Roads Department
of the Ministry of Infrastructure of Georgia

TRANS CASPIAN CORRIDOR – GEORGIA ACCESSIBILITY AND TRANSPORT ENHANCEMENT PROJECT (P513957)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

for the Modernizing Sections 4 and 5 of the International Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijani Border (S5) Road

Tbilisi 2026

Official Use Only

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Abbreviations

AH	Affected Household
AP	Affected Person
APA	Agency of Protected Areas
C-ESMP	Contractor's Environmental and Social Management Plan
CO	Carbon Monoxide
ch	Chainage
dB	decibel
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EIB	European Investment Bank
ESCP	Environmental and Social Commitment Plan
ESIA	Environmental and Social Impact Assessment
ESF	Environmental and Social Framework
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standard
EU	European Union
EWH	East-West Highway
GBV	Gender Based Violence
GDP	Gross Domestic Product
GEL	Georgian Lari
GIS	Geographical information system
GIIP	Good International Industry Practice
GoG	Government of Georgia
GPS	Global Positioning System
GRC	Grievance Resolution Commission
GRCE	Grievance Resolution Committee
GRL	Georgian Red List
GRM	Grievance Redress Mechanism
ha	hectare
hr	hour
IBA	Important Biodiversity Area
IBRD	International Bank for Reconstruction and Development
IDP	Internally Displaced Person
HSMP	Health and Safety Management Plan
H&S	Health and Safety
ICP	Infection control and prevention
IDP	Internally Displaced Person
ILO	International Labour Organization
IUCN	International Union for the Conservation of Nature
JICA	Japan International Cooperation Agency
KCIP	Kakheti Connectivity Improvement Project
kv	kilo volt
l	litre
LEPL	Legal Entity of Public Law
LMP	Labour Management Procedures
LEPL	Legal Entity of Public Law
m	meter
m^2	square meters
m^3	cubic meters
MEPA	Ministry of Environment Protection and Agriculture
mm/sec	millimetre per second
MoESD	Ministry of Economy and Sustainable Development
MoILHSA	Ministry of IDPs from the Occupied Territories, Labour, Health, and Social Affairs
NACHP	National Agency for Cultural Heritage Preservation
NAMR	National Agency of Mineral Resources
NAPR	National Agency of Property Management
NEA	National Environmental Agency
NGO	Non-Governmental Organization

OHS	Occupational Health and Safety
PAPs	Project-Affected Persons
PPE	Personal Protective Equipment
PRRC	Property Rights Recognition Commission
RAA	Richt-linien für die Anlage von Autobahnen
RAL	Richtlinien für die Anlage von Landstraßen
RAP	Resettlement Action Plan
RD	Roads Department of Georgia
RoW	Right of Way
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
SO_2	Sulphur Dioxide
t	ton
TC-GATE	Trans Caspian Corridor – Georgia Accessability and Transport Enhancement Project
VESC	Valued Environmental and Social Components
UNECE	United Nations Economic Cooperation for Europe
USD	United States Dollar
WBG	World Bank Group
WHO	World Health Organization

Executive Summary

Foreword

This Executive Summary of the Environmental and Social Impact Assessment (ESIA) for the construction and operation of the Sagarejo-Bakurtsikhe section of the International Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan Border (S5) Road (Kakheti Highway) describes major findings of the ESIA. It provides a summary of biophysical and socioeconomic baseline and explains how the proposed activities could affect people and the environment. It also lays out actions that have to be taken to avoid, reduce, mitigate, and compensate for the expected negative impacts. At an earlier stage of preparation for upgrading of S5, two Environmental Impact Assessment (EIA) reports were produced: one covering works to be undertaken between Tbilisi and Sagarejo, and the other - covering works to be undertaken between Badiauri and Bakurtsikhe. These two segments of the Highway were further broken down to smaller sections in which construction works are to be financed from various sources and be tendered as separate lots. Highway section between Tokhliauri and Badiauri is part of the Badiauri-Bakurtsikhe segment of S5 and covered by Badiauri-Bakurtsikhe EIA report now upgraded to the present ESIA document.

Present ESIA report is part of a larger set of environmental and social instruments prepared by the Roads Department of Georgia (RD) for the construction and operation of Sagarejo-Bakurtsikhe section of the Highway that also includes Stakeholder Engagement Plan (SEP), Resettlement Action Plans (RAPs), and Labor Management Procedures (LMP).

RD, in the capacity of the Project proponent, participated in the public consultation meetings held in compliance with the national legislation by the Ministry of Environmental Protection and Agriculture (MEPA) on the draft EIA report. Later, RD organized consultation meeting with stakeholders from the project-affected municipalities to inform local population on the changes introduced to the current version of the report upgraded in accordance with the World Bank's Environmental and Social Framework (ESF). Present ESIA report reflects public feedback received in these two rounds of consultation process. The SEP describes how communication with stakeholders will continue throughout Project life.

Introduction and Background

The Government of Georgia (GoG) is implementing a program of the upgrade of major roads of the country. RD under the Ministry of Infrastructure manages this program. It aims to improve transportation and transit of goods to surrounding countries, which is a significant and growing contributor to Gross Domestic Product (GDP). Transport of goods into and through Georgia has increased over the past 10-15 years as markets have expanded following the breakup of the Soviet Union, and Georgia is now a major transit country. Almost two-thirds of goods in Georgia are transported by road, and haulage by domestic and international truck companies is very evident on the country's highways. However, many roads are poorly equipped to cope with the volume of traffic and the proportion of heavy vehicles, and factors such as insufficient dual carriageways, routing through inhabited areas and inadequate maintenance and repair, hinder throughput and increase transit times. This creates difficulties for haulage companies and their clients, truck drivers, Georgian motorists, and local residents.

One of the main targets of the program for upgrading major roads in Georgia is the S5 - **the International Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijani Border (S5) Road, also referenced as** Kakheti Highway - the main route from neighbouring Azerbaijan and Russian Federation, also connecting to Turkiye and the Republic of Armenia. For planning purposes, the Kakheti Highway has been divided into sections of various lengths. The World Bank is providing assistaince to GoG for upgrading Section 3 of S5 (from Sagarejo/Tokhliauri to Badiauri) under the ongoing Kakheti Connectivity Improvement Project (KCIP) and agreed to support upgrading Sections 4 and 5 of S5 (Badiauri-Chalaubani and Chalaubani-Bakurtsikhe) in the frames of Trans Caspian Corridor – Georgia Accessibility and Transport Enhancement Project (TC-GATE, or "the Project"). Based on the scale of required civil works and potential to impact natural and social environment, the conduct of EIA and issuance of an Environmental Decision (permit) was required by the Law of Georgia on the Environmental Assessment Code of Georgia. The World Bank also required carrying out the Environmental and Social Impact Assessment (ESIA) to meet the World Bank's Environmental and Social Policy and Environmental and Social Standards (ESSs) and to identify environmental and social risks and expected impacts of the Kakheti Highway investments, define measures for applying

negative impact mitigation hierarchy, and produce plans for managing and monitoring environmental and social performance during construction and operation of the subject section of the Highway.

Technical and Environmental Standards

The technical design of the highway improvement meets Trans-European Motorway Standards and Recommended Practice (UNECE, 2002) to ensure that it provides for the adequate traffic flow at minimum operating cost, while ensuring harmonized conditions for motorway users, proper level of service, safety, speed, and driver comfort over medium and long distances. Works will be undertaken in compliance with the national legislation of Georgia, including environmental regulations, as well as the World Bank's ESF. The relevant ESSs of the World Bank are ESS1: Assessment and Management of Environmental and Social Risks and Impacts; ESS2: Labour and Working Conditions; ESS3: Resource Efficiency and Pollution Prevention and Management; ESS4: Community Health and Safety; ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement; ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources; ESS8: Cultural Heritage; and ESS10: Stakeholder Engagement and Information Disclosure.

Environmental Health and Safety Guidelines of the World Bank Group

The Environmental, Health, and Safety (EHS) Guidelines of the World Bank Group apply to the Project as a key source of Good International Industry Practice (GIIP). The General EHS Guidelines, together with relevant industry-specific EHS Guidelines, provide technical requirements and performance benchmarks for environmental protection, occupational health and safety, and community health and safety, and are used in conjunction with applicable national legislation, with the more stringent requirements prevailing.

Objectives of the ESIA

The ESIA is undertaken to meet requirements established by the World Bank for substantial-risk projects and to comply with the national legal framework. Prior to making a funding decision and proceeding with the Project, the World Bank and the RD shall be satisfied that:

- The Highway construction and designed and will be undertaken in compliance with Georgia's national regulations and World Bank requirements.
- The Project will include measures necessary to avoid or minimize significant adverse impacts on the natural and social environment and people's health and safety.
- Appropriate disclosure and public consultation are undertaken in line with the national legislation of Georgia and the World Bank's ESF, thus ensuring that all reasonable public feedback is adequately considered prior to a commitment for proceeding with the Project.

Environmental and Social Screening

The proposed works for the improvement of the Highway between Badiauri and Bakurtsikhe include construction of a four-lane section of the motor road. According to the national legislation, this activity is subject to EIA and environmental permitting. The World Bank has categorized TC-GATE as carrying substantial environmental and social risks and requiring a full-scale ESIA.

<u>Public Participation</u>

The World Bank policies and the national legislation of Georgia require meaningful public participation and involvement in the process of ESIA and environmental management planning. The main principles of public consultation include:

- Conduct of at least two public consultation meetings for environmental and social activities – on the scope of an environmental assessment, and on its draft report;
- Disclosure of the draft ESIA report to the public through in the national language;
- Announcement of the venue and time of stakeholder consultation meetings through central and local means of public communication;
- Invitation for written comments/questions on the draft ESIA; and

- Incorporation of public feedback into the ESIA report and re-disclosure of the finalized document.

With the financial support of the European Investment Bank (EIB), RD carried out a full-scale EIA of the highway construction in 2020 - the Scoping report was approved by MEPA on March 9, 2020. The EIA report was submitted for expert examination of permitting on April 14, 2021. MEPA arranged public consultation meetings on June 14, 2021, in villages Giorgitsminda and Badiauri; on June 15, 2021, in villages Bakurtsikhe and Kachreti; June 16, 2021, in villages Chalaubani and Melaani. The EIA report was disclosed through the RD's web page on June 4, 2021. MEPA published the Environmental Decision on October 4, 2021.

In 2022, the prepared EIA document was updated in accordance with the requirements of the World Bank Environmental and Social Framework (ESF). The draft Environmental and Social Impact Assessment (ESIA) report was disclosed on the website of the RD. Hard copies of the document were made available at the offices of the Sagarejo and Bakurtsikhe local self-governments located within the project implementation area, as well as at the RD offices and the office of the RD consultant, Tinatin Jijiashvili.

The RD organized a public consultation meeting to discuss the draft ESIA report. Members of the communities within the project area, including elected officials, representatives of local small and medium-sized enterprises, and other stakeholders, were invited to participate. The RD solicited and received questions and comments from stakeholders and, where appropriate, incorporated the feedback into the final ESIA report.

In accordance with the Terms of Reference (ToR), the objective of the assignment is to update the existing ESIA report for the Modernization Project of the Second Lot of the Tbilisi–Bakurtsikhe Road (Sagarejo–Bakurtsikhe Eastern Section), which forms part of the International Tbilisi–Bakurtsikhe–Lagodekhi–Azerbaijan Border (S5) Road. The ESIA was originally prepared in 2022 as an update of the EIA prepared in 2020–2021 in accordance with national legislation and European Investment Bank (EIB) policy requirements.

At this stage, the following aspects were assessed and updated as necessary in accordance with World Bank requirements:

(i) the description of the existing national legislation and regulatory framework related to environmental management, social protection, and cultural heritage management;
(ii) identification of sensitive environmental, social, and cultural heritage receptors within the Kakheti Region;
(iii) the social baseline of the project impact area;
(iv) temporary storage areas and final disposal arrangements for construction waste and excess materials;
(v) locations of construction camps;
(vi) additional studies of the biological and physical environment;
(vii) stakeholder consultations;
(viii) preparation of a conclusions and recommendations chapter; and
(ix) cultural heritage assessment.

Project Alternatives

Various alternatives of the highway alignment carry different levels of environmental and social risks, which have been critical in the analysis of project alternatives.

No "showstoppers" were identified during the ESIA, and the anticipated impacts can be managed by application of adequate construction standards and good environmental practices. Nonetheless, a "do-nothing" option was considered as one of the project alternatives. While it has no environmental and social impacts resulting from construction works, operating the highway in its current poor condition has negative environmental and social impacts from traffic jams, noise, low speed, and high emission. In the future with consideration of increased traffic flow, the situation will worsen. On the global scale, under the "do-nothing" scenario, local communities would lose opportunity of benefiting from all positive effects associated with the highway improvement, including profits

resulting from increased cargo turnover and tourism. Therefore, as the potential positive impacts of the project surpass its possible negative impacts, the “do-nothing” option was discarded.

Out of the four alternative alignments (eight different vertical alignment options) two were discarded due to the anticipated significant negative impacts. An alternative alignment with minimum impact on pine plantations and residential area, avoiding the sensitive areas such as pine forest, cemetery, and landslide sites and minimum impact on water environment has been selected as preferred option and was analysed in depth.

Project Description

Construction/reconstruction of the entire Kakheti Highway is a large and expensive project that the GoG plans to implement in several phases. At this stage, there is readiness to undertake works in the section starting at the eastern outskirts of the capital city of Tbilisi and ending at Bakurtsikhe village (approximately 80 km). This section crosses Sagarejo, Signagi, and Gurjaani municipalities of Kakheti administrative region. For the purposes of environmental and social studies, this section was broken down in two: from Tbilisi to Sagarejo and from Sagarejo to Bakurtsikhe, and two EIA reports were produced. For the purposes of construction works, the Highway between Tbilisi and Bakurtsikhe was broken down to even shorter six sections and works in each of these sections will be tendered as a separate lot. Brief description of these sections is provided in **Figure 2**.

Section 0. Lotchini Interchange to Vaziani Interchange

This section starts at chainage (ch) 0+310.22 and ends at ch 04+040.00. The starting point is to the east of the existing Lochini interchange (I/C). An ongoing project for the construction of Tbilisi Bypass Road is upgrading Lotchini I/C. RD ensured compatibility of infrastructure to be provided under Kakheti Highway of Tbilisi Bypass projects.

Section I. Vaziani Interchange to Ninotsminda Interchange

This section commences at ch 0+4040 and ends at ch 27+840. The starting point is located to the east of the designed Vaziani I/C. The end point at ch. 27+840 at the approach to Ninotsminda I/C. Noteworthily, there is a chainage fall, namely ch10+303.862 ≡ ch 10+100.000.

Section II. Ninotsminda Interchange to Tokhliauri Interchange (Sagarejo)

This section starts at ch 27+840 and ends at ch 35+500. The starting point is located at the approach to Ninotsminda, at the Iori railway Station. The end point is located to the east of the new Tokhliauri I/C.

Section III. Tokhliauri Interchange (Sagarejo) to Badiauri Interchange

This section starts at ch 35+500 and ends at ch 52+540. The starting point is located to the east of the new Tokhliauri I/C. The end point is located to the east of the new Badiauri I/C.

Section IV. Badiauri Interchange to Chalaubani Interchange

This section starts at ch 52+540 and ends at ch 75+100. The starting point is located to the east of the new Badiauri I/C. The end point is located to the east of the new Chlaubani I/C.

Section V. Chalaubani Interchange to Bakurtsikhe

This section starts at ch 75+100 and ends at ch 84+217.05. The starting point is located to the east of the new Chalaubani I/C. The end point is in Bakurtsikhe and coincides with the ch. 0+413.20 of the new road from Gurjaani to Tsnori, which is currently under design. RD ensured compatibility of the infrastructure to be provided by Kakheti Highway and Gurjaani-Tsnori projects.

The ESIA report covering the Highway spanning from Badiauri to Bakurtsikhe. Carriageway between these settlements will be constructed following a new alignment of 31.7 km. A central reservation will separate two pairs of highway lanes. Paved shoulders will be provided for breakdown and emergency use. Surface water drains, safety barriers, lighting and signage will be arranged for safe operation of the upgraded section of the highway. Total width of the road will be 26.50m. The cross-section parameters will be consistent with other sections of the highway: number of lanes – 4; lane width 3.75; carriageway width - 2x7.50m and median width including barriers – 4m. The design speeds of 100km/h and 80km/h are applied. Highway construction between Sagarejo and

Bakurtsikhe will require arrangement of 27 bridges. Sections 0 through IV run predominantly through agricultural lands. In Section V the route goes over a moderately difficult terrain including Gombori ridge and ends in the village Bakurtsikhe.

Based on experience gained from the implementation of other similar road projects, it may be assumed that the construction may involve a total workforce of about 200. Out of these workers, 60 to 70 percent may be local workforce, which could be hired as semi-skilled or unskilled workers during the construction period.

Land acquisition needs for construction between Badiauri and Bakurtsikhe were studied by resettlement specialists of the design company JV AECOM Limited (lead member) and ILF Consulting Engineers Austria GmbH. Summary of relevant RAPs is incorporated in the ESIA report.

Environmental and Social Impact Assessment Methodology

The ESIA process included the following activities (i) determination of the scope of the work; (ii) collection of detailed baseline data; (iii) assessment of expected impacts; (iv) outlining of mitigation measures; and (v) development of environmental management and monitoring plans.

The ESIA process was a combination of desk work and field work, comprising literature review, data collection from various agencies, visual observation (flora and fauna survey) and fact finding along the Right of Way (RoW), noise and air pollution modelling and analysis of the collected information. Results of engineering-geological and topographic survey and technical information related to the design were considered. Impacts of the project activities to be implemented outside the RoW - such as construction camps, temporary access roads, and vehicle stationing area were also identified and analysed. Environmental and social impact mitigation and monitoring plans were produced and included in the ESIA report.

Environmental and Social Baseline

The ESIA report presents information about the physical, biological, and socio-economic characteristics of the environment alongside the Highway alignment. The purpose of this description is to establish environmental and social baseline, to identify potential sensitivities, and to suggest adequate response through measures that are appropriate to avoid, minimize, or mitigate potential adverse impacts.

The baseline studies included the following components:

- Physical-geographical and administrative location
- General overview of the project zone
- Climate and meteorological conditions
- Baseline geological conditions
- Soils
- Hydrology
- Biological environment
- Atmospheric air quality
- Noise and vibration
- Baseline socioeconomic conditions

Expected Impacts and Mitigation

Upon assessment of baseline data and identification of sensitive environmental and social receptors, expected negative impacts of the Highway construction and operation were identified and the following mitigation measures were developed:

Impact on vegetative cover, fauna, and habitats: Clearing of the RoW for the new alignment will imply removal of vegetation, including cutting of trees. Loss of vegetation will be kept at a possible minimum. Removal of trees for the Project needs from the State Forest will be authorized by the National Forestry Agency (NFA) and payment to the State budget for each extracted tree will be processed according to rates established for various species.

The selected alignment of the road does not affect any critical habitat. Impact on natural habitat is limited to the Chalaubani-Bakurtsikhe section (Section V) of the Project area, where a mixed oak-hornbeam forest is present. In this section, the Project will affect a strip approximately 6 km in length,

covering an area of up to 45 ha. This represents approximately 0.088% of the total area of oak-hornbeam natural forest habitat in the region of Georgia. Planting or restoration of significantly degraded forest of the same species composition over the area no less than the affected forest will be undertaken to offset the damage and prevent net loss of the natural habitat. Professional ovbersight will be provided to ensure quality of planting/restoration and arrangements will be put in place for adequate maintenance.

Disturbance of local communities: Movement of construction machinery, location of the temporary work camps, and temporary storage of construction materials and waste will be planned to avoid or minimize barriers for free and safe movement of the local population. Deterioration of the air quality near populated areas will be controlled through oversight on the technical condition of construction machinery. Operation of engines in idle regime will be discouraged. Operation of construction machinery will be limited to the regular working hours. Local roads, if affected by movement of construction machinery and heavy vehicles, will be restored to the original or the improved condition, as feasible, before contractor leaves the work site.

Labour management: RD, through the technical supervision consultant, will monitor living and working conditions of Contractor's personnel at work camps and construction sites throughout the contract life. Bulk of unskilled and some skilled labour will be recruited from the local communities, which would be a tangible employment opportunity in the project area.

Operation of work camps and access roads: Work camps/bases and temporary access roads will be located preferably in the already transformed areas to minimize landscape and ecosystem degradation. In the construction phase, work camp(s) will be arranged within the project implementation area and will have temporary impacts on the surroundings. A construction camp may be used for lodging a limited number of workforces, for parking construction vehicles and machinery, and for on-site storage of some types of construction waste. Access to safe drinking water and decent sanitary facilities shall be provided. If the construction camp is used for living, then residential blocks must be separate from storage facilities; be property ventilated and illuminated. The already existing access roads will be used. The camps will be organized to have designated areas for storage of materials and waste and will be equipped with septic tanks. Offsite maintenance/servicing and fuelling of machinery will be encouraged. In case not feasible, the areas designated for fuelling / servicing of machinery will be provided with ground lining and barriers preventing release of spillage. Similar precautions will be taken at the areas allocated for storing hazardous substances. After completion of works contractor will be obliged to remove all temporary facilities from the site, clean up and restore the area to the original state to the extent possible under the circumstances.

Air pollution: Air pollution can appear during earthworks, gravel crashing, concrete mixing, and transportation in case of improper maintenance and operation of equipment, inadequate storage of fine-grained materials, and movement of vehicles on unpaved or dusty surfaces. To reduce generation of dust and reduce emissions, construction equipment will be maintained in good working condition and mixing equipment will be sealed. Concrete mixing plants will be installed at a safe distance from settlements taking into account prevailing wind directions. Speed limits will be set for construction vehicles, and all loose material will be covered with tarpaulins when transported off-site with trucks. A wheel-washing facility will be provided and ensured that it is used by all vehicles before leaving all sites. All unpaved roads and significant areas of uncovered soil will be sprinkled during working hours in dry weather conditions.

Earth works: Prior to excavation, topsoil will be removed and stored separately the height of stockpile will be 2m. Landscape restoration will be carried out to ensure stabilization of slopes, the exact height of the slopes will be known after the detail design. Seeding of the grass at the slopes and planting trees may be required for landscaping. Longitudinal drains will be provided to ensure the removal of water from the paved carriageway of the road so that it can provide adequate service under adverse weather conditions. The road-side drainage system, the subgrade drainage and the cross- drainage systems will be integrated to maximize efficiency. All water flowing off the carriageways, shoulders and footpaths will be intercepted and channelled to appropriate discharge points. In mountainous areas, the location and design of such discharge points must be carefully selected to avoid erosion of the earthworks' embankments.

Historical, cultural, and archaeological sites: All known historical and cultural monuments along the right of way were identified and mapped during ESIA. The road alignment will not cause physical damage to these monuments. There is a likelihood of chance finds during earth works, though. If an

artefact is encountered by a works contractor, all activities on site will be immediately taken on hold and the National Agency for Cultural Heritage Preservation under the Ministry of Culture of Georgia will be urgently notified. Works will resume only upon receipt of written communication from National Agency for Cultural Heritage Preservation.

Occupational health and safety: The Contractor will be obligated to provide personnel with health insurance. The Contractor should have the responsible persons (for health and safety, environment and social) who will prepare Health and Safety Management Plan (HSMP), will arrange daily/weekly/monthly trainings of the workers, who will control daily works at the site according to the HSMP and the Environmental and Social Management Plan (ESMP). Workers and other personnel involved in the project will be provided with personal protection equipment and gear.

Resettlement: Research of the social baseline revealed several sensitive human aspects of the project implementation such as land alienation, relocation, and impact on the roadside businesses caused by diversion of the traffic flow to the new alignment. Subsistence of the majority of affected households considerably depends on the land plots and small businesses the ownership and use of which will be altered in the course of the project implementation. This finding emphasizes the importance of diligent planning and timely provision of adequate compensation and restoration of livelihoods by developing and implementing of the RAP in accordance with World Bank's ESS5.

Disruption of income steam for roadside vendors: Some 57 roadside vendors, operating within sections IV and V of S5 according to the 2025 survey, will be affected once bulk of the current traffic switches to the newly constructed highway. This includes 31 vendors concentrating near Barjiskhevi gully in the middle of section IV, which is a common resting stop for travellers. There are several roadstide restaurants as well, likely to be affected by the construction of the new highway. Impacts on the affected vendors will be mitigated by the development and implementation of a livelihood restoration plan (LRP). The main measure for avoiding livelihood impacts is the arrangement of an organized and safe marketplace adjasent to the new alignment of Kakheti Highway designed to carry 200 trading spaces. It will provide a reasonable alternative for vendors currently operating in sections IV and V as well as for 132 more vendors found in section III. LRP will also include training of the affected roadside vendors for enhancing and diversifying their basic business skills.

Operation of construction machinery: Technical condition of the construction equipment and machinery will be checked on regular basis to minimize air pollution from exhaust, and soil pollution from leakage of fuel/oil. The risk of operational and emergency spills of fuel and lubricants will be mitigated by designation of special parking and servicing sites, to be located away from waterways and other sensitive environmental receptors. The sites will be equipped with wastewater/spill capturing and treatment facilities.

Impact on soil: Excavation works may cause loss of topsoil and trigger erosion if not properly managed. These impacts will be mitigated by removal and storage of topsoil separately for its use for later reinstatement of the area.

Landscape restoration will be carried out to ensure stabilization of slopes. This would include seeding grass and planting trees depending on location.

Discharge of untreated wastewater will be prohibited.

Impact on surface water: The selected alternative alignment ensures minimum impact on surface water bodies. However, keeping in mind that the new alignment crosses ravine and rivers, special attention will be paid to operations in these sections of the road. Sourcing sand and gravel from riverbeds will be prohibited. No stockpiling of construction materials and waste will be allowed in or near waterways.

Accumulation of construction waste: Temporary storage of waste will be organized by separating construction debris, household solid waste, and hazardous waste. The latter, comprising used filters, tires, and lubricants from machinery, will be kept in a closed and isolated storage.

Transportation of waste from the construction sites will follow a time-bound schedule. Hazardous waste will be removed/utilized by licensed contractors. Formal instructions will be obtained from local authorities for the final disposal of inert waste. Sites for temporary storage of excess material will be agreed with local municipalities. Sites for permanent disposal of excess material – such of soil, rock, and other non-hazardous materials– will be recommended by municipalities and cleared by the

MEPA. Solid waste and household garbage will be disposed to the closest municipal landfill in Sagarejo and/or Gurjaani under the agreement with the Solid Waste Management Company of Georgia. Volumes of disposable waste will be minimized to the extent possible through re-cycling/reuse and back-filling as feasible.

Operation of quarries and borrow pits: Purchase of inert construction materials will be allowed only from the licensed legal and/or physical bodies. The Contractor may also hold or wish to obtain a resource use license and operate own quarries. Opening of new borrow pits will be avoided if those already in operation can be used instead. Operation of quarries will be carried out in accordance with the conditions of licenses issued by the National Agency of Mineral Resources (NAMR) of MEPA. In Georgia, extraction of sand and gravel from riverbed is not explicitly prohibited. Therefore, restrictions additional to the license terms will be applied to disallow material extraction from river channels. The Contractor will be responsible for developing, agreeing, and strictly adhering to quarry/borrow pit operation and re-cultivation plan. Performance of license holders will be subject to oversight by the Environmental Inspection Department of the MEPA.

Environmental and Social Management Plan

This ESIA report includes an ESMP with a full set of the proposed mitigation measures, as summarized above, and monitoring indicators. Once on board, works contractor will develop a more detailed Contractor's ESMP (C-ESMP) based on this document. ESMP included in the present ESIA report also describes the role of RD. RD is responsible for the overall implementation, coordination, and supervision of the Environmental and Social Management Plan (ESMP). This includes ensuring compliance with World Bank Environmental and Social Standards (ESSs) and national legislation, integrating ESMP requirements into bidding documents and contracts, supervising contractors' environmental and social performance, managing stakeholder engagement and grievances, and reporting on ESMP implementation throughout construction and operation. RD has been implementing projects financed by international financial institutions for several years. The organization is staffed with a sufficient number of qualified personnel.

A supervision consultant will be hired by RD to provide technical control and quality assurance of civil works. Environmental and social monitoring will be an integral part of the consultant's assignment and information on the compliance with the ESMP will be included in the supervisor's regular reporting to the employer. RD will have an overall responsibility for applying due environmental and social diligence. This will include ensuring quality of the supervision consultant's performance, site inspections, timely response to any issues identified by the consultant or by the RD inspectors, and record keeping on all environmental aspects of the project implementation.

Environmental Supervision Department of the Ministry of Environment will perform monitoring and control of key environmental and social parameters within the project area as part of their general mandate and annual work plans.

Before commencement of works, the Contractor will be asked to develop and to have agreed by the RD and the World Bank a works organization plan, C-ESMP, Waste Management Plan (including spoil disposal), Traffic Management Plan, Occupational Health and Safety plan, Re-cultivation Plan (including borrow pits/quarries (if any) and other disturbed areas), Compensatory Afforestation / Reforestation Plan, Land Management and Erosion Control Plan, Worker Code of Conduct, Emergency Response Plan, and Grievance Redress Mechanism (GRM) for Contractor's employees.

Operation of the Highway

The improvement of the Kakheti Highway aims at minimizing the need for interventions during its operation and maintenance. Ensuring safe and good environmental performance will be a high priority at the operations stage and will comply with the requirements of the national legislation and the best international practices.

Traffic related noise modelling carried out for operation stage of the project showed that noise level in the residential areas will not exceed allowable limits. Noise mitigation measures at the operation stage are not required.

RD will, through an outsourcing arrangement, permanently maintain and, in a longer term, improve greening along the RoW. Regular collection of solid waste along the highway will be organized by

RD and outsourced to a contractor. State technical control of the Kakheti Highway through regular oversight and inspection by RD will be provided.

Introduction

Located along a transit corridor connecting Europe and Asia, Georgia has the potential to link a number of countries in the region to the Global Economy. Roads from the break of bulk points on the Black Sea coasts such as Poti, Sokhumi and Batumi, as well as from Russian Federation and Turkey, basically merge on the E-60 highway to connect to the Baku (Azerbaijan) port on the Caspian Sea. Therefore, a number of infrastructure projects have been initiated by the Georgian Government to improve the physical as well as the operating climate of the land transport, with the support of international development partners such as the World Bank, European Investment Bank (EIB), Asian Development Bank (ADB), European Bank for Reconsgtruction and Development (EBRD) and Japan International Cooperation Agency (JICA).

GoG, assisted by the international organizations, implements the program for the improvement and upgrading of international highways and roads of the State importance. This program is managed by the RD of the MOI of Georgia. Status of works on the EWH and S5 corridors' improvement is provided in below **(Table 1)**.

Table 1: Status of Corridor Improvement

Road Section	Length	Planned To Upgrade	Financier	Status
Natakhtari-Agaiani	16.7 km	4 lane dual carriageway	State Budget	Completed
Agaiani-Igoeti	11.7 km	4 lane dual carriageway	WB	Completed
Igoeti-Sveneti	25.5 km	4 lane dual carriageway	WB	Completed
Sveneti-Ruisi	14.3 km	4 lane dual carriageway	WB	Completed
Ruisi - Agara	19.5 km	4 lane dual carriageway	WB	Completed
Agara-Zemo Osiauri	12.0 km	4 lane dual carriageway	WB	Completed
Zemo Osiauri - Chumateleti	14.0 km	4 lane dual carriageway	EIB - Lot 1 WB - Lot2a Lot2b	Lot 1 - completed Lot 2a - completed Lot 2b - completed
Chumateleti - Khevi	11.6 km	4 lane dual carriageway	WB EIB	Completed
Khevi - Ubisa	12.2 km	4 lane dual carriageway	ADB	Completed
Ubisa - Shorapani	13 km	4 lane dual carriageway	EIB	Completed
Shorapani - Argveta	14.7 km	4 lane dual carriageway	ADB	Completed
Zestafoni-Samtredia	56.5 km	2 lane due carriageway - 41.3 4 lane dual carriageway - 15.2	JICA	Completed
Kutaisi Bypass	41.3 km	2 lane dual carriageway	GoG	Completed
Samtredia - Grigoleti	11.5 km	4 lane dual carriageway	EIB, GoG	Implementation
	18,5 km			Completed
	12 km			6 km completed, 6 km under Implementation
	9.5 km			Completed
Grigoleti - Kobuleti	14 km	2 lane dual carriageway	EIB	11 km completed, 3 km under Implementation
Batumi bypass	14.3 km	4 lane dual carriageway	ADB, AIIB	Completed
Samtredia-Choloki	70.0 km	4 lane dual carriageway	EIB	Preparation
Choloki - Kobuleti bypass	32.0 km	2 lane dual carriageway	ADB	Completed
Vaziani bypass	3.7 km	4 lane dual carriageway	GoG	Completed
Vaziani - Sagarejo	23.8 km	4 lane dual carriageway	GoG	Preparation
Sagarejo bypass	7.6 km	4 lane dual carriageway	GoG	Preparation
Sagarejo bypass - Badiauri	17.0 km	4 lane dual carriageway	WB	Preparation
Badiauri-Chalaubani	22 km	4 lane dual carriageway	TBD	Preparation

Chalaubani-Bakurtsikhe	9 km	4 lane dual carriageway	TBD	Preparation
Bakurtsikhe-Gurjaani	9 km	2 lane dual carriageway	WB	Completed
Gurjaani Bypass	6.5 km	2 lane dual carriageway	WB	Completed
Bakurtsikhe - Tsnori	16.6 km	2 lane dual carriageway	ADB	Completed
Tsnori - Lagodekhi	40.4	2 lane carriageway	ADB	Ongoing tender procedures for detail design

The Government of Georgia is committed to complete the East West Highway Project by 2029. The East-West Highway is a strategic project in the Government's effort of transforming Georgia into a transport and logistics hub for trade between Central Asia and the Far East on the one hand, and Turkey and Europe on the other. Connecting the East-West Highway to the main border crossing points is becoming a critical part of Georgia to enhance its role as a transit country along the Silk Road.

Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan Border international road (S5), also referenced as Kakheti Highway, is the eastern extension of East-West Highway (S60) and links capital city of Tbilisi to the state border with Azerbaijan. Reconstruction of Kakheti Highway commenced in 2022, and the first section (Tbilisi to Sagarejo) is already completed. Works are ongoing in the section from Sagarejo to Badiauri. Preparation is underway for the construction of subsequent sections (Badiauri to Chalaubani and Chalaubani to Bakurtsikhe).

The Feasibility Study and Preliminary Environmental Assessment of the entire Kakheti Highway corridor was carried out by the RD in 2018 under one of the World Bank financed transport projects. It provided detailed baseline information and pointed out all sensitive environmental and social receptors along the highway alignment. With the financial support of EIB, RD carried out a full EIA of Kakheti Highway construction and operation in 2020 and produced two EIA report for the Highway sections between Tbilisi and Sagarejo and Samarejo and Bakurtsikhe. For Sagaremo-Bakurtsikhe part of Kakheti Highway, the Scoping Report was approved by MEPA on March 9, 2020. The full ESIA report was submitted on April 14, 2021. MEPA arranged public consultation meetings on June 14, 2021, in villages Giorgitsminda and Badiauri; on June 15, 2021, in villages Bakurtsikhe and Kachreti; June 16, 2021, in villages Chalaubani and Melaani. The EIA report was disclosed through the RD's web page on June 4, 2021. MEPA published the Environmental Decision (permit) on October 4, 2021.

World Bank financing is sought to cover the highway section between Badiauri and Bakurtsikhe. The submitted document covers the fourth and fifth sections of the second lot from Badiauri to Chalaubani and from Chalaubani to Bakurtsikhe (**Figure 1**).

Figure 1: Project area



Tbilisi-Sagarejo-Bakurtsikhe section is part of the International Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan Border (S5) road, which starts at the eastern part of the Sagarejo and ends near Lagodekhi at the existing Border crossing point to Azerbaijan. This section of the Highway crosses territories of Sagarejo and Gurjaani municipalities. GoG's final decision on the arrangements and sources of funding for the upgrading Tbilisi-Bakurtsikhe-Lagodekhi road is the following: section between Tbilisi and Tokhliauri (Sagarejo) is financed from the State budget and Tokhliauri-Badiauri

section is being constructed with the financial support of the World Bank as part of KCIP. Also, sections for Badiauri-Chalaubani and Chalaubani-Bakurtsikhe will be financed by the World Bank. The present ESIA report covers section between Badiauri and Bakurtsikhe.

With the financial support of the European Investment Bank (EIB), RD carried out a full-scale EIA of the Sagarejo-Bakurtsikhe highway construction in 2020. MEPA published the Environmental Decision on October 4, 2021. In 2022, the EIA document was updated in accordance with the World Bank ESF requirements. In accordance with ToR, the objective of assignment is to update the existing ESIA report prepared in 2022 for sections 4 and 5.

Present draft ESIA report, updated to meet the requirements of the World Bank's ESF, will be disclosed to project stakeholders and general public in line with the ESS 10 of the World Bank's ESF. Feedback received through the consultation process will be incorporated in the final version of the present ESIA report and the record of consultations will be attached.

The ESIA report is organized as follows:

- Chapter 1 provides introduction of the project and clarifies needs for development of ESIA;
- Chapter 2 describes regulatory framework applicable to the project and institutional arrangement for its implementation;
- Chapter 3 provides a description of the proposed project, including both the infrastructure to be constructed and the construction process;
- Chapter 4 describes project alternatives and undertakes their comparative analysis;
- Chapter 5 describes methodology of the ESIA;
- Chapter 6 describes the baseline biophysical and social environment in the project's impact area;
- Chapter 7 describes environmental and social risks and expected positive and negative impacts of the project at the construction and operation phases as well as the measures that are needed in order to avoid, reduce, or mitigate negative impacts;
- Chapter 8 summarizes how environmental and social performance of the project will be managed and monitored;
- Chapter 9 lays out approach to the public disclosure and stakeholder engagement in the ESIA process and GRM;
- Chapter 10 lists references consulted during the ESIA;
- Chapter 11 carries Annexes to the document.

1. Legal and Regulatory Framework

This chapter describes the national and international legal framework that will apply to construction and operation of the Badiauri-Chalaubani and Chalaubani-Bakurtsikhe road sections, including policies, laws, standards, international treaties, and institutional set-up for their implementation.

In case of any discrepancy between the requirements of Georgian national legislation and World Bank (WB) policy, the stricter requirement will be implemented within the project, both at the implementation and operation stages.

2.1 National Legal and Regulatory Framework

Georgia's legal framework for environmental protection is based on the Constitution of Georgia, framework legislation, normative acts and standards, as well as international conventions and agreements ratified by the Parliament of Georgia.

Constitution of Georgia (Adoption: ***24 August 1995*****;** Last Major Amendment: ***29 June 2020***) does not directly address environmental matters, it does confirm the right of any person to live in a healthy environment, use the natural and cultural environment, at the same time obliging any person to take care of the natural and cultural environment. The Constitution also establishes the legal framework that guarantees public access to information, stating that an individual has the right to obtain full, unbiased, and timely information regarding his or her living environment (*Article 29*).

While *Article 29* directly addresses environmental rights, other constitutional provisions strengthen the social and governance context for ESIA:

- Right to Safe and Healthy Working Conditions**:** Guarantees *the right to safe working conditions*, which supports occupational health and safety obligations under project implementation and monitoring. **(**Article 26 – Freedom of Labour**);**
- Right to Health Protection: Affirms *the right to health care* and state regulation of health services, indirectly supporting broader social wellbeing considerations in project planning (Article 28 – Protection of Health).

2.1.1 Environmental Laws and Regulations

The following environmental laws and regulations are applicable to the project:

Laws:

- On the Environmental Assessment Code (reg.# 360160000.05.001.018492; 01.06.2017; Last amendment 26.06.2025);
- On the Atmospheric Air Protection (reg.#420.000.000.05.001.000.595; 22.06.1999; last amendment 02.07.2025);
- On the Water (reg.#400.000.000.05.001.000.253; 16.10.1997; last amendment 30.06.2023);
- On the subsoil (reg.#380.000.000.05.001.000.140; 17.05.1996; last amendment 12.06.2025);
- On the regulation and engineering protection of the sea, reservoirs and riverbanks of Georgia (reg.# 400.010.010.05.001.000.830; 27.10.2000; last amendment 16.04.2025);
- On the sanitary protection zones of the resorts and resort zones (reg.#470.210.000.05.001.000.339; 20.03.1998; last amendment 16.04.2025);
- On the Soil Protection (reg.#370.010.000.05.001.000.080; 12.05.1994; last amendment 02.11.2021);
- On the Soil Conservation and Fertility Restoration-Improvement (reg.#370.010.000.05.001.001.274; 08.05.2003; last amendment; 30.06.2023)
- On the Animal World (reg.#410.000.000.05.001.000.186; 25.12.1996; last amendment 29.06.2023);
- On the Forest Code of Georgia (reg.# 390000000.05.001.019838; 28.05.2020; last amendment 25.11.2025);
- On the Waste Management Code of Georgia (reg.#360160000.05.001.017608; 26.12.2014; last amendment 26.11.2025);
- On the Environmental Liability (reg.# 360150000.05.001.020241; 12.03.2021; last amendment 26.06.2025;

- On the “Red List” and the “Red Book” of Georgia (reg.#360.060.000.05.001.001.297; 06.06.2003; last amendment 02.07.2025);
- On the Licenses and Permits (reg.#00.310.000.05.001.001.914; 24.06.2005; last amendment 17.12.2025);
- On the Cultural Heritage (reg.#450.030.000.05.001.002.815; 08.05.2007; last amendment 12.12.2024).

Technical regulations approved by the Georgian government

- On the Approval of Technical Regulations of Drinking Water (#58; 15.01.2014; reg.#30000160070.10.003.017676);
- On the Approval of the Technical Regulation on Protection of Georgia's Surface Waters from Pollution (#425; 31.12.2013; reg.#300160070.10.003.017650);
- On the Water Protection Zone (#440; 31.12.2013; reg.#300160070.10.003.017640);
- On the Sanitary Rules for Taking Water Samples (#26; 03.01.2014; reg.#300160070.10.003.017615);
- On the Hygienic Assessment of Materials, Reagents, Devices and Technologies Used in the Water Supply System (#73; 15.01.2014; reg.#300160070.10.003.017692);
- On the Approval of the Technical Regulation of Packaged Natural Mineral Water and Source Water (#719; 26.12.2014; reg.#30000160070.10.003.018338);
- On the Approval of Technical Regulation on Calculation of Extremely Permissible Emissions of Harmful Substances in Atmospheric Air (#408; 31.12.2013; reg.#300160070.10.003.017622);
- On the Approval of Technical Regulations on the Calculation of Extremely Permissible Discharge Norms Launched in Contaminated Water Facilities with Wastewater (#414; 31.12.2013; reg.#300160070.10.003.017621);
- On the Approval of Technical Regulation - Methodology for Determining (calculating) Damage to the Environment" (#54; 14.01.2014; reg.#300160070.10.003.017673);
- On the Approval of Technical regulation - Waste Transportation Rules (#143; 29.03.2016; reg.#300160070.10.003.019208);
- On the Approval of Technical Regulation on Removal, Storage, Use and Re-cultivation of the Fertile Soil (#424; 31.12.2013; reg.#300160070.10.003.017647);
- On the Approval of technical regulations - Determining the level of Soil fertility and Soil conservation and fertility monitoring (#415; 31.12.2013; reg. #300160070.10.003.017618);
- Construction Norms and Ruls (СНиП) 2.05.03-84 - Design of Bridges, Viaducts, Overpassess and Pipes;
- Construction Norms and Rules (СНиП) 2.05.02-85 - Motor Roads (regulates traffic safety, environmental issues, set forth main technical and traffic operation norms, crossins and intersections, paving aspects, etc.);
- Construction Norms and Rules (СНиП) 2.07.01-89 – Urban Planning (planing and Development of Urban and Rural Settlements).

Orders

- On the Approval of the State Registration of Water Use approved by the Minister of Environmental and Natural Resources Protection of Georgia (order #106; 12.08.1996);
- On the Approval of the Rules of Primary Accounting of Water Use approved by the Minister of Environment and Natural Resources Protection of Georgia (order #107; 12.08.1996);
- On the approval of the norms of the quality condition of the environment approved by the minister of Labour, Health and Social Affairs of Georgia (Order #297; 16.08.2001);
- On the Rules for Making Decision on Compilation of an Ecological Audit Report and Continuation of Current Operations approved by the Minister of Environmental Protection and Agriculture of Georgia (Order #2-827; 11.10.2018).

Law of Environmental Assessment Code of Georgia (Reg. #360160000.05.001.018492; 01/06/2017) is the main environmental law, which is applicable to this project. This low regulates procedures for conducting environmental impact assessment and issuing environmental decisions on the activities defined by the law. The code was adopted in 2017 and finally all its provisions came into force on June 1, 2018. This code replaced the law on environmental impact permit guiding environmental impact permission procedures before. The new Environmental Assessment Code guides the evaluation of how potential projects can affect environmental and social resources.

Administered by MEPA, this Code harmonizes Georgian environmental legislation with European legislation.

The list of activities subject to environmental impact assessment was modified, extended, and prioritized based on scale and impact significance. The new Code introduces a screening procedure, which requires the project proponent, with Ministry agreement, to identify if the proposed project has potential to cause significant environmental impacts and thus require a full-scale environmental study. The new law replaced the previous Environmental Impact Permit with an Environmental Decision. In addition, the new Code includes new approaches for public participation and information disclosure. One of the main elements is that public participation has to be ensured at all stages of decision-making, not only at the time the EIA report is prepared and disclosed. In addition, information disclosure and public consultations are now the obligation of the Ministry instead of the project developer.

Law of Georgia on Environment Protection (reg. #360.000.000.05.001.000.184; 10.12.1996) - The law establishes the main principles of environment protection. Provisions of the law that are relevant to the project include environmental management, licensing, standards, environmental impact assessment, ecosystem protection, protected areas, and biodiversity. The ESIA includes mitigation measures that are designed, in part, to ensure the project meets the requirements of this Law.

Law of Georgia on Licenses and Permits (reg. #300.310.000.05.001.001.914; 24.06.2005) - This Law regulates activities, which may result in an increased hazard to human life or health, involve interests of importance to the State or public, or are connected to consumption of State resources. The Law defines the full list of activities, which require licenses and permits, and sets out the rules for granting, amending and abolishing licenses and permits. The project will require a general license for forest usage. In addition, the construction contractor will use licensed companies for waste management, wastewater removal and discharge, and other such services.

Law of Georgia on Water (reg. #400.000.000.05.001.000.253; 26.10.1997) - The Law regulates water resources in Georgia, including the use and protection of surface and underground water. Project developer is obliged to prepare technical project for extraction of water from any surface water body, which shall be agreed with and approved by MEPA. It is noted that the project will use only small quantities of water, there will be no discharges of wastewater or other materials to water bodies, and there will be limited potential for significant impacts on water quality.

Law of Georgia "On Water Resources Management" (Reg # 400000000.05.001.021003; 30/06/2023). The purpose of this law is to create a legal basis for water resources management in the country, which ensures the implementation of a unified state policy in the field of water resources protection and use, the right of citizens to access clean water, the creation of a safe environment for human health and life, and the protection and sustainable use of water resources in accordance with the principles of integrated management. The ESIA includes mitigation measures that are designed, in such a way that the optimization of water resource use is implemented within the framework of the project.

Georgia is transitioning from the Law of Georgia on Water (1997) to the Law of Georgia on Water Resources Management (2023)**.** The 1997 law remains in force until September 1, 2026**,** when most provisions of the 2023 law come to force. Accordingly, SMDS works implemented before 1 September 2026 will be governed by the 1997 law and its current by-laws. Should any SMDS activities extend beyond **September 1, 2026**, they will comply with the 2023 law and its byways, including requirements associated with river-basin management, permits for water abstraction and wastewater discharge, and enhanced monitoring and reporting.

Law of Georgia on Soil Protection (reg. #370.010.000.05.001.000.080; 12.05.1994) - This law is intended to ensure preservation of soil integrity and improve soil fertility. Its primary applicability to the project will be to require excavations at towers to preserve topsoil by removing and storing it before using it to reinstate disturbed sites, and to take the same precautions to preserve topsoil and reinstate disturbed areas if soil or earthen materials are taken from borrow pits for use at tower locations or the substation. In addition, the project will be required to manage fuels and other hazardous substances, so they do not contaminate soils.

Law of Georgia on Protection of Atmospheric Air (reg. #420.000.000.05.001.000.595; 22.06.1999) - This law prohibits human activities that affect air quality from causing a negative impact on human health or the environment. The project will not require a permit but will control dust and prevent excessive emissions from vehicle and equipment engines.

Law of Georgia on the Forest Code of Georgia (reg. # 390000000.05.001.019838; 28.05.2020; last amendment 25.11.2025**)** - This Code regulates legal relations related to forest management. The purpose of this Code is:

- to conserve the biodiversity of the forest of Georgia, and, in order for the environmental, social and economic functions of forest to be performed, to preserve and improve its qualitative properties, and the quantitative and qualitative characteristics of forest resources;
- to preserve the original natural and cultural environment of forest, including the vegetation cover and animal world, and natural and cultural property located in forest, and rare and endangered plant species and other assets for future generations and to ensure the harmonized regulation of their interrelation;
- to ensure targeted and rational use of forest resources and other natural potential of forest;
- to determine the main principles of forest management which shall become the basis for sustainable forest management.

Law of Georgia on the System of Protected Areas (reg. #360.050.000.05.001.000.127; 07.03.1996) - The law establishes categories of protected areas and defines activities that are permissible within the boundaries of such areas. The project will not cross or have any direct impact on any protected area.

Law of Georgia on the "Red List" and "Red Book" of Georgia (reg. #360.060.000.05.001.001.297; 06.06.2003) -This law establishes the rules for compiling and maintaining the Red List and Red Book of Georgia, which identify endangered species of wild animals and plants that are found in Georgia. This law prohibits taking or causing significant effects on listed species and their habitats. Several species of plants and animals on the Georgia Red List are found in the forests and other land that will be crossed by the road corridor, and it will be necessary to cut or damage at least some listed plant species and listed animals could also be disturbed by construction.

Law of Georgia on Cultural Heritage (reg. #450.030.000.05.001.002.815; 08.05.2007) - This law sets "compulsory conditions for the implementation of large-scale earth works", which would include construction of roads. Also, as required by the law, the project has a chance find procedure that requires the work to be stopped and the Ministry of Culture informed in case a find is encountered.

Law of Georgia on the Waste Management Code (reg. #360160000.05.001.017608; 26.12.2014) - This Code establishes the legal framework for the management of hazardous and non-hazardous wastes, including minimizing waste generation and maximizing reuse and recycling.

The law will require the project to manage all wastes in a way that protects the environment. It is likely, that the project will generate more than 1 000 tons of inert wastes, mostly in the form of excavation, in which case RD and/or the construction contractor will have to develop and submit a waste management plan for review and approval by MEPA; this plan will have to be made publicly available. Implementation of the waste management plan will have to supervise by an environmental manager. If the project will generate more than two tons of hazardous waste, which is not considered to be likely, it will have to develop and implement a hazardous wastes separation and collection system and provide information and appropriate training to workers.

2.1.2 Social Laws and Regulations

The Constitution of Georgia declares that everyone is free by birth and is equal before law regardless of race, color, language, sex, religion, political and other opinions, national, ethnic, and social belonging, origin, property and title, place of residence. Article 26 of the Constitution of Georgia (1995) considers that labor shall be free, including the right to healthy working conditions.

The following social laws and regulations are applicable to the Project:

Laws:

- On the Labour Code (reg. # 270000000.04.001.016012; 17.12.2010; last amendment 16.04.2025);
- On Funded Pensions (reg. #280060000.05.001.01906; 21.07.2018; last amendment 26.06.2025);
- On occupational Safety (reg. #270000000.04.001.017910; 19.02.2019; last amendment 26.06.2025);
- On Gender Equality, 2010 (reg. #010.100.000.05.001.003.962; 26.03.2010; Last amendment 12.11.2025);
- On Trade Unions (reg. #040040010.04.001.016259; 30.11.2018; last amendment 29.09.2020);
- On Social Protection of Repressed Persons and Acknowledgement of Those as Victims of Political Repressions (reg. #280.090.060.05.001.000.310; 11.12.1997; last amendment 31.10.2014);
- On Social Aid, 2006 (reg. #280.080.020.05.001.002.699; 29.12.2006; last amendment 01.12.2022
- On Mental Aid, (reg. # 470.080.000.05.001.002.359; 14.07.2006; last amendment 17.12.2025);
- On Public Health (reg. # 470.000.000.05.001.002.920; 27.06.2007; last amendment 09.12.2025);
- On HIV / AIDS (reg. # 470.230.000.05.001.003.732; 17.11.2009; last amendment 13.12.2024);
- On the Conflict of Interests and Corruption in Public Service (reg. #010.320.050.05.001.000.268; 17.10.1997; last amendment 17.12.2025);
- On General Education (reg.# 430.050.000.05.001.001.778; 08.04.2005; last amendment 17.12.2025););
- On Higher Education (reg. # 430.020.000.05.001.001.626; 21.12.2004; last amendment 10.12.2025);
- On Vocational Education (reg.# 430060000.05.001.019178; 20.09.2018; last amendment 24.06.2025););
- On Culture (reg. # 450.000.000.05.001.000.217; 12.06.1997; last amendment 14.05.2025).

Law of Georgia on the Labour Code (reg. # 270000000.04.001.016012; 17.12.2010) regulates labor and human resource management in Georgia. The Code regulates labour relationships between workers and employees working in Georgia in enterprises, institutions, and organizations, regardless of their ownership or organizational form. It supports the realization of human rights and freedoms through fair reimbursement and the creation of safe and healthy working conditions. The Code sets provisions for employment guarantees, working time, health and safety conditions, and so forth.

The Labour Code of Georgia defines the minimum age of the employees as 14 years. Employees under 18 years of age are not allowed to undertake certain jobs, as defined in the Code, and there are limits on working hours for workers between 14 and 18. For this project, RD will prohibit the contractor from employing anyone under 18 years old.

Law of Georgia on Occupational Safety (reg. #270000000.04.001.017910; 19.02.2019) - This new law defines basic requirements and general principles of occupational safety for jobs that are dangerous, hard, harmful, and/or hazardous. The above- mentioned activities are listed in the ordinance of GoG #381. This law would apply to contractors and supervising engineers, and to RD employees who visit project locations during construction and/or operation.

The law imposes a general obligation on employers to provide employees with a safe and healthy working environment and to inform workers of the potential risks their jobs may present to their health and safety. Measures that must be taken include, but are not limited to, training and information campaigns as well as adoption of relevant preventive measures. The law includes requirements for organizing and managing health and safety programs, providing emergency care and services, and responding to accidents. Other requirements include controlling access to hazardous workplaces, providing personal protective equipment at no charge to workers, and medical examinations.

2.1.3 Laws and Regulations on Land Acquisition and Resettlement

Georgia has developed a number of laws to regulate land ownership rights and expropriation processes. A key principle is that compensation of physical assets should be provided at full replacement cost to be determined as per the World Bank standards. The laws also provide for compensation for income losses (e.g., losses resulting from loss of harvest). The laws require consultation with and prior notification of the affected peoples, so that they are fully aware of and participate in the expropriation process.

The following laws of Georgia relate to land use and land acquisition/expropriation, and relevant processes and procedures:

Laws

- On the Civil Procedural Code of Georgia (reg. # 060.000.000.05.001.000.301; 14.11.1997; last amendment 14.05.2025);
- On the Procedures for Expropriation of Property for Necessary Public Needs (reg. # 020.060.040.05.001.000.670; 23.07.1999; last amendment 13.06.2023);
- On the General Administrative Code of Georgia (reg. # 020.000.000.05.001.000.616; 25.06.1999; last amendment 17.12.2025);
- On the Administrative Procedural Code of Georgia (reg. #030.000.000.05.001.000.672; 23.07.1999; last amendment 17.12.2025);
- On the Constitution of Georgia (reg. # 010.010.000.01.001.000.116; 24.08.1995; last amendment 29.06.2020);
- On the Civil Code of Georgia (reg. # 040.000.000.05.001.000.223; 26.06.1997; last amendment 11.11.2025);
- On the Ownership Rights to Agricultural Land (reg. # 370030000.04.001.017924; 25.06.2019; last amendment 25.06.2019);
- On the recognition of the Property Ownership Rights Regarding the Land Plots Owned (Used) by Physical Persons or legal entities (reg. # 370.060.000.05.001.003.003; 11.07.2007; last amendment 17.12.2025);
- On the state property 2010 (reg. # 040.110.030.05.01.004.174; 21.07.2010; last amendment 17.12.2025);
- On the Public Register (reg. # 040.150.000.05.001.003.390; 19.12.2008; last amendment 17.12.2025);
- On the frames of national project, the Law of Legal Power of Land Parcels Systemic and Sporadic Registration and Improvement of Quality of Cadastral Data (reg. # 040150000.05.001.018150; 03.06.2019; last amendment 17.12.2025);
- On the Rules for Expropriation of Ownership for Necessary Public Need (reg. # 020.060.040.05.001.000.288; 11.11.1997; last amendment 15.07.2020);
- On the Civil Procedural Code of Georgia (reg. # 060.000.000.05.001.000.301; 14.11.1997; last amendment 09.12.2025);
- On the Tax Code of Georgia (reg. # 200000000.05.001.016012; 17.09.2010; last amendment 17.12.2025);
- On the Entrepreneurship (reg. # 240000000.05.001.020373; 02.08.2021; last amendment 26.11.2025).

Law of Georgia on the Procedure for Expropriation of Property for Necessary Public Needs (reg. #020.060.040.05.001.000.670; 23.07.1999) - Georgia has the constitutional power to seize any property from registered owners by means of expropriation for projects of imminent public necessity. The decision is made only through a Regional Court that must be preceded by the Decree of Minister of Economy and Sustainable Development of Georgia, justifying the imminent nature of the public necessity. The court decision must include a description of the property to be expropriated and an instruction on the necessity to pay due compensation.

The expropriator (in this case, RD) has to make every reasonable effort to acquire property by negotiation and is required to value the property at fair market value (at its own expense) before negotiations. RD does not intend to expropriate any land unless all other attempts to reach agreement fail and the road section cannot be routed to avoid disputed land. The detailed RAPs for

Sagarejo-Bakurtsikhe part of the Kakheti Highway were developed in agreement with the Resettlement Policy Framework (RPF) that had been produced at the feasibility study stage. Once the decision was made to finance Sagarejo-Tokhliauri section from the proceeds of the World Bank loan, RAP for this section was updated for full alignment with ESS 5 of the World Bank.

Law of Georgia on Payment of Substitute Land Reclamation Cost and Damages in Allocating Farmland for Non-Farming Purposes (reg. # 370.020.000.05.001.000.244; 02.10.1997) - This law establishes requirements for compensating the country and affected private landowners and users for property loss, plus lost profits by the beneficiary, of an allocation of agricultural land for non-agricultural purposes. In the event that agricultural land is taken out of agricultural use, the law requires that a land replacement fee be paid to cover costs of agricultural land of equivalent size and quality, and that the owner/user of such land be fully compensated for damages. This law will apply when RD acquires agricultural land for roads, bridges and etc. and also will apply if agricultural land or crops are damaged during construction or maintenance activities.

2.1.4 International Environmental and Social Treaties

2.1.4.1 International Environmental Treaties

Georgia is a party to the following international legal instruments pertaining environmental protection:

- Convention on Biological Diversity, 1992;
- Convention on the Protection of the World Cultural and Natural Heritage (World Heritage Convention; 1972; universal);
- Aarhus Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters, 1998;
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), 1979.
- European Landscape Convention, 2000;
- Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, 1989;
- European Convention on the Protection of the Archaeological Heritage, 1992;
- Convention for the Safeguarding of Intangible Cultural Heritage, 2003;
- Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 2000;
- Convention to Combat Desertification, 1994;
- Framework Convention on Climate Change, 1992;
- Framework Convention on Climate Change, Kyoto Protocol, 1997;
- Vienna Convention for the Protection of the Ozone Layer, 1985;
- Montreal Protocol on Substances that Deplete the Ozone Layer and amendments made in London 1990;
- Copenhagen 1992, Vienna 1995, Montreal 1997, and Beijing, 1999;
- Geneva Convention on Long-Range Transboundary Air Pollution, 1979;
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989;
- Stockholm Convention on Persistent Organic Pollutants, 2001;
- Rotterdam Convention on the Prior Informed Contest for Certain Hazardous Chemicals and Pesticides in International Trade, 1998;
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), 1979;
- On the Water Quality for Human Consumption (Council Directive), 1998;
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Ratified in May 1999);
- Cartagena Protocol on Biosafety (Ratified in November 2008).

Aarhus Convention (Ratified in April 2000) - The UNECE Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters, usually known as Aarhus Convention helps member countries to establish rights of the public (individuals and their associations) to receive environmental information that is held by public authorities ("access to environmental information"). This can include information on the state of the environment, but also on policies or measures taken, or on the state of human health and safety where this can be affected by the state of the environment. In addition, public authorities are obliged, under the Convention, to

actively disseminate environmental information in their possession. Upon ratification of the convention, the county took up an obligation to ensure citizens' access to justice in environmental matters. The obligation considers provision of a package of guarantees that allows citizens, including civil society, to ask a national court to check whether a public authority has respected the rights and fulfilled the related legal requirements.

Emerald network - Georgia is a signatory to the Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979), which highlights the conservation of endangered species and their habitats, including migratory species. Under the Convention, Georgia is required to establish and maintain "Areas of Special Conservation Interest" (ASCI), also known as Emerald Sites (similar to the EU's Natura 2000 sites), which collectively comprise the Emerald Network. Emerald Network is established to conserve flora and fauna species and their habitats and to support sustainable use of biological resources. The Habitats Directive and the Birds Directive establish requirements for assessing potential adverse effects on Emerald Network sites (in the European Union, on Natura 2000 sites) and require the implementation of measures to reduce potential impacts to acceptable levels, and to offset losses of valuable biodiversity.

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Ratified in May 1999) - an international treaty that was designed to reduce the movements of hazardous waste between nations and specifically to prevent transfer of hazardous waste from developed to less developed countries. The Convention is also intended to minimize the amount and toxicity of wastes generated, to ensure their environmentally sound management as closely as possible to the source of generation, and to assist less developed countries in environmentally sound management of the hazardous and other wastes they generate.

Cartagena Protocol on Biosafety (Ratified in November 2008) - a Protocol to the Convention on Biological Diversity is an international agreement which aims to ensure the safe handling, transportation and use of living modified organisms (LMOs) resulting from modern biotechnology that may have adverse effects on biological diversity, taking also into account risks to human health.

2.1.4.2 International Social Treaties

International social Conventions Ratified by Georgia:

- The UNECE Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters, usually known as Aarhus Convention (Ratified in April 2000);
- Fundamental, Governance and Technical conventions of the International Labour Organization (ILO) covering regulations on employment policy, remuneration, holidays with pay, human resources development, minimum age, freedom of association, etc. as well as those prohibiting forced labour, child labour and discrimination.

The UNECE Convention on Access to Information, Public Participation in Decision-making, and Access to Justice in Environmental Matters, usually known as Aarhus Convention (Ratified in April 2000) helps member countries to establish rights of the public (individuals and their associations) to receive environmental information that is held by public authorities ("access to environmental information"). This can include information on the state of the environment, but also on policies or measures taken, or on the state of human health and safety where this can be affected by the state of the environment. In addition, public authorities are obliged, under the Convention, to actively disseminate environmental information in their possession. Upon ratification of the convention, the county took up an obligation to ensure citizens' access to justice in environmental matters. The obligation considers provision of a package of guarantees that allows citizens, including civil society, to ask a national court to check whether a public authority has respected the rights and fulfilled the related legal requirements.

