Roads Department

of the Ministry of Regional Development and Infrastructure of Georgia

KAKHETI CONNECTIVITY IMPROVEMENT PROJECT

Modernization of Tbilisi-Bakurtsikhe (Sagarejo – Bakurtsikhe Eastern Part) of International Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan Border (S5) Road

Environmental and Social Impact Assessment

and

Environmental and Social Management and Monitoring Plans

(DRAFT FOR CONSULTATION)

Tbilisi

2022

Table of Contents

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
AIIB	Asian Infrastructure Investment Bank
AH	Affected Household
AP	Affected Person
BMP	Biodiversity Management Plan
EIB	European Investment Bank
EU	European Union
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EHS	Environmental, Health, and Safety
EHSG	Environmental, Health, and Safety Guideline
ESIA	Environmental and Social Impact Assessment
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standard
EWH	East West Highway
GDP	Gross Domestic Product
GEL	Georgian Lari
GIIP	Good International Industry Practice
GIS	Geographical information system
GoG	Government of Georgia
GRC	Grievance Resolution Commission
GRCE	Grievance Resolution Committee
GRL	Georgian Red List
GIIP	Good International Industry Practice
GRM	Grievance Redress Mechanism
IBA	Important Bird and Biodiversity Areas
IBRD	International Bank for Reconstruction and Development
HSMP	Health and Safety Management Plan
ICP	Infection control and prevention
IDP	Internally Displaced Person
ILO	International Labor Organization
KIMP	Kakheti Integrated Mobility project
LEPL	Legal Entity of Public Law
LMP	Labor Management Procedures
MoEPA	Ministry of Environment Protection and Agriculture
MoESD	Ministry of Economy and Sustainable Development of Georgia
MoIA	Ministry of Internal Affairs of Georgia
MoILHSA	Ministry of IDPs from the Occupied Territories, Labor, Health and Social Affairs of Georgia
MoRDI	Ministry of Regional Development and Infrastructure

NAM	National Agency of Mines
NAPR	National Agency of Public registry
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 (Guidelines for the construction of motorways)
RAL	Richtlinien für die Anlage von Landstraßen (Guidelines for the construction of country roads)
RD	Roads Department of Georgia
RoW	Right of Way
RU	Registration Unit
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
SEP	Stakeholder Engagement Plan
USD	United States Dollar
VEC	Valued Environmental and Social Components
WB	World Bank
WHO	World Health Organization

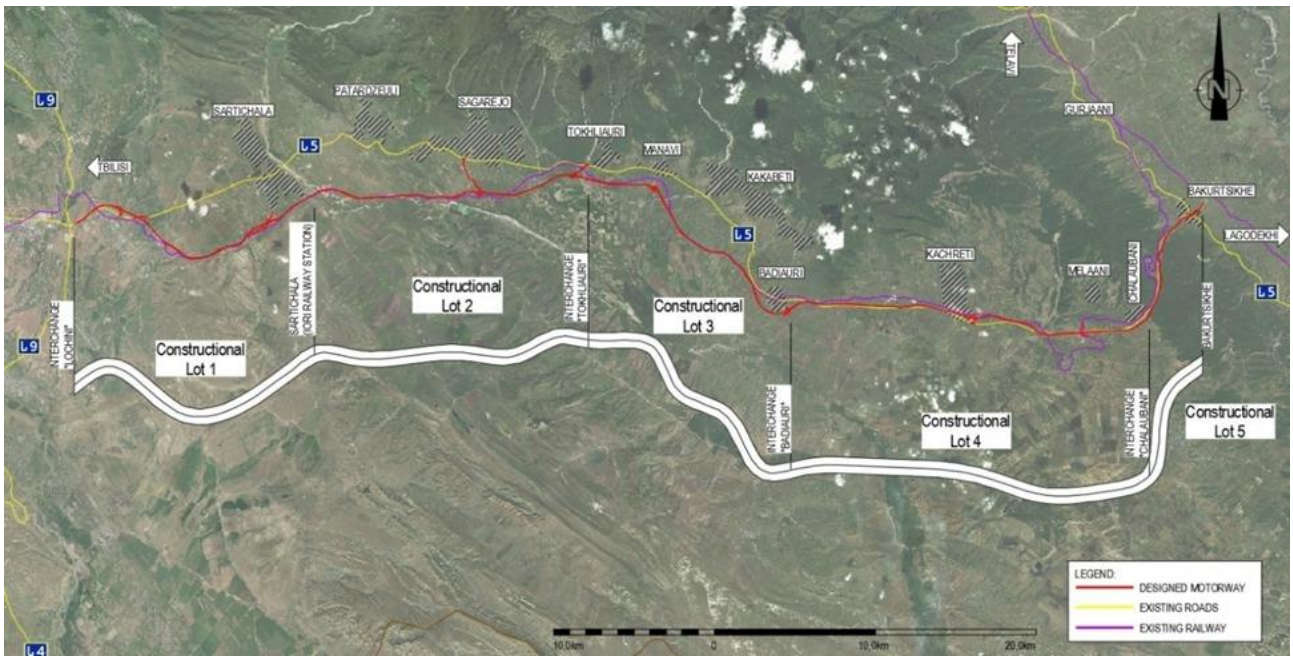
Executive Summary

Foreword

This Executive Summary of the Environmental and Social Impact Assessment (ESIA) for Construction and Operation of the Sagarejo-Bakurtsikhe Highway section describes the proposed project and presents major findings of the ESIA. The document provides a summary of environmental and socioeconomic conditions and of how the project could affect people and the environment. In addition, it summarizes the actions that have to be taken to reduce the effects on the environment or people.

This ESIA covers Lots 3-5 of the planned S5 Kakheti highway, of which Lot 3 (17 km, Tokhliauri – Badiarui) is proposed to be financed by the World Bank under the Kakheti Connectivity Improvement Project.

