Republic of Serbia
Ministry of European Integration

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#ЕУ ЗА ТЕБЕ

NON-TECHNICAL SUMMARY - RAILWAY LINE BELGRADE–NIŠ, SECTION III PARAĆIN–TRUPALE

EU PPF
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LIST OF ABBREVIATIONS AND ACRONYMS

AZE	Alliance for Zero Extinction (Alijansa za nulto istrebljenje)
BAP	Biodiversity Action Plan (Akcioni plan za biodiverzitet)
BATs	Best Available Techniques (Najbolje dostupne tehnike)
BMP	Biodiversity Management Plan (Plan upravljanja biodiverzitetom)
CBA	Cost - Benefit Analysis (Analiza troškova i koristi)
CDW	Construction and Demolition Waste (Otpad od građenja i rušenja)
CH	Critical Habitats (Kritični habitat)
CITES	*Convention on International Trade in Endangered Species (Konvencija o međunarodnom prometu ugroženih vrsta)*
EAAA	*Ecologically Appropriate Areas of Analysis (Ekološki odgovarajuće oblasti analize)*
EBRD	European Bank for Reconstruction and Development (Evropska banka za obnovu i razvoj)
EIA	Environmental Impact Assessment (Procena uticaja na životnu sredinu)
EIB	European Investment Bank (Evropska investiciona banka)
ESIA	Environmental and Social Impact Assessment (Procena uticaja na životnu sredinu i socijalna pitanja)
ESMP	Environmental and Social Management Plan (Plan upravljanja životnom sredinom i društvenim pitanjima)
ESPOO	The Convention on Environmental Impact Assessment in a Transboundary Context (Konvencija o prekograničnom uticaju na životnu sredinu)
EU	European Union (Evropska Unija)
EUD	European Union Delegation (Delegacija Evropske Unije)
EUNIS	European Nature Information System (Evropski informacioni sistem o prirodi)
FS	Feasibility Study (Studija opravdanosti)
GDP	Gross Domestic Product (BDP – Bruto domaći proizvod)
GHG	Greenhouse gas (Gas staklene bašte)
GSM-R	Global System for Mobile Communication – Railway (Globalni sistem mobilne komunikacije za železnice)
HD	Habitat Directive (Direktiva o staništima)
HGV	Heavy Goods Vehicle (Teško teretno vozilo)
IBA	Important Bird Areas (Značajna područja za ptice)
IBAT	Integrated Biodiversity Assessment Tool (Integrisani alat za procenu biodiverziteta)
ILO	International Labour Organization (Međunarodna organizacija rada)
IPA	Important Plant Areas (Značajna područja za biljke)
IPF	Infrastructure Project Facility (Podrška infrastrukturnim projektima)
IUCN	International Union for Conservation of Nature (Međunarodna unija za zaštitu prirode)
MCA	Multi Criterial Analysis (Multikriterijumska analiza)
MEI	Ministry of European Integration (Ministarstvo za evropske integracije)
MCTI	Ministry of Construction, Transport, and Infrastructure (Ministarstvo građevinarstva, saobraćaja i infrastrukture)
PBA	Prime Butterfly Areas (Odabrana područja za dnevne leptire)
PBF	Priority Biodiversity Features (Prioritetne karakteristike biodiverziteta)
PD	Preliminary Design (IP- Idejni projekat)

PFS	Pre-feasibility study (Prethodna studija opravdanosti)
PPF9	Project Preparation Facility 9 (Pomoć u pripremi projekata 9)
RAP	Resettlement Action Plan (Akcioni plan za raseljavanje)
ROS	Republika Srbija
SEETO	South-East Europe Transport Observatory (Transportna opservatorija za jugoistočnu Evropu)
SEP	Stakeholder Engagement Plan (Plan angažovanja zainteresovanih strana)
SRI	Serbian Railways Infrastructure (IŽS – Infrastrukture Železnice Srbije)
SRT	Safety in Railway Tunnels (Bezbednost u železničkim tunelima)
TEN-T	Trans-European Transport Network (Transevropska transportna mreža)
TSI	Technical Specifications for Interoperability (Tehničke specifikacije interoperabilnosti)
UNESCO	The United Nations Educational, Scientific and Cultural Organization (Organizacija Ujedinjenih Nacija za obrazovanje, nauku i kulturu)

CONTENTS

1. SUMMARY

1.1. Introduction

The Belgrade-Niš railway corridor holds paramount significance within the Republic of Serbia, serving as a linchpin in the nation's transportation infrastructure development strategy. Forming a crucial segment of the SEETO Corridor X, it serves as a pivotal link between Central and Western Europe, and regions spanning Greece, Turkey, and the Middle East. Moreover, it constitutes an integral component of the indicative expansion of the Core TEN-T railway network across the Western Balkans.