Fundamental, Governance and Technical conventions of the International Labor Organization (ILO) covering regulations on employment policy, remuneration, holidays with pay, human resources development, minimum age, freedom of association, etc. as well as those prohibiting forced labor, child labor and discrimination.

2.2 Institutional Framework for Environmental and Social Management

Ministry of Environmental Protection and Agriculture

MEPA is primarily responsible for the environmental protection and sustainable use of natural resources. The Ministry's responsibilities include to:

- intermit, limit, or stop any activity having or likely to have adverse impact on the environment, as well as unreasonable use of natural resources;
- review and approve environmental and social assessments and to issue a series of permits, including for environmental impact;
- control the implementation of mitigation measures by the developer, which in this case is RD;
- receive free and unrestricted information from the developer about the use of natural resources, monitoring systems, waste management, etc., and explanations from authorities concerned with the project;
- ensure public participation in environmental the decision-making process.

RD will apply for the environmental decision for works to MEPA. MEPA consists of several functional departments, which are responsible for different aspects of environmental protection and administration.

Department of Waste and Chemicals Management of MEPA is responsible for:

- Agreeing on waste management plans;
- Developing and implementing a unified state policy on waste and chemicals management within the scope of its competence;
- Developing national waste management strategies and national plans and coordinating their implementation;
- Within the scope of competence, regulating waste and chemicals, state accounting, database production;
- Within the scope of its competence, fulfilling the obligations defined by the international agreements of Georgia in the field of waste and chemicals management;
- Registering waste management activities.

Department of Environmental Supervision of MEPA undertakes State control in the field of environment protection and use of natural resources;

- Prevention, detection, and suppression of facts of illegal use of natural resources;
- Prevention, detection, and suppression of environmental pollution;
- Control over the fulfilment of Georgia's international obligations in the field of environment within its competence;
- Monitoring the implementation of the legislation, including the creation of a database of the object of regulation, control over the fulfilment of the licenses submitted by the objects of regulation, the conditions set by the environmental decisions.

National Environmental Agency under MEPA

The National Environmental Agency (NEA) is a LEPL law under MEPA, which was established as an agency on September 1, 2008. The agency is an organization independent from state administration authorities, which operates independently under state control.

Recent reorganization in MEPA moved Department of Environmental Impact Assessment from the main body of MEPA to NEA, giving NEA the important mandate of undertaking state expert review of EIA reports and issuing environmental decisions (permits). More specifically, ***Department of Environmental Impact Assessment of NEA*** will be:

- Carrying out screening and scoping procedures in accordance with the rules established by law, issuing environmental decisions on activities subject to environmental impact assessment, and organizing expertise for this purpose;
- Making relevant decisions on the strategic environmental assessment report and the draft strategic document;
- Organizing transboundary environmental impact assessment procedures
- Ensuring the participation of the public and stakeholders in the environmental decision-making process and ensuring access to relevant information and public hearings for this purpose;

- Organizing the necessary procedures for discharge from the environmental impact assessment of the planned activity, preparing a relevant proposal, and submitting it to the Government of Georgia;
- Reviewing and agreeing on draft regulations for the technical discharge of pollutants into surface water bodies and technical regulations for the abstraction of water from surface water bodies;
- Reviewing and agreeing on the draft report on sources of air pollution, the inventory of harmful substances emitted by them, and the norms of maximum permissible emissions of harmful substances into the ambient air, in accordance with the rules established by law;

Other goals and objectives of NEA include:

- Establish systems for monitoring of ongoing meteorological, hydrological, geological processes and environmental (ambient air, surface and underground waters, sea, soil) quality status on the territory of Georgia and ensure their proper functioning;
- Collect and disseminate environmental monitoring data at national and international levels, including the global information networks;
- Process environmental observation data, assess the State of environment and disseminate relevant information;
- Within its competence, produce short-, medium- and long-range forecasts and issue warnings on expected extreme natural events and extremely high environmental pollution; provide this information to central and local authorities and mass media;
- Monitor negative hydrometeorological and geological phenomena (snow avalanches, hail, fog, deficiency in precipitation, erosive/abrasive processes, landslide, debris flow, rock fall and others);
- Study of physical processes of climate change, participate in elaboration of mitigation and appropriate adaptation measures against possible negative consequences caused by these changes;
- Participate in implementation of state policy and strategy in the field of natural and anthropogenic hazard reduction.

National Forestry Agency under the MEPA

National Forestry Agency (NFA) is a LEPL under the MEPA, which is mandated to ensure protection, restoration, and sustainable use of Georgia's forests. The main tasks of the Agency are to:

- Manage the State Forest within the frames defined by the Law of Georgia on the Forest Code of Georgia;
- Establish and revise boundaries of the State Forest;
- Undertake forest inventory and registration, carry out forest zoning and prescribe predominant type of use in these zones, develop/approve Forest Management Plans and oversee their implementation;
- Care for forests, protect them from pests and disease, fire, and other hazards, and restore damaged/lost forest cover; allocate parcels of the State Forest for their sustainable economic use and special use to eligible bodies and undertake State Forest harvesting for commercial purposes and for supplying dependent rural households with firewood.

The National Forestry Agency shall ensure the issuance of relevant permits and approvals for deforestation, special forest use and exclusion from the forest fund in the areas under the management of the forest fund.

Agency of Protected Areas under the MEPA

Agency of Protected Areas (APA) is a LEPL under MEPA. Its primary responsibility is to manage Georgia's strict nature reserves, sanctuaries, national parks, natural monuments, managed reserves, protected landscapes, biosphere reserves, and participate in the management of world heritage sites, wetlands of international importance, and Emerald sites.

The objective of APA is to improve the management of protected areas, ensure functionality of territorial administrations, and supervise the process of following legally established regulations and to plan, create and develop new protected areas.

As of 2021, the total area of protected areas is 798,287 hectares, which is 11.5 percent of the country's territory. At present in Georgia (according to IUCN criteria) there are 94 protected areas of 5 different categories, namely: 14 state reserves, 13 national parks, 40 natural monuments, 24 sanctuaries, and 3 protected landscapes.

APA, within its competence, is authorized to issue and / or restrict the right to carry out certain activities within the protected areas.

LEPL National Agency of Mineral Resources operates under the MEPA. **Within the scope of the competence, NAMR carries out the following activities:**

- In accordance with the legislation of Georgia, granting those licenses that are defined by the Law of Georgia on Licenses and Permits for Use of Mineral Resources (except Oil and Gas) and conduct and coordinate activities for this purpose;
- Preparation of appropriate maps of minerals (or manifestations of the minerals), inventory of deposits and manifestations, creation of state balance and cadastral database and organizing their renewal process;
- Issuing conclusions about existence-absence of minerals in the expected land area;
- Preparation of information about minerals using the geological foundation materials;
- Issuance of license documents that are strict registration documents;
- Production of License Registry;
- Approval of the mine exploitation plan within the scope of license;
- Management of integrated state foundation of minerals;
- Participation in the activities of the State Interagency Commission of Mineral Reserves;
- Monitoring and control of fulfilment of licensing conditions as it's defined by the license.
- Inventory of all types of conducted and ongoing industrial and scientific geological works in the territory of Georgia, its territorial waters, continental shelf, and special economic zone.

LTD Solid Waste Management Company of Georgia under MEPA

The Company has created a single effective waste disposal system on national level and has developed a network of regional sanitary landfills and appropriate number of waste transport stations linked with these landfills as an integral part of a national integrated waste management system.

The company provides for the collection and disposal of solid waste, including asbestos-containing waste, across the country. The Company provides services to law firms under a contract.

Ministry of Economy and Sustainable Development of Georgia

MoESD is responsible for issuing Construction Permits for infrastructural projects, as well as for supervision over constructing activities and for arranging Acceptance Commission after completion of construction.

LEPL Technical and Construction Inspection Agency under MoESD is the main State entity responsible for conducting construction permit issuing procedures and after, construction supervision and compliance monitoring.

National Agency of State Property

LEPL National Agency of State Property was established on September 17, 2012. The Agency is part of the system of the MoESD of Georgia and exercises powers related to the privatization / sale of the State property, the transfer of the right of use and the management of enterprises with state ownership. The Agency also manages issues related to strict accounting forms and manages the property of interested individuals and legal entities through the electronic auction website www.eauction.ge.

The main areas of the Agency's activities include management and disposal of state property; transfer of state property for use; Exercising powers of a partner/shareholder in enterprises with state ownership; management of the issues related to the agreement, registration, production, storage, usage and expertise-utilization of strict accounting forms; facilitation of the management of the property of interested individuals and legal entities, including through the electronic auction website www.eauction.ge.

Ministry of Culture of Georgia

The main tasks of the Ministry in the field of protection of cultural heritage are:

- To develop / conduct a unified cultural heritage policy, including a unified museum policy;
- Proper conservation / restoration, tangible conservation / promotion of tangible and intangible cultural heritage, immovable and movable cultural monuments and objects of cultural heritage, objects of cultural heritage, other cultural values, in accordance with the authorities defined by the legislation of Georgia;
- Implementation of measures related to the definition of the rules for conducting works on archaeological works and cultural heritage monuments;
- To develop recommendations on the construction, placement or dismantling of monuments, architectural-sculptural and decorative compositions throughout Georgia in accordance with the rules established by law.

The policy-making agency of the Ministry in the field of cultural heritage protection is the LEPL under the Board of the Ministry - the National Agency for Cultural Heritage Preservation of Georgia.

National Agency for Cultural Heritage Preservation Georgia under the Ministry of Culture of Georgia

LEPL National Agency for Cultural Heritage Preservation (NACHP) is responsible on supervision of the construction activities in order to protect archaeological heritage. In case if construction is to be carried out in a historic sites or zones of cultural heritage, consent of the national agency for cultural heritage preservation is also required for issuing construction permit.

In case of chance finds of the potential archaeological value, project proponent shall contact the national agency for cultural heritage preservation and seek guidance on the course of action. All action has to be taken on hold till the guidance from the agency is received formally. Project proponent is obligated to allow sufficient time and provide favourable conditions for undertaking works necessary for excavation, removal of artifacts from the site and its conservation. Works may resume only upon formal consent of the agency. In rare cases, changes may be required in the project design to bypass the site of exceptional importance and historic value.

Ministry of Internally Displaced People from the Occupied Territories, Labour, Health and Social Affairs of Georgia

Ministry of Internally Displaced People from the Occupied Territories, Labour, Health and Social Affairs of Georgia **(**MoILHSA) develops, implements, and coordinates the State policy on labour, healthcare and social protection of the population, as well as relocation and resettlement of IDPs and eco-migrants. The functions (approved by the GoG resolution N473 Sep14.2018) of the ministry include management and administration of the following areas:

- *Internally Displaced Persons (IDPs), eco-migrants, and reintegration*: regulating issues of IDPs and eco-migrants according to the political, socio-economic, and demographic conditions of the country, collecting data on eco-migration flows caused by emergencies (natural disasters, epidemics, etc.), facilitating reintegration of Georgian citizens returning from emigration to Georgia;
- *Healthcare*: regulating operation of public and private healthcare facilities. ensuring public health protection, regulation of medical and pharmaceutical activities;
- *Social protection*: providing targeted social assistance to eligible citizens, ensuring children's welfare, developing and implementing policies aimed against domestic violence and abuse, protecting and rehabilitating victims of domestic violence;
- *Labour and employment*: regulating labour relations and promoting social partnerships, managing labour migration and facilitating legal employment abroad (seasonal labour migration), promoting employment, including coordination for recruiting in alternative, non-military labour services, facilitating the development of labour safety and protection mechanisms in organizations and institutions and elimination of labour discrimination cases supervising compliance with labour safety norms at high-risk, heavy, harmful and dangerous work sites as defined by the Law of Georgia on Labour Safety.
- Integration of persons under international protection legally residing in Georgia and stateless persons having status for living in Georgia: developing and implementing relevant programs for local integration of internationally protected persons, aliens legally residing in Georgia and

stateless persons having status for living in Georgia, and perform this function, cooperation with relevant competent governmental entities.

Labour Inspection Department of MoILHSA

LEPL Labour Inspection Department MoILHSA ensures the effective execution of the labour norms by:

- Controlling and checking compliance with occupational health safety (OHS) at the workplace;
- Preventing forced labour and exploitation;
- Investigating and recording work-related accidents and occupational illness cases at workplaces;
- From January 1, 2021, supervising labour rights to determine compliance with the Labour Code.

As a result of changes to OHS law in February 2019, the Labour Inspectorate is now mandated to make unannounced visits at workplaces at any time of the day or night, without a court order and prior notice to investigate, examine and check the workplaces to ensure effective and continuous compliance with work safety and labour rights' regulations. The employers are required to inform the labour inspectorate of any accidents at their workplaces within 24 hours according to OHS law, however anyone could inform the labour inspectorate of the accident.

Ministry of Justice

The main activities of the Ministry are legislating, harmonization of legislation and raising legal awareness in public.

Ministry of Justice, on the one hand, provides legislative activities, and on the other, ensures harmonization of legislation with international legal standards. In this regard, Ministry of Justice is working closely with the Parliament, the Office of the Georgian Government (the Chancellery), relevant ministries, other state and local agencies, as well as foreign and international organizations.

The Ministry includes several legal entities under public law, including the House of Justice, as well as the National Agency of Public Registry, which regulates land and real estate registration issues.

National Agency of Public Registry under the Ministry of Justice - the governmental office in charge for official registration of land ownership is LEPL National Agency of Public Registry (NAPR). NAPR is also in charge of property transfer through purchase agreement from landowners to the RD. Previously operating Municipality (Rayon) Archives are now transferred into the possession of Municipal Registration Offices of the NAPR and information is registered and stored in a centralized database. Municipality Archives are used for cross-verification of ownership documentation and validity of physical possession of land by persons seeking registration as legalizable owners. If valid registration in the NAPR database does not exist, the Archives can be used to prove the rights of for a particular land parcel and historical documentation can be used for legal registration.

Property Rights Recognition Commission - Under the Law of Georgia on Recognition of the Property Ownership Rights Regarding the Land Plots Owned/Used by Physical Persons or Legal Entities (2007), GoG has established the Property Rights Recognition Commission (PRRC) at the municipal level for recognition of ownership rights of owners/users for registration. PRRC verifies and authorizes application of ownership for registration with the NAPR. PRRC authorizes application of only those interested persons, who are not registered but have non-agricultural or agricultural plots adjacent to the parcel where the applicant lives.

In cases when the project is important for public and state, and the landowner refuses to accept resettlement or compensation, the law of Georgia on the Procedure for the Expropriation of Property for Necessary Public Social Needs can be used as the last resort, as described above.

Municipalities

The Constitution of Georgia gives the principles to identify the rights of a self-governing unit and not the rights of a self-governing unit. A detailed list of the rights of self-governing units based on the principles given by the Constitution is given in Article 16 of the Code of the Local Self-Governing Body of the Organic Law. Municipalities participate in spatial and territorial planning of the municipality and approving urban planning documents, including the general plan of land use. They

issue construction permits for small-scale infrastructure and are authorized to exercise control of the construction works. Municipalities are mandated to manage public property and natural resources (e.g., land and forest) owned by them. They are in charge of the collection and disposal of household waste, management of local roads, controlling street trade, protecting and regulating cemeteries, and a few other functions that may have relevance for decision- making and construction under the TC-GATE. In addition, local municipalities will play an important role in designating and allocating sites for the arrangement of construction camps and will have crucial function in the grievance redress mechanism, functioning as interlocutors between local communities, construction contractor, technical supervisor, and the RD.

Ministry of Infrastructure

The Ministry of Infrastrucure oversees regional and infrastructure development throughout the country, which also includes modification and modernization of the State roads network of international and domestic importance. The Ministry works out suggestions and recommendations pertaining important investments into the national infrastructure and submits them for review and decision-making to the minister Cabinet. The RD is an agency subordinated to the Ministry of Infrastructure.

Roads Department under the Ministry of Infrastructure

RD is an entity subordinated by MI is responsible for elaboration of policy and strategic plans related to developing motor roads, management of road and traffic related issues and construction, rehabilitation, reconstruction and maintenance of the roads of public use of international and national significance, utilizing funds from the state budget, lawns, grants and other financial sources.

RD is an implementing entity of the World Bank-financed TC-GATE and will carry responsibility for all aspects of the project implementation. Because the Kakheti Highway is an international motor road, RD will be responsible for its operation and maintenance beyond the Project life. RD commissioned present ESIA, and RD will exercise control over the adherence of construction works with the ESMP included in the present ESIA report.

RD is responsible for general oversight of environmental compliance of works through ensuring quality performance of the technical supervisor and the contractor.

RD recognizes that the global sustainability challenges, including environmental protection, resource scarcity and social responsibility, are of critical importance and must be addressed. RD is committed to an idea that effective management of social and environmental impacts associated with the field of its operation/business is vital to success of road construction/rehabilitation projects.

RD has the Environment and Social Issues Division, which includes three different units: the Environmental Unit, the Registration Unit and the Resettlement Unit.

During the past 10 years, the RD increased environmental and social management capacity. The Environmental monitoring is overseen by the Roads Department, through a special unit called the Environmental Protection Unit. Environment Protection Unit of the Road Department consists of 5 qualified specialists (internal staff) and 2 environmental safeguards consultants (one for the World Bank projects and one for the ADB/EIB projects).

This unit reviews:

- The E(S)IAs and E(S)MPs related to RD projects and perform monitoring of compliance of the contractor's performance with the approved E(S)MPs, E(S)IAs, environmental standards and other environmental commitments of the contractor;
- Undertakes regular field visits to the project sites for verifying relevance and coverage of the factual information provided in the supervision consultant's reports, and providing Roads Department's direct oversight of the outstanding and/or high-risk environmental issues related to the project implementation;
- Ensures that approved projects comply with Georgian environmental and social legislation and permitting requirements;
- Participate in preparation of bidding documents and reports;
- Carrying out any supplemental site-specific environmental studies; etc.

The RD announces tender for hiring consultant firm for preparing the E(S)IA/IEE reports and/or project-specific field investigation and data verification.

One of the challenging aspect RD is facing during construction, rehabilitation and maintenance of highways/roads is to minimize an impact on environment and local population while maximizing roads capacity and their lifetime. To achieve these targets RD is proactively identifying and managing all social and environmental risks and impacts associated with its operations in a manner consistent with the national legislation of Georgian and international environmental, social, health and safety standards.

For RD the sustainable development means creating long-term value for our Government, Stakeholders and for Society by actively reducing the impact on the environment during the roads and highway rehabilitation or construction. RD is committed to constantly mitigate its activities to achieve the highest standards of environmental sustainability, particularly in the areas of climate protection, anti-littering, eco-design, air pollution, noise, vibration, surface and ground water pollution, soil, waste, biodiversity, etc.

RD believes that sustainability is a shared responsibility, best delivered in collaboration with other governmental sectors and RD therefore is engaged with Governmental institutions, supervision companies, construction companies, communities, and other stakeholders to fulfil the commitments.

To achieve these goals, RD is:

- Designing, constructing, rehabilitating, operating and maintaining the roads in a safe, reliable, sustainable, environmentally and socially responsible, and efficient manner;
- Conducting operations in compliance with all applicable National laws, regulations and international standards, while setting more stringent standards for Supervision and Construction Companies as well as for RD itself whenever feasible;
- Taking into account all international conventions and Association Agreement;
- Following new environmental and social standards and policies (if any) of the donor organizations (the World Bank, ADB, EIB, EBRD), and others);
- Improving social and environment performance through the effective use of internationally recognized environmental and social management systems;
- Creating the safe and healthy working conditions, and protecting and promoting the health of all workers for whom it is a Principal Employer;
- Ensuring all managers, supervisors and employees are aware of the organizational and of their individual responsibilities for environmental, social, and health and safety performance and that information and training is provided to enable employees and contractors to operate in a manner that minimizes risk to their health and to the environment;
- Establish effective GRM system for employees and other stakeholders to express concerns and make suggestions about RD's activities and practices and acting in a transparent and accountable manner to address and respond to concerns and feedback;
- Avoiding or minimizing adverse impacts on health and safety of local community and on the environment by avoiding or minimizing pollution of air, soil, water; ensuring to minimize the noise and vibration caused by road construction/rehabilitation activities;
- Protecting and conserving biodiversity by avoiding habitats destruction or degradation particularly of natural and critical habitats as also protected areas; and ensuring access of communities to natural resources on which their livelihoods depend;
- Arranging for all types of the projects the public consultation meetings with stakeholders, according to the necessity about the ESMPs, ToRs, ESIA reports, and others;
- Taking into account the Climate Resilience in the project preparation and implementation.

Resettlement Unit consists of 16 employees (civil servants), one social safeguards consultant and two local resettlement consultants (One is dedicated to the WB project and two are involved in resettlement implementation in projects funded by EIB).

The main tasks of the resettlement unit are:

- Preparation of the ToRs for RAPs and relevant social documents;
- Review RAPs and other social documents, elaborate comments/recommendations;
- Implementation of resettlement procedures according to RAPs;

- Preparation of monitoring, completion reports, and policy statements (as necessary).

In order to strengthen RD's capacity and support affected persons (APs) in the land/assets' legalization and registration process, which is rather difficult and time-consuming for them, the **Registration Unit** was established two years ago. Registration Unit consists of 6 employees (civil servants). The responsibilities of RU include the facilitation of registration procedures required for land acquisition and resettlement. Particularly, within the projects of special State and public importance the following procedures are implemented:

- Request from the authorized entities the documentation required for the registration of the properties which are not registered in the Public Registry and have to be acquired by RD for the project needs;
- Assessment of documents necessary for registration and their compliance with the requirements of Georgian legislation; registration of these properties in the Public Registry;
- Systematic registration of affected properties with corrected cadastral data, which have to be acquired by RD but was registered with inaccurate and/or wrong cadastral data in the Public Registry;
- Registration of the State ownership rights in the NAPR on the properties which need to be expropriated by the RD from the private owners in accordance with the Law of Georgia on the Procedures for Expropriation of Property for Social Needs;
- Registration of properties located in the RoW in the NAPR.

Innovative approaches developed to address land registration and acquisition problems:

- The department became an authorized user of the public registry and provided multifunctional services, which is saving time and human resources.

RD capacity to manage Health and Safety

Besides the employees listed above, the Environment and Social Issues Division has also recruited 2 highly qualified consultants for Health and Safety issues: one for WB funded project for Modernization of Tbilisi-Bakurtsikhe (Sagarejo-Bakurtsikhe Eastern) Part of the International Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan Border (S5) Road implemented by the RD, and one for construction of the Kvesheti-Kobi road section project financed by ADB/EBRD. Both are reporting directly to the head of the Division.

The need of Health and Safety (H&S) consultants has been identified since the First Aid incident happened nearby to a construction area which was not properly fenced. The incident resulted in child's injury on Gurjaani-Bakurtikhe bypass road construction. A root cause analysis and safeguards corrective action plan were prepared after the incident and a health and safety audit of all sections on the project was conducted. During the investigation of incident and review of safety arraignments quality of civil work Contractor, was concluded that it is urgent to have H&S specialist on board.

2.3 World Bank's Environmental and Social Standards

Environmental and Social Framework

As the Project will be implemented with financial support of the World Bank, in parallel with the national environmental and social legislative requirements, it shall meet the requirements of the World Bank's ESF. ESF comprises 10 ESSs.

ESSs relevant to the TC-GATE are the following:

ESS1: Assessment and Management of Environmental and Social Risks and Impacts: identification, control, and monitoring of risks and impacts, including identification of applicable requirements and monitoring outcomes.

ESS2: Labour and Working Conditions: labour relations, rules of employment, occupational health and safety, workforce protection, worker grievance mechanism, with specific requirements for contractor and subcontractor employees.

ESS3: Resource Efficiency and Pollution Prevention and Management: conservation of resources and control/prevention of wastes and pollution.

ESS4: Community Health and Safety: avoidance and control of risks and impacts on communities from project activities and workers, emergencies, security, and other factors.
ESS5: Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement: identification, planning, avoidance/response to the need for physical and/or economic displacement due to project activities, including information disclosure and consultation.
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources: protection and conservation of biodiversity and habitats, support livelihood of local communities
ESS8: Cultural Heritage: protection of tangible and intangible cultural heritage.
ESS10: Stakeholder Engagement and Information Disclosure: identification and engagement of local and other stakeholders throughout the project life cycle, disclosure of project information, grievance redress mechanism for external stakeholders.

The World Bank classifies proposed projects into four risk categories: low, moderate, substantial, and high. Construction works in Sagarejo-Badiauri road section are assigned substantial environmental and social risk category. This classification is due, in part, to the sensitive environments that may be affected, and the need for land acquisition and involuntary resettlement. Risk category may be revised during the project life, if the World Bank determines considerable change in circumstances defining the risk level.

Table 2 provides summary of main gaps between the requirements of relevant ESSs and the national legislation of Georgia pertaining the project. In the areas where differences are present, more stringent of the two sets of requirements will apply.

Table 2: Summary of Key Gaps between National and the World Bank requirements in Environmental, Social, Health, and Safety Aspects

ESS &Topic	ESF Requirements	National Requirements and Gaps Thereof	Approach to Gap Bridging
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts			
E&S Assessment	E&S screening is required for all activities to identify required procedures and instruments for E&S management	Procedures and instruments of E&S management are pre-defined for activities listed in Annex I of EIA Code; screening is required for activities listed in Annex II of the EIA Code; no due diligence is required for all the rest types of activities	On top of the national requirement, undertake screening of activities not appearing in Annex I and Annex II lists of EIA Code
	Need for undertaking full-scale ESIA is determined for each individual activity taking into consideration its nature, location, presence of sensitive E&S receptors nearby, complexity of expected impacts and volume of information available about these impacts upfront, challenges for designing adequate mitigation measures, etc.	Need for EIA is ruled for particular types of activities (including their scale) regardless their location, proximity to sensitive receptors and other specific circumstances if they are listed in Annex I of EIA Code; case-by-case decision on the need of EIA are taken for activities listed in Annex II of EIA Code; need for EIA is not evaluated for activities which are not listed in any annexes of EIA Code.	Assess need for full-scale ESIA for each individual activity and undertake it in all cases where expected impacts are not well known upfront, complex, spread beyond immediate area of activity, and may require unconventional mitigation measures tailored for given circumstances.
	ESF sets up equal requirements for the assessment and management of E&S, risks, and impacts.	EIA is expected to cover social aspects of an activity, but emphasis falls on environmental side, while social due diligence requirements are superficial.	Ensure symmetric coverage of E&S aspects of activity in the ESIA process, including a comprehensive social impact assessment.
	Offset of significant residual impacts is required to the extent feasible.	Does not require offset of significant residual impacts. Payments to the State budget are imposed in case of significant and measurable damage to the environment.	Explore feasibility of offsets and undertake them based on the feasibility assessment outcome.
	Differentiated approach to vulnerable and disadvantaged people is required at project level for ensuring their meaningful participation in project-related decision-making, designing adjusted impact mitigation measures, and ensuring fair sharing of project benefits.	No differentiated treatment of vulnerable and disadvantaged is required to facilitate meaningful involvement of disadvantaged and vulnerable beyond general national norms and regulations.	Include in the ESIA process mapping of vulnerable and disadvantaged and mainstream their needs into project design and implementation modality.
	Project proponent is required to undertake regular E&S monitoring of works according to	Project proponent is not required to produce a monitoring plan. Monitoring requirements are	Require that ESMPs, including E&S monitoring plan, are developed for

Project monitoring & reporting	the monitoring plan developed by project proponent, ensure that works contractors follow prescribed mitigation measures, and enforce corrective action in case of poor E&S performance. ESMP of the project proponent (included in the ESIA report of self-standing) defines frequency and format of regular reporting on E&S performance. E&S reporting is undertaken by the project proponent and its results are used by the project proponent for adaptive management.	established by the national authority and included in the conditions of environmental decision (permit). No E&S monitoring is undertaken for activities that are not subject to full-scale EIA and environmental permitting. Project proponent does not generate E&S monitoring data but rather uses data from self-monitoring by works contractors. Universal form of E&S monitoring applicable to all operations regulated by environmental decision (permit) is the assessment of residual impacts and submitting its results to the national authority. Project proponent is directly responsible for submitting monitoring reports to the national authority as set forth in the conditions of environmental decision (permit) but does not have clear responsibility for ensuring good E&S performance of contractors and does not apply sanctions to mis-performing contractors. Department of Environmental Supervision under MEPA carries control and enforcement functions.	operations with the expected tangible E&S impacts. Require that project proponent undertakes regular E&S monitoring as set forth in the ESMP and produces monitoring reports. Require that project proponent takes responsibility for E&S performance under the project and uses monitoring outcomes for timely application of corrective actions.
	Third-party monitoring may be applied to enhance monitoring capacity and/or to ensure impartial external tracking of E&S impacts by civil society, academia, etc.	No third-party monitoring is practiced.	Apply their party monitoring if feasible
Livelihood restoration	Explore a need for, discuss and agree features of, and deliver assitaince to the discplaced people in livelihood restoration on top of providing compensation as per RAP.	Regulations in place to provide replacement cost and offer land-for-land compensation where possible, but no requirement for livelihood restoration or other allowances.	Explore impacts of relocation on the livelihoods of affected people; develop and implement livelihood restoration plans as reasonable.
Information disclosure and stakeholder engagement	For all projects involving E&S risks of impacts and benefits as well, information disclosure and engagement of the stakeholders is required throughout the project life. Project proponent shall develop and implement Stakeholder Engagement Plan.	EIA Code requires disclosure of draft screening reports and EIA reports. National authority holds public consultations on these documents. EIA c-Code requires disclosure of project proponent's report on the residual E&S impacts of a completed project. There is no requirement	Develop and implement Stakeholder Engagement Plan.

		stakeholder engagement throughout the project life.	
ESS2: Labour and Working Conditions			
Working conditions and management of labour relations	Institutions involved in project implementation, including works contractors, are required to have in place Labour Management Procedures clearly defining terms and conditions of employment, including wages, working hours, and overtime payments; eligibility for rest and medical leave, insurance, standards of accommodation worksite, etc. Contractors are required for develop and adopt Code of Conduct through which they commit to non-discrimination and equal employment opportunity, restriction of child and forced labour, unacceptance of SEA/SH, no nuisance to local communities, socially and environmentally responsible behaviour, etc.	Institutions are not required for have own LMP. The requirement is confined to the compliance with the Labour Code of Georgia Code of Conduct is not defined and required by the national legislation.	Develop and implement LMP for the project and cause contractors to adopt their own LMP aligned with the project LMP. Obligate contractors to adopt and adhere to the Code of Conduct.
Grievance redress mechanism	Contractors and consultants deployed for project implementation are required to have GRM for their staff and personnel.	No requirement for works contractors to practice GRM.	Require contractors to establish and operate GRM for workers.
Occupational Health and Safety	Project proponent is required to set forth and enforce contractors' compliance with OHS standards in line with the sector specific EHS Guidelines of WBG. Project proponent is required to undertake regular monitoring of OHS performance of works contractors, apply preventive measures in case shortfalls are identified, and enforce requirement improvement of OHS practices followed by contractors.	Georgia's Labour Code and Law on Labour Safety are aligned with the ESS 2, but enforcement mechanism is weak. Project proponent is required to have a defined number of OHS in-house staff or a part-time consultant depending on the number of employees. No requirement to assign OHS specialist to a given project. Neither project proponent nor national authority are required to undertake regular monitoring of OHS performance and document results. National authority undertakes occasional spot checks or responds to incidents.	- Include OHS requirements in works contracts, - Have a designed OHS specialist(s) overseeing project implementation; - undertake regular OHS monitoring and record results; - Instruct works contractors on good OHS practices and actively enforce adherence to these practices.

Community workers	Requirements for working conditions and OHS applied to community workers	No requirements cover community workers	Extend applicability of requirements pertaining worksite safety and working conditions to cover community workers
Primary supply workers	Project proponent is required to apply due diligence to primary suppliers by screening risks of them using child labour and/or forced labour, discriminating workers by race, ethnicity, gender, etc., and failing to provide decent working conditions to personnel. If screening reveals such issues, project proponent shall require suppliers to take corrective actions or, if issues persist, project proponent shall replace such primary suppliers.	Project proponent carries no responsibility for the labour management and occupational health and safety practices exercised by suppliers. State regulatory agencies are mandated to enforce respective requirements of the national legislation on suppliers.	Screen primary suppliers against poor labour management and OHS practices and to take action in case of grossly poor performance is revealed.
ESS3: Resource Efficiency and Pollution Prevention and Management			
Energy use	For energy-intensive projects, project proponent is required to follow Environment, Health, and Safety Guidelines of the World Bank Group to ensure optimization of energy usage to the extent technically and financially feasible.	National laws on Energy Efficiency, and Energy Efficiency of Buildings apply.	Follow EHS Guidelines of WBG in addition to complying with the national legislation.
Water use	For water intensive projects, calculation of water balance, assessment of specific water use (volume of water used per unit of production), analysis of project impacts on water-dependent communities and other users, and use of best available water-saving technologies is required. Climate change impacts shall be considered and built into the design of water-intensive projects.	Calculating water balance is required in the process of EIA but not the assessment of specific water use. National legislation prioritizes municipal water supply for domestic consumption over other types of water use. No specific requirements and principles of water sharing (e.g., for irrigation, power generation, etc.) or water saving are stipulated explicitly. No scrutiny is applied to build climate perspective into water-intensive projects.	Explore project impacts on the affected communities and other water users within the watershed and apply mitigation measures. Include design-for-climate principles into the development of engineering solutions for the project
Use of raw materials	For projects that are likely to use significant volume of raw materials, project proponent is required adopt measures specified in EHS Guidelines of WBG to support efficient use of raw materials to the extent technically and financially feasible.	No requirements exist to optimize use of raw materials.	Follow EHS Guidelines of WBG in order to optimize use of raw materials in projects expected to use them in large volumes.

	Extraction of natural construction material (sand and gravel) from riverbed is considered environment-damaging bad practice and is prohibited under World Bank financed projects. Timely reinstatement of material extraction sites is mandatory.	Material extraction from riverbed is not explicitly prohibited. It is recommended that extraction is made from natural agglomeration of sediment. Area covered by an extraction license may include riverbed (originally or as a result of meandering). Extraction site reinstatement plan is required and is subject to approval by the Ministry of Environmental Protection and Agriculture, while the extraction license is issued by the National Agency of Mineral Resources. Enforcement of reinstatement plans is weak. Reinstatement usually does not start until entire site is used up and the license has expired after years of operation.	Prohibit material extraction from river channel. Obtain site reinstatement plan as approved by MEPA from the license documents held by contractor and monitor its implementation. Inform MEPA on significant infringements of site reinstatement plan for the action by Environmental Supervision Department of MEPA.
Pollution prevention and management	Project proponent is required to avoid the release of pollutants or, when avoidance is not feasible, minimize and control the concentration and mass flow of their release using the performance levels and measures specified in national law or the EHS Guidelines of WBG, whichever is most stringent. This applies to the release of pollutants to air, water and land.	Air, water, and land pollution are managed following the Law on Air Quality Management, Law on Waste Management Code, Law on Water, and thresholds for permitted concentration of pollutants in emissions and discharges established in by-laws and regulations supporting enforcement of the above laws.	Require project proponent to compare requirements of national legislation and respective parts of EHS Guidelines of WBG to identify areas where higher than national standards may apply and strive to attain them as technically and financially feasible.
ESS4: Community Health and Safety			
Community health and safety	Project proponent is required to keep communities within the project impact zone informed about ongoing and upcoming works and to have contract information displayed for the attention of communities to facilitate their access to GRM. Project proponent is required to assess risks of negative impact on communities within the project impact zone and apply impact mitigation hierarchy to address risks of local communities - suffering from cultural, economic, and health implications of labour influx,	No specific requirements to manage impacts of labour influx and other risks faced by local communities. All activities at worksites are subject to general national legislation and any specific regulations that may come into force in case of infectious disease breakout.	Require project proponent to assess risks of negative impacts on local communities and apply mitigation hierarchy to risk management.

	- getting into traffic accidents involving contractors' equipment and machinery, - suffering health impacts from pollution originating at worksites, - having reduced availability of losing ecosystem services as a result of project's environmental impacts, etc.		
Security personnel	Project proponent is required to apply due diligence while selecting security personnel through reviewing their track record and monitor their performance to exclude abuse of power, nuisance to local communities and other misbehaviour.	No requirement/responsibility other than recruiting certified security personnel is posed on the user of such personnel.	Require project proponent to apply due diligence to the selection and performance monitoring of security personnel.
ESS5: Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement			
Applicability	ESIA report is required to provide an overview of the conducted assessment of involuntary resettlement need, scope, impacts, and their mitigation. Procedures for handling involuntary resettlement apply to both formal and informal users of land and other property. Procedures for handling involuntary resettlement apply to the loss of livelihood in a broader sense than the loss of material property.	EIA report is not required to provide information on the need for involuntary resettlement, its scope, and impacts. Involuntary resettlement procedures apply to only legal and 'legalizable' property owners (i.e., ones with legitimate claims to land and property that may be registered under national law) but not to informal users. No procedures in place to assess to assess loss of livelihood as a result of project implementation.	Include summary of the assessment of involuntary resettlement need, scope, impacts, and their mitigation. Assess not only material loss of affected people but impact on livelihood as well.

General	Project design shall avoid/minimize need for displacement. Affected people shall be provided replacement cost, be offered land-for-land compensation where possible and be fully compensated prior to getting under impact. A comprehensive RAP shall be developed that sets forth compensation methodology, provides data from census, sets cut-off dates, considers special treatment for vulnerable and disadvantaged, and includes monitoring plan is required. RAP must be developed in a participatory manner and meaningfully discussed with the affected people. GRM must be available for affected people. RAP implementation completion report shall be produced documenting process outcomes. Audit is to be undertaken for significant displacement.	No specific requirement to avoid displacement. No requirements for public consultations, and no additional requirement for vulnerable. No requirement for the establishment and operation of GRM in addition to the blanket coverage by Administrative Code of Georgia. No requirement for a detailed RAP, establishment of cut-off dates, giving notices, and monitoring of RAP implementation. No requirement for displacement audit.	Develop and implement RAP that meets requirements of ESS5 prior to commencement of works in the impact area. Produce RAP completion report satisfactory to the World Bank.
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources			

Habitat classification and conditions under which impact on habitats is permitted	ESS 6 classifies habitats into transformed, natural, and critical habitats and sets conditions under which an activity impacting various types of habitats may proceed. An activity impacting natural habitat may proceed if there are not technically and financially feasible alternatives and if application of mitigation hierarchy to the expected impacts allows to achieve not net loss or, preferably, net gain of biodiversity. Mitigation measures may include biodiversity offsets, as feasible. An activity impacting critical habitats may proceed if there are not technically and financially feasible alternatives, project follows due process defined in international treaties and national legislation, net gain of target biodiversity values is achieved, no net reduction of populations of critically endangered species and no significant conversion of critical habitats occur, and long-term biodiversity monitoring is organized to track project impacts and effectiveness of mitigation measures.	National regulatory framework provides for protecting, conserving, and restoring biodiversity. However, species more than habitats are in the focus of protection. National law does not define transformed, natural, and critical habitats. EUNIS Terrestrial habitat Classification is practiced for the purposes of the establishment and management of Emerald Network sites and developing protected area management plans. No generic conditions are set forth under which an activity affecting various types of habitats may proceed. Such conditions may be defined in an environmental decision (permit) issued for an individual activity. No requirement for biodiversity offsets exist. Compensation for negative impact on biodiversity is required in the form of monetary payment to the State budget (e.g., payment for the extraction of trees set by individual species)	Require project proponent to map and classify habitats within project impact area in line with the requirement of ESS 6. Observe conditions under which World Bank financing may be spent on project affecting natural and critical habitats. Develop and implement Biodiversity Management Plans for projects affecting natural habitats.
ESS8: Cultural Heritage			

General	Developing and adhering to the project-specific change find procedure is required. Maintain confidentiality of change finds or other aspects of cultural heritage if advisable for ensuring safety and integrity of the heritage. Meaningful consultation with stakeholders on the planned activities involving cultural heritage is required. Assuring equitable benefit sharing from the use of cultural heritage is required.	Law of Georgia on Cultural Heritage provides required procedures in case of chance finds. No requirements for developing project-specific chance find procedures. Requirements on stakeholder consultation and consideration of benefit-sharing are not explicit in the national legislation.	Develop project-specific change find procedure as relevant based on the national legislation with the emphasis of awareness-raising and training of works contractors. Omit information on chance finds and other cultural heritage from public sources if advisable for safety purposes. As part of the EIA and SEP preparation, undertake mapping of cultural heritage stakeholders, understand the way they use or have used cultural heritage, and design and implement the project in the way ensuring agreeable and fair use of cultural heritage by identified stakeholders.
ESS10: Stakeholder Engagement and Information Disclosure			
Engagement during project preparation	Identification and analysis of stakeholders, including disadvantaged or vulnerable groups, is required. Development of a Stakeholder Engagement Plan for project lifetime is required. SEP shall be sensitive to the needs of various types of mapped stakeholders to ensure meaningful consultation; shall include institutional arrangements, staffing, roles and responsibilities, and budget for implementation. Disclosure of information on the expected E&S risks, main impacts, and approach to their mitigation is required at the early stage of project preparation.	No requirements for stakeholder identification and analysis. E&S information disclosure at the early stage of project preparation happens only for activities listed in Annex II of EIA Code (mostly moderate risk activities) through the disclosure of screening report. Screening and early disclosure of information is not required for higher-risk activities (included in Annex I of EIA Code) and low risk activities (not listed in any of the Annexes of EIA Code).	- Identify and analyse stakeholders. - Develop SEP. - Ensure disclosure of core information on E&S risks, impacts, and mitigation measures at the early stage of project design.
Engagement during project implementation	Stakeholder engagement throughout the project life through the implementation of SEP is required.	No requirement for stakeholder engagement throughout the project life. Consultation meetings are confined to those on the draft environmental screening report and draft EIA report.	Implement (and periodically update, as need be) SEP throughout the project life.

Grievance Redress Mechanism	Project proponent is required to establish and operate GRM throughout project life. Formal, informal, and anonymous complaints are accepted and acted upon. GRM shall be sensitive to SEA/SH complaints and handle them with respective caution.	No requirement for institution-specific or project-specific GRM. Grievances are handled according to the provisions of General Administrative Code of Georgia. Anonymous complaints are not accepted. Procedures for grievance redress are not sensitized to the treatment of SEA/SH complaints.	Establish and operate project-level GRM according to the requirements of ESS 10.

Project implementation will also follow general and sector-specific Health, and Safety (EHS) Guidelines of the World Bank Group (WBG) and Good International Industry Practice (GIIP).

2. Project Description

3.1 General Overview

Construction/reconstruction of the entire Kakheti Highway is a large and expensive project that the GoG plans to implement in several phases. At this stage, there is readiness to undertake works in the section starting at the eastern outskirts of the capital city of Tbilisi and ending at Bakurtsikhe village (approximately 80 km). This section crosses Sagarejo, Signagi, and Gurjaani municipalities of Kakheti administrative region. For the purposes of construction works, the Highway between Tbilisi and Bakurtsikhe was broken down to six sections (0 to V) and works in each of these sections will be tendered as a separate lot. Below is the brief description of these sections (**Figure 2**).

Section 0. Lotchini Interchange to Vaziani Interchange

This section starts chainage (ch) 0+310.22 and ends at ch 04+040.00. The starting point is to the east of the existing Lochini interchange (I/C). An ongoing project for the construction of Tbilisi Bypass Road is upgrading Lotchini I/C. RD ensured compatibility of infrastructure to be provided under Kakheti Highway of Tbilisi Bypass projects.

Section I. Vaziani Interchange to Ninotsminda Interchange

This section commences at ch 0+4040 and ends at ch 27+840. The starting point is located to the east of the designed Vaziani I/C. The end point at ch. 27+840 at the approach to Ninotsminda I/C. Noteworthily, there is a chainage fall, namely ch10+303.862 ≡ ch 10+100.000.

Section II. Ninotsminda Interchange to Tokhliauri Interchange

This section starts at ch 27+840 and ends at ch 35+500. The starting point is located at the approach to Ninotsminda, at the Iori railway Station. The end point is located to the east of the new Tokhliauri I/C.

Section III. Tokhliauri Interchange to Badiauri Interchange

This section starts at ch 35+500 and ends at ch 52+540. The starting point is located to the east of the new Tokhliauri I/C. The end point is located to the east of the new Badiauri I/C.

Section IV. Badiauri Interchange to Chalaubani Interchange

This section starts at ch 52+540 and ends at ch 75+100. The starting point is located to the east of the new Badiauri I/C. The end point is located to the east of the new Chlaubani I/C.

Section V. Chalaubani Interchange to Bakurtsikhe

This section starts at ch 75+100 and ends at ch 84+217.05. The starting point is located to the east of the new Chalaubani I/C. The end point is in Bakurtsikhe and coincides with the ch. 0+413.20 of the new roads from Gurjaani to Tsnori, which is currently under design. RD ensured compatibility of the infrastructure to be provided by Kakheti Highway and Gurjaani-Tsnori projects.

Figure 2: Map of the Kakheti Highway corridor (Section 0 through Section V)



Total length of the Highway between Tbilisi and Bakurtsikhe is about 80 km (Figure 3). **Highway segment covered with the present ESIA spans Badiauri and Bakurtsike and its length is 31677 m** (**Figure 3).** Works in this section were designed by JV AECOM Limited (lead member) and ILF Consulting Engineers Austria GmbH appointed by RD under with the consent of MI. The design was developed under the Forth East-West Highway Improvement Project financed from the World Bank loan.

Figure 3: Situational map of Kakheti Highway segment between Badiauri and Bakurtsikhe (Section IV and V)



3.2 Road Design Standards

The technical design of the highway improvement meets Trans-European Motorway Standards and Recommended Practice (UNECE, 2002). It is mostly based on the German design standards RAA (Richt-linien für die Anlage von Autobahnen) and RAL (Richtlinien für die Anlage von Landstraßen) applicable to motorways and rural roads. The mentioned standards are applied for years and are internationally accepted. In the RAA, motorways are defined as grade separated, multi-lane roads with median. The RAL defines rural roads as roads outside of urban areas, without median having grade separated interchanges or intersections at same grade.

In the current design the following are applied with regard to roads' design:

- The motorway is designed according to the RAA Design Standard, with relaxations, mainly justified by the Trans-European Motorway Design Standard, where useful cost savings can be achieved and where safety is not significantly affected;
- The secondary road network is designed according to the RAL Design Standard and/or the Georgian Design Standards (SST Gzebi:2009). The secondary roads regard all roads to be designed for the connection of the new motorway to the existing local road network and correspond practically to the secondary roads at the interchanges;
- The local road network is designed according to the Georgian Design Standard (SST Gzebi:2009) with design speed ranging from 40-60 km/h and 40 km/h, for paved and non-paved roads respectively. The local roads regard all roads to be designed for the restoration of the disturbed local road network. The local road network includes roads of smaller traffic significance;
- With regard to the design of the roundabouts, the NCHRP Report 672 “Roundabouts: An informational Guide – Second Edition” (2010), is applied. RPS 2009 (Richtlinien für passiven Schutz an Straßen durch Fahrzeug-Rückhaltesysteme) is an additional German standard regarding safety barriers and guardrails, which is taken into account for determining the roadside formations.

3.3 Main Design Parameters of the Road

The functional classification of the road under the design, according to RAA, is class II or higher. According to the RAA Design Standard, the design classes for this road category and the corresponding marginal values of the design parameters are given below (**Table 3**).

Table 3: Main Design Parameters

Guideline	Unit	RAA		
Design Class		**EKA 1B**	**EKA 2**	**EKA 3**
Design Speed	[km/h]	120	100	80
Horizontal				
Recommended Radius	[m]	≥ 720	≥ 470	≥ 280
Min length (Lb) of circular element of curves	[m]	75	55	55
Recommended max length (L) of straights with constant gradient (m)	[m]	2,000	2,000	2,000
Min length (L) of straights between curves that turn in the same direction (alignment aesthetic)	[m]	400	400	400
Recommended min horizontal radius R (m) at the end of straights L_S > 500m	[m]	(1,300(2))	(1,300(2))	(1,300(2))
Vertical				
Max longitudinal gradient s(3)	[%]	4.5	4.5	6.0
Min longitudinal gradient s (when drained using gutters)	[%]	0 (0.7)	0 (0.7)	0 (0.7)
Min longitudinal gradient s in tunnels and on ≥ 100 m long bridges	[%]	0.7	0.7	0.7
Min tangent lengths (T) of Vertical curves	[m]	120	100	100
Cross slope				

Max cross slope (super elevation) q	[%]	6	6	6
Min cross slope (super elevation) q	[%]	2.5	2.5	2.5
Max cross slope (super elevation) q on bridges should be restricted	[%]	5	5	5

At this section primarily the geometric characteristics corresponding to the design class EKA 2 are applied. However, in difficult conditions, the marginal values corresponding to the design class EKA 3 are also applied, which is justified by the Trans-European Motorway Design Standard.

Thus, under the project, the Highway is a two-way highway. In each direction, the road has two lines of 3.75m width each and 2.50m and 1.0m wide roadsides. Total width of each way of the road is 11.0m, and there is the 3.0m wide demarcation strip between the ways. In areas where highway crosses rivers and ravines, at variable relief sections and passages under the main road the highway runs on bridges. Opposite direction, ways of road have separate parallel bridge structures. Width of road on each bridge structure is 11.0 m. On bridges, roads have 1.3m wide pedestrian walkways on one side. Pedestrian walkways and communication galleries are separated from road paving with protective barrier. Distance between parallel structures of bridges is 3.0m.

3.4 Secondary and Local Roads

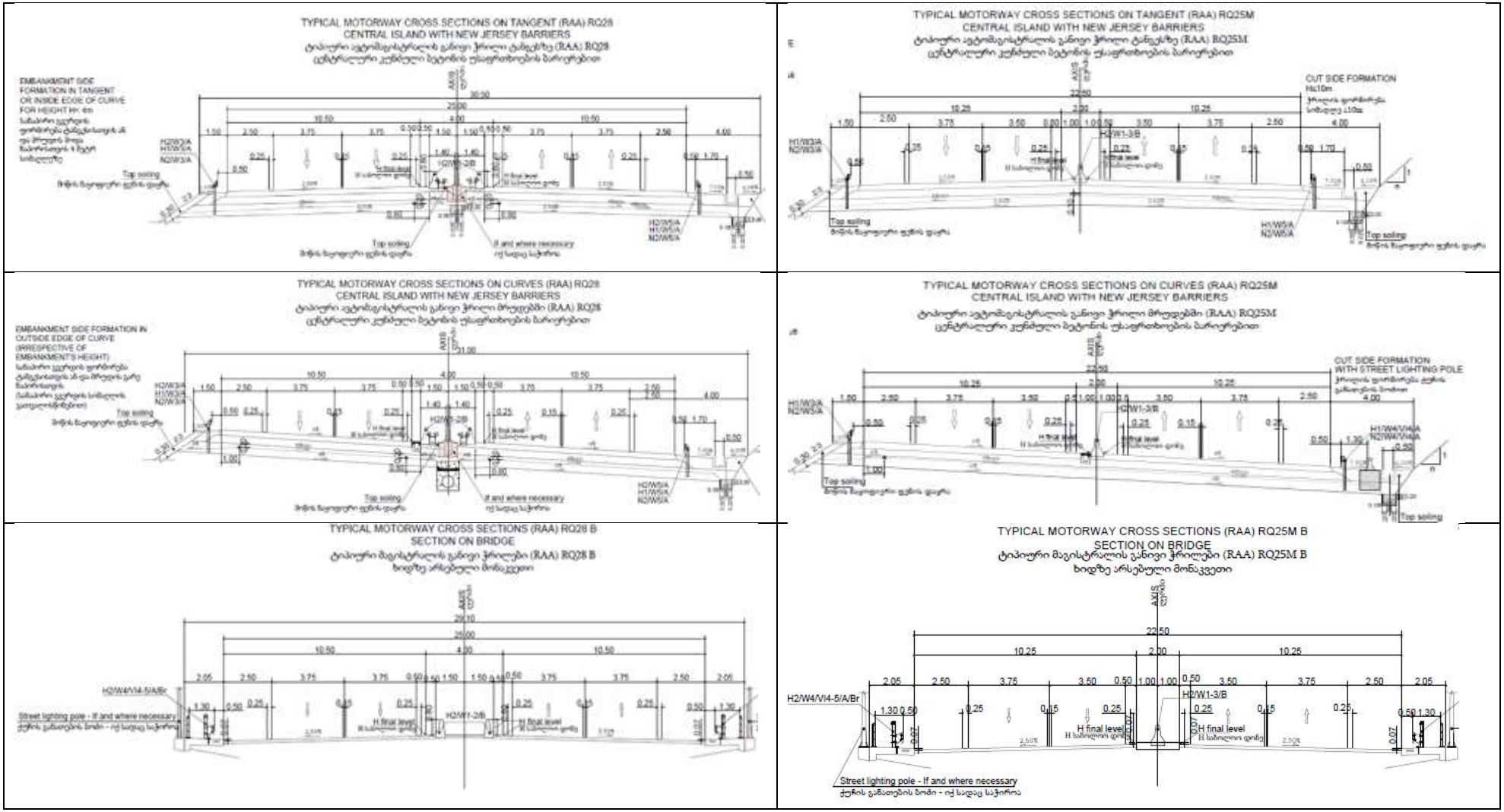
The secondary roads regard all roads, which are designed for the connection of the new motorway to the existing local road network and correspond practically to the secondary roads at the interchanges. In accordance with the RAL Design Standard, the secondary roads belong to EKL 4 design class. Wherever feasible, the secondary road networks are designed with the geometric characteristics corresponding to the EKL 3 design class. The relevant marginal values of the design parameters are given below (**Table 4**).

Table 4: Design classes EKL 3 and EKL 4 (RAL) and marginal values of design parameters

Guideline	**Unit**	**RAL**	
Design Class		**EKL 3**	**EKL 4**
Design Speed	[km/h]	90	70
Horizontal			
Recommended Radius (1)	[m]	300 - 600	200 – 400
Min length (Lb) of circular element of curves	[m]	50	40
Recommended max length (L) of straights with constant gradient (m)	[m]	1,500	1,500
Min length (L) of straights between curves that turn in the same direction (alignment aesthetic)	[m]	600	400
Recommended min horizontal radius R (m) at the end of straights	[m]	450 (2)	-
Vertical			
Max longitudinal gradient s	[%]	6.5	8.0
Min longitudinal gradient s (when drained using gutters)	[%]	0 (0.5)	0 (0.5)
Min longitudinal gradient s in tunnels and on ≥ 100 m long	[%]	0.7	0.7

bridges			
Min tangent lengths (T) of Vertical curves	[m]	70	55
Cross slope			
Max cross slope (super elevation) q	[%]	7.0	7.0
Min cross slope (super elevation) q	[%]	2.5	2.5
Max cross slope (super elevation) q on bridges should be restricted	[%]	5	5

Figure 4: Typical cross-sections (Left - RQ-28 Class; Right - RQ-25M)



3.5 Typical Cross-Sections

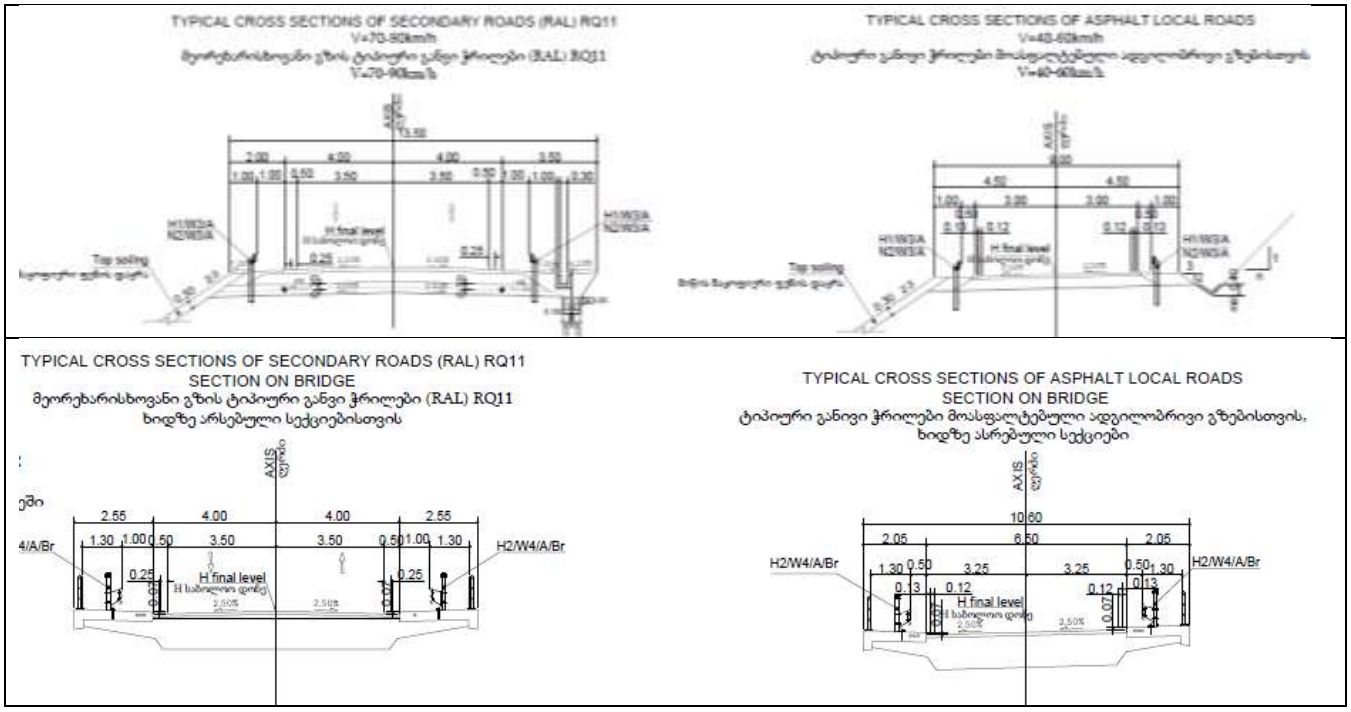
As per the requirements of RAA Design Standard of the considered project class and RD, typical RAA cross sections are used along the project highway, namely:

- RQ-28 class cross section along the section from Badiauri road junction to Chalaubani. However, the width of the carriageway is selected using the TEM design standard, and
- RQ-25M class cross section in a more complex area (from Chalaubani to Bakurtsikhe). The standard average width is adapted to Trans-European Motorway Design Standard.

The examples of used typical cross-sections are provided in Figure 4.

According to the RAL Design Standard, Trans-European Motorway Design Standard, and the Georgian Road Design Standard the following typical cross-sections are applied for the secondary and local road network: RQ-11 (RAL) and the one similar to L40 (T>200, SST Gzebi:2009). The examples of typical cross-sections see in **Figure 5.**

Figure 5: Typical cross-sections for Secondary and Local roads



Typical cross-sections for all possible cases (embankments, cuts, structures) and various side formations (e.g., high embankments, light poles, retaining walls etc.) were duly proceeded in line with the provisions of the European Norm (EN) 1317 to provide the relevant safety barriers (shoulder, ditches etc.).

3.6 Interchanges

The configuration (general outline) of each interchange was determined during the previous stages of the current Project. The interchanges are designed in accordance with the RAA Design Standard for the EKA 1B and EKA 2 design class roads, primarily the former one. According to this Design Standard, for the EKA 1 design class, the diagonal (exit upstream of the structure) and the symmetrical half cloverleaf interchanges only two suitable structures of four side configuration of interchanges are suitable. From other type configurations, Cloverleaf type interchange was used at Village Bakurtsikhe due to density of the settlements there.

The entry and exit ramps at the interchanges are generally envisaged on horizontal tangents. In exceptional (difficult) cases entry and exit ramps are envisaged on horizontally curved sections, however with large and adequate horizontal radii.

At grade roundabouts, where the interchanges' ramps and the secondary roads cross, are envisaged for better traffic flow quality and safety and since this kind of at grade intersections are common and widely applied in the country.

The interchanges are given below in **Table 5.**

Table 5: Interchanges

Approx. Ch.	Name	Type / Configuration
63+891	IC Kachreti	Left trumpet
74+300	IC Chalaubani	Diagonal half-cloverleaf
82+560	IC Bakurtsikhe	Rhombic

3.7 Bridges

The corridor of the designed Highway crosses a number of surface water bodies. The main ones are river৬ Chailuri, Lakbe, and Chalaubani. Besides, there are dry gullies and irrigation/drainage channels in the Highway corridor.

In the fourth lot, the project envisages the construction of 12 bridges, including 10 road bridges (totaling approximately 380 m), one railway bridge with a length of approximately 95 m and one road overpass bridge with a length of approximately 60 m.

In the fifth lot, the project includes the construction of 4 road bridges with a total length of 730 m and the construction of one road overpass with a length of 24.9 m and a width of 60 m.

3.7.1 Bridge Type Selection

For each bridge, a design and calculation report has been prepared and submitted of this Draft Design Report. In this section, the fundamentals of the adopted bridge design are briefly discussed

- AASHTO–Standard Specifications for Highway Bridges, 2002;
- AASHTO–Standard Specifications for Seismic Design of Highway Bridges, 2002

And their Interim Issues are used. For indefinite cases in these specifications, necessary sections of the CALTRANS – Bridge Design Specifications Manual and Design Memos, State of California, Department of Transportation, 2000-2004, ACI – Concrete Manual, vol. 1-5, 2002 are referred.

Functionality, safety, constructability, economic feasibility, durability, and architectural and environmental conformity with the surrounding are the basic parameters to be considered in the determination of the appropriate bridge type.

The two basic geometric parameters that largely determine the bridge type selection are the number and lengths of spans; and the width of the bridge platform.

Based on the alignment layout, the bridge decks accommodate either two lanes, or three lanes depending on whether a climbing or acceleration/deceleration lane is required. Also in a few areas, the width of the edge strips is increased to secure the required forward sight distance on horizontal curve locations.

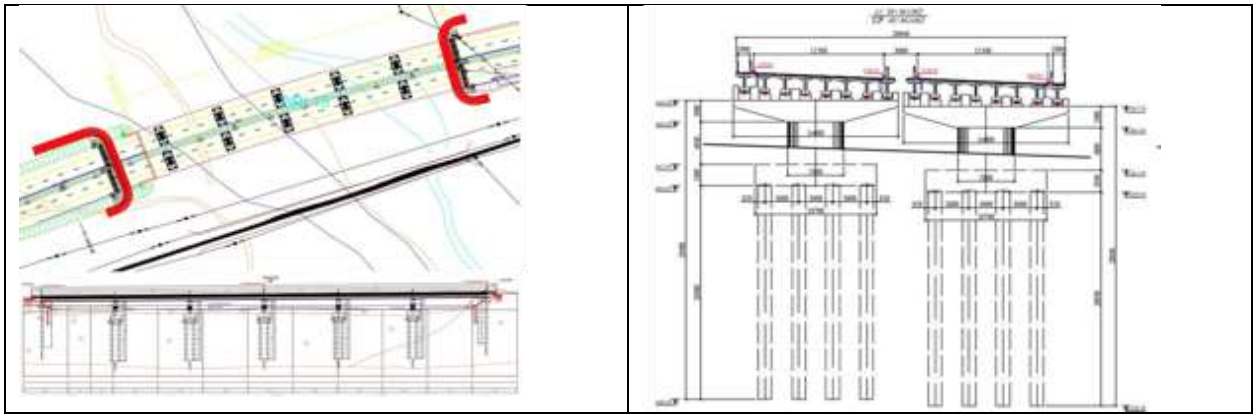
Most common bridge types can accommodate a wide range of platform widths; in this regard the span length has been considered to be the main geometrical criterion in the selection of the bridge type for the project.