Figure E1 – map of the project corridor



The ESIA is part of a larger set of the Georgia Roads Department's (RD's) environmental and social documents prepared for the construction and operation of Sagarejo-Bakurtsikhe Highway which also includes a Stakeholder Engagement Plan (SEP), Resettlement Action Plans (RAPs), and Labor Management Procedures (LMP). The ESIA document will be available in Georgian and in English on the Internet at and at the following locations:

- The Roads Department of Georgia: Al. Kazbegi Avenue 12, Tbilisi, Georgia;
- The Consultant office: Zurab da Teimuraz Zaldastanishvilebis 16, Tbilisi, Georgia;
- Sagarejo Municipality: D. Agmashenebeli Str. #9, Sagarejo, Georgia;
- Gurjaani Municipality: Noneshvili Avenue #13, Gurjaani, Georgia.

The developer of the project, the Roads Department of Georgia (RD), according to the Georgian Legislation (EIA procedures) participated in the public consultation meetings with the municipalities the project will affect in order to receive comments and information from affected people and other interested parties, it should be noted that the RD will organize the public consultation meeting in municipalities to inform and update the information for the local population regarding changes in ESIA report and introduce to them the World Bank's Environmental and Social Framework (ESF) and receive comments (if any). The SEP of the same project provides details on the program to receive comments and information during the public consultation period.

Introduction and Background

The Government of Georgia is conducting a program to upgrade the major roads of the country, managed by the RDof the Ministry of Regional Development and Infrastructure (MoRDI). The program aims to improve transportation and transit of goods to surrounding countries, which is a significant and growing contributor to 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 throughputs and increase transit times. This creates difficulties for haulage companies and their clients, truck drivers, Georgian motorists, and local residents.

The main target of the program for upgrading major roads in Georgia is the S5 Kakheti Highway - the main route from neighbouring Azerbaijan and Russia, also connecting to Turkey and Armenia. For planning purposes, the Kakheti Highway has been divided into sections of various lengths. The World Bank is providing series of loans to the Government of Georgia for upgrading highway through East West Highway Improvement Projects (EWHIPs) and is considering providing financing for upgrading Kakheti Highway section. The World Bank financed Kakheti Connectivity Improvement Project (KCIP) will support construction of the highway section from village Tokhliauri to Badiauri (17km) - Lot 3. Lots 0, 1, and 2 will be financed from the State budget, while source of funding for Lots 4 and 6 is yet to be defined. National legislation of Georgia requires Environmental Impact Assessment (EIA) of the construction of Khakheti Highway. EIA was undertaken separately for Lots 0, 1, and 2 and for Lots 3, 4, and 5. EIA report covering Lots 3, 4, and 5, comprising Highway section from Tokhiliauri (Sagarejo) to Bakurtsikhe, was upgraded to meet the requirements of the World Bank once the decision was made to finance construction of Lot 3 from the proceeds of the World Bank loan. Present ESIA report for works in Tokhliauri (Sagarejo)-Bakurtsikhe section of the Highway, including arrangement of a roadside marketplace near Badiauri interchange, carries an Environmental and Social Mitigation Plan and an Environmental and Social Monitoring plan as well.

<table>
<tr><th>Lot #</th><th>Segment Description</th><th>Construction Financier</th><th>Coverage by ESIA Documents</th></tr>
<tr><td>0</td><td>Lotchini to Vaziani</td><td rowspan="3">State Budget</td><td rowspan="3">EIA report meeting national requirements
(environmental permit obtained)</td></tr>
<tr><td>1</td><td>Vaziani to Ninotsminda</td></tr>
<tr><td>2</td><td>Ninotsminda to Tokhliauri (Sagarejo)</td></tr>
<tr><td>3</td><td>Tokhliauri (Sagarejo) to Badiauri</td><td>World Bank (KCIP)</td><td rowspan="3">Present ESIA report meeting national and World Bank requirements
(environmental permit obtained)</td></tr>
<tr><td>4</td><td>Badiauri to Chalaubani</td><td>tbd</td></tr>
<tr><td>5</td><td>Chalaubani to Bakurtsikhe</td><td>tbd</td></tr>
</table>

Technical and Environmental Standards

The technical design of the highway improvement meets the Trans-European Motorway (TEM) standards. The project will be implemented in compliance with the Georgian legislation and environmental standards, as well as the World Bank's ESSs relevant to the project. The relevant standards are ESS1: Assessment and

Management of Environmental and Social Risks and Impacts; ESS2: Labor 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.

Objective of the ESIA

The resent ESIA is intended to meet requirements established by the World Bank for Substantial-risk projects and to meet Georgia legal requirements. Prior to making a funding decision and proceeding with the project, the World Bank and RD will have to be satisfied that:

- The program will meet Georgian national requirements and World Bank requirements.
- The project will include measures as necessary to avoid or minimize significant adverse changes in environmental, health and safety, and socio-economic conditions.
- Appropriate public consultation and disclosure are undertaken in line with Georgian national law and the World Bank's ESF, thus ensuring that all reasonable publicand other opinions are adequately considered prior to a commitment for proceeding with the project.

Environmental Screening

The proposed works for the improvement of the Highway between Sagarejo and Bakurtsikhe include construction of a four-line section of the motor road with a range of bridges on a new alignment bypassing Sagarejo. According to the Georgian law, the proposed project is subject to environmental decision and environmental permitting.

Public Participation

The Bank policies and the Georgian legislation 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 ESIA of the highway construction in 2020 - the Scoping report was approved by the Ministry of Environmental Protection and Agriculture (MoEPA) on March 9, 2020. The Final version of the ESIA report was submitted on April 14, 2021. The MOEPA 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 ESIA report was disclosed at the RD's web page on June 4, 2021. The MOEPA published the Environmental Decision on October 4, 2021. The present ESIA report was updated according to the World Bank's ESF requirements.

The draft ESIA report will be posted on the web page of the RD. Hard copies of the document will be made available at the offices of Sagarejo and Bakurtsikhe local self- governments located within the project implementation area, RD, and the office of Tinatin Jijiashvili, RD consultant.

RD will organize a public consultation meeting to discuss the draft ESIA report. Members of the communities in the project area, including elected officials, as well as representatives of the local small and medium

businesses and other stakeholders will be invited. RD will seek questions and comments from the stakeholders and will incorporate received feedback into the ESIA report, as appropriate.