This document is founded upon insights derived from Section III (Paraćin – Trupale) of the Preliminary Feasibility Study (PFS) for the "Reconstruction and Modernization of the Belgrade-Niš Railway," authored by the PPF9 team in 2022. The data contained herein encapsulate essential details concerning environmental and societal safeguarding, garnered through a blend of theoretical inquiry and on-site assessments conducted during the composition of this report, alongside insights from the ongoing development of the technical (engineering) project, known as the Conceptual Project.

Further investigative efforts, encompassing evaluations of air quality, noise levels, vibrations, surface water conditions, and biodiversity along the corridor, are slated for execution and inclusion in the forthcoming Environmental and Social Impact Assessment (ESIA) report.

The scope of this study pertains specifically to the segment between Paraćin and Trupale, spanning a distance of 61 kilometers, excluding the Stalać – Đunis section, which lies beyond the purview of this investigation. The PPF9 team, entrusted with oversight of this sub-project, has engaged the SAFEGE consortium, comprising Egis, EPEM, and KPMG, as the designated executor. The primary mandate of this consultancy consortium is to furnish the Feasibility Study, Conceptual Project, as well as the requisite ESIA and Environmental Impact Assessment (EIA) documents, ensuring compliance with pertinent national legislation.

1.2. Legal framework

The regulations on environmental and social aspects applicable to this project are numerous and diverse. Therefore, only key requirements related to the project are selected in this section. However, a comprehensive and detailed list of legislation related to the project will be developed as part of the project management system for construction and operation. The Environmental Impact Assessment (EIA) procedure in the Republic of Serbia is regulated by the Law on Environmental Impact Assessment, which is aligned with the European EIA Directive (85/337/EEC, 97/11/EC, 2003/35/EC, and COM 2009/378 as accepted by Directive 2011/92/EU and amended by Directive 2014/52/EU).

1.2.1. National Regulatory Framework for Environment and Society

This legal, legislative, and institutional framework for environmental protection and societal considerations in Serbia is based on the Constitution of Serbia, which stipulates the right to a healthy environment and the obligation of all, in accordance with the law, to protect and improve it. Health and the environment are also supported by numerous government strategies, international agreements, and sustainable development goals. Environmental protection legislation in Serbia encompasses over 100 laws and regulations. Currently, the majority of them are aligned with European Union directives and other legislation.

1.2.2. National EIA Procedure

The Law on Environmental Impact Assessment ("Official Gazette of RS", No. 135/04 and 36/09) regulates the process of environmental impact assessment, the content of EIA, public participation, participation of interested bodies and organizations, international notification of projects that may have significant impacts on other environments and their commencement, as well as other important issues for EIA. The impact assessment covers projects in the fields of industry, mining, energy, transportation, tourism, forestry, agriculture, water management, waste management, communal activities, and projects planned in protected natural areas or areas of special designation defined by the Regulation on Determining the List of Projects Requiring Environmental Impact Assessment and the List of Projects for Which Environmental Impact Assessment May Be Required ("Official Gazette of RS", No.114/08). The Ministry of Environmental Protection is responsible for the environmental impact assessment process and grants approval for the EIA, in accordance with the Law on Environmental Impact Assessment. The Regulation on Determining the List of Projects Requiring Impact Assessment and the List of Projects for Which Environmental Impact Assessment May Be Required ("Official Gazette of RS", No. 114/08) establishes List I projects (requiring environmental impact assessment) and List II projects (for which environmental impact assessment may be required). The subject project, based on its characteristics, is categorized under List I, item 7: Construction: 1) main railway lines including ancillary facilities (bridges, tunnels, and stations). The Law on Environmental Impact Assessment ("Official Gazette of RS", No. 135/04 and 36/09) regulates the process of environmental impact assessment, the content of the environmental impact assessment study, participation of interested bodies and organizations and the public, transboundary notification of projects that may have significant impacts on the environment, supervision, and other environmental impact assessments. This project proposal falls under category "A" of EBRD's screening categorization. As such, the project requires a special, formalized, and participatory assessment process in line with the EBRD's comprehensive set of specific performance criteria (PR) expected to be met, covering key areas of environmental and social impacts and issues.

