Lake Shkoder as the railway traverses the Nature Managed Reserve and its habitats. This same ecosystem is associated with key evolutionary processes, and it is vital to critical habitat features such as species of conservation concern, endemic or geographically restricted and those found in globally significant concentrations. Therefore, the mitigation and offset measures foreseen under ESIA should ensure No Net Loss (NNL) and Net Positive Impact (NPI) for this Critical Habitat, as outlined below.

As for PBF, none of the aquatic species triggering the Critical Habitat criteria will be impacted by the project given the contractor will apply the measures foreseen in enlisted in section 6.2.10. “Biological and ecologial resources” as well as in the chapters dealing with air quality (section 6.2.1.), noise and vibrations (section 6.2.2.), groundwater (section 6.2.7.) and surface water (section 6.2.8.). None of aquatic species such as fish, molluscs and waterbirds triggering Critical Habitats are directly impacted by the project, as the majority of project activities during construction are undertaken far from water tables. In areas where the railway goes close to the lake, the mitigation measures foreseen under section 6.2.8.2. “General mitigation measures” and section 6.2.10. “Biological and ecologial resources” will be applied in order to ensure NNL.

Fauna of the Critical Habitat of Lake Shkoder Nature Managed Reserve

Impact on terrestrial species is mitigated through the measures foreseen for air quality (section 6.2.1.), noise and vibrations (section 6.2.2.), climatic conditions (section 6.2.3.), climate change (section 6.2.4 and Table 6-11. Natural vegetation), geological issues (section 6.2.5) and above all by those mentioned in the Biological and ecologial resources (section 6.2.10).

Animal species will **temporarily** lose parts of their habitat; most of them will move to other parts of similar habitats that will not be affected by the reconstruction of the railway line. **As the railway already exists since 1985, it is not expected any further habitat fragmentation.** The disturbance of habitats of animals during the construction period will take place within a narrow strip of land.

Other impacts related to animal disturbance, noise, dust, traffic, and increased incidents of animal killing are temporary and considered to be of minor frequence.

Flora of the Critical Habitat of Lake Shkoder Nature Managed Reserve

Temporary habitat loss in Nature Managed Reserve of Lake Shkoder

The only critical habitat to be directly impacted by the project activities is represented by degraded forest formations dominated by a mix of deciduous oak species (Quercus fraineto), shrubs of Hornbeam (*Carpinus orientalis*) and Jerusalem thorn (*Paliurus spina-christi*). Small plots of agricultural land and pastures split the degraded forest and shrubby formations. The terrain is karstic. The planned interventions, the potential impacts, the habitat loss either temporarily or permanently are described in section *6.2.10.1.2.2 Deciduous forests and scrubs*.

A working strip, called the railway belt, and located on both sides of the railway line, will be used during construction and operation activities. This surface will be temporarily lost during the railway construction. Nevertheless, the natural habitats inside the working strip will be immediately rehabilitated after the construction works.

c. Measures to ensure NNl and NPI

The measures foreseen under the ESIA aim to implement the mitigation hierarchy as mentioned in EBRD PR6. The following section (6.2.10.1.6) summarizes the framework for the development of a Biodiversity Monitoring and Management Plan for biodiversity features qualifying as PBF and CH. This will allow the monitoring of project impacts, the avoidance and reduction of impact where possible and foresee for more specific restoration measures.

Fauna

The existing underpasses, bridges, and road culverts, as well as the additional box culverts designed by the Project play the role of wild fauna passages.

Moreover, the Shkoder Lake has been proclaimed a Nature Managed Reserve and Ramsar area because of its aquatic biodiversity and the migratory birds that are not affected by the lack of any wild terrestrial fauna passage under the railway line.

The road underpasses, bridges, and pipe and box culverts serve also as passages for the small-sized fauna. Compared to the existing situation, the project plans to add a number of culverts and to increase their diameter size. Therefore, the small fauna will have more possibilities to safely pass under the railway line. The added new box culverts and the replacement of the existing ones will facilitate the fauna circulation. The new and the replaced box culverts will have a bigger diameter size than the existing ones: the new box culverts will be large enough (size 2x2 m or 2x3m) to allow the passage of mammals such as Red fox, Golden Jackal, Badger etc. The culverts are designed to avoid blocking from sediments, to allow for regular maintenance and the temporary flows. **This will lead to a Positive Net Impact for the fauna circulation during the operation, following the project implementation.**

Regarding temporary habitat loss for the flora due to construction works, the working strip is narrow (4 meters), therefore, the impact on flora is expected to be very low.

<u>Measures to be implemented in Km 132+600 to km 135+100 and Km 135+100 to km 135+700</u>

In order to avoid or mitigate the impacts on amphibians, reptiles, ground nesting bird species, small mammals during the project implementation, the following measures should be respected (and developed as necessary in the BAP):

Avoidance measures

The avoidance measures below will aim to avoid any possible impact occurring during construction and operation. The avoidance measures include:

- Avoid clearance of vegetation during breeding season (March - August) in order not to disturb the breeding animals and not to destroy nests and offsprings. Undertake the vegetation clearance outside of the breeding season to allow breeding animals to occupy other habitats.
- Avoid working at night, where possible, in order to reduce light pollution for animals active at night.
- Avoid discharge of solid waste into the river, streams, along the riverbanks, in ponds and water reservoirs and whatever natural or human made watercourse.
- Avoid discharge of wastewaters into natural or human made watercourses, ponds and reservoirs.
- Avoid storage of large quantities/volume of waste by removing frequently/regularly any food waste or similar attractants for animals, especially carnivores.
- Avoid creating dumpsites that would attract omnivorous species and scavengers.

Mitigation measures

- Significant noise and human activity should be limited as much as possible to reduce disruption terrestrial and riparian vertebrates' movement.
- Employees must be restricted from engaging in hunting while on duty.
- Conduct a training program for the employees on the code of conduct and care for the wildlife.
- Conduct a training program for the employees on the code of conduct and care for the wildlife prior to start-up of construction work.
- Reduce at maximum blasting and tree falling during the breeding season (March-August). This period is considered as construction restriction period, as most of the terrestrial and riparian vertebrate species do breed in the respective period.
- Employ qualified expertise for preconstruction surveys in order to avoid direct impact (destruction of nest, killing of offsprings) if construction works have to take place during the breeding season.
- Employ qualified expertise for preconstruction surveys in order to avoid project activities in areas of high density for breeding birds.
- Ensure the mesh size of the fence to be large enough to allow the passage of small, medium and large mammals and other non-flying animals.

Ground nesting birds and priority biodiversity features such as *Tawny Pipit (Anthus campestris), Eurasian Thick-knee (Burhinus oedicnemus)* etc., might be impacted by project activities during construction phase. Nevertheless, since both species are ground nesting there is no shortage of nesting habitat, both in Koplik plain and Shkoder Nature Managed Reserve. As such, the main impact would be represented in the form of disturbance of nesting activity if birds are nesting close to the railway infrastructure. However, there will be no significant impact on the above species provided if both avoidance and mitigation measures described hereinabove are successfully implemented.

Flora

Temporary habitat loss in Nature Managed Reserve of Lake Shkoder

Measures to be implemented in Km 132+600 to km 135+100 and Km 135+100 to km 135+700

- ***Avoidance*** of vegetation clearing on the right side of the railway line. The working strip will be located only on the left of the railway line. Other avoidance measures are specifically mentioned in section *6.2.10.1.6 Biodiversity mitigation measures*. Monitoring and control the invasion of alien species.
- ***Minimization*** of vegetation clearing on the left side of the railway line. The working strip on the left that lies on the railway belt is already cleaned (Figure 1) from shrubs by the implementation of another project (construction works of a water supply pipeline). The left working strip will be fenced before the start of the construction works in order to not extend the already cleaned area;

Figure 1. Vegetation cleared in the working strip on the left of the railway line (km 132+600 to km 135+200).

- ***Restoration*** of the vegetation within the working strip once the construction works are achieved. Although this working strip is already cleaned from vegetation by another project, the Albanian railways will rehabilitate it. The rehabilitation works must start immediately after the end of construction activities within this section. The restoration activities will be included in the BAP, which will be detailed by the construction Contractor. The detailed preparation and the monitoring of BAP will be supervised by the environmental institutions (RAPA and REA Shkoder, Environmental specialists of the Municipality of Malesia e Madhe and its Directory of Forestry, as well as EBRD representatives.

The Consultant recommends using a mix of the following species to be planted during the vegetation rehabilitation activities:

- *Salix alba* (if appropriate at this location, to be determined by the team in charge of BAP implementation)
- *Populus alba* (if appropriate at this location, to be determined by the team in charge of BAP implementation)
- *Quercus fraineto*
- *Carpinus orientalis*
- *Paliurus spina-christi*
- *Quercus cerris*
- *Quercus robur*
- *Carpinus orientalis*

The surface size of the working strip on the left of the railway line is about 2500 m x 5 m = 1.25 ha. Therefore, the total land surface to be restored or rehabilitated is 1.25 ha. This land surface lies within the left working strip. After finishing of the construction works, the restoration (and addition) of vegetation in the working strip should be supervised by a biologist/botanist. Restoring the habitat with these species, which are experiencing degradation, will create a positive net gain for the habitat.

Once the left working strip is restored and the vegetation has grown, there will be no net loss at mid-term (the necessary time for vegetation growth) due to the project implementation.

Permanent habitat loss in Nature Managed Reserve of Lake Shkoder

Some residual impacts will remain regardless of the avoidance, mitigation and restoration measures taken by the project during the construction works. Residual impacts will occur only due to construction and operation of railway stations as well as passages and new service roads. Nevertheless, the surface of natural habitats to be impacted by such residual effects is minimal. As shown before, the permanent loss would be 0.28 ha with only half of it within the Nature Managed Reserve of Lake Shkoder.

New service roads will be constructed in and around the Nature Managed Reserve of Lake Shkoder. As a result, habitat loss during the construction and operation of the service roads will be permanent.

The total length of the service roads is circa 5.4 km. The majority of them is located in arable land, i.e. in non-natural habitats. The remaining 703 m falls in natural habitats composed of deciduous oak forest**.** From this length, only 358 m fall within the Nature Managed Reserve while the rest of 345 m is outside the protected area.

The measures to ***avoid*** and ***mitigate*** this permanent habitat loss were implemented through the design development.

Some 0,098 Qha for different species will be subject to offset or compensation, as indicated in the table below. For those CH species preferring the same habitat, a common offset measure will be proposed.

CH Polygon Name	Area (ha)	Habitat quality (Q)	Residual Impact (Qha)
Nature Manage Reserve	0,14	0,7	0.098 ha

Restoration measures are related to the plantation of vegetation for an area at least equal to the lost vegetation one. The species to be planted would be the same as those being lost. i.e., species will be the Turkey Oak (*Quercus cerris*), Hungarian oak (*Quercus fraineto*), Common Oak (*Quercus robur*), Oriental Hornbeam (*Carpinus orientalis*). The first area (minimum 1380 m^2 selected to plant this vegetation is close to Bajze Train Station, in between Bajze (Lat. 42.277749°; Long. 19.420884°) and Lacaj (Lat. 42.260578°°; Long. 19.413888°), and the second is the working strip located inside the Nature Managed Reserve of Lake Shkoder, where a minimum 1440 m^2, currently not covered by vegetation, should be replanted. These additional trees will be planted in the open areas created by changes on the curves and in areas that are today covered by grass.

Once the offset measures are implemented it can be said that will be no net losses at mid-term (the necessary time for vegetation growth). Since the compensated area will be properly restored and protected from overgrazing and cutting, this will result in Net Positive Impacts.

The table below presents the key species (flora and fauna) on which efforts regarding avoidance, mitigation and restoration should be focused. The success of the No Net Loss and Net Positive Impact strategy should be evaluated according to the status of these species during construction and operation phases:

Table 6-125_Key species for the assessment of the NNL and NPI strategies

No	Species	Type	Measure
1	*Anthus campestris*	Fauna	Avoidance and mitigation measures + restoration of of their nesting habitat inside the Nature Managed Reserve of Lake Shkoder if identified in the project zone.
2	*Burhinus oedicnemus*	Fauna	Avoidance and mitigation measures + restoration of of their nesting habitat inside the Nature Managed Reserve of Lake Shkoder if identified in the project zone.

No	Species	Type	Measure
3	**Any other amphibians, reptiles, ground nesting bird species identifed in the project zone**	Fauna	Avoidance and mitigation measures + restoration of of their nesting habitat inside the Nature Managed Reserve of Lake Shkoder if identified in the project zone.
4	*Salix alba*	Flora	Avoidance and mitigation measures + restoration and (re)planting around Ishmi bridge.
5	*Populus alba*	Flora	Avoidance and mitigation measures + restoration and (re)planting around Ishmi bridge.
6	*Quercus fraineto*	Flora	Avoidance and mitigation measures + restoration and (re)planting in the Shkoder NMR and in the specified location close to Bajze Train Station
7	*Carpinus orientalis*	Flora	Avoidance and mitigation measures + restoration and (re)planting in the Shkoder NMR and in the specified location close to Bajze Train Station
8	*Paliurus spina-christi*	Flora	Avoidance and mitigation measures + restoration and (re)planting in the Shkoder NMR and in the specified location close to Bajze Train Station
9	*Quercus cerris*	Flora	Avoidance and mitigation measures + restoration and (re)planting in the Shkoder NMR and in the specified location close to Bajze Train Station
10	*Quercus robur*	Flora	Avoidance and mitigation measures + restoration and (re)planting in the Shkoder NMR and in the specified location close to Bajze Train Station

Appendix 8 includes two maps presenting the respective position of the railway line section located near Shkoder NMR and the relevant PBF and CH located close to this section.

6.2.9.1.6. Biodiversity Action Plan Framework

A **Biodiversity Management Plan** should be developed and implemented by the Contractor to ensure that the project, particularly in the section located in the Shkoder Lake Management Reserve, will not have any adverse impact on the biodiversity. This plan will describe the Biodiversity Offset Strategy and explain how the offset will be developed to compensate for the critical habitat loss and ensure “no net loss” occurs through (i) create and rehabilitate, wherever possible, the riparian forest and (ii) create and rehabilitate, wherever possible, the deciduous forest impacted during construction. The BAP, wich is also required by the ESAP, will be approved by EBRD prior to implementation.

The BAP must include the rehabilitation of the degraded deciduous forest formation crossed by the railway line from km 132+600 to km 135+700. The degraded forest parcels must be defined in detail in the BAP, in collaboration with the forest and municipal institutions as well the owners of the land.

The detailed preparation and the monitoring of BAP will be supervised by the environmental institutions (RAPA and REA Shkoder, Environmental specialists of the Municipality of Malesia e Madhe and its Directory of Forestry). BAP will be approved by the EBRD representatives before implementation.

This plan should respect the following framework:

- Responsibility for development and implementation of the Plan: Contractors
- The time frame when the Plan should be developed: Preconstruction phase (in time for EBRD approval 6 months before the start of the construction works)
- The timeframe when the Plan should be revised: 3 months after any substantial Project change
- Necessary approval of the Plan should be conducted by EBRD 3 months before the start of construction works.

Scope of Biodiversity Management Plan

For the design of the Biodiversity Management Plan, the following objectives must be met:

Prerequisites:

- Stakeholder engagement and consultation;
- **Organization of awareness campaign and educational activities for both the staff working on the reconstruction activities but also the local communities**
- Partnerships evaluation;
- Consider biodiversity priorities, resource/staff availability, and timing and costs issues;
- A baseline survey of biodiversity and indicators selection; and
- The target of 'no net loss' to biodiversity.

The necessary actions to implement these activities are:

- Monitoring: Identify organization(s) with responsibility for managing monitoring activities and reporting on the progress being made on individual actions. A dedicated team will be appointed to implement the Biodiversity Action Plan made up of employed staff members, independent consultants, and scientific entities or of NGO's given the necessary funding to implement the works. The monitoring will be intended to determine the potential effects on biodiversity generated by the project introduced changes in comparison with the baseline. The monitoring program should be implemented according to the specific pipeline sections requirements, and the defined conservation priorities, to make sure that the introduced mitigation measures and restoration works are effective and to identify the corrective actions in case deficiencies are identified.
- Evaluation: Biodiversity Management Plan will review indicators and performance against objectives, targets, and stakeholder expectations to measure how well the Biodiversity Management Plan has been implemented, and how successful it has been. Periodically a review of objectives and targets will be made to determine their achievement or not, and the eventual need to introduce the required enhancements for the action plan.
- Reporting: The communication and verification of the progress and outcomes of the Biodiversity Management Plan to all interested parties will help to build support and increase the probability of success for current and future biodiversity-related activities. The participation of the local people will be the key source for the evaluation of indirect impacts from logging, hunting, fishing, or overharvesting. Therefore, the inclusion of such people within stakeholder engagement groups will be essential in the success of all the Biodiversity Management Plan elements and will also help to manage expectations, to promote the partnership approach, help improve local livelihood and to avoid conflict. Reporting will be performed through the development of alternative,

independent mechanisms, such as a website on biodiversity activities, which will include the development of tools to report data internally, making data available for reference and decision making to practitioners, management and to local NGO and government groups for species and habitat records.

Biodiversity Management Plan must additionally address the following topics:

- *The invasive species management plan*
    - The invasive plant species have been recognized as the main drivers of negative impacts due to the vegetation damage during the construction work. For this reason, the management of invasive species must be performed with additional care, and it represents a priority for this project. This is especially important, as proper invasive species management will lead to positive impacts on some habitats, thus creating net gain.
    - The most important precondition for invasive species management is knowledge about the invasive species presence (as some new invasive species can be introduced), their proper removal and recovery of native vegetation cover that will be resilient to new invasion. To assure that goal of permanent invasive species elimination is achieved, monitoring has to be applied and repeated if necessary. Details about the invasive species management and monitoring of the success will be developed within the Restoration and rehabilitation plan
    - The special effort of invasive species management should be implemented in protected areas.
    - Roles and Responsibilities, Resources, Monitoring and Corrective Actions.
- *Vegetation recovery*
    - Activities connected to vegetation measures should be supervised by botanists to see that all measures are performed as it was planned.
    - The vegetation recovery must be focused on recovering the species or habitats identified as priority biodiversity features/critical habitats or creating the habitat conditions that will support species identified as priority biodiversity features regarding this project.
- Internal training of Contractor´s workers on main provisions of the Plan must be carried out before the start of construction works. Records of trained personnel should be kept and regularly updated Minimal action required

These measures have been developed to satisfy the main objectives of the Biodiversity Management Plan:

- Measures listed in this section for the Biodiversity and Protected areas protection should be developed:
    - All construction works should be performed outside of the period of nesting of most wetland birds that have been recorded in the wider project area (from March till the end of August)
    - All construction works should be performed with constant surveillance of ornithologists to assure the proper implementation of measures regarding avoidance of impact on birds (avoiding the most sensitive time of the year and the day).
    - All working vehicles should be carefully washed with hot water before moving into the core zone of NMR to prevent the introduction of invasive species.

- During the rehabilitation work on the railway line in the Shkoder Lake Management Reserve, constant supervision of biologists or other related experts for nature conservation must be present to assure no additional surfaces will be damaged.
- Establish the work camps and pipes yards outside the core zone of Shkoder NMR.
- Heavy machinery and vehicles that will be used during the construction works should be carefully washed (with an accent on washing the wheels) before the start of construction works to lower the possibility of spreading the seed of invasive plant species. Washing should be repeated whenever machinery and vehicles are transported into the core zone of Shkoder NMR.
- If the invasive plant species appear within the working corridor during the construction work, they should be removed and properly deposited. After the reinstatement activities, the presence of invasive species should be monitored and in case, additional measures will be implemented.
- After the finishing of the construction works, adequate tree and shrub species should be planted in the appropriate area for the project to have a net gain of biodiversity and to prevent the establishment of invasive plant species.
- On all sites where vegetation cover would be removed or damaged by accident, a mixture of grasses and legumes should be sowed to prevent soil erosion, introduction and spreading of invasive plant species.
- If the invasive plant species appear within the working corridor during the construction work, they should be removed and properly deposited. After the reinstatement activities, the presence of invasive species should be monitored and in case, additional measures will be implemented.
- **The plan is envisaged to be performance-based and must be compliant with EBRD PR6. In case the set objectives are not achieved, other mitigation measures should be considered, applied, and monitored.**

The BAP should particularly monitor and asses the status of the key species described in the table 6.16 of the previous section during construction and operation activities, and update this table as needed.