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” have been 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

The Tbilisi-Bakurtsikhe section (Approx. length 80km), starts at the eastern part of the Tbilisi and ends near village Bakurtsikhe. This part of the corridor crosses Sagarejo, Signagi and Gurjaani municipalities. The section subject of this ESIA connects Sagarejo with Bakurtsikhe. This will be a completely new section of the highway, bypassing Sagarejo. The total road length of the Sagarejo-Bakurtsikhe section will be 61.5km. A section financed by WB is located between villages Tokhliauri and Badiauri (Lot 3), with total length 17km and is subject of this ESIA.

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 comply with those of the previous sections of the highway, viz.: number of lanes – 4; lane width 3.75; carriageway width - 2x7.50m and median width including barriers – 4m. The design speed of 100km/h and 80km/h is applied. The project includes 31 bridges. The new section runs through agricultural lands CH 52 + 540 of the corridors will pass the new Badiauri road junction. Then at CH 75 + 100 - Chalaubani new road junction. The route will pass through the relatively difficult terrain conditions of Gombori ridge and will end in the village Bakurtsikhe, chainage 84 + 217.05.

The Kakheti highway section between Tbilisi and Bakurtsikhe is being divided into six constructional lots, and for each constructional lot, an independent design is being carried out. More precisely, the constructional lots are:

Constructional Lot 0 – Lotchini Interchange to Vaziani Interchange

This Constructional Lot (CL) commences at chainage 0+310.22 and ends at chainage 04+040.00. The start of the Lot at ch. 0+310.22 is located to the east of the existing Lochini interchange (I/C). Concurrently with the under-consideration Project of the Tbilisi – Bakurtsikhe road, there is another road Project running regarding the Tbilisi By-Pass, in which the Lotchini I/C is being upgraded. The start of the current Project to the east of

the existing Lotchini I/C was the result of discussions with the Roads Department of Georgia (RD), in order for the two Projects to be compatible. The end of the CL 0 at ch. 04+040 is located close After the Vaziani I/C.

Constructional Lot 1 – Vaziani Interchange to Ninotsminda Interchange
The Constructional Lot (CL) 1 commences at ch. 0+4040 and ends at ch. 27+840. The start of the CL 1 at ch. 0+4040 is located to the east of the designed Vaziani interchange (I/C). The end of the CL 1 at ch. 27+840 is located before the Ninotsminda or Sagarejo east I/C. It is noted that there is a chainage fall, namely ch.10+303.862 ≡ ch. 10+100.000.

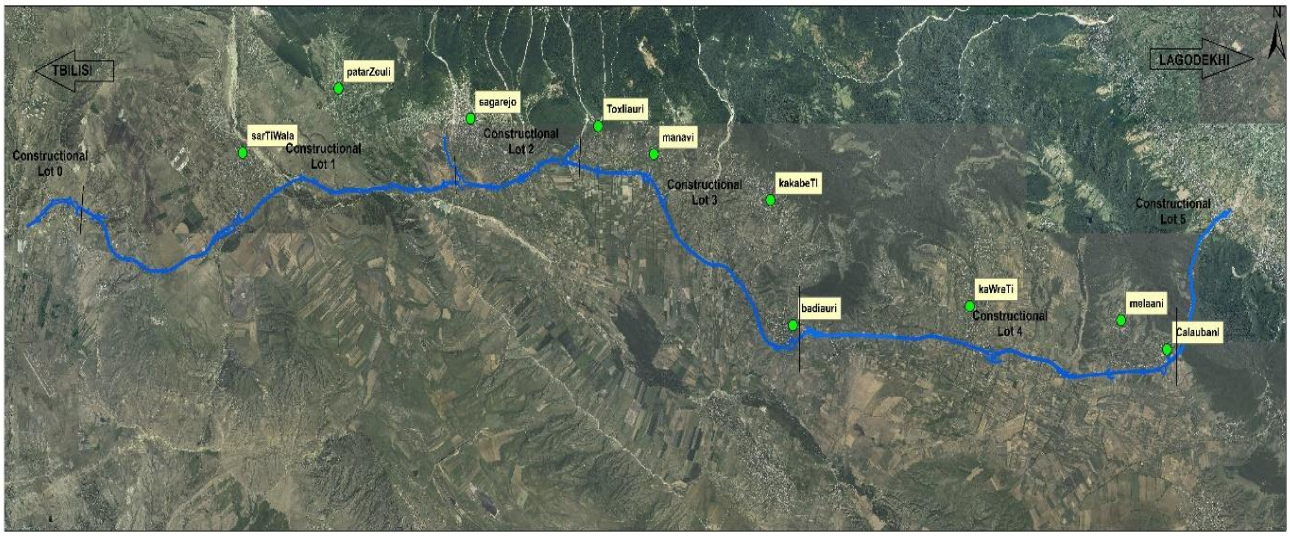
Constructional Lot 2 – Ninotsminda Interchange to Tokhliauri Interchange
The CL 2 commences at ch. 27+840 and ends at ch. 35+500. The CL 2 is subsequent to the CL 1. The start of the CL 2 at ch. 27+840 is located before Ninotsminda to the Iori railway Station. The end of the CL 2 at ch. 35+500 is located to the east of the new Tokhliauri I/C.

Constructional Lot 3 – Tokhliauri Interchange to Badiauri Interchange
The 3rd CL commences at ch. 35+500 and ends at ch. 52+540. The CL 3 is subsequent to the CL 2. The start of the CL 3 at ch. 35+500 is located to the east of the new Tokhliauri I/C. The end of the CL 3 at ch. 52+540 is located to the east of the new Badiauri I/C.

Constructional Lot 4 – Badiauri Interchange to Chalaubani Interchange
The 4th CL commences at ch. 52+540 and ends at ch. 75+100. The CL 4 is subsequent to the CL 3. The start of the CL 4 at ch. 52+540 is located to the east of the new Badiauri I/C. The end of the CL 4 at ch. 75+100 is located to the east of the new Chlaubani I/C.