Construction of the precast concrete beams at a remote casting yard will ease beam production and ensure quality assurance requirements are achieved. High strength pre-stress strands are placed within each beam to greatly increase their structural capacity. Furthermore, since these precast beams are erected in their actual position using a mobile crane, the required space for the superstructure construction can be significantly reduced.

3.7.2 Bridge Cross-Section

The below figures, showing the cross-section and layout of a river bridge as an example, indicate the typical cross-section and layout of the designed main road bridges (**Figure 6**).

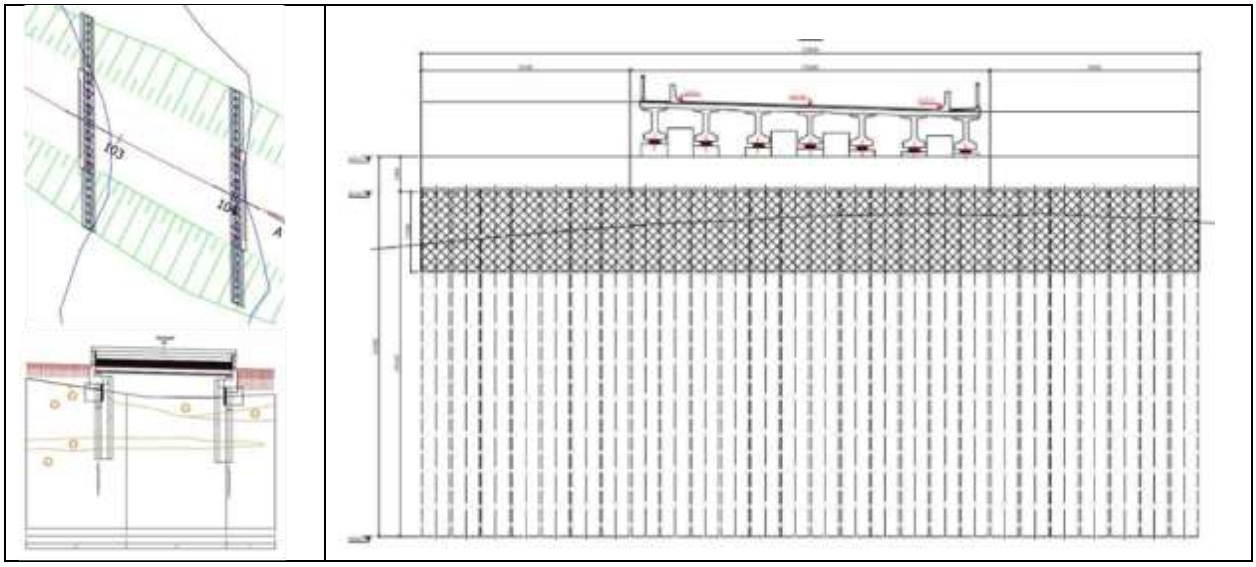
Figure 6: Typical Layout Plan and Longitudinal Section (right) and Cross Section (left) of Main Road Bridges



For all main road bridges, New Jersey type concrete barriers are considered at the sides of the paved road platform. A single pedestrian walkway has been included in the design adjacent to the right side of the roadway (according to traffic flow direction). The distance after the barrier at the left edge of the structure has been optimized to reduce the overall width of the structure.

For the service road bridges, the typical layout and cross sections are shown below. Raised walkways have been included in the design along both sides of the bridge considering two-way traffic. These walkways include a light vehicle/pedestrian barrier at the outer edges of the bridge.

Figure 7: Typical Layout Plan and Longitudinal Section of a Service Road Bridge (right) and Cross Section of Service Road Bridges (left)



3.7.3 Foundations of the Bridges

Site investigations have been performed for each bridge, in order to identify and evaluate the soil conditions at the abutment and pier locations. For all bridges boreholes have been performed. Borehole drilling have been carried out at almost every abutment or pier location.

In the determination of the foundation depth and type of the structure, the results of the abovementioned investigations have been considered. As a general principle, all foundations have been designed as either shallow foundation bearing on rock or piled foundation with the end of the piles socketed into rock. In this regard, based on the depth of the weak layers (which may be alluvial-colluvial soil; residual soil formed by highly weathering of the rock), the foundation elevation and type has been evaluated. For large depths of weak layers, pile foundations have been used to transfer the bridge loads to the stronger layers at greater depth. Any foundation on soil, residual soil or highly weathered - very weak rock has been avoided.

While the hydraulic design of structures is based on the estimated 100-year flood (or Q1%)[1], the bridge foundations are usually designed to withstand erosion that would be expected from the damage that could occur if the calculated extreme flow is exceeded. Consequently, the design of erosion protection of bridge foundations used for Kakheti Highway is based on more stringent criteria than the erosion protection of the highway carriageway. Accordingly, gabion mattresses have been used for the protection of foundations of bridges, while riprap or gabion protection can be adopted for the protection of earthworks, depending on the flow characteristics.

The design of the rip rap protection is based on both the velocity and the level of the river at the relevant section, which are calculated from the volume flow in the river.

3.8 Pedestrian crossings

At all crossings of the Highway, as well as at the intersections of secondary roads (both bridges and underground crossings), sidewalks are provided on both sides of the road to the right of the carriageway traffic flow. The minimum width of the footpath is 0.6 m. Sidewalks are separated from the carriageway with curbs.

[1] As per Order of the Minister of Economy and Sustainable Development of Georgia No1-1/251, dated February 18, 2011, on the Use of Norms, Rules, and Technical Regulations and Other Documents in Force Prior to 1992 for the Purposes of Technical Supervision and Civil Works.

3.9 Railway design

The new motorway crosses the existing railway line at one point: 70+755. A railway bridge will be built at the railway crossing site as part of the project. It should be noted that updated route of the railway line repeats the existing rail route on a given section. In practice, it envisages restoring the existing railway line to its original condition after the construction of the highway construction.

3.10 Drainage Design

The objective of this document is to design the drainage elements along the alignment. The drainage elements are necessary to ensure the correct evacuation of rainwater in the area affected by the project and to prevent damage to road carriageway caused by surface and underground water.

Drainage elements considered in this report are:

- Transversal drainage: bridges and culverts.

Longitudinal drainage:

- Guard ditches (along the base of embankments or on top of sections in cuts), to convey the surface runoff to transversal drainage elements;
- Road pavement drainage (gutters, curbs, pipes, edge drains) to get rid of the stormwater falling directly on the road pavement.

Transversal drainage re-establishes the continuity of rivers, streams and water receptors affected by the highway alignment, secondary roads, junctions, and interchanges. Basically, any drainage elements require an evaluation of:

- the catchment basin (or watershed) and its features (geometric characteristics, permeability);
- the hydrological transport model: a mathematical model used to simulate river or stream flow and calculate the peak flow according to return periods. Return periods adopted in this report for hydraulic calculations are:
  - 100 years for transversal drainage (expected to reiterate once per 100 year).
  - 25 years for longitudinal drainage (expected to reiterate once per 25 year).
- Design criteria definition;
- Hydraulic calculation of the drainage elements so their capacity matches the maximum discharge.

This report does not consider Highway interceptions with the irrigation network, partially unused and dilapidated segments of linear infrastructure that may require additional culverts and crossings. However, no specific hydrological study is required for handling such cases alike interceptions with other utilities (water supply, gas, electricity) are going to be handled.

3.10.1 Design of Drainage Structures

Culverts crossing the project motorway are designed in compliance with standard design practices for motorways using box type culverts. Culverts on the design motorway ensure uninterrupted discharge of precipitations, water from ravines and water from drain channels.

3.10.2 Motorway Drainage

The primary purpose of a road drainage system is to remove the water from the road and its surroundings. Advantages of a good drainage system are effective removal of rainwater out of the road surface and its surroundings, road structures that stay dry, good bearing capacity, and a road that is nice and safe to drive.

The road drainage system consists of the following components:

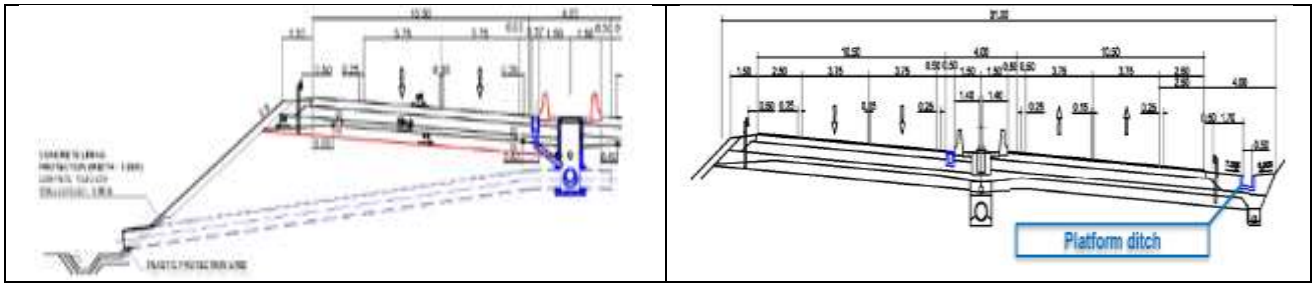
1. Platform gutter: it is needed in curves to drain the runoff of the external carriageway and prevent the flooding of the internal carriageway;
2. Collector pipe: On embankments the platform gutter discharges directly on the side, but in cut sections it is needed a collector pipe of variable (calculated) diameter, to convey the flow to the nearest discharge point;

3. Platform ditch: it collects the water from the pavement and from the slope of the cut (excavated cross sections)
4. Central drain: it collects the water infiltrated in the central part of the carriageway, between the barriers. It is a 200 mm plastic slotted pipe (PVC or HDPE), laid at a constant depth of 1.4 m below the centreline (level of the longitudinal profile). This pipe discharges on every intersection with culverts, manholes, and bridges. No specific manhole is required for access or maintenance.

Side Ditches are trapezoidal ditches, disposed along the head of cuts and the foot of embankments that receive water from the natural land. They drain water coming from the natural land, preventing that this water reaches the road platform or the embankment. It has to be considered as a standard protection along the entire length of the alignment. Side ditches are generally simply excavated on the ground, but in special conditions (high velocity, relevant flow), they have to be protected with concrete lining.

The drainage scheme of the Motorway is shown in **Figures 8.**

Figure 8: The drainage scheme of the motorway



3.11 Road Pavement Design

For the design of the layer, structures the German Guidelines RStO 2012 have been applied. Purpose of the RStO is to create and maintain a standard for carriageways and trafficked areas by using technically appropriate and economical structures. The guidelines are mainly based on the function of the traffic area, the relevant design traffic load, the position of the traffic area in the landscape, the sub-soil conditions, the type of structure and the condition of the traffic area to be restored, along with the conditions that result from the location of the traffic area – in a rural or in an urban area.

The RStO guidelines are based on experience in the construction and use of pavements for traffic areas, and from research findings and calculations to estimate the performance of the different structures. The design and construction are subject to the relevant additional technical conditions of contract and directives.

Summary for Motorway:
- ✓ Thickness of frost layer regular: 60 cm
- ✓ Thickness of frost layer in cutting areas: 65 cm
- ✓ Thickness of frost layer on embankments > 2.0 m: 55 cm

Summary for Roundabouts:
- ✓ Thickness of frost layer regular: 60 cm
- ✓ Thickness of frost layer in cutting areas: 65 cm
- ✓ Thickness of frost layer on embankments > 2.0 m: 55 cm

Summary for IC Ramps, Connection and National Roads:
- ✓ Thickness of frost layer regular: 50 cm
- ✓ Thickness of frost layer in cutting areas: 55 cm
- ✓ Thickness of frost layer on embankments > 2.0 m: 45 cm

Summary for Secondary Paved Roads:
- ✓ Thickness of frost layer regular: 50 cm
- ✓ Thickness of frost layer in cutting areas: 55 cm

- ✓ Thickness of frost layer on embankments > 2.0 m: 45 cm

According to the RSTO, the non-frost susceptible layer should be found in ground with deformation modulus of 45MPa. Considering the designed motorway and secondary roads are mainly on embankment, there should be an additional layer, below the non-frost susceptible layer, which will carry these characteristics. This layer will be the Subbase layer of 30cm thickness, and it has to be compacted that way in order for the final compacted material to have deformation modulus of 45MPa. If the embankment material has such characteristics, then this layer can be omitted, and filled with the embankment material until the non-frost susceptible layer. Similarly, in cuts, if the geological background formation has deformation modulus equal or greater of 45MPa the subbase layer can be omitted and the non-frost susceptible layer to be founded on the geological background. The subbase is to be applied only in paved roads.

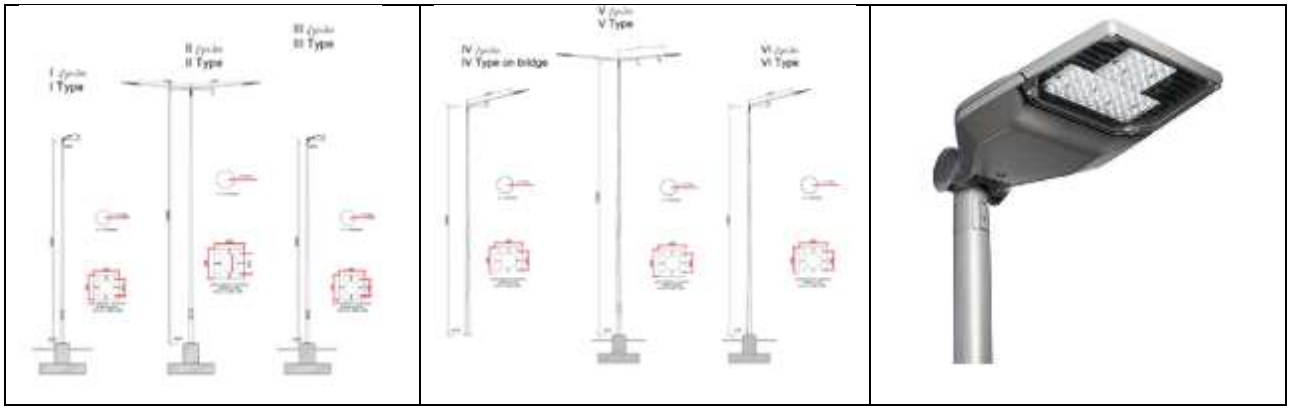
3.12 Road Lighting Design

Designed road lighting network comprises the following main components:

- 10 kV voltage feeding cable lines from nearest transformer substations;
- 10/1 kV transformer substations;
- 10/0,69/0,23kV voltage power distribution cable lines from connection points to lighting posts and lighting fixtures.

Lighting posts with lighting fixtures are divided into the 6 groups (**Figure 9**).

Figure 9: General view of lighting posts



3.13 Road Safety Design and Road Signage

In order to determine the key technical characteristics of the proper safety barrier, the methodology described in the relevant RPS Standard was applied. Thus, for the selection of the minimum required technical characteristics of the safety barrier, parameters affecting traffic as the speed limit, the increased possibility of diversion and the ADT of vehicles and heavy traffic were taken into account.

According to RPS, preservation of flat / levelled surroundings around the safety barrier id needed. Specifically, the provision of curbs and drainage gutters in front of the restraint systems in case their height is greater than 7cm above the boundary line of the pavement should be avoided. In addition, the operation of the safety barriers should not be restrained by vegetation, sign poles, etc. which are in the range of the operating width of the restraint systems.

3.14 Construction Organization

3.14.1 General overview

Prior to the onset of the core construction works at pre-construction phase, Contractor is responsible for resolving organizational and technical issues. Pre-construction phase involves construction sites preparation for works including arranging of a temporary infrastructure (construction camps, offices and etc.) necessary for the highway construction works and mobilization of relevant construction machinery (crusher and sorting plant, concrete and asphalt plants, etc.). Arranged temporary infrastructure should be provided with water- and power-supply of temporary objects.

After the preparatory stage, the construction corridor will be prepared for construction including relocation of existing engineering and communication lines, cutting trees and plants. Afterwards, earthworks are planned (including the striping and storage of topsoil). Sections and fills will be provided at relevant locations in the project corridor; roadbeds will be prepared, and the topography will be put in order. At the same time, the road infrastructure will be provided, and viaducts, bridges and other communications will be constructed.

After the construction of the road and bridges is over, certain improving works will be accomplished, including the installation of the road marks, painting lanes, etc. An important stage of the project implementation is the management of different types of waste originated in the course of the construction. After the construction works are complete, the building camps and other temporary facilities will be demobilized, the cultivation works will be done, and the landscape will be harmonized.

The works of the project highway will be realized as a single plan, i.e., the earthworks will be accomplished all along the corridor and the viaduct sections and bridges will be constructed simultaneously. As the works are finished, improvement and re-cultivation works will be accomplished all along the road. The preparatory works will take approximately 1 to 2 months. The improvement and re-cultivation works will take approximately the same time. The remained time of construction (28-30 month) covers major works, including earthworks and concrete works. In total, road construction will take about 2.5-3 years.

Approximately 150-200 people will be employed in the construction phase, with minimum 70% local people.

3.14.2 Construction Camps

According to the ESIA document prepared in 2022, 3 location alternatives were developed for construction camps:

- Alternative 1: East of Village Badiauri, two non-agricultural plots belonging to Iori Ltd with a total area of about 5 hectares. Approximate coordinates: X - 547632; Y - 4610424. Cadastral code of plots: 55.06.62.120 and 55.06.62.118. These plots coincide with the selected corridor of the highway and are subject to resettlement if this option is implemented;
- Alternative 2: West of Village Kachreti, adjacent to the project corridor, to its north. Approximate coordinates: X - 554516; Y - 4610757. Cadastral code of the plot: 51.20.59.152.
- Alternative 3: Existing construction camp of Black Sea Group Ltd. in the village of Bakurtsikhe. Approximate coordinates: X - 572266; Y - 4616834. Cadastral code of the plot: 51.14.61.247.

Of the above locations, #1 was located at the beginning of the project zone where the construction of the Badiauri road junction is planned. The former gas station and several auxiliary buildings are located in this area (**Figure 10**). After the changes made to the design, the construction of the Badiauri road junction will be carried out by the construction contractor of Section 3. Accordingly, the use of the proposed location #1 as a construction camp territory will not be possible during the construction of Sections 4 and 5.

Figure 10: #1 Location Selected for Construction Camp in 2022



During the site visit, some technical issues were encountered during the inspection of the proposed Camp #2 area. The area proposed in 2022 is currently not used for agricultural purposes (**Figure 11**).

Figure 11: #2 Location Selected for Construction Camp in 2022



A railway line runs between the proposed area for Camp #2 and the road alignment. The nearest access road connecting the construction camp to the project area is intersected by the railway line. The existing underpass the railway, has limited heighr to allow the passage of construction equipment. Also, the 1 km long unpaved access road leading to the area is in poor condition (**Figure 12**).

Figure 12: The access road to the camp #2 and the existing railway crossing



Regarding the proposed camp alternative #3, located in Bakurtsikhe, which was also used as a construction camp during previous project phases, the site is currently owned by the “Black Sea Group Company“. The territory is quite large and the location is convenient, particularely for construction activities under Section V of the project.

As shown in **Figure 13**, the site is fenced, has an access road, and is located close proximity to the project area. It is also clear from the images that the territory has not been used for several years.

A key constraint is the presence of a winery bordering the proposed cam site on three sides (**Figure 13**). The winery is owned by the company “Askaneli Dzmebi” and has been in operation for several years.

Figure 13: #3 Location Selected for Construction Camp in 2022



If the construction camp will not have a negative impact on the wine production process (noise, vibration and emissions) during the construction phase, this alternative should be considered as an option.

The Consultant used the following criteria in the process of finding a suitable area for the construction of camp: (i) the area should not be used for agricultural activities; (ii) the area should be in state ownership;

(iii) it should be located in the middle of the project area; (iv) there should be an access road to the area; (v) large-scale felling of trees should be avoided.

Along both the existing road and the project line, almost the entire length of the road is occupied by agricultural plots (**Figure 14**).

Figure 14: Agricultural plots located adjacent to the project road



During the site visit, the most suitable area for the construction camp, which met all the criteria, was selected at the location shown in **Figure 15**.

Figure 15: Area selected for construction camp and bulk material storage



The selected area consists of the following two land plots, both of which are owned by Gurjaani Municipality: (i) Cadastral Code: 51.18.58.008, total area 20 ha; (ii) Cadastral Code: 51.18.57.373, total area 58 ha.

As shown in **Figure 16**, No vegetation is present within the area, and the site is not located on a slope.

Figure 16: Area selected for construction camp



The selected area is accessible via an asphalt road connecting both the existing highway and the project road and crosses the railway line over an existing overpass (**Figure 17**).

Figure 17: Access road and railway crossing point

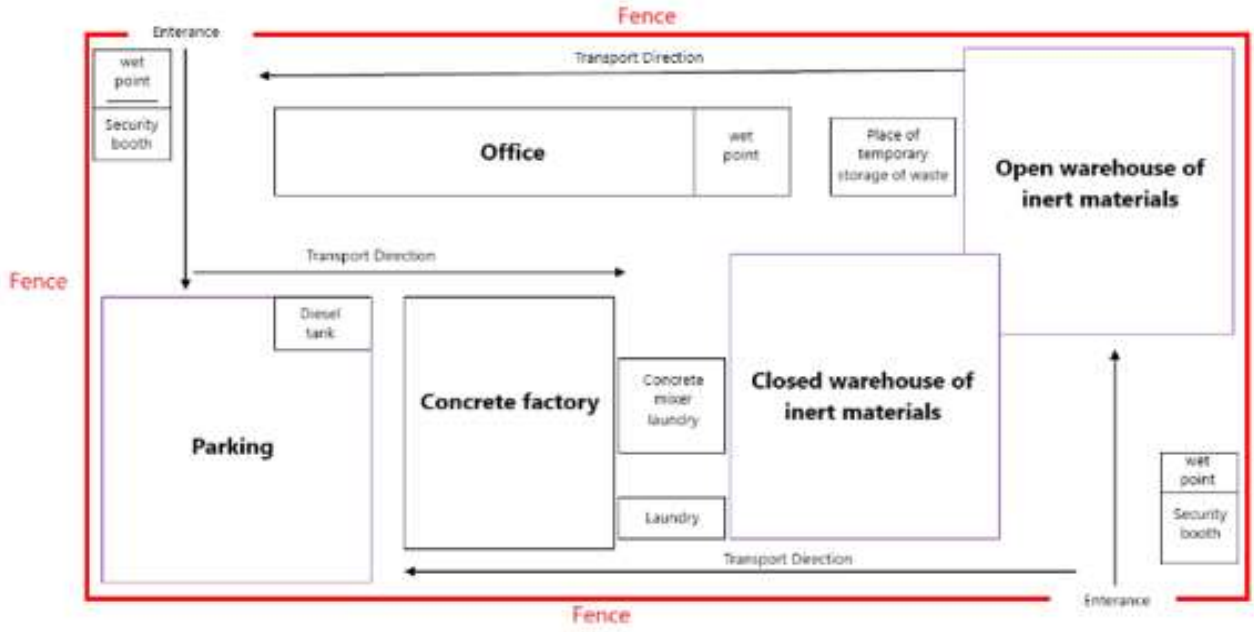


The selected area is quite large and could easily be used for bulk material disposal. The area that was designated for bulk material disposal in 2022 is currently agricultural land.

On the territory of the selected construction camp, a vehicle parking area, concrete plant and approximately 5 ton-capacity diesel reservoirs will be provided. The diesel reservoir is planned to place in the existing building. The sites of open and close storage of inert materials will also be provided on the territory. Besides, wet patches and relevant cesspits will be provided on the territory of the camp. See the tentative plan of the construction site in **Figure 18.**

However, the final decision about the location of the camps will be made at further stages, by the Construction Contractor. During the selection process the contractor will have an obligationto considering the above-listed criteria. Warehouses, offices, parking area, plant and equipment needed for the construction works, etc. will be provided at the camps.

Figure 18: Plan of Construction Camps



3.14.3 Supposed List of Construction Techniques

The construction works will use typical construction machinery commonly used in similar types of projects. **Table 6** gives the probable list of the principal construction machinery to be used during the construction works. The precise list will be provided before the construction works start.

Table 6: Main techniques to be used during the construction works

Item	Approximate qty, pcs.
Grader	2-3
Excavator	5-8
Excavator-based pneumatic drilling hummers	2-5
Bulldozer	2-5
Tractor	2-5
Bush-cutting machine	2-3
Uprooting machine	2-3
Tree cutting machine	1-2
Crane with motor motion	2-3
Smooth roller	2
Pneumatic roller	2-3
Asphalt/concrete distributor	1-2
Motor-truck concrete mixer,	10-15
Dump truck	20-35
Vibrator	7
Hand drill	2-3
Mobile compressor (with pneumatic hammers)	2-3
Watering and washing machine	3-5

Road marking machine	2-3
Fuel transporter	2-3
High-sided truck	2

3.14.4 Quarries

The construction of the design road will need the use of different materials, such as sand, gravel, cement, steel, bitumen, etc.

The design area is quite rich in the natural construction material (sand and gravel). There are dozens of licensed quarries operating in the region. Most of them are located on the Mtkvari and Iori rivers. Therefore, it will not be needed to transport the essential construction material needed for the Highway over the long distances (the distance of transportation will mostly 10-20 km maximum).

Table 7: Licensed deposits adjacent to the Highway corridor

No	Number and date of the resolution	Location of the licensed area, the kind and quantity of the resource	License holder	Term of validity
1	Resolution №1163/S dated July 28, 2017	Extraction of gravel and sand from Iori River in the area adjacent to village Khashmi, Sagarejo Municipality, total extraction volume in terms of license validity: 225 300 m^3	"Boran Construction" Ltd. (ID Code 405161970)	25 years
2	Resolution №1164/S dated July 28, 2017	Extraction of "Khasmi" gravel and sand from Iori River in the area adjacent to village Khashmi, Sagarejo Municipality, total extraction volume in terms of license validity: 138 300 m^3	"Boran Construction" Ltd. (ID Code 405161970)	25 years

A major portion of the material cut down during the earthworks will be used in fills. In such a case, the amount of originated waste rock will decrease on the one hand and the need to use natural resources of the inert materials will be diminished on the other hand. The quality of the cut materials will be tested at the laboratory before they are used in fills. As per the available information, most of the cut material is clay grounds, which will be suitable to be used for construction works after stabilization.

Pozzolana Cement is produced widely throughout the country. Consequently, the cement for the project will be supplied from the local sources. Of them, the plants in Rustavi are noteworthy.

Steel materials for bridges/viaducts, as well as bitumen, are expected to be imported from the neighbouring countries. The potential sources of bitumen import are Turkiye and Azerbaijan, and Iran. However, it should be noted that in 2020, , a new bitumen plant was commissioned in Rustavi under the "Enterprise Georgia" program, making it highly likely that bitumen supplies will be sourced from this facility.

3.14.5 Water Supply and Drainage

Water supply

During the construction of the design highway, water will be used for drinking and economic purposes. As mentioned above, we consider the probability to provide concrete plants and consequently, the amount of water needed to make the concrete mix. Besides, the amount of technical water necessary for regular watering of the construction grounds and for fire-prevention purposes is to be considered. As already mentioned, no crushing and sorting shops will be installed on the camp territory.

The principal sources of drinking and economic water supply in the region are artesian wells and boreholes. Supply reservoirs of sufficient capacity will be provided at the construction camps. Tank-cars

can be used for water supply of individual sites. Technical water will be mainly supplied from the surface water bodies near the corridor (Rivers Iori, Alazani, etc.).

The amount of drinking and domestic water supply depends on the number of the staff employed for construction. The water consumption is calculated according to the construction norms and rules SNiP 2.04.01-85 “Internal Water Supply and Sewerage” and is 25 l per worker in one shift (8 hours).

If considering that the working day will be a one-shift one, the maximum number of staff employed for the construction works will be 200. If considering that the works are accomplished in one shift and the number of working days a year is 300, the consumed amount of drinking and domestic water will be:

200 x 25 = 5000 l/day. i.e., 5 m^3/day; 5 x 300 = 1500 m^3/year.

The construction works will use technical water mainly to make concrete mix. The concrete mixer will be installed at one of the construction camps. Maximum rated capacity of a concrete mixer is 55 m^3/hr. Maximum expected annual capacity with a one-shift work (6 hours) is 900 hr/year in terms of 150 day/year working schedule. Maximum annual design production will be consequently: 55 m^3/hr* 900 hr/year = 49,5 thousand m^3/year. On average 0,3 m^3 water is used to produce one cubic meter of concrete mix of different grades. Thus, the consumed amount of water will be:

55 x 0,3 = 16,5 m^3/hr. 16,5 x 6 = 99 m^3/day. 16,5 x 900 = 14 850 m^3/year.

During the intense traffic of vehicles and techniques, particularly in dry weather, the regular watering of the construction grounds will be considered. The construction grounds will be watered with a special vehicle filling its reservoir presumably from a surface water object.it should, be considered that the construction of the transport highway is planned in quite a dry region. Consequently, the number of dry days in a year is taken as 100 only and maximum amounts of water needed for watering the construction ground is taken as 150 m^3. Consequently, the total amount of irrigation water will be:

100 x 150 = 15 000 m^3/year.

If necessary, the water for fire prevention will be supplied from the water supply reservoirs installed on the territory of the construction camps.

As already mentioned, the inert materials will be ground and sorted by using the sub-contractors’ operating plants, which will be installed on the material extraction sites. Thus, we do not take into account the amount of water used by the grinding and sorting plants.

Based on the calculations given above, the total amount of water used for technical purposes during the construction works will be approximately 30 000 m^3/year. The approximate amount of technical water needed for various unforeseen cases (fires and the like) will not exceed 40 to 50 thousand m^3/year.

Wastewater drainage

The calculation of approximate amount of the domestic sewage effluents is done by considering 5-10% of the consumed drinking and domestic water. The volume of domestic sewage originated during the construction works will be 1425 m^3/year, i.e., 4,75 m^3/day. On the territories of the camps, sewage will be emptied into the cesspits with approximate capacity of 15-20 m^3. Mobile WCs will be used on the construction grounds. The accumulated wastewater will be removed with a special vehicle and utilized in the nearest sewage systems (presumably, in Sagarejo or Gurjaani).

The concrete plant will ultimately consume the water needed to make the concrete mix and consequently, no wastewaters will be originated.

If necessary, on the territory of camps, the relevant infrastructure must be envisaged for water drainage, in particular: settling lagoons and when necessary, even more sophisticated treatment facilities will be provided for technical effluents. If it is decided to discharge the waters discharged from the treatment plants into a surface water body, an additional agreement with MEPA and development of the maximum admissible discharge plan will be necessary.

3.14.6 Relocation of Utility Lines

There are several communication objects in the project road corridor. Noteworthy of them is Baku-Supsa oil pipeline operated by British Petroleum, as well as local and international gas pipelines owned by the Georgian Oil and Gas Corporation. Besides, the project highway crosses such communication objects, as water supply and power supply lines, telephone cables, irrigation channels, etc.

The following technical solutions were suggested for the utility relocation:

- The utility lines will be relocated and restructured under the project agreed with the provider, by strictly adhering to the requirements and standards of the provider;
- If the utility lines are running parallel to the road alignment, they must be relocated beyond the borders of the impact corridor, parallel to the road;
- If the utility lines cross the road laterally, ducts, culverts, etc. will be laid in the road cross section to safeguard other utilities.

Without efficient coordination, obstructions are expected what is associated with extra costs and deterioration of the living standard of the local people.

3.14.7 Traffic Management During Construction

Normal practice is for the Contractor to propose a Work Schedule and Methodology to the Engineer's Representative, which may include traffic diversions and traffic management as required. The Engineer's Representative must approve the Contractor's proposals regarding the traffic diversion before the work plan can commence.

As the project envisages the development of a new corridor for the project road and at the same time, secondary (ground) roads are quite well developed in the region, the existing traffic control will not be associated with great difficulties.

In this regard, the last, about 6-km-long section of the village is an exception. From village Chalaubani to village Bakurtsikhe, this section runs along the Gombori Ridge and compared to other sections, there are no secondary roads along it. In addition, some sections of the new road coincide with the existing road and consequently, the traffic along the road will be significantly obstructed during the intensive construction works.

An important alternative alignment for the local population to have trouble-free traffic is the Vaziani-Gombori-Telavi Road running on Gombori Pass. During the intensive works on Gombori Ridge of the project highway, the traffic flows will be shifted to the said road for certain time periods.

Besides, all proper traffic control measures will be taken along the 6-km-long section: The works will be first of all, accomplished within the corridor to widen, during which the traffic will move along the old road. After the given stage is over, the traffic flow will move to the new road and the works will start in the old road corridor. Temporary embankments are envisaged to provide the adequate space for construction.

The priority in specifying the organizational procedures necessary for the road traffic will be given to the improved safety of the road and local infrastructure. All sites where the construction works are planned near the traffic flows will be clearly marked in the technical draft of traffic organization, and physical barriers will be installed between the construction sites and the traffic flows.

Similarly, the temporary objects and/or diversion routes for each local road, along which the traffic may be hampered during the construction, will be shown in the complete technical design. For such sites, small-scale measures for traffic covering the construction period will be developed.

3.14.8 Temporary Access Roads

Roads of local importance in the corridor of the highway are quite developed. There is a network of dirt roads between the agricultural lands. During the construction phase, the main (key) transport highway is

the existing road From Tbilisi to Bakurtsikhe. Thus, Highway construction does not envisage cutting the temporary ground roads.

3.14.9 Restoration of temporarily developed areas and roadside

After the completion of the construction of the project highway, reclamation works will be carried out, which envisages the restoration of the temporarily used areas and bringing them to the initial condition as much as possible. During the reclamation works, one of the guiding documents will be the technical regulation approved by the Resolution №424 of GoG on Removal, Storage, Use and Reclamation of the Fertile Soil Layer dated 31.12.2013.

The reclamation works mainly concern the roadside strip (slopes of the bulkheads and incisions created for the roadway), as well as the areas of landfills and camps. During the reclamation and landscape harmonization works, a fertile layer of soil will be used, which will be removed from the project and stored separately before the main land works start.

3.14.10 Projected intensity of traffic on the highway in 2020, 2030 and 2040 years

In the tables below give series of future traffic indicators compiled according to the feasibility study report. These data are used to model emissions of air pollutants and noise.

Tables 8, 9 and 10 provide traffic forecasts for 2020, 2030 and 2040.

Table 8: Traffic forecast for 2020

2020					
N	Area	Light Auto	Heavy Auto	% Heavy Auto	Total
1	Badiauri - Mzisguli	8,568	1,678	16.4	10,246
2	Mzisguli - Signagi turn	8,837	1,691	16.1	10,528
3	Signagi turn - Bakurtsikhe	4,637	1,414	23.4	6,051

Table 9: Traffic forecast for 2030

2030					
N	Area	Light Auto	Heavy Auto	% Heavy Auto	Total
1	Badiauri - Mzisguli	22,333	3,043	12	25,376
2	Mzisguli - Signagi turn	22,678	3,082	12	25,760
3	Signagi turn - Bakurtsikhe	15,950	2,558	13.8	18,508

Table 10: Traffic forecast for 2040

2040					
N	Area	Light Auto	Heavy Auto	% Heavy Auto	Total
1	Badiauri - Mzisguli	24,214	4,003	14.2	28,217
2	Mzisguli - Signagi turn	24,644	4,056	14.1	28,700
3	Signagi turn - Bakurtsikhe	16,778	3,325	16.5	20,103

4. Analysis of alternatives

4.1 General

Highway section subject to this ESIA will be a four-lane 31,7 - km-long one starting at Badiauri and ending in Bakurtsikhe. The project corridor will cross the territories of Sagarejo and Gurjaani Municipalities - the two self-governing units of the Kakheti administrative region.

Geographically, the initial section of the project corridor from the eastern part of Badiauri to Chalaubani (Section III) runs across a smooth relief, in the transient zone of Iori Plateau and the south-western slope of Gombori Ridge. An approximately 6-km-long Section V crosses Gombori Ridge, a watershed of Iori and Alazani Rivers, from south-east to north-west. The landscape in Section IV of the Highway corridor is predominantly agricultural (vineyards) and significantly transformed by human activities. Section V runs near Gombori Ridge, across forested areas, but mostly along the existing road corridor or near it.

As part of feasibility study, the following technically and financially viable alternative approaches to Kakheti Highway modernization challenge were considered:

- No-action scenario
- Widening of the existing road
- Construction in a new corridor

The Badiari-Bakurtsikhe section (Sections IV and V) is a component of the S5 highway and the alternatives were discussed in 2019 for all six sections of the highway together. Given that the construction of Section III is already in the completion phase, the route of the highway planned for this sector plays a crucial role in the discussion of alternatives for Sections IV and V. Accordingly, in the presented document, alternatives are discussed for all Sections III, IV and V.

4.2 No-Action Alternative

Under the No-Action Alternative, the modernization of the Tbilisi-Bakurtsikhe section of the International Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan Border Road (S5) would not be implemented. This would avoid all the environmental and social impacts associated with the construction and operation of the road. If modernization of the Tbilisi-Bakurtsikhe section will not be implemented, the goals and outcomes described in the Introduction (Chapter 1) and Project Description (Chapter 3.) of this report would not be achieved.

It should also be noted that the No-Action alternative will drastically weaken the positive social-economic effect of the already modernized sections of international highways running across the territory of Georgia and will have a negative impact on the expectations of the country's population and businesses.

On the other hand, improved transit function of the Country and increased international, trips in the country, and improved transport infrastructure are of vital importance, and if Tbilisi-Bakurtsikhe international highway improvement project will not be implemented this will lead to overloading of the existing highways and may become a significant hampering factor for the social-economic development of the country.

4.3 Widening of the Existing Highway

At the initial stages of the feasibility study, the option of widening the existing highway was discussed as one of the alternatives, but it became clear that it not an acceptable option as it is not sufficient to achieve the set goals for avoiding the force-majeure circumstances related to the non-linear alignment of the existing highway. The road alignment fails to ensure the due realization of the main expected benefit of the project implementation (reduction of transportation time and distance, traffic safety, etc.). This option does not provide an opportunity to meet the standards set for the international roads.

Besides, important social-economic and environmental deficiencies were identified, including such an important gap as the road passing across several densely populated zones, including villages Sartichala,

Patardzeuli, Ninotsminda, Sagarejo, Tokhliauri, and Manavi. Accordingly, the given option was associated with many cases of resettlement. The near location of the residential houses would increase the impact caused by noise and emissions on the local population (in both phases of the project). In this regard, it would be necessary to realize expensive mitigation measures (an instalment of noise barriers), particularly in the operation phase. Besides, the population safety risks, scales of visual-landscape impacts would be increased, etc.

Upon considering the above-mentioned, the road-widening alternative was declined and construction of a new corridor, which will be maximally distanced from the sensitive receptors (predominantly the residential zones) was selected.

4.4 Alternative Options of the new Highway Corridor

Construction of the new Highway will significantly improve the opportunities for convenient traffic in the east-west direction of the country what will reduce the likelihood of the above-listed risks. The project will contribute to the economic development of the country. Reduced costs of transportation and/or improved access to them ensure high competence for the economic activity in the region:

- Road service: the improvement of the state of the road may result from an increased traffic intensity what will increase the local incomes of the roadside businesses, such as fuelling stations, hotels, restaurants, etc.
- Tourism: similarly, the road improvement will result in the increased number of tourists interested in the region and will increase the incomes and general well-being in the region;
- Social benefit: by improving the conditions of the road, the access to health, education, cultural sites will be improved, and other social needs may increase;
- Employment: local population will be engaged in the construction works what will have a positive impact on their incomes.

Due to the above, modernization of the Highway along the new alignment will strongly support the sustainable development of the country and there is no alternative to its implementation. As for the environmental and social risks of the project implementation, their management is possibly by the application of negative impact mitigation hierarchy.

During the review of the design alternatives for the Sagarejo-Bakurtsikhe part of the Tbilisi-Bakurtsikhe Section of the highway, it was divided into two sub-sections: E (Tokhliauri-Chalaubani) and F (Chalaubani-Bakurtsikhe) for which different alignments were considered.

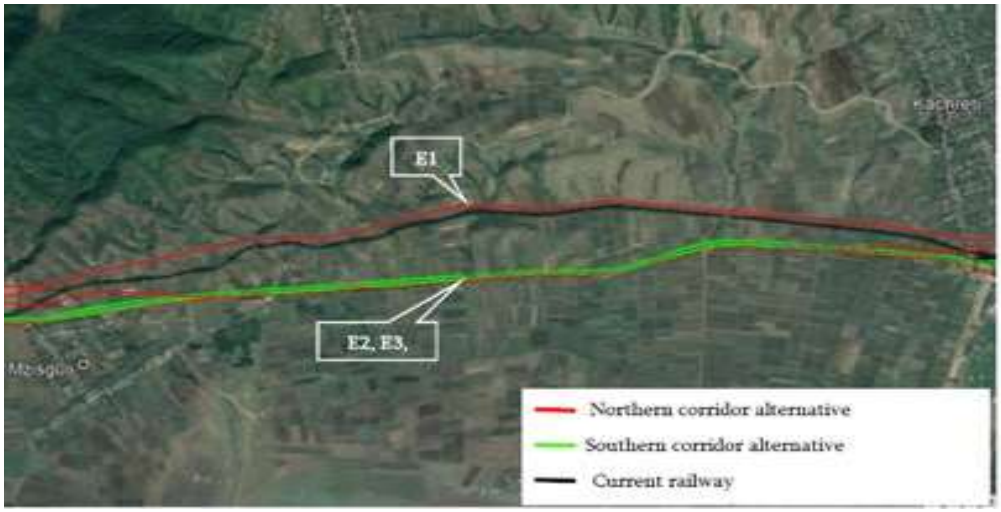
Figure 19: Alternatives of the road alignments



Badiauri-Kachreti site

Two alternative corridors: the northern and southern directions were considered for Badiauri-Kachreti area of sub-section E. The northern corridor is an extension of option E1, while the southern corridor combines options E2, E3, and E4. These options are given in **Figure 20.**

Figure 20: E Plan of alternatives of Badiauri-Kachreti area of the sub-section



Option E1 at Badiauri-Kachreti section continues north of the existing railway and follows the lower (southern) slope of the mountain ridge. There is more pristine landscape along this section: the small forest fragments, some of which will be cut down during the road construction. While crossing the lower part of the slopes, the alignment will cross a small natural gully at several points. Option E1 will have an impact on several households: a private house and a homestead plot near village Kachreti, north of the existing Kakheti Highway.

Options E2, E3, and E4 run south of the existing railway. Most of it coincides with the existing highway and implies its widening. As the terrain along this section is favourable and at the same time, there are

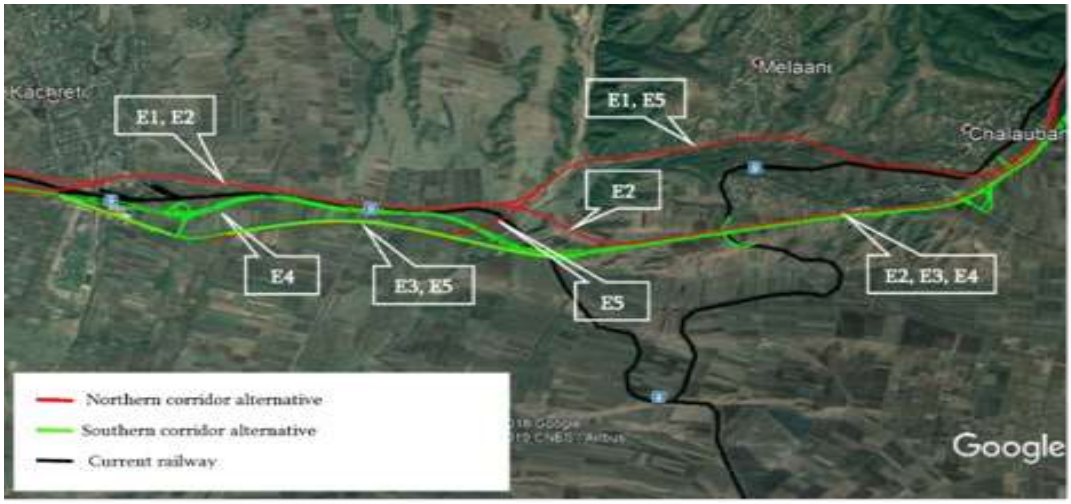
no settled areas in the area, the extension will not cause a significant impact on geological and social issues.

Overall, the advantages of the E2, E3, and E4 alternative for Badiauri-Kachreti area are clear. The main disadvantage of this option is the impact on agricultural land plots. Besides, during the construction phase, more attention must be paid to the regulation of traffic along the existing highway. However, unlike the E1 option, it has less impact on the geological environment, water bodies, homestead plots, and natural habitats. The construction works and transportation operations along this section will be relatively simple.

Kachreti—Chalaubani site

Four alternative options were considered for the Kachreti-Chalaubani area of sub-section E: E1, E2, E3, E4, and E5. These options are given in **Figure 21.**

Figure 21: Plan of Kachreti-Chalaubani site of sub-section E



E1 and E2 alignments cross the homestead plots in the southern part of village Kachret and it will bypass Kachreti Railway Station from north. Then the alignment continues across the agricultural lands and at the same time, crosses the gullies found on the given territory.

Before crossing the Lakbe River, it is divided into two paths:

To the north, E1 alternative alignment continues which will run across the terrain, which is quite dissected with the gullies on the southern slopes of the Gombori Ridge. From the south, the alignment will pass village Melaani (agricultural lands), then it reaches the railway and continues on the territory of village Chalaubani.

Following the crossing of Lakbe River, E2 alignment continues south, crosses partly agricultural and partly forested areas, and joins alternatives E3 and E4, which run across the existing road corridor.

Alternatives E1 and E2 will mainly affect the agricultural lands. Another disadvantage of this option is the probability to have a direct impact on the houses in Kachreti and proximity to the settled area (risks of population disturbance with noise and emissions). This issue was accepted by the local population during the public consultation held to discuss the former scoping report. In addition, the relatively difficult terrain conditions of the E1 alignment south and southwest of Melaani village are noteworthy. In this area, these two alternatives will have an increased impact on relatively natural landscapes.

E3 alignment continues in the existing road corridor and needs widening. This is why, as soon as its first section will have an impact on the hotel complex on the right side of the road (Kachreti Ambassador). This issue was also raised during the public consultation held to discuss the former scoping report. Then,

the highway crosses the production areas of “Georgian Wine and Spirits” Ltd. and continues through the existing road corridor, within the limits of the agriculture plots, and joins E4 Alternative at the intersection with the railway line.

In the case of implementation of the E3 alternative, an impact on business facilities (hotel, winery) in village Kachreti will be inevitable and will require very high financial compensations.

The initial section of the E4 alternative route will run approximately the intermediate areas of options E1 and E3 making it quite advantageous in terms of less impact on the residential area in village Kachreti on the one hand and on the hotel complex on the other hand. Then, the alignment continues across the agricultural plots and reaches the railway. Then, the corridor crosses the railway line, joins the E3 alternative and the existing motorway consequently. After the intersection, alternatives E3 and E4 continue in the existing road corridor before entering village Chalaubani. There are some small objects along the road in the mentioned area; however, the development of the alignment is planned on the opposite side and therefore the probability of impact on them is not high.

Alignment E4 will mainly affect the agricultural plots. Besides, there are some residential houses in villages Kachreti and Chalaubani and perhaps, some small business facilities, which will be subject to impact. However, as compared to other options, the need for economic and physical resettlement will, not be high. There are no particularly sensitive areas in respect of biodiversity and the terrain is mostly favourable for the construction works.

The alignment will cross the railway at two points and needs renovation.

Alternative to E5 is proposed for this area, which envisages the combined development of E3 and E1 alignments, i.e., the alignment will first go south and then, it will continue to the north. This option does not have any significant advantages. It will affect large business facilities in Kachreti and besides, near village Melaani, it will cross in rather unfavourable terrain conditions, in the non-developed areas.

The corridor bypasses Kachreti Railway Station from the south and continues eastwards; it will cross the existing railway line at two points and will go round Chalaubani from the south.

Putting E2 alignment to operation needs the modernization and renovation of part of the railway corridor. The road alternative option also covers a part of the railway. Consequently, the existing infrastructure must be modernized to build the new highway in the said corridor.

Summary of E sub-section alternatives

As per the scale of the preliminary study accomplished to prepare the feasibility study for the project, the situation is different in terms of the expected social and environmental impacts of different alternative alignments. Surely, there is a difference between the numbers of plots affected by the different alignments of alternative E. however, none of them can be considered non-feasible. When assessing the potential impacts of the project, the main focus should be on agriculture. Viticulture, which is a common agricultural branch in the region and potentially affected vineyards grown over large areas are particularly worthwhile.

As for the impact on biodiversity, it is not virtually expected for the E sub-section. Besides, it should be noted that the infrastructure necessary for the road along the given section of the road is located on the territory, which was already maximally developed and the expected impact on the natural habitats is insignificant.

In view of the impact on the protected areas, none of the alternative corridors is distinguished. All of them are quite distanced (6 km or more) from the Emerald Candidate Site Gombori (GE0000027) situated to the north of the Highway corridor.

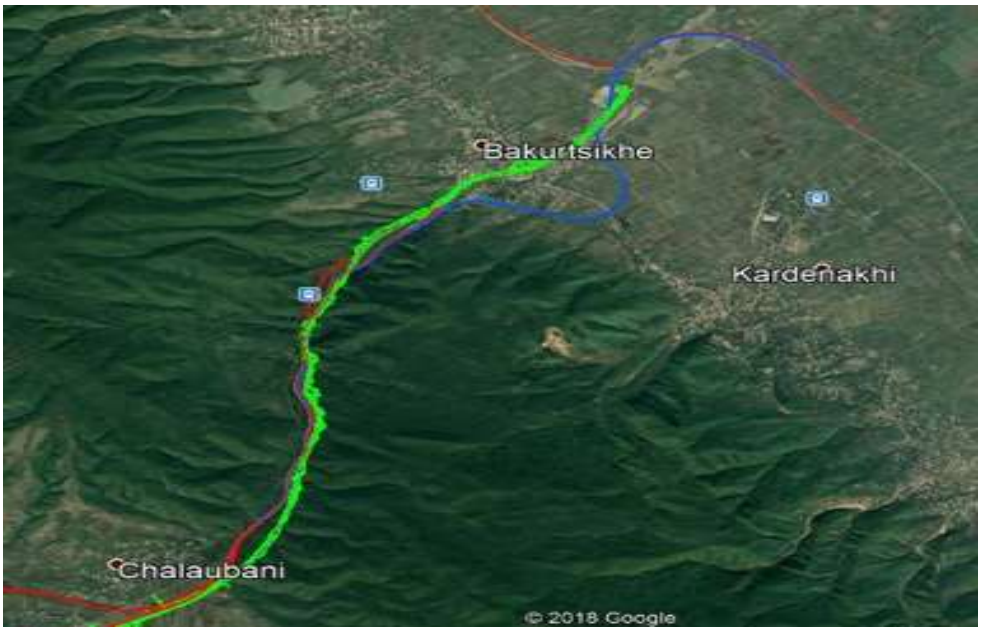
Following certain environmental and social considerations according to the above-described alignment, E4 alternative alignment, which will run south and maximally avoid the sensitive sections, was preferred.

4.5 Alternative corridors for sub-section F: Chalaubani-Bakurtsikhe

It is difficult to develop many alternative alignments for sub-section F of Chalaubani-Bakurtsikhe, as the locally existing road follows a narrow gorge, which from both sides is bordered with a mountainous and hilly terrain covered with forest. Consequently, three alignments: F1 (green), F2 (red) and F3 (blue) were considered for this section.

The alternatives of the given sub-sections are given in **Figure 22.**

Figure 22: Plan of alternatives of sub-section F



Along the Chalaubani-Bakurtsikhe section of the new road, as compared to the initial section, there are some obstacles because of the mountainous terrain. Besides, as mentioned above, the area is completely covered with dense forests, which, in the case of road construction, will have a very high impact on the forest fund and biodiversity of the area (deforestation, habitat reduction, fragmentation). The use of the existing road corridor is difficult, as this will cause the disruption of the busy traffic cycle typical to this Highway, and besides, it will not be possible to significantly improve the road parameters.

The road corridor near village Chalaubani does not cross settlements. Consequently, the impact on the social environment is not expected. However, the potential impact on small roadside businesses and local vendors is noteworthy. Acoording the survey undertaken in 2025, the total of 57 roadside verdors were operating within sections IV and V of Kakheti Highway, out of which 31 vendors were concentrated near Barjiskhevi gulley in the middle of section IV. This is the location where the travellers often take a rest and stop by trading counters to buy refreshments. This arrangement will discontinue as the bulk of traffic switches to the newly constructed highway. Also, there are several restaurants along the road near the natural spring, which are likely to also be affected by the new road construction. However, a new roadside marketplace will be provided for the affected vendors from highway sections III, IV, and V with 200 trading spaces. Additionally, affected roadside vendors will receive training for enhancing and diversifying their general business skills. In respect of the impact on the social environment, F3 alignment is important, which bypass the Bakurtsikhe crossroad from the east, follows the right bank of the Chalaubniskhevi River, and crosses the settled area. Physical relocation of project-affected people cannot be avoided in this section. However, the approved design of this section does not have technically and financially feasible alternatives. Other alignments would have significantly greater length and environmental footprint, among other adverse sides.

Summary of F-section Alternatives

Based on the comparative analysis, F1 alternative alignment was preferred. It will run across more favourable terrain conditions and as compared to other options, the risks of disturbance of the geological environment and origination of waste rock is less with this option. It should be noted that F1 alignment follows the river gorge, and it is planned in a manner as to avoid the existing road as much as possible to minimize traffic hindrance and the need for the active management of traffic flows along the highway during the construction. The selected alternative, which coincides with the road running across the territory of village Chalaubani has a higher impact on the residential area than alternative F3. Consequently, additional mitigation and compensation measures will be necessary in the given area. The implementation of the project with the considered alternative corridors is not associated with the impact on the protected areas.

It should be noted that building a tunnel or a complex of tunnels along the given Highway sub-section of the alignment is not feasible from engineering standpoint, due to substantial difference in the elevation from the sea level between the potential portals of such tunnel(s). Consequently, this option is not subject to detailed consideration.

4.6 Comparative Analysis of Alternatives

All considered alternatives are technically feasible. However, the following road corridor alignments were preferred:

E4 alternative alignment with the length of 31.7 km is preferred for the E sub-section. The advantage of this alignment as compared to other options is as follows:

- Better technical parameters of the highway and compliance with the international standards meaning better traffic conditions, fewer risks of impact on the safety of passengers and local people, etc.
- A greater distance from the residential areas is important in terms of less impact of emissions, noise and vibration propagation both, in the construction and operation phases;
- Less risks of physical resettlement;
- More stable geological conditions;
- Less impact on natural habitats as compared to some alternative alignments;
- Less impact on the existing infrastructure (including railway infrastructure);
- Some sections of the selected corridor coincide with the existing highway associated with less impact on land and land resources.

F1 alternative option was preferred for the F sub-section. Less impact on the sensitive receptors (geological environment, biodiversity) of nature along the given section must be viewed as the main advantage of the alternative as compared to the other two options. Along the site in the residential zone of Chalaubani, additional mitigation and compensation measures will be necessary to propose.

The selected alignment for Sections IV and V of the Kakheti Highway to be constructed under the World Bank financed TC-GATE is provided below in the **Figure 23.**

Figure 23: Approved alignment for Badiauri to Bakurtsikhe section of the Highway



5. ESIA Methodology

5.1 Introduction

The present ESIA evaluates potential environmental and social impacts related to the construction and operation of the Badiauri-Bakurtsikhe section of the Highway. The evaluation of impacts was based on an assessment of their extent (local, regional, national), duration (short, medium, long-term) and reversibility (temporary or irreversible effects).

Baseline data were collected by desk studies and field surveys of the buffer zone of the new road section and included most of the areas likely to be significantly affected by the project. The ESIA process consisted of bellow mentioned activities, which are common for the similar studies conducted according to the international standards:

- Collection of baseline data describing biophysical and social environment within the study area; desk studies and field surveys to address identified gaps in the existing data; update of information on topics and areas where significant negative impacts are expected;
- Identification of the expected positive and negative impacts of the proposed works on the highway and of its operation thereafter; assessment of the likelihood and significance of the potential negative impacts; and development of mitigation measures;
- Analysis of alternatives in terms of location, technology, design and operation, including the "no-project" alternative;
- Development of the Environmental and social mitigation and monitoring plans;
- Final draft ESIA report disclosure and arrangement of the stakeholder/public consultation meetings.
- Communication with national and local agencies collecting and owning information and sources on baseline conditions.
- Review of the scientific and other literature sources and conducting field reconnaissance surveys to gain an understanding of environmental and social resources in and near the corridor, and of the wider region.
- Detailed field surveys of the corridor by teams of specialists during 2021 to verify information on physical and biological resources that was collected from reference materials and to fill gaps in knowledge and finalize the identification of potential receptors.

The assignment consisted of the desktop review of the primary and secondary data followed by the field works for reconnaissance of proposed road alignment. Data collecting included review of the scientific literature/publications, the "Feasibility Study for Upgrading of Tbilisi-Bakurtsikhe and Tsnori-Lagodekhi Road" (DG Consulting Ltd In association with AECOM Ltd and ILF Consulting Engineers, 2017), the Scoping and EIA Reports prepared according to the national legislation of Georgia (Eco Specter LTD 2020-2021), and Resettlement Action Plans for each Lot sections (Lots 4 and 5) of the Tbilisi-Bakurtsikhe Road section (association of AECOM Ltd and ILF Consulting Engineers, 2021).

Field surveys were conducted for specific environmental and social components of particular concern, including:

- Landscapes and visual receptors;
- Soils and ground conditions;
- Geology and geo-engineering conditions;
- Botanical survey of the corridor;
- Fauna and ornithology;
- Nationally designated protected areas and Emerald Sites;
- Land use;
- Cultural heritage and archaeology;
- Socio-Economic conditions.

5.2 Methodology for Scoping of the National EIA Procedure

The following methodology was applied for scoping and finalization of the EIA report by collection of the baseline information important for the project. The Law of Georgia on the Environmental Assessment Code of Georgia sets forth procedures for undertaking EIA, carrying out expert examination of EIA report, its disclosure, public participation in the decision-making, and issuance of an environmental conclusion on the EIA. Annexes I and II to the Code list out activities which are subject to EIA (Annex I) or require environmental screening to determine whether the EIA will be required.

The type of works required for the construction of Tbilisi-Bakurtsikhe Road section are included in Annex I:

- Point 11. Construction of motor roads of international or intrastate significance;
- Point 13. Construction of tunnels and/or bridges located on the motor roads of international or intrastate significance.

On 13 March 2020, Scoping Conclusion No. 22 was issued by Order No. 2-245 of the Minister of Environmental Protection and Agriculture of Georgia. Subsequently, on 4 October 2021, the Environmental Decision was issued by Order No. 2-1420 of the same Ministry.

5.3 Public Participation

In accordance with the EIA Code of Georgia, the preparation of the EIA report is preceded by a scoping procedure. Article 8 of the EIA Code of Georgia provides for the involvement of the public and other stakeholders at the scoping stage. Pursuant to the provisions of the Code, MEPA organized public consultation meetings on the draft Scoping Report Information about the scheduled consultation meetings, together with the scoping statement and the scoping report, were published on the website of the Ministry and announcements on the meeting were posted on the information board of the Sagarejo and Gurjaani administrative buildings[2] Public consultation meetings on the draft scoping report were held on February 4-5, 2020 at six locations of Sagarejo and Gurjaani Municipalities,

[2] Link to the advertisement of public consultation meetings on the draft scoping report: https://mepa.gov.ge/Ge/PublicInformation/19306

Consultation meetings were attended by representatives of RD, local municipal governments, and local communities.

Paragraph 5 of Article 12 of the EIA Code of Georgia provides for the involvement of the public at the EIA stage as well. Pursuant to the provisions of the Code, MEPA organized public consultation meetings on the draft EIA Report on the construction of Sagarejo-Bakurtsikhe road section. Information about the consultation meeting, together with the draft EIA Report, was published on the website of the Ministry and announcement of the consultation meeting was posted on the information board of the Sagarejo and Gurjaani administrative buildings[3].

5.4 Methodology of the Geological Survey

The geological survey methodology consisted of the desk top review of the primary and secondary data followed by the field works for reconnaissance of proposed road alignment.

These investigations included the following activities:

- Engineering geological mapping;
- Trial Pits;
- Continuous core drilling;
- Undisturbed and disturbed sampling of the subsoil materials;
- In-situ tests;
- Laboratory tests;
- Reporting.

These investigations were interpreted with aim to define a sound engineering geological and geotechnical model. This model is taken into consideration for the design of Structure, Earthworks and Pavement.

5.5 Methodology for Air, Noise, and Vibration

Air

The calculation of emissions of harmful substances and the spread of noise / vibration in the ambient air is performed using the relevant methodological and normative documents. Expected changes in the reporting points were determined for the most unfavourable conditions. The existence of air pollution and noise sources in the project area was taken into account in the calculation process. The obtained results were compared with the normative documents in force in Georgia.

Combining features of these models enables predicting concentrations of carbon monoxide (CO), nitrogen dioxide (NO2), particulate matter (PM) and other pollutants near roadways and highways. Options are available for modelling near intersections, parking lots, elevated or depressed freeways, and canyons. It is also possible to evaluate air pollution caused by both moving and idling vehicles and to estimate the length of queues formed by idling vehicles at controlled crossings.

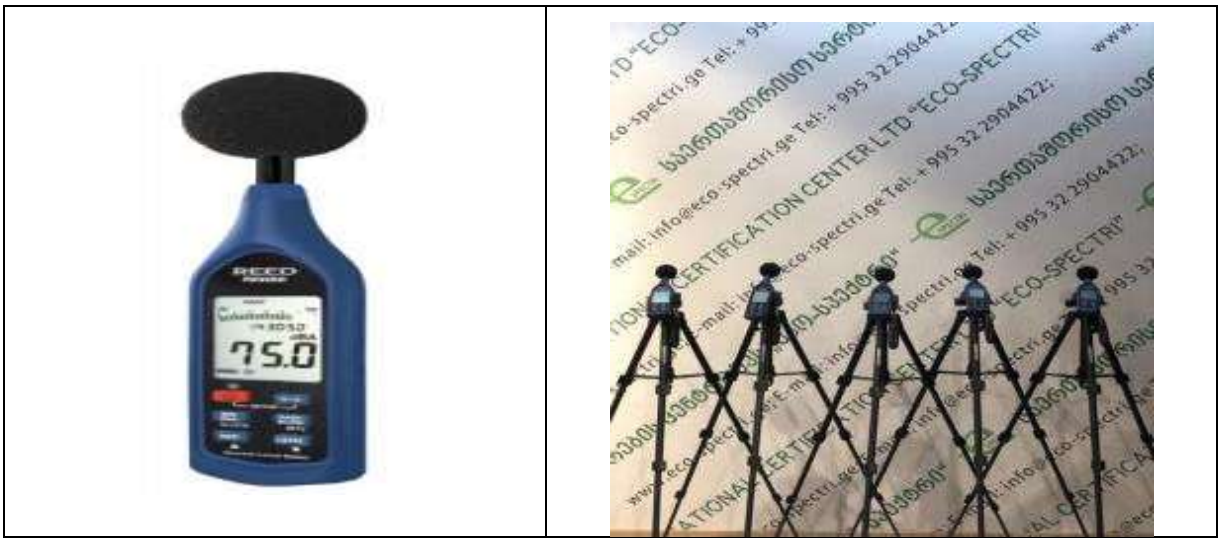
Noise measurements

To measure noise propagation noise meters of American brand REED series R8080 (**Figure 24**) was used. The noise meter is a 2nd class device of IEC 61672-1 standard. It can store 64,000 recordings and Windows software. The noise meter can save the received signals in internal memory and describe each signal according to level and date stamp. The device has a wind protective cap reducing the impact of environmental conditions (wind, temperature) during recording. The device is used to measure the noise level from the following sources: industrial equipment/devices, construction structures, public places, vehicle and railway traffic and long-term measurements. As per the International Finance Corporation, the noise level must be measured by using the 1st or 2nd class noise meter meeting the requirements of the guideline of the International Electrotechnical Committee. As per this guideline, the noise monitoring

[3] Link to the advertisement of public consultation meetings on the draft EIA report: https://mepa.gov.ge/Ge/PublicInformation/31799

is undertaken round the clock with the aim to identify the existing baseline noise level of the environment adjacent to the designed or existing facilities or to examine the noise level in the operation phase.