6.2.10. Land use

Section 5.2.11 of the baseline information describes the land use on both sides of the whole length of the railway line.

6.2.10.1. Design, preconstruction, and construction stages

Source of impacts: The main permanent land acquisition for the project purposes is needed for the service roads (4 ha), Lezhe freight station (1.4 ha) and the improvements of the connectivity roads and level crossings (2.1 ha). In total, 7.5 ha will be expropriated. The other land surface needed for the service and connectivity roads falls in the existing municipal roads and in the railway belt, which is an Albanian Railways property.

Roughly, 112 km of non-paved service roads are needed for the project. The land surface needed for the service roads is mainly state and municipal land. The land within the railway belt is an Albanian Railway property. The existing local roads that need to be upgraded to serve as service roads are municipal property.

All the stations will be rehabilitated within the Albanian Railways land property. While the planned new freight station in Lezhë will be located partly in Albanian Railways property (the railway belt belongs to HSH) and partly in private agricultural land.

Temporary land acquisition is needed for work camps, any eventual access road, and the necessary working strip.

Impacts and mitigation measures:

Impacts on land use and the proposed mitigation measures include:

- Permanent land acquisition in agricultural areas for service and connectivity roads. This impact cannot be avoided. The planned location and length of the needed service roads depend mainly on the local road network, the location of the level crossings, and the location of the houses and service facilities on both sides of the railway line. The mitigation measures consist mainly of the optimum use of the existing local roads as service roads and designing any new underpass whether it is allowed by the topography.
- Permanent land acquisition in agricultural areas for Lezhë 2 freight station. This impact cannot be avoided. The planned location of the new Lezhë freight station is function of the future railway line branch to Shengjin port. The mitigation measures consist mainly of the optimum shape of the station to occupy less agricultural land. A part of the land surface required for Lezhë 2 station falls in the railway line belt that is Albanian Railways property.
- Temporary land acquisition for working strip for construction purposes. This impact can be reduced by using as much as practicable the railway belt and the existing local roads to reduce the working strip. Fencing the working areas reduce also the temporary land acquisition.

It should be underlined that there is no need for permanent land acquisition across the shrubby and forested area of the Nature Managed Reserve of Shkoder Lake.

The magnitude of impacts associated with land acquisition can be evaluated as low to moderate. The sensitivity also can be evaluated as low to moderate, because of the limited agricultural land surface in Albania. As a result, the overall significance of the impacts related to land use results low to moderate.

6.2.10.2. Operation and maintenance

As the rehabilitated railway line will follow the existing track, the Project will not create any additional land use restriction problem. The construction of new service and local connectivity roads will enhance the existing situation concerning circulation on both sides of the railway line. The total length of these roads will be roughly 112 km. In some locations (e.g. Shkoder, Spathari village, etc.), due to the chaotic development of the territory, crossing the railway is the same way to reach the other parts of the village/ town/agricultural land, etc. The Project will stop the illegal crossings and proposed secured and legal ones.

The land acquisition issues and compensation of the affected landowners will be performed before the construction phase. Consequently, it is not expected any impact on land use during the operational phase.

6.2.11. Soil and soil quality

The railway line, the new service roads, the train stations, including the planned Lezhë 2 new station, lie partly in an agricultural area and partly in shrubby and forested areas. However, the main part of the railway line and the service roads lie in soil with high agro-pedologic quality. Besides, the railway line crosses the neighbourhoods of Mamurras, Lezhë, and Shkoder cities.

Section 5.2.13 gives the baseline information on the type of soil crossed by the railway line, as well as on soil quality from the agro-pedologic point of view.

6.2.11.1. Design, preconstruction, and construction stages

Source of impacts and potential impacts: The construction machinery and the heavy trunks may pollute the soil with oil spills and may compact and damage the soil in the working areas.

The construction of the new Lezhë station 2 and the new service roads across agricultural areas require a permanent loss of agricultural land and topsoil.

The expected adverse impacts on soil include:

- Permanent loss of topsoil from earthworks for the construction of the new service roads, construction of stations in new locations, construction of the new planned Lezhë 2 station;
- Damage to topsoil from earthworks for the construction of the work camps, any eventual temporary access road, etc.
- Soil compaction within the working strip from the circulation of the heavy trunks for construction works, and transportation purposes; and
- Soil pollution, which can occur through oil spills from transport and working vehicles or through sewage and urban waste from work camp during construction activities;
- Increase of soil erosion from vegetation clearing.

The above-mentioned adverse impacts are evaluated as probable, of medium significance, and local extent.

Proposed mitigation measures: The following mitigation measures are proposed:

- Permanent loss of soil of good quality

  The permanent loss of soil of good quality cannot be avoided. The location of the site for construction of Lezhë 2 station (at km 71) cannot be changed in function of the soil quality, because of the planned railway line branch to Shengjin port. Similarly, the location of the new service roads depends on the geographical location of the existing road network, housing, and level crossings.

  In this case, it is suggested to remove the topsoil, preserving and reuse it in other locations. This impact is evaluated as local to municipal extent. The overall significance is moderate to high because of the land surface required for the new service roads.

- Damage to the soil of good quality because of soil compaction from working and transport machinery.

  The mitigation measures to avoid soil compaction include:

  - Whether reasonable, remove the topsoil within the area of the eventual work camps and working strips. Preserving it during construction activities and reinstall to rehabilitate the same areas once the construction phase is done.
  - using the existing rural and local roads as access roads;

  - Fencing the construction area to minimize soil compaction, mainly in the buffer areas;
  - Performing construction works during dry periods when soils are not saturated.
- Damage to soil quality because of any eventual pollution from working and transport machinery oil spills.
  - Applying the best practices for mitigation of soil pollution from wastewater and solid and hazardous waste.
  - Develop and implement a Waste Management Plan;
  - Regular maintenance of all machinery to prevent engine oil and fuel leaks;
  - Provision of equipment for the evacuation of leakages

The damage to soil quality can be mitigated and therefore the overall significance can be evaluated as insignificant to low.

6.2.11.2. Operation and maintenance

During the operation phase, the only source of impact is the maintenance of the railway line and stations that require the use of small quantities of hazardous waste like oils, greases, paints, etc. that may pollute the soil. The mitigation measures are similar to those applied during the construction stage.

In a conclusion, there is not foreseen any significant impact on the soil quality during the operation stage.

6.2.12. Infrastructure utilities

Infrastructure includes all utilities that cross or run very close to the railway line, and therefore constitute a risk for the Project's implementation and vice-versa can be adversely affected by the construction of the railway line.

The road infrastructure that can influence the project design and vice-versa can be influenced by the project implementation is studied in detail by the Consultant as part of the service roads, level crossings, and underpasses and overpasses. Whereas the drainage system is taken into consideration in the hydraulic study of the project.

The infrastructure to be identified include gas pipelines, water supply pipelines, power and telecommunication lines (underground cables and overhead lines), and power substations and cabins.

6.2.12.1. Design, preconstruction, and construction stages

The infrastructure facilities identified by the Consultant include power lines (110, 220, and 400 kV), power substations and cabins, telecommunication lines (including underground cables), and water supply pipelines. Neither existing gas pipeline nor exiting optical fibre system exist currently within the fingerprint of the Project's area. Furthermore, according to the information provided by the municipalities up to data, no transmission water supply pipeline crosses the railway line.

Source of impacts and potential impacts: Infrastructure utilities that cross or run very close to the railway line, and therefore constitute a risk for the Project's implementation and vice-versa can be adversely affected by the construction of the railway line.

As mentioned in section 5.2.18, the railway line crosses the track of the planned Ionian - Adriatic Gas Pipeline project (IAP project) at km 38+800. Given that the railway line is expected to be rehabilitated before the construction of IAP, it is recommended to insert a concrete pipeline, which will pass the future gas pipeline. The concrete pipeline will be installed during the rehabilitation of the railway line. As a result, no impact is expected to occur during the construction of the planned gas transmission pipeline.

Passing water pipelines across the railway line may damage the sustainability of the railway subgrade if the pipelines are built after the rehabilitation of the railway line.

Table below shows the water supply pipelines that cross the railway line, as well as the way the design has taken into consideration these water pipelines.

Table 6-126_Designed solutions related to the crossed water supply pipelines

No	Location	Water pipe diameter (mm)	Designed solution
1	Km 68+410	22	Diverted at Box culvert; 1.5x2m at km 68+380
2	Km 68+460	40	Diverted at Box culvert; 2x2m at km 68+420
3	Km 93+600	200	Added new culvert at km 93+600 for the water pipe
4	Km 122+560	75	Diverted at Culvert 2x2m at km 120+670
5	Km 112+600	50	Added new culvert; 1.5x2m at km 112+600 for the water pipe
6	Km 113+300	90	Diverted at Culvert; 1.5x2m at km 113+340
7	Km 114+560	65	Diverted at Culvert; 1.5x2m at km 114+580
8	Km 116+025	75	Diverted at Culvert; 1.5x2m at km 115+845
9	Km 116+565	90	Diverted at Upgraded bridge; L=5m; at km 116+477
10	Km 117+150	110	Added new culvert at km 117+150 for the water pipe
11	Km 118+455	50	Diverted at Culvert; 1.5x2m at km 118+463
12	Km 122+820	90	Diverted at Culvert; 1.5x2m at km 122+668
13	Km 132+290	80	Added new culvert at km 122+290 for the water pipe
14	Km 136+170	50	Diverted at New Bridge; L=20m; km 186+030

Figure below show two examples of water supply pipeline diversion.

Figure 6-204_Diverting water supply pipelines. Left: through a culvert; and Right: through a bridge

Power and telecommunication lines located near the railway line may constitute a risk for the future electrification of the railway line. Besides, an optical fibre backbone with being laid in the railway track to ensure telecommunication among the stations, as well as signalling for level crossings at the open line, which will be protected by autonomous automatic protection systems.

As mentioned in section 5.2.13, there is no transmission power line in the close vicinity of the railway line, and therefore there is no expected cumulative impact with the power lines.

Anyway, before construction activities, the project's developer and the construction company will check out if the railway line is crossed by any distribution power line, telecommunication cable and/or line, or any water distribution pipeline.

Suggested mitigation measures: Mitigation measures will include the following:

- Provide advanced coordination during construction phases, with municipalities, local community, and related institutions/agencies dealing with the infrastructure utilities;
- Maintaining utility connection in a temporary location;
- Minimizing the time without service,
- Installing alternative or new service before disconnecting the existing services; and
- Allowing service disruption only during periods of non-usage or minimum usage.
- Divert the water pipeline at the closest culvert (e.g. km 68+410) or bridge (e.g. km 116+565). If there is no any culvert/bridge in the vicinity, then design new culverts for the crossing of the water pipes (e.g. km 93 +600 and km 117+150).

In any case, good coordination with the due institutions, local governments, and the local community can completely avoid any accidental impact on any longitudinal underground infrastructure.

In conclusion, no significant impacts on the infrastructure utilities during the construction stage are expected.

6.2.12.2. Operation and maintenance

No adverse impacts on the infrastructure utilities are expected during the operation phase.

6.2.13. Landscape and visual issues

Due to the lack of landscape mapping, the landscape and visual issues are assessed concerning the Project's components and activities. The landscape characteristics within the project area are described in section 0 of the baseline information. The potential impacts to the landscape are described hereinafter in the function of the locations of the railway line components and the natural and cultural values of the project's area.

During preconstruction and construction, the landscape and visual amenity will be affected from the vegetation clearing and earthworks for service roads and drainage channels; the construction of work camps; circulation of heavy trucks; the presence of construction engines and activities across typical agricultural areas, etc.

It is not planned neither any eventual access roads nor any service road within the only shrubby and forested area crossed by the railway line (from km 132+500 to km 137+750). The other part of the railway line crosses only agricultural land and urban areas. The railway line is located sufficiently far from the cultural heritage sites that have also tourist values.

6.2.13.1. Design, preconstruction, and construction stages

Source of impacts and potential impacts: During preconstruction and construction stages, the landscape and visual amenity can be affected by the following:

Demolition of stations, bridges, culverts

The demolition works will temporarily affect the visual amenity. As a mitigation measure, it is suggested to remove the ruins of these objects as soon as possible. The station sites should be fenced. As a result, the impact of demolition works on visual amenity can be evaluated as temporary and mitigable, and therefore there are not expected residual effects.

Construction of the stations' bridges, culverts, retaining walls, and underpasses to replace the demolished ones

The reconstruction of the existing stations' bridges, culverts, retaining walls, and underpasses affects the landscape during the whole construction phase. The mitigation measures include the fencing, wherever possible, of the working area around the stations and bridges. During the construction works within the urban areas, the transport vehicles should circulate inappropriate hours of the day, etc.

Construction of new railway components.

The construction of the planned new project's components that may affect the visual amenities include:

- New freight station in the north of Lezhë, in an area currently used as agricultural land
- Some new underpasses;
- New service and connectivity roads; and
- The fencing of the railway line

The expected adverse effects on visual amenities will be temporary and will last only during the construction stage, excepting the following project's components:

- New Lezhë freight station in the middle of an agricultural area;

- The increase of the railway line vertical alignment from km 70 to km 80 across the agricultural area. This increase will be from 30 to 100cm;
- The increase of the railway line vertical alignment from km 30 to km 41 across the agricultural area. This increase will be up to 70 cm;
- New service and connectivity roads through agricultural areas;
- The fencing of the railway line

The expected impacts of the above-mentioned project's components on visual amenity will be permanent, of the local extent and low magnitude, resulting in an overall low significance.

Earthwork for improving the horizontal and the vertical railway alignment

The residual effects that are linked to the changes of landforms concern the increase of the railway line vertical alignment from km 70 to km 80 and from km 20 to km 40 across the agricultural area.

The effects of the earthworks for improving the vertical and horizontal railway line alignment and the related transport activities last only during the construction period. They cannot be avoided but can be reduced by performing construction works as soon as practicable, rehabilitating the old tracks of the horizontal alignment, using the existing local roads as access roads, etc.

The impact of the vertical and horizontal line improvements on visual amenity can be evaluated as temporary and mitigable, and therefore there are not expected residual effects. As per the impacts on the landforms, the expected potential impacts can be evaluated as insignificant because of the following:

The vertical increase of the railway line will be done in the sections from km 70 to km 80 and from km 28 to km 40 where the railway line runs across agricultural lands. As the railway line already exists and the horizontal alignment will be raised from 30 to 100 cm, the overall impact on landform can be evaluated as insignificant to low significance.

Landscape and protected areas and natural heritage

The effects on landforms and visual amenities that can be associated with the protected areas and natural heritage within the wide project's area concern overall the NMR of Shkoder Lake, which eastern edge of the terrestrial part is already crossed by the railway line. Hereinafter are assessed the status and location of the protected areas and the natural heritage sites within the wide project's area, as well as any eventual impact on the landscape.

- Nature Managed Reserve of Shkoder Lake:
    - The railway line has been build 20 years earlier than the proclamation of this area as a Nature Managed Reserve.
    - The railway line runs on the eastern edge of the terrestrial part of this NMR.
    - The railway line belt on both sides of the railway is not covered by shrubs and forest;
    - It is planned neither any eventual access roads nor any service road within the only shrubby and forested area crossed by the railway line (from km 132+500 to km 137+750);
    - The Project design do not foresee any change in railway line horizontal or vertical alignment within the borders of this protected area;
    - Bajze station, which will be rehabilitated, is surrounded by agricultural lands;

- Because of the topography and the geographical distance from the lakeshore, the railway line is not visible from the tourist zones of the lakeshore. The most visited zones of the lakeshore are as follows:
- Shiroke and Zogaj are located on the opposite shore of the lake, roughly 7 km from the railway line (Km 102 of the line);
- Syri Sheganit Nature Monument is located 2km from the railway line. The line is not visible from this hydro monument because of the topography. The same can be said for the karst lakes of Hurdhana 1 and 2, respectively, which are located 1.7 km from the railway line.

Thus, the relationships between the landscape, the NMR of Shkoder Lake, the natural heritage within this NMR, and the Project's components and activities, results insignificant.

- Other protected areas and natural heritage sites

  The visual amenity of the railway line from other protected areas and natural heritage sites located within the wide project area is rather low and therefore is it not expected any adverse impact related to this environmental topic.

Landscape and cultural heritage and tourist sites

Maps 10.1 and 10.2 (maps of cultural heritage monuments and zones, respectively – separate files in pdf format) shows the distance of the cultural monuments/sites from the railway line.

- Concerning cultural heritage sites/objects that have also tourist values, the following can be said:
  - *Shkoder city:* The railway line is not visible from the historical/archaeological heritage sites/monuments of Shkoder city. The only cultural heritage site located close to the railway line is the historical cemetery of Rrmaji, in Shkoder. The distance from the ancient castle of Rozafa (Shkoder castle) to Kiri River Bridge and Shkoder station is located 2.9 and 3.0 km in a straight line, respectively. Furthermore, Shkoder station is not visible from the castle because of the hilly terrain situated between them. The railway station and the main bridges are not visible from other cultural heritage sites/monuments. Thus, in general, the impact of the railway line rehabilitation on the visual amenities within the territory of Shkoder town can be evaluated as insignificant.
  - *Lezhë city:* The railway line and Lezhë's Drini River Bridge is visible from the ancient castle. The closest distance between the castle and this bridge is roughly 800m in a straight line. While the distance between the bridge and the ancient historical center of the city is roughly 350 m. The heart of the historical center of the city is the ruins of the historical church where is buried the national hero (Gjergj Kastrioti, called Skanderbeg). The visibility of the bridge from this church is low. Thus, in general, the impact of the railway line rehabilitation on the visual amenities within the territory of Lezhë town can be evaluated as low to insignificant.
  - *Preza castle:* Preza castle is located approximately 1.0 km from the railway line (km 26+000 of the line). The visibility is generally low and therefore the expected impact on visual amenity can be evaluated rather as insignificant.

As a result, the relationships between the landscape and the cultural heritage and tourist sites within the wide project's area, and the Project's components and activities, results insignificant.

Mitigation measures:

The mitigation measures to reduce any potential effect on the landscape, during the construction phase, include:

- Quick removal of the material resulting from the demolition of stations, bridges, and culverts;
- Reducing as much as practicable the working strip;
- Fencing the stations during construction works;
- Choosing appropriate colours for the fencing and the stations;
- Wherever possible planting trees around the stations.

6.2.13.2. Operation and maintenance

Once the construction works are done some of the expected effects on the landscape will be positive, while others will be negative.

Residual negative impacts and proposed mitigation measures:

- Presence of the new Lezhë freight station in the middle of an agricultural area. This impact is probable, of the local extent and low magnitude. It can be mitigated by planting trees around three sides (excepting the front side – western one) of the station. Once the mitigation measures are undertaken, the overall impact can be evaluated of low significance.
- New service roads through agricultural areas. This impact can be evaluated as probable, of the local extent, and low magnitude. It cannot be mitigated. However, their overall impact can be evaluated of low significance.
- Presence of fencing in both parts of the railway line. This impact can be evaluated as probable, of the local extent, and low magnitude. It can be mitigated by choosing the appropriate design and colours for the fencing. Once the mitigation measures are undertaken, the overall impact can be evaluated of low significance.
- Improvement of the horizontal and vertical railway line. This impact can be evaluated as probable, of the local extent, and low magnitude. It cannot be mitigated. However, their overall impact can be evaluated as low significance to insignificant, as the railway already exists.

Residual positive impacts

The residual positive impacts on the landscape issues are mostly associated with the visual amenity, as follows:

- The visual aspect of the railway station buildings will be much better compared to the existing ones. This impact can be evaluated as probable, of the local extent, and low magnitude. However, their overall impact can be evaluated of low positive significance.
- The visual aspect of the improved and secured level crossings and the newly improved service roads, bridges, underpasses, and drainage channels will be much better compared to the existing ones. This impact can be evaluated as probable, of the local extent, and low magnitude. However, their overall impact can be evaluated of low positive significance.