Constructional Lot 5 – Chalaubani Interchange to Bakurtsikhe
The 5th CL commences at ch. 75+100 and ends at ch. 84+217.05. The CL 5 is subsequent to the CL 4. The start of the CL 4 at ch. 75+100 is located to the east of the new Chalaubani I/C. The end of the CL 5 at ch. 84+217.05 coincides with the ch. 0+413.20 of the new road from Gurjaani to Tsnori, which is currently under design. The end of the current Project was the result of discussions with the RD, in order for the two road Projects to be compatible.

Figure E2 – map of the project alignment by lots

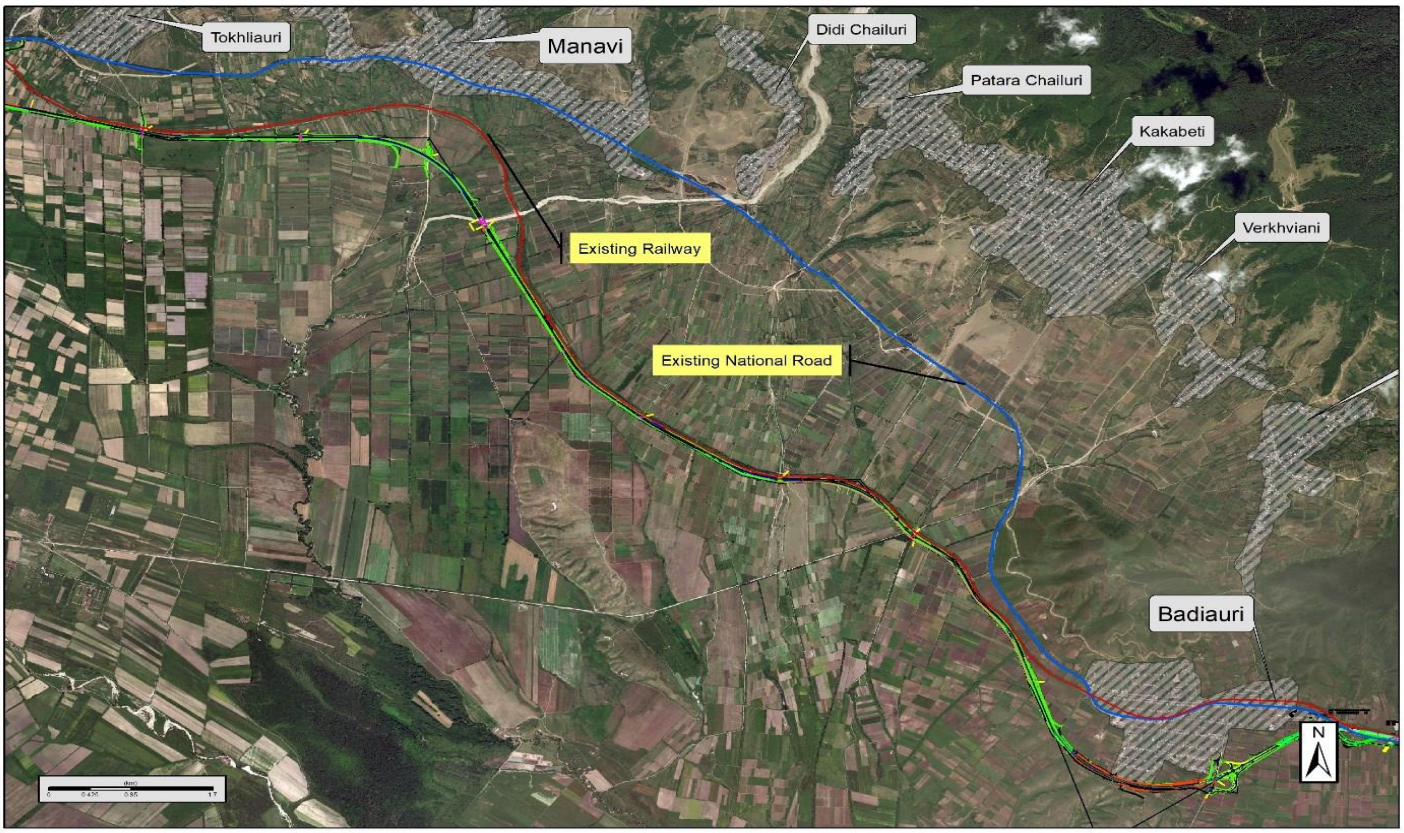


The Constructional Lot 3, which will be constructed under the World Bank loan, the four-lane divided Kakheti Motorway starts after the designed Tokhliauri Interchange (Chainage 35+500) with direction towards East – Southeast and ends after the village of Badiauri, after the designed Interchange (Chainage 52+540) with a total length of 17+040m and lane with of 3.75m. From the begging of the Lot 3, the designed motorway wings its way to the east in parallel to the existing railway line for approximately three kilometers and at approx. Chainage 37+500 due to different geometric requirements and conditions, the motorway turns Southeast

while the existing railway continues Eastward. At approx. Chainage 41+500, after the crossing of the Chailuri River, the designed motorway is again oriented parallelly to existing railway corridor about 7km. Then it deviates again from the existing railway line in order to by-pass the Badiauri Settlement from the southern side. About Chainage 51+200, the Motorway turns Northeast, moving towards the existing road and the existing Railway Line, completing the Badiauri by-pass. In order to reduce the Noise impact on the settlements, the by-pass is mostly located in a double cut section. The orientation of the motorway remains the same until the end of the Constructional Lot at Chainage 52+540. The Design foresees new Badiauri I/C at approx. Chainage. 51+783 which connects to the existing national road, the village of Badiauri and the road to Iormogalo settlement. In addition, the Motorway serves the settlements of Tokhliauri, Manavi, Chailuri, Kakabeti and eliminates the travel time towards the Lagodekhi and Telavi, considering design speed of 120km/h. The design also provides the complete restoration of the existing local road network, which is disrupted by the presence of the Motorway. Significant length of local roads is following the motorway, in order to maintain the access to the land properties. In addition, at the interchanges, secondary roads - ramps are envisaged for the connection of the new motorway with the local road network. These roads are connected via underpasses and overpasses.