Figure 24: Noise meters owned by the organization



Vibration

The VM40 is designed for measuring vibration in buildings, bridges, towers, pipelines and various other large structures. The measurements serve to prevent possible structural damage or disturbance to people. The VM40 contains a sensor (**Figure 25**), recording and evaluation electronics and an accumulator in its robust casing. It is especially suitable for autonomous operation over longer periods of time e.g., on construction sites.

Figure 25: Triaxial Vibration Monitor VM40A/B



The instrument contains three highly sensitive piezoelectric systems for vibration measurement of all three special dimensions. The signal processing is controlled by a microprocessor. The VM40 is operated via its seven keypad buttons and illuminated LCD display. The measurement data can be transferred to a PC via the USB interface. The instrument also has a port for connecting a charger and a relay output for the external signalling of vibration occurrences. The VM40 can measure in accordance with the following standards:

- DIN 4150-3: Structural Vibration – Effects of vibration on structures
- BS 7385: Evaluation and measurement for vibration in buildings
- SN 640312 a: Effects of vibration on buildings

5.6 Methodology for Cultural Heritage and Archaeological Survey

As with flora and fauna, surveys began with a review of the literature, in particular the database of registered cultural heritage sites maintained by the Ministry of Culture of Georgia (www.memkvidreoba.gov.ge) and information on tourist attractions such as historical and cultural monuments and monasteries. During the preparation of the draft ESIA, a desk study was undertaken to identify settlements within five kilometers of the corridor and to fix the locations of known natural and cultural heritage sites. A field visit was conducted in order to interview local people and learn more about sites that may not be widely known or registered in databases. Additional information was collected regarding cemeteries in the area, both older ones and more recent ones. During the visit, a number of cultural heritage sites were visited to gain more information regarding current conditions.

5.7 Methodology for of Flora and Fauna Surveys

The floral study was undertaken during the 2020-2021. The botanical team began the initial desk study to record species in their early emergence/growth period to ensure they could be identified in later visits.

The surveys of flora and fauna habitats along the highway corridor included a comprehensive review of the scientific literature and a botanical and zoological field surveys of the general area conducted by the experts of relevant fields. The key objectives of the surveys were the identification and visual assessment of habitats and vegetation units present along the route and confirmation of reports in the literature, classification of habitats, and identification of expected impacts during construction and operation of the road.

Biodiversity studies were conducted during several phases of project preparation, including a preliminary study during the feasibility assessment and scoping phases, and a detailed study during the EIA stage. Additional surveys were conducted during development of current ESIA Report. The field studies of flora, fauna, and habitats were carried out with involvement of the botanists, zoologists, ichthyologists, and forestry specialists. The first round of field work was carried out in summer and fall of 2020. Additional field studies were undertaken in Section III of the Highway in the fall of 2021 for contributing to the update ESIA report to meet additional requirements of ESF.

Additional biological surveys aimed at assessment and classification of flora and fauna habitats in compliance with the World Bank ESS6 requirement and covered three main components:

- Study and assessment of the types and sensitivities of the floral habitats present in the project corridor, and the identification of species composition of these habitats. This component of the study also included numerical and volumetric inventory (or taxation) of directly affected trees in the project corridor;
- Study and assessment of the types and sensitivities of faunistic habitats and the identification of species composition of animals supported by these habitats;
- Checking the location of nationally designated protected areas and Emerald Sites vis-à-vis the road corridor and assessing possible impacts of road construction and operation on these protected areas based on the types of species and habitats targeted for protection.

The floristic assessment included compiling a detailed list of vegetation on the project site and

identifying habitats in the area. In addition to identifying plant species and compiling lists, threat and endemic statuses were determined for the respective species.

Plant species was identified by Georgian Flora (Ketskhoveli, Gagnidze, 1971-2001), Georgian Plants Volume I and II. Taxonomic data and species nomenclature validity were verified in the International Plant Taxonomy Database (The Plant List Vers. 1, 2010).

Threat categories for plant species were determined according to the Georgian Red List (2006). For those endemic species in the study area, for which the status was not specified in the Red List of Georgia, the threat status was indicated according to the Red List of Endemic Plants of the Caucasus (Solomon et al., 2014).

Projective coverage of plants was determined according to the Brown-Blanche scale (see table)

Table Floristics Scale of Projection Coverage Determination of Plant Species and Correlation of Projection Coverage Percentage: Traditional Brown-Blanche Scale (Peet & Roberts, 2013).

Coverage area	Brown-Blanche
One individual	r
small, scarce	+
0–1%	1
1–2%	1
2–3%	1
3–5%	1
5–10%	2
10–25%	2
25–33%	3
33–50%	3
50–75%	4
75–90%	5
90–95%	5
90–100%	5

GPS coordinates were taken from each sample point. Elevation, slope inclination and exposure were determined from sea level.

Along with the inventory of plant species diversity at the sample points, the share of coverage of each species in the total projected coverage of plants was determined. The percentage coverage scale was used to determine the species coverage. The connection of this scale to the traditional vegetation assessment - Brown-Blanche.

Because in the meadow type habitats in the project area, the area of the sample plot (site) was 5x5 m^2, while in the shrubland and floodplain forest habitats it was 10X10 m^2.

The study covered road corridor received data via GPS (GARMIN Etrex 20) and a broader impact area. 8x42 Binoculars, Discovery WP PCs and Canon 550D + 70-300 cameras were used to identify species over long distances.

The existing biomes were prepared.

- **Mammals**: direct encounters with them, observation of footprints, viewing of excrement, as well as the discovery of dens, hollows and shelters;
- **Reptiles and amphibians**: direct encounters with them and viewing of habitats suitable for them;

- **Invertebrates**: Relatively large (butterflies, beetles, dragonflies, bees-like, locusts, spiders, molluska) invertebrates were recorded visually, while the rest was searched under rocks, logs, and soil cover. It is also necessary to inspect plants and plant debris. In addition, we applied the method of sticking to the tent and mowing with the so-called insect net. The next step was to identify them;
- **Birds:** Species were recorded in sunny and windless weather. Binoculars were used to identify species. Voice identification was also performed;
- **Fish:** The fauna field study was carried out to identify the existed aquatic inhabitants within the surface waters of the project corridor, the samples were obtained from the river. However, it should be noted that the project corridor is intersected by streams, in which the flow of rivers decreasing during the summer and in most cases completely dries up.

Fishing was not identified during the field surveys. The net and fishing-rod were used for collection of the ichthyological material. The findings were recorded and total length, roundfish length, head length, postdorsal distance, eye diameter, number of scales in the lateral line, number of rays in the dorsal and anal fins, etc of the fishes were measured.

5.8 Methods, Approaches and Evaluation Criteria Used to Assess the Environmental Impact

The potential environmental and socioeconomic impacts that may result from project construction and operation, determines whether the potential impacts are likely to be significant. A number of criteria were used to determine whether or not a potential impact of the proposed project could be considered "significant." These are outlined with reference to specific environmental and social issues in this ESIA.

The quantitative and qualitative assessment of expected impacts was undertaken, based on existing information available and experience with other highway projects. The ESIA covers the direct impacts and any indirect, secondary, cumulative, short-term medium-term, and long-term, permanent and temporary, reversible and irreversible, beneficial and adverse impacts of the proposed scheme.

For impacts considered to be significant and for many lesser impacts, the RD will implement a variety of mitigation measures, as discussed in Chapters 7 and 8.

5.9 Methodology for Assessing Social-economic Conditions and Impacts

The social-economic information was collected from the local municipalities, National Statistics Office of Georgia, and secondary data/reports, including census and inventory of assets undertaken in the process of RAP preparation. 100 percent of directly affected households present at the site were covered by the census conducted for the purposes of RAP produced for Section IV-V of the Highway where works will be conducted under TC-GATE. The objective of the social impact assessment was to identify major risks to social and economic conditions in the project area and to assess impacts of construction and operation on those conditions. The impacts can be direct and indirect, intended and unintended, positive and negative.

Social impact assessment involved the following major tasks:

- Identifying types of adverse and beneficial impacts of the road construction and operation on local population;
- Assessing the level of socioeconomic risks in terms of frequency (how likely is it to happen) and consequences;
- Assessing the acceptability of the risks;
- Introducing mitigation measures to reduce risks to acceptable levels.

Social impact assessment addressed the following types of information:

- Enumeration of affected people through the census;

- Profile of local communities (including number of people, gender and age distribution, average household composition, etc.);
- Economic issues, including potential impacts on local markets for goods and services, employment opportunities for construction, operation, and decommissioning phases of the project;
- Estimation of required labour and possible influx, assessment of risks related to labour organization and management health issues, including the risk of transmitted disease to the local population due to labour influx, impacts on health and safety of workers and local communities including risks of the potential increase of Gender-Based Violence (GBV) including SEA/SH;
- Social infrastructure, including the adequacy of health care and education facilities, transport and roads, power supply, freshwater supply to support project activities and personnel as well as the local communities;
- Cultural heritage information, including possible impacts on tangible and intangible cultural heritage, issues associated with sites that have archaeological, historical, religious, cultural, or aesthetic values;
- Social equity, including local social groups who might gain or lose as a result of the project or operation; this includes identification of potentially vulnerable and disadvantaged groups who may be disproportionately and negatively impacted by the project and/or may not be able to benefit in an equitable manner from benefits provided by the project.

In addition, the direct impacts to the private properties and assets impacted by the project and the determination of relevant compensation and rehabilitation measures have been described in the RAPs prepared for the project.

6. Baseline

This Chapter describes the current environmental and social conditions that could be affected by the project. Environmental and social baseline provided information on physical-geographical and administrative location of the project zone, general overview of the project zone, climate and weather, geological and hydrogeological conditions. Describes flora and fauna habitat common to project corridor. Socio-economic conditions introduce and provide a general description of demography, main economic activities and fields of employment and income in the region. Also provides information of important cultural heritage monuments in the region and the role they play in tourism development.

6.1 Physical-Geographical and Administrative Location

The Highway corridor is located on a plain-hilly Iori Plateau, also known as Gare Kakheti Plateau. It is located in the Mtkvari-Alazani inter fluke and is stretched for 170 km from north-west to southeast. The specific physical-geographical features of Iori Plateau are developed from its single elevated-plain, wavy, slightly dissected relief and dry Continental climate with resultant hydrological, soil and geographical and geobotanic conditions. The given territory differs from other parts of Georgia by lack of water, scarce vegetation, and vast degraded areas with lack of fertile soil cover.

Approximately 6 km section of the project road from village Chalaubani to village Bakurtsikhe runs along the territory of Gombori Ridge, which is the watershed of Iori and Alazani Rivers. The ridge is extended from the north towards the southeast. The last very small section of the project corridor can be attributed to the accumulative Alazani Valley, which is formed from Young Quaternary sediments. It is inclined to the southeast.

According to the administrative-territorial division of Georgia, the project corridor belongs to Sagarejo and Gurjaani Municipalities. Sagarejo Municipality is located in the western part of Kakheti. Sagarejo Municipality is bordered by Gardabani Municipality to the west and by Gurjaani Municipality from east,

and Tianeti and Telavi Municipalities from north. The southern border of Sagarejo Municipality borders the Republic of Azerbaijan. The territory of the municipality covers 1553.69 km².

Gurjaani Municipality is bordered by 5 administrative municipalities. It is bordered by Sagarejo Municipality from the west, by Signagi Municipality from the southeast, by Telavi Municipality from the northwest, by Kvareli Municipality from the north and by Lagodekhi Municipality from the east. Gurjaani Municipality is the smallest administrative-territorial unit in Kakheti region covering an area of 846.0 sq.m.

A site location on the physical map of Georgia and project corridor is provided on the **Figure 26.**

Figure 26: Location of the study corridor on the physical map of Georgia



6.2 General overview of the Study Area

The environmental and social research covers approximately 32 km of the Highway between Badiauri to Bakurtsikhe. Section IV mainly run across the smooth terrain and the areas with technogenic load (agricultural plots of field, homestead lands). Section V of the Highway extends from the southwest to the northeast and runs across more complex terrain with a more natural landscape. These territories are not used for agricultural activities by the local population.

The road corridor starts from village Badiauri. The section of the corridor mainly goes through the agricultural land plots. The alignment does not cross significant engineering communications. It should be noted that the secondary ground roads, and third-tier irrigation channels, and low-voltage power transmission lines are located along the alignment (**Figure 27**).

Figure 27: The starting point up to the village Badiauri





Project corridor bypasses village Badiauri. There are several homestead lands under impact along this section. This section mostly crosses agricultural plots. The small part of the described section covers a hilly terrain (**Figure 28**).

Figure 28 : The village Badiauri bypass section





After village Badiauri the project corridor joins the existing road approximately 10 km up to village Kachreti. In the described section, the road expansion goes to the northern (mainly to the agricultural lands), which is essential regarding the low impact on the homesteads and small businesses in village Mzisguli.

Figure 29: Section between villages Badiauri and Kachreti



Next to village Kachreti, the corridor continues across agricultural plots. Approximately 2.3 km section runs in parallel to the existing railway line. The alignment slightly turns southwards and an approximately 2.5 km section crosses the river Lakbe, the existing road, and the railway line. This section will run across the agricultural plots, will cross a small ravine and partially non-cultivated areas. Then, the project corridor will join the existing road and will follow it up to the village Chalaubani (for about a 4,7 km long section). At this point, the corridor will cross the railway once again. It should be noted that the road expansion is planned southwards (mostly at the expense of non-cultivated areas). Therefore, the expected impact on the agricultural plots and homesteads in the northern part of village Chalaubani is very low.

Figure 30: Illegal dump sites near the project corridor



The 22 km long Badiauri-Chalaubani corridor is significantly different from the 9 km long Chalaubani section in the following components:

1. Terrain and geomorphology

Badiauri–Chalaubani (Lot 4): (i) Runs mostly across smooth/flat to gently rolling relief, described as the transitional zone of the Iori Plateau and lower/foothill parts of the Gombori Ridge. (ii) The corridor is largely associated with agricultural landscapes and cultivated lands.

Chalaubani–Bakurtsikhe (Lot 5): (i) Includes an approximately ~ 9 km segment that crosses the Gombori Ridge (watershed of the Iori and Alazani river systems), with more complex terrain. (ii) This ridge segment

is explicitly highlighted as being more sensitive due to geological conditions and biodiversity, and it is also where more “cut” works/waste rock generation are expected compared to other parts.

2) Land use and environmental sensitivity

Badiauri–Chalaubani (Lot 4): Predominantly intensively used agricultural lands (highly anthropogenic habitats), with multiple locations where the corridor relates to existing infrastructure and secondary access routes.

Chalaubani–Bakurtsikhe (Lot 5): The Gombori Ridge part includes forest habitats (notably oak-hornbeam type habitat mentioned as relatively valuable) and is identified as the most sensitive portion botanically and zoologically (even if sensitivity drops again as the alignment reaches more technogenic/agricultural areas near Bakurtsikhe) (**Figure 31**).

3) Access, traffic management, and constructability constraints

Badiauri–Chalaubani (Lot 4): The ESIA notes that because the project largely develops a new corridor and the region has secondary (ground) roads, traffic management is generally not expected to be very difficult along most of the alignment.

Chalaubani–Bakurtsikhe (Lot 5): The ~ 9 km Chalaubani → Bakurtsikhe ridge segment is called out as the exception: few/no secondary roads, and in places the new road coincides with the existing road, meaning traffic can be significantly obstructed during intensive works (with diversion emphasis to the Vaziani–Gombori–Telavi road as an alternative route during works).

Figure 31: Chalaubani Bakurtsikhe section



6.3 Climate and Meteorological Conditions

The climate at Iori Plateau belongs to the dry subtropical and is characterized by non-severe winter and dry, temperate, and hot summer. Generally, the average temperature in January varies from 0 to -2°C and the temperature in July is 23-24°C. Precipitations amount to 499-600 mm per year. Gombori ridge is characterized by a moderately humid climate. Subtropical climate prevails in Alazani plain. It is characterized by hot summers and moderately cold winters. It is quite well protected, from the west and north. The average annual temperature is 11-13 ° C, on January 0, -1 ° C. The warmest month is 21-25 ° C. Precipitation is 700-1000 mm per year, maximum precipitation is in May, minimum - in January.

The detailed climatic characteristics of the project corridor according to the data of the nearest - Sagarejo, Gombori, and Gurjaani meteorological stations (Source: “Construction Climatology”) are provided below **Tables 11-16.**

Table 11: Average monthly and annual air temperatures, t°C

Municipality	Month												Annual	Abs. annual min.	Abs. annual max.
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
Sagarejo	- 0,1	1,1	4,6	10,1	15,4	19,0	22,0	21,8	17,3	12,1	6,3	2,0	11,0	-24	38
Gombori	-2,6	-1,7	1,7	7,1	12,1	15,7	18,3	18,6	14,3	9,6	4,0	-0,1	8,1	-27	35
Gurjaani	0,9	2,5	6,5	11,8	16,8	20,5	23,6	23,6	19,0	13,5	7,6	2,7	12,4	-22	38

Table 12: Extreme air temperatures, t°C

Municipality	Average maximum of the hottest month	The coldest five-day-long period	Mean value of the coldest day	Mean value of the coldest period	Period with average monthly temperature <80C		Average temperature at 1:00 pm	
					Duration, days	Average temperature	In the coldest month	In the hottest month
Sagarejo	27,9	-7	-12	-0,2	151	2,6	2,7	26,0
Gombori	24,7	-12	-16	-2,4	178	1,1	0,8	22,9
Gurjaani	29,8	-8	-4	0,8	133	3,2	3,2	27,9

Table 13: Air humidity %

Municipality	Month												Ave
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Ave
Sagarejo	71	69	69	68	69	66	64	63	70	75	76	72	69
Gombori	75	75	76	72	7	74	75	73	74	79	78	74	75
Gurjaani	76	73	72	72	7	68	65	64	72	78	80	78	72

Municipality	Average relative humidity at 1:00 pm		Average daily amplitude of relative humidity	
	In the coldest month	In the hottest month	In the coldest month	In the hottest month
Sagarejo	61	52	14	23
Gombori	63	62	18	23
Gurjaani	69	51	12	24

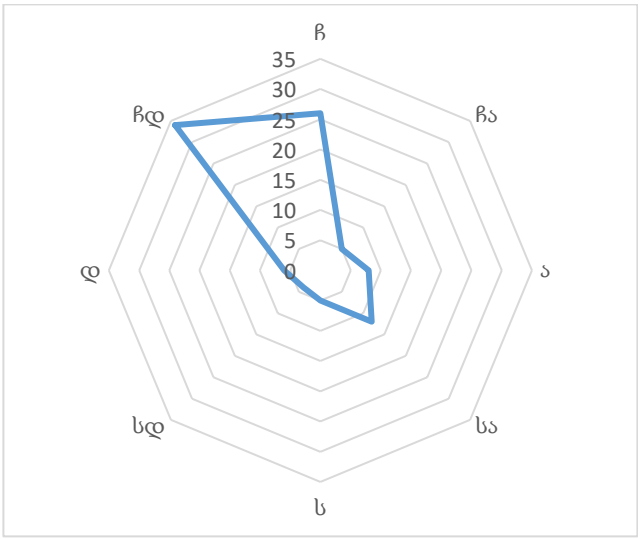
Table 14: Atmospheric precipitations

Municipality	Annual Precipitation	Maximum Daily precipitation	Weight of snow cover	Number of days with a snow cover	Snow cover water content
Sagarejo	761 mm	102 mm	0,50 KPa	41	-
Gombori	807 mm	111 mm	0,62 KPa	74	76 mm
Gurjaani	802 mm	84 mm	0,50 KPa	25	-

Table 15: Wind Characteristics for the OHL Route

Administrative Unit	Wind Velocity, m/sec								
	January		July		Maximum Likely Wind Velocity (m/sec) for Recurrence Time of:				
	Max	Min	Max	Min	1 year	5 years	10 years	15 years	20 years
Sagarejo	4,6/	0.4	2.7	1.2	19	23	25	26	27
Gombori	4.6	0.4	2.7	1.2	18	22	24	24	25
Gurjaani	3.8	0.8	2.7	1.2	16	19	21	22	22

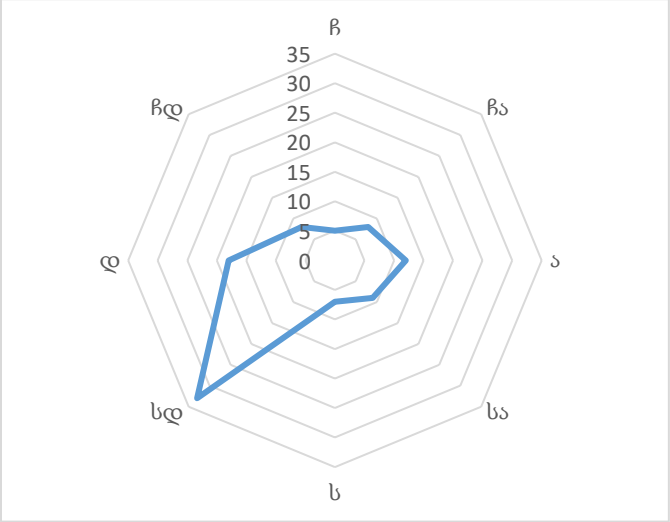
Wind rose, %



Still - 18% Sagarejo



Still - 60% Gombori



Still - 8% Gurjaani

Table 16 : Rated seasonal freezing depth of grounds

Municipality	Argillaceous and loamy (cm)	Fine and dust-like sand clay-sand	Large- and average-coarse gravel & sand	Large-clastic
Sagarejo	7 cm	8	9	10
Gombori	48 cm	58	62	72

As the data above show, the project area has no particular extreme climatic conditions hampering the construction of the highway.

6.4 Baseline Geological Conditions

The baseline study of geological conditions within the potential corridor of the new Motorway (Road) alignment between Tbilisi – Bakurtsikhe included several stages. The initial study includes reviewing the available literature and geological and geotechnical maps (desk study). The geological field studies (including drilling works) along the corridor were conducted during the Feasibility Study.

During the desk study, the existed geological data was collected from various sources (public and private).

Based on the collected, evaluated, and processed geological, hydrogeological, geotechnical, etc. information, a pre-estimation of the geological conditions to the area of the potential corridor of the new Motorway (Road) alignment between Tbilisi and Bakurtsikhe, had been carried out before coming onto the ground. Alternatives of alignments, geological cross sections at various critical areas of special interest such as, areas of potential slope instabilities, areas of high cuts, or high embankments, preliminary foundations of structures etc. and the preparation of an engineering geological report to describe the expected geological conditions of the wider alignments corridor and the engineering geological conditions expected to be encountered along the main alternative solutions and the one to be selected for Detailed design.

The geological study focused mainly on the geological, engineering-geological and geotechnical conditions, geological risks and details of the Sagarejo-Lagodekhi alignment corridor.

6.4.1 Geomorphological Conditions

The project area is located in the south-eastern part of the country within the intermountane low land area. The study area encompasses three river basins, namely the catchments of the river Mtkvari (Kura) at the western, the river Iori in the central part and the Alazani River at the eastern.

The project corridor of the eastern part of Tbilisi-Sagarejo occupies the south-eastern slopes and eastern distribution of the Georgian Belt and is represented by the relief of lowland and hilly-river valleys. According to the geomorphological zones of Georgia, this area belongs to the Iori plateau. The height of the Iori plateau varies from 90-150 m to 1000 m. The terrain is composed of long, north-western to south-eastern, anticline and monoclinic hilly ridges composed of Miocene, Middle, and Lower Pliocene Rocks and their dividing plains, formed by continental sediments formed by syncline basins. The relief is plain-hilly.

The relief corridor is presented in medium and soft forms with slopes of 10-35 ° and 360-1,000 marks of absolute height. The road corridor cuts a series of hills that run from the Georgian Belt to the southern part of the country.

The project area is partly on hilly terrain, with sloping slopes steeply sloping. The territory is characterized by flattened forms where rock masses are fixed to the ground surface. The relief slopes and regulated areas are found where old river terraces (connected to old river markings) have developed in the past or where ancient, old and active landslide activity has taken place. The population are involved in agricultural activities (mainly cultivated vineyards). The trees are helping to maintain the stability of the land and prevents the further development of large-scale landslides.

The typical morphology of the project highway corridor section from Sagarejo to Chalaubani is generally even and hilly slopes. The corridor is dissected with small gullies and has diversified terrain from Chalaubani to Bakurtsikhe runs across Chalaubani gorge. The final section (a small part) moves to Alazani River accumulation valley.

6.4.2 Geology

The Iori plateau is composed of weakly folded Cenozoic sandstones, conglomerates, clays, and limestones. The large part of the plateau is a system of ejaculate folds, developed based on Neogene formations, and only its north-western corner, bordered by the Tbilisi basin and the Ujar-Sartichala section of the Iori gorge, is Paleogene. Extensive syncline ponds, such as the Great Shirak, Naomar, and others, are filled with Quaternary continental sediments — clays and rocks. The Gombori Range is composed mainly of Cretaceous and Tertiary sediments, while the Alazani Plain is composed of young Quaternary sediments.

The oldest geological formation is the Middle Eocene sedimentary rocks, which are fixed to the west of the highway corridor. The western part of the corridor to the central and eastern zones of the road, the Upper Eocene, Oligocene, and Neogene sagging rock formations are found, mainly represented by marls, sandstones, shales, and conglomerates, and numerous olistostromes. The descriptions of the old and new stratigraphic compilation of the

Sagan rock are as follows:

(i) Middle Eocene sedimentary rock formations are mainly distributed west of the highway corridor (and with a more limited distribution in the valley near Bakurtsikhe) and represented by conglomerates, loose limestones, limestones, sandstones, marls, and clays;

(ii) Upper Eocene sedimentary rock formations cover the previous formations west of the highway corridor and are represented by fine-grained conglomerates, coarse-grained sands, olistomers, loose limestones, limestones, coal, and clay;

(iii) In the western and central parts of the motorway corridor, represented by fine-grained sediments such as foraminiferal marls, clays, sandstones, conglomerates, and conglomerate breccias by a group of Upper Eocene and Oligocene formations found;

(iv) A group of Oligocene and Lower Miocene (Maykop series) formations in the central part of the section and represented by carbon clays (Khadumi horizon), gypsum-containing marls with a thin layer of yarosites, quartz-karst sandstones;

(v) Middle Miocene marine molasses formations in the central part of the corridor, represented by clays, sandstones, conglomerates (sometimes basal conglomerates), marls, olithic, and lose limestones;

(vi) The central part of the corridor, represented by clays, sandstones, conglomerates, marls, and limestones by Lower and middle Sarmatian-marine molasses;

(vii) The central part of the corridor, represented by sandstones, clays, conglomerates, and sometimes marls by Upper Sarmatian-marine and continental molasses;

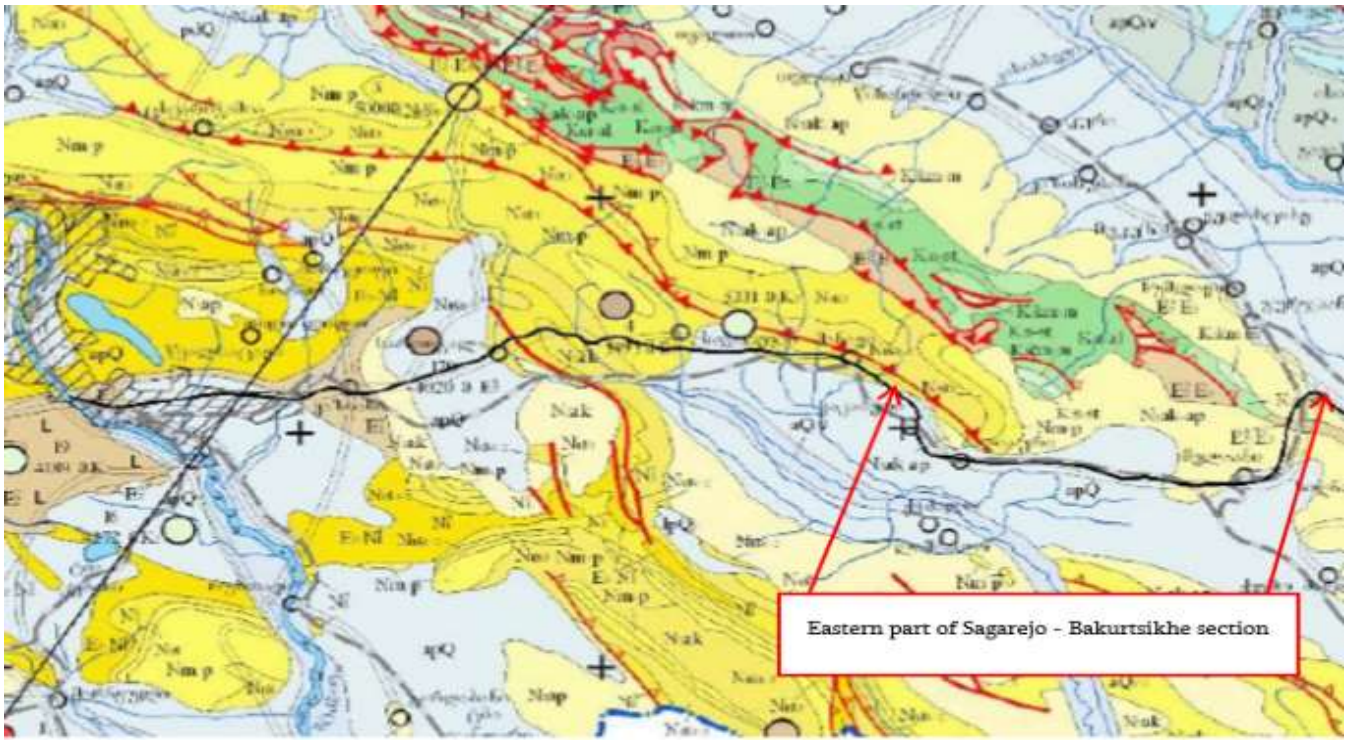
(viii) The eastern part of the corridor, represented by conglomerates, sandstones, and clays by Meotian and Pontic marine and continental molasses;

(ix) Caspian Sea Achaemenid Tier, marine and continental molasses, located locally in the western, central, and eastern part of the corridor, represented by conglomerates, sandstones, sands, and clays with volcanic ash inclusions;

(x) The eastern part of the corridor, represented by sands, loams, clays, and sandstones by the Caspian and Aspheron tier of the Caspian Sea, marine and continental molasses.

The surface reveals the overlying formations of modern Quaternary sediments, represented by alluvial, alluvial-proluvial, alluvial, and colluvial-fractured and coarse-grained with ancient and old landslide formations, boulders, gravel, sands, conglomerates, upper conglomerates, Proluvial sediments, eluvial formations (coarse-grained gravel, sands, loamy clays, gravel).

Figure 32: A part of the geological map showing the project corridor, scale: 1:500,000

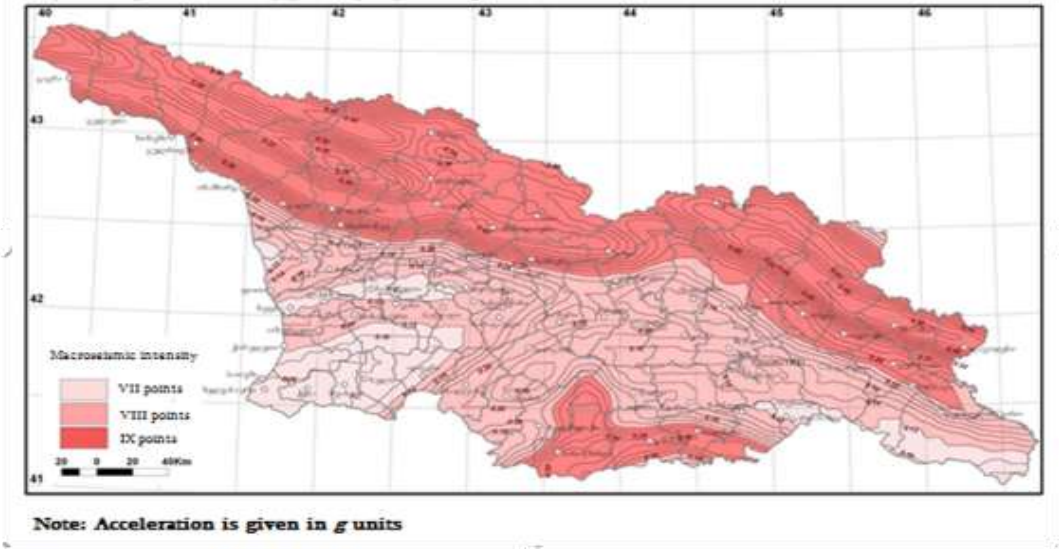


N₂ak-ap	The **Aghchagil and Aspheron stages of the Caspian** Sea province, continental and marine molasses, made up of sands, loams, clays and sandstones.
N₂ak	The **Aghchagil stage of the Caspian Sea province**, marine and continental molasses, made up of, conglomerates, sandstones, sands, clays with volcanic ash intercalations.
Nm-p	The **Meotian and Pontian** marine and continental molasses, made up of, conglomerates, sandstones and clays
N₁s₃	The **Upper Sarmatian** marine and continental molasses, made up of, sandstones, clays, conglomerates and sometimes marls.
N₁s₁-₂	The **Lower and Middle Sarmatian** marine molasses occurring at the central part of the corridor, made up of, clays, sandstones, conglomerates, marls and limestones.
N₁²	The **Middle Miocene** marine molasses formations, made up of, clays, sandstones, conglomerates (sometimes basal conglomerates), marls, oolitic and arenaceous limestones.
E₃-N₁	The **Oligocene and Lower Miocene** (Maicop Series) formations group, is made up of, carbonaceous clays (Khadum horizon), gypsiferous marls with thin coating of jarosite, intercalations of quartz-micaceous sandstones.
E₂³-E₃	The **Upper Eocene and Oligocene** (Matsesta) formations, is characterized by the presence of, shallow water deposits like, foraminiferal marls, clays, sandstones, conglomerates and conglomerate breccias.
E₂³	The **Upper Eocene** sedimentary rock formations, made of shallow marine conglomerates, gritstones, olistostromes, arenaceous limestones, carbonaceous and clay sandstones.
E₂²	The **Middle Eocene** sedimentary represented by conglomerates, arenaceous limestones, limestones, sandstones, marls and clays.
	Reversed faults and upthrusts/overthrusts
	Normal faults and faults of unstated nature

6.4.3 Tectonics and Seismicity

According to the seismic zoning of Georgia (Decree №1-1/2284 of the Minister of Economic Development of Georgia of October 7, 2009, Tbilisi "On approving Building Norms and Rules "Earthquake-Resistant Building" (PN 01.01.09), the country is divided into 3 zones with different seismic activities (zones 7-9, with increasing seismicity) the project corridor is within zone 8 and the design earthquake magnitude should be considered to be M=8 (See the Map of Seismic Hazards). Dimensionless coefficient of seismicity (A) is 0,17 on average.

Figure 33: Map of seismic hazards in maximum horizontal acceleration and points

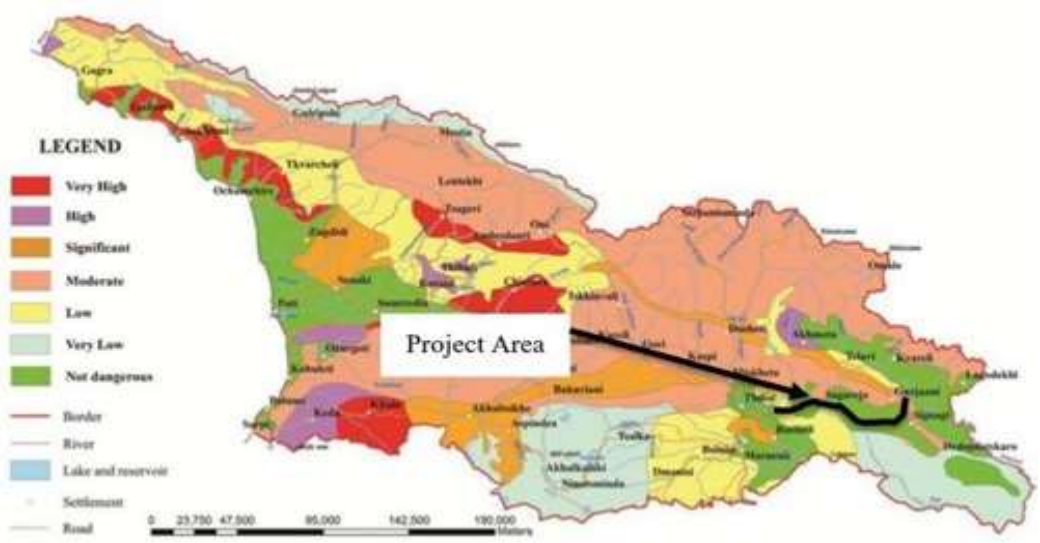


6.4.4 General Hazardous Geodynamic Processes

According to the study on the of landslide risks in Georgia been carried out by Gaprindashvili et al. (2014), on the Figure 6.3.2.6.1 below the landslides risks project zone are provided on the landslides' hazards zoning map of Georgia. According to that map, the project road corridor is located in the primarily "not dangerous" (green colour) and only locally in the "low" (Yellow colour) to "moderate" (pink colour) landslide risks area. That means, the landslides are not characteristic or occur very rarely along the project corridor.

However, along some sections of the project corridor, characterized with weak soils, the artificial interference (mainly slope treatment and building the roadbed) and non-compliance with geotechnical recommendations may lead to the activation of the processes, which are stabilized at present.

Figure 34: Zoning map of Georgia according to the risk of landslides



6.5 Soils

The landscape of Iori Plateau varies from semi-deserts to steppes and forest steppes. The soil cover is quite diversified and is presented by black-brown soils and steppe chernozems, transient forest-steppe and after-forest soils (brown, etc.), as well as salt-solonez soils. Black soil formation is a dominant form as a result of deforestation; at places where the forest survived for a long time, the chernozems are not yet developed thoroughly. A part of the project corridor coincides with agricultural lands and consequently, along this section, there is a quite strong soil cover. Along the sections of the highway running near the surface waters, alluvial soils also present.

The main pollution of soils is weather and contamination with different substances related to the improper use of organic and inorganic fertilizers, destruction of field protection and wind-belts and unproper operation of irrigation systems, wind, and water erosion.

Within the limits of the project corridor, the brown soils are common in the intensive agriculture lands (particularly from the starting point to village Chalaubani). Brown forest soil is formed in the foothills and lower slopes of Gombori Ridge. Turf-carbonate intensely skeletal soils are formed in the corridor of the last section. The soils along the project corridor are intensely cultivated.

6.6. Hydrology

6.6.1 General

The project corridor crosses many surface water bodies, including rivers and dry ravines. The Upper Samgori irrigation system with the irrigation pipes and channels are watering the summertime.

The highway alignment crosses the following rivers: Chailuri, Lakbe and, Chalaubniskhevi. The River Calauniskhevi flows the highway corridor approximately 6km, Gombori Ridge, and crosses the alignment of several locations.

The water beds of the gullies appear only during the showers and snow melting.

6.6.2 River Chailuri

River Chailuri heads on the south-eastern slope of Gombori Ridge, at 1435 m asl. It flows into the Iori River from its left side. The basin area is 167 km², and the length is 29,6 km. The rain, snow, and underground waters fed the river. Flooding is frequent during the spring period. The local population of the villages Didi Chailuri and Burdiani use the river Chailuri for irrigation.

6.6.3 River Lakbe

River Lakbe is also important in Gurjaani municipality, which is the left tributary of river Iori. Lakbe starts at Gombori valley. Length – 32 km. It is fed by snow, rain, and groundwater. Flooding is frequent during the spring period. The main tributaries are Kartakhevi, Jimitistskali (right side), Mkrali Ole (left side).

Lakbe (Lakbi) Reservoir - is located in Gurjaani Municipality near the village of Arashenda and is created by the damming of the river Lakbe.

The uniqueness of the Pkhoveli forest area near the village of Arashenda determines by the presence of naturally flowing acidic waters and mineral-rich mud here, which has healing properties. The territory is part of the Gombori Highlands.

The construction of the reservoir started in the 80s of the last century for reclamation. The water reservoir supposed to supply the Shirak Valley with irrigation water, which was not completed and now it is presented as a natural lake. Its maximum depth is 22 meters.

6.6.4 Chalaubniskhevi River

Chalaubniskhevi River represents the tributary of the Alazani River and flows from the top hill on the East of the village Chalaubani, at the altitude of 1.030 m asl and runs along a narrow valley down to Bakurtsikhe. The river length up to Bakurtsikhe is approximately 11.5 km, its total fall is 540 m, and its mean gradient is 4.6%. The river feds with rain and groundwaters. It characterizes by spring floods, autumn freshets, unstable summer, and stable winter low-water periods.

As the river gets close to village Bakurtsikhe, its gorge enters the alluvial plain of the main river of East Georgia, the River Alazani.

Table 17: Cumulative areas of the sub-basins of the Chalaubniskhevi River

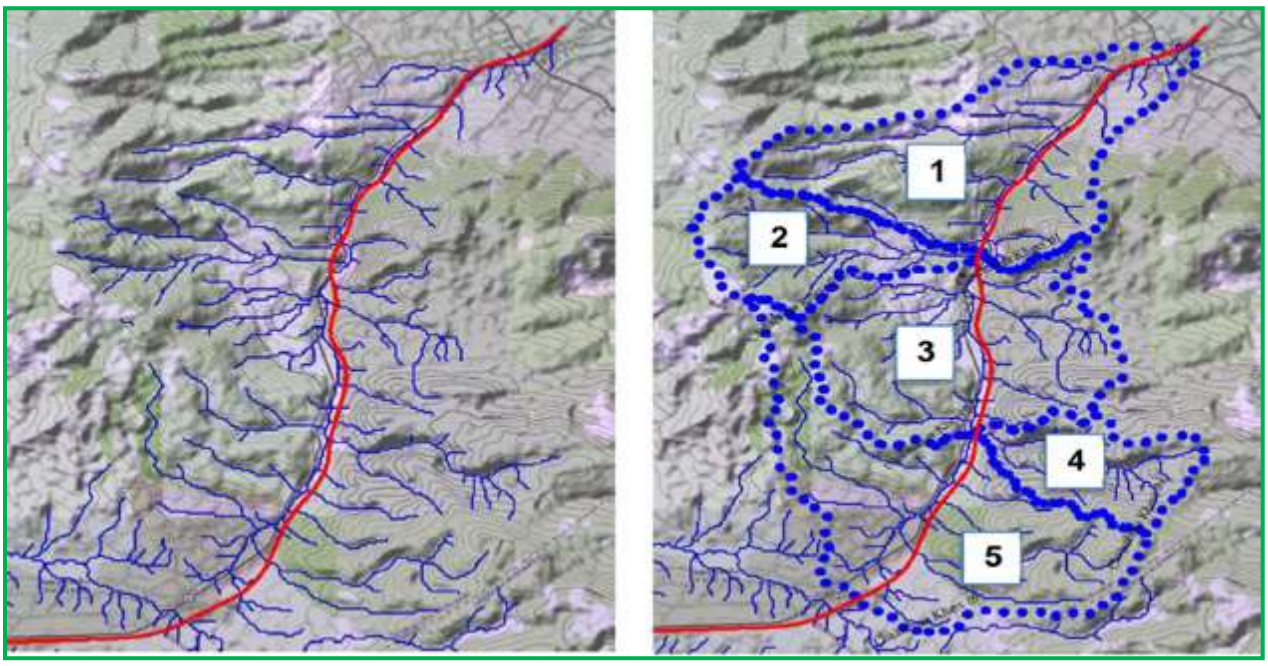
River	Sub-basin	Cumulative area (km^2)	Design flow (peak discharge) (100 years - m^3/sec)
Chalaubniskhevi	Sub-basin 5	7,2	36,51
Chalaubniskhevi	Sub-basin 5+4	9,3	63,99
Chalaubniskhevi	Sub-basin 5+4+3	15,5	68,10
Chalaubniskhevi	Sub-basin 5+4+3+2	18,2	80,20

Chalaubniskhevi	Sub-basin 5+4+3+2+1	24,8	84,69

Figure 35: Boundaries of the water catch basins of the principal intersecting watercourses along Badiauri-Chalaubani section



Figure 36 : Boundaries of the water catch basins of the principal intersecting watercourses along Chalaubani- Bakurtsikhe section



6.6.5 Peak Discharges of Water and Mudflow Current

The rivers and nameless gullies crossing the project corridor are not studied hydrologically. Therefore, the values of their water peak discharges in the project sections are identified by the method given in the Technical Reference to Calculate the Peak Discharges of the Rivers in the Caucasus (**Table 18**).

Table 18: Water peak discharges of the rivers and gorges crossing the project corridor, m3/sec

Name and number of the river/ gorge	Peak discharges m3/sec				
	$\tau =$ 200 years	$\tau =$ 100 years	$\tau =$ 50 years	$\tau =$ 20years	$\tau =$ 10years
Dry gully #42	6.30	5.25	4.04	2.85	2.19
Chailuri River #43	162	135	104	73.2	56.3
Dry gully #44	44.2	36.8	28.3	20.0	15.4
Nameless gully #45	84.2	70.2	54.0	38.1	29.3
Dry gully #46	107	89.2	69.6	48.4	37.2
Nameless gully #47	21.0	17.5	13.5	9.50	7.30
Dry gully #48	9.72	8.10	6.23	4.40	3.38
Dry gully #49	7.52	6.27	4.82	3.40	2.62
Dry gully #50	25.7	21.4	16.5	11.6	8.93
Dry gully #51	50.4	42.0	32.3	22.8	17.5
Dry gully #52	48.0	40.0	30.7	21.7	16.7
Dry gully #53	12.4	10.3	7.92	5.59	4.30
Dry gully #54	27.5	22.9	17.6	12.4	9.56
Dry gully #55	10.1	8.44	6.49	4.58	3.52
Dry gully #56	8.54	7.12	5.47	3.86	2.97
Dry gully #57	11.8	9.82	7.55	5.33	4.10
Dry gully #58	14.3	11.9	9.15	6.46	4.97
Dry gully #59	79.3	66.1	50.8	35.9	27.6
Dry gully #60	10.5	8.77	6.74	4.76	3.66
Dry gully #61	12.7	10.6	8.15	5.75	4.42
Nameless gully #62	4.96	4.13	3.17	2.24	1.72
Dry gully #63	19.7	16.4	12.6	8.90	6.84
Dry gully #64	66.4	55.3	42.5	30.0	23.1
Dry gully #65	63.0	52.5	40.4	28.5	21.9
Dry gully #66	22.7	18.9	14.5	10.3	7.89
Karoli gully #67	92.5	77.1	59.3	41.8	32.2
Nameless gully #68	48.7	40.6	31.2	22.0	16.9
Jimitis Khevi #69	70.9	59.1	45.4	32.1	24.7
Dry gully #70	25.2	21.0	16.1	11.4	8.76
Arashendas Khevi #71	62.2	51.8	39.8	28.1	21.6

Tsru Khevi #72	52.0	43.3	33.3	23.5	18.1
Dry gully #73	18.2	15.2	11.7	8.25	6.34
Dry gully #74	30.8	25.7	19.8	13.9	10.7
River Lakbe #75	146	122	93.8	66.2	50.9
Dry gully #76	5.95	4.96	3.81	2.69	2.07
Dry gully #77	22.7	18.9	14.5	10.2	7.89
Dry gully #78	6.54	5.45	4.19	2.96	2.27
Dry gully #79	9.02	7.52	5.78	4.08	3.14
Dry gully #80	25.2	21.0	16.1	11.4	8.76
Dry gully #81	3.70	3.08	2.37	1.67	1.29
Dry gully #82	7.79	6.49	4.99	3.52	2.71
Dry gully #83	17.5	14.6	11.2	7.92	6.09
Dry gully #84	7.32	6.10	4.69	3.31	2.55
Dry gully #85	31.2	26.0	20.0	14.1	10.8
Dry gully #86	10.9	9.08	6.98	4.93	3.79
Dry gully #87	8.18	6.82	5.24	3.70	2.85
Dry gully #88	3.47	2.89	2.22	1.57	1.21
Dry gully #89	2.81	2.34	1.80	1.27	0.98
Chalaubnis Khevi #90 5+4+3+2+1	125	84.7	79.9	56.4	43.4

The design water conductivity of the structures crossing the water bodies within the highway is in line with the data given in the table.

Peak discharges of mudflow current:

The Chailuri (# 43) intersecting the project corridor originates on the southern slope of the Tsiv-Gombori ridge. The river basin has intense manifestations of gravitational processes (rockfall, landslides, etc.) and the accumulation of large volumes of solid material at the bottom of the valley. When it floods, the streams are filled intensively with solid material, which has high importance on the longitudinal slopes of the bed, and a two-phase stream or flood forms. The limit volume of solid sediment in similar flows (volumetric concentration).

Table 19: Peak discharges of mudflow current of River Chailuri, m3/sec

Name and number of rivers	year	Minimum water discharge	Water peak discharge	Mudflow peak discharge
Chailuri River #43	200	0.5	162	195
	100	1	135	163
	50	2	104	125
	20	5	73.2	88.2

	10	10	56.3	67.8

The peak discharge values of mudflow currents given in Table above are taken as design values at the crossing points with the project highway.

6.6.6 River Calaubniskhevi in Bakurtsikhe

In hydrological respect, the most sensitive area of the entire project is the road section, which crosses the densely populated territory of village Bakurtsikhe and at the same time. The risks are seen in the possible reduction of the area of the river water-conducting section following the construction of the project highway, which, in terms of peak discharges, may damage the buildings, premises, and highway structures located at the riverside. By considering this, the project organization accomplished hydraulic modelling means the relevant software.

Approaching the village of Bakurtsikhe, the valley of the Chalaubniskhevi river meets the alluvial plain of the Alazani River, the most important river of the eastern part of Georgia. Right at the outlet of the narrow gorge lies the village of Bakurtsikhe. The urban area has been developed along the riverbanks, and the existing road runs close to the riverbed. In some locations, the river is partially encumbered with constructions and embankments. Riverbank protection walls exist on roads for erosion and flooding.

Figure 37 : River Chalaubniskhevi in village Bakurtsikhe and the existing road



The section of the project envisages widening the existing road through additional carriageways, junctions, and secondary roads. The corridor of the new highway is wider than the existing road. Specific hydraulic modelling was performed to assess the impact on the houses and buildings in some sections and test the interactions between the river and the new corridor.

Figure 38: The locations of the project highway and the riverbed



The hydraulic modelling follows this workflow:

The river flow was calculated for 100 years: 84,7 m3/s.

The topographical survey performed for the road design has been used to produce a detailed Digital Terrain Model.

A specific software such as the HECRAS River Analysis (developed by the US Army Corps of Engineers - Hydrologic Engineering Center) computed the depth of the water flow and the flooded areas (steady flow, one-dimensional simulation). This software is considered an international reference for hydraulic calculations.

The existing location model was integrated with the new highway and secondary roads;

The modelling takes into account the new geometric parameters of the location after construction. The calculation scheme is the same as for the hydraulic modelling of the existing condition, although the calculation sections provide for a new configuration, including erosion counter measures;

The river depth and wet perimeter were compared to assess the impact of construction on the river and its surroundings.

The hydraulic model takes into account 20 cross-sections along an approximate length of 3 km.

Figure 39: Locations of cross sections assessed during the hydraulic modelling

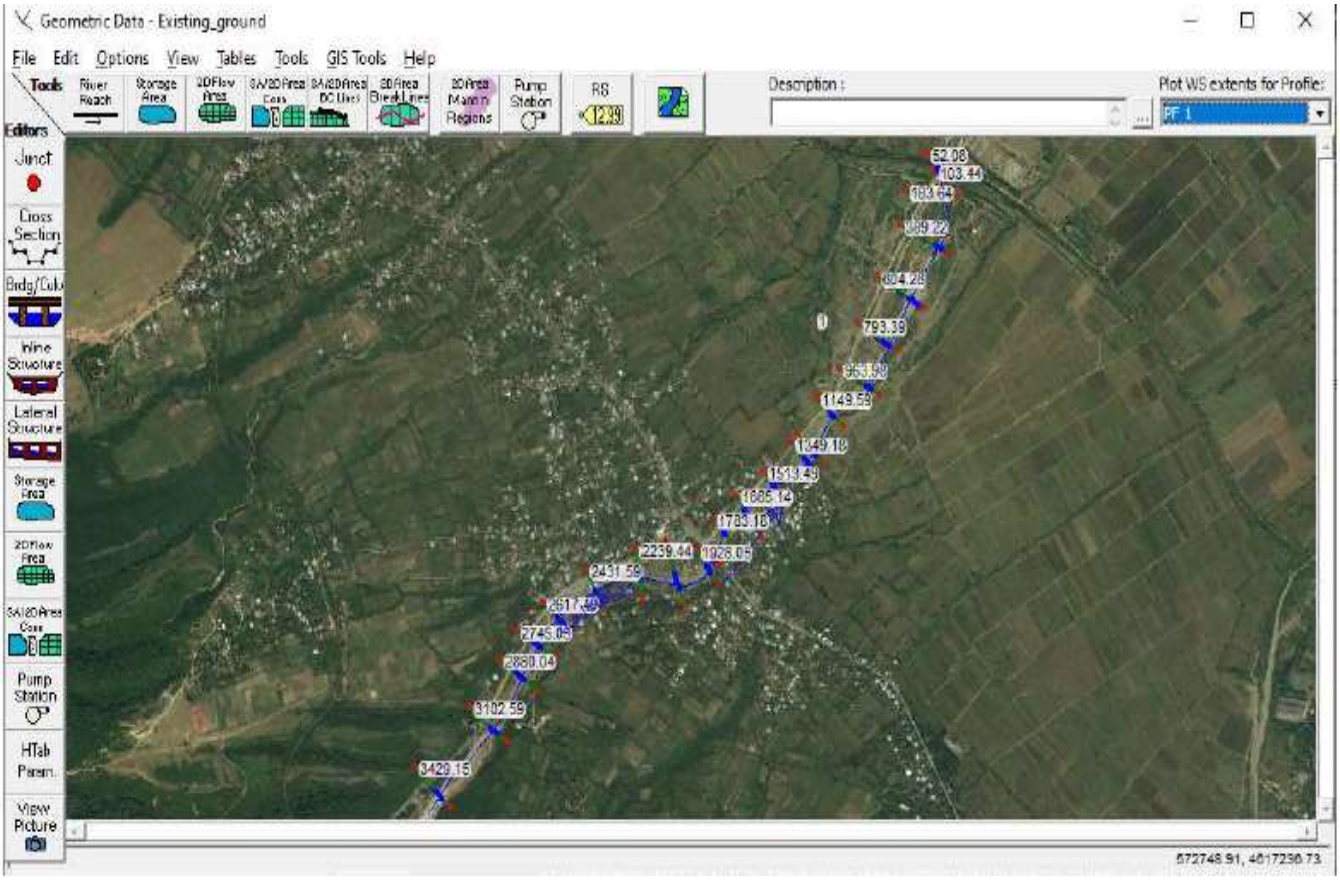


Figure 40 : Boundaries of the flooding zone in terms of design peak discharge



6.7 Biological Environment

Biological research was conducted in the designed S5 corridor (from village of Tokhliauri to village of Bakurtsikhe) in accordance with World Bank's ESS6. The biological research included three main components:

Determine the types and sensitivities of the habitats represented in the project corridor, as well as the floristic composition of these habitats. This component of the research also includes a detailed and volumetric assessment of directly affected trees in the project corridor;

Study of the faunal environment and assessment of their habitats;

Study and evaluation of nationally and internationally designated protected areas.

The initial biodiversity studies were conducted in several stages, including scoping and EIA. Furthermore, additional study was carried out under the present ESIA (December 2025). The following specialists took part in the research process:

- Botanist
- Zoologist
- Ichthyologist
- Forester

The research process focused on sensitive species and habitats. Based on the information presented in this document, the impact caused by the construction-operation of the road on the project area and the surrounding habitats / species was assessed

6.7.1 Flora

General description of the vegetation

Thorny scrub valleys with forest elements occupy large territories of the project area. As a result of the agricultural activities, the natural vegetation is quite modified. The lands suitable for agriculture are cleared off forests having led to the disappearance of the forest cover. Major part of the area is covered with vineyards, cornfields, and pastures. At locations not developed for agricultural purposes, there naturally grown aspen (Populus hybrida) trees and low-productive forest elements, such as: Elm tree Ulmus campestris, mulberry (Morus alba), European crab apple (Malus communis), European pear (Pyrus communis), Hawthorn (Crataegus kyrtostyla), Damson (Prunus divaricata), blackthorn (Prunus

spinosa), Christ's thorn (Paliurus spina christi). Such cenoses usually develop on the sites of cut-down forests and are the remnants or derivatives of such forests. The territories in front of Gombori Ridge are covered with sea-buckthorn, hornbeam, hawthorn, dogrose, buckthorn, etc.

Astragalus (Astragalus microcephalus), caper (Capparis spinosa) and wormwood (Artemizia lerchina) are covering the slopes.

There is swamp vegetation at some points, which are mainly presented by Cattail (Typha latifolia, T. laxmannii) and reed (Arundo donax). The area of Gombori Ridge is covered with coniferous and mixed forest (**Figure 41**).

Figure 41: Photos of the project area



Summary of biological environment survey results

Natural vegetation within Sagarejo-Bakurtsikhe road section area is heavily altered due to agricultural activities. Plains favourable for agricultural lands are cleaned up from forests, which led to a disappearance of the forest cover. Major part of the area is covered by vineyards, cornfields, pastures, Bluestem (Bothriochloa ischaemum), Oriental hornbeam (Carpinus orientalis).

The project corridor partly follows the railway, after the village Manavi. The plantings of Black locust (Robinia pseudoacacia), tree of heaven Ailanthus altissima and Common walnut (Juglans regia) (with VU status on the Red List of Georgia) are used as windshields. The road section crosses the agricultural land plots from the village Badiauri to the village Chalaubani.

Figure 42: The windshields covered by the Black Locust (Robinia pseudoacacia)



At approximate coordinates: X-547673; Y-4610424 project corridor intersects Road S5 and continues adjacent to the existing motorway.

At approximate coordinates: X-561912; Y-4608705 project corridor crosses the river Lakbe, which is mainly presented in the form of a dry ravine.

The project road crosses the River Lakbe, which mainly is dry gully. The following species grow along the bank of the river: Elm tree (Ulmus glabra), Gaiter-tree (Swida australis), Paliurus spina-christi, Rubus sp., Salix wilhelmsiana, Populus canescens, Tamarix ramosissima, Cotinus coggygria, Humulus lupulus, Lonicera steveniana, etc.

The most sensitive is Gombori Ridge (along the River Chalaubani) and its surroundings. The project road crosses fragmented forest at X-566759; Y-4608635, which is mainly covered by oak-hornbeam stands. As per the EUNIS Land Habitat Classification, the given habitat is classified as G1.A1 (Quercus - Fraxinus - Carpinus betulus woodland on eutrophic and mesotrophic soils).

Description: Atlantic, mid-European and eastern European forests dominated by Quercus robur or Quercus petraea, on eutrophic or mesotrophic soils, with usually ample and species-rich herb and shrub layers. Carpinus betulus is generally present. The forest restoration process takes a favourable course along the given section: there are about 15 suckers on a 5x5 m plot.

Phytocenoses: Carpinion betuli

Species: Carpinus betulus, Quercus robur=Quercus imeretina, Q. petraea, Juniperus foetidissima, J. excelsa, Cotinus coggygria.

G1.A, Acer campestre, Sorbus torminalis, Ligustrum vulgare, Cornus mas, Rhamnus catharticus, Viola mirabilis, V. alba, V. suavis, Polygonatum multiflorum, Pulmonaria mollis ssp. mollis = P. molissima, Convallaria majalis = C. transcaucasica, Festuca heterophylla, Melica uniflora, Poa nemoralis.

G1.A1A: Epimedium alpinum = E. colchicum, Erythronium dens-canis = E. caucasicum.

G1.A1B: Gagea lutea, Erythronium dens-canis = E. caucasicum, Adoxa moschatellina, Anemone ranunculoides.

G1.A1C: Pyrus mollis = P. caucasica, Lonicera caprifolium, Cotinus coggygria, Stellaria holostea, Carex pilosa, Festuca heterophylla.

Relevant class other classification systems: European forest types 6.5 Mesophytic deciduous forests (except 6.5.8: ravines and slopes). Milieux naturels de Suisse 2008 6.3.3 Carpinion.

Figure 43: A fragment of the oak-hornbeam forest



Figure 44: The forest fragment with evident forest restoration



The corridor continues in a forest habitat for about 1.5-2.0 km and hen runs across the habitat with agricultural plots. Then, starts the Gombori Ridge section from village Chalaubani to village Bakrtsikhe.

The Highway corridor crosses forest near Barjiskhevi gully, which remains predominantly dry throughout the year. This location falls in Section IV of the Highwahy.

The forest is covered with the following species: Lime (Tilia caucasica), Hornbeam (Carpinus betulus), Oriental hornbeam (Carpinus caucasica), Elm tree (Ulmus glabra), Gaiter-tree (Swida australis), European cornel (Cornus mas), Comon walnut (Juglans regia), Nut (Corylus avellana), willow (Salix alba), along the road black locust (Robinia pseudoacacia) and black poplar (Populus italica).

This forest habitat according to the EUNIS terrestrial habitat classification is G1.A1 Quercus - Fraxinus - Carpinus betulus forest on eutrophic and mesotrophic soils.

Many food outlets are located near the Barjiskhevi gully in Section IV of the Highway, which has a negative impact on the nearby Chalaubani River gorge. Numerous dumpsites are arranged in the ravine (**Figure 45**).

Figure 45 : Illegal dumpsite in Chalaubn River gorge



After passing the forested area, the Highway corridor extends to a final point of approximately 3.0 km within the settlement and anthropogenic landscape, the floristic composition of which is approximately similar to that described above.

In total, 24 sample plots (reference sites) were studied in the project corridor. Their layout is shown on the map. Tables with the description of each sample plot are provided in Annex 1.