6.2.14. Cultural Heritage

6.2.14.1. Design, preconstruction, and construction stages

Design stage and ESIA preparation

Within the whole project area, there are several known and recorded historical and cultural heritage sites or objects.

According to EBRD PR8 (Cultural Heritage), “the client will carry out meaningful consultation and information provision in respect of the project with all key stakeholders with the view of:

- identifying cultural heritage likely to be affected;
- understanding the significance of cultural heritage to stakeholders, including local communities;
- assessing the impacts and risks; and
- applying mitigation hierarchy; and (e) identifying opportunities for potential community benefit.

According to Law 17/2018 “On the cultural heritage and Museums”, before starting the construction works approval of the Archaeological Survey Agency (ASA) is required. This approval must be preceded by an overview of the existing cultural heritage and archaeological sites near the railway line.

The Consultant has identified all the known cultural heritage sites/objects within the Project area. The expert engaged for this task is a licensed archaeologist. Besides, in all the affected municipalities the responsible persons for the cultural heritage have been consulted.

The nature of the impact of the proposed project upon the heritage resource has been assessed using a number of criteria:

- Heritage Sensitivity
    - Each of the sites within has been awarded an initial judged level of sensitivity; either High, Medium, Low or Uncertain, based on data retrieved from the sources outlined above. This is intended to provide a framework for comparisons between different sites. The categories do not reflect a definitive level of importance or value of a site, but a provisional comparative sensitivity based on criteria such as the site’s current status, the current knowledge about it, its survival and future potential, etc. The result is an analytical tool which may inform later stages of archaeological/heritage assessment and mitigation of the resource of the project.

Table 6-127 Heritage sensitivity

Heritage sensitivity	*Examples*
High	Internationally and nationally important resources including: • World Heritage Sites; • Scheduled Monuments; • Listed buildings; and • Registered Parks and Gardens.

Medium	Regionally important resources of a well defined extent, nature, date and significance
Low	Locally important resources
Unknown	Resources of uncertain character, extent and/or date

- Impact magnitude:

The potential impact has been assessed on the project construction footprint. The magnitude of impact has been graded according to the scale outlined in Table 4 below.

Table 6-128 Magnitude of impacts

Impact Magnitude	*Description*
Large	Complete destruction of the site or feature. Change to the site or feature resulting in a fundamental reduction in our ability to understand the resource and its historical context and setting
Moderate	Change to the site or feature resulting in an appreciable reduction in our ability to understand the resource and its historical context and setting
Small	Slight change to the site or feature resulting in a small reduction in our ability to understand the resource and its historical context and setting
None/Negligible	No material change to the site or feature. No real reduction in our ability to understand the resource and its historical context and setting
Unknown	The extent or nature of the deposits is unknown, or construction techniques have not yet been determined

There are two categories of potential impact of the proposed project upon the archaeological/cultural heritage resource:

- Direct. A direct physical impact on the resource by the project construction, including both the severance and complete removal of deposits; and
- Indirect. Adverse impacts to the visual setting of the resource by the project construction (a temporary impact), or disturbances through factors such as vibration, changes in hydrology, etc.

The majority of the project impact will be a direct impact occurring during its construction phase, including topsoil stripping of the construction areas, movement of heavy machinery, excavation of the cable trench and reinstatement. Other impacts may include temporary compounds, borrow pits, and access zones, the exact location and extent of which are not yet known.

- Significance of impact

The significance of the potential impact of the project upon the known resource has been assessed by comparing the judged importance of an individual site against the magnitude of the impact upon it. The significance of impact has been graded according to the scale detailed in Table 3 below.

Table 6-129 Significance of impacts

	High Sensitivity	Medium Sensitivity	Low Sensitivity	Unknown Sensitivity
Large Impact Magnitude	Very Significant	Significant	Moderate	Unknown
Moderate Impact Magnitude	Very Significant	Significant	Moderate	Unknown
Small Impact Magnitude	Significant	Moderate	Minor	Unknown
None/Negligible Impact Magnitude	None/Negligible	None/Negligible	None/Negligible	Unknown
Uncertain Impact Magnitude	Unknown	Unknown	Unknown	Unknown

Significance of impact to cultural heritage is measured as a product of the importance of a specific cultural heritage site and the magnitude of the impact on that site. Significance of impact, except for intangible heritage impacts, is judged based on international heritage preservation and academic standards and must be validated by the appropriate national authorities and by local community stakeholders. Direct physical impacts are typically irreversible and spatially discrete.

Potential Impacts

Cultural heritage sites are highly vulnerable and sensitive to Project activities, particularly construction activities. Project activities may produce impacts that affect the quality, character, function, or appearance of cultural heritage sites. Four mechanisms that have the potential to significantly impact cultural heritage sites are:

Direct physical disturbance to sites during construction;

Indirect physical impacts, such as vibration and pollution from 1) construction activities such as blasting or pile hammering, 2) the movement of heavy vehicles and equipment and 3) negative effects on the setting or ambience of cultural heritage sites during the operations phase (e.g. noise from compressor stations near a place of worship);

Blockage of user access to sites; and

Negative effects on setting and ambience of sites.

Direct Physical Impacts

Physical disturbance is most likely to occur as a result of earth-moving activities during construction. Such impacts are spatially discrete and typically irreversible. This type of impact could diminish or eliminate the scientific, cultural, or historical value of a site by disturbing structures and artefacts. Physical impacts will also compromise the integrity of spatial and/or stratigraphic relationships of artefacts, features and/or the landscape of the site. Such impacts could be caused by the inadvertent excavation or grading of the site or by the compression or distortion of the site associated with heavy vehicle traffic, especially under wet ground conditions. Artefacts from the disturbed portion of such a site, even if recovered intact, will be of greatly reduced scientific value. Damage to monuments or sites with ICH value could cause stakeholder and/or government approval issues.

Indirect Physical Impacts

This type of impact is applicable to sites with above-ground features or standing structures, such as walls, buildings or standing monuments. Indirect physical impacts, such as vibration and pollution, could diminish the scientific, historical or aesthetic value of a site by affecting the state of preservation and the quality of a site. Vibration and pollution may be caused by the movement of heavy vehicles and equipment and certain construction techniques such as blasting and pile hammering. For example, if heavy equipment and vehicle traffic occur too close to a site, the nearby vibration and pollution from equipment and vehicles could affect the quality, appearance and preservation of a site.

Blockage of User Access

This type of impact is applicable to sites with ICH value, monuments, and archaeological sites that receive public visitors. Project construction activities or logistic sites could potentially block pedestrian or vehicular access to cultural heritage sites that are important to local or international visitors.

Negative Effects on Site Setting and Ambience

This type of impact is applicable to sites with ICH value, monuments, and archaeological sites that receive public visitors. Project construction activities or logistic sites could interfere with the character of the setting with noise, dust and the movement of vehicle, equipment and personnel. The Project also has the potential to alter the physical appearance of the landscape around cultural heritage sites, which may detract from a site's value.

Significance of impact to cultural heritage is measured as a product of the importance of a specific cultural heritage site and the magnitude of the impact on that site. Significance of impact, except for intangible heritage impacts, is judged based on international heritage preservation and academic standards and must be validated by the appropriate national authorities and by local community stakeholders. Direct physical impacts are typically irreversible and spatially discrete.

Preconstruction and construction stage

Potential impacts: Damage to cultural heritage from earthworks for the construction of the railway line, stations, service roads, and level crossings; circulation of heavy trucks over the known and not yet discovered cultural objects/sites, etc. The adverse impact on these objects/sites would be high, irreversible, permanent, and of regional to national importance.

Suggested mitigation measures: The correct evaluation of the potential impacts on cultural heritage often represents a challenge. That is why it is compulsory to engage an archaeologist during construction works. Both the EBRD PR 8 and the Albanian Law 17/2018 require the application of the "chance find procedure". All contractual personnel will be trained to stop all activities if any valuable historical or pre-historical items are found. If this happens, construction will not begin again until authorized by the competent public institution for the protection of cultural heritage.

Some parts of the project area, especially in Lezhë territory have a rich discovered cultural heritage. Based on the history of this ancient town (VIII century BC), as well as in its geographical position and landscape, the probability of the presence of non-discovered archaeological sites/objects may be significant.

Consequently, the potential impacts of the project on cultural heritage may be characterized as follows:

- There is no formally known cultural heritage site/object within the railway line, stations, and service road sites' locations. Thus, the potential impacts as low.and

- Based on the existing cultural heritage, the history of Lezhë, Shkoder, and Malësia e Madhe territories, and on the geographical features of this area, it is expected that there is a medum potential for unknown archaeological sites/ if any ground breaking activity occurs outside of the project footprint.
- The potential impact for noise, vibration and dust for the ICH Catholic cemetery is high and appropriate mitigation will be needed in stakeholder consultation with the community.

Therefore, the likely impacts might be evaluated of low probability, low to moderate magnitude, and national extent. In this case, the significance would be low to medium, the extent would include the national scale, because of the particularities and importance of Lezhë's history and cultural heritage at the national level and further on.

As a conclusion, the potential impacts on the formally known cultural heritage can be evaluated of low.

There is a high potential impact for the ICH Catholic cemetery.

The possibility that the construction work may uncover encounter chance finds during work should not be discounted.

It is recommended archaeological monitoring is undertaken during any groundbreaking activities and should be included as an integral part of the development process of this project. A cultural heritage management plan CHMP should be implemented in advance of construction with a Chance Find Procedure which will be implemented for the Project construction activities.

6.2.14.2. Operation and maintenance

No adverse impacts on cultural heritage during the operation phase are expected. However consideration for noise, dust and vibrations will need to be applied for the Catholic Cemetery.

The operation of the trains for passengers will increase the visits to the cultural heritage sites, especially within the archaeological parks of Lezhe and Shkoder and other historic sites/monuments, such as the church (in Lezhe) where the Albanian national military commander Skanderbeg is buried, the castles of Preze (Vore Municipality), Kruje, Lezhe and Shkoder.

6.2.15. Waste generation

6.2.15.1. Design, preconstruction, and construction stages

The main source of waste generation will be construction activities and the workforce during the construction stage. The fractions of waste that will be created are concerning the types of materials and equipment to be used during the construction activities (earth and concrete works, electro-mechanical works, installation works, etc.).

Appropriate filling material must replace the removed one and therefore quarries and/or gravel pits for extraction of the filling material (embankment and ballast) and concrete production are necessary. These raw materials are also needed for increasing the height of the embankments in the section Lezhë-Baqel (km 69+500 to km 80+800), to avoid any eventual railway line inundation (see section 6.2.8).

The extraction of filling material, including the selection of the related quarries and/or gravel pits are discussed in the Geological Report. It should be underlined that all the existing filling material will be reused, after mixing it with crushed stone.

Other sources of solid waste are the demolition of the existing bridges, which will generate a considerable amount of concrete and metallic waste. The removal of the rails and sleepers will produce metallic, concrete, and wood waste. It should be underlined that only a small amount of the existing sleepers is in concrete because the main part is in wood.

As technical routine maintenance of construction machinery and transport vehicles will not be conducted within the construction zones, no generation of waste that is characteristic for this type of activity (used tires, batteries, oils, etc. from vehicles) is expected.

Fuel storage facilities would not be necessary and therefore would not be provided within any construction areas or contractor's compound.

The workers will produce packaging and sanitary wastes during their stay on construction sites. The packaging waste is municipal waste and according to its composition is similar to the waste from the households.

Any eventual vegetation clearing within the working strip will generate organic waste, which is composed mainly of branches that will be retained and redistributed on the site that would allow production of nutrient that will facilitate the natural regeneration of the working strip.

The table below gives an indicative overview of the expected types of waste generated during the construction activities. This list is systematized according to the classification of the European Waste Catalogue[288] and the Albanian Catalogue of Waste[289]. Both these catalogues are identical.

Table 6-130_Expected waste types during the construction phase

Waste type	Description of waste type	Comment related to the Project (source of waste generation)
Group 01 – Waste resulting from exploration, mining, quarrying, and physical and chemical treatment of minerals		
01 05 04	Drilling muds and other drilling wastes (Freshwater drilling muds and wastes)	Drilling geotechnical boreholes
Group 02 – Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing		
02 01 07	Waste from forestry	Any eventual vegetation clearing
Group 13 – Oil waste and wastes of liquid fuels		
13 02	Waste engine, gear, and lubricating oils	-Drilling engine; -Dredging engines; -Construction engines; -Transport vehicles

288 https://ec.europa.eu/environment/waste/framework/list.htm

289 Vendimin e Këshillit të Ministrave nr.09/2018 "Për miratimin e katalogut Shqiptar të Mbetjeve"

Waste type	Description of waste type	Comment related to the Project (source of waste generation)
Group 15 – Packaging waste		
15 01	Packaging waste, paper, and cardboard, plastics, wood, metal, composite packaging, glass, etc.	-Workforce; -Work camp; -Construction of the stations' buildings
Group 17 – Construction and demolition waste		
17 01	Concrete, bricks, tiles and ceramics	-Demolition of the bridges and culverts; -Construction of new bridges and culverts -Demolition of stations' buildings; -Construction of new stations buildings
17 04	Waste from metals	-Removal of the existing rails; -Construction of the stations' buildings; -Construction of covered parking areas; -Fencing the railway line and stations;
17 05 04	Waste from land excavation	-Earthworks for railway line embankment; -Quarries for filling material; -Earthworks for service roads; -Earthworks for stations rehabilitation; -Earthworks for Lezhë2 station construction; -Earthworks for construction of underpasses and any new passenger overpass
17 09 04	Other construction waste (mixed waste)	-Work camps; -Construction of the stations' buildings

Sources of impacts

Based on the table above, the sources of the potential impacts can be summarized as follows:

- *Wastewater:* oil, fuels, greases, paints, etc.; and sewage generated from construction activities, including the workforce.
- *Solid waste:* Soil and rocks, vegetation, metallic, concrete and woody waste, limestone, sand and gravel, packaging waste, which are included in the category of solid wastes;
- *Hazardous waste:* Oils, fuel, grease, paints, etc., which represent the category of hazardous waste, deriving from construction activities.

Potential impacts

The main potential impacts include the following:

- *Wastewater:* Temporary impacts on the terrestrial and aquatic biodiversity, ground and surface waters, soil quality, and the health of workers and local population.

The main sensitive receiving environments that can be affected from the wastewater include:

  - The ground waters at the crossing of Mati River (km 55+000 to km 56+000). The riverbed at the Mati Bridge is a recharge area, and therefore there is a risk of pollution for ground waters;
  - The ground waters from the crossing of Kiri River to (km 103+000) to the crossing of Përroi Thatë (km 127+000). The ground waters are used for supplying in drinking water the local population through hydrogeological wells;
  - The ground waters within the Shkoder city area. Some hydrogeological wells supply Shkoder and its neighbourhoods in drinking water.
  - The quality of the Shkoder Lake water because of the presence of the permeable Quaternary cover layer from Shkoder to Aliaj Village (roughly at km 129+000).
  - The quality of Shkoder Lake water because of the good hydraulic connection between this Lake and the limestone geological formations from Aliaj Village to Hani Hotit (km 129+000 to km 140+000).
  - The quality of the Syri Sheganit Nature Monument (hydro monument) and that of other karst springs (Syri Zi, Hurdhana 1, Hurdhana 2, etc.), because of the good hydraulic connection between these springs and the limestone geological formations over which runs the railway line (approximately from km 129+000 to km 132+000).

- *Solid waste:* Temporary impacts on the aesthetics, biodiversity, water resources, soil quality, traffic and tourism.

The main sensitive receiving environments that can be affected from the solid waste include:

  - The terrestrial part of the NMR of Shkoder Lake;
  - The towns of Shkoder, Lezhë and Mamurras;
  - The working strip located joint to the national road;
  - The forested area crossed by the railway line;
  - The cultural monument of Rrmaji, Shkoder;
  - The river and streambeds where the existing bridges will be rehabilitated (Mati, Drini and Kiri Rivers Bridges) or new bridges will be built (Ishmi, Droja, Lezhë's Drini, Gjadër; and Rrjolli and Përroi Thatë Streams)

- *Hazardous waste:* Temporary impacts on the terrestrial and aquatic biodiversity, ground and surface waters, soil quality, and the health of workers and local population.

The main sensitive receiving environments that can be affected from the wastewater are identical to those related to the pollution from the wastewater.

Mitigation measures

EBRD PR3 requires the strategy concerning the waste generated during preconstruction and construction activities to include290:

- Avoid or minimise the waste generation;

290 https://www.ebrd.com/news/publications/policies/environmental-and-social-policy-esp.html

- Reuse, recycle or recover or reuse waste as a source of energy; and
- Treat and dispose of waste in an environmentally sound manner.

The mitigation measures include the following:

Wastewater

The construction company should implement an Environmental Mitigation Plan (EMP) for waste water, which must be prepared prior to the construction period, in compliance with the EBRD PR3, the Law No 9115/2003, "On environmental management of the waste water", as amended by the law 07/2018, which is in compliance with the Water Framework Directive (2000/60/EC)[291] and especially the Urban Waste Water Directive[292].

The wastewater resulting from the Project's activities include mainly the sewage generated by the work force and the use of concrete for different railway line components (bridges, culverts, stations' buildings, retaining walls, noise barrier foundations, etc.).

As the work camps will be installed within the existing stations, the waste water generated by the workforce will not be a problem of concern, because the existing stations are already connected to the sewage system. Besides, in each station there are impermeable places that will used to park the working machinery whenever necessary. In these impermeable places, special spaces must be reserved for any container of hazardous liquid substance for the working machinery such as fuel, oil or grease.

Portable toilet cabins must be installed through the railway sections located far away from the work camps and the urban areas. These sections are as follows:

- All the main bridges locations. The portable toilet cabins must be installed outside of the rivers and streambeds. The location of these bridges is as follows:
    - Ishmi River Bridge (km 35+100);
    - Droja River Bridge (km 41+800);
    - Mati River Bridge (km 55+500);
    - Lezhe's Drini River Bridge 1 (km 67+700);
    - Lezhe's Drini River Bridge 2 (km 69+650);
    - Kiri River (km 103+000);
    - Vraka Channel (km 111+530);
    - Rrjolli Stream (km 118+000);
    - Banushi Stream; (km 121+000); and
    - Perroi Thate Stream (km 127+050);
- In the open line sections crossing agricultural areas and far away from the urbanized areas. The indicative locations within these sections include:
    - Section from km 30+000 to km 35+000: the portable toilets could be placed at the planned level crossings (km 31+ 930 and km 33+130);
    - Section from km 58+000 to km 66+700: the portable toilets could be placed at the planned level crossings (km 58+ 500, km 59+480, km 60+ 860, km 63+ 600, km 65+ 080 and km 65+800);

291 https://ec.europa.eu/environment/water/water-framework/index_en.html

292 https://ec.europa.eu/environment/water/water-urbanwaste/index_en.html

- Section from km 70+000 to km 94+000: the portable toilets could be placed at the planned level crossings (km 72+ 130, km 74+000, km 75+ 900, km 76+ 860, km 78+ 140, km 79+ 860, km 81+ 920, km 82+980, km 84+ 400, km 85+ 730, km 87+000, km 88+210, km 90+200, and km 92+230);
- Section from km 70+000 to km 102+000: the portable toilets could be placed at the planned level crossings (km 72+ 130, km 74+000, km 75+ 900, km 76+ 860, km 78+ 140, km 79+ 860, km 81+ 920, km 82+980, km 84+ 400, km 85+ 730, km 87+000, km 88+210, km 90+200, km 92+230 and km 99+680);
- Section from km 108+000 to km 118+000: the portable toilets could be placed at the planned level crossings (km 109+ 430, km 110+520, km 111+ 600and km 112+ 600, km 114+550, km 115+830 and km 117+140);
- Section from km 119+500 to km 127+000: the portable toilets could be placed at the planned level crossings (km 120+ 560, km 121+950, km 122+ 560 and 125+200);
- Section from km 127+000 to km 131+000 (Bajze station): the portable toilets could be placed at the planned level crossings (km 128+ 160 and km 129+890);
- Section from km 132+280 to km 135+700 (motorway underpass): the portable toilets could be placed at the planned level crossings (km 133+ 360 and km 135+210);
- Section from km 132+280 to km 135+700 (motorway underpass): the portable toilets could be placed at the planned level crossings (km 133+ 360 and km 135+210);
- Section from km 135+700 to km 139+000 (from the motorway underpass to Hoti Village): the portable toilets could be placed at the planned level crossings (km 136+ 160 and km 138+0300;
- Section from km 139+000 to km 140+000 (from Hoti Village to Hani Hotit): a portable toilets could be placed at km 139+000.