1.3. Basic Project Description

The considered section Paraćin – Trupale, part of the Belgrade Center – Niš railway line, is 61km long, excluding the Stalać – Đunis section, which is not part of this study. The entire Paraćin – Trupale section is a double-track electrified railway line.

The Stalać-Đunis section is an integral part of the Belgrade-Niš railway line, and the project documentation has not been prepared within the scope of the PPF9 project.

It is planned for the highest category of international passenger trains to operate at speeds of up to 200 km/h, while other passenger trains will operate at speeds below 200 km/h, depending on the train category.

The project speed, both for passenger and freight trains, is set at 100 km/h on turnouts. Considering the railway line category and the project speed of 200 km/h, the project includes fencing of the railway line. A protective wire fence is planned along the entire section.

In parts of the railway line where noise protection is required, the project includes the installation of noise protection barriers, 3.5 meters high at the edge of the embankment.

1.4. Preliminary Description of Environmental and Social Foundations

This section describes the main components of the physical and natural baseline environment in the area affected by the implementation of the proposed Project. The characterization of the existing environment and identification of sensitivities along the proposed railway route included a comprehensive review of a wide range of existing data sources and basic field checks.

1.4.1. Description of the Environment

The climate in the project area ranges from continental to moderately continental, with annual precipitation usually ranging from 500–600 mm, while air humidity is moderate. It is characterized by relatively colder winters, autumns warmer than springs, and moderately warm summers. Specifically, low annual rainfall dominates, while summer precipitation is characterized by high evaporation due to high temperatures, often accompanied by summer storms and showers. Wind is a significant factor causing temperature variations, bringing precipitation or drought. Wind speed is usually low. Most of Serbia has a Cfb climate[1] (Köppen climate classification).

[1] *Climatic regionalization of Serbia according to Kopen's climate classification, https://doi.org/10.2298/IJGI1702103M*

The average winter temperature is above 10°C, and summer temperatures are above 20°C. Spring temperatures differ slightly from autumn temperatures. The average annual precipitation in lower areas is around 520 mm, and sometimes exceeds 650 mm. The least precipitation occurs in winter, while spring precipitation is slightly higher than in autumn.

Serbia ranks 155th (out of 192) in the 2022 World Risk Index Report (Institute for Environment and Human Security of the United Nations University) (111th out of 181 countries in the 2021 report) with a world risk index of 1.84 (Very Low). Exposure is also very low, with moderate vulnerability. Sensitivity is high, a change from the 2021 report when it was assessed as moderate. ThinkHazard assesses that in Serbia, there is a high risk of river floods, urban floods, and forest fires, while earthquakes, landslides, water scarcity, and extreme heat carry a moderate risk.

Along the Belgrade–Niš railway route, the oldest lithological layers consist of Proterozoic amphibolites and amphibolitic schists, leptinite and micashists, black quartzite, gneiss, and marble. The Paleozoic is represented by aplite and migmatites. Paleozoic rocks are also represented by various petrographic varieties, among which metamorphosed basal conglomerates and sandstones, schists represent sedimentary-volcanogenic series altered under green schist facies conditions.

Through the area traversed by the railway, characteristic classes of fluvial and fluvioglacial soils prevail, with notable azonal soil types of varying development and fertility. Portions adjacent to the Velika and Južna Morava rivers constitute fertile alluvial soil, considered the highest quality, most fertile, and economically most productive soil in these regions, classified as the second class of agricultural land.

Based on the isolated lithostratigraphic composition, the research area comprises Paleozoic rock complexes forming the peripheral parts of the Velika and Južna Morava rivers, within which Neogene and Quaternary sediments were deposited. Hydrogeological properties of lithological environments and structural types of porosity delineate the following structural types of porosity in this area: intergranular type (with high and low potential), fissure-karst, and areas poor in outcrops - conditionally arid terrains (with low rainfall).

Groundwater represents the most significant water resource in the central part of the Velika Morava basin, utilized for water supply. The current state regarding groundwater protection can be characterized as poor, affecting all facilities with only the first zone of sanitary protection, while the second and third zones of sanitary protection are often undefined or not adhered to.