The design of Lot 3 includes two overpass bridges of 180m total length, and eight underpass box structures. Two motorway bridges are envisaged in the design, for the Crossing of Chailuri river and the Badiauri I/C with total length of 125m. In addition, the design envisages the construction of 86 drainage structures – culverts, including the complete restoration of the local Irrigation network. The design also includes significant amount of ground improvements due to the presence of weak ground, which leads to the application of Flexible Pavement throughout these 17.04 km.

Figure E3 – map of the lot 3



Taking into consideration that traffic may decline along the existing road of Lot 3 which will impact the activities of roadside vendors from villages along the road, the project envisions supporting the construction of an additional marketplace along the highway corridor to expand opportunities for local traders who wish

to start or continue business activities closer to the new highway corridor. The special marketplace dedicated for these purposes was designed as part of the Lot 3 road section. The place will be constructed by RD, but father maintenance of the marketplace will be an obligation of local municipality. In this regard, RD plans to sign the memorandum of understanding with local municipality. Also, the municipality will provide the furniture/minor infrastructure and utilities (electricity, gas, water supply, sanitary facilities etc.) for the mentioned marketplace. The present ESIA covers assessment of environmental and social risks and mitigation of the expected negative impacts of marketplace construction as well.

Figure E4 – map of the marketplace

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 % may be local workforce, which couldbe hired as semi-skilled or unskilled workers during the construction period.

Land acquisition needs are being studied by resettlement specialists of the design company *JV AECOM Limited (lead member) and ILF Consulting Engineers Austria GmbH*. Their report is submitted separately. Summary of the land acquisition and resettlement impacts under the section covered by the ESIA, including those covered under the Resettlement Action Plan for Lot 3, is incorporated in the ESIA report.

Environmental Impact Assessment Methodology

The ESIA process included the following activities (i) determination of the scope of the work; (ii) collection of the 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, car stationing area – have been considered as well. On the initial stage of the ESIA, spatial boundaries of the study area were defined to allow identification and assessment of the expected impacts and to enable comparative assessment of project alternatives in a given environment.

Environmental and Social Baseline

The ESIA report presents information about the physical, biological, and socio- economic characteristics of the environment alongside the project 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, including demographic data (population number, gender, age), education, employment, and livelihoods data; assessment of potentially disadvantaged and vulnerable groups including ethnic minorities.

Risks of the construction phase include impact on surface water, vegetation and soil, disturbance of terrestrial wildlife, noise and emissions, physical relocation of five households, agricultural land take, and disruption of economic activity for several roadside traders. The highway design has been developed so as to bypass the settled and sensitive areas, and mitigation measures have been suggested for the sensitive sections. All risks, including technical, environmental and social, were carefully examined in order to develop a safe and less damaging alterative. The overall environmental and social risk of the Kakheti Connectivity Improvement project has been assessed as Substantial. Most environmental and social impacts are manageable through the developed technical solutions, implementation of relevant mitigation measures and adherence to conventional good construction practice.

Expected Impacts and Mitigation

Taking into account the location and sensitivity of human settlements and environmental receptors, the following mitigation measures were developed to mitigate the main risks associated with the project implementation:

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 project needs will not cause functional damage to the ecosystem, however compensatory tree planting will be carried out within the Kakheti corridor at the ratio of 1:3 (except for the trees cleared from the private land plots). Selection of species for planting will be based on the natural composition of local flora. Clearance from the National Forestry Agency will be obtained authorizing tree felling in the forested areas.

Greening of the construction sites along the RoW, as well as maintenance of the re-planted areas for two years will be included in the contractor works. RD will be responsible for further maintenance of plantations. Re-cultivation of disturbed areas, including re-planting, will enable to mitigate disturbance of animal species. The selected alignment of the road does not affect any critical habitat. According to the data collected during surveys, Kakheti Highway corridor mainly crosses 2 different types of habitats: (i) lowland-hilly arid-denudative type habitat, agricultural lands and anthropogenic meadows with small ravines, and (ii) foothill oak-hornbeam forest type Habitat according to EUNIS terrestrial habitat classification: G1.A1 Quercus - Fraxinus - Carpinus caucasica forest Habitat developed on eutrophic and mesotrophic soils. The impact on natural habitat located within the Project RoW differs according to the landscapes provided in the alignment of different lots. The main impact on the natural habitat is expected in the Chalaubani-Bakurtsikhe part of the Highway (Lot 5) where greenery is represented by a mixed oak and hornbeam forest stand. Project will affect a 6 km long strip of which equals to 24[1] ha area and makes about 0.047% of the entire natural habitat of oak-hornbeam forest in this region of Georgia.

Tokhliauri-Badiauri 17 km section of Sagarejo-Bakurtsikhe Highwayroad to be construction with the World Bank support, does not include natural habitats and only plain-arid-denudative type habitat, agricultural lands and anthropogenic meadows with small ravines represented. Most of the areas are currently intensively cultivated and are highly anthropogenic. Part is used for grazing and is characterized by scarcity of tree-vegetation cover. It is notable that impacts on the different varieties of grapes cultivated on these lands, which may be characteristic to the region, is also expected.

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 condition or improved, as feasible, before contractor leaves the work site.

Labour management: The Contractor will be obligated to ensure adequate lodging for all personnel mobilized under the contract through monitoring compliance with acceptable standard.. The project will have a positive impact on the local population's employment.

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 fueling of machinery will be encouraged. In case not feasible, the areas designated for fueling/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 of 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.

[1] Road length (6km)*road width (40m)

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 least 300 m away from settlements windward. 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. To improve natural landscape seeding of the grass at the slopes and planting trees will be required. 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 the 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, Sports and Youth 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 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, economic impact due to impact on annual and perennial crops on the acquired lands, and physical resettlement of two households. Impacted crops include maize, wheat, lucerne (alfalfa), trees and vines, as well as other annual crops (watermelon, strawberry, beans, potatoes, mixed vegetables). In the medium and long term roadside businesses may be impacted due to the diversion of the traffic flow to the new alignment and decline of traffic on the current road. 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.