The sewerage of the portable toilets will be collected by sewerage trucks, which will be discharged to the sewerage systems of the crossed municipalities. The discharging places and other details will be defined in agreement with the crossed municipalities.

The transport trucks will be washed in the licensed places that do not belong to the Project;

The Constructor will avoid/minimize the discharge of the waste water into the soil and the surface waters; The concrete material for the bridges' piles and piers will be produced by licensed and specialised companies, which production facilities are licensed; The small bridges and the box and pipe culverts will be in precast that will be prepared in licensed places by licensed companies.

No concrete will be discharged outside the piers' formwork whether it will be necessary to use concrete for bridges foundations.

Solid waste

The temporary impacts of solid waste generated by the project activities can be mitigated by implementing an EMP for such types of waste, which must be prepared prior to the construction period, and in accordance with the EBRD PR3, the Law No. 9010/2003, "On environmental management of solid waste", as amended, which comply with the Directive 2008/98/EC "On Waste", as amended[293].

The Project design has planned to reuse the entire existing substructure filling material that will be removed. This material will be mixed with other one (crushed limestone) and will be reused to fill the railway subgrade. As the railway vertical alignment in some short sections will be increased and railway will be wider (6.6m) than the existing one (6.0m), all the existing filling material will be reused.

The concrete waste that will derive from the demolition of the existing bridges will be reused to fill the railway subgrade both sides of the new bridges. The concrete slippers also will be reused in the filling of the subgrade both sides of the new bridges when the vertical alignment will be higher than the existing one because of the increased conveyance of the planned new bridges.

Roughly, the only solid waste that cannot be reused is the waste resulting from the demolition of the stations' buildings, from which only a part of the bricks can be reused for construction purposes. Whether the solid waste cannot be reused by the Project, they can be used for different other purposes. The Municipality of Malesia Madhe proposed to use the concrete waste pieces for protection against erosion in the Perroi Thate and Banushi Streambeds.

The solid waste will be handled in close collaboration with the local governments (see section 5.2.16) and the Albanian Railways. In general, the solid waste than cannot be reused neither by the Project nor by the local governments will be disposed at the disposal sites defined by the municipalities.

All the wooden slippers will be transported initially to the closest stations. Then the Albanian Railways will find the best possible solution as follows:

- Treating the wooden slippers and then use them for generating energy or heating; or
- Transport them to the Elbasan incinerator, which generates electricity

The metallic material (rails, etc.) will be collected and sell by the Albanian railways or send to Elbasan furnace for smelting and producing iron.

Locals can use the waste resulting from vegetation clearing for heating or other domestic purposes. The vegetation clearing will be applied only in the railway section crossing shrubby and forest areas (from km 132+600 to km 138+000). The shrubs are composed mainly from the Oriental hornbeam and in a lesser scale from the Turkey oak, which are good for heating.

Hazardous waste

Leakage of fuels and oil from the transport trucks and working machinery and paintings for the new stations' buildings constitute the hazardous waste. The transport truck will be supplied in fuel in the licensed places. Fuels and oil for the working machinery will be stored in impermeable places. Any accidental leakage of fuel or oil will be collected and transported at the licensed facilities. The same will be applied concerning the leakage of paintings.

The temporary impacts of hazardous waste generated by the project activities can be mitigated by implementing an EMP for hazardous waste, which must be prepared prior to the construction period, and in accordance with the: EBRD PR3; the Law 9010/2003, "On environmental management of solid waste"; Law 9537/2006, "On hazardous waste management"; and the DCM 103/2003 "On Environmental Monitoring", which comply with the articles 17 to 20 of the Directive 2008/98/EC "On Waste", as amended[294].

293 https://ec.europa.eu/environment/waste/framework/

294 https://ec.europa.eu/environment/waste/hazardous_index.htm

The mitigation strategy and measures related to the potential impacts from wastewater and hazardous waste should be based on the Groundwater Directive 2006/118/EC, which has been developed in response to the requirements of Article 17 of the Water Framework Directive[295]. The design has already considered the reuse of the waste from land excavation and from demolition of the bridges and culverts.

Environmental benefits from waste management

Once the construction works are finished and all the above mentioned mitigation measures are undertaken, a short comparison between the existing situation and the situation after the rehabilitation of the railway line would be as follows:

- The existing wooden slippers that are impregnated by oil products will be replaced by more environmentally friendly concrete slippers;
- Any eventual small fuel or oil spot on the slippers surface will be removed because the slippers will be replaced;
- Solid waste remained in the freight stations will be removed;
- Any urban solid waste within the almost abandoned stations will be removed;
- The drainage system will be cleaned from the sediments and the vegetation; etc.

As a result, the Project will bring benefits concerning the situation of the waste compared to the existing situation.

Conclusion: Waste generated from construction activities will be significantly reduced. Waste impact, which would be temporary if necessary remediation actions are undertaken, can be evaluated of low probability, low to moderate magnitude and to an overall low significance.

6.2.15.2. Operation and maintenance

The table below gives an indicative overview of the expected types of waste generated during the operational stage. This list is systematized according to the classification of the European Waste Catalogue and the Albanian Catalogue of Waste.

Table 6-131_Expected waste types during operation and maintenance phase

Waste type	Description of waste type	Comment related to the Project (source of waste generation)
Group 02 – Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing		
02 01 07	Waste from forestry	Vegetation clearing for the maintenance of the drainage system
Group 13 – Oil waste and wastes of liquid fuels		
13 02	Waste engine, gear and lubricating oils	Waste generated from locomotives, cranes (at the freight stations), etc.
Group 15 – Packaging waste		
15 01	Packaging waste, paper, cardboard,	Waste generated from stations' employee and

295 https://ec.europa.eu/environment/water/water-framework/groundwater/resource.htm

Waste type	Description of waste type	Comment related to the Project (source of waste generation)
	plastics, wood, metal, composite packaging, glass, etc.	trains' staff
Group 17 – Construction and demolition waste		
17 04	Waste from metals	Rails' maintenance, parking areas, fencing, etc.
17 05 04	Waste from land excavation	Maintenance of the drainage channels;
17 09 04	Other construction waste (mixed waste)	Maintenance of the woody pieces (e.g. slipper's)
Group 20 – Municipal waste (+similar waste from the industry), including fractions of selected waste		
20 03 01	Mixed municipal waste	Urban waste generated within the stations
20 03 06	Waste from sewage cleaning	Generated from the trains' toilets

The mitigation strategy and measures are similar to those applied during the construction stage.

6.2.16. Occupational and Community Health and Safety

Occupational health and safety (OHS) aims at the anticipation, recognition, evaluation, and control of hazards arising in or from the workplace that could impair the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general environment296.

OHS includes laws, standards, and programs that aim at ensuring a healthy and safe working environment, a well-functioning working community, the maintenance of employees' working ability and functional capacity, and the promotion of their health.

6.2.16.1. Design, preconstruction, and construction stages

The construction period is estimated at roughly 36 – 42 months and will require the employment of about 2,000 persons. This estimation is based on the Durrës-Tirana railway line, which construction is planned to last roughly 24 months. The majority of the unqualified workforce will be hired from the local population.

For financial and practical purposes, the whole railway line could be split into four sections, the construction of which may be performed at the same time, for the whole line to be built within the practical time limits.

Any eventual use of blasting for demolishing the existing bridges is a source of danger. Operating with heavy machinery equipment and transport and handling of concrete pieces and rails also present serious dangers to the health of workers.

During the construction works, workers at the construction site will have to follow and comply with the regulations on occupational safety, as provided by the EU Directive 92/57 "On the

296 https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_093550.pdf

implementation of minimum safety and health requirements at temporary or mobile construction sites297", which prescribe:

- Keeping the construction site in good order and maintaining a satisfactory state of cleanliness;
- Choosing the locations of work camps concerning the easy access to these locations and determining routes or areas for the passage and movement of equipment;
- Specify the conditions under which various materials are handled;
- Perform technical maintenance, pre-commissioning checks, and regular checks on installations and equipment with emphasis on correcting any faults which might affect the safety and health of workers;
- Demarcate the areas for the storage of various materials, in particular when dangerous materials or substances are involved;
- Specify the conditions under which the used dangerous materials are removed;
- Specify the safe manner of storage and disposal or removal of waste and debris;
- Adopt measures based on progress made with the site, of the actual period to be allocated for the various types of work or work stages;
- Assure cooperation between employers and self-employed persons concerning occupational safety;
- Interaction with industrial or urban activities on the area within which or in the vicinity of which the construction site is located.

The Contractor will be obliged to develop and implement procedures to protect public health and safety. This will include an introduction of rules for workers and site security to prevent unauthorized access to active construction sites, workers' camps, transport vehicles, construction machinery, and equipment storage areas. The Contractor will prepare emergency response plans to respond to accidents and emergencies in a manner appropriate to the construction and operational risks. This plan will be based on the prior identification of major-accident hazards and will include measures necessary to prevent major accidents and to limit their consequences for local communities.

The potential impacts on community health, safety and security deriving from the above actions are associated with the following impact factors:

- Emission of dust and particulate matter;
- Emission of noise and vibrations;
- Increase of traffic;
- Influx of workers, increased incidence of communicable disease
- Risks associated with the presence of personnel on site (within the project area) and at offsite operations and activities (within the community).
- Risk of unauthorized access to the site.

Given the high external workforce in the area, the impact of the workforce on the local population and on the GBVH is considered to be high and mitigation measures should be taken to avoid or reduce impacts related to GBVH.

297 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31992L0057

There is also a risk of GBVH within the workforce, given the fact that in construction projects like this one, the majority of workers are likely male.

Some of the mitigation measures to comply with the risk associated with GBVH are as follows:

- Appoint a female CLO who will manage the possible cases related to GBVH;
- Mandatory and repeated training and awareness-raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women;
- Provide training to workers on the HSH Code of Conduct and policies related to the GBVH;
- Provide training and regular communications to human resources and/or other relevant persons (employees, supervisors, managers, and contractors) on understanding sexual harassment in the workplace, and on how to respond to allegations of sexual harassment in the workplace;
- Provide training to community liaison officers and/or other relevant persons on how to respond to allegations of GBVH perpetrated by employees and contractors in affected communities;
- Implement a confidential grievance mechanism for making anonymous reports of incidents of sexual harassment in the workplace;

Require all employees and contractors to sign the sexual harassment policy or commit to comply with this policy as part of the terms and conditions in their employment contract.

Transport safety practices will be adopted and implemented according to the Traffic Management Plan to prevent eventual traffic incidents and nuisance impacts on people.

Conclusion: The adverse impacts associated with occupational health and safety may be evaluated of low probability and significance and local extent if the related national standards and legislation and the best international practices are applied.

6.2.16.2. Operation and maintenance

Communities at or close to the railway line will mainly be disturbed by noise and vibration caused by train operation. This is expected to be more in the beginning until they have adapted to the changed living conditions associated with railway. During operation, community safety will be mainly endangered from the increased risks for accidents from unauthorized crossing of railway and electrification.

Mitigation measures proposed for Community Health, Safety and Security and mitigation measures elaborated under quality of life cover impacts related to the community reaction to the operation of railway.

In addition, during the operational phase electrification of trains will put more pressure on the electric power supply and diversions of utilities on local businesses and communities. In order to minimize negative impacts, the following measures will be taken before and during operation:

- Adequate electrification of railway to be done in order to avoid lack of electricity in the area.
- Adequate strengthening of the local electrical grid to support the electrification of railway and avoid any reduction in the availability of the communities/businesses to electricity in the area.

Maintenance activities of the trains/track or electrification system, which may potentially result in impacts such as on the occupational health and safety for the workers that will perform regular maintenance of the railway and public safety during the maintenance.

The railway operators (Albanian Railways) will develop and implement a Safety Management System for the operational phase that should be based on the EU Directive 2004/49 for Railway Safety, as amended that harmonised safety principles, including procedures for granting safety approval to railway operators and infrastructure owners.

This Directive aims to ensure the development and improvement of rail safety by:

- harmonising the regulatory structure in the Member States;
- defining responsibilities between the actors;
- defining common safety targets and common safety methods;
- establishing a safety authority and an accident and incident investigating body; and
- common principles for the management, regulation and supervision of railway safety.

Article 9 of the Directive requires establishing and implementing a Safety Management System in conformity with the national safety rules. This System shall ensure the control of all risks associated with the activity of the infrastructure manager or railway undertaking, including the supply of maintenance and material and the use of contractors. The safety management system shall also take into account, where appropriate and reasonable, the risks arising because of activities by other parties. It shall be developed with the aim of coordinating the emergency procedures of the infrastructure manager with all railway undertakings that operate on its infrastructure.

The railway operator should also develop and implement procedures to protect workers and public health and safety. The operator (e.g. Albanian railways) will prepare emergency response plans to respond to accidents and emergencies in a manner appropriate to the operational risks. This plan will be based on the prior identification of major-accident hazards and will include measures necessary to prevent major accidents and to limit their consequences for local communities. The occupational and safety of rail workers include workers vulnerability due to exposure to high voltage electricity, moving trains, poor environmental conditions (including adverse weather conditions and poorly maintained and disorganized office space), unsociable working hours, risk of slips and fall accidents, exposure to hazardous products, etc.

The EU Directive 92/57 regulations on occupational safety include298:

- Specify the conditions under which various materials are handled;
- Perform technical maintenance, pre-commissioning checks, and regular checks on installations and equipment with an emphasis on correcting any faults which might affect the safety and health of workers;
- Demarcate the areas for the storage of various materials, in particular where dangerous materials or substances are involved;
- Specify the conditions under which the used dangerous materials are removed;
- Specify the safe manner of storage and disposal or removal of waste and debris;

298 EU Directive 92/57

- Adopt measures based on progress made with the site, of the actual period to be allocated for the various types of work or work stages;
- Assure cooperation between employers and self-employed persons concerning occupational safety;

Other standards regarding the workforce include:

- Use equipment that is fit for its intended purpose;
- Before to start a job or go on or near the line, be sure the required plans and permits are in place;
- Never undertake any job unless you have been trained and assessed as competent.

Conclusion: The adverse impacts associated with occupational health and safety may be evaluated of low probability and significance and local extent if the related standards and the best international practices are applied.

6.2.17. Labour issues and working conditions

6.2.17.1. Design, preconstruction, and construction stages

The preconstruction and construction duration would require approximately 36 to 40 months. It is estimated roughly 500 workers are necessary for each railway line Lot, and therefore the total number of the workforce would be around 2000.

The construction companies and their employees would be obliged to follow the provisions of the various legal acts in the areas of labour and social protection legislation.

Measures need to be outlined in terms of the protection of employees including:

- Only qualified personnel undertaking tasks relevant to their duties;
- provision of suitable personal protective equipment;
- no activities to be undertaken in adverse weather conditions;
- provision of sanitary services and welfare amenities on-site; and
- risk assessments and identification.

These measures, together with the commitment to comply with EU standards and Albanian health and safety laws will provide the foundation on which the welfare of employees and workers' health and safety would be based.

Working conditions and work camps will be set in compliance with relevant EU and Albanian labour legislation. The work camps will be established on the existing railway stations, which have the necessary infrastructure concerning the power and water supply and the wastewater. The workers accommodation shall be fulfil the EBRD requirements that are expressed in a published guidance299 that is prepared by both the IFC and the EBRD. The accommodation for workers shall be appropriate, clean, and safe and, at a minimum, meet the basic needs of workers. In particular, the provision of accommodation shall meet national legislation and international good practice in relation, but not restricted, to the following:

- Provision of minimum amounts of space for each worker;
- Provision of sanitary and washing facilities and potable water;

299 https://www.ebrd.com/downloads/about/sustainability/Workers_accomodation.pdf

- Provision of fire safety and safety from or other hazards;
- Provision of first aid and medical facilities;
- Provision of heating and ventilation.

All contractors will be responsible for the Occupational Health and Safety Plan(s), which provides workers with a safe and healthy work environment. HSH will review and approve these plans and will be responsible for overseeing the contractor's performance. All workers will be trained in proper safety rules and procedures.

Workers Rights

As a result of the policies and procedures, workers' rights should be protected. However, issues with implementation and capacity may result in some breaches of workers' rights especially within the supply chain and amongst casual labourers.

If issues arise there is the opportunity for these to be identified and addressed through the worker grievance mechanism. However, individuals may be unwilling to report issues and as such breaches may go unnoticed.

No employee or job applicant will be discriminated against on the basis of his or her gender, marital status, nationality, age, religion or sexual orientation:

- In all contractor contracts, explicit reference will be made to the need to abide by Albanian law, international standards and HSH's policies in relation to labour and welfare standards.
- As part of the contractor and supplier selection process HSH will take into consideration performance with regard to worker management and rights as outlined in Albanian law, international standards and HSH policies.
- Implement a grievance mechanism open to employee and non-employee workers. Ensure that all workers directly and indirectly employed are informed on how to submit grievances.
- HSH will provide support to contractors and subcontractors to ensure that labour and working conditions are in line with Albanian law.
- Contractor contracts will specify that the same standards will be met by their subcontractors and suppliers.
- All workers (including those of contractors and subcontractors) will, as part of their induction, receive training on worker rights in line with Albanian legislation.
- All workers (including those contractors and subcontractors) will have contracts which clearly state the terms and conditions of their employment and their legal rights.
- Contracts will be verbally explained to all workers where this is necessary.
- All workers (including those contractors and subcontractors) will be able to join unions of their choice and have the right to collective bargaining.
- The worker grievance mechanism shall be open to the contractor and subcontractor workforce in the event that their grievance is not adequately resolved by their direct employer.

Conclusion: The adverse impacts associated with the labour issues and working conditions may be evaluated of low probability and significance and local extent if the related national standards and legislation and the best international practices are applied.

6.2.17.2. Operation and maintenance

Working conditions during operation are similar to the construction phase. Operation includes also some specific difficult working conditions such as the risk from high electric voltage, the risk from fast trains while working on the railroad, risk from the transport of hazardous substances (chemicals, liquid gases, petrol, etc.), the risk from fire (transport of ignitable products), etc.

The Albanian Railways and the employees would be obliged to follow the provisions of the labour and social protection legislation.

6.2.18. Accidents and Incidents of situation

6.2.18.1. Design, preconstruction, and construction stages

During project construction, the density of the built-up area should be observed within a bandwidth of 10 to 20 m on both sides of the railway line. There is no need for any working strip around the stations, which site construction will be fenced. The evaluation should be carried out for the characteristics of the environment, the distance between each populated area or object from the axis of the railway line and other facilities (residential or service and industrial areas), taking into account the potential for any eventual accident from construction machinery and transport trucks.

A Traffic Management Plan should be developed and implemented to avoid traffic incidents to the local community and workforce.

Impacts to surrounding communities will mainly have to do with risk of accidents with vehicles and people due to transport and traffic through the presence of trucks, heavy machineries and other machineries required during the construction phase. The potential impacts on transportation and traffic deriving from the above actions are associated with the following impact factors:

- Increase of traffic;
- Increased risk of road accidents;
- Interruption/limitation of infrastructures/services.
- Vibration and traffic increase in areas near the access roads that are going to be used.

Impacts will also be generated due to the need to transport materials and workers to and from the sites.

Another risk is presented by unauthorized access to work sites from residents or passers-by, which might lead to incidents. This risk is particularly relevant for children who out of curiosity might be willing to access the work site and risk falling into open trenches or be cause of other incidents related to construction works.

Specific mitigation measures will be implemented also in this case to reduce risks to the extent possible.