The hydrographic network is quite dense in the flat terrain traversed by the existing railway, with rivers belonging to the drainage basins of the Južna Morava and Velika Morava, as well as numerous streams. According to the

Regulation on Categorization of Watercourses [2], the water of the Velika Morava corresponds to class IIa, while the water of the Južna Morava corresponds to classes IIa and IIb.

Based on the Preliminary Flood Risk Assessment for Serbia[3], the entire course of the Južna Morava and Velika Morava rivers is assessed as flood-prone areas. The municipality of Ćuprija is designated as an area significantly affected by floods. Flood risk on the river is classified as high based on flood modeling, indicating that potentially damaging floods are expected to occur at least once in the next 10 years.

Since acoustic zoning does not exist for the subject area, the selection of permissible noise levels was made in accordance with the Regulation on Noise Indicators, Limit Values, Assessment Methods of Noise Indicators, Interference, and Adverse Effects of Noise on the Environment ("Official Gazette of RS", No. 75/2010). Based on this regulation, the subject area of the Belgrade-Niš railway section falls within acoustic zone 5 (industrial, administrative-governmental zone with residential areas, zones adjacent to highways, main roads, and city avenues). The limit values for noise in zone 5 are 65 dB(A) for day and evening, and 55 dB(A) for night. These limits are mandated by local laws in force. Reference noise values defined in the WHO Environmental Noise Guidelines for the European Region (2018) will be used in this study as they are more stringent than local and EU requirements. An analysis of the impact of noise generated by the projected traffic volume on the Belgrade-Niš railway section will be determined using the CadnaA software package.

Vibrations and low-frequency noise generated by railway traffic will be calculated using the VIBRA-1 software package (Ziegler Consultants and Sviss Rail). In the operational phase, a negative impact of vibrations on open tracks can be expected up to a distance of 25 m, and at station turnouts up to a distance of 35 m from the turnout.

Air quality monitoring in the Republic of Serbia is conducted by the Environmental Protection Agency. The obligations and tasks of the Environmental Protection Agency in managing air quality are further defined by the Air Protection Act ("Official Gazette of RS" No. 36/09, 10/13, and 26/21). The Belgrade-Niš railway is electrified, thus having minimal impact on air quality. In the municipalities of Paraćin and Niš, the air quality was categorized as Class III, extremely polluted, due to exceeding the limit values of suspended particles PM10 and PM2.5.

The Nature Protection Act regulates spatial planning, management, and use of space, natural assets, protected areas, and ecological networks, implemented based on spatial and urban planning plans, planning and project documentation, principles and programs for the management and use of natural resources and assets in mining, energy, transportation, water management, agriculture, forestry, hunting, fishing, tourism, and other activities affecting nature, while respecting measures and conditions for nature protection. Field research will be conducted

[2] *Official Gazette, Regulation on water classification: 5/1968-64, https://www.pravno-informacionisistem.rs/SlGlasnikPortal/eli/rep/sgsrs/vlada/uredba/1968/5/1/reg*
[3] *https://rdvode.gov.rs/doc/6.2.1%20Znacajna%20poplavna%20podrucja%20za%20teritoriju%20Republike%20Srbije.pdf*

throughout the four seasons (winter, spring, summer, and autumn). The area of influence (studied area) will encompass a 500 m corridor on both sides of the railway. Additionally, the study area will be expanded to fully cover ecologically appropriate areas of analysis (EAAA) for characteristics requiring further research.

The potential natural vegetation of the surveyed area has been reduced by urbanization, the establishment of various plantations, and deforestation to create arable land. Accordingly, a large portion of this area consists of artificial habitats, including arable land, built, industrial, and other artificial habitats, living fences, etc. Natural habitats that can be observed along the research area include forests, shrubs, grasslands, and aquatic habitats. Fauna in the region around the railway area is sporadically surveyed.

The railway track does not pass through protected areas. Furthermore, there are no protected areas within the area of influence (500 m zone). Within the zone influenced by the railway corridor, two ecological corridors have been identified: the Velika Morava River and the Južna Morava River. These corridors are of international significance and represent ecological pathways and connections facilitating the movement of individuals within populations and gene flow between protected and ecologically significant areas, according to the regulation on the ecological network. According to the Nature Protection Act, Article 130, the Ecological Network will be established and become part of the European ecological network Natura 2000 on the day of the Republic of Serbia's accession to the European Union.