Figure 46: Location of the studied reference sites in the project corridor

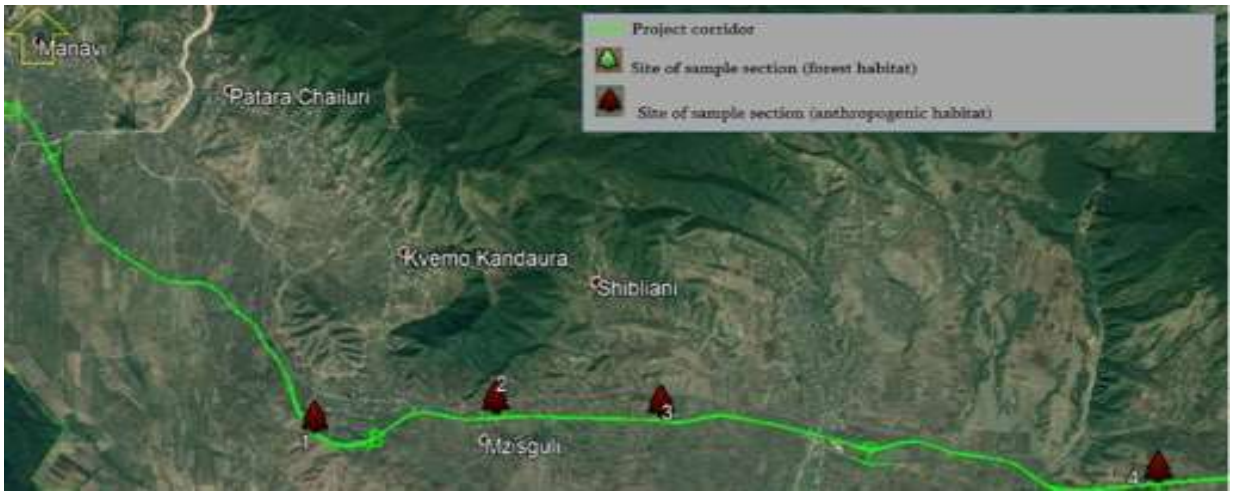


Figure 47 : Location of the studied reference sites in the project corridor (continued)



Reference sites No. 2 through 8 are located in Section IV (Badiauri to Chalaubani)

Reference sites No. 8 through 24 are located in Section V (Chalaubani to Bakurtsikhe)

Part of Section IV is also under heavy anthropogenic impact (sites No. 2, No. 3, and No. 4) however, reference sites No. 5, No. 6, No. 7, and No. 8 carry natural oak-hornbeam forest.

Section V is the most diverse in terms of vegetative cover. It includes natural habitat represented by oak-hornbeam forest (sites No. 9, No. 15, and No 17) as well as hornbeam-oriental hornbeam, hornbeam, and oak forests, forests and meadows transformed under heavy anthropogenic impact, and human settlements.

Description of timber resources available in the project area

Parts of the project impact area, mostly around Gombori Ridge (section V) are covered by forested lands managed by LEPL Kakheti Forest Service of the National Forest Agency. These forests offal within the jurisdiction of the Gurjaani Forest District (forest management unit).

During survey, all specimen of tree species with a diameter of 8 cm and more were subject to inventory. Timer volume was calculated by species. In addition, all shrub species and trees with diameters of less than 8 cm were recorded as non-timber vegetation.

The table below summarizes timber and non-timber vegetation within the RoW, indicating the number of recorded specimen and timber volumes.

Table 20: Description of the trees and plants identified during the botanical survey

№	Species		Qty, pcs.	Volume, cub. m.
	English	Latin		
	Caspian locust	Gleditsia caspia	1	0.14
	Acacia	Acacia dealbata	667	41.1
	Georgian oak	Quercus iberica	6,090	2,319.779
	Hornbeam	Carpinus caucasica	5,369	813.384
	Oriental hornbeam	Carpinus orientalis	12,184	759.913
	Hawthorn	Crataegus microphylla	507	46.134
	Damson	Prunus insititia	4	0.143
	Field maple	Acer campestre	1,900	472.494

	Ash tree	Fraxinus excelsior	655	253.715
	European crab apple	Malus sylvestris	1	0.484
	European pear	Pyrus communis	1	0.088
	Beech	Fagus orientalis	850	167.123
	Wild Cherry	Cerasus avium	5	0.616
	Lime	Tilia caucasica	5	3.762
	Elm tree	Ulmus foliacea	2	0.187
Total			28241	4,879.062
	Hawthorn	Crataegus microphylla	6,241	0.12
	European cornel	Cornus mas	9,712	0.11
	Acacia	Acacia dealbata	8,667	0.18
	Blackberry	Rubus fruticosus	1,980	0.01
	Dogrose	Rosa chinensis	350	0.01
	Catbriers	Smilax excelsa	11,658	0.02
	Oriental hornbeam	Carpinus orientalis	29,649	0.51
	Ash tree	Fraxinus excelsior	1,152	0.11
	Field maple	Acer campestre	21,665	0.26
	Georgian oak	Quercus iberica	17,487	0.31
	Beech	Fagus orientalis	463	0.11
	Wild service tree		471	0.05
	Hornbeam	Carpinus caucasica	4,975	0.12
	Gaiter-tree	Swida, Thelycrania	3,758	0.09
	Nut	Corylus avellana	3,426	0.21
	Medlar	Messpilus germanica	1,737	0.06
	Lime	Tilia caucasica	491	0.08
	Wild Cherry	Cerasus avium	323	0.078
			124,205	2.438

6.7.2 Fauna

The corridor of the project road starts form nearby territory of the village Tokhliauri. A large part of the study area (from the starting point to the village of Chalaubani) runs along the agricultural lands and pastures. Consequently, there is already a strong anthropogenic impact on the species living here. This part of the study corridor, which runs along the Iori plateau, is characterized by small rivers, most of which dry up completely during the summer.

In the last section of the project area (within the Gombori ridge - from the village Chalaubani to the village Bakurtsikhe) we meet forest areas. This area is the most sensitive both from a zoological and botanical point of view, as here we find forest habitats. The last section again runs to high-quality technogenic areas, namely in the village Bakurtsikhe populated area and on agricultural lands. This section is also much less valuable from a zoological point of view.

Field surveys in the design corridor of the new road were conducted in June 2020, May 2021, and December of the same year. The research methods were selected based on the specifics of the project area relief and target species. We paid special attention to rare and endangered species, which are included in the "list of globally endangered species" and the Red List of Georgia.

Results of field research and literary analysis (mammals)

Large mammals

The project area is anthropogenically loaded and as literature and field research have shown it is not an important habitat for large mammals, however we have listed species (table) which may also be accidentally identified in the project area or in its vicinity.

Table 21: According to literary sources, the following species of mammal may be in the project impact zone

№	English name	Scientific name	Common name	IUCN	RLG	Bern II	Bern III
	Otter	Lutra lutra	Common Otter	NT	LC	✓	
	Roe deer	Capreolus capreolus	Roe deer	LC	VU		✓
	Bear	Ursus arctos	Brown Bear	LC	NT	✓	
	Jackal	Canis aureus	Golden Jackal	LC	LC		
	Wild Boar	Sus scrofa	Wild Boar	LC	DD		
	Badger	Meles meles	Common Otter	NT	LC	✓	
	Wolf	Canis lupus	Grey Wolf	LC	LC	✓	
	Fox	Vulpes vulpes	Red Fox	LC	LC		
	Wildcat	Felis silvestris	European Wildcat	LC	LC		
	Weasel	Mustela nivalis	Least Weasel	LC	LC		✓
	Marten	Martes sp.	Marten	LC	LC		

IUCN - International Red List

RLG - Red List of Georgia

NT - Approaching danger

LC – Least Concern

VU - Vulnerable

NE - Not Evaluated

DD - Data is not sufficient to assign status

Bern II - Berne Convention Annex 2

Bern III - Berne Convention Annex 3

During the field research and literature review it was obvious that a large proportion of the species are present in protected areas where they encounter a safe and natural environment.

From cats - Wildcat (Felis silvestris), from martens - marten (Martes sp.) and from doglike - fox (Vulpes vulpes) are the most common predators in Georgia. They are found everywhere except in the swamps of Colchis. There may be occasional visitors to the study area.

One of the smallest least weasel and one of the largest common otter (Meles meles) may be spotted in the project area although this is not a suitable habitat for them.

Among large dog-like Jackals (Canis aureus) and wolves (Canis lupus) may have been spotted randomly in the project area. We did not see any signs of their animal activity during the field surveys however, literature and a survey of locals confirm the facts of their few visits to the study area. However, this environment is not conducive to food and safety.

Field research has also not seen roe deer (Capreolus capreolus), wild boar (Sus scrofa), and bear (Ursus arctos) which are also known to be associated with the Mariamjvari Reserve and the Korughi Refugium. Locals also told us about the few facts of roe deer appearing in the village, as for the study area we did not see any significant habitat for them. The impacts caused by the project on them will be minimal.

The most important of the species listed in the table is the otter (Lutra lutra) protected by the Berne Convention, IUCN International Status Endangered - (NT), Georgia is now undergoing renewal of Red List status and the otter will usually no longer have vulnerable status and it will change – least concern (LC) By status. Otter is closely connected with water by the way of its life. It lives in rivers, lakes, canals, it can be found on the seashore. Extends vertically up to 2,300 m above sea level. It feeds on fish, amphibians, crustaceans, rarely birds, small mammals, and reptiles. The individual area includes 5 km of rivers and canals, 2-3 km of lakes and reservoirs. No bio-waste sign of otter was found in the study area despite it being reported in the literary sources. The closest distribution area of ottar is the Iori River, but not the rivers that cross the project area.

Small mammals

The study area is not significant for small mammals either. As field research and literature review has shown, at least 15 species of small mammals may accidentally enter this area (Table. Because this area is anthropogenically loaded, the main species are synanthropes).

Table 22: List of small mammals

№	English Name	Scientific name	Common name	IUCN	RLG	Bern II	Bern III
1	Hedgehog	Erinaceus concolor	Southern white-breasted hedgehog	LC	LC		
2	Hare	Lepus europaeus	European Brown Hare	LC	LC		✓
3	House Mouse	Mus musculus	House Mouse	LC	LC		
4	Dormouse	Dryomys nitedula	Forest Dormouse	LC	LC		✓
5	Gueldenstaedt's Shrew	Crocidura gueldenstaedti	Gueldenstaedt's Shrew	LC	NE		

6	Common Squirrel	Sciurus vulgaris	Eurasian Red Squirrel	LC	LC		✓
7	Major's pine vole	Microtus majori	Major's pine vole	LC	LC		
8	Ural field mouse	Apodemus uralensis	Ural field mouse	LC	LC		
9	Caucasian squirrel	Sciurus anomalus	Caucasian squirrel	LC	LC	✓	
10	Small mole	Talpa sp.	Levant Mole	LC	LC		
11	Social Vole	Microtus socialis	Social Vole	LC	LC		
12	Field mouse	Mus macedonicus	Balkan Short-tailed Mouse	LC	LC		
13	Social Vole	Apodemus fulvipectus	Social Vole	LC	LC		
14	Asia Minor Mouse	Apodemus mystacinus	Broad-Toothed mouse	LC	LC		
15	vole-mouse	Microtus arvalis	Microtus arvalis	LC	LC		

IUCN - International Red List
RLG - Red List of Georgia
NT - Approaching danger
LC – Least Concern
VU - Vulnerable
NE - Not Evaluated
Bern II - Berne Convention Annex 2
Bern III - Berne Convention Annex 3

At no stage of the project is it expected to worsen the population trend for the species listed in the table. Significant habitat damage is not expected which will lead to chain irreversible processes. Neither species of high value are presented for conservation, on which additional measures would be desirable. As literart processing showed, a large proportion of species are represented in protected areas bordering the project area, and it is these areas that create the important habitat for species listed in the table. And this section of the road may be a migration corridor for them.

Probably the most notable of the species listed in the table is the Caucasian squirrel (Sciurus anomalus), which chooses deciduous and sometimes mixed forests as its habitat. It is often associated with the human habitation of life but most of the road is less attractive to it due to lack of food and dangerous reasons.

All groups of terrestrial vertebrates distributed in the project impact area are represented by widespread and numerous species. They often do not require special protection measures. Therefore, it is sufficient to carry out general actions aimed at minimizing the impact on the environment during the construction and operation of the facility (maximum protection of vegetation, protection of soil and water from contamination with harmful substances, reduction of noise, vibration levels and dust, etc.) The project area should be considered as a medium sensitivity zone in terms of fauna sensitivity.

Chiropter: Georgia is a party to the EUROBATS Treaty on the Protection of European chiropter. Therefore, special attention was paid to them.

According to literary sources, several species of bats are known in the vicinity of the project area (**Table 23**). There is a need for adequate shelter for bat species, namely: they need the following types of shelters:

Breeding shelters where female bats give birth and raise young (from May to July);

Winter shelters where bats sleep during the winter (from November to March);

Summer shelters that are used by males and infertile females;

Transit shelters used during migration or relocation;

Mating shelters used in the fall, during the mating season.

Table 23: According to the literature sources the following species of bats may be in the project impact zone

№	English name	Scientific name	Common name	IUCN	RLG	Bern II	Bern III
1	lesser mouse-eared bat	Myotis blythii	Lesser Mouse-eared Bat	LC	LC	✓	
2	Greater Horseshoe Bat	Rhinolophus ferrumequinum	Greater Horseshoe Bat	LC	LC	✓	
3	Pygmy Pipistrelle	Pipistrellus pygmaeus	Pygmy Pipistrelle	LC	LC	✓	
4	Common Pipistrelle	Pipistrellus pipistrellus	Common Pipistrelle	LC	LC		✓
5	Serotine bat	Eptesicus serotinus	Serotine Bat	LC	LC	✓	
6	Brown Long-eared Bat	Plecotus auritus	Brown Long-eared Bat	LC	LC	✓	
7	Whiskered Myotis	Myotis mystacinus	Whiskered Myotis	LC	LC	✓	

IUCN - International Red List
RLG - Red List of Georgia
LC – Least Concern
Bern II - Berne Convention Annex 2
Bern III - Berne Convention Annex 3

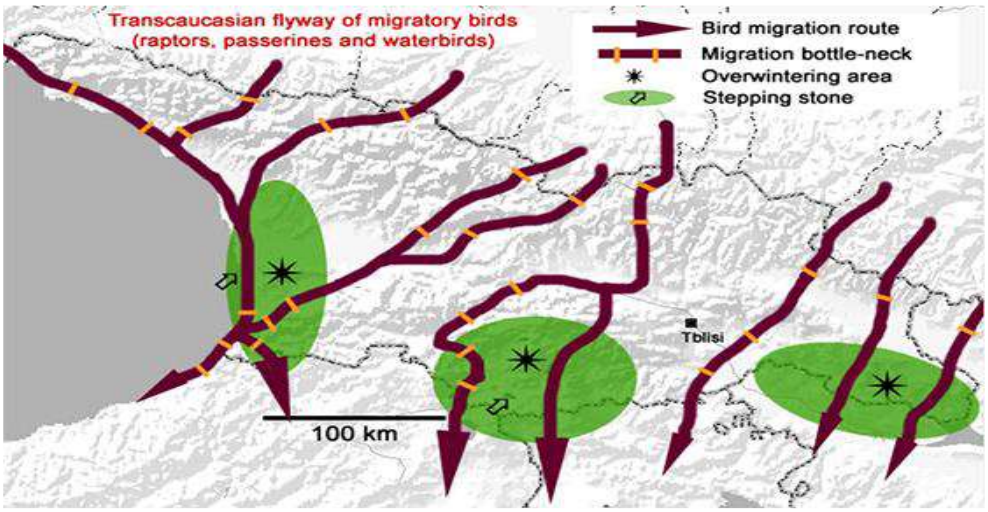
It is especially important for hibernation to have a system of caves where there is no sharp change in temperature. And in summer the same species use trees and buildings as shelters. During the active period it can also be found in tree hollows, rock crevices and buildings.

According to the results of the study, habitats suitable for bats directly in the project area are less represented, so it can be said that the species listed in the table live but away from the project area, where the above-mentioned conditions are favourable for them. Due to the above, the impact of the project on the bats will not be significant.

Ornithofauna

Georgia is also an important area for West Palearctic birds, as one of their main migration routes runs here (fig.) (Black Sea Basin, Javakheti and Dedoplistskaro), however, the study area itself is not an important migration route, the so-called "Narrow throat", a place to stop, rest or spend the winter. The study also checked that the study area belonged to Important Bird and Biodiversity Areas (IBAs) or not. The project area does not belong to such areas.

Figure 48 : Migration corridors



Most of the bird species represented in the study area are widespread throughout Georgia. However, their populations are numerous.

The main part of the birds identified in the study area is represented by shrub species. Forms related to rocky places and water are also found. During the migration period, for water and swamp birds, the riverbanks and floodplains can be used as a temporary shelter.

Of the birds distributed in the study area, 82 birds may be included, according to field research and literature data.

Table 24: Species of birds known in the literature and identified during field research in the study areas

№	Species	Scientific Name	Common Name	Georgia	IUCN	RLG	Bern Annex 2
1	Grey Heron	Ardea cinerea	Grey Heron	YR-R	LC	-	
2	Great Bittern	Botaurus stellaris	Great Bittern	YR-R	LC	-	x
3	Great Cormorant	Phalacrocorax carbo	Great Cormorant	YR-R, M	LC	-	
4	Black Kite	Milvus migrans	Black Kite	YR-R, M	LC	-	x
5	Eurasian Sparrowhawk	Accipiter nisus	Eurasian Sparrowhawk	YR-R, M	LC	-	x
6	Northern Goshawk	Accipiter gentilis	Northern Goshawk	YR-R, M	LC	-	x
7	Common Buzzard	Buteo buteo	Common Buzzard	YR-R, M	LC	-	x
8	Rough-legged Buzzard	Buteo lagopus	Rough-legged Buzzard	WV, M	LC	-	x
9	Booted Eagle	Hieraaetus pennatus	Booted Eagle	BB, M	LC	-	x
11	Western Marsh Harrier	Circus aeroginosus	Western Marsh Harrier	YR-R, M	LC	-	x
12	Merlin	Falco columbarius	Merlin	WV, M	LC	-	x
13	Common Kestrel	Falco tinnunculus	Common Kestrel	YR-R, M	LC	-	x

14	Common Quail	Coturnix coturnix	Common Quail	YR-R, M	LC	-	
15	Yellow-legged Gull	Larus michahellis	Yellow-legged Gull	YR-R	LC	-	
16	Rock Dove	Columba livia	Rock Dove	YR-R	LC	-	
17	Common Wood Pigeon	Columba palumbus	Common Wood Pigeon	YR-R	LC	-	
18	Common Cuckoo	Cuculus canorus	Common Cuckoo	BB, M	LC	-	
19	Eurasian Eagle Owl	Bubo bubo	Eurasian Eagle Owl	YR-R	LC	-	x
20	Eurasian Scops-Owl	Otus scops	Eurasian Scops-Owl	BB, M	LC	-	x
21	Little Owl	Athene noctua	Little Owl	YR-R	LC	-	x
22	Tawny Owl	Strix aluco	Tawny Owl	YR-R	LC	-	x
23	European Nightjar	Caprimulgus europaeus	European Nightjar	BB, M	LC	-	x
24	Common Swift	Apus apus	Common Swift	BB, M	LC	-	
25	European Bee-eater	Merops apiaster	European Bee-eater	BB, M	LC	-	x
26	European Roller	Coracias garrulus	European Roller	BB, M	LC	-	x
27	Common Kingfisher	Alcedo atthis	Common Kingfisher	YR-R, M	LC	-	x
28	Common Hoopoe	Upupa epops	Common Hoopoe	BB, M	LC	-	
29	Eurasian Green Woodpecker	Picus viridis	Eurasian Green Woodpecker	YR-R	LC	-	x
30	Greater Spotted Woodpecker	Dendrocopos major	Greater Spotted Woodpecker	YR-R	LC	-	x
31	Lesser Spotted Woodpecker	Dryobates minor	Lesser Spotted Woodpecker	YR-R	LC	-	x
32	Calandra Lark	Melanocorypha calandra	Calandra Lark	BB, M	LC	-	x
33	Wood Lark	Lullula arborea	Wood Lark	BB, M	LC	-	
34	Eurasian Skylark	Alauda arvensis	Eurasian Skylark	YR-R, M	LC	-	
35	Crested Lark	Galerida cristata	Crested Lark	YR-R, M	LC	-	
36	Barn Swallow	Hirundo rustica	Barn Swallow	BB, M	LC	-	x
37	Northern House Martin	Delichon urbicum	Northern House Martin	BB, M	LC	-	x
38	White Wagtail	Motacilla alba	White Wagtail	YR-R, M	LC	-	x
39	Grey Wagtail	Motacilla cinerea	Grey Wagtail	YR-R, M	LC	-	x
40	Yellow Wagtail	Motacilla flava	Yellow Wagtail	BB, M	LC	-	x
41	Bohemian Waxwing	Bombycilla garrulus	Bohemian Waxwing	WV	LC	-	x

42	Lesser Grey Shrike	Lanius minor	Lesser Grey Shrike	BB, M	LC	-	x
43	Red-backed Shrike	Lanius collurio	Red-backed Shrike	BB, M	LC	-	x
44	Blackcap	Sylvia atricapilla	Blackcap	BB, M	LC	-	x
45	Common Chiffchaff	Phylloscopus collybita	Common Chiffchaff	BB, M	LC	-	x
46	Green Warbler	Phylloscopus nitidus	Green Warbler	BB	LC	-	
47	Spotted Flycatcher	Muscicapa striata	Spotted Flycatcher	BB, M	LC	-	x
48	Northern Wheatear	Oenanthe oenanthe	Northern Wheatear	BB, M	LC	-	x
49	Isabelline Wheatear	Oenanthe isabellina	Isabelline Wheatear	BB, M	LC	-	x
50	Common Redstart	Phoenicurus phoenicurus	Common Redstart	BB, M	LC	-	x
51	European Robin	Erithacus rubecula	European Robin	YR-R	LC	-	x
52	Common Nightingale	Luscinia megarhynchos	Common Nightingale	BB, M	LC	-	x
53	Eurasian Blackbird	Turdus merula	Eurasian Blackbird	YR-R	LC	-	
54	Song Thrush	Turdus philomelos	Song Thrush	YR-R, M	LC	-	
55	Mistle Thrush	Turdus viscivorus	Mistle Thrush	YR-R, M	LC	-	
56	Long-tailed Tit	Aegithalos caudatus	Long-tailed Tit	YR-R, M	LC	-	
57	Eurasian Penduline Tit	Remiz pendulinus	Eurasian Penduline Tit	YR-R, M	LC	-	
58	Coal Tit	Parus ater	Coal Tit	YR-R	LC	-	x
59	Great Tit	Parus major	Great Tit	YR-R	LC	-	x
60	Blue Tit	Parus caeruleus	Blue Tit	YR-R	LC	-	x
61	Wood Nuthatch	Sitta europaea	Wood Nuthatch	YR-R	LC	-	x
62	Eurasian Treecreeper	Certhia familiaris	Eurasian Treecreeper	YR-R	LC	-	x
63	Winter Wren	Troglodytes hiemalis	Winter Wren	YR-R	LC	-	x
64	Corn Bunting	Miliaria calandra	Corn Bunting	YR-R, M	LC	-	
65	Black-headed Bunting	Emberiza melanocephala	Black-headed Bunting	BB, M	LC	-	x
66	Ortolan Bunting	Emberiza hortulana	Ortolan Bunting	BB, M	LC	-	
67	Eurasian Chaffinch	Fringilla coelebs	Eurasian Chaffinch	YR-R, M	LC	-	
68	European Goldfinch	Carduelis carduelis	European Goldfinch	YR-R, M	LC	-	x
69	European Greenfinch	Carduelis chloris	European Greenfinch	YR-R, M	LC	-	x

70	Eurasian Bullfinch	Pyrrhula pyrrhula	Eurasian Bullfinch	YR-R	LC	-	
71	Hawfinch	Coccothraustes Coccothraustes	Hawfinch	YR-R, M	LC	-	x
72	Spanish Sparrow	Passer hispaniolensis	Spanish Sparrow	YR-R, M	LC	-	
73	Tree Sparrow	Passer montanus	Tree Sparrow	YR-R	LC	-	
74	House Sparrow	Passer domesticus	House Sparrow	YR-R	LC	-	
75	Common Starling	Sturnus vulgaris	Common Starling	YR-R, M	LC	-	
76	Rose-coloured Starling	Sturnus roseus	Rose-coloured Starling	BB, M	LC	-	x
77	Eurasian Golden Oriole	Oriolus oriolus	Eurasian Golden Oriole	BB, M	LC	-	x
78	Eurasian Jay	Garrulus glandarius	Eurasian Jay	YR-R	LC	-	
79	Black-billed Magpie	Pica pica	Black-billed Magpie	YR-R	LC	-	
80	Common Raven	Corvus corax	Common Raven	YR-R	LC	-	
81	Rook	Corvus frugilegus	Rook	YR-R, M	LC	-	
82	Hooded Crow	Corvus corone	Hooded Crow	YR-R	LC	-	

YR-R = Year-round resident; breeder, present throughout the year;
YR-V = Year-round visitor; non-breeder, present throughout the year;
BB = Breeding bird; breeder, absent during non-breeding period;
SV = Summer visitor; non-breeder, present in spring and summer;
WV = Winter visitor; non-breeder, present in late fall, winter and early spring;
M = Migrant; bird of corridor; present primarily in fall and spring;
IUCN Red List of Threatened species – IUCN;
LC = Least Concern;
RLG = Red List of Georgia

Figure 49 : Left: European Goldfinch - Carduelis carduelis, right: Red-backed Shrike - Lanius collurio



Figure 50 : Left: Barn Swallow - Hirundo rustica, right: Eurasian Jay - Garrulus glandarius



Fish

The water bodies facing the project corridor are poor from an ichthyological point of view. Obtaining material, especially during the summer, is very difficult. The species of fish known in the literature and recorded during field studies are given in Table 6.7.2.9 with relevant photos.

During the field work (June 2020) most of the rivers were dry and an ichthyological study was conducted only on the river Chailuri. It should also be noted that the water temperature in the river Chailuri was quite high, and the transparency was low. Consequently, the ichthyofauna in this section of the project area is quite poor. During the study, only one species was recorded from the river Chailuri: Kura loach - Oxynoemacheilus brandtii.

№	English name	Scientific name	Common name	IUCN	RLG	FD/LD
1	Kura barbel	Barbus cyri	Kura barbel	NE	NE	LD
2	Mursa	Luciobarbus mursa	Mursa	LC	NE	LD
3	Kura chub	Alburnoides eichwaldii	Kura chub	LC	NE	LD
4	Kura bleak	Alburnus filippii	Kura bleak	LC	NE	LD
5	Kura loach	Oxynoemacheilus brandtii	Kura loach	LC	NE	FD
6	Chub	Squalius agdamicus	Chub	NE	NE	LD
7	Transcaucasian barb	Capoeta capoeta	Transcaucasian barb	LC	NE	LD
8	South caucasian gudgeon	Romanogobio macropterus	South caucasian gudgeon	LC	NE	LD
9	Blackbrow bleak	Acanthobrama microlepis	Blackbrow bleak	LC	NE	LD
10	Bulatmai barbel	Luciobarbus capito	Bulatmai barbel	VU	NE	LD
11	Cobitis saniae	Cobitis saniae	Cobitis saniae	NE	NE	LD

IUCN - International Red List
RLG - Red List of Georgia

NE -Not Evaluated
LC – Least Concern
VU - Vulnerable
FD - Species identified during field research
LD - Literary data

Figure 51: Kura loach (Oxynoemacheilus brandtii) Extraction place the river Chailuri





Results of field research and literary analysis (reptiles)

Up to 60 species of reptiles have been described on the territory of Georgia, of which up to 23 species may be encountered in the study area through literary data and field research results. Of these, 1 species of tortoise, 9 species of lizard and 13 species of snake. Some of them are taken from other environmental impact assessments carried out in the project area, which we did not see during the field research, and we did not literally prove the existence of species such as: Sand lizard (Lacerta agilis), Slow worm (Anguis colchica) and Artwin lizard (Darevskia derjugini.) Among the red-listed species are two species of Mediterranean turtle, Testudo graeca, also protected by the Berne Convention. Also, the western sand boa (Erys jaculus) which does not live specifically in the project area, but a study has been recorded in its vicinity. During a previous field trip, we saw European glass lizard mashed on the road (Pht.), And locals also provided us with photo evidence of two species of snake: Eastern four-lined ratsnake and steppes ratsnake.

Photo evidence of Eastern four-lined ratsnake (Elaphe urartica), and the steppes ratsnake (Elaphe dione).

Figure 52: European Glass Lizard (Pseudopus apodus)



Figure 53: Eastern four-lined ratsnake (Elaphe urartica) provided by a local resident, taken near Sagarejo



Figure 54: Steppes ratsnake. (Elaphe Dione), Provided by a local resident, taken near Bakurtsikhe



Table 25: Reptile species known in the literature and identified during field research

№	Species	Species	English	IUCN	RLG	Bern	FD/LD
1	Mediterranean Tortoise	Testudo graeca	Mediterranean Spur Thighed Tortoise	VU	NT	+	LD
2	Agama	Paralaudakia caucasia	Caucasian Agama	LC	LC	-	FD
3	Glass Lizard	Pseudopus apodus	European Glass Lizard	LC	LC	-	FD
4	Kura Lizard	Darevskia portschinskii	Kura Lizard	LC	LC	-	LD
5	Meadow Lizard	Darevskia praticola	Meadow Lizard	NT	DD	-	LD
6	Medium Lizard	Lacerta media	Medium Lizard	LC	LC	-	LD
7	Striped Lizard	Lacerta strigata	Striped Lizard	LC	LC	-	LD
8	Common Blind Snake	Xerotyphlops vermicularis	Eurasian Blind Snake	LC	LC	-	LD
9	Western Sand Boa	Eryx jaculus	Western Sand Boa	LC	VU	-	LD
10	Smooth Snake	Coronella austriaca	Smooth Snake	LC	LC	-	LD
11	Red-Bellied Racer	Dolichophis schmidti	Red-Bellied Racer	LC	LC	-	LD
12	Steppes Ratsnake	Elaphe dione	Steppes Ratsnake	LC	NT	-	LD
13	Eastern Four-Lined Ratsnake	Elaphe urartica	Eastern Four-Lined Ratsnake	NE	LC	-	LD

14	Spotted Wipe Snake	Hemorrhois ravergieri	Spotted Wipe Snake	LC	LC	-	LD
15	Common Grass Snake	Natrix natrix	Grass Snake	LC	LC	-	LD
16	Tessellated Water Snake	Natrix tessellata	Tessellated Water Snake	LC	LC	-	FD
17	Dahl's Whip Snake	Platyceps najadum	Dahl's Whip Snake	LC	LC	-	LD
18	Soosan Snake	Telescopus fallax	Soosan Snake	LC	LC	-	LD
19	Transcaucasian Rat Snake	Zamenis hohenackeri	Transcaucasian Rat Snake	LC	LC	-	LD
20	Levantine Viper	Macrovipera lebetinus	Levantine Viper	LC	LC	-	LD
21	Slow worm	Aanguis colchica	Slow worm	LC	NE	-	LD
22	Artwin Lizard	Darevskia derjugini	Artwin Lizard	NT	NT	-	LD
23	Sand Lizard	Lacerta agilis	Sand Lizard	LC	LC	-	LD

IUCN - International Red List
RLG - Red List of Georgia
DD - Data is not sufficient to assign status
NT - Approaching danger
LC – Least Concern
VU - Vulnerable
NE –Not Evaluated
FD - Species identified during field research
LD - Literary data
Bern - Berne Convention

Results of field research and literary analysis (amphibians)

12 species of amphibians are described on the territory of Georgia, out of which 6 species (table) may be found in the study area with the help of literary data and field research results. Only two species were confirmed during the field study: the lake frog (Pelophylax ridibundus) (Pht.) And the green toad (Bufotes variabilis).

Table 26: Species of amphibians known in the literature and identified during field research

№	Species	Species	English	IUCN	RLG	FD/LD
1	Southern crested newt	Triturus karelinii	Southern crested newt	LC	NT	LD
2	Syrian spadefoot	Pelobates syriacus	Syrian spadefoot	LC	NT	LD
3	Shelkovnikov's treefrog	Hyla orientalis	Shelkovnikov's treefrog	NE	LC	LD
4	Green toad	Bufotes variabilis	Eurasian green toad	DD	LC	FD
5	Marsh frog	Pelophylax ridibundus	Marsh frog	LC	LC	FD
6	Caucasian brown frog	Rana macrocnemis	Caucasian brown frog	LC	LC	LD

IUCN - International Red List

RLG- Red List of Georgia
FD - Speciesidentified during field research
LD - Literary data
DD - Data is not sufficient to assign status
NT - Approaching danger
LC – Least Concern
NE -Not Evaluated

Figure 55: Left: Marsh frog (Pelophylax ridibundus) right: Green toad (Bufotes variabilis)



Results of field research and literary analysis (invertebrates)

As a result of fieldwork and processing of literary data, we identified up to 60 species typical of study areas (Pht.). The project area is not a significant habitat or edible environment for identified species, so the impact will be minimal.

Figure 56: Left: Long-horned beetles (Aegosoma scabricorne) right: Prauing mantis (Mantis religiosa)



Table 27 : Species of insects and other invertebrates identified during field research

№	English Name	Scientific Name	Common name	IUCN	RLG

Insects					
1	Six-spot burnet	Zygaena filipendulae	Six-spot burnet	NE	-
2	Painted Lady	Vanessa cardui	Painted Lady	LC	-
3	Bath white	Pontiac daplidice	Bath white	LC	-
4	Comma	Polygonia c-album	Comma	LC	-
5	Green-veined white	Pieris napi	Green-veined white	LC	-
6	Cabbage butterfly	Pieris brassicae	Cabbage butterfly	LC	-
7	Neptis rivularis	Neptis rivularis	Neptis rivularis	LC	-
8	Heath fritillary	Melitaea athalia	Heath fritillary	LC	-
9	Southern white admiral	Limenitis reducta	Southern white admiral	LC	-
10	Queen of Spain fritillary	Issoria lathonia	Queen of Spain fritillary	LC	-
11	Sail swallowtail	Iphiclides podalirius	Sail swallowtail	LC	-
12	Brown argus	Aricia agestis	Brown argus	LC	-
13	Silver-washed fritillary	Argynnis paphia	Silver-washed fritillary	LC	-
14	Orange tip	Anthocharis cardamines	Orange tip	LC	-
15	Tiger moths	Amata phegea	Tiger moths	NE	-
16	death's-head hawkmoth	Acherontia atropos	death's-head hawkmoth	NE	-
17	Green-underside Blue	Glaucopsyche alexis	Green-underside Blue	LC	-
18	Long-horned beetles	Aegosoma scabricorne	long-horned beetles	LC	-
19	Checkered beetles	Trichodes apiarius	Checkered beetles	NE	-
20	Flower chafers	Protaetia metallica	Flower chafers	NE	-
21	Firebug	Pyrrhocoris apterus	Firebug	NE	-
22	Seven-spot ladybird	Coccinella septempunctata	Seven-spot ladybird	NE	-
23	Green tiger beetle	Cicindela campestris	Green tiger beetle	NE	-
24	leaf beetles	Chrysolina sp.	leaf beetles	NE	-
25	Froghoppers	Cercopis intermedia	Froghoppers	NE	-
26	Shield bugs	Carpocoris purpureipennis	Shield bugs	NE	-
27	Ground beetles	Carabus adamsi	Ground beetles	NE	-
28	Jewel beetles	Capnodis cariosa	Jewel beetles	NE	-
29	Bombardier beetle	Brachinus elegans	Bombardier beetle	NE	-

30	Beetles	Eulasia chrysopyga	Glaphyridae	NE	-
31	Leaf beetles	Galeruca tanaceti	Leaf beetles	NE	-
32	Short-winged earwig	Forficula smyrnensis	Short-winged earwig	NE	-
33	Meadowhawks	Sympetrum sp.	Meadowhawks	NE	-
34	Keeled skimmer	Orthetrum coerulescens	Keeled skimmer	NE	-
35	Blue-tailed damselfly	Ishnura elegans	Blue-tailed damselfly	NE	-
36	Scorpion-flies	Panorpa sp.	Scorpion-flies	NE	-
37	Green Grasshopper	Omocestus viridulus	Green Grasshopper	LC	-
38	Praying mantis	Mantis religiosa	Praying mantis	LC	-
39	Empousa	Empusa pennicornis	Empousa	DD	-
40	Western honeybee	Apis melifera	Western honeybee	NE	-
41	Field crickets	Gryllus campestris	Field crickets	LC	-
		Other Invertebrates			
42	Pill woodlice	Armadillidium sp	Pill woodlice	LC	-
43	Turkish snail	Helix lucorum	Turkish snail	LC	-
44	land snail	Xeropicta derbentina	land snail	NE	-
45	earthworms	Eisenia sp.	earthworms	NE	-
46	Ground crab spiders	Xysticus sp.	Ground crab spiders	NE	-
47	Slender crab spider	Tibellus sp.	Slender crab spider	NE	-
48	False black widows	Steatoda paykulliana	False black widows	NE	-
49	Nursery web spider	Pisaura mirabilis	Nursery web spider	NE	-
50	Jumping spider	Philaeus chrysops	Jumping spider	NE	-
51	Wolf spiders	Pardosa sp.	Wolf spiders	NE	-
52	Goldenrod crab spider	Misumena vatia	Goldenrod crab spider	NE	-
53	Green huntsman spider	Micrommata virescens	Green huntsman spider	NE	-
54	Ground spiders	Gnaphosa sp.	Ground spiders	NE	-
55	raft spider	Dolomeds fimbriatus	Raft spider	NE	-
56	Jumping spider	Asianellus festivus	Jumping spider	NE	-
57	wasp spider	Argiope bruennichi	Wasp spider	NE	-

RLG – Red List of Georgia
DD - The data is not sufficient to grant the status
LC - Least Concern
NE - Not Evaluated

Figure 57: Location of the project territory and Important Bird and Biodiversity Areas (IBA)



6.7.4 Protected Areas

The project road corridor crosses the territories of two municipalities: the Sagarejo and Gurjaani. There are sites of national importance and protected by international conventions in the two municipalities, with the following sites located closest to the project corridor:

Protected areas of national importance:

Mariamjvari State Reserve (1022.5 ha). Mariamjvari State Nature Reserve is located on southern slopes of Tsiv-Gombori, north-east side of Sagarejo and north of village Antoki. The major aim to establish Mariamjvari Nature Reserve was the conservation and maintenance of untouched landscapes of relict-sosnovski pine (Pinus Sosnowsky Nakai) of Caucasus. It should be noted that the option being farthest from the Mariamjvari State Reserve was selected among the considered alternative corridors of the road. The shortest distance to the reserve is 3.8 km and more (north from the starting point of the corridor). There are settlements and agricultural lands between the Reserve and the project corridor;

Korugi Managed Reserve (2068 ha), belonging to Mariamjvari State Reserve administration. It is located in Iori valley and is a narrow strip of an uneven shape heading from the North-West to South-East. The major purpose of establishing Korugi Managed Reserve was the protection and taking care of flora and fauna of the unique riverside woods. The Managed Reserve is located 2,0 km and more south of the village Badiauri bypass of the project corridor. There is a hilly terrain used as pastures between the Managed Reserve and the project corridor;

Areas protected by the international conventions:

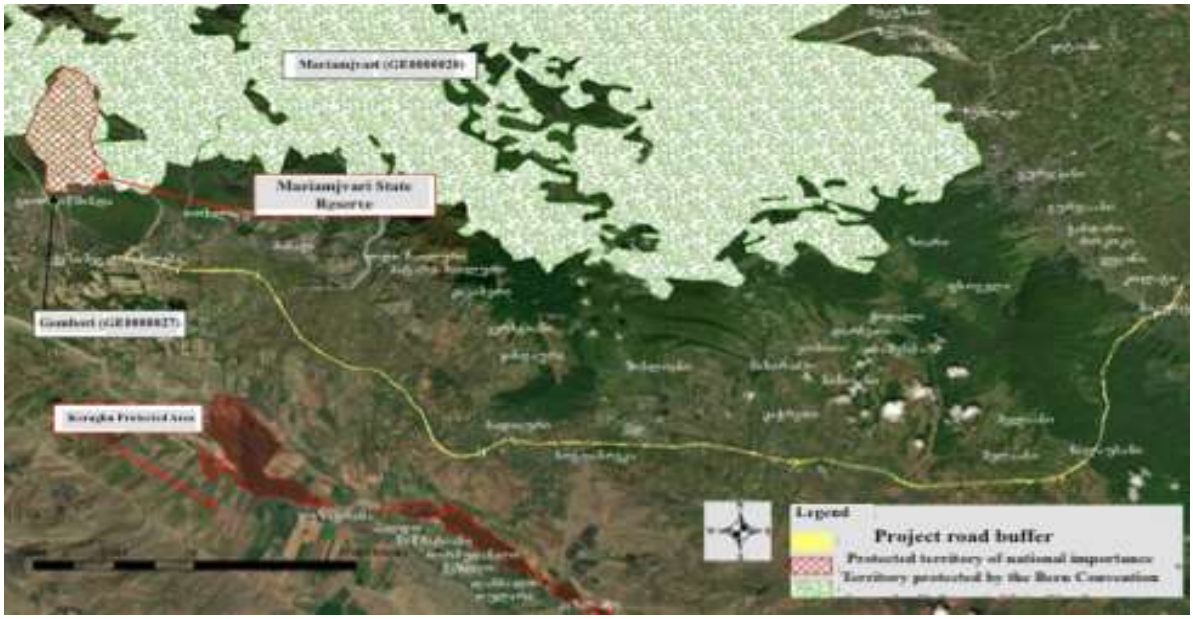
The Emerald Network Site protected by the Bern Convention: Gombori (GE0000027). The Emerald Site is located north the initial section of the project road corridor in approximately 3,5 km and more. There are settlements and agricultural lands between the protected areas and the project corridor;

Important Bird and Biodiversity Areas (IBAs): Iori area and Alazani Valley. The boundary of the former IBA runs adjacent to the Badiauri bypass of the project corridor at the distance of 0,02 m and more and the latter IBA is located 5 km and more east of the eastern point.

The project corridor is quite far from the nationally important sites and those in the region protected by the international conventions. Besides, there are urban zones and anthropogenic areas of other types between the project corridor and the protected landscapes.

In terms of proximity, IBA "Iori Site" is noteworthy, whose border runs across the adjacent areas of the designed Highway corridor, near village Badiauri. During the field survey, this area was carefully inspected to identify important bird areas or important bird habitats. The study found that this section is not a landscape suitable for IBA "Iori Site". Rather, river floodplain forests included in the Korugi Managed Reserve are much more attractive for specially protected birds. The corridor directly affected by the project, which runs along the border of the above-mentioned IBA Site, is agricultural lands and pasture. This type of habitat covers quite large area and is quite transformed.

Figure 58: Location of the designed Highway corridor and protected areas



Atmospheric air quality

Atmospheric air pollution is one of the environmental challenges facing humanity today. Atmospheric air is polluted with harmful substances emitted from anthropogenic and natural sources. The sources of air pollution are transport, energy, industry, and agriculture. The National Environment Agency of the Ministry of Environment Protection and Agriculture of Georgia monitors quality Atmospheric air.

In 2014-2017, the outdated air quality assessment system was gradually replaced by modern European systems. There are eight new, state-of-the-art automatic stations in the country, which enable 24-hour monitoring of ambient air quality.

The quality of atmospheric air is monitored at three locations in Telavi, Kakheti region. The four-stage measurements of 26 indicators conducted in 2017 are in **Table 28.**

Table 28: Results of four-stage air quality measurement by 26 indicators undertaken in 2017

Location/phases	Nitrogen dioxide mcg / m^3				Sulfuric dioxide, mcg / m^3				Ozone, mcg / m^3			
	I	II	III	IV	I	II	III	IV	I	II	III	IV
Agmashenebeli Street Lukoil petrol station	48.10	53.73	56.63	50.29	<2.46	2.36	<2.17	<2.83	43.38	38.41	54.57	17.45
Near the monument of Erekle II	26.98	45.47	39.00	35.79	<2.46	2.36			48.08	41.87	60.30	23.77
Gurjaani road M42. "Gulf" petrol station	2.10	31.55	20.38	27.90								

During preliminary survey, no significant stationary sources of emissions, noise and vibration have been observed within the corridor selected for highway construction. Only petrol stations must be noted, which are not typically characterized by significant volumes of emissions of harmful substances.

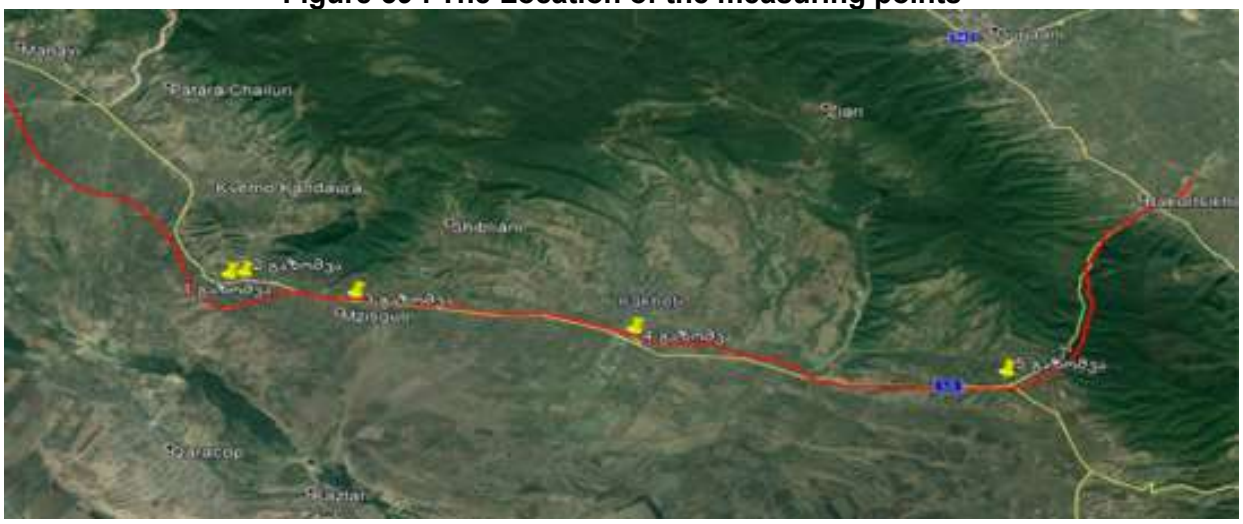
6.7.5 Noise and Vibration

During the preliminary survey, no significant stationary sources of emissions, noise, and vibration have been observed within the alignment of the highway construction. The petrol stations do not have significant volumes of emissions of harmful substances.

Noise measurements were conducted by the consulting company on July 2-3, 2020. Data collection was performed within 24 hours. The interval between sampling by noise meters was 2 seconds. The average amount of data received by each noise meter is 45,000 units. The environment was not affected by any environmental conditions (rain, wind, emergency, etc.). Measurement control 5 locations were selected as points:

- Village. Badiauri - in the yard of a residential house - residential area;
- Village. Badiauri - in the yard of a residential house - residential area;
- The village. Mzisguli - on the balcony of a residential house - residential area;
- Village. Kachreti - in the yard of a winery - entrepreneurial zone;
- Village. Chalaubani - in the yard of a residential house - residential area.

Figure 59 : The Location of the measuring points



Noise measuring devices were installed, according to the standards by the representatives of the consultant. Noise meter configurations are:

- Noise pressure range: total 30 - 130 dB;
- Noise meter response speed: slow (1 second);
- Noise frequency weight: A weight;
- Microphone type: 0.5 "(12.7 mm) capacitor.

According to the received data from the installed equipment, the noise level slightly exceeds the admissible values at the 2nd and 3rd points. The daytime noise levels are low, according to the Georgian legislation. Even though, in some cases, the noise level increases during different times of the day and night. There was only one place (location N3) where the noise level increased. The 1st and 3rd locations, measuring the noise level were in the yard, which is provided approximately 2m fences. The fences significantly reduce the noise impact on the receptors.

Vibration measurement results

The baseline data on vibration was collected via instrumental measurements. The measurements of the vibration were taken at the nearest residential buildings, close to the project area and number of the measurements at each location varied from 1400 to 1500. The vibration frequency range was from 1-80 Hz. The figure below shows the location of the measurement point.

Figure 60: Location of the vibration measuring points



The highest data recorded during measurements are as follows:

X direction - 12:47:28 - 0,34 mm/sec

Y direction - 12:26:33 - 0,41 mm/sec

Z direction - 23:20:49 - 0,37 mm/sec

As the investigation data showed, the vibration level at building 1 is much lower than the reference values under DIN 4150-3 Standard..

6.8 Baseline Socioeconomic Conditions

Introduction

This section describes socioeconomic conditions in and near the alignment of Sagarejo Eastern Part – Bakurtsikhe sub-section of Tbilisi-Bakurtsikhe section of International Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan Road (S5). The data were collected from public statistical sources and other public sources. In addition, field surveys were conducted of cultural heritage monuments located near the project corridor. This section and the following three sections discuss topics of concern, including demography, economy, employment and unemployment, infrastructure, land and water resources, social services, cultural heritage, etc. Data are analyzed on regional and municipal levels.

General description of the region

The project corridor runs across the territories of Sagarejo and Gurjaani Municipalities of Kakheti region. The administrative center of Sagarejo Municipality is the city of Sagarejo, 45 km east of Tbilisi and 772 m above sea level. The territorial organs of the Municipality are the city of Sagarejo and villages Gombori, Kochbaani, Ujarma, Khashmi, Patardzeuli, Tskarostavi, Ninotsminda, Giorgitsminda, Tokhliauri, Manavi, Didi Chailuri, Patara Chailuri, Kakabeti, Verkhviani, Kandaura, Badiauri, Mzisguli, Shibliani, Iormuganlo, Duzagrama, Lambalo, Tular, Sataple, Udabno.

Gurjaani Municipality is the geographical center of Kakheti. There are a total of 31 settlements with one city: the city of Gurjaani, which is the center of the Municipality. Village Sakrebulos (village administration units) are: Gurjaani, Vazisubani, Velistsikhe, Vejin, Kalauri, Kardanakhi, Melaani, Shashiani, Chalaubani, Cheremi.

Demography

As of 2025, over 51,5 thousand people live in Sagarejo Municipality, which is 17,2% of the total population of Kakheti region. 10,2 thousand people live in the urban area, 41,3 thousand people live in the rural area.

As of 2025, over 49,5 thousand people live in Gurjaani Municipality, which is 16,6% of the total population of Kakheti region. 7.2 thousand people live in the urban area, 42,3 thousand people live in the rural area. The majority of the locals in both municipalities are Georgians.

Based on the official statistics (source: National Statistics Office of Georgia), the data on Sagarejo and Gurjaani Municipalities population is given in **Table 29.**

Table 29: Population of Sagarejo and Gurjaani municipalities, thousand people (as of January 1)

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Georgia	**3 728.6**	**3 726.4**	**3 729.6**	**3 723.5**	**3 716.9**	**3 728.6**	**3 688.6**	**3 736.4**	**3 715.5**	**3 715.5**
Kakheti	**317.8**	**315.9**	**314.7**	**312.5**	**310.1**	**309.6**	**304.9**	**306.2**	**303.1**	**298.5**
Sagarejo Municipality	52.1	52.1	52.2	52.2	52.2	52.3	52.0	52.2	51.8	51.5
• Urban	10.9	10.8	10.7	10.6	10.5	10.5	10.3	10.4	10.2	10.2
• Rural	41.2	41.3	41.5	41.6	41.7	41.8	41.7	41.8	41.6	41.3
Gurjaani Municipality	53.9	53.5	53.1	52.6	52.1	51.0	51.0	50.8	50.4	49.5
• Urban	7.9	7.8	7.8	7.7	7.6	7.5	7.4	7.4	7.3	7.2
• Rural	46.0	45.7	45.3	45.0	44.6	44.3	43.6	43.4	43.0	42.3

The population in the settled areas adjacent to the project corridor is given in **Tale 30.**

Table 30: Population in villages adjacent to the project corridor, thousand people

Rural	Population, man		
	As per 2002 census	As per 2014 census	Dynamics
Sagarejo Municipality:			
Tokhliauri	1053	983	-70
Manavi	3106	2769	-337
Patara Chailuri	1062	890	-172
Didi Chailuri	1014	850	-164
Kakabeti	3487	2771	-716
Verkhviani	540	495	-45
Kvemo Kandaura	1247	1013	-234
Badiauri	1644	1286	-358
Mzisguli	677	578	-99
Gurjaani Municipality:			
Kachreti	-	1958	-
Naniani	-	506	-
Melaani	-	1079	-
Chalaubani	-	897	-
Bakurtsikhe	-	2574	-

As the Table shows, the population in the settled areas under the potential impact has decreased significantly from 2002 to 2014.

Employment and unemployment levels

As per the official statistics, as of 2024, the number of employed in Kakheti is 121,9 thous. The number of self-employed people is quite high. Most self-employed people in both municipalities are engaged in agriculture.

Table 6.10.4. shows the statistical data of Kakheti Region for the last three years (Source: National Statistics Office of Georgia).

Table 31: Employment rate in Kakheti Region

	Kakheti				
	2020	**2021**	**2022**	**2023**	**2024**

Active population, total	122.2	127.2	128.2	133.7	135.9
Employed, including:	109.5	116.1	116.7	117.6	121.9
- Hired	57.1	56.5	59.6	65.3	72.4
- Self-employed	52.4	59.6	57.0	52.3	49.6
Unemployment rate, %	10.4	8.7	9.0	12.0	10.2

Economy

Kakheti region is an agricultural region, with viticulture as its main activity. There are some oil reserves in Sagarejo and Dedoplistskaro municipalities. In addition, recently, some important tourist facilities have been built and improved. Several small hydro-power plants were also built on the southern slope of the Caucasus of Kakheti.

The local economy of Sagarejo Municipality is mainly presented by agriculture, tourism, services, and trade. By considering the turnover and incomes, the most perspective and fast-developing branches are tourism and agriculture. As per the statistical data, As per the statistical data, in 2024, 1,087 active economic subjects were operating on the territory of the municipality. Of them, 29 agricultural cooperatives operate in the municipality.

The leading branches of the economy in Gurjaani Municipality are industry, tourism, agriculture, trade, and service industry. According to the data of 2024, there are 2,373 active economic subjects operating in the Municipality. Recently, the volume of investments in the Municipality has increased significantly, with its great portion spent for tourism and industry sectors.

Agriculture

A large proportion of the production of Sagarejo Municipality is presented by agricultural products. The following branches of agriculture are well developed: crop growing making 12% of the total grain produced in the region and viticulture making 15% of the grapes grown in the region. The following grape varieties are most commonly grown: Rkatsiteli, Saperavi, and Manavis Mtsvane. In this regard, the zones of villages Manavi and Khashmi are particularly worthwhile. Cattle-breeding and poultry-raising are also important branches of the municipality.

Viticulture is a leading branch in Gurjaani municipality. 6 out of 18 micro-zones of Georgia are in Gurjaani Municipality (with an area of 17,000 ha) what allows making world-famous wines there, such as Mukuzani, Akhashen, etc. In terms of agriculture, alongside with viticulture, fruit growing is also a well-developed branch. Gurjaani Municipality produces an average of 25-30 thousand tons of peaches and nectarines a year, with 80-85% being high-quality, i.e., sales product. 22% of the primary products is exported.

National grape production in 2024 reached 321.5 thousand tons, which is 45.7% higher than in 2023, demonstrating significant growth in viticulture. In 2025, Kakheti processed a record 327,000 tons of grapes, cementing the region's position as the primary viticulture center of Georgia.

The project highway will run mainly across the agricultural lands, which are intensively cultivated. Some of the areas under the potential impact are used as pastures.

An exception is a ≈6-km-long section running on Gombori Ridge, with a relatively intact landscape without agricultural plots found adjacent to it.

Public Healthcare, education, and community infrastructure

There are several multifunctional healthcare facilities in the city of Sagarejo:

Sagarejo Regional Hospital - multifunctional centre for inpatient and outpatient services;

Clinic Life – maternity clinic;

Sagarejo Multi-Profile Medical Centre, Geo Hospitals

These facilities are fully equipped and have the capability to provide full medical service to patients from the city and nearby villages.

Other important pieces of public infrastructure include office of Sagarejo municipality (includes 25 administration units), post office, commercial banks, a theatre, 26 schools, 26 kindergartens; 3 sport schools, a music school, and a multi-profile Youth House with a number of extra-curricular classes for schoolchildren.

Tourism, Cultural Heritage Archaeological Monuments

The project area is located in the Kakheti region, near the currently operating highway. It starts from Sagarejo municipality, in particular from Lochini gorge and continues to the end of the village Bakurtsikhe.

The surrounding villages of the project area are distinguished by the existence of archaeological monuments. List of these monuments is given in Table

Table 32: Archaeological monuments in the vicinity of the project area

№	Location	Name	Period
1	Sagarejo Municipality, Badiauri	Teletisgori Namosakhlari	Bronze Age: BC. 4th-2nd millennia; Late Bronze Age-BC. ჩ. 16th-11th centuries
2	Sagarejo Municipality, Badiauri	Gorasamarkhi	Bronze Age: BC. 4th-2nd millennia; Late Bronze Age-BC. ჩ. 16th-11th centuries
3	Sagarejo Municipality, Badiauri	Teleti Church of Saint Giorgi	Middle-Ages: 4th - 18th centuries. Late Middle Ages: 16th-18th centuries
4	Sagarejo Municipality, manavi	Former church of Natlismtsemeli	Middle-Ages: 4th - 18th centuries
5	Sagarejo Municipality, manavi	Zeiani N1 Korgan	Bronze Age: BC. 4th-2nd millennia
6	Sagarejo Municipality, manavi	Former church of Saint Mariam	Middle-Ages: 4th - 18th centuries
7	Gurjaani municipality, Chalaubani	Tinis Khevis Namosakhlarebi and Samarovani	Bronze Age: BC. 4th-2nd millennia; Middle Bronze Age: BC 3rd millennium. 2nd half - BC 17th c
8	Gurjaani municipality, Chalaubani	Sadgomi Khutsiskhevi	Stone Age: From ancient times BC. 6th millennium; Paleolithic: from ancient times BC. Up to 12000
9	Gurjaani municipality, Chalaubani	Sadgomi White Stones	Stone Age: From ancient times BC. 6th millennium; Paleolithic: from ancient times BC. Up to 12000
10	Gurjaani municipality, Chalaubani	Rtskhilis seris namosakhlari and Samarovani	Bronze Age: BC. 4th-2nd millennia; Middle Bronze Age: BC 3rd millennium. 2nd half - BC 17th c
11	Gurjaani municipality, Chalaubani	Namosakhlari Khosros Gora	Bronze Age: BC. 4th-2nd millennia Iron Age BC 10th-6th centuries
12	Gurjaani municipality, Chalaubani	Namosakhlari Singlis Seri	Bronze Age: BC. 4th-2nd millennia; Iron Age BC 10th-6th centuries. Late Bronze Age-BC.16th-11th centuries

13	Gurjaani municipality, Chalaubani	Namosakhlari Mochrili Gora	Bronze Age: BC. 4th-2nd millennia; Middle Bronze Age: BC 3rd millennium. 2nd half - BC 17th c; Iron Age BC 10th-6th centuries. Early Iron Age BC. 10th-8th centuries; The period of extensive absorption of iron in BC. 7th-6th centuries
14	Gurjaani municipality, Chalaubani	Namosakhlari Didgori	Bronze Age: BC. 4th-2nd millennia; Middle Bronze Age: BC 3rd millennium. 2nd half - BC 17th c
15	Gurjaani municipality, Chalaubani	Namosakhlari Garetki Gora	Bronze Age: BC. 4th-2nd millennia, Iron Age BC 10th-6th centuries
16	Gurjaani municipality, Katchreti	Hill graves	Bronze Age: BC. 4th-2nd millennia; Middle Bronze Age: BC 3rd millennium. 2nd half - BC 17th c
17	Gurjaani municipality, Katchreti	Samarovani	Middle Ages: 4th - 18th centuries. Early Middle Ages 4th-9th centuries
18	Gurjaani municipality, Katchreti	Sadughara Valley hill graves	Bronze Age: BC. 4th-2nd millennia; Early Bronze Age BC. 3500-2500
19	Gurjaani municipality, Katchreti	Sadgoi Karaliskhevi	Stone Age: From ancient times BC. 6th millennium; Paleolithic: from ancient times BC. Up to 12000
20	Gurjaani municipality, Katchreti	Namosakhlari	Bronze Age: BC. 4th-2nd millennia
21	Gurjaani municipality, Katchreti	Grave	Antiquity: BC. 5th - A.D. 3rd c. Late Neolithic (Late Roman): A.D. 1st-3rd cc
22	Gurjaani municipality, Katchreti	Archangel church	There is no information
23	Gurjaani municipality, Bakurtsikhe	Samarovani	Bronze Age: BC. 4th-2nd millennia; Middle Bronze Age: BC 3rd millennium. 2nd half - BC 17th c
24	Gurjaani municipality, Bakurtsikhe	Gorasamarkhi	Bronze Age: BC. 4th-2nd millennia
25	Gurjaani municipality, Bakurtsikhe	Goramitsa Samarovani	Bronze Age: BC. 4th-2nd millennia

Surface archaeological excavations were carried out within the project area. The project area for the construction of the project road does not intersect with any of the above visible, immovable monuments. Consequently, no negative impact on the mentioned monuments is expected in the construction of the highway. Visual assessments do not reveal any archaeological sites or artifacts; however, due to the specifics of the field, it is difficult to rule out the possible risks of archaeological remains in the ground. Therefore, maximum care and attention should be paid during any type of land works. Due to the fact that the project envisages land works, it is advisable to carry out archaeological monitoring during the works. Particularly noteworthy is the supervision of land works and caution in the vicinity of the above-mentioned cultural heritage sites (if any). In case of any archaeological finds (traces of buildings, ceramics, artifacts made of glass, metal or other materials, osteological materials) in accordance with the Law on Cultural Heritage, earthworks should be stopped immediately to avoid damage to the archaeological site or cultural layer. At the same time, the National Agency for Cultural Heritage Preservation of Georgia should be informed in writing immediately, and the works should be resumed only on the basis of their official permission.

7. Environmental and Social Risks and Impacts

7.1 Potential Impacts on Physical Environment

7.1.1 Potential impacts on landscapes and views

Construction phase

Within the assessment of landscape impact and visual changes of the sight, the value of the selected territory, its natural quality and human impact on the mentioned territory are the most important issues. Consideration should be given to how noticeable is the project corridor be for the receptors, such as population and passers.

Visual-landscape changes are also related to preparatory, and construction works; movement of construction machinery and transport is expected during the works. In addition, for arrangement of temporary facilities at the construction camps, will require cutting of the vegetation cover that will generate significant amount of removed soil. Its temporary and permanent disposal will cause deterioration of the aesthetic view.

Potential receptors of visual-landscape changes may be local population and passengers, as well as wildlife. The initial part of the corridor runs along the unpopulated areas. These sites are not under the visual sight of the population and the construction work will just impact on the animals and passengers. Several sections of the corridor run along the populated areas and agricultural lands where main impact receptors will be communities of villages: Badiauri, Kachreti, Melaani, Chalaubani, Chailuri and Bakurtsikhe.

Landscape visual impact will also be due to temporary spoil disposal areas. The site for stockpiling material and dimensions of the pile must be selected so avoid significant visual impact. Most of material will be used in construction. By the end of works it is assumed that spoil will be fully removed from the sites.