The workforce will be trained to avoid accidents and incidents during construction works. A Labour and Working Conditions Management Plan will prevent any accident and incident. The workforce will be equipped with Personal Protection Equipment (PPE) in the function of the type of construction activity.

An Emergency Preparedness and Response Plan will be developed and implemented to respond to every possible accident and incident.

A Community Health and Safety Management Plan will be prepared in detail and implements to address any eventual accident concerning the workforce and the locals. The main lines of this plan are already described in the ESMP.

The work camps and the working areas will be fenced to prohibit any intrusion of the locals and livestock. The work camps will be established in the stations areas that have the necessary infrastructure (electricity, water, sewage) and are fenced.

To avoid/mitigate the accident situations, it is suggested to apply the mitigation strategies and measures associated with the Occupational Health and Safety, and Labour issues and working conditions.

The ESMP includes the main lines of an Emergency Preparedness and Response Plan that will be developed in detail and implemented by the Contractor to respond to every possible accident and incident.

Mitigation measures: During the design and construction stage, the Albanian Railways will take into consideration the implementation of the applicable standards on the secured level crossings, the closure of the informal crossings, the fencing of the railway line and stations.

Avoidance:

- Avoid the routes that crosses sensible receptors like schools or hospitals or limit traffic at these receptors during day hours;
- Plan transportation routes in consultation with Municipalities, road department and Police;
- Avoid transport activities, particularly those involving heavy goods vehicles during peak hours (7:30-8:30 AM and 12:00-13:00 pm);

Minimization:

- Conduct a detailed traffic survey of the access roads to be used during construction. Specific focus, to assess any social risks along the selected transportation route. The data shall be used to avoid high traffic hours if the local communities and provide data for development of the TMP;
- Ensure that local communities are timely informed about road closures, works on roads or use of heavy good vehicles;
- Ensure that all Contractors and Subcontractors follow the TMP;
- Assessment of buildings and houses during preconstruction surveys to present in the proximity of the roads and access roads to be performed before the starting of the works and continuous monitoring of the buildings conditions is required and included in the TMP.
- Notify through local government all the habitants on the affected areas to coordinate the traffic flow for the local users;
- Plan and implement awareness campaigns on risks related to the traffic increase, especially in the schools present in the area;
- Place flagman for traffic management in sensible receptors like schools and health centers;

- Ensure that all drivers (both of Contractors and Subcontractors) receive induction and training on road safety rules.
- Frequent testing of drivers to eliminate drink driving, also check for use of seatbelts and identify speed limits that are monitored during the construction phase.

Conclusion: The adverse impacts associated with accident issues may be evaluated of medium probability and significance and local and regional extent, if the related national standards and legislation and the best international practices are applied.

6.2.18.2. Operation and maintenance

Overview of the potential accidents and incidents

According to the International Railway Safety Council, the main risks that can occur during the railway line operation and maintenance include300:

- Trains collision;
- Derailments;
- Level/grade crossing and trespass;
- Railway staff risks;
- Risks at stations;
- Transport of dangerous goods

Mitigation measures: During the design and construction stage, the Albanian Railways will take into consideration the implementation of the applicable standards on the secured level crossings, the closure of the informal crossings, the fencing of the railway line and stations, as well as on the new signalization system will avoid any eventual train collision and other accidents. All these elements (level crossings, fencing, signalization, etc.) will be appropriately maintained during the whole operation phase.

The Project's design has already considered all the TEN-T standards related to railway safety.

For the above-mentioned risks that can occur during railway line operation, the related mitigation measures include:

- Trains' collision can occur between two trains or between trains and infrastructure. Mitigation: The new signalling and communication system will avoid such incidents;
- Derailments are often related to technical failures such as poor track geometry, damaged or defective switches and crossings, wear and fatigue in the wheel-rail interface, vehicle suspension faults. Operator errors such as the incorrect setting of points, excessive speed, and poor driving behaviour can also result in derailments. Mitigation measures: The Project design has improved the horizontal and vertical alignment, the rails and other railway structure components will satisfy the European standards;
- Level/grade crossing. There is a multitude of scenarios in which accidents occur including road users who are unaware of the level crossing, distraction/inattention, failure of level crossing equipment, or a second train unexpectedly approaching the

300 https://international-railway-safety-council.com/common-risks-managed-railway-industry/

crossing. However, the most common accidents resulting from violations by road users ignoring the warning of approaching trains. Mitigation measures: All the level crossings from Vorë to Hani Hotit will be secured;

- Trespassers present a common risk, particularly in densely populated areas. Serious injuries and fatalities are common and whilst they do not represent a significant risk to passengers, such events cause both serious disruption and significant psychological trauma to the victim's family, railway staff, and emergency services who have to respond to them. Modern trains are quiet and trespassers often only realize the danger when it is too late. Mitigation measures: Fences, public announcements, education campaigns, and police patrols should be used to prevent trespassers. The Project design includes the fencing of the railway line from Vorë to Hani Hotit.
- Railway staff risks can cause staff injuries and fatalities. The most vulnerable are the track workers, who operate under the risk of moving trains and high voltage electricity. The prolongation of working hours can result in tiredness because of which the workers are more vulnerable to accidents. Mitigation measures: Improving workers' safety including the use of high visibility clothes, safe-working procedures on track, safety culture interventions, permits to work, and various technologies to warn workers of approaching trains.
- Risks at stations. The typical risks at stations include slips, trips, and falls (particularly on stairs and escalators) and boarding and alighting incidents at the interface between the train and the platform. Mitigation measures include the careful design of stations, clear signage, the use of video surveillance, etc. All the station buildings of the railway line Vorë-Hani Hotit will be designed to avoid/reduce as much as practicable these risks. Video surveillance is also included in the Project's design.
- Transport of dangerous goods: The transport of dangerous goods such as chemicals, petrol, liquefied gasses, nuclear waste, etc., require particular measures to control the risk such as improved maintenance of vehicles and track, routing away from heavily populated areas, and special handling and security. Requirements for the safe transport of dangerous goods by rail across borders are controlled by international laws.

Conclusion: The Project's design has already considered the TEN-T standards related to railway safety. As a result, the adverse impacts associated with accident issues during operation and maintenance may be evaluated of low to moderate probability and significance and of local extent, if the operational standards and the best international practices are applied.

6.2.19. Compliance with other plans/programmes/projects

The cumulative impacts may arise from the interference of the proposed project with other plans/programs projects within the same sector (transport) or the same project area.

Sources of cumulative impacts:

- The rehabilitation of the railway line is included in all the existing urban and transport national and municipal development plans (see section 5.2.18), and therefore do not contradict these plans. Consequently, no significant adverse cumulative impacts are expected to occur from the Project's development in combining with those plans.
- The rehabilitation of the railway line is included in the category of activities that are allowed by the Managing Plan of Shkoder Lake Nature Managed Reserve (see section 3.2.1.1 and Table 3-14).
- The rehabilitation of the railway line may interfere with the following projects:
  - Adriatic - Ionian Corridor (AIC), which is crossed at km 40+343. ;
  - Ionian Adriatic gas Pipeline (IAP), which is crossed at km 38+800; and
  - The planned eastern bypass of Shkoder, which will be crossed at km 102 +500 and 105+100.

6.2.19.1. Design, preconstruction, and construction stages

Potential cumulative impacts: The potential cumulative impacts that may arise from the interference of the above-mentioned plans/programs projects are as follows:

- The rehabilitation of the railway line is included with all the existing urban and transport national strategies, as well as in municipal general local development plans (see section 5.2.18 of the baseline information), and therefore does not contradict these plans. Consequently, no significant adverse cumulative impacts are expected to occur from the Project's development in combining with those plans.
- The rehabilitation of the railway line is included in the category of activities that are allowed by the Managing Plan of Shkoder Lake Nature Managed Reserve (see Table 3-14).
- The crossing of the railway line with the Adriatic - Ionian Corridor (AIC), the planned eastern bypass of Shkoder and the Ionian Adriatic gas Pipeline (IAP), would have the following potential cumulative impacts
  - Adriatic - Ionian Corridor (AIC), which is crossed at km 40+343. ;
  - Ionian Adriatic gas Pipeline (IAP), which is crossed at km 38+800; and
  - The planned eastern bypass of Shkoder, which is crossed at 102 +500 and km 105+100.

Proposed mitigation measures:

The Project is part of the existing urban and transport national and municipal development plans and therefore in compliance with them. Implementing the proposed project means implementing these plans, and therefore the cumulative impacts with these plans are positive, probable, of the national and municipal extent, and an overall moderate to high significance.

The Project is classified in the category of activities that are allowed by the Managing Plan of Shkoder Lake NMR (see section 3.2.2 and Table 3-14), and therefore it does not constitute a source of negative cumulative impacts if the necessary mitigation measures are undertaken.

As per the crossing of the infrastructure projects, the following can be said:

- Adriatic – Ionian Corridor (AIC): There is already built a road overpass, which also allows the railway line electrification and therefore no mitigation measures are necessary;
- The planned eastern bypass of Shkoder: According to ARA, the road bypass will overpass the railway line. The cross-section of the overpass will allow the electrification of the railway line. Thus, no mitigation measures are necessary;
- Ionian Adriatic gas Pipeline (IAP): A culvert to be built at the planned crossing of the gas pipeline with the railway line, and therefore no other mitigation measures are necessary.

Conclusion: The cumulative impacts associated with the above-mentioned plans/programs/projects during the construction phase can be evaluated as follows:

- Urban and transport national and municipal development plans: As the proposed project is an integral part of each of these plans, no adverse cumulative impact during the preconstruction and construction stage is expected.
- Managing Plan of Shkoder Lake NMR: The Project is classified in the category of activities that are allowed by the Managing Plan of Shkoder Lake NMR (see 3.2.2), and therefore it does not constitute a source of significant cumulative impacts if the necessary mitigation measures are undertaken. Furthermore, the railway line within the current borders of this Protected Area is built in 1985, whereas the Protected Area was proclaimed in 2005. The likely impacts of the Project on this PA are expected to be temporary and reversible. Thus, no significant cumulative impact associated with the existing Shkoder Lake NMR, are expected.
- Longitudinal infrastructure projects: The cumulative impacts during the construction of the railway line are expected to be as follows:
    - Adriatic - Ionian Corridor (AIC): There is already built a road overpass and therefore, it is not expected any cumulative impact between this road and the railway line. Besides, the overpass allows the railway line electrification;
    - The planned eastern bypass of Shkoder: According to ARA, the road bypass will overpass the railway line. The cross-section of the overpass will allow the electrification of the railway line and therefore no adverse cumulative impacts are expected;
    - Ionian Adriatic gas Pipeline (IAP): A culvert to be built at the planned crossing of the gas pipeline with the railway line, and therefore no adverse cumulative impact is expected.

6.2.19.2. Operation and maintenance

The Project is part of the existing urban and transport national and municipal development plans and therefore in compliance with them. Implementing the proposed project means implementing these plans, and therefore the cumulative impacts with these plans can be evaluated as positive, probable, of the national and municipal extent and therefore resulting in an overall moderate to high positive significance.

The railway line within the borders of Shkoder Lake NMR follows the path of the existing line. Besides, the number and the diameter size of the new culverts within this NMR will be higher than the existing one. That results in an improvement of the conditions of the circulation of the wild fauna on both sides of the railway line. Besides, the rehabilitated railway line will generate less noise than nowadays. As a result, the expected cumulative impacts during operation will be positive. These impacts are evaluated as positive, probable, of the local extent and moderate magnitude. The overall significance is expected to be low to moderate and positive.

There are expected cumulative impacts of the functioning of the railway line associated with the operation phase of the Adriatic – Ionian Corridor, the eastern bypass of Shkoder, and the Ionian Adriatic gas Pipeline. Once constructed, none of these objects creates any negative impact on the other ones.

Conclusion: The cumulative impacts associated with other plans/programs/projects during operation are expected to be as follows:

- Urban and transport national and municipal development plans: cumulative impacts are expected to be of an overall moderate to high positive significance;
- Management Plan of Shkoder Lake NMR: cumulative impacts are expected to be positive and of an overall low to moderate significance;
- Longitudinal infrastructure projects (Adriatic-Ionian Road Corridor, Shkoder bypass road and Ionian-Adriatic gas Pipeline): cumulative impacts are expected to be insignificant.

6.2.20. Social issues

The socioeconomic issues concern the population living on both parts of the whole railway line, as well the transport sector in Albania and the rail connection with the northwestern Balkan countries.

6.2.20.1. Design, preconstruction and construction stages

Source of impacts: The design, preconstruction and construction activities affect the population of approximately 70 settlements, which are crossed or located close to the railway line alignment. Amongst the cities located within the Project's area, the railway line crosses only Shkoder and Lezhë. It should be underlined that they are crossed in their neighbourhoods.

The sources of impacts during the preconstruction and construction phase include the demolishing and construction activities (work camp, eventual road access, vegetation clearing, demolition of the existing stations, bridges and culverts, removal of filling material in some sections of the railway line, construction of new stations and new bridges and culverts, improvement of the vertical and horizontal railway line alignments, construction of retaining walls, rehabilitation of Lezhë tunnel, etc.), transport activities, traffic, permanent and temporary land acquisition, an influx of temporary workforce, etc.

During the site preparation period, the workforce required for site security, manual labour, civil works, transportation of goods and other similar services will most likely be drawn from the local labour pool.

Additional employment opportunities will rise for the security safeguard of the construction areas and to prevent H&S risks to the local population. The security personnel will be hired from local residents, although the number of employees required is still unknown.

Potential impacts: The likely impacts during the preconstruction and construction phase include negative and positive effects.

- The expected negative effects include:
    - Disturbance from the working machinery and transport trucks (increased traffic, dust, noise, and vibration, etc.). The disturbance from traffic and working machinery and transport vehicles occurs mainly within the settlements crossed by the railway (Lezhë and Shkoder cities and some villages);
    - Land use restriction within the agricultural areas. Some farmers may face access interruption to their agricultural lands when the agricultural land and the farmhouses are located on the opposite sides of the railway line;
    - Impacts on mobility for vulnerable groups like elderly, persons with disabilities or children crossing the railway line during the construction phase accessing health centers or schools;
    - Eventual tensions that may arise from any eventual temporary land acquisition and loss/damage to livelihood (e.g. agricultural plants), as well as from any permanent land acquisition (e.g. service roads, Lezhë freight station). These tensions may raise whether the landowners are not recompensed fairly and in the due time;
    - Eventual tensions between the local population and the construction company staff and workforce. These tensions may arise overall when the working strip is not strictly respected and therefore additional livelihood of the local population may be damaged.
    - The employment of women in construction projects is likely to be minor than men, which are seen as the main workforce.

- The positive effects during the railway line construction are temporary and last only during construction activities. They include:
    - Creation of local employment because of the recruitment of the local workforce and the stimulation of the service sector (mainly bar – restaurants for the need of the construction company staff and the workforce);
    - Modest stimulation of economic growth at a local level as a result of the incomes created from the local workforce and usage of local services; , although there is no available data from which to estimate levels of indirect employment and indirect economic opportunities generated by the Project and the impacts will depend on the nature of the local economy, the availability of required goods and services in the area and ways in which employees choose to spend their earnings.
    - Eventual engagement of the local construction companies, and therefore increase of employment, local incomes, as well as incomes of the local government because of the taxes paid by the local companies

Mitigation measures:

- The suggested mitigation measures, related to the disturbance from the working machinery and transport activities, include:
    - Develop and implement a Traffic Management Plan, which should include:
        - Identification of all risks from construction and transport activities;

      - Clearly define and communicate to residents, especially vulnerable groups points of access and crossing points during construction phase;
      - Maintain open access and crossing points to sensitive receptors like schools and health care centers;
      - Define access routes to the sites, and try to avoid largely inhabited areas;
      - Identification of all public roads and paths that will be affected, and the roads and pedestrian paths proposed temporarily during the construction period;
      - Schedule the traffic diversion in the function of the construction activities and the needs of the local population.
   - Take appropriate measures to reduce dust and noise and vibrations;
   - Fencing the working strip, especially within the urban areas
- The land use restriction is taken into account during the Project's design. The Consultant has designed new service roads linked to underpasses and secured level crossings that intend to ensure a satisfying circulation between both sides of the railway line. Besides, some of the new planned culverts will serve also as agricultural underpasses. That is why these new culverts will have an increased diameter size (3x2 m, at minimum)
- To avoid any tension related to the compensation of the affected landowners, the beneficiary should correctly recompense the affected landowners before start the preconstruction works. As provided in the LARF of the proposed project, the compensation should be based on EBRD PR 5 "Land Acquisition, Restriction on Land Use and Involuntary Resettlement".
- Any eventual tension of the local community with the workforce should be avoided. The suggested measures include:
   - Fencing the working area;
   - Do to not allow the workforce to damage private properties;
   - Respect the Traffic Management Plan;
   - Respect the mitigation measures related to noise and vibrations;
   - Respect the deadlines for construction activities;
   - Rehabilitate the working strip, as soon as practical after construction works

Except for the temporary need for workforce and any possible involvement of the local construction companies, there is no other significant positive socio-economic impact during railway rehabilitation.

It is acknowledged that employment is a key concern to communities in the study area although most construction jobs on the project will be short-term, it is expected that employment impacts will be higher in communities near the project.

As part of its overall commitment to enhancing project benefits to communities, HSH will agree on an Employment Strategy with Contractors that will include the expected level of local input for unskilled labour.

   - Contractors will be required to source the unskilled labour from within Albania with the best efforts to recruit unskilled labour from the communes crossed by the railway. Agreed measures will be monitored and reported on.

- A fair and transparent recruitment process will be established with all positions widely advertised and open to all regardless of ethnicity, religion, or gender.
- The Project will work with local authorities and employment organizations to ensure that all positions are advertised in a manner that is accessible to the settlements and communes crossed by the railway;
- The Project will ensure that the recruitment process is fair and transparent, public and open to all regardless of ethnicity, religion, or gender; and
- The Project will stipulate that the Primary Contractor provides clear contracts prior to mobilization stipulating working hours, pay, and other terms of employment.

Additionally, HSH will work with national-level companies as a further method of increasing project-related employment opportunities.

- In order to increase women's employment opportunities and for vulnerable categories, the following measures should be taken:
  - Provide equal training for men and women;
  - Provide employment opportunities for women heading households;
  - Offer employment opprotunities for vulnerable groups like newly graduated people or long-term jobseekers;
  - Collaborate with local employment offices and local authorities to individuate and offer employment opportunities to members of vulnerable families or individuals;
  - In field training during the development of implementation phase, also through Contractor/s and Sub-Contractors;
  - Establish training and re-training programs that specifically target women, to increase their opportunities;
  - Define the number of persons to be interviewed for a new position which needs to be women;
  - Clearly indicate that the position opportunity is for both men and women;
  - Provide a women-friendly working environment.

In conclusion, the expected adverse impacts on the socioeconomic environment can be evaluated of low to moderate probability, of the local extent, and in an overall low to moderate significance. They are related overall to the land acquisition and the temporary disturbance of the local community.

6.2.20.2. Operation and maintenance

The economic issues constitute the main goal of the Project. The existing situation favours neither the passengers' transport nor the freight one. The rehabilitation of the railway line will affect positively the following:

- Significant cross-border and therefore regional positive impact because of the national rail network connection to the regional and European railway networks through Corridor X;

- The increase of the importance of the port of Durres;
- Meet the demand of growing industries of cement, construction materials, minerals (chromium, copper, iron, etc.);
- Creation of opportunities for an increase of business at a national and regional level and therefore increase in employment and incomes;
- Promotion of small/medium enterprise, business, export, tourism;
- Promotion of public transport, including the attraction of car users to public transport;
- Contribution to urban restructuring, shortening travel distances and improving cities sustainability;
- Linking by rail the main economic nodes of the country.

Other impacts include inter alia:

- Financial impact at a national and local level.

  The cost of investment for railway rehabilitation is feasible. Consequently, railway transport compared to road transport will decrease the cost of freight and passengers.