Operation of construction machinery: Technical condition of the construction 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 erosionif 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 of 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. No works will be carried out in waterways. 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.

Technical condition of machinery operated near/in the waterway will be checked on daily basis to avoid leakage and operational spills of fuel and lubricants. No stockpiling of construction materials and waste will be allowed in or nearby the waterways. According to the design drainage ditches will carry filters installed on both sides of the carriageway (including bridge) enabling to avoid surface water pollution with runoff from the road or in case of road accidents during operation.

Accumulation of construction waste: Temporary storage of waste will be organized by separating construction debris, household solidwaste, 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 disposalof 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 MOEPA. Solid waste and household garbage will be disposed to the closest municipal landfill in Sagarejo and/or Gurjaani under the agreement with Solid Waste Management Company. Volumes of disposable waste will be minimized to the extent possible through re-cycling/reuse andback-filling as feasible.

Operation of quarries and borrow pits: Purchase of inert construction materialswill be allowed only from the licensed legal and/or physical bodies. 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 and borrow pits, as well as extraction of gravel from river terraces, will be carried out in accordance with the conditions of a license issued by the National Agency of Mines of the Ministry of Economy and Sustainable Development of Georgia. Contractor will be responsible to develop, agree and strictly adhere to quarry/borrow pit operation and re-cultivation plan. Disturbed area must be re-cultivated after completion of material extraction activities. Performance of license holders will be subject of the Environmental Inspection of the MOEPA.

Environmental and Social Management Plan

This ESIA report includes a draft ESMP with a full set of the proposed mitigation measures, as summarized above, and monitoring indicators, based on which the Contractor's ESMP will be developed It also describes the role of the RD in overseeing adherence of construction works to the recommended mitigation measures

and identifies the needs for the RD's technical and institutional capacity building for ensuring full environmental compliance of the project.

A supervision consultant will be hired by the 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 into the supervisor's regular reporting to the RD. The 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.

Various units of the MOEPA 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 selected contractor will be asked to develop and to have agreed by the RD and the World Bank a works organization plan, Contractor's 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), Biodiversity Management Plan, Land Management and Erosion Control Plan, Worker Code of Conduct, Emergency Response Plan and Grievance Redress Mechanism (GRM). The contractor will also develop and have agreed by the client a plan of Tree Compensation Management Plan.

Operation of the Highway

The improvement of the Kakheti Highway aims at minimizing the need of interventions during its operation and maintenance. Ensuring safe and good environmental performancewill be a high priority at the operations stage and will comply with the requirementsof 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, through an outsourcing arrangement, will permanently maintain and, in a longer term, improve greening along the RoW. Regular collection of solid waste along the highway will be organized by contractor identified by the RD. State technical control of the Kakheti Highway through regular oversight and inspection by RD will be provided.

1. 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, EIB, ADB, EBRD and JICA.

The Government of Georgia is committed to complete the East-West Highway by 2024. 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.

After Modernization of International Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan Border (S5) Road E-60 highway will connect to S5 and widen international routes. The corridor of S5 road crosses the Sagarejo, Gurjaani, Sighnaghi and Lagodekhi localities. Upgrade of the existing road and other structures requires traffic capacity expansion, including artificial structures in medium topographic and geological conditions without interrupting the traffic flow.

The Government of Georgia, 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 MoRDI of Georgia. Status of East West Highway (EWH) and S5 Corridors Improvement is provided in table 1.1 below.

Table 1.1 Status of Corridor Improvement

Road Section	Length	Planned Upgrading	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 – Lot 2a Lot 2b	Lot 1 - completed; Lot 2a - completed Lot 2b - Implementation
Chumateleti - Khevi	11.6 km	4 lane dual carriageway	WB EIB	Implementation
Khevi - Ubisa	12.2 km	4 lane dual carriageway	ADB	Implementation
Ubisa - Shorapani	13 km	4 lane dual carriageway	EIB	Implementation
Shorapani - Argveta	14.7 km	4 lane dual carriageway	ADB	Implementation
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 12 km 9.5 km	4 lane dual carriageway	EIB, GOG	Implementation
Grigoleti - Kobuleti	14 km	2 lane dual carriageway	EIB	Implementation
Batumi bypass	14.3 km	4 lane dual carriageway	ADB, AIIB	Implementation

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	Implementation
Vaziani - Sagarejo	23.8 km	4 lane dual carriageway	GoG	The Contract is signed
Sagarejo bypass	7.6 km	4 lane dual carriageway	GoG	The Contract is signed
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	The Contract is signed
Tsnori - Lagodekhi	40.4		ADB	Feasibility study

Tbilisi-Sagarejo-Bakurtsikhe road 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 existing Border crossing point to Azerbaijan. This section of the road crosses territories of Sagarejo and Gurjaani municipalities. Upgrade of the existing road and other structures requires traffic capacity expansion, including artificial structures in medium topographic and geological conditions without interrupting the traffic flow.

Government of Georgia took final decision about arrangements and sources of funding for the construction of Tbilisi-Bakurtsikhe-Lagodekhi highway: the section between Tbilisi and Sagarejo will be financed from the State budget, the Tokhliauri-Badiauri section between Sagarejo and Bakurtsikhe will be constructed with the financial support of the World Bank as part of the Kaheti Connectivity Improvement Project (KCIP). Source of financing of Badiauri-Chalaubani and Chalaubani-Bakurtsikhe sections is not identified yet

The present ESIA report covers the road section between Sagarejo and Bakurtsikhe. Despite that WB finances Tokhliauri-Badiauri part (17 km) of Sagarejo-Bakurtsike section of S-5 ESIA is common for all three Lots within this section. As initial ESIA was developed for mentioned section (3 lots) and all baseline data is already collected by RD, which is bases of this report is and it is difficult to divide the investigated areas, that each section is connected to.