After the construction works are complete, the machines and equipment, construction materials and waste will be removed from the construction sites, temporary structures will be dismantled and removed, labor force will leave the project zone and reinstatement of the temporary developed territories will be carried out that will reduce the impact.

Operation phase

Main source of the visual impact is the traffic in the operation phase. Considering the baseline condition (frequent traffic jams, emergency situations and so forth) discussed by current ESIA Report, operation of the road will have positive impacts. Planting of trees and plants along the road corridor will support restoration of the landscape components. Re-cultivation of landscape along the road corridor will facilitate restoration of the landscape components. The impact of operation phase can be assessed as low.

7.1.1.1 Mitigation Measures

Construction phase

Visual impact of construction works will be mitigated by keeping to the boundaries of the worksites and traffic routes and preservation of vegetation. The impact during construction will be unavoidable, though short term (restricted to duration of construction), local and reversible. Under condition that mitigation measures are implemented the magnitude of residual impact will be low to negligible.

The following measure are suggested for mitigation of visual- landscape impacts:

- Temporary structures, materials, and waste (including spoil) should be avoided from visible places and should be places as far as possible;

- Structures and colours of temporary structures (green, brown) should be harmonized with the existing environment;
- The waste and materials should be properly managed, the sanitary conditions observed, and the waste removed from the territory in a timely manner;
- The height of the placed inert materials must not exceed 5 m which is optimal in respect of mitigating the risks of instability and negative visual impact. The driving routes of transport and techniques is to be observed;
- The night illumination on the work sites should be controlled to avoid bright light and light pollution. Propagation of light to the adjoining residential zones will be minimized;
- All disturbed areas (including borrow pits/quarries) should be recultivated after completion of the works. Adherence to the terms of licenses for the extraction of natural construction materials will be tracked by RD through technical supervisor and overseen by MEPA.
- Demobilization of the temporary infrastructure and re-cultivation of area following the completion of the works is required.

Operation phase

Landscaping and recultivation of cut slopes and piles of excess material and other measures aimed at harmonizing construction site with the surrounding environment will continue into the operation phase. Proper delivery of recultivation works will be essential for restoring the area adjacent to the RoW to quazi-natural condition and minimizing residual visual impacts. RD, through operation and maintenance contractor, will complete site reinstatement and ensure proper functioning of drainage, irrigation, and other elements of infrastructure arranged to protect slopes and earth piles from erosion and facilitate natural and/or artificial revegetation of the area.

7.1.2 Impact on Soils

Construction phase

Deterioration of soil stability and productivity

The highest risks of topsoil damage and erosion are expected during earth works and movement of heavy machinery in the project corridors. It may result in soil compaction, erosion, and deterioration of its fertility. The most significant measure to reduce such impact is preliminary removal of surface topsoil layer and proper storage for further use.

Earth works, as well as soil removal-storage will increase the risk of erosion and soil wash-out. Impact risk will be relatively higher during high precipitation period.

The risk of erosion is high in lot 5, where the proposed road crosses the Gombori ridge. Cutting the slopes will cause a decrease in slope stability and the risk of erosion will increase sharply. The risk of erosion will increase even more in rainy weather. The risk of erosion is relatively low in the territory of lot 4.

Also, the risk of erosion in the fifth lot will increase as a result of moving machinery over difficult slopes.

Deterioration of soil quality may be caused by unconsidered events (for instance: spill/leakage of fuel/lubricants from construction machinery and vehicles, storage reservoirs, operating on the project areas, improper handling and spillage of hazardous substances; improper management of topsoil, removed during construction phase; improper management of wastewater, etc.).

In total, degree of impact on soil fertility and quality can be assessed as medium. Significance of the residual impact depends on performance of the ESMP.

Significant part of the corridor selected for the Highway construction (approximately 60%) will run through the agricultural land plots, which are intensely cultivated and where the soil cover is quite visible. At mentioned locations the average thickness of the topsoil is approximately 20 cm. Overall, the total length of such a section is approximately 29 km and the average width of the roadbed is 35 m. However, it

should be noted that for construction of approximately 45% (13 km) of the project corridor is planned to be extended of the existing road (151 500 m^3 total volume of topsoil is to be cut at the sections running across the agricultural plots).

Approximately 6 km of the project corridor (approximately 12% of the total length) runs along the Gombori Ridge. However, this section, a significant part of the road will be constructed at the small gullies. As the section runs in forest zone, the average topsoil height is 15 cm. The topsoil removal is considered at about 60% (Along the sections running on Gombori Ridge in total 21 600 m^3 topsoil is expected to be cut).

Small part of the corridor (about 6%) runs across the non-agricultural areas, and by bypassing village Badiauri, it runs on a hilly terrain and along the railway line at some sections. At such locations, the topsoil quality is low, and its average height equals to 10 cm (total volume of topsoil is 12 000 m^3).

The remaining section of the highway (approximately 20-25%) will run across the areas where topsoil is not identified. For example: the intersections of the existing infrastructure (local roads, channels, pipelines, etc.); intersections of the existing buildings (especially the last section of the road leading to village Bakurtsikhe); riverbeds with alluvial material, etc. Besides, approximately 8-10 thousand m^3 topsoil will be stripped at the junctions of viaducts and secondary roads.

Overall, the total approximate volume to the topsoil to strip will be 195,000 m^3.

The risks of qualitative deterioration of soil are associated with unforeseen events (e.g., spills/leakages of oil products from the construction machinery operating in the project zone, supply reservoirs or other plants and facilities; improper handling of hazardous substances or their spills; improper management of the topsoil stripped during the construction; improper wastewater management, etc.).

Operation phase

During operation phase, the destruction of the topsoil or its instability is less expected. The Highway operation is usually related to soil pollution with heavy metals in a narrow band on either side of the road. Pollutants settling in soil within the RoW may impair vegetation growth and increase the risk of erosion. Impact on soil may result from blockage of the drainage system which may cause flooding and/or erosion of soil. Another impact is the pollution with litter. The impact on soil during operation is more difficult to manage as the sources of impact in this stage are the users of the Highway.

7.1.2.1 Mitigation Measures

Construction phase

One of the environmental commitments of the building contractor during the implementation of earthworks will be minimal impact on the topsoil. In order to avoid or mitigate impact on topsoil and other impacts caused by accidental fuel/oil spills, poor management of waste and/or polluted runoff, the operation ground must be established with consideration of environmental safety measures, as presented below:

- Ground clearance must be minimized;
- Topsoil from all areas required for permanent and temporary needs of the project must be removed;
- To preserve the quality of the topsoil during the removal its mixing with the subsoil should be avoided;
- To avoid loss of the productive soil layer, all suitable topsoil and other material shall be saved and stockpiled separately for the future recultivation of the area;
- Stockpiles of removed topsoil must be properly designed and managed;
- Stockpiles of excavated soil must be properly designed and managed – stability of the stockpile through preservation of ‘safe’ slope inclination and diversion of runoff from the area must be ensured;

- Topsoil and subsoil must be stored separately until reuse. (The topsoil removed from the new road alignment may be handed over to the local municipality for soil quality improvement);
- To ensure stability, the topsoil piles shall not be higher than 2 meters. The piles must be placed and managed so as to avoid erosion and washing off. Drainage trenches around the piles must be provided;
- Soil compaction may be reduced by strictly keeping to temporary roads, camp/operation ground boundaries;
- Disturbed vegetation must be replanted immediately after the construction/disturbance stops;
- Any temporary fuel tank shall be placed in a covered area with berms or dikes to contain any spills. Any spill shall be immediately contained and cleaned up with absorbent materials;
- Onsite repairs /maintenance/fuelling activities shall be limited. Priority shall be given to offsite commercial facilities. If impossible, a designated area and/or secondary containment for the on-site repair or maintenance activities must be provided. In case of the fuel/oil spills risk, an oil trap shall be additionally provided;
- On-site vehicles and equipment shall be inspected and regularly checked for leaks. Leaking vehicles/equipment shall not be allowed onsite;
- Secondary containment devices (drop cloths, drain pans) shall be used to catch leaks or spills while removing or changing fluids from vehicles or equipment. Drip pans or absorbent materials shall be provided. On small spills absorbent materials shall be used;
- Use of off-site vehicle wash racks (commercial washing facilities) is preferable. If on-site cleaning is necessary, washing areas for should be arranged away from surface water bodies and berms should be provided to prevent direct discharge of wastewater and pollution of natural waterways. If feasible, wastewater may be collected for pollutant settling and water evaporation;
- Draining water should be kept away from cultivated agricultural plots;
- Waste collection area must be arranged to avoid receiving a substantial amount of runoff from upland areas and draining directly to a water body;
- Adequate training on environmental protection and safety shall be provided to the staff;
- In the construction stage, the responsibility for topsoil protection from pollution rests with the contractor. During stripping, storing, and using the topsoil the requirements of Technical Regulation on the Approval of Rules for Removal, Storage and Use of Topsoil and Re-cultivation, approved by the decree №424 of the GoG should be taken to consideration.
- Likelihood of impacts on soil during construction will be medium. Under condition that mitigation measures are implemented the magnitude of residual impact will be low.

Operation phase

Impacts related to the operation phase may be partly mitigated by awareness raising and education of the community. The establishment of the rest/service facilities with consideration of environmental requirements may also contribute to the reduction of soil pollution with waste. To prevent impact on erosive sliding of the soil or flooding, blockage of the drainage system must be avoided. Phytoremediation may be considered as a measure for reduction of soil contamination. Contractor will be obligated to maintain freshly cut slopes, compacted piles of soil material, and landscaped areas during the defect liability period. RD, through the road operation and maintenance contractor, will take over this function thereafter. Slope maintenance will focus on preventing eroded earth polluting carriageway and blocking stormwater removing passages and drainage channels as well as facilitating natural regeneration of vegetative cover. Gabions, retaining walls, and other engineering solutions may be provided against erosion as need be in case slopes demonstrate unpredicted instability.

Likelihood of impacts on soil during operation will be medium to high. Under condition that mitigation measures are implemented the magnitude of residual impact will be low.

7.1.3 Potential Impacts on Geology

Construction phase

The construction activities may create the risks of geological instabilities in the project ROW, thus during the assessment of expected impact and developing the appropriate mitigatory measures, the probability of landslides and other mass movements in road cuts, erosion from fresh road cuts and fills, and sedimentation of natural drainage channels should be taken into account. It should be also considered that siltation of canals and gullies in the RoW may cause their blockage and flooding of the area.

The important impact that highway development projects have on the natural geologic erosion process includes temporary exposure of disturbed soils to precipitation and to surface runoff. The soil exposure and the resulting reshaping of the topography may create risks of temporary detrimental erosion and sedimentation.

The two factors that have the greatest impact on the slope stability are the slope gradient and the groundwater. Generally, the greater is the slope gradient and the presence of the groundwater, the lower is the stability of a certain slope regardless of the geologic material or the soil type.

The erosion of embankments near surface water body may have environmental impacts, including pollution of surface water, damage to adjacent land. In general, the process may be controlled by:

- Selection of a reasonable embankment height -and stabilization of the slopes;
- Establishment of temporary berms, slope drains, temporary pipes, contour ditches, ditch checks, diversions, sediment traps.

Culverts used in the road, bridge and berm construction are supposed to prevent flooding and washing out of roads. They also minimize erosion, build-up of standing water, and provide pathways for run-off.

According to the geological baseline data, the project corridor runs across great and less sensitive areas in an engineering-geological respect. If supposed mitigation measures and geotechnical design solutions listed below will be implemented, the construction work will not lead to the significant risks of geological hazards and value of the expected impacts can be assessed as low.

Operation phase

The operation impact is less likely to occur, as the design is developed based on the results of extensive geotechnical and engineering geological surveys implemented in the design stage of the project. However, monitoring of the highway artificial structures (drainage systems, water pipelines, etc.) and, if necessary, to carry out the rehabilitation and cleaning works there. Particularly, observation and monitoring of stability and effectiveness of the slope and bank protection structures along Chalaubani-Bakurtsikhe section (Chalaubaniskhevi River) will be required.

7.1.3.1 Mitigation Measures

Construction phase

The contractor will ensure that proper drainage is maintained throughout construction so that it cannot destabilize slopes, damage vegetation, or erode topsoil.

In Oder to ensure the stability of the geological environment in the construction phase, the following mitigation measures will be taken:

- Large-scale earthworks in relatively complex areas should be accomplished under the supervision of a geotechnical engineer;
- Topsoil and subsoil must be stored separately until reuse. (The topsoil removed from the new road alignment may be handed over to the local municipality for soil quality improvement);
- To ensure stability, the soil piles shall not be higher than 2 meters. The piles must be placed and managed so as to avoid erosion and washing off. Drainage trenches around the piles must be provided;

- Soil compaction may be reduced by strictly keeping to temporary roads, camp/operation ground boundaries;
- Proper treatment of the slopes of cross-sections and embankments should be carried out;
- In the areas where the slope inclination does not correspond to minimum safety requirements for embankments the specific measures should be developed;
- The embankments should be arranged considering the bearing capacity of the grounds. On the sites where the ground is not sufficiently stable, additional reinforcement;
- The foundations of the engineering structures should be arranged considering the geotechnical characteristics of the existing grounds. Bridge piers should be founded below the scouring depth;
- The bridges should be protected against washout by taking relevant measures;
- The structures crossing the surface waters should be designed to release peak discharges as per the effective standards;
- In order to prevent bogging of local sites, it is necessary to:
- Provide temporary drainage system along the perimeter of embankments and bulk materials by considering local topography and to use small-capacity pumps if necessary; to provide periodic cleaning works with the aim to maintain the conducting capacity of the drainage systems;
- Place the fills and materials in the manner to avoid the bogging of the adjoining areas;
- Divert rain waters by bypassing highly sloped and other sensitive sites by using relevant water diversion techniques (channels, pipelines, temporal berms, settling basins);
- Compact the ground fills properly;
- Limit or stop works on slopes during the wet weather;
- Recultivate the damaged areas after the completion of the works;
- Properly design and manage stockpiles of excavated soil– stability of the stockpile through preservation of 'safe' slope inclination and diversion of runoff from the area must be ensured;
- Adequately train staff on environmental protection and safety.
- Likelihood of impacts on soil during construction will be medium. Under condition that mitigation measures are implemented the magnitude of residual impact will be low.

Operation phase

In the operation phase, seasonal repairs/cleaning of drainage systems and water pipes is necessary. It is recommended to provide the observation in the project corridor in the initial years of operation. Based on the monitoring results, additional protection measures must be taken.

7.1.4 Potential Impacts on Air Quality

Construction phase

The major air quality issue during road construction is the production of dust during earthworks, storage and transportation of soil or other fine-grained materials (cement, sand,), and vehicles moving across unpaved or dusty surfaces. Dust is also emitted during the production of concrete, especially if good production practice for dust emissions mitigation is not followed. It is very difficult to accurately quantify dust emissions arising from construction activities. It is thus not possible to easily predict changes to dust soiling rates or PM10 concentrations.

Air quality during road construction will be also impacted by the emissions from construction machinery and heavy vehicles used for materials transportation, though it is strongly recommended to ensure appropriate technical service for the traffic fleet used in road construction.

As project corridor and existing road are mostly distanced and cross each other another in few sections the increasing the impact from construction machinery on air quality is less expected. Consequently, the cumulative effect caused by the traffic will not be significant.

In the zones near the residential areas large volume of earthworks or demolition activities are not planned. The secondary roads are well developed there and providing of alternative access routes to the

construction sites are not required that would significantly reduce the likelihood of significant impact on the atmospheric air which may arise from mobile sources of air pollution at different sites of project corridor.

Likelihood of impacts on air quality during construction will be high. Considering the measures to be implemented for mitigation of expected impacts the magnitude of residual impact will be low to negligible.

The primary activities that could generate air pollution include:

Cement silos - loading the cement from the bulk-cement transport unit into the silo and then its dosed delivery to the mixer for concrete production. The silos are equipped with standard fabric filters with the 99,8% efficiency and batching plants are closed systems. Accordingly, dust emissions into the ambient air are less expected. The calculated emission of inorganic (cement) dust mass is 0,0326 t/year;

Construction machinery parking area - the sources of emission are vehicles engines when starting, heating, moving, and idling. The main transport type causing emissions are excavators (3 units) and dump trucks (5 Units);

Diesel reservoir - The reservoir breather is the source of ambient air pollution during the storage of oil products (small breathing) and loading them (big breathing). The polluting substances from the diesel reservoir are Dihydrosulfides (Annual emission, t/year 0,0000044) and Alkanes C12-C19 (Saturated Hydrocarbons C12-C19 annual emission, t/year 0,001572);

Belt conveyor for crushing plant - transportation of inert materials is performed with an open belt conveyer, with the width of 1 m and total length of 10 m. The polluting substance from crushing and sorting units is inorganic dust (Annual emission, t/year 0.007776);

Inert materials supply and storage: during unload and storage of the bulk materials dust emissions are expected to take place. Expected annual emission inorganic dust, containing silicon dioxide of 70-20%, emitted during unloads is 0,072 t/year; and during storage will equal to 0,0031357 t/year;

Gravel supply and storage: during unload and storage of the Gravel dust emissions are expected as well. Expected annual emission inorganic dust, containing silicon dioxide of 70-20%, emitted during unloads is 0,1296 t/year; and during storage will equal to 0,00188142 t/year;

During operation of the construction camp(s), the impact on atmospheric air quality is less expected and will not exceed the legally established standard either at the border of a 500-m radius or at the nearest settled areas. Therefore, the value of negative impact from operation of the camps will be low. Despite this, the construction contractor is responsible to take relevant mitigation measures to reduce expected impact and realize the best construction practice.

Operation phase

During the operation phase, the ambient air emissions will be associated with the operation of engines. The following pollutants will be emitted: Nitrogen oxides (NOX), Small dust particles (PM2), Benzoil (BZL), Sulphur dioxide (SO2). Amounts of vehicle-emitted pollutants mainly depend on the technical condition of the vehicles, fuel quality and speed. Older vehicles usually have lower fuel consumption efficiency and cause higher emissions of combustion by-products.

A GHG emissions accounting assessment was conducted as part of the economic analysis of TC-GATE investments. Construction of the Highway is expected to result in a net reduction of GHG emissions over its operational lifetime compared to a without-project baseline. Specifically, the Project is expected to result in the cumulative avoidance of 36,075 tons of CO2 over 2025–2044, with a net present economic value of between US$322,363 and US$644,726, depending on the parameters used for the economic value of carbon.

The new alignment of the Highway will run quite far from the densely populated areas. A shift of the current traffic flows onto the new highway will reduce the impact of the traffic along the present road on the atmospheric air what is a positive impact.

After construction the Sagarejo-Bakurtsikhe section the max. Speed limit will be 110 km/h which was defined due to the geometric profile of the alignment and in accordance with the Georgian Law on “Traffic Safety” adopted in 2014 (speed limits correspond to the Georgian Design Standard for roads of international importance with daily traffic of more than 8 000 vehicles). The improved road capacity will result in an increased number of vehicles passing the route and in higher emission levels.

Dispersion of main pollutants emitted by traffic (CO, NO_2, and PM) was modelled aiming on evaluation and comparison of traffic induced air pollution along the Sagarejo-Bakurtsikhe road section. (Traffic emissions mostly depend on speed, vehicles technical condition and percentage of Heavy Goods Vehicles (HGV) in the traffic flow.)

Modelling results revealed that concentrations of CO, NO_2, and PM would not exceed the MAC and would be negligibly low as compared with MAC. Modelling results are given in **Table 33** Pollutant concentrations were evaluated at the border of the nearest residential house and in 500-m radius from road boundaries.

Table 33: Air pollution modelling results

No/Y	Pollutant	500 m radius	Nearest residential house	500 m radius	Nearest residential house	500 m radius	Nearest residential house
		2020		2030		2040	
Badiauri							
1	NOX	0.613113	5.844767	1.201172	12.210026	1.424328	13.960266
2	PM 2.5	<0.000	0.2123	<0.000	0.5062	<0.000	0.569658
3	BZL	<0.000	0.02	0.006243	0.050620	0.006407	0.05
4	SO2	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Mzisguli							
		2020		2030		2040	
N	Pollutant	On the border of a 500-m radius area	On the border of the nearest residential house	On the border of a 500-m radius area	On the border of the nearest residential house	On the border of a 500-m radius area	On the border of the nearest residential house
1	NOX	0.346874	3.70291	0.943342	7.792434	1.073351	9.213351
2	PM 2.5	<0.000	0.1166	<0.000	0.3	<0.000	0.3
3	BZL	<0.000	0.01	<0.000	0.030123	<0.000	0.03
4	SO2	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Kachreti							
1	NOX	0.4	6.823159	0.891884	7.714737	1.047665	9.674028
2	PM 2.5	<0.000	0.285841	<0.000	0.295098	<0.000	0.350097
3	BZL	<0.000	0.02346	<0.000	0.03	<0.000	0.03501

No/Y	Pollutant	500 m radius	Nearest residential house	500 m radius	Nearest residential house	500 m radius	Nearest residential house
		2020		2030		2040	
4	SO2	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Chalaubani 1							
1	NOX	0.1201	2.273076	0.203654	4.7466	0.248621	5.77342
2	PM 2.5	<0.000	0.1	<0.000	0.2	<0.000	0.2
3	BZL	<0.000	0.01	<0.000	0.02	<0.000	0.02
4	SO2	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Chalaubani2							
1	NOX	0.388267	0.748593	0.579126	0.944853	0.680258	1.157146
2	PM 2.5	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
3	BZL	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
4	SO2	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Bakurtsikhe							
1	NOX	0.502634	10.329552	0.726545	12.004419	0.532218	14.348109
2	PM 2.5	<0.000	0.469658	<0.000	0.498691	<0.000	0.615284
3	BZL	<0.000	0.03844	<0.000	0.04229	<0.000	0.050415
4	SO2	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000

Results of modelling enable to conclude that no specific air pollution mitigation measures are recommended for Sagarejo-Bakurtsikhe road section; however, it is advised to keep proper planning of greenery near settled areas.

Besides, it should be noted that the new Highway will run quite far from the densely populated areas and shifting the traffic flows onto the new highway will reduce the impact of the traffic along the alinement of present road on the atmospheric air, what is a positive impact.

Likelihood of impacts on air quality during operation will be high. Magnitude of the residual impact, according to the modelling, will be low.

7.1.4.1 Mitigation Measures

Construction phase

During the construction works, the following mitigation measures will be realized during the construction works to reduce the emissions of dust and combustion products in the atmospheric air:

- All facilities with stationary sources of emissions (e.g., concrete plant, aggregate crushing-sorting machine) should be registered and controlled by the MEPA according to the requirements the national legislation. The facilities should be located far from the settlements and equipped with appropriate filters, which should be permanently maintained;
- To reduce dust spreading, speed limitation of the vehicles and proper management of dust generating materials is required; where available, for the transportations alternative routes should be used;
- Idling of engines should be restricted;

- The technical condition of vehicles and machinery should be regularly controlled;
- During the transportation of materials and waste generating dust, across the settled areas or in wind, covered trucks should be used;
- Loading and unloading heights of the materials in the vehicles will be maximally minimized;
- All unpaved roads and significant areas with unpaved soil should be permanently watered, especially during dry and windy weather;
- Provide a wheel-washing facility and ensure that it is used by all vehicles before leaving the sites;
- Keep at least 300 m distance from residences windward to batching plants.

Operation Phase

Based on the best possible estimates, operation of the upgraded section of Highway between Sagarejo (Tokhliauri) and Bakurtsikhe will not cause tangible increase nuisance from dust and emissions. Overall, maintaining vegetation in the road corridor will serve as an effective tool for dust control.

7.1.5 Potential Impacts From Noise and Vibration

Potential impacts due to noise

Road construction will introduce additional noise sources to the local area. Road construction noise is caused by construction equipment and operations, i.e., there are two main sources of noise during the construction: noise resulting from road upgrading works, and noise from additional activities, such as transport of materials by Heavy Goods Vehicles (HGV) along the route. The dominant source of noise from the most construction equipment is the engine, usually a diesel, without sufficient muffling. Noise levels during the construction will vary depending on the construction activity and schedule. Noise levels induced by the main road construction equipment and operations are presented in in **Table 34**.

Table 34: Construction equipment noise emission levels

Equipment	Typical noise level (dB) approximately 15 m from source
Air compressor	81
Backhoe	80
Compactor	82
Concrete mixer	85
Derrick crane	88
Bulldozer	85
Grader	85
Jack hammer	88
Paver	89
Pile-driver (impact)	101
Pile-driver (sonic)	96
Pneumatic tool	85
Truck	88

Noise can be defined as unwanted sound. The sound pressure level emitted from any activity that can be heard by a receiver depends on a number of factors. The impact of the noise depends not only on the sound pressure level but on frequency spectrum, noise duration, time of the day, the activity causing the

noise, and the attitude of the receiver. All these aspects must be taken into account in assessing the impact of noise.

The noise levels under the state standards are specified Decree # 297/N of the MoILHSA on Proving the Qualitative Norms of the Environment dated August 16, 2001. The given Resolution sets both, the admissible levels, and the maximum admissible levels of noise for different zones. The Georgian standard requirements for noise in the residential and commercial areas is given in **Table 35**.

Table 35: The Georgian standard requirements for noise in the residential and commercial areas

Receptor	Time interval (hr)	Average admissible noise level (dB)	Maximum admissible noise level (dB)
Residential	7:00-23:00	55	70
Residential	23:00- 7:00	45	60
Commercial	24	60	75

As per the World Bank Group guidelines on noise management, the noise impact should not exceed the levels given in **Table 36.** and the maximum admissible increase in the background noise levels must be of 3 dB at the nearest receptor. Noteworthily, the national standards in Georgia apply to the allowable limits inside the buildings and premises, not on the building facades.

Table 36 : WBG Guidelines on noise level

Receptor	One-hour Laeq (dB)	
	During the day 07.00-22.00	At night 22.00 – 07.00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Consequently, the main sensitive receptors found in the project impact area are buildings and premises used, either temporarily or permanently, by the local population.

Noise propagation modelling was done for the buildings within the radius of 500 m from the source. The study of the project corridor identified six areas (Badiauri, Mzisguli, Kachreti, Chalaubani 1, Chalaubani 2, and Bakurtsikhe) with buildings and premises. Each building was given a number to facilitate their identification and demonstration of modelling results for concrete buildings (see maps in **Figure 61** below). No noise modelling was conducted in these locations for construction and operation phases. Other parts of the Highway pass near agricultural land plots and noise modelling was not undertaken in those areas.

Figure 61: numbering of buildings for noise modeling

Badiauri area 	Mzisguli area 
Kachreti area 	Chalaubani 1 area 
Chalaubani 2 area 	Bakurtsikhe area 

Noise propagation from Highway during the construction and in the operation phase

During construction phase, the main sources of noise are the construction and auxiliary equipment. The main sites of equipment operations are within the construction corridor. Noise propagation during highway operation will be related to car engine operation, tires and road surface friction, and loud signals.

During construction works, movement of trucks and operation of the equipment in the RoW will cause exceeding of the permitted noise level at 194 buildings. When implementing the works along sensitive receptors, the Contractor will need to take the measures set out in the following paragraphs of this ESIA report.

Upon entering of the Highway into operation, the permitted noise level will be exceeded at 89 buildings during daytime and at 113 buildings at night. As for the modelling results by 2030, which are based on quite a high projection of traffic growth along the Highway, the noise level is expected to exceed the established standard at 172 buildings at daytime and at 204 buildings at night. Numbers of affected buildings per segment of the designed Highway is provided below:

Table 37: Location of buildings under predicted excessive impact from noise propagation during Highway operation

Section Name	Settlement Name	No of buildings under daytime impact		No of buildings under night-time impact	
		By entering operation	10 year into operation	By entering operation	10 years into operation
Section IV	Mzisguli	0	5	0	0
Badiauri to Chalaubani	Kachreti	29	54	32	89
Section V Chalaubani to Bakurtsikhe	Chalaubani	8	20	7	13
Sections III through V Tokhliauri to Bakurtsikhe		37	74	39	102

Installation of noise-attenuating barriers is likely to considerably decrease the number of houses under excessive impact. For instance, installation of two 4m high barriers of 700m and 400m length in Badiauri area is expected to bringdown the number houses under daytime impact to 4 and under night-time impact – to 8. RD will use this information about sensitive areas and individual houses expected to come under noise impact to undertake targeted monitoring of actual noise levels once any given section of Highway enters into operation and apply respective mitigation measures based on the monitoring outcomes.

Due to the size of the existing road, sloping angles and turning radii, the traffic flows currently are interrupted, the load on the engines increases, drivers frequently use signals, etc. The highway reconstruction and modernization will positively affect the project corridor as noise sources will be limited. The operation of the modernized road will change the baseline noise favourably.

7.1.5.1 Mitigation Measures

Construction phase

Noise attenuation measures should be taken mostly near the settled areas. The noise propagation mitigation measures include:

- Construction Norms and Rules 2.05.03-84, 1.05.02-85 and 2.07.01.89 should be considered particularely, the roads of international and national importance, should where feasible, be routed to bypass settlements. Access roads to the settlements shall be provided to maintain connectivity. For future expansion and to minizmize environmental and social impacts, the minimum distance between the carriageway edge and residential areas (settlement) should not be less than 200 m, and not less than 50 m from agricultural land. Where, due to technical or economic constraints,

routing through a settlement is unavoidable, the minimum distance from residential areas should be 50 m, which may be reduced to 25 m where appropriate mitigation measures, such as noise barriers, are implemented. For local roads, the minimum distance to residential areas should be 50 m and to agricultural land 25 m.

- The stationery noise and vibration producing equipment must be located as far from the settled areas as possible.
- Relevant choice of noise sources: all on techniques and vehicles used in the construction activities must operate trouble-free. One of the most efficient ways to reduce noise caused by individual equipment is using less noisy equipment. By selecting and/or using less noisy equipment, noise can be reduced or eliminated in some cases.
- Suitable period: Intense construction works will be undertaken during standard working hours. Night shirts will be considered only in case of paramount State importance. Contractor will be asked to respect holidays.
- Concrete noise-attenuating equipment: when working near the settled areas, as necessary (based on the monitoring results and in case of claims of the population), the Construction Contractor takes concrete measures, in particular:
- Mufflers: Most construction noise originates from internal combustion engines. A large part of the noise emitted is due to the air intake and exhaust cycle. Specifying the use of adequate muffler systems can control much of this engine noise;
- Shields: Employing shields that are physically attached to the particular piece of equipment is effective, particularly for stationary equipment and where considerable noise reduction is required;
- Aprons: Sound aprons generally take the form of sound absorptive mats hung from the equipment or on frames attached to the equipment. The aprons can be constructed of rubber, lead-filled fabric, or PVC layers with possibly sound absorptive material covering the side facing the machine. Sound aprons are useful when the shielding must be frequently removed or if only partial covering is possible;
- Enclosures: Enclosures for stationary work may be constructed of wood or any other suitable material and typically surround the specific operation area and equipment. The walls could be lined with sound absorptive material to prevent an increase of sound levels within the structure. They should be designed for ease of erection and dismantling.
- Mitigation on the roadway: In some cases, for example in urban areas or along the isolated sections of the project, temporary barriers may be needed and profitable adjacent to the work site or along the RoW. The barrier can be a natural cover, temporary cover and/or permanent cover (shield). Temporary methods of noise reduction include the use of temporary and/or rolling stock (shield) in both specific and non-specific operations. Some types of moving shield can be moved without breaking or it can be mounted and dismantled for multiple times. One example of such a barrier is a noise-attenuating curtain with trailers, which is an easily removable, temporary noise-attenuating barrier system.
- Mitigation at the existing receptors: The noise mitigation measures near the receiver can be of varying complexity, ranging from overnight evacuation of residents to building isolation. Even if the mitigation measures are used, it may be impossible to predict the expected outcome and there may be no guarantee that the taken measures will give the desired outcome. Thus, a noise reduction method near the receiver is used only in extreme cases. However, sometimes different creative methods are quite efficient.
- Trainings: Contractors are required to participate in training programs on project-related noise requirements, specifications and/or equipment operation. Such training may be provided by either project management staff, invited consultants and/or equipment manufacturers or suppliers. For example, project staff (or project consultants) may train the contractor on construction noise measurement issues that may be necessary to meet the contract specifications. In addition to the additional mitigation measures proposed by the Contractor, the Contractor must take into account the standards generally used in the construction phase of any project.

Operation phase

Once a given section of the Highway enters into operation, RD will undertake monitoring of the actual noise levels by day and by night near the already identified sensitive receptors to confirm whether the established threshold is indeed exceeded. If confirmed, the Contractor will be asked to design and arrange relevant means of impact mitigation (e.g., noise barrier walls, strips of buffer vegetation, etc.). Improving noise insulation of buildings may be undertaken for those houses that may remain under impact despite installation of barriers. If residual noise levels continue to exceed the threshold, physical relocation of residential homes and businesses may be considered and negotiated with the affected parties.

The type of noise barriers will be selected by observing ISO 11654 requirements.

Green noise attenuating barriers comprised of trees and bushes are effective only if there is enough space for allocating wide strip of land for creating the plantation. Coniferous species have better noise-protecting properties than broadleaf species, and they remain functional in all seasons. Noteworthily, noise-attenuation effect of the greenery is felt only in the shade created by plants. This means that noise will be reduced only in a certain part of the territory behind the green barrier and predominantly in the lower levels of the landscape.

Mitigation measures may include provision of noise-protective windows for the affected houses.

After the application of mitigation measures, monitoring of noise levels should be continued for a while to prove effectiveness of the undertaken measures and adapt them as required in case of need.

7.1.6 Potential Impacts due to Vibration

Two main sources of vibration in the construction phase will be crushing equipment to be used for processing of natural construction materials and operation of construction machinery and equipment.

Passenger vehicles rarely produce perceptible vibrations resulting to significant structural damage. Generally, traffic induced vibrations are caused by heavy vehicles. The vibration is generated from the damaged surface of the road, namely: potholes, cracks, and uneven pavement joints.

Vibrations produce damaging stress waves that quickly reach building foundations, causing their vibration. Several factors may contribute to vibration levels, including road condition, vehicle speed, vehicle weight, soil conditions, building characteristics, vehicle suspension system, season of the year, and distance between the structure and the road.

Vibration sources such as construction activities and road traffic, are among the sources considered potentially dangerous to buildings and structures. In general, structural damages to buildings are extremely rare and are in general caused by other sources. Structural damages occur when the permissive levels of vibration are exceeded. Degrees of damage are methodologically defined and vary from those that do not affect the structural safety of the buildings but affect the value of assets – e.g., formation of cracks in the plaster, increase in existing cracks, damage of architectural elements etc.

The classification of damage categories used in analysis of vibration impacts is determined by ISO 4866 and is the following:

Damage threshold: Formation of cracks on the surfaces of the thread-like drywall, increase of existing cracks on the plaster surfaces or on the surfaces of drystone walls; also cracks in the mortar joints in the thread-like construction in brick and concrete;

Minor damage: Widening of cracks, detachment and fall of plaster or pieces of plaster drywall; formation of cracks in blocks of brick or concrete;

Major damage: Damage of structural elements; cracks in the support columns; opening of joints; set of cracks in masonry.

Within the scope of the project, the relief conditions of the zones near the residential areas do not need large scale earthworks or drilling and blasting methods. Vibration impacts will be noticeable only locally, near construction sites and they will not have a significant negative Impact on the population. Only factors of potential damage to buildings are considered, for which the construction contractor must carry out periodic monitoring along the sensitive sections.

7.1.6.1 Mitigation measures

Construction phase

Monitoring of vibration source is the most effective form of noise mitigation and involves controlling the noise before its emission reaches to potentially offensive noise levels. Construction noise is typically generated by two source types: stationary equipment; and mobile equipment.

The mitigation measures to reduce the impact caused by vibration include:

- Replacement of heavy machinery with lighter devices;
- Use of manual labour in particularly sensitive areas;
- Prohibition of the simultaneous use of more than one equipment being a source of vibration on the construction site.

It is essential that the examination of structural condition of buildings adjacent to the main worksites is undertaken by Contractor prior to commencement of works and the baseline is recorded. If damages and cracks are found, they will be photographed, measured, and marked with special tapes to track possible worsening during construction works. In case vibration causes damage of buildings, Contractor will evaluate it, compare with the baseline, and determine relevant corrective measures (e.g., refurbishment or other) to be offered and negotiated with the affected party. If it is impossible to assess and mitigate the damage, the measures for the damaged buildings and other premises established in RAP will be followed. Namely, the buildings will be compensated entirely at the full value notwithstanding the degree of impact in the given case.

Operation phase

Monitoring of vibration impacts on nearly houses may be required in case of large-scale rehabilitation works during Highway operation. RD will be responsible to compensate or cause the operation and maintenance contractor or works contractor to compensate damage to residential houses or other infrastructure in case if the connection between road works and damage to houses/infrastructure is established.

7.1.7 Potential Impact on Surface Water and Groundwater

Construction phase

This section describes direct and indirect impacts of the project on surface water and groundwater resources. The maps prepared during the Detailed Design were evaluated to identify and assess surface water drainage systems, floodplains, and groundwater resources in the study area. Each project activity was evaluated with respect to its direct and indirect impacts on hydrologic features, and these impacts are assessed in terms of potentially affected area, sensitivity of receptor, likelihood of occurrence, duration, severity of outcomes, etc.

The design corridor crosses or comes close to some important rivers of Eastern Georgia, including the rivers Chailuri, Lakbe and Chalaubniskhevi. The first two rivers are crossed by the design highway at one point, while the alignment follows the Chalaubniskhevi River either along one side, or another, within the limits of Gombori Ridge. Consequently, the main impact receptor is the Chalaubniskhevi River. In addition to the above-mentioned, the small gullies and irrigation channels can be reviewed as potential objects of the impact during the construction works.

The risks of impact during the works near the surface water bodies are mostly associated with unforeseen events, such as negligence during the earthworks, improper waste management, spills of products due to the faulty techniques and vehicles, etc. Besides, during the construction of the bridge piers (particularly where motor bridge to be built across the Iori River), the loose of materials through washing down into the water, may impact the rivers' turbidity, and may impact on water use by humans or wildlife and fisheries. Water turbidity may also increase as a result of sand and gravel extraction from riverbeds in the environmentally detrimental manner.

Compaction of roads and land clearing could increase surface runoff, which could reduce infiltration, and this in turn could affect groundwater. Finally, working near rivers or gullies, crossing small streams with vehicles and equipment could contaminate water with oil products and by increase erosion of streambanks and streambeds.

Spills of fuel, lubricants, paints, or other materials could contaminate surface water and/or groundwater directly or could contaminate soils that are then eroded into surface water.

Concrete works can also contaminate water and contribute excess alkalinity, which would make it less useful by people or wildlife.

The risk to groundwater is considered to be negligible, as only small and localized areas could be affected. The risk to surface water, however, is more of a concern since the corridor and roads will cross several rivers.

Pollution of surface and groundwater is expected as from the generated solid and liquid construction waste, operation and accidental spills of fuel and lubricants, as well as from household sources of liquid waste generated at the construction camps. Operation of concrete plants will generate large amounts of wastewater, which may become a major source of pollution of release untreated. Under the preliminary design, installation of piles in the river during the construction of bridges is not planned. Construction of bridges will imply works in the waterway and carry risks of intentional or accidental dumping of construction and household waste as well as construction vehicles and machinery being washed in or driven through the waterway.

Overall, an impact of the construction of the road on the environment may be assessed as medium or low. The impact will be temporary and reversible. In case the mitigation measures are realized efficiently, the value of impact will be low or insignificant.

Operation phase

Building up a strip of land on the banks of the rivers will limit to some extent feeding of groundwater with precipitation (rain/snow). However, the impact will be insignificant. Other expected impacts are also low and typical for the operation of any road. These include pollution of the highway corridor with the trash thrown from the passing vehicles, pollution with construction waste generated during maintenance works, and pollution with oil products and other contaminants carried by the storm water runoff. Accidents involving cargo vehicles may result in dumping or spillage of the carried matter, due to proximity of this section of the highway to the river, pollution may easily enter the watercourse. However, reconstruction of the Sagarejo-Bakurtsikhe highway section is expected to sharply decrease traffic accidents and minimize needs for road repair. Hence the risks of operation phase are considered low.

It should be noted that the highway alignment will be equipped with relevant drainage systems (See project description sub-chapter) and ensure the relevant drainage of the rain and ground waters and prevention of bogging the slopes adjoining to the alignment.

In the operation phase, the impact on water environment may be considered as low or insignificant.

7.1.7.1 Mitigation Measures

Construction phase

The contractor will be required to implement the following measures during construction, and will implement the relevant measures during construction activities:

- Final locations of the construction camps/areas should be farther than 50 meters from a flowing rivers/streams or saturated land unless the contractor demonstrates to the Supervision Consultant that there is no feasible alternative;
- The locations of the camps should be farther than 15 meters from the drainageway of a rivers/stream unless the contactor demonstrates to the Supervision Consultant that there is no feasible alternative;
- The machines/equipment and potentially polluting materials will be placed far from the surface water objects (50 m and more), on the sites protected from the atmospheric precipitations. otherwise, additional protective means will be used to prevent getting the pollutants in the water;
- Vehicles and equipment may not work within 50 meters of the rivers/streams or 15 meters unless a road is required to run beside or through the riverbed/streambed/drainageway;
- Efficient drainage and storm water systems will be used on the territories of the camps and construction sites to avoid impact on the ground water level, bogging local sites and pollution of surface flow;
- Use of construction equipment and machinery in good operational conditions;
- Vehicles and equipment may not cross rivers/streams when the ground is wet. Damage to riverbeds/streambeds caused at road crossings must be repaired as soon as major construction works are completed in the area. For road crossings on unimproved roads that must be used for extended periods, the contractor should use gravel or other material to harden the crossing and prevent damage to the streambed from vehicles and equipment;
- Wash vehicles at private car washing areas (where possible) or arrange washing areas far from waterbodies;
- For sanitation sewage pits/biological toilets, while for other types of wastewaters - relevant treatment facilities should be arranged, for instance, arrangement of sedimentation ponds in order to clean leakage from suspended particles and/or in case of arrangement of car wash facility, it should be equipped with the oil reservoir. In case of making decision on discharging the wastewater into the surface water bodies, based on the national legislation, a forecast and plan of maximum permissible discharge must be prepared and approved by MEPA;
- Sediment controls will be placed at the downhill/downstream boundary of the construction zone when there is a risk that sediment-laden run-off could leave the construction site and either damage vegetation or reach rivers or streams. Such controls could include sedimentation ponds, silt fences, and/or other measures;
- Run on and runoff will be diverted around or otherwise prevented from coming into contact with concrete, including waste concrete, until concrete is fully cured;
- Local surface water may not be used to wash trucks and equipment, including especially equipment, batching, and ready-mix truck washing and cleaning.

In order to prevent unforeseen contamination of surface/ground waters, following appropriate environmental measures shall be taken:

- Provide fencing along the perimeter of the oil products supply reservoirs to prevent the propagation of pollutants in case of emergency spills;
- Arrangement of fuel tanks and other potential sources of contamination away from surface water bodies as much as possible;
- Arrangement of water draining channels throughout the polluting sites perimeter; arrangement of road cover in dry weather;
- Providing of water impermeable layers for the storage sites of potential pollutants (oil products);
- Use buildings of a shed type to the extent possible in the potential rainwater pollution areas of the camps;
- In case of spills of oil/lubricants, localize/clean the spilled product in the shortest time;

- The appliances creating the risk of ground water pollution when in operation equip with drip pans;
- Fill on time the trenches left after the earthworks;
- Conduct water protect measures during the construction of the bridges, namely accomplishing earthworks with maximum caution to avoid instability of the soils, avoid loose of material and water increased turbidity;
- During the bridge piers construction, the construction ground located adjacent to the surface object will be isolated from the water current in the rivers with temporary embankments so that the continuous river flow is maintained as far as possible and to avoid its fragmentation;
- After the construction is complete, the temporarily used areas will be recultivated and the sanitary conditions will be restored, and attention will be paid to providing the stability of sides of developed slopes and embankments.

Operation phase

To deal with the impacts related to the operation phase, mitigation measures suggested for the construction phase shall be apply to maintenance works. Proper planning of rehabilitation works in the sections close/in the riverbed can be an effective measure for protection of the water environment during maintenance works. In addition to that, to reduce impact on the water environment while maintenance:

- Paving should be performed only in dry weather to prevent runoff contamination;
- Proper staging techniques should be used to reduce the spread of paving materials during the repair of potholes and worn pavement. These may include covering storm drain inlets and manholes during paving operations, using erosion and sediment controls to decrease runoff from repair sites, and using drip pans, absorbent materials, and other pollution prevention materials to limit leaks of paving materials and fluids from paving machines.

Finally, pollution of surface and ground water may occur from regular operation of the highway through direct release of drainage carrying heavy metals, oil products and garbage from the road surface. Road design was developed and may be further adjusted, to minimize the rapid direct discharge of drained water into rivers and streams. From a longer-term perspective, as the country progresses in the implementation of recommendations for EU approximation, regulations of the age and technical condition of vehicles will considerably steepen and control over the quality of fuel will enhance.

Likelihood of impacts on water during operation will be medium. Under condition that mitigation measures are implemented the magnitude of residual impact will be low.

7.1.8 Impacts from Waste Generation

Construction phase

The impacts from the waste generated during the construction phase will be related inappropriate waste management. Construction activities, including construction machinery and equipment exploitation and operation of the campsites will generate the following types of the waste: household, inert and hazardous. Inappropriate management of generated waste may result to:

- Waste spreading around the adjacent areas;
- Contamination of topsoil, soil, ground waters and surface waterbodies with wastes and leached;
- Generation and spread of odours;
- Hampered movement and negative visual-landscape changes;
- Risks to human health.

Non-hazardous waste (excess material generated from excavation, demolished structures, organic waste from vegetation clearance, etc.) does not pollute environment with chemical agents, but unless disposed properly, may cause erosion, waterlogging, loading of runoff with particulate matter and thus harm aquatic like in surface water bodies, deterioration of aesthetic value of landscapes, etc.

Recyclable materials include but are not limited to cardboard, concrete aggregate, excavated rock, soil (uncontaminated), green waste, wood/lumber, scrap metal.

Household waste will be generated from the operation of campsites and work bases (offices, canteens, etc.) and at work sites (e.g., plastic bottles and cans discarded by workers on site). Assuming that the quantity of domestic waste generated per capita per year totals 0.7m3and the n umber of personnel deployed at worksite at any given time is approximately 200, the approximate total amount of waste produced during the construction will be equal to 200x0.7=140 m^3/year.

Hazardous waste will be generated in the form of used automobile batteries, tires and oils and operational spills of oil products. Asbestos-containing waste may be generated if construction works require handling of pipes and roofing tiles of old buildings.

Operation

During operation of the Highway, roadside litter may accumulate (unfortunate practice). It is predominantly food waste, plastic, and paper that people fly tip. The roadside litter is extremely unsightly. Uncollected litter may attract vermin. It can impact animals that may get trapped or poisoned with litter in their habitats. Cigarette butts and filters threaten wildlife, as fish and birds often mistake this waste for food. Litter may end up in rivers and canals, and the last but not the least, the litter is also a road hazard that may occasionally contribute to accidents.

7.1.8.1 Mitigation Measures

Construction phase

To prevent the impact of the waste generated during the construction on the environment it must be collected and temporarily stored in the selected area with consideration of the requirements listed below. The inert waste must be placed so as not to interfere with free movement of machinery and staff, far from the surface waterbodies (at least within 100 m). The waste must be source-separated in order to ensure proper management and enable reuse. Until removal from the site, domestic waste (food waste, plastic bottles, packaging) should be collected in containers with fitted lid to avoid attraction of scavengers, release of odour and scattering by wind. The lids also protect waste from rain and snow.

In Georgia the municipalities are responsible for the collection and disposal of household waste. The household waste generated during the construction will be collected and delivered to the nearest landfills in Sagarejo and/or Gujaani, due to the contract with the Solid Waste Management Company of Georgia.

Since Georgia has no infrastructure for the final disposal of hazardous waste, such waste generated during works for construction of Highway shall be handed over to licensed companies for stabilization/deactivation and placement in temporary safe storage or processing for reuse in certain technologic processes as permitted by law. The area allocated for temporary storage of hazardous waste shall have special preventive measures implemented, in particular, containers shall have secondary containment and no mixing of hazardous waste with any other waste shall be allowed. Hazardous waste containers shall be checked for tightness. The containers should be labelled according to the waste hazard classes. The staff involved in hazardous waste management shall be trained in waste management and safety issues. The waste shall be removed every 3 days. Treatment, utilization, disposal of waste shall be carried out by an authorized contractor.

When forest resources are affected, management of timber is regulated by Law on the State Property. According to the latter and the Law of Georgia on the Forest Code of t Georgia, wood/timber must be stored in the area indicated by the forestry authority and disposed according to the rules set in governmental regulations on approval of the rules for forest use. Upon decision of the forestry authorities. Finally, the wood/timber may be handed over to the municipality based on acceptance-submission certificate and subsequently and, by decision of the municipal authority, distributed to the residents.

Surplus soil disposal site must be selected with consideration of the national environmental regulations. Topsoil management must comply with requirements set in the Government resolution #424, dated December 31, 2013, on topsoil removal, storage, use and re-cultivation.

Sites of temporary storage of excess material should be agreed with the local municipalities. Site for permanent disposal of excavation spoil and other excess material will be selected by local municipalities and agreed with MEPA. Reuse of spoil material for the needs of construction is planned. Potential users of soil/spoil material will be identified to reduce the amount of permanent storage. Permanent disposal site management and re-cultivation plan must be developed whether appropriate.

Excavated soil can be used on site and/or for grading of disturbed areas after completion of construction works. Exact balance will be calculated as a part of the detailed design. According to preliminary estimate material can be fully utilized.

Impact of generated waste on environment during construction can be mitigated by proper storage, maximum reuse, and timely removal of unusable waste to the agreed location.

Contractor will be obliging to develop and provide detailed waste management plan.

If during construction asbestos-containing pipes or building with asbestos-containing roofing tiles are identified, procedures of their collection, removal and final disposal must be accomplished by using internationally accepted methods and requirements specified by Technical Regulation on Special Rules for Collecting and Treatment of Hazardous Waste approved by GoG in 2016 through the Resolution №145.

Operation phase

Although administrative penalties for littering have been introduced in Georgia, controlling litter accumulation along highway remains challenging. Public awareness and education represent one of the most effective means of reducing littering. In this regard, the following measures are recommended:

- Ensure that the community is aware of the range of ways to dispose of their waste correctly;
- Educate the community that littering is illegal, fines apply, and behaviour are monitored, inform the community of the level of fines that littering incurs;
- The signs may be suitable for placement in a series of two to four signs at 10 km intervals to repeat the message in different ways.

Management of Highway waste during operation, including waste from periodic maintenance works, will be responsibility of operation and maintenance contractor hired by RD.

Household waste that will generate from the marketplace to the provided as an alternative for roadside vendors currently operating along the existing road corridor will be managed by local municipality. This arrangement will be documented in the Memorandum of Understanding to be signed between RD and Sagarejo municipality.

7.1.9 Potential impacts on biological environment

The impact of the project on the biological environment is expected in several areas, namely:

- Habitat loss-fragmentation;
- Impact on flora and vegetation during the cleaning of project areas and land works;
- Direct and indirect impacts on the faunal environment, including ichthyofauna and their habitat while working near water bodies;
- Impact on protected areas and protected species characteristic of those areas.
- Habitat loss and/or fragmentation
- Habitat loss at construction phase

When assessing habitat loss as a result of road construction, the types of habitats present in the project corridor and their value, as well as the size of the impact area should be taken into consideration. Based on the data derived from desk-top research and the information collected in the field, the designed corridor of Highway crosses two basic types of habitats:

1. Plain-hilly arid-denudation type habitat, including agricultural lands and anthropogenic meadows with small ravines, in some places with shrubs and windbreaks. Most of this area is currently intensively cultivated and under heavy anthropogenic impact. Part of the area is used for grazing and has minimal high-growing vegetation. This habitat is passed by the designed Highway corridor from Tokhliauri to Chalaubani (Section IV). A small patch of such habitat is also present near village Badiauri where the Highway corridor bypasses a hilly terrain. It is noteworthy that in the described habitat, where it is crossed by surface water bodies, small communities of plants characteristic of the floodplain are found. However, such locations are heavily transformed from anthropogenic impact and their separation as a self-standing type of habitat is considered irrelevant.
2. Foothill oak-hornbeam forest habitat; according to EUNIS terrestrial habitat classification - G1.A1 Quercus-Fraxinus-Carpinus betulus forest on eutrophic and mesotrophic soils. This type of habitat is crossed by the designed corridor of the Highway as it leads to Gombori Ridge (Section V). A small patch of this habitat is located to the South from village Chalaubani as well.

At the end, the designed corridor of the Highway passes through the Bakurtsikhe settlement and populated areas around it, which is transformed under the anthropogenic impact to the extent that it does not support any wildlife.

In summary, the designed corridor passes predominantly heavily transformed habitats, good part of which is cultivated for crops. Areas under lighter anthropogenic impact and natural habitats are present in Highway section V leading to Gombori Ridge. Considering the length, width, and respectively – the environmental footprint of the Highway corridor, it is possible to estimate the habitat loss in quantitative terms (**Table 38**).

Table 38: Construction Impacts Resulting in Habitat Loss

Habitat Type	Road Section Passing through Given Type of Habitat				Total Area of Habitat Type in Georgia (according to the monograph "Spatial-temporal analysis of Georgian landscapes") (ha)	Habitat Loss (%)
	Approximate Length (m)	Approximate Width (m)	Approximate Area (ha)	Approximate loss (ha)		
Habitat 1 (transformed) Plain-hilly arid-denudative, agricultural lands and meadows with heavy anthropogenic impact	40 000	35	140	140	114,000	0.12
Habitat 2 (natural) - Foothill oak-hornbeam forest habitat which, according to the EUNIS terrestrial habitat classification, belongs to G1.A1 Quercus - Fraxinus - Carpinus betulus forest on eutrophic and mesotrophic soils - Mukhtar habitat which, according to EUNIS Terrestrial Habitat Classification, belongs to G1.A1 Quercus - Fraxinus - Carpinus betulus forest on eutrophic and mesotrophic soils.	6 000	75	45	45	51,000	0.088

According to the data presented in the table, as a result of the project implementation, low-value plain-hilly agricultural type habitats are mainly affected. Its degree of anthropogenic is very high and is not distinguished by the uniqueness of the constituent components of biodiversity. Such habitats cover quite large areas of the region and only 0.12% of them will be lost.

The oak-hornbeam forest habitat is relatively valuable, however, only a small section of the project route of about 6 km located in Chalaubani-Bakurtsikhe part of the project area will pass within it. The loss of this natural habitat will affect up to 45 hectares, that makes 0.088% of the total area of oak-hornbeam natural habitat present in this region of Georgia.

Overall, the impacts caused by habitat loss can be assessed as low or medium significance. The project does not require analogous habitat restoration or other significant mitigation measures to compensate for the loss. Carrying out standard mitigation measures under appropriate control conditions will ensure that residual impacts are minimized.

Habitat alteration and fragmentation at construction phase

In addition to habitat loss, some habitats will also undergo habitat change. Such impacts are expected in the affected areas, where there is no need for permanent habitat development, although they will be used temporarily to arrange construction camps and landfills. It should be noted that the sites selected for the arrangement of temporary infrastructure will not be large areas and are similar, low-cost habitats. After the completion of the construction works, it is planned to recultivate such areas and restore them to their original condition. The risk of invasion and infestation of invasive and adventitious plant species in the project area is not high.

As for the probability of habitat fragmentation: areas with the same structural composition are represented on both sides of the assimilated track. The construction corridor does not separate different types of habitat. In addition, the project area does not represent a significant migratory corridor for terrestrial animals. Therefore, the fragmentation of habitats will not be significant in the construction process.

Operation phase

No additional direct pressure on local habitats is expected during the operation phase of the road. The probability of fragmentation of the habitat in the presence of road gaps (cuts, holes) is relatively important at this stage of the activity. As a result, some species of animals will face a certain barrier to moving over a large area in order to obtain food or for breeding. The project envisages the arrangement of rectangular pipes in the appropriate places of the road, which will be designed for the animals as underpasses to ensure the corridor from one side of the road to the other. The same function will be performed to some extent by the infrastructure for transverse drainage (pipes, canals). It is also noteworthy that four main bridges and other small aqueducts will be constructed on the section leading to the Gombori Ridge. Such design solutions will further reduce forest-type habitat fragmentation.

Impact mitigation measures

As mentioned, the project is planned to be implemented mainly in low-value habitats. Consequently, there is no need for biodiversity offsets. It is important to protect the boundaries of the corridor for the road during the construction works, as well as the area of the equipment and vehicles.

It is important that after the completion of the works, especially the slopes treated on the section leading to the Gombori Ridge, proper fortification and reclamation works are carried out in order to facilitate the natural restoration of the habitats.

Culverts designed along the Highway provide sufficient crossing for animals at the operation phase.

Impact on vegetation

Construction phase

Direct as well as indirect impacts on vegetation and floristic environment are expected during the construction of the designed Highway.

The direct impact is the clearing of the road alienation strip from vegetation expected only in the fifth sector. As mentioned above, 28,241 adult (8 cm and more in diameter) trees will be affected. The main part of them comes from the section leading to Gombori ridge.

Quantitatively distinguished is the brush Carpinus orientalis (12,184 root), which is not a high value plant. Relatively valuable species: Quercus iberica oak and Carpinus caucasica hornbeam will be removed from the environment in the amount of 6,090 and 5,369. In addition, 124,205 rootstocks of different species with a diameter of less than 8 cm are affected.

It should be noted that according to the taxation conducted, no species of the Georgian Red List is directly affected in the project corridor.

Indirect impacts on vegetation are also expected. For example: contamination of the surrounding areas with construction material waste; damage / compaction of soil during construction, spillage of oil products; emissions of harmful substances into the ambient air. However, due to the low sensitivity of the species presented in the corridor, the impact of such a species will not be significant.

In general, it can be said that the vegetation cover of most parts of the corridor is not distinguished by high value both in terms of species and quantity. From the starting point of the corridor to the village Chalaubani (Section IV), mainly the cultivated and secondary species will be affected directly. Impacts on plant species composition can be assessed as of low significance. No mitigation or compensation measures for the floristic environment will be required in this area.

Moderately valuable species of Quercus iberica (oak) and Carpinus caucasica (hornbeam) occur in the Highway section between villages Chalaubani and Bakurtsikhe (Section V). Quite a large number of specimen belonging to these species will be affected. The impact on vegetation in this part of the corridor can be assessed as moderate. Therefore, the implementation of mitigation measures should be given special attention during construction and operation of the Highway in this Section. It is important that the slopes treated after completion of works are properly recultivated to maximize the natural restoration of vegetation and habitats. During works, the construction site boundaries will be observed in order to prevent excessive damage of vegetation. Extraction of trees for clearing the roadbed will be agreed and overseen by the NFA or municipality, depending on whether activity is undertaken in the State Forest or outside of its boundaries. Compensation for the extracted trees will include payment to the State budget as per national legislation.

Operation phase

The risks of vegetation damage-destruction during the operation phase of the road are minimal. Possible indirect impacts may be related to dust and emissions caused by traffic movements, contamination by surface runoff. Pollutants from the road surface may have an impact on the development of green space. It is important that in the initial years of operation of the road (2-3 years) the monitoring section of the Gombori ridge is established to control the restoration of vegetation on the treated slopes and to take additional measures if necessary.

7.1.9.1 Mitigation Measures

Construction phase

- Protecting the boundaries of the project corridor to prevent excessive damage to plants;
- Specimen of protected species (in case such need emerges during construction) will be removed from the environment in accordance with the requirements of Article 24, paragraph 1, f) of the Law of Georgia on the Red List and Red Book of Georgia, in agreement with the MEPA;
- Habitat offset will be undertaken to achieve no net loss of natural forest habitat on the estimated 45 ha by planting forest with the same composition of species or restoring a heavily degraded

area of a similar habitat on the area no less than 45 ha. Professional oversight on forest afforestation/restoration will be provided for quality assurance and arrangements will be put in place for proper maintenance;
- Proper reinforcement and reclamation of the cultivated slopes, especially on the section leading to the Gombori Ridge, after the completion of the works, using a fertile soil layer. If possible, carry out artificial planting works in the roadside area with local species of trees and plants.

Operation phase

No direct impact on the flora is expected during the mains operation phase. Indirect impacts may be related to dust and emissions from traffic, contaminated surface runoff (contaminants introduced from the road surface may affect green pavement development and soil organisms). The requirements set for the construction phase (mitigation measures) will be observed during the repair works.

Direct and indirect impact on fauna

Construction phase

Both direct and indirect impacts on fauna species are expected as a result of road construction. Damage and death of animals as a result of land works and various activities (for example: traffic collisions, falling into ditches, etc.) should be considered as a source of direct impact in the construction process. As a result of earthworks, habitats (nests, holes,) may be destroyed. Vegetation reduction will also affect the food base.

Impacts are mainly on small mammals: different species e.g., rodents. However, in terms of possible impacts on mammals, there is also a section of the Gombori ridge, where we can meet such valuable species as: marten (Martes sp.), Forest cat (Felis silvestris), Caucasian squirrel (Sciurus anomalus). However, it should be noted that the existence of these species has not been confirmed during field studies. Quite a few species of large mammals are known from the project area, some of which are protected by the International and National Red List as well as various conventions, although the project area is not particularly attractive and, based on literature study and interviews with local population, they are very rarely noticed here. Their main refuge seems to be the border protected areas that surround the road. Consequently, these species will be less affected.

In addition, birds will be affected. Although the section of the corridor leading to the village Badiauri is approaching one of the areas of the important bird area, the risks of significant impacts on the highly endangered bird species have not been confirmed during the fieldwork. Impacts on birds will be mainly noticeable during the construction of the outlet section in the abovementioned forest zone. Appropriate measures need to be taken to mitigate the impact.

In different parts of the corridor, the terrestrial turtle (Testudo graeca -VU) can be inhabited with the same success, which can be endangered, it is necessary to take appropriate precautions against it.

Indirect impacts include:

- The spread of noise, dust, and combustion products from machinery, as well as intensive human activities will cause animal distress and migration to other areas;
- Unsystematic distribution of waste and improper management of wastewater (consequently changes in the quality of the environment) will lead to deterioration of the living conditions of terrestrial and aquatic animals. Lethal cases will also occur;
- Night lighting systems on construction camps can cause animal alarm and disorientation of birds;
- Poaching facts may also occur on the part of service personnel.

Possible impact on ichthyofauna

In terms of possible impacts on ichthyofauna, the sections of the project corridor that intersect or pass in the vicinity of surface water bodies are distinguished. However, as studies have shown, none of the

crossing water bodies are distinguished in terms of ichthyofauna diversity. It should be noted, however, that the project does not involve segregation of river streams or arrangement of retaining structures within it, which could lead to fragmentation of ichthyofauna habitats. Indirect impacts are expected, which are related to the increase of turbidity in the water near the beds (during the arrangement of piers) and the entry of various pollutants into the water.

Temporary impacts on aquatic habitats and species may also include the discharge of wastewater from construction camps into the river and the release of small amounts of pollutants from other construction operations.

In general, negative impacts on fauna species are expected in several directions. However, population decline in none of the species, which may alter the degree of their conservation, is to be expected. Nevertheless, it is necessary to conduct construction work in the context of appropriate mitigation measures, as well as post-construction reclamation work, to mitigate the impact to some extent. After the completion of the construction works, certain types of impact sources (construction camps, equipment, construction personnel) will no longer exist, which will facilitate the return of some species to their old habitats.