- Employment increase at a local and national level.
  - Railway transport modernization will influence the increase of industrial activities and employment (Durrës Port, Lezhë, Shkoder - passengers and freight; Kruje and Lezhë - cement plants; Milot – chromium mineral coming from the mines located within the north-eastern part of Albania, etc.);
  - Increase of trade and services infrastructure because of incomes generated from increased employment rate.

- Improvement of well-being.

  The increase of incomes resulting from employment increase will improve health and educational services infrastructure, the possibility for the local population to spend more on taking a vacation, etc.

- Opportunity for people in poor economic conditions to travel cheaper than with road transport.
- Tourism activity.

  The improvement of well-being because of incomes increase from employment increase will improve the tourist services and infrastructure such as in the Shore of Shkoder Lake, the historical and archaeological zones of Lezhë and Shkoder, the Mountainous area of Malësia e Madhe Municipality, etc.

- Increase of local governments incomes

  The increase of industrial and tourist activities will increase local and national taxes, a part of which will be used for the improvement of the overall infrastructure (roads, sewage, and sewerage, green spaces, electricity supply, cultural heritage sites/objects, etc.

- Demography

  Employment's increase will motivate the inhabitants of the project are not to leave this region, because until now, a part of its population has migrated towards larger cities such as Tirana and Durrës or immigrated to foreign countries (mainly Italy, Greece, Germany, etc.), where employment opportunities are larger. The population movement in the affected municipalities shows the same tendency faced in many small urban centres of the country, where the young people move towards the big cities and foreign countries. Therefore, the average age of the population in these small settlements is quite high, because only old people have remained.

In conclusion, the expected adverse impacts on the socioeconomic environment during the operational phase can be evaluated as positive, probable, of local, municipal, and national extent. They are evaluated of a high and positive significance.

6.2.21. Ecosystem Services

***Potential impacts*:**

The railway line crosses the forest and shrubs, and likely significant impacts are recognized to be vegetation clearing, temporary habitat loss, migration of animal populations due to disturbance, the introduction of invasive species, etc. The main impacts on the local ecosystems occur during the construction period.

The working strip may reduce the degraded forest and shrub habitats: Degraded Forest formations are dominated by a mix of deciduous oak species (km 132+500 to km 137+750). In the working strip area, all vegetation will be removed and the terrain will be flattened. This will affect the change and degradation of habitats.

The railway project will affect the ecosystem of Shkodër Lake, as the railway traverses the Nature Managed Reserve and its habitats. This same ecosystem is associated with key evolutionary processes, and it is vital to critical habitat features such as species of conservation concern, endemic or geographically restricted, and those found in globally significant concentrations. Therefore, the mitigation and offset measures foreseen under ESIA should ensure No Net Loss (NNL) and Net Positive Impact (NPI) for this Critical Habitat.

As for PBF, none of the aquatic species triggering the Critical Habitat criteria will be impacted by the project given the contractor will apply the measures foreseen in enlisted in ESIA section 6.2.10. “Biological and ecological resources” as well as in the chapters dealing with air quality (section 6.2.1.), noise and vibrations (section 6.2.2.), groundwater (section 6.2.7.), and surface water (section 6.2.8.). None of the aquatic species such as fish, molluscs and waterbirds triggering Critical Habitats is directly impacted by the project, as the majority of project activities during construction are undertaken far from water tables. In areas where the railway goes close to the lake, the mitigation measures are foreseen under section 6.2.8.2. “General mitigation measures” and section 6.2.10. “Biological and ecological resources” will be applied in order to ensure NNL.

The team engaged with ecosystem service beneficiaries has evaluated the ability of others to benefit from these ecosystem services. The degree to which a project impacts ecosystem service beneficiaries is determined by whether the impacts interfere with beneficiaries’ current and foreseeable use. For example, the discharge of project effluent in a river could affect downstream water users if water quality falls below certain quality standards. Conversely, the project will not affect the recreational benefits of the river as long as visitors do not perceive a change in water smell, colour, or quantity.

Decision tree to prioritize relevant ecosystem services according to potential project impacts on beneficiaries:

The impact on shrubs and forests is the loss of biomass

Could the project affect the ability of others to benefit from	**Yes, Temporary**

this ecosystem service?	
Is this ecosystem service important to beneficiaries' livelihoods, health, safety, or culture?	**No**
Do beneficiaries have viable alternatives to this ecosystem service?	**YES, OR UNKNOWN**

The impact on the ecosystem of Shkodër Lake

Could the project affect the ability of others to benefit from this ecosystem service?	**No**
Is this ecosystem service important to beneficiaries' livelihoods, health, safety, or culture?	**YES, OR UNKNOWN**
Do beneficiaries have viable alternatives to this ecosystem service?	**YES, OR UNKNOWN**

Based on desktop-collected data, the presence of ES is mainly assumed within or in the vicinity of Nature Managed Reserves, and the ESs seem to be important to the stakeholders' livelihoods, health, safety, or culture. The lack of field data limits the direct prioritization of the ESs (presence of ESs within the proposed working strip and railway corridor and their importance to the stakeholders' livelihoods, health, safety, or culture. A comprehensive site visit (within the preconstruction survey) will help to prioritize the ESs, and identify site-specific impacts and mitigation measures.

Assessment of project impacts and dependencies on priority ecosystem services

Project impacts	Potential impacts on ecosystem Services	Assessment of the impacts
	Type Condition	
Air pollution	- Temporary reversible impacts on local air quality due to atmospheric emissions from construction activities.	**<u>ESs in Shkodër Lake</u>** ***Magnitude of the impact*** low to moderate ***Receptor sensitivity*** low ***Significance of impacts*** low
Water abstraction and pollution	- Impact on surface water by sediment plumes; - Accidental pollution of freshwater resources by solid and liquid wastes; - Modification of the river morphology; - Consumption of freshwater	**<u>ESs in Shkodër Lake</u>** ***Magnitude of the impact*** negligible ***Receptor sensitivity*** low

Project impacts	Potential impacts on ecosystem Services	Assessment of the impacts
	Type Condition	
	resources.	***Significance of impacts*** negligible
Loss of biodiversity	- Compensation in the form of biodiversity offsets; - Damage to Protected Area of Shkoder Lake NMR.	**<u>ESs in Shkodër Lake and clearance of shrubs and forests</u>** ***Magnitude of the impact*** Moderate ***Receptor sensitivity*** medium ***Significance of impacts*** Moderate
Change in habitat/land cover	- Clearing of the vegetation - Habitat loss/ degradation, fragmentation, direct species loss, disturbance /displacement;	
Perturbation of soil	- Erosion on the riverbeds and streambeds; - Modification of rivers and streams morphology; - Accidental pollution of soil by solid and liquid wastes; - Temporary land take and surface sealing; - Soil compaction; - Re-mobilization of contaminants within the soil profile.	**<u>ESs in Shkodër Lake and clearance of shrubs and forests</u>** ***Magnitude of the impact*** Low ***Receptor sensitivity*** medium ***Significance of impacts*** Low

As a conclusion, the potential impacts on the ecosystem services can be evaluated of medium probability, of low to medium significance, and regional extent.

Mitigation measures:

Avoidance:

- Establish alternative access to maintain accessibility where alternative grazing areas within the surrounding areas are located;
- Maintain accessibility where medicinal plants areas are located and establish alternative access;

Minimisation:

- Control of railway construction to ensure downstream water supply and quality changes are minimized and do not disrupt grazing quality and disrupt vegetation cover outside of the construction areas;
- Hazardous materials and emergency response management to avoid contamination of surface water and soil;

- Judicious clearence of vegetation in the working strip area to minimize impacts on local habitats;
- Use of pesticides for vegetation clearance during construction and operation will be prohibited;
- A Construction Traffic Management Plan will be implemented to reduce traffic disturbance to touristic facilities and sites in the area;

Restoration:

- Reinstatement of temporary disturbed areas during construction will include reprofiling and re-vegetation;

Alien invasive species protocol:

- Good construction industry wildlife management practise, including injured wildlife protocol, workforce awareness sessions, reduced speed limits, wildlife interaction reporting, waste and litter controls.

7. Monitoring Programme

This chapter has been prepared following the national regulations. CMD 912/2015 “On the EIA methodology” requires the preparation of a monitoring program. Whereas Article 41 of the Law 10431/2011 “On Environmental Protection” provides for the parameters /environmental receptors to be monitored during a project development stages. This Law is in full compliance with the Directive 2004/35/EC “On environmental liability with regard to the prevention and remedying of environmental damage301”

The preparation of the Environmental and Social Monitoring Plan for the design, construction, and operation phases of a project is an integral part of the environmental permit.

7.1. Parameters/environmental receptors to be monitored

The monitoring of the state of the environment is the observation and recording of the quality of the environmental receptors. According to the Albanian regulations[302], the list of these receptors includes:

- the quality of surface water;
- the quality of groundwater;
- air quality;
- waste;
- noise;
- radiation;
- the quality of the land;
- flora, fauna, biodiversity, forests;
- the impact of economic sectors on the environment components;
- monitoring of natural phenomena and their potential impact on the environment;
- monitoring the impacts of environmental pollution on human health; and
- monitoring the community and occupation health and safety

This list does not include any social and cultural receptors, which are subject to other regulations, such as the Law 27/2018 “On Cultural Heritage and Museums”, Law 8561/1999 “On Expropriations and Temporary Takings of the Private Property for Public Interest”, etc.

7.2. Routine parameters monitored at country level

At country level, the monitored environmental receptors and their routine parameters, the location of the monitoring points and of the environmental receptors, both the National Monitoring Programme and the State of Environment Report provide the responsible monitoring institutions, the frequency, and the related regulations/standards, which are published yearly by the National Environmental Agency. Table below has been prepared based on the most recent of them, namely the National Monitoring Programme for 2019[303] and the State of Environment Report for 2019[304].

301 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM%3Al28120

302 Law 10431/2011 “On environmental protection”, as amended, Article 41

303 National Programme for Environmental Monitoring. NEA, 2019

304 State of Environmental report. NEA, 2019

Table 7-132_Environmental receptors monitored regularly at country level

Receiving environment	Parameters to be monitored	Monitoring institution and frequency	Regulation/standard
Groundwater quality (water wells and springs)	Temperature, pH, TOC, PD, nutrients (N, P), microelements, basic organic and microbiologic parameters, chlorides, PBC, pesticides, and PAH	Albanian Geological Survey Twice a year, but needed quarterly	-Water Framework Directive 2000/60/EU (Annex V(2)- Ground waters); -Directive 2006/118 / EU "On the protection of groundwater against pollution and deterioration"305; -DCM 379/2016 "On the approval of the regulations on drinking water quality"
Surface water quality (Shkoder Lake, rivers)	Temperature, transparency, pH, alkalinity, electric conductivity, dissolved oxygen, NKO, NBO5, nitrites, nitrates, ammonia, Total P, chlorophyll; -Microbiological indicators (Echeria coli, streptocoque)	NEA Quarterly	-Law 111/2012 "On Integrated Water Resources Management306"; -DCM 246/2014 "On the environmental quality norms for surface water"; -Water Framework Directive 2000/60/EU (Annex V(1)- Surface waters)
	Nutrients (N, P)	NEA Quarterly	
Air quality	SO_2, NO_2 (NOx), CO, O_3, Benzene, PM10 (PM2.5) and microelement (Pb, As, Mn, Ni, Cu, Zn, Cd),	NEA	-Law 162/2014 "On environmental air quality protection" -DCM 352/2015 "On the assessment of environmental air quality and the requirements related to some pollutants" -Air Quality Directive (2004/107/EC and 2008/50/EC)
Solid Waste	The annual amount of generated waste according to the Albanian waste catalogue.		-Law 10463/2011, "On integrated waste management", as amended; -DCM 687/2015 "On adopting rules for keeping, updating and publishing data on the differentiation of waste collection at source
Noise	LaeqT, (Laeq/Day dB(A) Laeq/Night dB(A))		-Law 9774/2007 "On the assessment and management of environmental noise"; -MoE ordinance 1037/1, date 12.4.2011 " On the assessment and management of environmental noise"; -Environmental Noise Directive 2002/49/EC
Soil quality	Physical-chemical parameters, microelements, organic components	Ministry of agriculture; -Once 3 years or more rarely	No obligatory from EU
	Nutrients (N, P)	-Ministry of agriculture; -Once 3 years	
Biodiversity and forests	Maintenance, preservation and improvement of biodiversity and ecosystems	-Ministry of agriculture; -NAPA and RAPA	Law 9587/2006 "On Biodiversity Protection"; Law 81/2017 "On Protected Areas"; Law 1006/2008: "On the protection of wild fauna"; Law 10120/2009, "On Protection of the Medicinal Plants"
Effects of environmental pollution on human health	Health of project-affected people and workers	-Institutions of public health; -routine compulsory	DCM 564/2013: On the approval of the rules "On Minimum Safety and Health Requirements at the Workplace".

305 Directive 2006/118/EU develops in detail Article 17 of the Water Framework Directive 2000/60/EU

306 Law 111/2012 is in full compliance with the Water Framework Directive 2000/60/EU

Receiving environment	Parameters to be monitored	Monitoring institution and frequency	Regulation/standard
		medical control for children	

7.3. Monitoring plan concerning the proposed project

Based on the provisions of the Law 10431/2011 “On environmental protection”, as amended (Article 41), and on the characteristics of the Project’s area and of the proposed Project’s elements, the receiving biophysical environments that should be monitored concerning the proposed project are given in the table below.

Table 7-133_Monitoring plan for the proposed project stages

	Receiving environment (as per Law 10431 /2011, Art. 41)	Phase	Yes /No	Regulations/standards	Comment related to the proposed project
1	Groundwater quality				
	-Water wells at the overlaid aquifers; -Syri Sheganit Spring	PC	Y	-Water Framework Directive 2000/60/EU (Annex V(2)- Ground waters); -Directive 2006/118 / EU “On the protection of groundwater against pollution and deterioration”307 -DCM 379/2016 “On the approval of the regulations on drinking water quality”	-Water of the wells was analysed by NEA; -Water of the wells monitored twice a year by NEA, the affected municipalities and Health institutions[308]
		C	Y		Monitored also by Regional Health Institutions (DCM 379/2016); Monitoring locations and frequency are defined by Regional Health Institutions; Monitoring indicators are provided by DCM 379/2016;
		O	N		
2	Surface water quality				
	-Shkoder Lake at Sterbeq	PC	Y	-Law 111/2012 "On Integrated Water Resources Management"; -DCM 267/2014 "On approval of the list of priority substances in water environment" -DCM 246/2014 "On the definition of environmental quality norms for surface water"; -Directive 2006/44 “On the quality of freshwater that needs protection for supporting fish life”	Shkoder Lake water is quarterly analysed by NEA;
		C	N		The project aims at improving the groundwater quality through avoidance of pollution from wastewater
		O	N		Monitored quarterly by NEA and published yearly in the State of Environmental Report
	Rivers Ishmi, Mati, Lezhë’s Drini and Drini	PC	Y		Monitored twice a year by NEA; To be monitored quarterly by the Consultant during the construction of the bridges crossing these rivers
3	Air quality				

307 Directive 2006/118/EU develops in detail Article 17 of the Water Framework Directive 2000/60/EU

308 DCM 379/2016 “On the approval of the regulations on drinking water quality”

	Receiving environment (as per Law 10431 /2011, Art. 41)	Phase	Yes /No	Regulations/standards	Comment related to the proposed project
	Action area	PC	N	-Law 162/2014 "On environmental air quality protection" -DCM 352/2015 "On the assessment of environmental air quality and the requirements related to some pollutants" -Air Quality Directive (2004/107/EC and 2008/50/EC)	Monitored by NEA at Shkoder and Lezhë
	Action area	C	Y		Daily visual monitoring of air quality; Monitor mitigation measures related to air quality that can be affected by earthworks and transport activities
	Action area	O	N		No need for air monitoring during operation
4	Waste				
	Action area	PC	Y	-Law 10463/2011, "On integrated waste management", as amended; -DCM 687/2015 "On adopting rules for keeping, updating and publishing data on the differentiation of waste collection at source	Monitored by the related state Agency; Monitored by the Consultant for the Project's purposes
	Action area, especially at the stations & bridges	C	Y		Visual monitoring; Monitor mitigation measures related to waste generated by construction activities
	Action area	O	Y		Visual monitoring; Monitor waste management
5	Noise				
	Action area	PC	Y	-Law 9774/2007 "On the assessment and management of environmental noise"; -MoE ordinance 1037/1, date 12.4.2011 " On the assessment and management of environmental noise"; -Environmental Noise Directive 2002/49/EC	-Monitored by NEA at Shkoder and Lezhë cities; -Measured by the Consultant during the preparation of the DD and ESIA
	Action area	C	Y		-During working hours, measure noise levels at a distance of one metre from the most affected façade of any occupied dwelling or other residential building; -Monitor mitigation measures related to noise and vibrations that can be generated by demolition, construction and transport activities
	Action area	O	Y		Monitoring noise generated by trains once the rehabilitated railway line will be in operation
7	Soil quality				
	Action area	PC	N	n/a (the soil might be polluted by wastewater and hazardous waste)	No need for monitoring; There is no any hot spot within the project area.
	Action area	C	Y		Visual monitoring; Monitor mitigation measures related to hazardous waste (accidental oil leakage, etc.) by construction and transport engines.
	Action area	O	N		Visual monitoring at the stations, especially the freight stations
8	Flora, fauna, biodiversity, forest				
	Both sides of the railway line and watercourses	PC	Y	Law 9587/2006 "On Biodiversity Protection"; Law 81/2017 "On	Biodiversity and protected areas included in the ESIA; The NMR of Shkoder lake is monitored by RAPA Shkoder and NAPA

	Receiving environment (as per Law 10431 /2011, Art. 41)	Phase	Yes /No	Regulations/standards	Comment related to the proposed project
	Both sides of the railway line and watercourses	C	Y	Protected Areas"; Law 1006/2008: "On the protection of wild fauna"; Law 10120/2009, "On Protection of the Medicinal Plants"	Visual monitoring; Monitor mitigation measures related to flora, fauna, biodiversity and forest that can be affected by construction and transport activities.
	Both sides of the railway line and watercourses	O	Y		No need for monitoring; Lack of activities that can affect these topics; Anyway Shkoder Lake NMR is monitored by NEA, NAPA and RAPA Shkoder
9	Nature phenomena and their environmental impacts				
					No nature phenomena are associated with the project development phases.
10	Effects of environmental pollution on human health				
	Local communities	PC	Y	DCM 564/2013: On the approval of the rules "On Minimum Safety and Health Requirements at the Workplace".	Information collected by the Consultant (communities living on both sides of the railway line)
	Action area	C	Y		Eventual information collected by the developer[309]
	Drinking water quality in the crossed aquifers	O	Y		Drinking water quality monitored (monthly) by the Municipalities' health sector and twice a year by NEA
	Shkoder Lake water quality (Sterbeq monitoring station)				Bathing waters (Shkoder Lake at Sterbeq) quality monitored quarterly by NEA

PC – Preconstruction; C – Construction; O – Operation; Y – Yes; N - No

As the railway line crosses important rivers and runs close to Shkoder Lake, several monitoring stations are included in the systematic yearly monitoring of the National Environmental Agency[310], as given in the table below:

Table 7-134_Environmental receptors in the project area that are regularly monitored by NEA

Receiving environment	Parameters to be monitored	Frequency	Sampling location	Monitoring institution
Surface water quality (Shkoder Lake; Rivers Ishmi, Mati, Lezhë's Drini, Drini)	Nutrients (N, P) in Shkoder Lake	Quarterly	See Map 5: Environmental monitoring map; See Figure 5-86	National Environmental Agency; Institute of Public Health
	Temperature, transparency, pH, alkalinity, electric conductivity, dissolved oxygen, NKO, NBO5, nitrites, nitrates, ammonia, Total P, chlorophyll; -Microbiological indicators (Escherichia coli, streptococcus)	Twice a year		
Groundwater quality	Temperature, pH, TOC, PD, nutrients (N, P), microelements, basic organic and microbiologic parameters, chlorides, PBC, pesticides, and PAH	Twice a year	See Map 5: Environmental monitoring map	Albanian Geological Survey and NEA

Other receiving environments to be monitored regard the livelihood restoration and the land acquisition and compensation, as given in the table below.