According to the Law of Georgia on the Environmental Assessment Code of Georgia (2017), works for the reconstruction of S-5 road are subject to environmental impact assessment and issuance of the construction permit is conditional upon positive conclusion of the expert environmental review of the EIA report to be undertaken by the Ministry of Environmental Protection and Agriculture. Because reconstruction works between Sagarejo and Badiauri are to be financed by the World Bank through KCIP, environmental due diligence applied to these works shall be consistent with the World Bank's ESF. Present ESIA report is prepared to meet the requirements of both - EIA Code of Georgia and ESF of the World Bank.

The Feasibility Study and Preliminary Environmental Assessment of the entire 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 theEIB, RD carried out a full ESIA of the highway construction in 2020 - the Scoping report was approved by MOEPA on March 9, 2020. The Final version of the ESIA report was submitted on April 14, 2021. The MOEPA 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 ESIA report was disclosed at the RD's web page on June 4, 2021. The MOEPA published the Environmental Decision on October 4, 2021.

With the above arrangements, the ESIA report for road construction between Tbilisi and Bakurtsikhe required an update due to the fact that works between Sagarejo and Bakurtsikhe will be undertaken with financial support of the World Bank. As previous EIA report was developed according to the requirements of Local, Geordan legislation and EIB E&S Principles and Standards it did not fully comply with WB ESF ESS standards, mostly requirements of ESS6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources, ESS2 – Labor and Working Conditions. ESS4 – Community Health and Safety, and ESS10 – Stakeholder Engagement and Information Disclosure. To achieve consistency with the requirements of the Bank's ESF, RD hired an individual consultant to update the above-referenced ESIA report to the satisfaction of the Client and the World Bank.

RD will procure construction works on S-5 and will be responsible for the provision of RoW. This will imply acquisition of privately-owned land as well as transfer of user rights to some land currently registered with the State Forest Fund to RD. RD will hire a company to serve as the supervising engineer responsible for overseeing development of detailed designs and provision of construction works by the construction contractors.

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 conditions of biophysical and social environment in the area of project's impact;
- 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 on the ESIA report;
- Chapter 10 lists references consulted during the ESIA;
- Chapter 11 provides Annexes to the document.

2. Legal and Regulatory Framework

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

2.1 National Legal and Regulatory Framework

Georgia's legal framework for environmental protection is based on the Constitution of Georgia. Though the Constitution 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.

Under the Constitution, the legal framework includes national laws, international agreements, subordinate legislation, normative acts, presidential orders and governmental decrees, ministerial orders, instructions and regulations. In addition to the national legal framework, Georgia is signatory to a number of international conventions, including several related to environmental and social protection.

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 16.03.2021);
- On the Atmospheric Air Protection (reg.#420.000.000.05.001.000.595; 22.06.1999; last amendment 02.03.2021);
- On the Water (reg.#400.000.000.05.001.000.253; 16.10.1997; last amendment 15.07.2020);
- On the entrails (reg.#380.000.000.05.001.000.140; 17.05.1996; last amendment 15.07.2020);
- On the regulation and engineering protection of the sea, reservoirs and river banks of Georgia (reg.# 400.010.010.05.001.000.830; 27.10.2000; last amendment 15.07.2020);
- On the sanitary protection zones of the resorts and resort zones (reg.#470.210.000.05.001.000.339; 20.03.1998; last amendment 15.07.2020);
- 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; 02.11.2021)
- On the Animal World (reg.#410.000.000.05.001.000.186; 25.12.1996; last amendment 15.07.2020);
- On the Forest Code of Georgia (reg.#390.000.000.05.001.000.599; 22.06.1999; last amendment 16.03.2021);
- On the Waste Management Code of Georgia (reg.#360160000.05.001.017608; 26.12.2014; last amendment 15.07.2020);
- On the Compensation for Damage Caused by Dangerous Substances (reg.#040.160.050.05.001.000.671; 23.07.1999; last amendment 02.03.2021);
- On the “Red List” and the “Red Book” of Georgia (reg.#360.060.000.05.001.001.297; 06.06.2003; last amendment 16.03.2021);
- On the Licenses and Permits (reg.#00.310.000.05.001.001.914; 24.06.2005; last amendment 17.07.2020);
- On the Cultural Heritage (reg.#450.030.000.05.001.002.815; 08.05.2007; last amendment 16.11.2021).

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);

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 Environmental 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 Labor, Health and Social Affairs of Georgia (Order #297; 16.08.2001);
- On the Rules for Making a 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 MOEPA of Georgia, 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 MoEPA. 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 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; 22.05.2020) - 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 Education, Science, Culture and Sport 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 MoEPA; 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 02.08.2021);
- On Funded Pensions (reg. #280060000.05.001.01906; 21.07.2018; last amendment 02.08.2021);
- On occupational Safety (reg. #270000000.04.001.017910; 19.02.2019; last amendment 29.09.2020);
- On Gender Equality, 2010 (reg. #010.100.000.05.001.003.962; 26.03.2010; Last amendment 15.07.2020);
- 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 09.06.2021);
- On Mental Aid, (reg. # 470.080.000.05.001.002.359; 14.07.2006; last amendment 23.06.2021);
- On Public Health (reg. # 470.000.000.05.001.002.920; 27.06.2007; last amendment 22.06.2021);
- On HIV / AIDS (reg. # 470.230.000.05.001.003.732; 17.11.2009; last amendment 05.07.2018);
- On the Conflict of Interests and Corruption in Public Service (reg. #010.320.050.05.001.000.268; 17.10.1997; last amendment 01.04.2020);

- On General Education (reg.# 430.050.000.05.001.001.778; 08.04.2005; last amendment 27.04.2021);
- On Higher Education (reg. # 430.020.000.05.001.001.626; 21.12.2004; last amendment 09.06.2021);
- On Vocational Education (reg.# 430060000.05.001.019178; 20.09.2018; last amendment 02.11.2021);
- On Culture (reg. # 450.000.000.05.001.000.217; 12.06.1997; last amendment 16.03.2021).