Operation phase

After the commissioning of the road, some sources of direct and indirect impacts on wildlife (eg land and construction works, camps, etc.) will no longer exist. However, the intensity of traffic will increase. Consequently, the risks associated with collisions with animals and the spread of noise will increase. Appropriate mitigation measures will be taken in this regard.

In addition, the possible impact of the night lighting system on birds is considered. The lighting systems used according to the project will be directed as much as possible towards the surface of the road. In general, night lighting systems will not have a significant impact on birds.

Impact mitigation measures

Construction phase

- Protect the boundaries of the work area to prevent damage to additional areas;
- Inspection of the indicated project corridors at the stage of preparation and identification of animal habitats (nests, huts) in the corridors;
- Limitation of machinery and transport speeds;
- Enclosing pits and ditches with brightly coloured objects to prevent animals from falling into them;
- Operational filling of pits and ditches. Prior to excavation work, it is necessary to inspect the pits to rule out the possibility of animals in them;
- Cover small boards on ditches that animals can jump on;
- Minimal use of light in construction camps at night;
- Proper waste management;
- Taking measures to mitigate noise, emissions, and water pollution;
- Explain to service personnel the importance of species' conservation and the sanctions applicable in case of infringing environmental legislation;
- Carrying out reclamation works after the completion of construction works.

Operation phase:

- Arrangement of underpasses will be provided to reduce the impact caused by habitat fragmentation;
- Regular collection of waste accumulated along the road;

- Mitigation measures (designed for the construction phase) will be taken into account during the maintenance (repair) of the road, which will reduce the emission of harmful substances and water pollution.

7.1.10 Impact on Protected Areas

The project corridor does not run in the vicinity of areas protected by national law. One of the corridor areas is close to the Iori Region IBA. However, as the field verification showed, it is very different from the type of habitat (floodplain forests) for which the IBA was nominated. The affected area is an anthropogenic area. Therefore, it can be said that the project will not affect the areas protected by international conventions either.

Summary of impacts on the biological environment

Based on the above, below is a summary **Table 39** providing the following information by species:

- Expected impacts as a result of project implementation;
- Source of impact;
- Estimated area of impact;
- Planned mitigation and compensation measures;
- Period of mitigation and compensation measures.

The construction contractor will take biodiversity impact mitigation measures in accordance with the information in the Table which will ultimately ensure that the expected impact on biodiversity is minimized as a result of the project implementation.

Table 39: Biodiversity Impact Summary and Mitigation Measures by Species

№	Receptor	Impact characterization	Sources of impact	Area of impact	Mitigation measures	Period
1	Plant pulp Species, them Among the red List types	Direct impact - Plant species from the environment Removal / damage;	Project corridor Clean-up; Land works	Project road corridor Especially Botanical Research Identified in the process Of average value Adjacent to plots places.	Removal of protected species from the environment "Red List of Georgia and the Red Book of Georgia Article 24, paragraph 1 of the Law, F) in accordance with the requirements of subparagraph; Protecting the boundaries of the work zone	On the preparatory stage
Mammals						
2	The otter (Lutra lutra) is protected by the Bern Convention however Gardabani candidate is not included in the standard data form of the precinct	There are no habitats for this species in the project corridor Fixed. The probability of impact is minimal and not Require targeted mitigation measures	-	-	-	-
3	Wolf (Canis lupus) and the tortoise (Canis aureus) (observed In the field research), fox (Vulpes vulpes), forest cat (Felis silvestris), marten (Martes sp.) Also, badger, roe deer, wild boar These	Direct impact: Possibility of damage to habitats (sororities) as a result of earthworks and cutting of slopes; Transport collision, falling into nuts and injury.	Cleaning the project corridor from wood and vegetation; Land works; Transport operations.	Sections with less anthropogenic load in the project corridor	Pre-tracing of the work area; Protect the boundaries of the work area to prevent damage to additional areas; Protection of traffic routes and speeds of vehicles; Fences, ditches, and similar elements are fenced with barriers to prevent animals from falling into them - e.g. I had a large ribbon of discrete color and any flat material;	Before starting work; In the process of works; During transport operations; In the process of earthworks;

	species are known from the bordering protected areas				Placing planks in pits and trenches for easily trapped animals; Thorough inspection of ditches and pits; Carry out reclamation measures, including restoration of fertile soil layer	Before filling ditches and pits; Upon completion of the works
		Indirect Impact: Concern and migration due to noise propagation in other areas and other anthropogenic factors; Impact on the relatively small mammals that feed on these species; Cases of poaching.	Noise caused by construction works; Works, concrete works, use of various contaminants, waste; Poaching by service personnel	Sections of the project corridor with less anthropogenic load, including the section mainly on the Gombori Ridge	Implement the noise mitigation measures given in the ESIA report; Protection of plants from impact; Protection of the environment from pollution, Proper waste management; Explain the importance of the species to the service staff and in bad faith in connection with the relevant sanctions in case of action;	During the works, especially the land in the process of works; During the works, constantly; Conduct training before starting work
4	Caucasian squirrel (Sciurus anomalus)	Direct impact: Habitats (large Possibility of damage to trees, windows)	Cleaning the project corridor from vegetative cover	Exit section to Gombori Ridge	Pre-tracing of the work area; Protect the boundaries of the work area to prevent damage to additional areas; A preliminary, thorough inspection of affected areas to identify large bluetongue trees in these areas; Construction personnel should be instructed that they are not allowed to be killed or otherwise exposed if this species is detected, but They must be allowed to escape from the area while carrying out the work. In the extreme case, their Concern should be expressed only by allowing animals to escape the corridor. If an animal is Accidentally stuck in the work area, workers must find a way for him to escape unharmed from the area;	Before starting work; In the process of work; on each Start work on the construction site; Throughout the project cycle; Throughout the project cycle, especially Before cleaning the corridor

					Protection of the Georgian environment in case of detection of Caucasian squirrel (Sciurus anomalus) Inform the Minister of Environmental protection and Agriculture of Georgia and take further actions according to their instructions.	
		Indirect Impact: Concern and migration due to noise propagation in other areas and other anthropogenic factors; Cases of poaching.	Noise caused by construction works; Works, concrete works, use of various contaminants, waste; Poaching by service personnel	Exit section to Gombori Ridge	Taking noise mitigation measures; Protecting plants from excessive impact; Protection of the environment from pollution, proper waste management; Explain to service personnel - the importance of the species and unscrupulous in connection with the relevant sanctions in case of action;	During the works; During the works, constantly; Conduct training before starting work
5	Bats, including species protected by the Bern Convention	Colonies and habitats (caves, caverns) of these species were not observed during the research. Indirect impacts are mainly expected: Concern and migration to other areas by noise propagation and other anthropogenic factors; other areas By noise propagation and other anthropogenic factors;	Noise caused by construction works;	Project corridor; especially, old buildings where bats may have lived;	Implement the noise mitigation measures given in the ESIA report; Explain to service personnel the importance of the species and the appropriate sanctions in the event of dishonesty; Pre-tracing of the work area;	During the works, especially during the earthworks; Conduct training before starting work; Before starting work.

6	Other small terrestrial mammals, mainly rodents,	Direct impact: Possibility of damaging habitats (sororities) as a result of cutting trees, clearing grass cover, earthworks and cutting slopes during the road clearing process; Transport collision, falling into nuts and injury.	Cleaning the project corridor from vegetation; Land works; Transport operations.	The whole of the project road Length, perimeter of dumps;	Protect the boundaries of the work area to prevent damage to additional areas; Protecting traffic routes; Preliminary, thorough inspection of affected areas to determine areas of concentration of small animals in these areas; Fences, ditches, and similar elements are fenced with barriers to prevent animals from falling into them - e.g., Tin, polyethylene, etc. Placing planks in pits and trenches for easily trapped animals; Thorough inspection of ditches and pits; Carry out reclamation measures, including restoration of the fertile soil layer.	In the process of works; During transport operations Before starting work on each construction site; In the process of earthworks; Before filling ditches and pits; Upon completion of the works
		Indirect Impact: Concern and migration due to noise propagation in other areas and other anthropogenic factors; Reduction of food base due to vegetation cleaning; Soil and water pollution; Poaching and vandalism by service personnel.	Noise caused by construction works; Works, concrete works, use of various contaminants, waste; Poaching by service personnel	Along the entire length of the project road	Take noise mitigation measures; Protecting plants from excessive impact; Protection of the environment from pollution, Proper waste management; Explain to service personnel the importance of the species and the appropriate sanctions in the event of dishonesty	During the works, especially during the earthworks; During the works, constantly; Conduct training before starting work
Birds						

7	Relatively large birds of prey	Direct impact - not expected. However, it is not excluded that they may temporarily enter the area of impact and disturb them indirectly: Concern and migration due to noise propagation in other areas and other anthropogenic factors; Impact on small mammals/reptiles that feed on these species; Cases of poaching.	Noise caused by construction works; Poaching by service personnel.	Along the entire length of the project corridor. Especially the section leading to the Gombori Ridge	Implement the noise mitigation measures given in the ESIA report; Protect small mammals from impact; Explain to service personnel the importance of the species and the appropriate sanctions in the event of dishonesty.	During the works, especially during the earthworks; Throughout the project cycle; Conduct training before starting work
8	Small birds, including birds of prey, blackbirds, sparrows	Direct impact: Possibility of damaging habitats (nests) Cutting down trees, clearing grass cover, land as a result of works and cutting of slopes;	Cleaning the project corridor from vegetation; Land works.	The entire length of the project road, especially the section leading to the Gombori Ridge	Pre-tracing of the work area; Protect the boundaries of the work area to prevent damage to additional areas; Preliminary, thorough inspection of affected areas to identify bird nests and other shelters; Service personnel will be instructed that it is not permissible to kill representatives of the fauna, but they should be allowed to escape from the area for work; In extreme cases their concern should be expressed only by giving the animals a corridor to escape;	Before starting work; In the process of works; Before starting work on each construction site; Throughout the project cycle, especially Before cleaning the corridor and

					Prohibition of any direct impact on trees with bird nests in the period from April to July; Carrying out reclamation measures, including measures to restore the fertile layer of the soil	starting the earthworks; April-July period; Upon completion of the works
		Indirect Impact: Concern and migration to other areas Noise propagation and other anthropogenic by factors; Reduction of food base due to vegetation cleaning; Environment pollution; Poaching and vandalism by service personnel.	Noise caused by construction works; Poaching and vandalism by service personnel	Along the entire length of the project road	Taking noise mitigation measures; Protection of trees and vegetation from impact; Explain to service personnel sanctions applicable in case of infringing environmental legislation.	During the works, especially during the earthworks Throughout the project cycle Conduct training before starting work
Reptiles						
9	Various species of reptiles (their potential habitats are vegetated areas along the existing road. Red-listed species: Mediterranean turtle (Testudo graeca)	Direct Impact: Damage to attractive shelters; Direct impact due to equipment collision, trench failure and/or other causes. Indirect Impact:	Cleaning the project corridor from vegetation; Earth works; Transport operations; Poaching by service personnel.	Along the entire length of the project road, especially areas covered with high grasslands and riverside	Pre-tracing of the work area; Construction supervisors (supervisors) should be informed about the visual characteristics and behaviour of turtle species; Construction personnel should be instructed that they are not allowed to kill or otherwise expos this species if	Before starting work; Before starting work; Before the start of the works and during the works;

		Concern and migration with noise propagation to other areas and other anthropogenic Poaching/vandalism by staff direct impact: damage to attractive shelters; direct impact due to equipment collision, trench failure and/or other causes. Indirect Impact: Concern and migration due to noise propagation in other areas and other anthropogenic factors; Poaching/vandalism by staff			detected, but they should be allowed to escape from the area for work; In extreme cases, their concern should be expressed only by allowing the animals to escape the corridor. If an animal is accidentally trapped in a work area, workers must find a way to let them escape unharmed from the territory; Protect the boundaries of the work area to prevent damage to additional areas; Carefully inspect the perimeter of the area to be treated (especially the area covered with grass) to identify turtle individuals or their habitat; If this species is detected, if it does not extend beyond the impact area, a similar type of habitat should be found outside the perimeter of the project corridor and turtle individuals should be released into the wild; Thorough inspection of ditches and pits; Protection of the environment from pollution, proper waste management; Carry out reclamation measures, including restoration of the fertile soil layer.	In the process of works; In the process of works; In case of detection of these species; Before filling ditches and pits; Constantly during the works; Upon completion of the works;
Amphibians and aquatic biodiversity						

10	Amphibians	Direct impact: damage to attractive habitats for amphibians (small puddles, riverbanks) Indirect impact: water and soil pollution	Earthworks, concrete works, use of various polluting materials, waste;	Along the entire length of the project road, especially water In the vicinity of facilities, when arranging bridge piers	Pre-tracing of the work area; Protect the boundaries of the work area to prevent damage to additional areas; Preserve puddles temporarily in the trail after passing cars on the road, or maximize water accumulated as a result of snowmelt on the roadsides during the amphibian breeding season. Before disturbing such places, the animal should be given a corridor to escape. Thorough inspection of ditches and pits; Protection of the environment from pollution, proper waste management; Reclamation measures, including soil Conduct fertile layer restoration measures.	Before starting work; In the process of works; When working the land, especially in the spring; Before filling ditches and pits; During the works, constantly; Upon completion of the works
11	Fish and aquatic living organisms	Direct impact - not expected; Indirect impacts due to the risks of deteriorating water quality due to mismanagement of waste, discharge of wastewater into the river and intensification of erosion processes in the coastal zone	Land and riverbank works; Construction of bridge piers; Use of contaminants, waste; Functioning of construction camps.	River crossing areas (bridge construction sites)	Take measures to reduce erosion processes along the riverbank;	In the process of earthworks

7.2 Socio-economic Impacts

Construction of Kakheti Highway will have a positive impact on Georgia's economy overall. Modernization of Sagarejo-Bakurtsikhe segment of the S5 Highway, as a part of the program to upgrade the major roads of the country launched by the GoG, will contribute to improvement of transportation and transit of goods between surrounding countries, which is a significant outcome for GDP growth of the country. Road construction may have some negative impacts too (nuisance from dust, noise, vibration; loss of roadside businesses and property/land/harvest). Most negative impacts of the construction phase will be limited in time, confined to the areas in immediate proximity to construction sites, and reversible. Impacts from land take and physical relocation are more complex and require greater effort to duly mitigate and compensate.

7.2.1 Involuntary Resettlement

Impacts and mitigation measures related to land acquisition and relocation, as well as restrictions on business and land use, are covered by Highway section-specific RAPs developed by RD using services of ILF CONSULTING ENGINEERS in cooperation with AECOM Ltd. As mentioned in project description (Chapter 3), the Highway segments between Sagarejo and Bakurtsikhe were divided into three sections (III, IV, and V), and three independent RAPs were prepared for each one. RAPs are consistent with the requirements of the World Bank's ESS5 on Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement.

The following impacts from involuntary resettlement are documented in RAPs:

- Impacts on various types of land parcels
- Impacts on auxiliary structures
- Impacts on fruit-baring trees and vineyards
- Impacts on field crops
- Impacts on businesses

Information about the number of Affected Households (AHs), resettled households, businesses, Affected Persons (APs) and their vulnerability and severity is summarised in the **table 40**. below. The details are available in RAPs.

Table 40 : Data on affected households, persons, and businesses

Impact Receptors	Lot 3	Lot 4	Lot 5
AHs to be physically relocated	2	2	15
AHs/APs	330/1 316	373/1,496	95/373
Businesses (roadside shops)	0	2	21
Severely impacted AHs	310	362	84
Vulnerable AHs	14	16	7

7.2.1.2 Mitigation Measures

RAPs prepared for each section of the Kakheti Highway provide requirements and rules for assessing expected impacts and determining relevant mitigatory/compensation measures and conducting negotiations with affected persons. RAPs include compensation of AHs at a full replacement cost of-, or lost land, or assets, and provide them assistance to improve or at least restore their living standards and livelihoods to pre-project levels. Other objectives of the RAPs include:

- Avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring project design alternatives;

- Avoid forced eviction;
- Mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use by: (a) providing timely compensation for loss of assets at replacement cost and (b) assisting displaced persons in their efforts to improve, or at least restore, their livelihoods and living standards, in real terms, to pre-displacement levels or to levels prevailing to the beginning of project implementation, whichever is higher;
- Improve living conditions of poor or vulnerable persons who are physically displaced through provision of adequate housing, access to services and facilities, and security of tenure;
- Conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to enable displaced persons to benefit directly from the project, as the nature of the project may warrant;
- Ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected;
- Economic opportunities of local population.

Certain negative impact during construction works will occur due to propagation of dust, noise and vibration, and temporary restriction of free movement from the project related activities, as well as limitation of access to agricultural land and vineyards.

Once the new Highway is constructed, make-shift trading stands located along the existing road will lose their current function, change their profile, and focus on local people. At the same time, some local small businesses will benefit by the provision of services to construction workers (food supply, small maintenance works, etc.). In case contractor decides to rent accommodation in the villages for all or part of workers instead of running dorms at the construction camp, this will provide additional temporary income for local communities. However, negative impacts during construction phase may occur due to failed expectations of employment for local residents.

To resolve challenges related to the reduction of local small businesses, agricultural trading points (mini markets) will be arranged along the new Highway. This approach has already been applied in Georgia: an agricultural market was built at the side of Ruisi-Agara section of the East-West (E-60) Highway, where the locals rent space and sell their products to the Highway travellers. The World Bank has commissioned a Socio-Economic Study for Improving Local Market Development Opportunities in the Sagarejo-Badiauri section of Kakheti Highway. The study was undertaken by DEPA Consulting and delivered in September 2021. It identified a need for upgrading the existing arrangements at some existing trading points and providing a new infrastructure for an agricultural mini market nearby the newly constructed Highway.

7.2.2. Health and Safety Impacts

Both, in construction and operation phases, health and safety risks associated with the project may be categorized in the following way:

- Accidents and emergencies
- Health damage from exposure to harmful working environment
- Health damage from environment pollution with project-related emissions and discharges
- Spread of communicable diseases
- Impacts on community health and safety
- Construction phase

Presence of workers in the construction area and nearby settlements, movement and operation of construction vehicles and machinery, emissions and discharges from construction, generation of hazardous waste, unrestricted access to worksites, careless storage of construction materials and waste may be harmful to health and safety of local communities. Workers temporarily residing in the construction area may get in conflict with permanent residents due to cultural, ethnic, religious differences and behavioural patterns. Gender-based violence may occur. Likelihood of spread of sexually transmitted and infectious diseases, including COVID, may increase. Water borne diseases may erupt among

workers and spread out in case of poor quality of water supplied to work camps and work sites and poor sanitation (lack of decent toilets, poor arrangements for observing personal hygiene, etc.). Movement of contractor's cars and equipment through local roads may disrupt regular traffic and increase likelihood of traffic accidents. Noise and dust from movement and operation of machinery will be nuisance to local residents and may aggravate/cause health issues among some. Poorly demarcated, fenced, and guarded construction site may be intentionally or accidentally penetrated by people who should not have access to these sites, including children. Roaming cattle may also get into the territory of construction sites. External presence at construction sites carries significant risk of health damage, and life loss. Construction materials and temporarily stored construction waste kept outside demarcated and fenced construction area may lead to trauma and traffic accidents. Finally, if pollutants harmful to human health are released from the construction sites in the form of emissions, discharges, or solid waste, local communities may face increased health risks with temporary or long-lasting consequences.

Operation phase

Community disturbance will decrease considerably upon completion of works. However, new traffic on the constructed road will become a source of noise in the locations not affected in the past. At the same time, traffic will tangibly reduce in the current alignment that will turn into a local road and nuisance to residents along the old road will drop. Modern design and furniture of the new Highway will result in higher traffic safety and lesser emissions from individual vehicles, although traffic stream is expected to increase over time. Presence of pedestrians and animals on the Highway is life-threatening and strictly prohibited. Attempts to cross the Highway, move domestic animals on the carriageway or Highway shoulders, and drive agricultural machinery or animal-powered transportation means on the Highway may lead to deadly accidents.

7.2.2.1 Mitigation Measures

Construction Phase

Construction contractor will be obligated to adopt an Environmental and Social Code of Conduct, acquaint all workers and personnel with it, and have them sign off the document. Provision of the Code will include principles of safe, peaceful, and respectful co-existence of workers with local communities. RD, through the supervision consultant, and construction contractor will establish communications with local law enforcement authorities so they are aware of the influx of workers, including where they will be working and where they will reside, and can take appropriate precautions. Based on prior experience from similar projects, the risk of GBV under this project is assessed to be low. Most construction works will be undertaken away from residential areas. Majority of labor force is expected to be recruited from local communities or other parts of Georgia. Over the last fifteen years, Georgia has progressively strengthened its legislation, institutional capacity, and services in support of GBV survivors, and enforcement mechanisms, introducing clearer definitions and penalties for sexual violence and harassment. Nevertheless, a number of mitigation measures will be taken to prevent GBV-associated risks, such as sensitization for project employees and communities and adoption and monitoring of Code of Conduct for all project workers.

Construction contractor will prepare and agree with the affected settlements programs of works and traffic management plans. Population will be informed about any disruption in the provision of utility services caused by construction works and about timing and duration of particularly noisy or otherwise disturbing activities. Warning signs and fencing will be installed to ensure no entry to construction sites by people external to the construction company. Working hours, in particular during operation near the residential areas will be observed. Noise, dust, and harmful emissions will be reduced by implementation of mitigation measures. Waste disposal in general, and especially the disposal of harmful waste, will be undertaken exclusively in agreement with obtained permits and concluded handover agreements.

Construction contractor will develop an Emergency Response Plan to be able to promptly respond to incidents that may lead to industrial emissions and spills, fire, and other events threatening human and environmental health. If damaged by movement of construction machinery and vehicles, will be restored

by contractor prior to quitting the site. Restoration should bring the local roads to at least the original condition or upgraded as feasible.

Operation phase

To ensure wellbeing and good health of residents in a few settlements closest to the Highway that may be exposed to excessive noise impacts, Roads Department will undertake monitoring of actual noise levels at day and night once the Highway becomes operational. Construction of noise barriers, planting of noise breaking green shields, and other mitigation measures will be designed and implemented as need may be, relocation of the affected households being the final resort. Guardrails and other Highway furniture will be installed to limit entry of the carriageway by pedestrians, unauthorized transport, and roaming animals.

7.2.3 Impacts on Health and Safety of Workers

Workers are exposed to worksite risks which always exist but vary depending on housekeeping practices, observance of occupational health and safety rules and standards, and more broadly – on labour management by contractor. Informal employment of workers puts them at risk of unfair treatment and payment, exploitative working regiment, insecurity in case of illness and trauma, discrimination, and abuse. If personal protective equipment is not provided or workers are not trained in its use, severity of damage in case of incidents increases. The likelihood of incidents increases if contractor has no adequate capacity to assess worksite risks, organize activities the way to decrease worker's exposure, train and inform workers, give them safety guidance, and enforce observance of instructions. Failure of contractor to monitor working conditions, reveal locations with unsafe environment, and timely remove workers from the zone of danger may lead to the loss of health and life. Damage and casualties in case of emergency situations depends on the existence of physical means to address these emergencies and awareness of personnel of the course of rapid action.

7.2.3.1 Mitigation Measures

Environmental and Social Code of Conduct as well as Labour Management Procedures are the documents that construction contractor will be obligated to develop, agree with the employer, and implemented throughout the contract life. These documents require that employer concludes a formal contract/agreement on employment with every worker, so that conditions of such agreement protect ensure fair and regular remuneration, standard working and resting times, and other working conditions essential for workers' wellbeing. RD, as project implementing entity, is responsible for monitoring and ensuring compliance with national labour laws and LMP. This includes monitoring and, where necessary, applying remedial actions, in order to cause all contractors and sub-contractors to ensure compliance with national labour legislation and requirements of the project LMP. The LMP covers vulnerable workers, gender, unskilled labour force, migrant workers, locally recruited workers from an ethnic minority, workers with disability or with health conditions that require accommodation or specific preventive measures, among others. Code of Conduct prohibits any type of discrimination, child labour, and forced labour, and so does the Labour Code of Georgia. Each worker will be provided with health and life insurance.

Contractor will be held responsible for establishing and effectively operating contractor's Grievance Mechanism, so that workers are given a channel of communication to raise their concerns in case of unfair treatment, unsafe working environment, and other issues.

Contractor will develop and implement worksite management plans in line with the national legislation and the relevant provisions of EHSG of the World Bank. Adequate sanitation, potable water, decent dormitories and canteens, rest areas, toilets, medical services will be provided to workers following these plans.

Works contractor will develop, agree with supervision engineer, and implement an OHS Management Plan. The Plan will detail procedures, institutional responsibilities, required materials and technologies, and training schedules for ensuring safety at worksites. OHS risk assessment at each worksite will be mandatory. Toolbox conversations will be held with workers at the beginning of their shift. PPE will be

provided, and its use enforced. First aid medical kits will be present at worksites and their expiry dates tracked. Exposure of workers to worksite hazards, such as excessive noise, high concentration of pollutants in closed spaces, etc. will be monitored by instrumental measurements and people will be removed from a danger zone immediately upon exceedance of thresholds.

Emergency Response Plan will be in place to have a readily available blueprint of action in case of life-threatening incidents. These plan, among other arrangements, will include institutional arrangements and necessary contact information for relevant national authorities, emergency services, and medical facilities.

Workers' training on OHS will be planned, organized, and delivered on regular basis and records of training data will be stored on file.

7.2.4 Expected Impact on Agriculture

The designed corridor of the Highway is located in land-rich region of Georgia and loss of the agricultural plots will not have a high negative impact on the agricultural activities there. Even a positive impact is expected in the exploitation phase: the improved transportation conditions create good realization prospects for the agriculture.

The construction and exploitation of the transport infrastructure may constrain the driving of cattle to the pastures to some extent. In order to avoid the farmers' limited access to the resources, this issue will need to be considered, and the construction be duly organized. The project must envisage the provision of the relevant passages for domestic animals along the relevant road sections (highways crossing the road) in the exploitation phase.

The project highway corridor from the river Lochini to village Sartichala, is crossed by 5 control valves of the upper main channel of Zemo Samgori irrigation system (G-6, G-7, G-8, G-9, G-10) and by Chumatkhevi riverbed, which is used by "Georgian Amelioration" Ltd. to discharge water from the upper main channel to the lower main channel as additional supply. The project road from village Sartichala to village Kakabeti crosses the left main channel of Kvemo Samgori irrigation system in 4 points. Therefore, the possible impact of the project implementation on the irrigation water resources must be considered. The impact may occur in two directions:

- Limited access to the irrigation water in the period of active irrigation;
- Deterioration of irrigation water quality.

The impact on irrigation water quality is associated only with unforeseen cases. For example: negligence during the earthworks, improper waste management, spillage of oil products due to malfunction of equipment and vehicles, etc.

7.2.4.1 Mitigation Measures

The design solutions for the intersections of the irrigation system and the project highway will be agreed with Georgian Amelioration Ltd. Implementation of construction works at such intersections should be implemented according to the agreement conditions. The construction work on such sites should be accomplished in the passive agricultural season. In the course of the works to accomplish during the irrigation season, would not result to interruption of water supply. According to the project, the capacity of irrigation facilities will be maintained in the operation phase and the users will not have any problem with irrigation water supply. For this purpose, relevant communication will be established between the Roads Department and "Georgian Amelioration" Ltd. for the whole project cycle.

To avoid impact on irrigation water quality is contractor will be required to make relevant precautionary measures. discharge all kinds of wastewater into the irrigation water channels will be prohibited and supervised by the supervisor. On the other hand, all mitigation measures designed to protect surface water quality will be implemented.

7.2.5 Expected impact on local infrastructure

The following crossing points of the project road with the infrastructural communications were identified:

- Different voltage power transmission lines;
- Regional and local roads;
- Railway line;
- Irrigation channels, and
- Underground pipelines (including natural gas pipelines), etc.

7.2.5.1 Mitigation Measures

The following technical solutions were suggested for the utility relocation:

- Relocation and reconstruction of utility lines should be agreed with the provider, and implemented with strictly adhered to the requirements and standards of the provider;
- The utility lines running parallel to the road alignment should be relocated beyond the borders of the impact corridor, parallel to the road;
- The utility lines crossing the road laterally, ducts, culverts, etc. should be laid in the road cross section for safety of other utilities.

7.2.6 Expected Impacts on Historical and Archaeological Monuments

The project corridor does not intersect with any of the visible, immovable cultural heritage, and works will not hinder access to any monuments of history and culture or places of worship. Hence, no tangible impacts is expected during the construction or operation of the Highway.

In respect of cultural heritage and archaeology, the probability of the appearance or damage of invisible resources (those in the ground) is much reduced by the specific nature of the design corridor as it will mainly run across the agricultural plots where the ground is intensely cultivated. Despite this, the chance finding of the archaeological artifacts cannot be excluded and the preventive measures against the damage of the artefacts in the deep earth layers with the historical value must be taken.

7.2.6.1 Mitigation Measures

In case of a chance find, Contractor as well as supervision Engineer are obligated to immediately cease all physical activity on site and promptly inform RD. The Contractor is responsible for the notification to NACHP under the Ministry of Culture. Upon receipt of the notification, NACHP takes the lead in handing of the case through providing any instructions for immediate consideration to Contractor; dispatching professionals for rapid assessment and evaluation of the site; planning and undertaking actions required for securing the site and retrieving finds subject to transportation; safely packing and removing such finds from the site; conserving the site for future in-depth excavations and research if need be, for the arrangement of archaeologic park if the site can become a touristic attraction, or handing over the site to RD for the resumption of works. In case the site requires further archaeologic study or is designated as an object of immovable cultural heritage, RD will commission design changes so that the Highway alignment is adjusted to bypass the given site. Under any circumstances, Contractor shall await a formal clearance from the Ministry of Culture for the resumption of works.

RD has experience in following the above course of action gained during the implementation of the Third East West Highway Improvement Project. Archaeologic finds from 3rd to 1st centuries BC made during earth works under that Project have become a valuable asset of Georgia’s historic heritage, and a small archaeologic park is open for visitors at the side of the Highway.

Contractor will be required to include chance find handing procedure into C-ESMP and deliver respective training to workers involved in earth works.

Table 41: Summary environmental and social risks and adverse impacts

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & duration of impact	Significance
Landscapes and views				
Residents near construction site	Low	Alteration of current view over the landscape	Low permanent	Negligible
Tourists/travellers/visitors	medium	Reduction of aesthetic value of landscape due to road infrastructure	Medium permanent	Minor
Land use				
Residential areas	High	Land take and relocation from current places of residence	Medium	Moderate
Forests	High	Forest vegetation clearance in the RoW	Medium permanent	Moderate
Natural protection areas	High	No direct impact. Highway infrastructure may become visible from some spots of Emerald Sites	Very low permanent	Negligible
Areas protected for cultural or natural heritage	High	No direct impact. Highway will become visible in the distance from some monuments.	Medium permanent	Moderate
Agricultural land used for annual crops	Medium	Impact on private land plots within the buffer zone	Medium permanent	Moderate adverse
Agricultural land not cultivated	Low	Impact on private land plots within the buffer zone	Medium permanent	Minor adverse
Perennial crops	High	Impact on private land plots within the buffer zone	Medium permanent	Minor
Soil and geodynamics				
Soil under construction camps, construction sites and nearby	Medium	Degradation due to compacting, operational spills, reduction of revegetation ability	Medium over extended period	Moderate
Cut slopes	High	Erosion and triggering of landslides	Medium over extended period of time or permanent	High
Air quality				
Population in the vicinity of the Highway	High	Fugitive dust generation during construction and maintenance Emissions from construction vehicles and machinery	Medium temporary Low permanent	Moderate Minor

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & duration of impact	Significance
		Emissions from vehicles driving through the Highway		
Vegetation	Medium	Fugitive dust settling on plants and interfering with growth	Low temporary	Negligible
Noise				
Population in the vicinity of the Highway	High	Moderate nuisance during construction and slight nuisance during operation	Medium temporary Low permanent	Moderate during construction Minor during operation
Fauna within 100-200m	Medium to High	Significant disturbance	High temporary	Moderate
Vibration				
Old rural houses located in proximity to construction sites	High	Exacerbation of ongoing deterioration, worsening of structural integrity, cracking	Medium to high permanent	High
Water bodies and water supply				
Rivers	Low to Medium	Sedimentation of rivers/gullies from erosion due to soil disturbance Disruption of flood flows due to congestion Contamination from spills Sand and gravel extraction from the riverbanks	Low to medium temporary	Moderate
Groundwater	Low to Medium	Reduced recharge due to compaction of soil Contamination from spills Reduced availability due to extraction	Low temporary and permanent	Minor
Irrigation service users	High	Disruption of water supply if works are undertaken in the irrigation season where Highway intercepts irrigation infrastructure	Medium temporary	Moderate
Flora				
Common tree and shrub species	Medium	Extraction of specimen within the RoW	Low permanent	Minor
Tree and shrub species of conservation value	High	Extraction of specimen within the RoW	Medium permanent	Moderate
Habitats				
Natural habitat	Medium	Reduction of area of the natural forest habitat, where crossed by the Highway;	Medium permanent	Moderate

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & duration of impact	Significance
		Reduction of biodiversity value in the vicinity of the Highway due to disturbance.		
Modified habitat	Low	Further reduction of biodiversity value from anthropogenic impact	Low permanent	Negligible
Fauna				
Common species of terrestrial fauna	Medium	Animal death due to crushing or direct impact. Worker interference with animals or nests. Abandonment of home territories due to construction disturbance. Nest abandonment/disruption of breeding animals due to construction disturbance. Change in species composition due disturbance.	Medium temporary Low permanent	Minor
Terrestrial fauna of conservation value	High	Animal death due to crushing or direct impact. Worker interference with animals or nests. Abandonment of home territories due to construction disturbance. Nest abandonment/disruption of breeding animals due to construction disturbance. Change in species composition due to disturbance.	Medium temporary Low permanent	Minor to Moderate
Bats	High	Loss of hibernating and nesting places in mature trees	Medium over extended period	Moderate
Migratory birds (raptors, waterfowl, wading birds)	Medium	Disturbance during construction and operation of Highway	Medium temporary Low permanent	Minor to Moderate
Large birds (raptors, cranes, etc.)	Medium	Disturbance during construction and operation of Highway	Medium temporary Low permanent	Minor to Moderate
Community health and safety				
Local communities	Medium to High	Worker influx: community disruption, crime, spread of infectious disease Accidents caused by the movement of construction vehicles and machinery, poor demarcation and fencing of worksite, improperly piled construction materials and waste Nuisance from disproportional use of security personnel or inappropriate behaviour of security personnel	Medium to High temporary	High

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & duration of impact	Significance
		Health damage from polluting emissions and discharges, and from poor waste management by contractor		
Physical and economic displacement				
House owners	High	Giving up the place and house of residence Inconvenient of adjusting to new place of residence and altered livelihood	Medium to High temporary Low to Medium permanent	High
Landowners	Medium to High	Giving up the currently owned and used land Inconvenience of adjusting to land use in a new location or to alternative investment of resources received in compensation	Medium temporary Low permanent	Moderate
Vendors	Low to Medium	Temporary loss of income Readjustment to new modality of roadside trading	Medium temporary	Moderate
Workers' health and wellbeing				
Personnel of construction contractor	High	Worksite trauma or loss of life Permanent decapacitation, disability, or health damage Illness from waterborne or other infectious disease contracted at work camp/accommodation Suffered discrimination, unfair treatment, SEA/SH	Medium temporary to High permanent	High
Public infrastructure				
Local roads, railroad, irrigation schemes, water, power, and gas supply lines	Medium	Damage to communications in or nearby the Highway RoW from the operation of construction vehicles and machinery	Medium temporary	Moderate
Cultural heritage				
Chance finds	High	Damage or destruction of an archaeological site or individual artifacts	High permanent	High

7.3 Cumulative Impacts

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities.

Multiple and successive environmental and social impacts from existing developments, combined with the potential incremental impacts resulting from proposed and/or anticipated future developments, may result in significant cumulative impacts that would not be expected in the case of a stand-alone development. The main goal of the cumulative impact assessment and management is to identify the combined action on the valued environmental and social components and specify the measures to reduce such impacts.

ESIA process defined the valued environmental and social components (VESC) to be considered in cumulative impact assessment. VECS have significant implications for regional economy; people residing in the impact zone are sensitive to these components; and sustaining VESC is important for preserving environmental health and long-term sustainability of ecosystem services. VESC are sensitive to impacts from various sources of origin which spread beyond the location of a given physical activity, are felt over the extended period of time, and amplify upon overlapping. Cumulative impacts relevant for the construction and operation of Kakheti Highway are emissions, noise and vibration, discharges, degradation and loss of forests and natural habitats, cultural heritage, and employment and other economic opportunities for the affected population.

Assessment of cumulative impact

Cumulative effect caused by the emissions in the atmospheric air, noise, and vibration

The impacts of emissions, noise and vibration will occur as a result of the implementation of the projects to consider. Impacts are typical in both, the construction and operation phases, although the sources and area of impact are different.

According to the calculations given in the ESIA reports, the impacts caused by emissions, noise, and vibration both, in the construction and operation phases will be mainly local by their nature and the approximate area of impact for each source does not exceed a radius of 1-2 km. Besides, the use of noise barriers along the sensitive sections for the considered projects is proposed, what will further reduce the value of long-term impacts. It should also be noted that the probability of the construction periods of the projects coinciding in time.

Following the above-mentioned, there will be no overlap of time and even spatial limits of impacts caused by emissions, noise and vibration during the implementation of the considered projects. Consequently, the value of the cumulative impact can be assessed as very low or insignificant.

Cumulative impact on surface and ground water quality and water resources

The considered road infrastructure will be built within the boundaries of two large, independent watersheds - River Iori and River Alazani. At several locations, the Highway intersects small and large rivers of these catchments including Mtkvari, Lotchini, Chailuris Tskali, Chailuri, Lakbe and Alazani. The Highway also crosses main and secondary canals of irrigation schemes.

None of the projects envisages the use of significant water resources during the construction. The construction of bridges will apply the technologies that are less harmful to the aquatic environment, in particular, significant separation of water flows and construction of artificial barriers are not planned during the construction of the piers. The works will be accomplished during the low-water period, what further reduces the likelihood of impacts on water quality.

It is particularly noteworthy that none of the projects envisages the construction of tunnels. Consequently, there will be no impact on groundwater quality and resources.

To summarise, the impact on the water environment may be mainly related to unforeseen cases. The watersheds which are main impact receptors belong to separate catchments basins and therefore, the likelihood of combined impacts on them is low. If the quality of implementation of the mitigation measures proposed by ESIA report will be controlled to the extent possible within the scope of each project, there will be no significant impact on surface and groundwater quality/resources either for any particular Project, or in cumulative terms.

Cumulative impact on soil fertility, stability, cultivation resource and quality

The value of cumulative impact may be assessed as average. In order to mitigate the impact within the scope of the reviewed projects, it is necessary to establish a permanent control to manage and maintain the topsoil layer.

The project corridors will mostly run across the agricultural lands of Kakheti Region. Also noteworthy are some sections that cover the forest zone with quite valuable soil resources like along other sections. An important measure to mitigate the impact on soil resources is advance stripping of the topsoil in the project corridor and its subsequent use for the recultivation works. As per the EIA reports, the estimated amount of stripped topsoil for all four projects is 255 thousand m3. The impact on soil quality is mainly associated with unforeseen events during the construction phase.

The value of cumulative impact can be assessed as average. In order to mitigate the impact, within the scope of both projects, maximum control to manage and maintain topsoil layer is necessary.

Cumulative Impact on geological environment

The project roads will be constructed mainly over a plain terrain with mostly satisfactory engineering-geological conditions. No high-risk areas in terms of hazardous geodynamic processes are observed in the construction corridors. In this regard, Section V within Sagarejo-Bakurtsikhe part of the Highway running across Gombori Ridge should be taken in consideration. The relevant slope protection measures will be needed for these locations. The given risks have been considered during the project detailed design and relevant reinforcement measures by considering the pre-calculated slope stability coefficients was proposed for them.

The risks of embankment deformation formation in certain areas are notable. According to the relevant assessments the replacement of unsuitable ground was included in the project design.

Overall, the geological environment is not a highly sensitive receptor, and the value of cumulative impacts will not be high. Surely, it will be necessary to properly monitor the operations envisaged by the project and the EIA reports.

Cumulative Impact on biological environment

The projects mostly cross the agricultural habitats and meadows covered with shrubs and grasses of a low value. According to the estimates given in the EIA reports, the total loss of this type of habitat for both projects is approximately 250 ha making only 0.7% of the given type of habitats in the region.

Besides, the valuable modified floodplain habitats and foothill oak-hornbeam forest habitats at some locations (mainly at the intersections of water bodies and at the intersection of Gombori Ridge) will be under the impact. The total loss of this type of habitat is about 40 ha making only 0.01% of the total area.

Overall, the cumulative effect caused by the habitat loss will be of low value. After completing the works, the planned re-cultivation works will further mitigate the above-described effect.

The vegetation cover affected by the projects is not distinguished either in terms of quantity, or species. Only two Red-Listed species will be affected: 1 walnut tree (Juglans regia L) and 1 iguana hackberry

(Celtis glabrata). Important species include oak (Quercus iberica) and hornbeam (Carpinus caucasica), although these species are affected only along the section running across Gombori Ridge of Sagarejo Eastern part-Bakurtsikhe. Therefore, the cumulative impact on them will be the case.

Significant wildlife habitats within the scope of the project will not be affected. In this regard, the section running across Gombori Ridge of Sagarejo Eastern part-Bakurtsikhe is noteworthy. However, this area has quite high degree of anthropogenicity. According to the ESIA Reports, there are several areas where the Red-Listed species of Georgia may be directly affected: the Greektortoise (Testudo graeca (VU)), the Caucasian squirrel (Sciurus anomalus), etc. However, particular mitigation measures are proposed for the projects during the construction works.

None of the projects crosses the areas protected by national law or international conventions. Consequently, no direct impact will be the case. As the ESIA report states, the impact on the protected area is low and there is no need for special mitigation measures.

Overall, the cumulative impact on the biological environment will be low and no special mitigation or compensation measures are needed.

Employment and economics

If the projects in question are implemented simultaneously, or even separately, they will have a significant positive cumulative impact on the employment and the increased income in the region. The total number of the employees during the construction works will be 400 or 500. This can be a simultaneous, or continuous impact over time.

The development of the road network will increase trade, tourism and trips to neighbouring countries what will significantly improve the employment and the economic activity, as well as job opportunities.

Overall, the implementation of the projects in question will have a significant positive cumulative impact and will increase the incomes of the local population.

Cumulative Impact on cultural and historical-cultural monuments

The projects will not have any impact on significant historical-cultural sites and monuments. Following the specificity of the project corridors, the probability of impact on archaeological monuments is low. Cumulative impact may be assessed as low.

7.4 Residual Impact

None of the residual impacts will be of the value higher than average if the mitigation measures under the present ESIA report and other issues specified by the project are efficiently implemented. The need for taking the compensation measures within the scope of the project is minimal.

Under residual impacts, the social-economic impacts have been assessed. According to the feasibility study conducted in 2017 for Upgrading of Tbilisi-Bakurtsikhe and Tsnori-Lagodekhi Road, impact on agricultural land and especially impact on the vineyards having specific importance for the region have been identified as significant, as the Highway is located in Kakheti Wine production zone. Parts of the Highway corridor runs along the Manavi microclimatic zone characterized with specific varieties of grapes. Gurjaani microclimatic zone, located near village Bakurtsikhe is the second important one. During detailed design, all recommendations of the feasibility study were considered, and routes were selected and optimised to avoid impacts on vineyards to the extent possible.

The project will have significant impact on agricultural and residential other lands as well as on business. The compensation for resettlement and land acquisition and additional allowances for vulnerability and severity, as determined by the RAPs developed for the three separate sub-sections of the Sagarejo-Gujaani section of S5 Highway, will help to AHs in livelihood restoration. Currently, the RAPs is subject to update. More than 50% of land and assets are already successfully acquired from the owners. Asset valuation approach was agreed with all stakeholders. During public consultations, people affected with

involuntary resettlement stated that they are satisfied with unit prices and compensation amounts proposed to them. Also, they find livelihood restoration process described in RAP fair and reasonable. Therefore, provided that implementation of RAPs carries on in the current manner, residual impact on socio-economic environment will be low.

8. Environmental and Social Management and Monitoring Plan

Following the requirements of the national environmental legislation of Georgia and the World Bank's ESF, an important component of an ESIA report is the ESMP. It determines environmental and social requirements for project implementation and RD has overall responsibility for its implementation. ESMP consists of environmental and social mitigation plan and environmental and social monitoring plan. Mitigation Plan provides guidance to on what is to be done for avoiding or reducing negative impacts, as well as how, when, and where should these actions be undertaken. In the construction phase, Contractor is the party to apply most of the measures included in the mitigation plan. In the pre-construction and operation phases, Contractor is not on board, and other parties are identified as those responsible for the mitigation of negative impacts.

Table 8.1 carries Environmental and Social Mitigation Plan applicable to the construction of Kakheti Highway between Sagarejo (Tokhliauri) and Bakurtsikhe. It was developed to clearly identify measures that must be implemented to avoid, reduce, or mitigate potential moderate and major adverse impacts identified in the ESIA. It also identifies best management practices and other mitigation measures that will minimize, reduce, or eliminate many of the impacts of minor or even negligible significance which could escalate to become more important if they are not handled properly. It is expected that mitigation measures will be sufficient to reduce all risks to acceptable levels. In many cases, the ESMP requires development of detailed plans to manage specific risks and hazards and includes an overview of the relevant requirements of those plans. Primary responsibility for implementing mitigation measures during construction will rest with Contractor, although RD will have responsibility for some of the actions. All activities of Contractor, including implementation of mitigation measures, will be overseen by the Supervision Consultant (also known as the Supervision Engineer). RD is also responsible for ensuring that RAP is fully implemented, and the implementation report is cleared by the financier of works prior to authorizing mobilization of Contractor to a given construction site.

It is important to note that RD, in part through its Contractor, will also be responsible for complying with relevant requirements of the national legislation of Georgia, the World Bank's ESF, General EHS Guidelines of WBG, and the EHS Guidelines for Highway Construction.

RD will be responsible for the implementation of RAPs in each section prior to clearing mobilization of Contractor into a given worksite. RAP implementation report for Section III shall be cleared by the World Bank prior to the commencement of Works.

Table 8.2 provides the Environmental and Social Monitoring Plan. It is a tool for exercising close scrutiny over environmental and socioeconomic performance of project activities at all stages. Monitoring results will prompt corrective actions in case issues are identified. Regular monitoring will allow to address emerging problems on time and avoid greater damage. More specifically, environmental and social monitoring will allow to:

- Track actual impacts of the project during pre-construction, construction, and operation;
- Verify that mitigation measures are being implemented as required;
- Evaluate the effectiveness of mitigation measures and identify any shortcomings;
- Refine and enhance mitigation measures if needed;
- Develop mitigation measures to deal with unforeseen issues or changes in operations;

RD will ensure quality of environmental and social monitoring undertaken by Supervision Consultant and take action in case monitoring results reveal significant issues requiring managerial solutions. who will in turn supervise the design and construction contractors to ensure the company(s), their subcontractors, and all workers are fully implementing the proper mitigation measures during the preconstruction, construction, and demobilization phases. These measures include training for workers, so that they are familiar with their own responsibilities as well as their employer's. The first level of monitoring during

construction will be conducted by the contractor in routine management of ongoing activities. This will be supplemented by monitoring by the Supervision Consultant and RD, and by the World Bank.

Table 42: Environmental and Social Mitigation Plan

Pre-Construction and Contractor Mobilization Phase

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target Outcome of Mitigation	Responsible Body
1.1	Preparation of bidding/ procurement documents for Highway construction	Failure of bidders to recognize E&S requirements, to plan for E&S management, and to consider E&S requirements in cost proposal	As required by World Bank Standard Procurement documents, include relevant documentation (ESIA, EPF, SEP, ESCP) in procurement documents, and require proposals to include the following plans as part of Management Strategies and Implementation Plan: Occupational health and safety plan Land management and erosion control plan Worker Code of Conduct and Grievance Redress Mechanism Define key personnel to include in the project: E&S manager; Biodiversity specialist; Community liaison/social specialist; HR manager	Bidders understand E&S requirements and prepare responsive proposals Higher E&S capacity by bidders	RD WB (approval)
1.2	Preparation of bidding/ procurement documents for substation	Failure of bidders to recognize E&S requirements, to plan for E&S management, and to consider E&S requirements in cost proposal	As required by World Bank Standard Procurement documents, include relevant documentation (ESIA, EPF, SEP, ESCP) in procurement documents, and require proposals to include the following plans as part of Management Strategies and Implementation Plan: Occupational health and safety plan Land management and erosion control plan Worker Code of Conduct and Grievance Redress Mechanism Define key personnel to include in the project:	Bidders understand E&S requirements and prepare responsive proposals; Higher E&S capacity by bidders	RD WB (approval)

			E&S manager Safety manager Community liaison/social specialist HR manager		
1.3	Review and evaluation of proposals	Failure to consider bidders' E&S qualifications and experience in scoring proposals	Inclusion of E&S specialist(s) in proposal review team, with sufficient time provided Awareness by entire evaluation team of key E&S requirements Scoring includes corporate E&S experience and qualifications, E&S staff experience and qualifications and evaluation of management plans in MSIP Recognition of unqualified bidders	Bidders' E&S qualifications and experience receive full consideration in evaluations Bidders disqualified for inadequate E&S qualifications and experience or inadequate MSIP (that is, inadequate understanding of requirements)	RD
1.4	Selection of contractors	Award of contract to contractor unqualified or unprepared to develop and/or implement full C-ESMP	MSIP plans sufficient to avoid or control impacts Key staff qualified and available Award only to contractors with E&S qualifications and experience that meet specific criteria	Award to contractor able to implement this ESMP Contractor ultimately implements ESMP satisfactorily Fewer delays in project preparation and construction	RD WB (approval)
1.5	Stakeholder Engagement	Uninformed local people and other stakeholders Unrealistic expectations by local people and others	Outreach to identified stakeholders Realistic information on employment opportunities Meetings with community leaders and citizens as appropriate Implementation of Grievance Redress Mechanism	Well-informed supportive community; Realistic expectations; Trust of contractor and RD to resolve issues; Timely resolution of grievances.	RD manages overall program and deals with high-level grievances; Contractor implements on day-to-

		Long-term distrust of contractors and RD Protests or other disruptions Vandalism.	Train contractor workers and supervisors in relevant requirements of SEP, including receiving and reporting grievances.		day basis during construction
1.6	Management of E&S issues	Failure to hire qualified specialists with sufficient time to manage issues Excessive E&S impacts due to mismanagement or failure to manage E&S issues	Assign key E&S personnel defined in items 1.2 (transmission line) and 1.3 (substation) and provide sufficient time to perform duties Employ and train sufficient safety officers: at least one per work crew and overall ratio of at least 1 per 50 workers Train managers and supervisors/foremen in key requirements for E&S mitigation (i.e.., this ESMP and monitoring plan) Develop checklists for use by E&S staff to record findings Develop templates for monthly E&S reports to Supervisions Consultant Develop templates for investigating and addressing root cause of serious incidents/injuries/accidents Develop registers for recording grievances from external stakeholders and from workers	Qualified staff in sufficient numbers to implement/ oversee C-ESMP	Contractor
1.7	Update Contractor's ESMP (C- ESMP) by including all relevant technical details into; Waste Management Plan; Landscape Reinstatement Plan; Community Engagement, Health and Safety Plan; and Labor Management Procedure.	Contractor begins works without program to avoid or minimize impacts on human and environmental resources: Unsafe vehicles, accidents Damage to protected flora Subcontractor E&S performance not managed	Plans prepared by qualified E&S specialists and project managers Supervision Consultant to review and approve all C-ESMP plans and procedures, including C-MSIP plans that had been submitted in contractor's proposal All plans reviewed and ultimately approved by qualified experts Awareness-raising sessions on GBV conducted for all workers; Code of Conduct adopted, acknowledged, and signed by all workers on site (Contractor, Sub-Contractors, Supervisor, as applicable)	No activities undertaken without underlying procedure or plan to protect E&S Comprehensive contractor program for avoiding and minimizing impacts; Subcontractor compliance with plans	Contractor (prepare) SC (approve) RD Review

	Develop detailed method statements on: Working in or near surface water bodies; Noise management; Explosives and blasting (if explosives are to be used); Worker accommodation and work camp management	Noise disturbances to communities; Community disruption, violence, crime, disease due to worker influx Unsafe and/or unsanitary accommodations		All activities in accordance with C-ESMP; No unacceptable or unpredictable impacts	
1.8	Recruit and employ workers and subcontractors	Unqualified contractors and workers; Poor labour practices (substandard pay, uninformed workers, etc.) Excessive staff turnover	Implement Contractor's Labour Management Plan (LMP) Preference for local hiring, with PAPs given preference Written contracts with workers per LMP and Georgia law Other provisions per Labour Code of Georgia Subcontracts include and require compliance with contractor's LMP Subcontracts include and require compliance with C-ESMP Workers receive full induction training	Maximum hiring of PAPs and other locals.; At least 20% of workforce to be of local population; Workers employed in compliance with law (non-discrimination, equal opportunity, income, etc.) Low staff turnover	Contractor
1.9	Mobilize workers to worksites and settle them in work camps	Violence and discrimination at worksite Tensions and conflict between workers and nearby communities	Adopt Code of Conduct, including measures against SEA/SH, and have all workers sign off it; Deliver awareness sessions to all workers; Set up SEA/SH sensitive GRM including referral to adequate service providers in the area	Workers aware of unacceptable behaviour and its consequences No violence and discrimination occurs at worksite No nuisance for local communities from construction workers	Contractor (deliver training and set up GRM) SC (approve) RD (review)

1.10	Establish construction camps/laydown areas, storage areas, non-permanent access roads, quarries/borrow areas, etc. and other land contractor will need for temporary use/possession	Contractor trespasses on land Placement of construction zones in natural habitat or areas that require cutting protected flora Impacts outside boundary of designated area Unrecorded damage to biodiversity Excess damage to topsoil/subsoil, vegetation cover, erosion, spills and soil/water contamination, impacts on communities	Implement C-ESMP requirements for noise, fuel and hazardous materials, noise, worker safety, and community safety, etc., including worker training Reach written agreements with private landowners prior to undertaking activities on their lands Consult with National Forestry Agency prior to undertaking activities on Forest Fund lands and with municipalities prior to undertaking activities on land they control Implement flora/fauna surveys to inventory and map protected flora and nesting/roosting trees on lands required for construction purposes: minimize need for natural habitat and protected species as much as possible Train/warn workers to remain within boundaries and penalize for violations Maximize use of existing roads Consult with roads authority concerning Traffic Management Plan and damages to public roads Minimize movement of vehicles and equipment on unpaved roads in wet conditions Repair rutting and other damages to unpaved roads as soon as possible to minimize disruption to traffic Implement Flora, Fauna, and Habitat Conservation Plan, including at a minimum: Avoid placement of facilities in natural habitat without express authorization by Supervision Consultant If surveys detect hibernating bats or nesting bats, or raptors in mature trees, delay cutting and construction within 150m until after bats have left roost and/or young have left nests If surveys identify breeding or nesting fauna of conservation concern in or within 50m of areas to be disturbed, postpone clearing and other construction within 50m until young have left the nests	Compliance with approved C- ESMP No unexpected or unacceptable impacts All work within marked boundaries	Contractor (prepare) SC (approve) RD (Review)

			Minimize cutting of mature trees and trees of conservation concern: maintain log of all trees cut Maintain photographic and written log of plants of conservation concern that are cut Place 2+ bat boxes for every mature tree with evidence of bat hibernation/roosting/ nesting, within 50m of tree that was cut In an area within corridor but outside vegetation control zone, replanting of the saplings of native species at the ratio of 1:3 (planting 3 trees to compensate the loss of one) with subsequent minimum of 2-year maintenance Implement Land Management and Erosion Plan, including at a minimum: To extent possible, avoid landslide-prone areas and areas with severe erosion potential Establish and mark boundaries of construction zone Keep all activities inside boundaries Strip and store topsoil within boundaries, protect from erosion Store excavated subsoil separately, protect from erosion Install drainage control as needed to control erosion that would affect off-site Place gabions, walls, silt fences or other measures as necessary to prevent erosion from leaving construction areas Agree with Forestry Agency and/or landowners how debris/wood will be managed, with preference for donation to PAPs and loggers. Wood and debris to be removed before dry season.		
1.11	Establish accommodation, kitchens, sanitary facilities	Worker illness or death Worker dissatisfaction and lower productivity Contamination of land and water	If accommodations are to be provided, comply with IFC/WB guidance Workers' Accommodation; Develop and use operating and maintenance checklists for operation of canteens/kitchens	Sanitary and compliant facilities and amenities; Healthy workers Toilets in place where needed	Contractor

			Appoint persons to be responsible for cleanliness of accommodations, kitchens, canteens, break areas, etc. Provide toilets at or near all work locations, establish and enforce rules prohibiting workers from using the bush		
1.12	Plan access roads and undertake detailed survey of the RoW	Unnecessary impact on biodiversity and protected species Excessive erosion and off-site impacts	Maximize use of existing roads – Minimize roads through Natural Habitat – Avoid trees and shrubs of concern to extent possible Implement pre-construction Flora and Fauna Survey Plan prior to clearing/construction: Inventory and mark all specimens of tree and shrub species of conservation concern Identify and mark mature trees if there are signs of current or recent hibernating bats or nesting bats, or raptors Identify trees and locations with nests and other signs of breeding fauna species of conservation concern and raptors To extent possible, route corridor to minimize disruption of fauna species of conservation concern, and trees of conservation concern Maintain photographic and written log of plants of conservation concern that will need to be cut	Roads and corridor placed to minimize impacts on natural habitat and species of conservation concern Species of concern identified and properly managed	Contractor

Construction Phase

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target outcome of mitigation	Responsible Body
1.1	All activities	Worker injury or death Damage to vegetation, land, property outside construction zone	Implement Occupational health and Safety Plan: Medical clearance for workers to perform their tasks; Assessment of risks and identification of mitigation measures for all tasks, with PPE as last resort; Tasks are designed for maximum safe operations;	Tasks completed with no worker injuries or death; Tasks completed with no damage to vegetation, land or	Contractor

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target outcome of mitigation	Responsible Body
			Workers provided with proper equipment and tools, and PPE, to accomplish tasks safely; Only trained workers allowed to complete tasks; Safety Officers oversee all works; Sufficient First Aiders to provide first-level medical care as needed; Fully supplied first aid kits in all vehicles and equipment and at all workplaces Communications established with local medical facilities and personnel regarding works to be completed, arrange for support as appropriate; Record safety statistics (work hours, near misses, minor & incidents and accidents, fatalities) Worker transport (passenger vehicles only, no riding on heavy equipment, wear safety belts, etc.) Mark boundaries of construction zone before operations – Work within boundaries, penalize supervisors and workers for violations – Install physical barriers at deep excavations to prevent accidents Implement Traffic Management Plan, to include: Drivers/operators licensed for vehicles and equipment; Driver trained as needed and tested; Vehicles properly licensed/registered; Vehicles/equipment checked for safety daily by drivers/operators (horns, tires, fire extinguisher, headlights and taillights, safety belts, intact glass, etc.); Speed limits on; Sensitive areas with special precautions (hospitals, schools, etc.)	property outside construction zone	

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target outcome of mitigation	Responsible Body
			Keys never left in vehicle/equipment when driver/operator not present; Consultations with roads authorities concerning use of public roads (timing, locations, etc.); Flaggers trained and placed on public roads to control traffic at locations where heavy project traffic enters and leaves roadways		
1.2	Implement relevant C-ESMP plans as part of all activities	Excessive impacts on people and environment	Management of activities as planned to avoid or minimize potential impacts on people and environment	Implementation of mitigation measures Adaptive management for unexpected impacts Compliance with law and ESSs	Contractor SC
1.3	Manage subcontractors	Subcontractors not aware of E&S Poor labour practices and poorly trained workers Failure to implement C-ESMP Poor E&S performance, including safety, leading to environmental impacts, impacts on local communities, and worker injury or death	Include relevant portions of C-ESMP in procurement documents and subcontracts; Require compliance with contractor's LMP safety, and other requirements, or equivalent requirements approved by Contractor Supervision of C-ESMP implementation by contractor and Supervision Consultant Structure milestone payments to include C-ESMP implementation and withhold payments for failure to comply	Subcontractor implementation of C-ESMP No unacceptable E&S impacts	Contractor SC
1.4	Land clearing at road, construction zones, and new access roads (tree &	Worker injury or death;	Train workers and implement Occupational Health and Safety Plan: working with machinery and tools, working on steep slopes, animal/plant hazards, working in hot or cold environments, etc.	Minimum biodiversity damage due to land clearing;	Contractor

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target outcome of mitigation	Responsible Body
	vegetation cutting, land clearing, earth-moving in some places, equipment/building placement, etc.)	Excess damage to surrounding areas, including biodiversity and private land and property	Consult with National Forestry Agency prior to clearing operations on forest fund lands Agree with local forest managers and/or landowners how debris/wood will be managed, with preference for donation to PAPs and loggers. Consult with National Forest Agency on the height to which trees will be cut, with preference for at least 0.7-1m Conduct final pre-construction fauna survey to identify and mark locations of hibernating bats and of nests/breeding behaviour of fauna species of conservation concern; To extent possible, micro-locate construction boundaries to minimize cutting/clearing flora of conservation concern Implement Land Management and Erosion Control Plan, including at a minimum: Mark and stay within boundaries of construction zone and of new roads; Train/warn workers to remain within boundaries, penalize supervisors and workers for violations; Strip and store topsoil and subsoil/spoil in separate piles within construction boundaries, protect from erosion; Install drainage control as needed to control erosion that would affect off-site areas Manage biodiversity, including at a minimum: If surveys detect hibernating bats or nesting bats, or raptors in mature trees, delay construction/clearing activities within 150m until after bats have left roost and/or young bats, raptors, and/or species of conservation concern have left nests; If surveys identify breeding or nesting fauna of conservation concern in or within 50m of construction zone, postpone clearing and other construction within 100m until young have left the nests Maintain photographic and written log of plants of conservation concern that are cut;	No damage outside boundaries; Limited damage to ground surface and root zone; Survey completed, trees and shrubs marked; Bat box placement and tree/shrub plantings completed as required	

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target outcome of mitigation	Responsible Body
			Place 2+ bat boxes for every mature tree with evidence of bat hibernation/roosting/ nesting, within 50m of tree that was cut In an area outside vegetation control zone, plant 2+ trees/shrubs of same species for every tree or shrub of conservation concern that is cut; Do not cut trees to the ground but leave as much of the trunk as possible, at least 0.7-1m if agreed by agreed with National Forestry Agency Do not cut shrubs if they are less than 4m high Restore inadvertent damage to land outside boundaries per Land Management and Erosion Control Plan		
1.5	Corridor vegetation cutting/clearing	Excessive impact on biodiversity (flora, fauna, natural habitats); Unnecessary landscape and viewshed impacts Excessive erosion Landslides	Consult with National Forestry Agency (local managers) prior to clearing operations; Agree with representative of the National Forest Agency and/or landowners how debris/wood will be managed, with preference for donation to PAPs and loggers; Agree with National Forestry Agency the height to which trees will be cut, with preference of at least 0.7-1m; Remove excess wood and debris before dry season; Conduct final pre-construction fauna survey to identify and mark locations of hibernating bats and of nests/breeding behaviour of fauna species of conservation concern, bats; Train/warn workers to remain within boundaries, penalize supervisors and workers for violations; Plan and manage treefall to prevent logs from rolling downhill; Implement Land Management and Erosion Control Plan, including at a minimum:	No excessive loss of vegetation No triggering of erosion due to excessive clearance of vegetation	Contractor