309 DCM 564/2013: On the approval of the rules "On Minimum Safety and Health Requirements at the Workplace".

310 National Programme for Environmental Monitoring. NEA, 2019

Table 7-135_Monitoring plan concerning land acquisition issues

Receiving environment	Parameters to be monitored	Monitoring institution	Regulation/standard	Comment
Project affected people; Affected Municipalities	Damages to livelihood and related compensation	Developer; EBRD	-EBRD PR 5; -Law 8561/1999 “On Expropriations and Temporary Takings of the Private Property for Public Interest”, as amended in 2016, and 4 DCMs define the procedures for expropriation of immovable property.	To be monitored before and after the construction period
	Land compensation			To be monitored before and after the construction period

The local community and workforce occupation health and safety should be monitored regularly based on the national regulations and EBRD requirements, as shown in the table below.

Table 7-136_Monitoring plan concerning community and occupation health and safety

Receiving environment	Parameters to be monitored	Monitoring institution	Regulation/standard	Comment
Local community and workforce	Health and safety during construction	-Developer; -Health institutions	-EBRD PR 4: -DCM 564/2013: “On the approval of the rules on Minimum Safety and Health Requirements at the Workplace"; -Law 5/2014: “On safety and health in construction”	During the construction; During operation
Local community and workforce	Health and safety during operation	-Affected Municipalities; -Municipal Water and Sanitation Companies; -Health institutions	-EBRD PR 4: -DCM 564/2013: On the approval of the rules "On Minimum Safety and Health Requirements at the Workplace"; -Law 10237/2010: “On occupational safety and health”, as amended	During construction; During operation

8. Environmental Comparison between the Selected Option and the Existing Situation

In this chapter are compared from the environmental and social point of view the selected option and the existing situation. As mentioned in section 4.3, the only options to be compared to the environmental and social point of view are the following:

1. Option 0 (“zero”) or “do-nothing” option: existing situation; and

2. Option 1: basic option

8.1. Considered environmental and social topics

The environmental topics taken into consideration are the most significant ones that derive from the findings of chapters 5 and 6 of this document. They are weighted according to the methodology provided in section 4.3 above. The table below includes the considered topics and a short comment justifying why they are selected.

Table 8-137_Environmental topics taken into consideration in the comparative analysis

No	Topic	Reference (section)	Comment/ clarification	Weighting
1	Noise and vibration	5.2.2, 6.2.2	The railway line crossing inhabited areas is a source of noise and vibrations. The Project intends to reduce them through appropriate interventions. The railway line already exists	5
2	Climate change and GHG	5.2.4; 6.2.4	The Project can affect the Climate Change vegetation clearing for project purposes.	2
3	Climate change and flooding	5.2.4; 5.2.9; 6.2.4; 6.2.9	In some sections of the railway line, the low land is inundated when heavy rainfalls occur; Climate change predicts the increase of the heavy rainfalls.	8
4	Geology (subsidence)	5.2.5; 6.2.5	The existing railway substructure is affected from subsidence;	6
5	Earthquakes	5.2.6; 6.2.6	The Ishmi Bridge (km 35+100) is out of work because of an earthquake; The railway line crosses areas of high seismic risk.	6
6	Erosion and sedimentation	5.2.5.2	The rivers and streambeds and sides may be affected by erosion during the construction or the rehabilitation of the bridges.	4
7	Surface water	5.2.8; 6.2.8	The railway line crosses several watercourses, which water quality and hydrological regime can be affected by the construction works	4
8	Groundwater	5.2.7; 6.2.7	The railway line runs over some of the most important quaternary gravel aquifers of the country that serve for supplying drinking water to the urban and rural centres of the crossed area; The pollution of the groundwater may affect the quality of Shkoder Lake’s waters	5

No	Topic	Reference (section)	Comment/ clarification	Weighting
9	Biodiversity	5.2.10; 6.2.10	The railway line runs across agricultural and forest and shrubby areas; It crosses the NMR of Shkoder Lake (IUCN cat. IV of protection status)	5
10	Protected Areas	5.2.11; 6.2.11	The railway line runs across agricultural and forest and shrubby areas; It crosses the NMR of Shkoder Lake (IUCN cat. IV of protection status)	5
11	Land acquisition	5.2.12; 6.2.12;	The construction of the service roads require a land surface to be permanently occupied;	4
12	Land use restriction	6.2.12; 6.2.22	The closure of the informal crossings and the railway fencing may restrict the land use on both sides of the railway line	6
13	Topsoil	5.2.12; 5.2.13; 6.2.12; 6.2.13	The railway line runs mostly through agricultural lands. Construction activities within the working strip will impact the quality of the agricultural land (soil compaction and pollution); The construction of roughly 12 ha of new service roads mostly through agricultural land will cause the permanent loss of topsoil of good agricultural productivity.	3
14	Cultural heritage	5.2.16; 6.2.16	Although there is no known cultural heritage site/object close to the railway line, the chance finds procedure should be applied during construction works. There is an ICH site, Catholic Cemetery which has a high potential to be affected by project activities.	2
15	Traffic	6.2.12.2; 6.2.22.1	The construction of new service and local connectivity roads, the railway line signalling, the transformation of some under bridge roads onto underpasses, the construction of some underpasses and overpasses and the securing of all the level crossings will enhance the traffic issues at the country level.	5
16	Waste	5.2.17; 6.2.17	The rehabilitation of the railway line will generate considerable amounts of solid waste that should be managed.	5
17	Accidents and incidents	5.2.18; 6.2.20	The current conditions of the railway line are a source of accidents and incidents.	5
18	Socioeconomic issues	5.2.20; 6.2.22	The rehabilitation of the railway line will improve the overall socioeconomic conditions of the Project's area and further on.	20
19	**Total**			**100**

8.2. Evaluation of impacts' significance for each environmental topic

The options' comparison is performed based on the significance of impacts on each considered environmental and social topic.

Hereinafter is evaluated the significance of impacts for each of the above-mentioned topics.

8.2.1. Noise and vibration

The project will improve the existing situation related to the noise generated by trains during the operation phase.

The improved ground conditions, the reduced noise and vibration generated by the interaction between wheels and rails and between rails and slippers, as well as the installation of the noise protection barriers close to densely inhabited areas will significantly reduce the noise and vibrations.

Based on the adopted methodology for impacts evaluation (see section 4.2.3), the magnitude and stakeholders' concerns can be evaluated as follows:

Magnitude and stakeholders concern

- Option 0: The magnitude and stakeholders' concern is evaluated based on the existing situation. Due to poor railway line conditions (structure, substructure, etc.), the noise and vibration generated at the source can be evaluated as of moderate magnitude and stakeholders' concern (see Table 4-22).
- Option 1: The improved railway line components, including the mitigation measures against rolling noise, will improve the existing situation and the magnitude and stakeholders' concerns can be evaluated as low (see Table 4-22).

Receptor sensitivity

The sensitivity can is evaluated of moderate value (see Table 4-23 and Table 4-24) for Option 0 and low for option 1.

Significance of impacts

The table below gives the expected significance of the impacts (see Table 4-25, Table 4-26 and Table 4-27) related to noise and vibrations.

Table 8-138_Evaluation of impact significance associated with noise and vibrations

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	Moderate	Moderate	Moderate	-6
1	Low	Low	Minor	-4

8.2.2. Climate Change and Greenhouse Gas Emissions

The likely impact of the proposed project on climate change is related mostly to the greenhouse gas emissions (GHG) that are released into the atmosphere. The vegetation clearing for construction purposes will decrease the CO_2 capture (see section 6.2.4).

Whereas the adaptation to climate change concerns overall the predicted increase in precipitation and flood events that is described in the section on flooding hereinafter.

Magnitude and stakeholders concern

The construction works will temporarily affect the shrubby and degraded forest area from km 132+500 to km 135+750. Given that the shrubs and the degraded forest are not dense, only an insignificant amount of vegetation is expected to be removed. Based on the lack of industrial activities, Albania generates a modest amount of GHG, and therefore the stakeholders' concern can be considered as insignificant to low. Thus, the magnitude and stakeholders' concern can be evaluated as low (see Table 4-22).

Receptor sensitivity

The shrubby and forest area from km 132+500 to km 135+750 is sensitive because the railway line crosses the karst area. The growing of the vegetation after the construction works will take some time to be rehabilitated appropriately. The sensitivity can be evaluated as negligible to low (see Table 4-23 and Table 4-24).

Significance of impacts

Based on the adopted assessment methodology, the expected significance of the impacts (see Table 4-25, Table 4-26 and Table 4-27) related to climate change are given in the table below.

Table 8-139_Evaluation of impact's significance on the climate change associated with GHG emissions (CO_2 eq.)

Option	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	n/a	n/a	No impact	0
1	Low	Negligible to Low	Negligible to minor	-2

Thus, the overall impact's significance related to climate change because of the GHG emissions can be evaluated as negligible.

8.2.3. Climate Change and Flooding

In some sections, the crossed terrain is prone to flood events (e.g. km 32+000 to km 35+000 – flooded by Ishmi River; from km 69+000 to km 74+000 – flooded by Lezhë's Drini River and Fangu drainage channel. In these sections, the railway often serves as an embankment that creates an obstacle and does not allow the flooding to spread both sides of the railway (e.g. km 30+000 to km 35+000). Thus, on one side of the railroad, the inundation lasts longer and therefore the damage to agriculture is higher than on the other side.

Moreover, climate change predicts an increase of heavy precipitations and therefore an increase in flood events (see section 5.2.4).

Magnitude and stakeholders concern

- Option 0: The magnitude and stakeholders' concern is evaluated based on the impact intensity (see Table 4-19) and the probability of occurrence (see Table 4-18). The intensity can be evaluated as low to moderate, while the probability of occurrence is definite. Therefore, the magnitude and stakeholders' concerns can be evaluated as low to moderate.
- Option 1: The design and construction stages may influence the impacts caused by flood events. The magnitude and stakeholders concern is evaluated based on the impact intensity (see Table 4-19 and Table 4-20) and the probability of occurrence (see Table 4-18).

The design's related mitigation measures consist mainly in the rehabilitation of the drainage and irrigation system, increase of vertical railway alignment – km 30 to km 42 and km 69 to km 80, designing deeper and wider drainage channels alongside the railway - km 30 to km 35, adding new culverts of sufficient diameter size, design new bridges with bigger conveyance capacity, etc. Once these measures are undertaken, the intensity of the likely impacts can be evaluated as negligible to low (see Table 4-19 and Table 4-20), while the likelihood can be evaluated as "unlikely" (see Table 4-18). As a result, the magnitude and stakeholders concern results as negligible to low (see Table 4-21 and Table 4-22)

Receptor sensitivity

The current flood events can be evaluated as low to moderate sensitivity (see Table 4-23 and Table 4-24), while once the mitigation measures will be undertaken as provided in the Project's design, the sensitivity can be evaluated as low.

Significance of impacts

The table below gives the expected significance of the impacts that can be caused by flooding.

Table 8-140_Evaluation of impact significance related to flooding

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	Low to moderate	Low to moderate	Minor to moderate	-5
1	Negligible to low	Low	Negligible to minor	-2

8.2.4. Geology (Subsidence)

From km 25+000 to km 50+000, km 60+000 to km 68+000 and km 70+000 to km 90+000, the railway embankment and slopes are slightly affected by deformations that may derive from the inappropriate characteristics of the underlying quaternary geological formations (see section 6.2.5).

The railway embankment will be reinforced by taking the necessary geotechnical interventions, including the installation of geotextiles.

Based on the methodology for impacts evaluation (see section 4.2.2), the magnitude and sensitivity of impacts can be evaluated as follows:

Magnitude and stakeholders concern

- Option 0: The magnitude and stakeholders' concern is evaluated based on the existing situation.

  The subsidence of the railway subgrade has already affected 53 km of the railway line length. This subsidence is of concern for the stakeholders as it may cause rails' deforming and therefore a risk for trains. Consequently, the magnitude and stakeholders, the concern can be evaluated as moderate to a high value (see Table 4-22).

- Option 1: After the intervention, (reinforcement of the railway), the likelihood can be evaluated as "unlikely", while the magnitude and stakeholders' concern can be evaluated as of low value (see Table 4-22).

Receptor sensitivity

The railroad stability and the safety of the trains can be evaluated of low value once the design has taken into consideration appropriate mitigation measures (see Table 4-24).

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts that can be caused by the subsidence of the railroad and the trains' safety is shown in the table below.

Table 8-141_Evaluation of impact significance linked to the subsidence phenomena

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	Moderate to high	Moderate	Moderate	-6
1	Low	Low	Minor	-4

8.2.5. Earthquakes

The railway line runs within a seismically active area where frequent earthquakes occur.

The earthquakes of September and November 2019 showed that the railway is sensitive to this phenomenon. Since November 2019, the railway line is out of work because the last earthquake heavily damaged Ishmi Bridge.

The planned construction of all bridges will satisfy the required seismic measures as provided by Euro Code 8. Besides, the railway will be reinforced with geotextiles to avoid any subsidence in case of ground shaking.

Magnitude and stakeholders concern

- Option 0: The magnitude and stakeholders' concern is evaluated based on the existing situation.

  The damage to bridges is felt at the national level, but the impact is reversible as the bridge can be rebuilt. Consequently, the magnitude and stakeholders, the concern can be evaluated as moderate (see Table 4-22).

- Option 1: After the construction of the planned railway line, the magnitude and stakeholders' concern is evaluated based on the impact intensity (see table 4.2 and table 4.3) and the probability of occurrence (see Table 4-18).

  After designing the structures following Euro Code 8, the intensity of the likely impacts can be evaluated as moderate (see table 4.2), while the likelihood can be evaluated as "unlikely". As a result, the magnitude and stakeholders concern can be evaluated as low (see Table 4-21 and Table 4-22)

Receptor sensitivity

The current railway line stability and the safety against earthquakes can be evaluated with moderate sensitivity (see Table 4-23 and Table 4-24), while after the design will take into account Eurocode 8, the sensitivity can be evaluated as low.

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts that can be caused by the weak filling material on the railroad and the trains' safety would be as shown in the table below.

Table 8-142_Evaluation of impact significance related to the risk from earthquakes

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	Moderate	Moderate	Moderate	-6
1	Low	Low	Minor	-4

8.2.6. Erosion and Sedimentation

The sensitive areas concerning the erosion and sedimentation issues are as follows:

- The embankments protecting both riversides of Kiri River need to be reinforced to not affect the safety of the railroad;
- In the north of Lezhë, the stability of the railway is affected by erosion because of the flash floods of the Fangu Channel in case of heavy rainfalls. Within this section, the vertical alignment of the railway line will be increased and the slopes of the railway will be reinforced;
- The streambeds crossed by the railway line in the section Grile – Hani Hotit, where the high water discharge in case of heavy rainfalls may change the morphology of the streambed and erode the bridges' foundations.

Magnitude and stakeholders concern

- Option 0: The magnitude and stakeholders' concern is evaluated based on the existing situation.

  The erosion may cause damage to the railway and the riverbeds and streambeds sides. The magnitude and stakeholders' concerns can be evaluated as low (see table 4.5).

- Option 1: After intervention works that will be based on the Project's design, the magnitude and stakeholders' concerns are evaluated based on the impact intensity (see table 4.2 and table 4.3) and the probability of occurrence (see Table 4-18).

  After mitigation measures (reinforcement of the protection works (Kiri River) and increase of the vertical alignment (Lezhë), the intensity of the likely impacts can be evaluated as low (see Table 4-19 and Table 4-20), while the likelihood can be evaluated as "unlikely" (see Table 4-18). As a result, the magnitude and stakeholders concern can be evaluated as negligible (see Table 4-21)

Receptor sensitivity

The riverbeds and streambeds sides can be evaluated of moderate sensitivity (see Table 4-23 and Table 4-24) for option 0 and low for option 1.

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts that can be caused by erosion and sedimentation would be as shown in the table below.

Table 8-143_Evaluation of impact significance linked to erosion and sedimentation phenomena

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	Moderate	Moderate	Moderate	-6
1	Negligible	Low	Negligible to Minor	-2

8.2.7. Surface water

The most sensitive areas concerning the surface are the crossed rivers and streams, and Shkoder Lake. Between the railway line and the Shkoder Lake, there are also some karst springs (Syri Sheganit, Hurdhana 1, Hurdhana 2, etc.).

The karst springs are located more than 1.5 km from the railway line. The Shkoder Lake in the section from km 139+200 to km 140+000 is located from 50 to 70 m from the railway line.

The waters of the rivers and streams crossed by the railway line will be affected by the demolition of the bridges.

Magnitude and stakeholders concern

- Option 0: The magnitude and stakeholders' concern is evaluated based on the existing situation. The surface waters are not affected as long as there are no earthworks alongside the railway line, and therefore the value of magnitude and stakeholders' concern is zero.
- Option 1: The construction activities may affect surface water quality and regime. The magnitude and stakeholders concern is evaluated based on the impact intensity (see Table 4-19 and Table 4-20) and the probability of occurrence (see Table 4-18).

After mitigation measures (routine mitigation measures related to solid waste, wastewater, and hazardous waste (e.g. oils, grease, etc.)), the intensity of the likely impacts can be evaluated as negligible (see Table 4-19and Table 4-20), while the likelihood can be evaluated as "likely" (see Table 4-18). As a result, the magnitude and stakeholders concern can be evaluated as negligible (see Table 4-21)

Receptor sensitivity

The groundwater quality can be evaluated of low sensitivity (see Table 4-23 Table 4-24).

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts that can be caused to the surface waters would be as shown in the table below.

The table below gives the expected significance of the impacts that can be caused to the surface waters.

Table 8-144_Evaluation of impact significance to the surface waters

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	No impact	No impact	No impact	0
1	Negligible	Low	Negligible to minor	-2

8.2.8. Groundwater

The presence of recharge areas (crossing of Mati riverbed), Upper Shkoder aquifer) presents a moderate risk for groundwater pollution, especially where the groundwater is used for drinking water supply. The most sensitive areas are as follows:

- Mati River aquifer, which supplies in drinking water Durrës city and the villages of the area; and
- Upper Shkoder Aquifer, which supplies drinking water to Shkoder city and the villages of the area

The railway line is located more than 2.5 km from the sanitary protection zone of the hydrogeological wells that supply drinking water to the above-mentioned urban and rural areas and therefore there is expected any risk to ground waters pollution if routine mitigation measures are undertaken.

Magnitude and stakeholders concern

- Option 0: The magnitude and stakeholders' concern is evaluated based on the existing situation. As there are no earthworks alongside the railway line, the magnitude, and stakeholders, the concern can be evaluated as negligible (see Table 4-22).

- Option 1: The construction activities may pollute the ground waters. The magnitude and stakeholders concern is evaluated based on the impact intensity (see Table 4-19and Table 4-20) and the probability of occurrence (see Table 4-18).

After mitigation measures (routine mitigation measures related to wastewater and hazardous waste e.g. oil, grease, etc.), the intensity of the likely impacts can be evaluated as negligible to low (see Table 4-19 and Table 4-20), while the likelihood can be evaluated as "unlikely" (see Table 4-18). As a result, the magnitude and stakeholders concern can be evaluated as negligible to low (see Table 4-21)

Receptor sensitivity

The groundwater quality can be evaluated as low to moderate as the railway construction is not a source of hazardous waste generation (see Table 4-23 and Table 4-24).

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts that can be caused by the pollution of groundwater would be as shown in the table below.

Table 8-145_Evaluation of impact significance linked to the pollution of groundwater

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	Negligible	No impact	No impact	0
1	Negligible to low	Low to moderate	Minor	-4

8.2.9. Biodiversity

The railway line runs generally across agricultural lands, semi-urban and urban areas. The only section that crosses natural vegetation is the karst area within the territory of Malesia Madhe Municipality. Roughly, from km 132+500 to km 137+750 the railway line traverses an area covered with shrubs and degraded oak forest and therefore construction works reduce temporarily the habitats on both sides. While from km 139+000 to km 140+000 the railway runs between the motorway and a hilly foot covered with rare shrubs (Mediterranean Maquis).