1.4.2. Social Environment

Section 3 of the Belgrade-Niš railway starts in the town of Paraćin and ends in Trupale, a suburb of Niš. The railway passes through the suburbs of Niš, two larger towns, Paraćin and Ćićevac, as well as through a number of small villages along the existing and planned railway. The newly planned high-speed railway largely follows the existing railway corridor; however, there are several locations where changes are being made. The most significant changes are planned at the location between the stations of Stalać and Đunis, where the new railway involves the construction of tunnels and bridges. This section is not the subject of this Scope Definition Report, as separate studies have been prepared for this subsection (Stalać Đunis).

The directly affected population along the railway corridor can be estimated at approximately 35 thousand people. Serbia as a whole, including municipalities affected by the Project, is characterized by a significant decline in population in recent decades. The average age of the population in 2021 in all municipalities is higher than the national average, except in the city of Niš, where it is slightly lower. The aging index of the population, which represents the ratio of the number of elderly persons (60 and over) to younger persons (0–19 years), in 2021 ranges from 143.7 in Niš to 192 in Ćićevac, which is alarmingly high. Serbs make up the majority of the population in all affected areas, with the second largest ethnic group being Roma. As expected, in line with the ethnic composition, the majority of the population in all areas belongs to the Serbian Orthodox faith.

Aleksinac belongs to the fourth, lowest category of development, which is less than 60% of the national average. The municipalities of Paraćin and Ćićevac are characterized as third-category municipalities, with a level of development between 60% and 80% of the national average. Kruševac is characterized as a second-category municipality, with a level of development between 80% and 100% of the national average. The most developed municipality is Crveni Krst, territorially within the City of Niš, which belongs to the first group of municipalities with a level of development above the national average.

Niš and Kruševac are the key of local economic development in the region. Niš is widely known as a center of the tobacco industry and as a center of electroindustry, automotive parts and equipment manufacturing, as well as textile industry. Kruševac is developing its metal, chemical, and wood industry, as well as food and textile industry. Paraćin is known as a center of glass production, as well as textile and cement industries, and confectionery products. Aleksinac is known for coal mining, which is still present in the municipality but has significantly declined in the last decade, and the municipality is now more oriented towards automotive equipment and parts. Ćićevac, as the smallest municipality, has a developed wood processing industry, while most of the population still engages in agriculture.

In analyzing the employment sectors in municipalities, it is evident that the majority of people work in the manufacturing sector, with values in all municipalities above the national average (22%). Other important employment sectors are trade, transportation and storage, as well as education and social services.

The percentage of registered unemployed persons compared to the estimated working-age population (aged 19 to 64) is highest in Paraćin and Aleksinac, at 17%, followed by Ćićevac and Crveni Krst (Niš) at 14%, and Kruševac at 11%. Average net salaries in all municipalities are below the national average (€705 in January 2023). Salaries have increased over the past year in all municipalities, ranging between 15% and 19%.

The percentage of individuals without education or with incomplete primary education ranges between 15% and 22% in the affected municipalities, which is above the national average of 14%. The percentage of men and women who have completed primary education ranges between 22% and 28%, also above the national average in all municipalities. The high school completion rate is lower than the national average in all municipalities except in Niš, ranging between 40% and 47%. The completion rate of higher education (college or university degree) is lower than the national level, ranging between 8% and 14%.

Life expectancy at birth in 2021 ranges from 71.14 years in the municipality of Crveni Krst to 74.65 years in Kruševac, and is longer for women compared to men in all municipalities. The most significant causes of death in 2021 in all municipalities were cardiovascular diseases (ranging from 28% in Crveni Krst to as high as 55% in Paraćin).

The main road near Section 3 of the Belgrade-Niš railway is the E-75 highway. This road runs parallel to the railway in most locations between Paraćin and Niš. However, this road does not provide direct access to the railway corridor,

and numerous smaller roads, including several state roads, will have to be used to access project locations. Some of the major roads to be used include state roads 158, 215, and 217. Peripheral areas of larger cities have sewage systems, while in smaller villages, wastewater is mostly discharged into septic tanks. The water quality in local water supply networks meets acceptable standards. Solid waste disposal is organized in local communities, often on a weekly basis, but unfortunately, there is still a habit among the local population to dispose of waste in illegal dumpsites. Villages have public lighting, at least in central locations, and most have bus connections to municipal centers or other parts of the country.

Kruševac is the territorially largest municipality, while Ćićevac is the smallest. Agricultural land predominates over forest land in all municipalities; however, the percentage of agricultural land is lower than the national average of 70%. Agriculture is the dominant land use along the railway because it mainly passes through small, rural communities, and to a lesser extent through populated areas.