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target outcome of mitigation	Responsible Body
			Establish and mark boundaries of corridor and vegetation control zone; Keep all activities inside boundaries; Cut as few trees as possible, ensuring that no tree could fall on the line; Minimize land and soil disturbance. If soil has to be cleared, strip and store topsoil and subsoil separately within boundaries, protect from erosion; Install drainage control as needed to control erosion that would affect off-site; Place topsoil and plant plants/seeds of native species on broken ground. Protect wildlife: If surveys detect hibernating bats or nesting bats, or raptors in mature trees, delay cutting within 100m until after bats have left roost and/or young bats, raptors, and/or species of conservation concern have left nests If surveys identify breeding or nesting fauna of conservation concern in or within 50m of areas to be cleared, postpone clearing and other construction within 50m until young have left the nests To extent possible, micro-locate corridor boundaries to minimize cutting of mature trees and trees of conservation concern Maintain photographic and written log of plants of conservation concern that are cut Place 2+ bat boxes for every mature tree with evidence of bat hibernation/ roosting/nesting, within 50m of tree that was cut replanting of the saplings of native species at the ratio of 1:3 (planting 3 trees to compensate the loss of one) with subsequent minimum of 2-year maintenance of plantations		

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target outcome of mitigation	Responsible Body
			For every tree with evidence of raptor nesting, place 2+nesting platforms on trees outside the vegetation control zone Do not cut trees to the ground but leave at as much of the trunk as possible, up to 4m Do not cut shrubs if they are less than 4m high		
1.6	Earth works	Worker injury or death Excessive soil and spoil removed; Damage outside construction zone	Train workers and supervisors in Occupational Health and Safety Plan: Working in/near excavations/confined spaces; Working around heavy equipment; Workers trained in use of all tools and equipment; Use of harnesses on extremely steep slopes; Implement relevant provisions of Land Management and Erosion Control Plan: strip and store topsoil and spoil, protect against erosion; Mark and work within boundaries. Train workers and supervisors in Occupational health and Safety Plan: lifting, working at heights, electrical safety, general works, steep slopes Mark and work within boundaries of construction zone, penalize supervisors and workers for violations Plan the construction with aim to minimize the need for subsoil disposal on permanent stockpiles Train workers on Chance Find Procedure. Take all activity at worksite on hold in case of a find, immediately inform management and SC, follow their instructions, and do not resume works until formal notice from SC.	Works completed safely No damage outside boundaries Safe and efficient operations	Contractor SC
1.7	Sourcing of natural construction materials	Disruption of works due to penalties	Give preference to purchasing natural construction material from licensed suppliers over opening of own quarries	Prevent damage to landscapes and habitats from	Contractor SC

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target outcome of mitigation	Responsible Body
		imposed on Contractor Damage to landscape and habitats	Assess environmental performance track record of the primary supplier of natural construction material prior to making purchase agreement and keep informed on the environmental performance of primary supplier throughout duration of the purchase agreement Do not start extraction prior to obtaining an extraction license from the National Agency of Mineral Resources Develop and get approval of the Ministry of Environmental Protection and Agriculture on the Mining Site Reinstatement Plan; strictly adhere to the Plan throughout license period	unsustainable mining practices	
1.8	Restoration of land at construction sites (construction zones/areas, temporary access roads, other damaged lands)	Failure of vegetation to be restored Continued erosion; Reduced production from cropland and grasslands Landslides	Restore all disturbed areas per Land Management and Erosion Control Plan: Remove all wastes and debris; Grade surface as necessary for stable contours (except roads); Spread spoil and topsoil (except on rocky barren terrain); Remove excess spoil/soil for use elsewhere; Plant native species of grasses and shrubs. On private land used by contractor for construction zones and roads: restore land as above unless landowner requests modification (for example, no planting on cropland, leave roads in place, etc.)	Land returned to productive use	Contractor
1.9	Protection of camps, storage areas, equipment, property, substation, etc. (security)	Abuse of local population or workers, including injury or death Loss of community support, possibly active opposition; Liability for contractor and RD	No armed security; Subcontractor and guards checked for licenses, past abuses; Guards trained in appropriate use of force; Consultations with local law enforcement authorities.	No vandalism, theft, or incidents involving security	Contractor SC

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target outcome of mitigation	Responsible Body
1.10	Protect workers employed by primary suppliers	Child labour, forced labour, and/or serious safety issues at primary suppliers	If RD or contractor has significant control or influence over primary suppliers, contractor to monitor supplier and require improvement in labour safety practices or remedies in case of child or forced labour	No child labour or forced labour or serious safety issues at primary suppliers	Contractor (supported by RD if RD has significant influence or control)
1.11	Works near settlements	Accidental damage to private property Blocking of free movement and access to houses and property of local residents Traffic accidents due to movement of construction vehicles and machinery Nuisance experience by local communities due to noise and dust propagation Damage to health and loss of life among local residents due to uncontrolled entry to worksite Tension and conflict between workers and local communities due to labour influx	Ensure high quality and due implementation of Contractor's Community Health and Safety Plan Disallow temporary storage of construction materials and waste in the locations blocking free movement and access for local residents Immediately assess scope of accidental damage to private property and timely restore the damage to the same or better condition Undertake noise and dust control measures Ensure high quality and due implementation of Contractor's Traffic Management Plan Impose stringent speed limits for construction vehicles moving through and nearby local settlements Demarcate, fence, and place warning signs at the boundaries of worksite; prevent free entry by outsiders Enforce adherence of workers to Contractor's Code of Conduct Effective operation of Project GRM	Minimal nuisance for local communities due to construction works Prevention of injuries, negative health impacts and death among local residents due to construction activities, free access to worksites, and increased traffic No conflicts between workers and local residents	Contractor SC

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target outcome of mitigation	Responsible Body
1.12	Payment of invoices for completion of milestones	Failure to implement E-CSMP in completion of construction milestones: poor drainage on roads, works/damage outside construction zone boundaries, poor soil/spoil management, poor safety practices, risks to community, etc.	Consider relevant E&S management requirements to be an integral part of each construction site; Penalize initial failures to implement mitigations by withholding partial payment until mitigations are properly implemented; Penalize repeated failures to implement mitigations by considering milestones incomplete and reducing payments permanently	Proper implementation of C-ESMP Minimal impacts on biodiversity, people, and property	SC

Demobilization Phase

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target Outcome of Mitigation	Responsible Body
1.1	Closure of construction camps, parking areas, warehouses and other temporary infrastructure	Contaminated soil, waters remain after contactor departs; Liability for RD	Implement Land Management and Erosion Control Plan prior to departure: Remove all equipment, storage units/tanks, debris, wastes, etc. Remove any contaminated soil Grade and contour to eliminate standing water, to provide stable contours, and to match surrounding terrain as much as possible Spread spoil and replace topsoil Plant native species or take final action as requested by private landowners. Monitor plantings until established and self-sustaining	Areas used for construction operations restored to pre- construction uses or as agreed with landowners No residual liability or damages	Contractor
1.2	Payment of final invoice	Demobilization incomplete, with residual damage, unrestored land,	Retain payment until Supervision Consultant and RD confirm demobilization is complete from E&S perspective Appoint third party to complete restoration activities if Contractor fails, at Contractor's expense	No continuing or residual damages or contamination, land	SC RD

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target Outcome of Mitigation	Responsible Body
		improper drainage, etc.		restored to former use as required	

Operation and Maintenance

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target Outcome of Mitigation	Responsible Body
1.1	Updates of Occupational Health and Safety Plans	Incompliance with national regulations and GIIP Worker injuries and deaths	RD Safety Manual updated per changes to OHS regulations that may periodically occur OHS training delivered to RD's contractors on regular basis RD retains qualified OHS staff in sufficient numbers for strong field presence and good geographic coverage	OHS incidents kept at minimal rates	Road Maintenance Contractor RD
1.2	Routine maintenance and capital repair of Highway	Worker injury or death Damage to vegetation, soil erosion Traffic congestion and accidents Damage to private property (trees, crops, etc.)	Workers trained in requirements of RD Safety Manual specific to their jobs Workers trained on the requirements of Traffic Management Plan	Roadside accidents leading to damage of health and loss of life among workers and local residents kept at minimum Local communities do not experience nuisance and economic loss due to damage to their property No unnecessary damage to roadside vegetation occurs	Road Maintenance Contractor RD
1.3	Accidental spill of fuel and other liquids transported along the Highway	Surface water and soil pollution	The trained Maintained Contractor during the operation phase will have emergency response plan for response mitigation measures. The above-mentioned team will work according to this plan and will reduce and avoid the contamination of the water at the culverts by covering the spilled areas with the	Prevent pollution of the natural environment	Road Maintenance Contractor RD, Traffic Police

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target Outcome of Mitigation	Responsible Body
			sand, after the sand will absorb the contamination sand will be taken to the specialized landfill areas. In case spilled fuel/other liquid enters culverts, sand or other absorbent is applied to prevent spillage from releasing to natural environment. Contaminated absorbent is then excavated and disposed at the specialized landfill areas. Traffic control to minimize accidental spills.		
1.4	Noise propagation	Disturbance of local residents by traffic related noise	Undertake periodic instrumental measurement of noise levels or measurement upon receipt of complaint from the affected individuals/institutions to identify possible exceedance of the established thresholds for noise exposure Design and arrange noise barriers, noise absorbing green belts or other devices for reducing noise impacts	Prevent nuisance of roadside communities from excessive noise	RD
1.5	Littering of Highway	Environmental pollution and negative aesthetic impact	Undertake national information campaigns for raising public awareness of fines established for littering Install roadside signage for increasing awareness of Highway users on littering restriction and associated fines Exercise fining for Highway litters during traffic patrolling Regularly clean up the carriageway and shoulders	Prevent environmental pollution and deterioration of aesthetic appearance of the Highway	Road Maintenance Contractor RD Traffic Police Ministry of Environmental Protection and Agriculture
1.6	Animal collisions	Negative impact on wildlife Negative social impact due to loss of domestic animals	Keep record of animal collisions and if accident hotspots are identified, design and arrange additional berries or other protective infrastructure as well as warning signs and speed limits Raise public awareness on adverse impacts of free roaming cattle and other domestic animals and associated responsibility of owners	No loss of wildlife on Highway No loss of domestic animals on Highway	Road Maintenance Contractor RD

№	Activities	Potential Adverse Impact	Mitigation Measures/Best Management Practice	Target Outcome of Mitigation	Responsible Body
		Damage to health and loss of life among users of the Highway	Timely remove animal carcases from the carriageway	No injuries and loss of life due to traffic accidents involving animals	
1.7	Highway use in extreme weather conditions	Accidents due to slippery road surface, poor visibility and other impacts of extreme weather events	Installation of warning signs De-icing of road surface, cleaning of snow, and other due maintenance techniques applied in poor weather conditions Using media for warning public on poor visibility, frosting and other difficult conditions on the road; closing traffic in case of extremely poor conditions	Minimized traffic accidents due to poor weather conditions	Road Maintenance Contractor RD

Environmental and Social Monitoring Plan

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency /or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
All construction works	Technical progress and implementation of mitigation measures, compliance with Georgia E&S law, World Bank ESF, and C-ESMP	All areas	Observations during normal activities Inspections: monthly reports and incident reports E&S monitoring audit	Continuous or as necessary Annually during construction	Verify implementation of mitigation measures Verify implementation of C-ESMP	Supervision Consultant
	Working conditions Biodiversity management and erosion control	All active work areas Active and recent tree cutting areas, active sites on steep slopes, active construction sites New construction sites	Observation Inspection	During daily rounds (continuous) At least weekly; During daily rounds. At least weekly Before construction begins	Verify implementation of OHS Plan; Verify relevant aspects of C-ESMP are being implemented; Verify supervisors are aware of requirements, protected species are marked, etc.	Contractor E&S manager and/or specialist(s) Supervision Consultant
	Working conditions (equipment, tools, etc.) and workers (PPE)	All active work areas	Observations Inspections	During daily rounds (continuous); At least weekly	Verify safety of working conditions and workers; Provide guidance to supervisors and workers	Safety Officers Contractor safety manager Supervision Consultant
	Worker and supervisor safety training	All active work areas	Records checks & interviews	Daily or as needed before beginning new work	Ensure workers are trained to work safely	Supervisor Contractor safety manage

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency /or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
				Spot checks (at least once every site monthly)		Supervision Consultant
Progress reports/meeting	Technical progress and status of C-ESMP implementation: Safety; Biodiversity survey and restoration activities Erosion control & site stabilization Site restoration; Grievance management	Active sites	Interviews with contractor E&S & technical staff; Review monthly contractor and Supervision Consultant E&S reports Review worker & stakeholder grievance registers; Site visits	Monthly	Verify technical progress and E&S protection	Mandatory attendees: Contractor E&S personnel; Supervision Consultant RD
Drivers and vehicle safety	Driver qualifications	Office	Verify valid driver's license and operator's permit as required; Check with traffic police if needed Skills test as needed	Prior to trip authorization	Trained drivers	Contractor PM & safety manager Supervision Consultant
	Mobile plant/vehicle safety (horns, backup alarms, lights, tires, safety belts, fire extinguisher, clean-up kit, first aid kit, etc.)	All mobile plant in use	Inspect and complete checklist Review checklists and vehicles	Daily before first use Spot checks: at least monthly for each vehicle	Minimize traffic accidents, protect workers and other drivers/pedestrians	Driver/operator Contractor safety manager Supervision Consultant
Marking boundaries of work areas	Boundary is clearly marked	All active work areas	Observations and photographs	The day before work is to begin	Limit areas of impacts	Contractor supervisors &

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency /or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
				At least once during each stage of construction works	Verify no off-site damage	E&S personnel Supervision Consultant
Air quality	Visible dust – Dust coating leaves on nearby vegetation;	Unpaved roads & other construction areas	Observation	Continuous during daily rounds	Determine need for damping roads to suppress dust	All contractor managers, supervisors, E&S personnel Supervision Consultant
	Black smoke from vehicles, equipment, other engines	All areas			Determine need to remove engine from service until repaired	
Flora and fauna surveys (design team and preconstruction surveys)	Boundary of vegetation control zone marked; Flora species of concern logged, photographed, marked, and mapped; Mature trees with hibernating/nesting/bats/ birds logged, photographed, & marked Trees to be cut marked	Selected areas being surveyed, while surveys are ongoing	Visits to ongoing surveys Spot checks of specimen marking after surveys; Debriefs by survey team(s)	Visits and spot checks: one site daily Debriefs: daily verbal or email/written	Verify surveys are identifying species of concern, mature trees, natural habitat	Contractor E&S manager & specialists Supervision Consultant
Land clearing activities (roads, construction areas)	Compliance with Land Management and Erosion Control Plan, including: Boundary marking before construction begins;	All areas being cleared All areas under construction	Visits/inspections Reports from supervisors to E&S manager Inspections	Before clearing Daily during clearing After clearing and before construction At least weekly	Limit extent of clearing Verify topsoil salvaged	Contractor E&S personnel Contractor PM (spot checks) Contractor

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency /or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
	Working within boundaries Topsoil storage and spoil storage Drainage control to prevent erosion Condition of land/vegetation at boundary				Verify drainage controlled and erosion avoided Verify implementation of LC&EC Plan	E&S personnel Supervision Consultant
			Observation	Before clearing begins	Allow verification of working within boundaries	Contractor E&S personnel Supervision Consultant
	Site restoration	All construction sites	Inspections	When construction ends at that site	Verify restoration	Contractor E&S personnel Supervision Consultant
Excavations and cuts	Areas of excavations marked, edges of excavations marked (tape, rock barriers, etc.)	Foundation locations, cuts on steep slopes	Before breaking the ground	Before excavations	Limit area of disturbance	Contractor E&S Personnel Supervision Consultant
	Works are within boundaries	construction site	Observation, photographs	Daily during works	Limit area of disturbance	Contractor E&S personnel Supervision Consultant
	Soil salvaged and stored separately from subsoil/spoil	All excavations	Observations and photographs	At least once during works at each site	Topsoil conserved and protected from erosion	Contractor E&S personnel

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency /or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
						Supervision Consultant
	Workers received relevant training	Work sites and records	Interviews, records review	Prior to work at excavation sites	Verify workers can work safely	Contractor safety manager Supervision Consultant
	Barriers (tape, rocks, etc.) placed to prevent falls	Perimeter of excavations >1m deep	Observation	When excavation is complete Spot checks	Protect workers against falls	Supervisor Contractor E&S personnel
Vegetation clearing	Boundary of vegetation clearing zone marked; Trees to be cut marked Permission obtained for tree cutting from NFA or municipal authority depending on whether trees are extracted from the State Forest or beyond its boundaries Compensation for tree cutting paid to the State budget according to national regulations	Areas of vegetation clearance	Observation	Immediately prior to cutting/clearing	Prevent excessive damage to vegetation Prevent unnecessary tree-cutting Prevent breaching of national regulations on compensatory payment	Contractor E&S manager Supervision Consultant
Tree Planting	Replanting of the saplings of native species at the ratio of 1:3, with subsequent minimum of 2-year	Areas selected for planting	Observation	During planting seasons Prior to demobilization	Ensure timely and quality planting	Botanist appointed by contractor

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency /or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
	maintenance of plantations Survival of minimum 80% of plantings			Annually for 2 years after planting	Track survival rate and identify need for replanting	Supervision Consultant RD
Bat box placement	2+ bat boxes placed per mature tree with hollows supporting bat hibernating, roosting, nesting	Within 50m of tree that was cut	Observation	Within one month of tree cutting One year after original placement	Verify placement Verify in place	Contractor-appointed biodiversity expert Supervision Consultant
Land restoration	Implementation of Land Management and Erosion Control Plan Grading to stable contours as needed Placement of topsoil on bare ground Planting native species (seeds or plants) Establishment of self-sustaining vegetation cover	All areas where land was disturbed All restored areas except slopes not capable of supporting vegetation cover	Observation	Within one month of end of activities at that site Each month until vegetation cover determined to be self-sustaining and one year after that	Identify need for repairs or verify restoration Verify vegetation is established & determine if further action or repairs needed	Contractor E&S personnel (Botanist) Supervision Consultant RD
Noise generation	Noise levels	Workplaces Off-site locations	Instrumental measurement	Monthly at typical work sites Within 24 hours of request or noise complaint by worker or external party	Verify noise is within standard or identify need for mitigation	Contractor E&S personnel Supervision Consultant

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency /or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
Ensuring adequate Hygiene	Toilets & potable water	Work locations	Observations Inspections	Daily during rounds At least weekly	Verify sanitation	Safety Officers and/or E&S specialists, Contractor E&S specialist and/ or safety officer Supervision Consultant
Worker grievance resolution	Worker grievance register Grievance handling and resolution	Work sites and records office	Review of register Interviews of managers responsible for resolution and with complaining workers	Weekly Before monthly progress meeting	Verify grievances are being recorded and resolved; Verify grievances are being addressed properly	Contractor HR manager, supervisors Supervision Consultant
External stakeholder grievance resolution	Stakeholder grievance register Grievance handling and resolution	Records office Community	Review of register Interviews of selected stakeholders who submitted grievances and with persons responsible for addressing	Weekly Before monthly progress meetings	Verify grievances are being recorded and resolved; Verify grievances are being addressed properly	Contractor HR manager and PM E&S manager, social specialist Supervision Consultant
Stakeholder engagement	Worker behaviour in communities; Community satisfaction with project	Community	Reviews of grievance log Interviews with community leaders Reviews of grievance log Interviews with community leaders and local residents	Quarterly	Determine need for training/dismissals/ etc. Identify community issues	Contractor HR manager, PM, social specialists Supervision Consultant RD

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency /or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
Resettlement and compensation	Compliance with RAP	As specified in RAP				Supervision Consultant RD
Community health and safety	Contractor's communication campaign and information sharing with local communities Demarcation and safeguarding of construction site against entry by community members Preventing exposure of communities to hazardous construction waste, harmful emissions and discharges Construction traffic control outside construction sites, including stringent speed limits within settlements Construction materials and waste are placed, and machinery is parked the way not blocking free movement of local residents and their access to homes and properties	Around perimeter of construction sites and in their vicinity On the road within the construction area	Observation Conversation with the affected communities	Throughout construction works	Prevent damage of human heath, and loss of life	Supervision consultant Traffic Police

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency /or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
Erosion control, land stability	Effectiveness of erosion control and land restoration	Erosion prone areas	Observation	After undertaking of earth works	Identify need for further land stabilization and erosion control	Contractor Supervision Consultant

9. Information Disclosure and Stakeholder Engagement

9.1 Background

Stakeholder Engagement is the process of ensuring that everyone impacted by a road construction or rehabilitation project is consulted about how the project will affect their daily routine and safety, and gives them the opportunity to provide feedback. All projects financed by the World Bank will carry out stakeholder identification and develop and implement a grievance redress mechanism.

Roads are not just for vehicles. Everyone affected by road construction projects should be involved in consultation process. Stakeholder Engagement should reach out to residents, community groups, businesses, public services and others.

Stakeholder engagement is especially important in road-building or rehabilitation projects. Safe, accessible road infrastructure is better for local businesses, for tourism, for social development and for the economy. Too often, deadly mistakes are made in road construction simply because local communities are forgotten in the hurry to construct new, fast roads. From a construction point of view – making changes to a design during a project may cause delays and extra costs. It is better and more cost-effective to ensure community needs are understood and met before starting work. More importantly, not taking into account the needs of the community endanger local people and can result in loss of life and injury.

Responsibility for the preparation and implementation of the stakeholder engagement plan lies with the RD. This implies identification of interested parties, development of effective communication channels, conducting meetings, and updating the submitted preliminary plan at various stages of project development.

The objective of the project is the reconstruction of approximately 31.7 km of the 80 km International Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijani Border (S5) road section.

The SEP should provide an overview of national legislation of the Georgia, the WB requirements and international best practice related to information disclosure and outlines the general approach to stakeholder engagement and public consultation.

The SEP is a live document so it should be reviewed and updated periodically and in line with new activities, changes in Project design and newly identified stakeholders at various stages of project development.

9.2 Objectives of the Stakeholders Engagement

The objectives of stakeholder engagement at the design stage, when several project alternatives have been developed, are to ensure that project decision-making is informed, transparent, inclusive, and responsive to stakeholder concerns, in accordance with the WB Environmental and Social Framework.

Specifically, the objectives are to:

- **Disclose early and meaningful information** on the proposed project, its purpose, scope, and the design alternatives in a manner that is understandable and accessible to all stakeholder groups;

- **Identify and understand stakeholder priorities, concerns, and expectations** related to the project, including potential environmental, social, economic, and land-use impacts;
- **Facilitate informed comparison of alternatives**, including the "do-nothing" option where applicable, by engaging stakeholders on key trade-offs such as safety, land acquisition, resettlement risks, impacts on livelihoods, traffic patterns, and environmental sensitivities;
- **Integrate stakeholder feedback into project design**, ensuring that stakeholder inputs are systematically documented, analyzed, and considered in the refinement and selection of the preferred road alignment;
- **Identify vulnerable and potentially affected groups early**, including roadside communities, land users, farmers, small businesses, and road users, and ensure their views are adequately reflected in the decision-making process;
- **Build trust and maintain open communication** between the Project Proponent, local authorities, and affected communities, thereby reducing the risk of misunderstandings, opposition, or delays at later stages;
- **Establish a foundation for ongoing engagement**, including grievance redress arrangements, that will continue throughout subsequent stages of project development (detailed design, construction, and operation);

The main communication methods and mechanisms that will be used to consult with key stakeholders are presented below.

The Project Implementation Team will make public relevant information about the investment works at the early stages of the project, during the ESIA update stage, and then, as necessary, throughout the project. For effective communication with stakeholders, the following documents will be made public at the ESIA updating stage:

- Project description;
- Maps and layouts of alternatives;
- Preliminary impact overview;
- Non-Technical Summary (NTS);
- Grievance redress mechanism

Ways of disseminating information are provided in **Chapter 9.3** of the presented document.

9.3 Consultation Methods

The main communication methods and mechanisms that will be used to consult with key stakeholders are presented below.

9.3.1 Public Meetings

Public meetings are open meetings in villages/towns to present road alternatives, maps, and expected impacts. The main advantages of public hearings are: (i) high transparency and visibility; (ii) allowing the two-way dialogue and collective discussion; (iii) building the trust at early decision-making stage; (iv) suitability for explaining alternatives and trade-offs.

At the same time, when holding public meetings, it is necessary to take into account the possible negative consequences of such meetings, which are: (i) dominant voices may overshadow vulnerable groups; (ii) requires strong facilitation and time management; (iii) limited participation from women, elderly, or working people if poorly timed.

9.3.2 Meetings with Local Authorities and Institutions

Target groups for such meetings include: rayon administrations, utilities, police, emergency services, and others.

Such meetings have a positive effect in terms of assessing and regulating the following issues: (i) ensures institutional alignment; (ii) supports integration with urban plans; (iii) facilitates permitting and approvals; (iv) enables technical input on alternatives.

At the same time, it should be noted that the information obtained during such meetings: (i) may not reflect community concerns; (ii) can include risk of over-technical focus; (iii) can have limited public visibility.

9.3.3. Individual Meetings / Face-to-face Consultations

Face-to-face meetings require a lot of time and human resources, therefore, face-to-face meetings are held only with project-affected persons, businesses and tenants. In our particular case, face-to-face meetings should definitely be planned with illegal owners of land plots or businesses whose buildings have already been demolished. Face-to-face meetings yield positive results, namely: (i) Highly personalized information; (ii) Builds trust with affected persons; (iii) Effective for sensitive issues (land, compensation); (iv) Reduces misinformation.

However, it also has disadvantages, such as: (i) As mentioned, very time-consuming; (ii) Requires trained social specialists; (iii) Limited reach.

9.3.4 Focus Group Discussions (FGDs)

Focus groups will be conducted with the identified vulnerable groups i.e. the disabled, women, informal/illegal people and people in receipt of social benefits. A simple non-technical language will be used to ensure that the project impacts are communicated transparently to this group.

There are a number of positive aspects to meeting with focus groups: (i) Inclusive and safe environment; (ii) Enables detailed understanding of social impacts; (iii) Better participation of vulnerable group; (iv) High-quality qualitative feedback.

However, when conducting such meetings and evaluating the results, it should be taken into account that focus group meetings: (i) Not statistically representative; (ii) Time- and resource-intensive; (iii) Requires skilled facilitators.

9.3.5 Information Leaflets and Brochures

This approach is used to disseminate information about the project, mainly to inform private and legal entities living in the project area and adjacent to the project area.

The approach has a number of positive aspects, such as: (i) Simple and accessible; (ii) Easy to distribute widely; (iii) Good reference material; (iv) Useful for low-internet areas.

It is also necessary to consider the negative aspects of this approach to dissemination of information, such as: (i) One-way communication; (ii) Limited space for detail information; (iii) Risk of misunderstanding without explanation.

9.3.6 Project Website / Social Media Pages

Environmental and social documentation prepared for the project is subject to public disclosure, as required by both national legislation and World Bank policy.The publication of these documents allows interested parties to familiarize themselves with the project alternatives, as well as the positive and negative sides of the prepared alternatives, before the public discussion begins.

A descriptive approach to information dissemination allows for: (i) Broad and rapid dissemination; (ii) Cost-effective; (iii) Enables document downloads; (iv) Supports transparency and traceability.

The following factors should also be taken into account at the stage of analyzing the results: (i) Excluding people without internet access; (ii) Requiring regular updates; (iii) Limited depth of discussion.

9.3.7 Project Information Boards and Posters

Project Information Boards and Posters are placed in a prominent place within the project area as required by law. This method of information dissemination provides: (i) High visibility; (ii) Continuous access to information; (iii) Low maintenance; (iv) Supports transparency.

At the same time, it should be noted that this method can have: (i) No feedback mechanism; (ii) Limited content; (iii) May be ignored over time.

9.4 EIA Public Hearings and Initial Informal Meetings 2020-2022

According to the requirements of the national legislation of Georgia, RD commenced identifying and engaging with stakeholders in late 2020, during the preparation of the Environmental Scoping Report. On February 4-5, 2020, and June 14-16, 2021, MEPA held public consultations in the municipalities affected by the project.

In total, more than 100 individuals attended the public hearings. These included representatives from the local government, civil society, and general population. The meetings were conducted with involvement of RD's Environmental and Social Specialists and safeguard Consultants. During the meetings, participants were principally interested in the details of the project: route, RAP compensation criteria, environmental impacts, and employment opportunities. The table below summarizes the location, date, and attendance of these public hearings (disaggregated by gender), as well as the key issues that were raised as part of the discussions. Public

Table 43: Consultations held by MEPA with RD's involvement (2020-2022)

№	Date	Time	Location	Venue
Public consultations on the draft Scoping Report organized by MEPA				
1	04.02.2020	11:00 am	Sagarejo Municipality	Administrative building of village Giorgitsminda
2	04.02.2020	1:00 am	Sagarejo Municipality	Sdministrative building of village Badiauri
3	04.02.2020	3:00 pm	Gurjaani Municipality	Gamgeoba building of village Kachreti
4	05.02.2020	11:00 am	Gurjaani Municipality	Building of the House of Culture of village Bakurtsikhe
5	04.02.2020	1:00 pm	Gurjaani Municipality	Administrative building in village Chalaubani

6	05.02.2020	3:00 pm	Gurjaani Municipality	Public school of village Melaani
Public consultation on the draft EIA Report organized by MEPA				
7	14.06.2021	12:00 am	Sagarejo Municipality	Administrative building of village Giorgitsminda
8	14.06.2021	14:00 pm	Sagarejo Municipality	Sdministrative building of village Badiauri
9	15.06.2021	3:00 pm	Gurjaani Municipality	Gamgeoba building of village Kachreti
13	15.06.2021	11:00 am	Gurjaani Municipality	Building of the House of Culture of village Bakurtsikhe
11	16.06.2021	12:00 am	Gurjaani Municipality	Administrative building in village Chalaubani
12	16.06.2021	3:00 pm	Gurjaani Municipality	Public school of village Melaani

Besides of EIA report, additional individual and collective meetings and discussions with different groups of stakeholders and affected persons have been conducted in the frame of RAP and SEP. Taking into account the Covid-19 pandemic restrictions the public consultation process for RAP was conducted differently, namely: through individual face-to-face meetings during socio-economic survey of affected settlements (June 2020 – May 2021) and will continue during the RAP implementation process. The joint public consultations meetings have not been conducted due to COVID -19 related pandemic and quarantine established by the Government (31 March 2020) restricting public meetings. Additional individual and small groups' consultations will be also conducted after the RAP and SEP approval by the World Bank.

9.5. Meetings held 5-10/01/2026

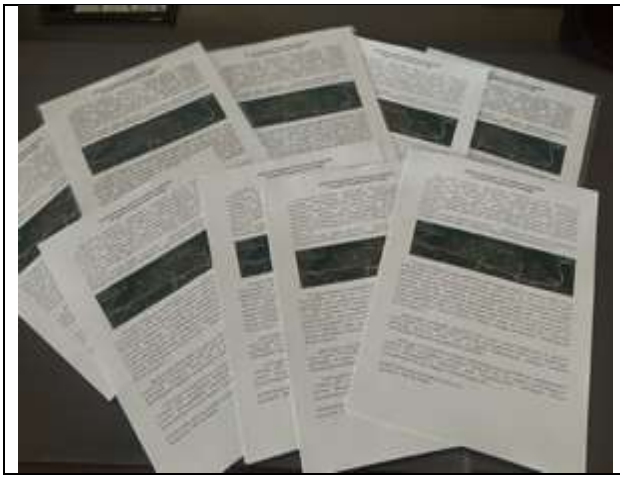
9.5.1 Introduction

On January 5-10, 2026, several consultation meetings were conducted by the Consultant with various stakeholders in and around the project area. The purpose of the meetings was to provide as much information as possible to all stakeholders about the planned project, as well as to collect stakeholder complaints, suggestions, and expectations.

Before entering the project area, information booklets were prepared **(Figure 62**), and relevant instructions were provided to the Consultant's group members. Each member of the group also had their own identification badge (Figure 62).

The prepared information booklets presented the technical data of the project, alignment of the project road, as well as alternative routes alignments. The information booklet also indicated the contact information of the consultant, in case interested parties had any questions or suggestions.

Figure 62: Information booklets and consultant badges





Before the commencement of information campaign, interested parties - legal entities and private individuals, were identified, on whom the implementation of the project would or could have a positive or negative impact. Interested parties were represented by local self-government bodies, public and private service providers, small and medium-sized businesses, as well as local residents and citizens from other regions who live or run business in the project area or its vicinity.

The implementation of the project will also have a certain impact on the population living along sections of the existing road that will be bypassed by the designed highway after project implementation. Along these sections of the road, the local population has conducted both legal and illegal business activities, from which they have derived income. Primarily, the affected population has been engaged in trading agricultural products, selling basic necessities, or operating small-scale catering establishments.

9.5.2 Meetings with Local Government Representatives

On January 9, 2026, the consultant's social team held meetings with representatives of both central and local government authorities. The purpose of these meetings was to familiarize local government representatives with the details, goals, and objectives of the planned project. During the above-mentioned meetings, representatives of self-government bodies expressed full support for the project. In their opinion, the project will contribute to regional development, promote one of the leading sectors of the region—agriculture—and consequently increase local budget revenues. Taken together, these outcomes are expected to have a positive impact on the region's youth and reduce outward migration, which is currently one of the main challenges faced by Sagarejo and Gurjaani municipalities.

On January 9, 2026, meetings were held with representatives of municipalities and local self-government bodies in the following municipalities:

a) Meeting was held with the Head of the Infrastructure and Spatial Planning Service of Gurjaani Municipality, Giorgi Kuprashvili (**Figure 63).**

Figure 63: Meeting with the Head of the Infrastructure and Spatial Planning Service of Gurjaani Municipality



b) Meeting was held with the representative of the Gurjaani Municipality in the village of Bakurtsikhe, Ms. Mariam Michitashvili (**Figure 54**).

Figure 64: Meeting at the Gurjaani Municipality in the village of Bakurtsikhe



c) Meeting was held with the representative of the Gurjaani Municipality in the village of Chalaubani, Mr. Givi Katsiashvili (**Figure 65**).

Figure 65: Meeting at the Gurjaani Municipality in the village of Chalaubani



d) Meeting was held with the assistant to the representative of the Gurjaani Municipality in the village of Kachreti, Mr. Gela Lazashvili (**Figure 66**).

Figure 66: Meeting at the Gurjaani Municipality in the village of Kachreti



As can be seen from the pictures above, in every municipality and village, an information booklet prepared within the framework of the project was posted on the relevant information board.

9.5.3 Meetings With Business Representatives and the Population

According to the initial plan developed by the Consultant, meetings were to be held in villages where the design road either passes through or is located in close proximity. Following these meetings, it was decided to expand the scope of the information campaign in order to reach a broader audience, particularly women living in the region, and to identify additional channels for obtaining feedback from them.

The consulting company held a series of meetings with representatives of small and medium-sized businesses located in the vicinity of the project area. During these meetings, entrepreneurs were provided with information about the planned activities of the road modernization and development project. At the same time, feedback was collected from business owners, mainly concerning potential challenges related to reduced vehicle traffic and its impact on their income (**Figure 67**).

Figure 67: Meetings with representatives of small and medium-sized businesses



As part of the information campaign, the consulting company also organized additional meetings in villages and settlements located near the project area. Within the framework of these meetings, the population was not only informed about the planned project activities but also invited to express their opinions and expectations (**Figure 68**).

Figure 68: Meetings with the villages and settlements population



9.5.4 Conclusions and Recommendations

Based on the information collected during the information campaign, the following mitigation measures and recommendations addressing social issues were developed within the framework of the project:

1. The contract to be signed with the construction contractor should include mandatory requirements regarding the employment of local personnel, including:

    - in cases of equal qualifications, preference should be given to local candidates;
    - at least 70% of unskilled labor positions should be filled by local personnel.

2. During the updating of the Resettlement Action Plan (in case of need), particular attention should be paid to existing businesses located along sections of the highway where a reduction in vehicle flow is expected, as a decrease in business income may occur.
3. With regard to gender issues, the construction contractor and/or consultant shall develop a Gender Action Plan covering both the project implementation and operation phases. Local non-governmental organizations should be involved in the preparation of this plan.
4. In accordance with safety and technical standards, it is prohibited to use the design road for unauthorized activities. Appropriate awareness-raising measures should be implemented to ensure that local communities understand these restrictions and the associated safety requirements.

9.6 Grievance Redress Mechanism

During implementation of the Project, there might be several issues related to environmental and social hazards and disputes on entitlement processes occurred due to the Project activities. A GRM will be set up for the Project to deal with both the environmental and social issues of the Project.

The GRM addresses grievances in an efficient, timely and cost-effective manner, that arise in the Project, either due to actions by RD or the contractor/sub-contractors employed by RD, from affected communities and external stakeholders. Separate mechanisms are being developed to address worker grievances in line with the project Labour Management Procedures. RD is responsible for managing the GRM, but many of the grievances on the Project will likely relate to the actions of the Contractor and so will need to be resolved by the Contractor(s). RD with the support of the Supervision Consultant will administer the GRM process deciding whether they or the Contractor is responsible and determining the best course of action to resolve the grievance. The Supervision Consultant will support RD to monitor grievance resolution being undertaken by the contractor.

The project GRM deals with the issues of land and other assets acquisition (e.g. amount of compensation, suitability of residual land plots, loss of access roads, etc.) as well as the losses and damages caused by construction works, and any other direct or indirect environmental and social impacts including SEA/SH related grievances. Therefore, the grievance redress mechanism was in place by the time RD starts preparation of RAP, ESIA and shall function until the completion of all construction activities and beyond till the defect liability period ends. PAPs and other potential complainants should be fully informed of the GRM, its functions, procedures, timelines and contact persons both verbally and through booklets and information brochures during consultations meetings and other stakeholder engagement activities.

RD implements an effective GRM, with the objective of helping third parties to avoid resorting to the judicial system as far as possible. RD's GRM includes three successive tiers of extra-judicial grievance review and resolution: (i) the first tier is the Grievance Resolution Committee (GRCE) at the local level; (ii) the second tier is the GRM RD internal level; and finally, (iii) the third tier is the Grievance Redress Commission (GRC) comprising of senior RD management at RD headquarters level. Complainants can seek redress from the judicial system at any time. The step-by-step process does not deter them from approaching the courts.

All grievance related correspondence is documented, and the grievance resolution process will be systematically tracked. Anonymous complaints will also be recorded and investigated as part of the GRM.

Grievance Resolution Committee (Stage 1)

Stage 1, of the GRM involves an informal (oral) review of the complaint (whether written or oral). A local Grievance Resolution Committee (GRCE) will be established in Municipality, with an office in the municipal building. The GRCE shall convene as per necessity (but at least once a month) and shall include eight members. Special provisions will be made for any complaints of a confidential nature. The GRCE is an eight-member committee comprising of the following:

Roads Department of Georgia (RD) representative as a GRCE Coordinator;

Regional/municipal representative (from "Gamgeoba") as a GRCE Secretary;

Village attorney ("Rtsmunebuli") as a GRCE member;

Elected two Representative of PAP of which at least one is woman as a GRCE member;

Representative of local NGO taking into account the grievance character – as a GRCE member;

Local specialist of social and environmental safeguards from the Supervision Consultant – as a GRCE member;

Local specialist of social and environmental safeguards from the Construction Company – as a GRCE member.

To ensure GRC's effective functioning, there is not necessarily to have all 8 members on board, at least 3 members: such as representative of local municipality, representative of PAPs and construction company representative are sufficient number persons to resolve the grievance on local level.

The RD's Social and Environmental Issues Division manager will act as secretary of the GRC (creation, coordination, and documentation). Members of the GRC will be invited in accordance with the types of complaints to be addressed. The meeting will start without the complainants by reviewing all PAP complaints received since the last GRC meeting, and to propose a solution to all grievances within the past one or two weeks. Then, the GRC will welcome the complainants whose grievances had been reviewed during the previous meeting to discuss proposed resolution.

For each grievance, the GRC will determine whether additional investigations are warranted. If so, additional information will be collected before the next GRC meeting and will also be provided to the PAP before the meeting. The GRC will then inform the PAP about the date, time and place of its review meeting, and invite the PAP accordingly.

The GRC will receive the complainant and discuss with them a solution to their grievance. The committee shall draw up and sign the minutes of their discussion on the matter. If the grievance is satisfactorily resolved, the PAP will also sign the minutes in acknowledgement of the agreement. In cases where the project has agreed to put in place additional measures, these will be specified, with a timetable for delivery, in the minutes of the meeting. If the grievance remains unresolved, the PAP will be explained the Stage 2 escalation process. Grievance redress procedure of Stage 1 is an informal tool of dispute resolution during the project preparation and implementation stages and allowing PAPs and the project implementation team to resolve the disagreement without any formal procedures, procrastination and impediments. International experience in different projects shows that such informal grievance redress mechanisms help to solve most of the complaints without formal procedures (i.e. without using the procedures specified in the Administrative Code or litigation). If the PAP is not satisfied, the grievance redress mechanism assists him/her in lodging an official grievance in accordance with the procedures of Stage 2 (the plaintiff should be informed of his/her rights and obligations, rules and procedures of making a grievance, format of grievance, terms of grievance submission, etc.).

Grievance Resolution at Central Level (Stage 2)

In this stage, the grievance will be reviewed at the RD level. Unsolved grievances at Stage 1, with the complainant's consent, will be sent to RD in written form. Similarly, aggrieved complainants/PAPs dissatisfied with the GRC decision, can escalate their grievances to RD at the central level. The GRC will assist him/her in lodging an official complaint. RD's GRM Focal point and, RD Social and Environmental Issues Division Manager will review the written complaints of PAPs, which were not satisfied at Stage 1 and send them internally to the appropriate departments (legal, technical, contracts etc.) for redress. The RD internal timeframe for referral is 10 days. The complainant shall be informed of the decision within a maximum of 30 days, in accordance with the response time stipulated in the Administrative Code of Georgia.

RD's Problematic Issues (Social and Environmental) Redress Commission (Stage 3)

If the grievance continues to be unresolved at Stage 2 by the appropriate department, it will be presented to RD's Problematic Issues (Social and Environmental) Redress Commission. The RD's Problematic Issues (Social and Environmental) Commission has regular meetings (at least once in a month) and during the meetings, will review and decide upon the grievance in compliance with the Administrative Code of Georgia. The complainant shall be informed in writing of RD's decision. If RD's decision fails to satisfy the aggrieved affected persons, they can pursue further action by submitting their case to the appropriate court of law. The composition of the Problematic Issues (Social and Environmental) Redress Commission is as follows:

- Head of Roads Department of Georgia (Head RD's Problematic Issues (Social and Environmental) Redress Commission);
- Deputy Head of Roads Department of Georgia Deputy Head of Permissions Department (member);
- Deputy Head of Roads Department of Georgia Deputy Head of Permissions Department (member);
- Deputy Head of Roads Department of Georgia Deputy Head of Permissions Department (member);
- Deputy Head of Roads Department of Georgia Deputy Head of Permissions Department (member);
- Head of Legal Division (member);
- Deputy Head of Legal Division (member);
- Head of Resettlement Unit (member);
- Head of Roads Maintenance Division (member);
- Head of Highway Projects Construction Division (member);
- Head of Internal Roads Construction Division (member);
- Head of Environmental and Social Issues Division (member)
- Deputy Head of Social and Environmental Issues Division (member)
- Head of Technical Supervision and International Projects Planning Division (member);
- Resettlement and social issues consultant (invited member);
- Head of Environmental Unit (member).

Closure of Grievances

A grievance will be considered "resolved" or "closed" when a resolution satisfactory to both parties has been reached, and after corrective measures has been successfully implemented. When a proposed solution is agreed between the Project and the complainant, the time needed to implement it will depend on the nature of the solution. However, the actions to implement this solution will be undertaken within one month of the grievance being logged and will be tracked until completion. Once the solution is being implemented or is implemented to the satisfaction of the complainant, a complaint closes out form will be signed by both parties (Environmental and Social Issues Division Manager or his representative and the

complainant), stating that the complainant considers that his/her grievance is closed. The grievance will then be archived in the Project Grievance database.

In certain situations, however, the Project may "close" a grievance even if the complainant is not satisfied with the outcome. This could be the case, for example, if the complainant is unable to substantiate grievance, or the complaint is proven to be fraudulent. In such situations, the Project's efforts to investigate the grievance and to arrive at a conclusion will be well documented and the complainant advised of the situation. RD will not dismiss grievances based on a cursory review and close them unless the complainant has been notified and had the opportunity to provide supplementary information or evidence.

Grievance Records and Documentation

RD will nominate a GRM Focal Point to manage a grievance database to keep a record of all grievances received. The database will contain the name of the individual or organization lodging grievance; the date and nature of the grievance; any follow-up actions taken; the solutions and corrective actions implemented by the Contractor or other relevant party; the final result; and how and when this decision was communicated to the complainant.

All information regarding the grievances submitted during the Project implementation, the received complaints, and the means for their practical and timely solution will be collected in the annual reports prepared by RD and submitted to the WB (e.g., Grievance monitoring and reporting will occur in RD's six-monthly and annual reports).

Protocol for Handling Sensitive Complaints including Gender-Based Violence and SEA/SH Related Complaints

RD will establish a protocol for confidential survivor-centred approach to handling sensitive complaints, including those related to gender-based violence, SEA/SH involving project personnel. The protocol will establish clear guidelines on the Do's and Don'ts of handling such complaints such as maintaining confidentiality of the complainant, requesting only most essential information, informing the complainant of their choice to register the complaint with other institutions, referring the complainant to urgent medical help or other relevant services, among others. All project workers and local communities will receive awareness training on the availability of the GBV-sensitized grievance mechanism. Grievance focal points will receive in-depth training on applying the protocol for sensitive complaints. For the development of protocol and training RD will engage qualified GBV and SEA/SH expert.

Workers' Grievance Mechanism

RD, currently, does not have internal grievance mechanism in place which allows its employees to raise workplace concerns. The conciliation procedure is provided by the Labour Code of Georgia. There is no system in place to track grievances received by RD employees.

RD requires contractors to develop and implement a grievance mechanism for their workforce including sub-contractors, prior to the start of civil works. The construction contractors will prepare their labour management procedure in line with the project's LMP before the start of civil works, which will also include detailed description of the workers grievance mechanism.

The workers grievance mechanism will include:

- a procedure to receive grievances such as comment/complaint form, suggestion boxes, email, a telephone hotline;
- stipulated timeframes to respond to grievances;
- a register to record and track the timely resolution of grievances;
- a responsible department to receive, record and track resolution of grievances.

The Supervision Consultant will monitor the contractors' recording and resolution of grievances, and report these to RD in their monthly progress reports. The process will be monitored by GRM Focal Point, a RD representative who will be responsible for the project GRM.

The workers grievance mechanism will be described in staff induction trainings, which will be provided to all project workers. The mechanism will be based on the following principles:

The process will be transparent and allow workers to express their concerns and file grievances. There will be no discrimination against those who express grievances, and any grievances will be treated confidentially.

Anonymous grievances will be treated equally as other grievances, whose origin is known. Management will treat grievances seriously and take timely and appropriate action in response.

Information about the existence of the grievance mechanism will be readily available to all project workers (direct and contracted) through notice boards, the presence of "suggestion/complaint boxes", and other means as needed.

Grievance Log

The Grievance Logs will be developed at both – GRCE and GRCN levels and for GM under LMP. The Grievance Logs will be developed and managed by the RD representative at site (Convenor of the GRCE/Contact Person), contractor and supervision companies and will be kept at site (in the RD office or Engineer's office and Contractor's office).

- The records in Grievance logs include the following information:
- Name and contact details of the claimant;
- Date of receiving claim;
- Form of claim – (oral or written);
- To whom the claim has been addressed initially (entry point);
- The brief description of the essence of claim;
- the stages, dates, and participants of negotiations with the AP with GRCE (stage 1);
- Minutes of meetings;

Final decision of the GRCE (in case of the dispute is resolved, the decision is about closure of the issue. In case if the dispute remains unresolved, the decision is about passing to the stage 2 of the grievance redress process);

Date of decision of GRCE;

Documents prepared by AP with the help of GRCE for passing to GRCN.

SEA/SH Complaints will be handled in accordance with the SEAH GRM protocol to be developed with expert help prior to beginning construction activities. The SEAH grievance protocol will be based on survivor-centred approach, will include strict measures of confidentiality, and referral mechanisms to adequate service providers in the project area. No information on SEAH incidents will be shared without the consent of the SEAH survivor.

10. Conclusions and Recommendations

The following key conclusions and recommendations were developed during the Environmental and Social Impact Assessment (ESIA) process:

- The activity considered in the ESIA Report involves the improvement of Sections 4 and 5 (Badiauri–Bakurtsikhe) of the Second Lot of the Tbilisi–Bakurtsikhe section of the international

Tbilisi–Bakurtsikhe–Lagodekhi–Azerbaijani Border (S5) highway. The project proponent is the Roads Department of the Ministry of Infrastructure of Georgia;

- The ESIA Report has been prepared in compliance with the requirements of national legislation and the Environmental and Social Framework of the World Bank;
- Implementation of the highway construction and operation project will contribute to the development of regional transport infrastructure and the international transport corridor linking Eastern Europe, the Caucasus, and Central Asia. It will significantly increase the volume of transit cargo transported through the territory of Georgia and promote the country's economic growth;
- Several alternative options for project implementation were considered in the ESIA Report, including the "no-action" alternative and four alternative corridor alignments. The option that is environmentally and socially preferable was selected;
- Temporary construction infrastructure will be arranged for the implementation of construction works. Its specific layout will be determined by the construction contractor and, if required, agreed with the relevant state authorities;
- Secondary roads within the project area are relatively well developed; therefore, the construction of new temporary access roads will not require significant effort;
- Most of the selected transport corridor is not characterized by significant morphological or geological diversity. The Badiauri–Chalaubani section does not include areas highly sensitive to hazardous geodynamic processes. In contrast, the Chalaubani–Bakurtsikhe section requires the implementation of appropriate stabilization and protection measures. Overall, the relief conditions are generally satisfactory, and no substantial changes to the existing geological environment are expected during construction;
- From an engineering-geological perspective, a relatively sensitive section is the approximately 6-km-long segment crossing the Gombori Ridge within the Chalaubani Gorge. However, even in this area, particularly complex engineering-geological conditions have not been identified. For each such section, safe slope inclination angles have been calculated, and protective structures will be applied where necessary;
- During construction works, stationary and mobile sources of air pollutant emissions and noise will be present within the project corridor. With the implementation of appropriate mitigation measures, impacts on the natural environment and local population will not be significant. During the operation phase, the installation of noise barriers is proposed for certain sections
- The biological environment along most parts of the project corridor (Badiauri–Chalaubani and Bakurtsikhe sections) is not considered sensitive. The degree of naturalness of vegetation cover and habitats is low. A biologically more notable area is the approximately 6-km-long section crossing the Gombori Ridge; however, the naturalness of the biological environment there is also significantly degraded. Overall, the anticipated impacts on biodiversity are assessed as low to moderate. Appropriate mitigation and compensation measures will be implemented
- The project corridor does not intersect or pass in the vicinity of protected areas
- The project corridor crosses several rivers, streams, and irrigation system distributors. Consequently, during the construction phase, there is a certain risk of impacts on surface and irrigation water quality. To prevent such risks, appropriate management of waste and wastewater is required;
- A significant portion of the project corridor passes through agricultural land characterized by fertile soils with a well-developed humus layer. Therefore, the construction contractor will implement appropriate measures to protect the fertile topsoil during project implementation;
- According to the results of archaeological studies conducted within the project corridor, impacts on historical and cultural heritage sites are not expected. However, the possibility of chance finds of archaeological artifacts exists, and preventive measures to avoid damage are required;
- Project implementation will require land acquisition and resettlement. Prepared Resettlement Action Plan (RAP) is subject to update. All affected persons will be provided with appropriate compensation packages;
- Based on the conducted analysis, cumulative impacts are not expected to be significant;

- As a result of the road modernization, substantial positive social and economic impacts are anticipated. The project will significantly contribute to the country's sustainable economic development, while the risks of road accidents and transport disruptions will be considerably reduced
- The ESIA Report includes an Environmental Management Plan (EMP) and an Environmental Monitoring Plan. Implementation of the measures outlined in these plans will significantly reduce the anticipated impacts

During project implementation, all environmental measures specified in the ESIA Report and required under the environmental legislation of Georgia will be carried out. Key measures include:

- Compliance with the obligations stipulated by the environmental decision and implementation of mitigation measures identified in the ESIA Report;
- Implementation of measures defined in the Waste Management Plan; the arrangement of disposal sites will be agreed with local authorities;
- Removal of trees and vegetation within the project corridor will be coordinated with the authorized bodies. Special attention will be given to the protection of Red List species, and any removal will be conducted under special supervision;
- Particular emphasis will be placed on ensuring engineering-geological stability. Additional protective structures will be applied as needed, and appropriate monitoring will be conducted;
- In the event of grievances from the local population, all possible measures will be taken to address them;
- Safety of road users will be ensured;
- Upon completion of construction works, the project area will be cleaned, materials and waste will be removed, and damaged areas will be restored and rehabilitated;
- Any significant unforeseen environmental problems will be reported to the Ministry of Environmental Protection and Agriculture of Georgia.

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Annex 1. Floristic Description of Sample Plots

Site №1 X-553142; Y-4610167. Exposition: S Slope gradient: 8° Plant projection coverage: 50% Habitat: Shybliak shrubs			
List of species / Projection coverage (%)			
Paliurus spina-christi	2	Aegilops cylindrica	1
Crataegus pentagyna	2	Achillea millefolium	+
Rubus sp.	1	Hordeum murinum	1
Papaver corniculatum	+	Stipa pennata	1

Site №2 X-564758; Y-4608494. Exposition: N/W Slope gradient: 3° Plant projection coverage: 50% Habitat: Ruderal, adjacent to the road			
List of species / Projection coverage (%)			
Glycyrrhiza glabra	2	Paliurus spina-christi	1
Rubus sp	4	Cynosurus echinatus	1
Salix wilhelmsiana	+	Brachypodium distachyon	1
Populous nigra	1	Hordeum murinum	1

Site №3 X-566898; Y-4608641. Exposition: N Slope gradient: 10° Plant projection coverage: 60% Habitat: Oak-hornbeam forest			
List of species / Projection coverage (%)			
Quercus iberica	3	Cornus mas	1
Carpinus betulus	3	Corylus avellana	+
Carpinus caucasica	1		
Acer campestre	1		

Site №4 X-566944; Y-4608649. Exposition: N Slope gradient: 8° Plant projection coverage: 60% Habitat: Oak-hornbeam forest			
List of species / Projection coverage (%)			
Quercus iberica	2	Acer campestre	1
Carpinus betulus	2	Corylus avellana,	+
Carpinus caucasica	3	Cornus mas	+
Swida australis	1	Hedera helix	+
Crataegus pentagyna	1		
Lactuca serriola	+		

Site №5 X-567012; Y-4608634. Exposition: N Slope gradient: 11° Plant projection coverage: 60% Habitat: Oak-hornbeam forest			
List of species / Projection coverage (%)			
Quercus iberica	2	Acer campestre	1
Carpinus betulus	2	Corylus avellana,	+
Carpinus caucasica	3	Cornus mas	+
Sambucus nigra	1	Sambucus ebulus	1

Site №6 X-567069; Y-4608603. Exposition: N Slope gradient: 10° Plant projection coverage: 60% Habitat: Oak-hornbeam forest			
List of species / Projection coverage (%)			
Quercus iberica	2	Crataegus pentagyna	1
Carpinus betulus	3	Humulus lupulus	+
Carpinus caucasica,	1	Lonicera steveniana	1
Acer campestre	1		
Corylus avellana	+		

Site №7 X-567129; Y-4608639. Exposition: N Slope gradient: 8° Plant projection coverage: 60% Habitat: Hornbeam-oak forest			
List of species / Projection coverage (%)			
Quercus iberica	2	Crataegus pentagyna	1
Carpinus betulus	3	Tilia caucasica	1
Carpinus caucasica,	1	Swida australis,	1
Acer campestre	1	Hedera helix,	1
Corylus avellana	+		
Sambucus nigra	1		

Site №8 X-569110; Y-4609979. Exposition: N/W Slope gradient: 5° Plant projection coverage: 60% Habitat: Floodplain			
List of species / Projection coverage (%)			
Salix alba	2	Crataegus pentagyna	1
Populus italica	1	Rubus sp.	3
Carpinus caucasica	1	Acer campestre	+
Robinia pseudoacacia	1	Swida australis	1
Morus nigra	1	Sambucus ebulus	1
Sambucus nigra	1		

Site №9 X-569001; Y-4610568. Exposition: N/E Slope gradient: 10° Plant projection coverage: 70% Habitat: Rocky riverbank			
List of species / Projection coverage (%)			
Salix caprea	+	Lactuca serriola	1
Paliurus spina-christi	+	Gypsophila elegans	1
Rubus sp.	1	Bromus briziformis	1
Glycyrrhiza glabra	1	Pinus nigra	1

Site №10 X-569333; Y-4610687. Exposition: N/E Slope gradient: 5° Plant projection coverage: 55% Habitat: Rocky riverbank			
List of species / Projection coverage (%)			
Tilia caucasica	2	Salix alba	+
Rubus sp.	1	Quercus iberica	2
Carpinus caucasica	+	Robinia pseudoacacia	1
Ulmus glabra	1	Populus italica	1
Swida australis	1	Crataegus pentagyna	1
Cornus mas	1	Acer campestre	1
Juglans regia	1	Hedera helix	+
Corylus avellana	1	Acer campestre	+

Site №11 X-569493; Y-4611427. Exposition: N/E Slope gradient: 8° Plant projection coverage: 60% Habitat: Shybliak shrubs			
List of species / Projection coverage (%)			
Salix alba	2	Cornus mas	+
Rubus sp.	3	Juglans regia	+
Carpinus caucasica	1	Corylus avellana	+
Ulmus glabra	1	Robinia pseudoacacia	+
Swida australis	+	Populus italica	1

Site №12 X-569453; Y-4612627. Exposition: N Slope gradient: 8° Plant projection coverage: 50% Habitat: Rocky riverbank			
List of species / Projection coverage (%)			
Acer campestre	1	Carpinus caucasica	1
Hedera helix	1	Tilia caucasica	+
Populus italica	1	Corylus avellana	+
Robinia pseudoacacia	+	Tilia caucasica	1
Carpinus betulus	2	Sambucus nigra	1

Site №13 X-569436; Y-4613016. Exposition: N/E Slope gradient: 7° Plant projection coverage: 50% Habitat: Oak-Hornbeam forest			
List of species / Projection coverage (%)			
Carpinus caucasica	2	Salix alba	1
Cornus mas	1	Populus italica	+
Corylus avellana	1	Hedera helix	1
Quercus iberica	3	Acer campestre	+
Crataegus pentagyna	1	Robinia pseudoacacia	1

Site №14 X-569521; Y-4613443. Exposition: E Slope gradient: 12° Plant projection coverage: 60% Habitat: Hornbeam-Oriental hornbeam forest			
List of species / Projection coverage (%)			
Carpinus betulus,	3	Acer campestre,	+
Carpinus caucasica	2	Swida australis	1
Cornus mas	1	Tilia caucasica	+
Corylus avellana	1	Salix alba	1
Crataegus pentagyna	1	Hedera helix,	1
Dactylis glomerata	1	Atriplex micrantha	+
Lactuca serriola	+	Onosma tenuiflora	+

Site №15 X-569854; Y-4614108. Exposition: N/W Slope gradient: 5° Plant projection coverage: 75% Habitat: Hornbeam-oak forest			
List of species / Projection coverage (%)			
Carpinus betulus,	3	Acer campestre	1
Quercus iberica	3	Corylus avellana	2
Carpinus caucasica	1	Cornus mas	1
Tilia caucasica	1		
Swida australis	1		

Site №16 X-570105; Y-4614510. Exposition: N/W Slope gradient: 8° Plant projection coverage: 80% Habitat: dry gully			
List of species / Projection coverage (%)			
Tilia caucasica	3	Carpinus caucasica	1
Carpinus betulus	2	Cornus mas	1
Salix alba	1	Crataegus pentagyna	1
Acer campestre,	1	Robinia pseudoacacia	1
Quercus iberica	1	Hedera helix	1
Humulus lupulus	2		

Site №17 X-570139; Y-4614746. Exposition: N/E Slope gradient: 10° Plant projection coverage: 80% Habitat: Hornbeam forest			
List of species / Projection coverage (%)			
Carpinus betulus	3	Corylus avellana	1
Paliurus spina-christi	2	Rubus sp	1
Juglans regia,	+	Ulmus glabra	+
Swida australis	1		
Cornus mas,	1		

Site №18 X-570555; Y-4615105. Exposition: N/E Slope gradient: 5° Plant projection coverage: 70% Habitat: anthropogenic forest			
List of species / Projection coverage (%)			
Robinia pseudoacacia	3	Corylus avellana	1
Paliurus spina-christi	2	Rubus sp	1
Carpinus betulus	1	Populus italica	+
Swida australis	1	Ailanthus altissima	1
Cornus mas,	1	Lonicera steveniana	+
Cotinus coggygria	1		

Site №19 X-571614; Y-4615867. Exposition: N/E Slope gradient: 3° Plant projection coverage: 40% Habitat:			
List of species / Projection coverage (%)			
Cedrus libani	r	Xanthium stramarium	1
Punica granatum	1	Juglans regia	r
Leucanthemum vulgare	1	Dactylis glomerata	1
Symphytum caucasicum	1	Xeranthemum annuum	1

Site №20 X-572084; Y-4616386. Exposition: E Slope gradient: 5° Plant projection coverage: 60% Habitat: anthropogenic meadow			
List of species / Projection coverage (%)			
Cedrus libani)	1	Dactylis glomerata	1
Punica granatum	1	Atriplex micrantha	1
Rubus sp.	2	Hordeum murinum	1
Robinia pseudoacacia	2	Carex canescens	1
Aegilops cylindrica	+	Amaranthus retroflexus	1

Site №21 X-572461; Y-4617053. Exposition: N/E Slope gradient: 8° Plant projection coverage: 55% Habitat: anthropogenic meadow			
List of species / Projection coverage (%)			
Hordeum murinum	3	Aegilops cylindrica	2
Agropyron cristatum	2	Brachypodium distachyon	2
Echinochlora crus-galli	1	Achillea millefolium	2
Astrodaucus orientalis	+	Poa bulbosa	1
Verbascum speciosum	r		

Site №22 X-572479; Y-4617183. Exposition: N/E Slope gradient: 5° Plant projection coverage: 60% Habitat: anthropogenic meadow			
List of species / Projection coverage (%)			
Rubus sp	2	Aegilops cylindrica	1
Morus nigra	1	Brachypodium distachyon	1
Hordeum murinum	3	Poa bulbosa	3
Astrodaucus orientalis	1	Carex canescens	1
Capsella bursa-pastoris	1	Amaranthus retroflexus	+
Achillea millefolium	1	Xeranthemum annuum	1