The negative impact on biodiversity will be temporary and reversible if appropriate mitigation measures are applied. Besides, the Project will enhance the existing situation because the rehabilitated culverts and the construction of new additional ones will serve as underpasses for wild fauna passage. The birds' nesting period and other stress to birds and fauna species will be avoided/reduced.

Magnitude and stakeholders concern

- Option 0: The railway line crosses a shrubby and degraded forest area, which biodiversity is evaluated as of low to moderate values. The existing railway line already fragments this habitat. However, the motor road that was built decennia before the railway already fragmented the same habitat. Both the railway and the motorway within the above-mentioned sections run parallel and almost joint to each other. The magnitude and stakeholders, the concern can be evaluated as low (see Table 4-22).
- Option 1: The construction activities may affect the biodiversity mostly through the vegetation removal and construction activities within the working strip. In addition to the routine mitigation measures related to biodiversity (e.g. reduce the working strip, avoiding the birds' nesting period and other stress to birds and other fauna species,

vegetation restoration after the construction works, etc.), the rehabilitated culverts and small bridges, as well as the construction of new additional culverts, will facilitate the wild fauna passage. The temporary reduction of the shrubby and forest habitat during construction works will be reduced, but not avoided.

The intensity of the likely impacts can be evaluated as of low to moderate value (see Table 4-19 and Table 4-20), while the likelihood as "definite" (see Table 4-18). Therefore, the magnitude and stakeholders' concerns can be evaluated as small (see Table 4-21 and Table 4-22).

Receptor sensitivity

The biodiversity can be evaluated with moderate sensitivity (see Table 4-23 and Table 4-24).

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts related to biodiversity would be as shown in the table below.

Table 8-146_Evaluation of impact significance on biodiversity

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	Low	Low	Minor	-4
1	Low	Moderate	Minor to moderate	-5

8.2.10. Protected Areas

From km 132+500 to km 135+700, the railway line traverses the recreational zone of the Shkoder Lake NMR, while from km 135+700 to km 140+000 it runs outside, but very close, to its eastern border. The terrain is karstified and covered with bushes. The Shkoder Lake's Nature Managed Reserve (NMR) was proclaimed in 2005 that means 21 years after the construction of the railway (1984). Thus, the existing railway fragments the habitats on both of its sides. In 2005, Shkoder Lake and adjacent areas have been designated as Ramsar site due to its importance for migratory birds. Besides, close to the lakeshore is a hydro-monument (Syri Sheganit Spring).

The Project's impacts will be negative only during construction. Earthworks and other activities may be a source of pollution to the waters of the lake and of the hydro- monuments located in the lakeshore, as well as for the birds' communities. The expected impacts can be mitigated through appropriate measures, including the avoidance of the birds' nesting period and other stress to birds and fauna species.

Magnitude and stakeholders concern

- Option 0: As the railway line crosses the eastern edge of the terrestrial part of the Protected Area, it fragments this NMR. The international importance of this protected area is linked overall to its aquatic part and water birds. Consequently, the magnitude and stakeholders' concern on the terrestrial part of the NMR can be evaluated as of low value (see Table 4-22).
- Option 1: The existing railway line already fragments this NMR. The magnitude and stakeholders concern is evaluated based on the impact intensity (see Table 4-19 and Table 4-20) and the probability of occurrence (see Table 4-18).

  In addition to the routine mitigation measures related to biodiversity (e.g. avoiding the birds' nesting period and other stress to birds and fauna species, etc.), the rehabilitated culverts and small bridges and the construction of new additional culverts will facilitate the wild fauna passage. As a result, the intensity of the likely impacts can be evaluated as moderate (see Table 4-19 and Table 4-20), while the likelihood can be evaluated as "definite" (see Table 4-18). As a result, the magnitude and stakeholders' concern can be evaluated as moderate (see Table 4-21 and Table 4-22).

Receptor sensitivity

The railway rehabilitation is included in the category of interventions that are allowed by the Managing Plan of the Shkoder Lake NMR and therefore by the Law "On Protected Areas". If the provisions of these regulations are strictly applied, the likely Project's impacts on the protected area can be evaluated of moderate sensitivity. However, due to its international status (Ramsar Area), the sensitivity can be evaluated as to moderate to high (see Table 4-24)

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts that are related to the protected areas would be as shown in the table below.

Table 8-147_Evaluation of impact significance on protected areas

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	Low	Moderate	Minor to Moderate	-5
1	Moderate	Moderate to high	Moderate to high	-8

8.2.11. Land Acquisition

The project elements require permanent land acquisition, overall for the following:

- Service roads; and
- Construction of the new Lezhë freight station (Lezhë 2)

Roughly, 60 hectares of the land surface are required for these elements. From this figure, approximately 80% (48 ha) is composed of the existing local roads that state (ARA), municipal or Albanian Railway properties. Therefore, only 7.5 hectares of land are private property that lies mainly in agricultural land.

Magnitude and stakeholders concern

The magnitude and stakeholders' concern can be evaluated as low to moderate values (see Table 4-22).

Receptor sensitivity

The sensitivity also (see Table 4-23 and Table 4-24) can be evaluated as of low to moderate value, because of the limited agricultural land surface in Albania.

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts related to the land acquisition issues would be as shown in the table below.

Table 8-148_Evaluation of impact significance on land acquisition issues

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	No impact	No impact	No impact	0
1	Low to moderate	Low to moderate	Minor to moderate	-5

8.2.12. Land Use Restriction

As the rehabilitated railway line will follow the existing track, the Project will not create any land use restriction problem.

The construction of a new side and local connectivity roads will enhance the existing situation concerning circulation on both sides of the railway line. The total length of these roads will be roughly 112 km. In some locations (e.g. Shkoder and Malesia Madhe Municipalities territories, Spathari village, etc.), due to the chaotic development of the territory, crossing the railway is the same way to reach the other parts of the village/ town/agricultural land, etc. The Project will stop the illegal crossings and proposed secured and legal ones. Therefore, the Project will improve the situation related to land use restriction.

Magnitude and stakeholders concern

The magnitude of impacts can be evaluated as of moderate value (see Table 4-22).

Receptor sensitivity

The sensitivity also (see Table 4-23 and Table 4-24) can be evaluated as moderate, because of the number of local inhabitants that are concerned by the existing land use restriction.

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts related to the land use restriction issues would be as shown in the table below.

Table 8-149_Evaluation of impact significance on land use restriction issues

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	Moderate - negative	Moderate	Moderate	-6
1	Moderate - positive	Moderate	Moderate	+6

8.2.13. Topsoil

Roughly, 7.5 hectares of private land will be transformed from agricultural land to service and connectivity roads and Lezhe 2 freight station. Other land surface belonging to the Albanian Railways will be used to build the new stations. The topsoil will be removed and stockpiled to be used for improving the quality of the agricultural land in other locations that will be defined in collaboration with the local governments.

Magnitude and stakeholders concern

The magnitude and stakeholders' concern can be evaluated as of low value (see Table 4-22).

Receptor sensitivity

The sensitivity also (see Table 4-23 and Table 4-24) can be evaluated as of low to moderate value, because of the limited agricultural land surface in Albania.

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts related to the topsoil would be as shown in the table below.

Table 8-150_Evaluation of impact significance on topsoil

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
“Zero”	No impact	No impact	No impact	0
1	Low	Low to moderate	Minor to moderate	-5

8.2.14. Cultural Heritage

There is no known cultural heritage site/object within the areas that may be occupied by the railway line realignment, the construction of any eventual underpasses, overpasses and side roads, and the new station of Lezhë. The only cultural heritage objects/sites that may be affected by the proposed project are any unknown archaeological objects/sites. If that occurs, the damage to the cultural heritage may be irremediable. The significance of the likely impacts depends on the importance of the eventual archaeological findings.

According to the provisions of Law, 27/2018: “On the Cultural Heritage and Museums” and the best practice, the chance of archaeological finds should be applied during construction works.

Magnitude and stakeholders concern

The magnitude of impacts varies in function of the eventual archaeological findings. It can be evaluated from negligible to a low value (see Table 4-22).

Receptor sensitivity

Because of any eventual archaeological finding, a certain value should be accorded to the sensitivity (see Table 4-23 and Table 4-24). As the dredging and earthworks will be performed mostly within the existing railway line belt, the value accorded to the sensitivity is low.

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts related to the cultural heritage issues would be as shown in the table below.

Table 8-151_Evaluation of impact significance on cultural heritage

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
”Zero”	No impact	Negligible to Low	No impact	0
1	Negligible to low	Negligible to Low	Negligible to Minor	-2

8.2.15. Traffic

The construction of new service and local connectivity roads, the railway line signalling, the transformation of some under bridge roads onto underpasses, the construction of some underpasses and overpasses and the securing of all the level crossings will enhance the traffic issues at the country level.

The magnitude of impacts can be evaluated by moderate (see Table 4-22). The sensitivity also (see Table 4-23 and Table 4-24) can be evaluated as moderate, because of the importance of the traffic at the country level.

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts related to the road traffic would be as shown in the table below.

Table 8-152_Evaluation of impact significance linked to the road traffic

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
”Zero”	Moderate	Moderate - negative	Moderate	-6
1	Moderate	Moderate - positive	Moderate	+6

8.2.16. Waste

The Project foresees the removal of the railway substructure filling material from Vorë to Hani Hotit. The removed material will be mixed with other ones extracted from authorized quarries and then reused to fill the railway subgrade. Thus, no significant amount of earth material will be generated. The main source of solid waste is the demolition of the stations and bridges that will generate a large amount of solid waste, mainly concrete.

Magnitude and stakeholders concern

- Option 0: The magnitude and stakeholders' concern is evaluated based on the existing situation. As there is no solid waste alongside the railway line, the magnitude and stakeholders, the concern can be evaluated as negligible (see Table 4-22).
- Option 1: The railway embankment is filled with material of weak quality, which will be removed and reused after mixing with other material. The demolition of the existing stations and bridges will generate a large amount of solid waste, mainly concrete that will be reused to fill the railway subgrade both parts of the new bridges. The magnitude and stakeholders concern is evaluated based on the impact intensity (see Table 4-19 and Table 4-20) and the probability of occurrence (see Table 4-18).

  After mitigation measures (removal of the solid waste to the locations defined by the related authorities/institutions), the intensity of the likely impacts can be evaluated as low (see Table 4-19 and Table 4-20), while the likelihood can be evaluated as “likely” (see Table 4-18). As a result, the magnitude and stakeholders concern can be evaluated as low (see Table 4-21)

Receptor sensitivity

As the demolition works are temporary and the solid waste can be removed in a short time, the receptor sensitivity can be evaluated as low (see Table 4-23 and Table 4-24).

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts that can be caused by the generation of solid waste would be as shown in the table below.

Table 8-153_Evaluation of impact significance linked to solid waste

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	Negligible	No impact	No impact	0
1	Low	Low	Minor	-4

8.2.17. Accidents and Incidents

The enhancement of the road traffic through service and connectivity roads improvement, the construction and operation of only secured level crossings, the railway line and stations fencing, as well as the appropriate signalling and interlocking system, will eliminate or drastically reduce the number and severity of accidents.

The improved railway line components will avoid or significantly reduce railway accidents and incidents.

Magnitude and stakeholders concern

The magnitude of impacts can be evaluated as of moderate value (see Table 4-22).

Receptor sensitivity

The sensitivity (see Table 4-23 and Table 4-24) can be evaluated as of moderate value, because of the importance of these issues at the country level.

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts related to railway accidents and incidents would be as shown in the table below.

Table 8-154_Evaluation of impact significance linked to the eventual accidents and incidents

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	Moderate	Moderate - negative	Moderate	-6
1	Moderate	Moderate - positive	Moderate	+6

8.2.18. Socioeconomic issues

The improvement of the socioeconomic issues constitutes the main goal of the Project. The existing situation favours neither the passengers nor the freight transport. The rehabilitation of the railway line will affect positively the following:

- The international transport towards Montenegro and further to Croatia and other central European countries;
- The increase of the importance of the Durrës Port;
- Creation of opportunities for an increase of business at the national and regional level and therefore increase in employment and incomes;
- Opportunity for people in poor economic conditions to travel cheaper than with road

transport; etc.

Magnitude and stakeholders concern

The magnitude of impacts can be evaluated as moderate to a high value (see Table 4-22).

Receptor sensitivity

The sensitivity also (see Table 4-23 and Table 4-24) can be evaluated as moderate to high, because of the increased international transport for passengers and freight.

Significance of impacts

Based on the adopted methodology (see Table 4-25, Table 4-26 and Table 4-27), the expected significance of the impacts related to the socioeconomic issues would be as shown in the table below.

Table 8-155_Evaluation of impact significance on economic issues

Opt.	Magnitude and stakeholders concern	Receptor sensitivity	Impact significance	Scoring
"Zero"	Moderate to high - negative	Moderate to high	Moderate to high	-8
1	Moderate to high - positive	Moderate to high	Moderate to high	+8

8.3. Environmental comparison between the selected option and the existing situation

The results of the tables above are summarized in the table below. Columns c4 and c5 give the evaluated impact significance for each of the considered options.

The selection of the environmental and social receptors and the weighting of each of them is a function of the following:

- Project purpose and objectives;
- Environmental and social characteristics of the project area;
- Project elements (components, activities and land surface requirements);
- EU, national and EBRD standards on the environment;
- Requirements of the Project's ToR and Inception Report;
- The judgment of the environmental experts;
- The stakeholder's concerns

Based on the above, the biggest weighting has been given to economic issues, which constitute the main goal of the project.

Table 8-156_ Approximate quantitative assessment of impacts for each Project alternative/option

	Environmental and Social topic/ Receptor/ Parameter	**Weighting (%)**	**Residual impact's significance**	
		Total = 100	**Option**	
c1	**c2**	**c3**	**c4**	**c5**
			Opt.0 (Do nothing)	**Opt.1** (Basic)
r1	Noise and vibration	5	-6	-4
r2	Climate change and Greenhouse Gas Emissions	2	0	-2
r3	Climate change and Flooding	8	-5	-2
r4	Geology (subsidence)	6	-6	-4
r5	Earthquakes	6	-6	-4
r6	Erosion & sedimentation	4	-6	-2
r7	Surface water	4	0	-2
r8	Ground water	5	0	-4
r9	Biodiversity	5	-4	-5
r10	Protected Areas	5	-5	-8
r11	Land acquisition	4	0	-5
r12	Land use restriction	6	-6	6
r13	Top soil	3	0	-5
r14	Cultural heritage	2	0	-2
r15	Road traffic	5	-6	6
r16	Waste	5	0	-4
r17	Accidents and incidents	5	-6	6
r18	Economic issues	20	-8	8
r19	Total weight: (r1 to r18)		-467	+8
	Option "Zero": $\sum_{i=1}^{18}(\mathrm{c3,ri\ x\ c4,ri})$			
	Option 1: $\sum_{i=1}^{18}(\mathrm{c3,ri\ x\ c5,ri})$			

In the table above the worst negative and the best positive weighting regarding each option results as follows:

Negative impacts: i=1□18□(c3x(-10)□ $\sum_{i=1}^{18}(\mathrm{c3\ x\ }(-10)$ = -1000,

i=1□18□(c3x(-10)□ i=1□15□ c□3□×(-10□□)

Positive impacts: i=1□15□ c□3□×(+10□□ $\sum_{i=1}^{18}(\mathrm{c3\ x\ }(+10)$ = +1000,

i=1□18□(c3x(+10)□

Where c3 is the value of column 3 in the table above.

The most environmentally friendly option has the highest value of r19. Those that have an r19 value superior to that of the Option "zero" (or "Do nothing") results in the enhancement of the existing environment.

From the table above results that the most environmentally friendly is option 1. That means the Project will enhance the overall existing environmental and socio-economic situation. Therefore, the proposed project is feasible from the environmental and social point of view.

9. Main Findings

This chapter summarizes the main findings of the ESIA report that are associated with the considered Project's options, as well as with the expected environmental and social effects that may arise from the implementation phases of the preferred option.

9.1. Considered Project's options and the preferred option

Two Project's options are considered:

- Option 1 (Basic option): construction of 54 secured level crossings;
- Option 2: (Expensive option): construction of 32 new overpasses and 22 secured level crossings

Option 1 (Basic option) is the preferred option from the environmental and social point of view (see section 2.2). Besides, the Project's promoter for financial and environmental reasons prefers it also. Consequently, the assessment of the expected environmental and social effects that may arise from the implementation of the proposed project relates to the "basic option".

9.2. The Project and the crossing of Shkoder Lake Protected Area

Although the railway line crosses a protected area (the Nature Managed Reserve of Shkoder Lake), the railway rehabilitation is included in the category of interventions that are allowed by the Managing Plan of this NMR, and therefore from the Law "On Protected Areas" (see section 3.2.2).

9.3. Expected significant effects of the Project

The expected significant effects are the residual ones, which are associated directly with the project elements and activities or indirectly with the interaction between the project and other development plans/programs/strategies within the same project area or in the same sector (transport).

9.3.1. Expected negative effects

The main adverse impacts are expected to occur during the preconstruction and construction stages. Some of them are reversible once the construction works are done. Other last sometime after the construction period.

The main expected adverse impacts are grouped in permanent and reversible ones.

Main expected residual negative effects

The ESIA study aims to assess the potential significant adverse impacts of a project before the project is approved. Besides, it takes into account the stakeholders' concerns in the environmental decision-making process during the whole project's life cycle.

The main expected permanent negative effects concern the land use and the landscape.

Permanent land take is necessary for 112 km service roads, the new Lezhë2 station and the connectivity roads. The main part of the required land surface falls in the existing local municipal roads and in the railway belt. Thus, only roughly 7.5 ha falls in private agricultural land. Anyway, the loss of 7.5 ha of land is justifiable compared to the positive effects that the Project will bring at national and local level.

However, the loss of 7.5 ha of the land surface is justifiable compared to the positive effects that the Project will bring at the national and local level, as provided hereinafter.

The presence of railway line fencing and any eventual noise barrier will affect the landscape and the visual amenities.

Main expected temporary negative effects

Some of the temporary adverse impacts are reversible once the construction works are done. Other last sometime after the construction period.

The main temporary adverse impact can be considered the eventual damages to the shrubby and degraded forest area in the section from km 132+600 to km 135+600. This impact is temporary and reversible, but the rehabilitation of the vegetation requires due time.

9.3.2. Expected positive effects

Expected significant permanent positive effects

The expected significant residual positive effects related to the biophysical and socioeconomic factors.

Expected significant residual positive effects related to the biophysical environment

The expected significant residual positive effects related to the biophysical environment include:

- Avoidance of the damages to the railway line from watercourses overflows (approximately from km 69.9 to km 74).
- Avoidance of the agricultural land inundation (km 32 to km 35; km 69.9 to km 74).
- The stations' buildings and platform canopies will fulfil the EU standards on energy efficiency and "green buildings";
- The design of the new stations' buildings will improve the visual amenity compared to the existing ones;
- Decrease of the GHG emissions from the railway line and stations operation;
- Reduce the railway noise and vibrations

Expected significant positive effects associated with the socio-economic environment

The main expected positive impacts occur overall during the operation stage. This category of impacts include:

- Enhancement of the economic situation of the country as a result of the railway line operation;
- The design of the railway line components will avoid/reduce at maximum any eventual damage due to earthquakes and therefore will avoid any eventual railway traffic interruption;
- Avoiding/reducing at maximum the railway line accidents and incidents;

- The railway infrastructure at the stations and level crossings will be adapted to disabled persons, children, etc.;
- Avoid/reducing the economic losses from agricultural land inundation;
- Improvement of the traffic as a result of the improvement of the level crossings and the service and connectivity roads;
- Create conditions for linking with the future railway line to Kosove; etc.

Main expected temporary positive effects

The main temporary positive impacts last only during the construction stage. They include:

- Temporary creation of employment from the recruitment of the local workforce and the stimulation of the local service sector for the need of the construction company;
- Engagement of the local construction companies, and therefore increase of their incomes.

9.4. Overall finding

Based on the findings of the environmental and social comparison between the existing situation and the basic option (see section 2.2) it results that the Project will enhance the existing overall environmental and social situation.