All private land needed for the construction and reconstruction of the railway, as well as all related facilities, will be acquired through expropriation or the process of involuntary land acquisition. The project will aim to use public land for these purposes.

Currently, there are 25 railway stations and stops along Section 3 of the Belgrade-Niš railway. According to the plans existing at the time of this report, it is expected that 14 existing stops will be closed, while 9 stations will be reconstructed and remain in use, as shown in the table below.

The current railway line is not fenced, and there are many level crossings (52). The new railway, which will have faster trains and more frequent rail traffic, will be fenced, and all level crossings will be closed.

1.5. Ecological and Social Evaluation of Options

In the previous feasibility study (PFS) from 2022 conducted by PPF9, four new alternatives were considered, including the "no project" scenario and three alternatives for increasing the speed to 200 km/h with the aim of shortening travel time and enhancing the competitiveness of national railway traffic. The speed within the railway nodes of Belgrade and Niš is limited to 100 km/h in all alternatives, as they are located in densely populated urban areas and due to limitations of existing infrastructure.

The selected variant from the PFS serves as the basis for further development through the Investment Program (IP). The goal of further route development is to further reduce environmental impact, primarily on biodiversity, reduce noise and vibration impact, and mitigate property expropriation, which causes physical and economic displacement. Along the section from Paraćin to Stalać, in line with technical requirements as well as ecological aspects, the railway

utilizes the existing corridor. The EBRD's hierarchy of mitigation measures has been and will be applied - to avoid, and if not possible, to minimize and mitigate identified impacts.

Along the section from Đunis to Trupale, certain alternative design solutions are being considered, which will be finalized during the IP phase and further addressed within the framework of the Environmental and Social Impact Assessment (ESIA).

1.6. Key Environmental and Social Impacts

Climate Change

During the construction phase, construction machinery and transportation vehicles using fossil fuels will be employed, as well as equipment powered by electricity. Some vegetation along the new railway sections will need to be cleared, reducing the potential for carbon sequestration and likely releasing biogenic carbon stored in biomass. Both factors are relatively small and localized, so the overall impact of the project on climate change during construction can be considered negligible. However, some negative impacts on climate change are expected due to emissions from construction machinery and transportation vehicles using fossil fuels.

In the operational phase, detected emission sources during operation include indirect emissions from electricity production (electric trains) and emissions associated with railway worker travel. Other emission sources during the operational phase are not expected. The overall impact of the project on climate change will be further assessed in the Environmental and Social Impact Assessment (ESIA). It is estimated that the overall impact of the project on climate change will be negligible to low adverse.

Geohazards

Negative impacts during the construction phase may include: soil erosion due to construction activities (deforestation, site preparation), soil stability and landslide risk, seismic activity.

During the operational phase of the project, pollutants will not be directly released onto the land. The only potential effects related to geology and soil characteristics are soil liquefaction and settlement, as well as erosion and sedimentation. The overall potential effects can be assessed as local, with low probability and significance.

The section of the railway from Paraćin to Niš is located in an area of seismic intensity VII and VIII degrees according to the MCS scale.

Considering the length, as well as structural elements, a possible earthquake of the mentioned intensity cannot cause extensive collapse and therefore cannot lead to serious consequences along the railway and at station facilities, both for the lives of employees and for the environment.

Soil

During the construction phase, soil contamination can be caused by improper handling of oil and oil derivatives used for construction machinery and other equipment during construction. Soil contamination can be minimized or completely eliminated by adhering to prescribed technical measures. Construction equipment (vehicles and machinery) moving around the construction site can cause soil compaction, which can damage soil productivity, disrupt drainage, and increase the risk of flooding. Potential impacts are expected during the operational phase due to the movement of machinery and equipment. The negative impact of structural damage and soil compaction caused by the use of heavy machinery can be mitigated by protective measures using existing access roads.

During the operational phase, there will be a negative impact on the soil due to its permanent loss. Permanent soil loss refers to the area of the infrastructure belt (25 m on both sides of the railway from the center of the outer tracks), except in the zone of the belt in inhabited areas (6 m on both sides of the railway from the center of the outer tracks). Soil contamination will mainly result from the following processes: pollution from atmospheric precipitation; deposition of organic and inorganic waste; spillage of cargo; deposition of atmospheric particles from wind and dispersion due to vehicle movement. In the case of soil contamination by oil and oil derivatives, the revitalization of such soil is a complex and lengthy process. If the soil consists of fine clayey material, infiltration and the possibility of soil contamination, and thus groundwater contamination, are reduced. On the other hand, if the soil layer is of significant thickness, then filtration, biodegradation, sorption, and evaporation processes become significant, resulting in faster groundwater contamination.

Water

The reconstruction and rehabilitation of infrastructure facilities are prerequisites for significantly improving the environment, although during preparation, construction, and operation, there may be limited and minor environmental impacts. In the long term, railway reconstruction should contribute to reducing the risk of surface and groundwater pollution by improving railway drainage conditions. Improving the technical condition of the railway will increase transport safety and significantly reduce the risk of accidents.

Negative impacts on surface water quality most commonly and easily manifest on bridges above certain watercourses, on sections of watercourses parallel to the railway route, as well as on culverts for small, torrential, and intermittent watercourses, and sections of the route with a high level of the first aquifer.

Temporary impacts occurring during construction activities, such as drainage, can cause surface water pollution and affect the shoreline. Works involving spillage can cause soil contamination, while excavation and disposal of contaminated soil can lead to groundwater pollution, and vegetation removal can cause stream turbidity.

When it comes to possible pollution of surface and groundwater, temporary impacts may occur during material transport, construction activities, and temporary waste disposal. Such impacts are generally short-term. Among the significant temporary, short-term, negative impacts on water (surface and groundwater), we can highlight the impact of sanitary wastewater from the worker camp, as well as water used for machine washing and maintenance. However, their impact on water pollution is negligible, local in nature, and will be minimized by applying environmental impact prevention measures.

Fuel for construction machinery and numerous freight vehicles will be delivered by tankers, posing a potential risk of petroleum product spills during overflow or malfunction, as well as leakage of small amounts of fuel and lubricants in case of malfunction.

Noise and Vibrations

During the construction phase, noise can be primarily caused by construction activities, transportation, and material handling, while the recipients of noise are construction workers, nearby settlements, flora, and fauna along the railway track. During construction works, periodic noise measurements are necessary to ensure that generated levels do not exceed legally permitted limits.

In the operational phase, the main source of noise will be the operation of the railway itself, with potential recipients being maintenance workers, nearby settlements, flora, and fauna along the railway track.

Biodiversity and Protected Areas

Construction activities (excavation, transportation, railway structure construction) will cause temporary and localized increases in ambient noise. Dust levels will be elevated. It is expected that a layer of dust will form on vegetation near all construction work locations, temporarily disrupting evapotranspiration and photosynthesis processes. The expected dust layer will be spatially limited, temporary (depending on meteorological conditions), and therefore will not significantly impact plant vitality.

During construction works over water habitats, localized sediment dispersion in the water column is expected, causing localized sediment haze (increased turbidity and changes in physicochemical conditions). This will cause short-term, temporary, and localized disturbance to present aquatic fauna.

The construction phase of the project may disrupt the migration of large mammals. Mortality of mammals is not expected due to their avoidance of construction areas and seeking refuge in surrounding shelters. Birds are expected to avoid the construction area. Individual animals may be harmed during construction works. The construction work area will become a temporary barrier for potential migrations and a source of noise and vibrations to which herpetofauna species are very sensitive.

During construction works, habitats within the project area will be disturbed due to mechanization and human presence. Each disturbed habitat poses a greater risk for the spread and distribution of invasive species. There is a possibility that invasive species may take over certain habitats from native species, so measures to mitigate this will be proposed.

By conducting construction works in accordance with regulations and professional rules, it is possible to prevent potential negative impacts on soil and vegetation due to uncontrolled spillage/leakage of hazardous materials (oil or fuel) from equipment and machinery.

The assessment of critical habitats will be carried out within the Environmental Impact Assessment Study after completing biodiversity research and concluding the basic assessment, when the completion of the EIA will be defined.

During the operational phase, possible identified negative impacts on biodiversity and protected areas include: habitat degradation, habitat fragmentation, direct mortality (as a result of increased risk of collisions with the railway and electrocution on power lines). Attention should be paid to bird collisions with high-speed trains, especially near IBAs or migration routes if identified. Increased human presence locally will disturb present fauna species, which will migrate to untouched habitats nearby. During maintenance activities, the introduction of invasive plant species is possible, for which mitigation measures will be proposed.

Air

During the construction phase, the main causes of potential negative impact on air quality are emissions from construction activities and the presence of construction machinery at the construction site.

In the operational phase, the existing and modernized part of the railway is electrified, so it does not fall into the category of air pollutant emission sources. It can be concluded that, compared to the current situation in terms of air pollution, the project does not have a significant negative impact on the environment. By modernizing the railway along with upgrading both tracks along the entire length, as well as increasing transport speed, gas emissions will be indirectly reduced if the goal of increasing rail transport of goods and passengers compared to road transport is achieved.

Waste

Potential negative impacts of the Project during the construction phase include inefficient handling of excavated material, storage, and disposal causing environmental pollution or sedimentation of water resources, environmental pollution (especially watercourses, groundwater, and soil) due to leakage and spillage of waste associated with poor waste handling and storage, short-term particle emissions such as dust, associated with handling and storing certain types of waste. By far, the most significant waste generated during the Construction Phase of the project will be soil/rock from excavation activities. The negative impact of waste could be: greenhouse gas emissions (during transportation and concrete production), water consumption, ecological impacts.

In the operational phase, possible types of waste include many types of municipal waste generated by passengers and train staff or station personnel. Waste will also be generated as a result of railway facility maintenance and in the event of traffic accidents. This includes metal waste, packaging waste, packaging contaminated with hazardous materials, oily rags, absorbent materials, wipes, filter materials, and protective clothing, etc. The amount of operational waste will be significantly less than that generated during the Construction Phase.

Social Impacts

Detailed mitigation measures to address impacts related to land use and land acquisition, including particularly physical and economic displacement, will be presented in project Resettlement Action Plans that will be publicly available. In summary, key measures to meet international standards and requirements include: Compensation to all affected individuals at full replacement value, both for formal and informal property registered before the cutoff date, and for any damage caused by the project, providing assistance to physically and economically displaced persons, with special measures for all vulnerable individuals and/or households; and implementing measures to restore income sources for all categories of economically displaced persons;

Measures to mitigate impacts related to community separation and loss of access include: consultations with local stakeholders, including local communities, on the locations of underpasses and overpasses and their construction. Assistance should be provided to businesses losing direct access to the railway for freight transport via private rail tracks in collaboration with the relevant authorities.

To mitigate potential impacts on infrastructure and municipal services, the following measures will be implemented: consultations with local stakeholders, including local communities, on the planned closure of stations/stops; providing options for integrated public transport for affected local communities; and implementing small investments to mitigate disruptions related to construction and/or permanent damage.

Best practice measures will be applied to manage risks related to community safety and security, including restricted access to unauthorized areas, conducting local safety awareness campaigns, measures to manage potential influx of workers, etc.

The proposed measures also include those specifically aimed at addressing identified risks related to gender-based violence and abuse of women.

A key measure to mitigate all impacts is maintaining regular communication with local communities and managing complaints.

The project will strive to enhance local employment and stimulate local procurement by implementing the following measures: organizing training for potential workers from local communities; posting job and procurement advertisements at the local level and encouraging women to apply; implementing transparent and fair employment procedures; and providing a grievance mechanism for workers. It is important to ensure that any worker accommodation used complies with best practice and that policies governing accommodation quality and management of services are in place and implemented.

In the operational phase of the project, significant negative impacts are not expected, and it is assumed that the impacts will be mainly positive. Nevertheless, mitigation measures for any identified negative impacts will be defined and presented as part of the ESIA study.

1.7. Stakeholder Engagement

At the level of the Belgrade-Niš railway corridor, a Stakeholder Engagement Plan was developed during the feasibility study phase of the project, which is available on the website of Serbian Railways Infrastructure. This Plan provides general guidelines for future planning and implementation of collaboration with stakeholders regarding the project.

For the Paraćin-Niš section, an annex to the Stakeholder Engagement Plan will be prepared to present the involvement of stakeholders conducted during the ESIA study phase, the main results of the collaboration, how they are integrated into project planning, and the collaboration planned during the construction and operational phases. This annex to the Plan will also be available on the website of Serbian Railways Infrastructure.

Serbian Railways Infrastructure bears overall responsibility for all stakeholder engagement activities related to the project, with coordination provided by the Project Implementation Unit. The Project Implementation Unit will appoint Community Liaison Officers, who will be the main points of contact for organizing stakeholder engagement activities and managing grievances at the local level.