Law of Georgia on the Labor Code (reg. # 270000000.04.001.016012; 17.12.2010) regulates labor and human resource management in Georgia. The Code regulates labor 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 Labor 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 government of Georgia #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 02.08.2011);

- On the Procedures for Expropriation of Property for Necessary Public Needs (reg. # 020.060.040.05.001.000.670; 23.07.1999; last amendment 15.07.2020);
- On the General Administrative Code of Georgia (reg. # 020.000.000.05.001.000.616; 25.06.1999; last amendment 02.08.2021);
- On the Administrative Procedural Code of Georgia (reg. #030.000.000.05.001.000.672; 23.07.1999; last amendment 30.03.2021);
- 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 02.08.2021);
- 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 15.07.2020);
- On the state property 2010 (reg. # 040.110.030.05.01.004.174; 21.07.2010; last amendment 02.08.2021);
- On the Public Register (reg. # 040.150.000.05.001.003.390; 19.12.2008; last amendment 02.11.2021);
- 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 02.03.2021);
- 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 02.08.2021);
- On the Tax Code of Georgia (reg. # 200000000.05.001.016012; 17.09.2010; last amendment 02.11.2021);
- On the Entrepreneurship (reg. # 240000000.05.001.020373; 02.08.2021; last amendment 02.08.2021).

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 RAP, which provides procedures for negotiations to reach agreement, losses for which compensation will be paid, and the means by which compensation will be paid.

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. The developed, disclosed, and consulted RAP provides entitlements for compensation impacts on agricultural land. and other assets.

2.2 International Environmental and social treaties

2.2.1 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.

2.2.2 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 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.

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.

2.3 Institutional Framework for Environmental and Social Management

Ministry of Environmental Protection and Agriculture

MoEPA 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;
- To review and approve environmental and social assessments and to issue a series of permits, including for environmental impact;
- To control the implementation of mitigation measures by the developer, which in this case is RD;
- To 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;
- To ensure public participation in environmental the decision-making process.

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

Department of Environmental Assessment of MoEPA – The functions of the department include:

- Carrying out screening and scoping procedures in accordance with the rules established by law, issuing environmental decisions on activities subject to environmental impact assessment, organizing expertise for this purpose;
- Making relevant decisions on the strategic environmental assessment report and the draft strategic document;
- Organize transboundary environmental impact assessment procedures;
- Ensuring the participation of the public / stakeholder in the environmental decision-making process and ensuring access to relevant information and public hearings for this purpose;
- Organize the necessary procedures for discharge from the environmental impact assessment of the planned activity, prepare a relevant proposal and submit it to the Government of Georgia;
- Review and agree on draft regulations for technical discharge of pollutants into surface water bodies, technical regulations for removal of water from surface water bodies;
- Review and agree on the draft report on the sources of air pollution and the inventory of harmful substances emitted by them and the norms of maximum emission of harmful substances into the ambient air, in accordance with the rules established by law;
- Issuance of permits for import, export, re-export and transit of ozone depleting substances.

Department of Waste and Chemicals Management of MoEPA is responsible:

- To agree on waste management plans;

- To develop and implement a unified state policy on waste and chemicals management within the scope of its competence;
- To develop national waste management strategies, national plans and coordination of their implementation;
- Within the scope of competence, regulation of waste and chemicals, state accounting, database production;
- Within the scope of its competence, fulfilment of the obligations defined by the international agreements of Georgia in the field of waste and chemicals management;
- Registration of waste management activities.

Department of Environmental Supervision of MoEPA (state sub-agency) - The main responsibilities of the department are:

- Exercising 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.

LEPL National Environmental Agency under the MoEPA

The National Environment Agency (NEA) is a legal entity of public law within the system of the Ministry of Environmental Protection and Agriculture of Georgia, 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.

Goals and main objectives of the Agency:

- 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 hazards reduction.

Legal Entity of Public Law (LEPL) National Forest Agency under the MoEPA

National Forest Agency (NFA) is a LEPL within the MoEPA, which aims to sustainably use the components of biodiversity in the forest maintenance and forest fund area.

The main tasks of the Agency are:

- Forest fund management within the framework of the powers established by this charter, legal and other statutory regulations;
- Implementation of measures for the care and restoration of forests;
- Regulation of forest management;
- Implementation of control in the territory of the forest fund (except for licensing conditions) within the framework of the powers established by law;
- Implementation of forest inventory.

The NFA 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.

LEPL Agency of Protected areas under the MoEPA

Primary responsibility of the Agency of Protected Areas (APA) is to manage Georgia's strict nature reserves, national parks, natural monuments, managed reserves, protected landscapes, biosphere reserves, world heritage sites and wetland sites of international importance.

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% 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.

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

Ministry of Economy and Sustainable Development of Georgia

Ministry of Economy and Sustainable Development (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 mandate is main state entity responsible for conducting construction permit issuing procedures and after, construction supervision and compliance monitoring.

LEPL National Agency of Mineral Resources (NAMR) under the MoESD

NAMR is a legal entity of public law that operates under the MoESD of Georgia. The NAMR was established on December 27, 2017 by the Government of Georgia.

Within the scope of the competence, NAMR carries out the following activities:

- In accordance with the legislation of Georgia, granting those licenses that's 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;

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/realization of 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: 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, Sports and Youth 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.

LEPL National Agency for Cultural Heritage Preservation Georgia under the Ministry of Culture, Sports and Youth 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 NACHP. 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 Persons (IDPs) from the Occupied Territories, Labor, Health, and Social Affairs of Georgia

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

- IDPs, eco-migrants and reintegration issues – 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;
- Health care – providing of individual medical services; ensuring public health protection; regulation of medical and pharmaceutical activities;
- Social protection of the population - providing the population with targeted social assistance (TSA) on time delivery of relevant benefits to the social groups defined by the law; childcare and issues related to it, facilitating the development and implementation of policies to fight against domestic violence and protect victims of domestic violence;
- Labor and employment - promoting labor relations and social partnerships; regulating labor migration and creation/development opportunities for legal employment abroad (seasonal labor migration); employment promotion including coordination for recruiting in alternative, non-military labor services; facilitating the development of labor safety and protection mechanisms in organizations and institutions and elimination of labor discrimination cases; supervising compliance with labor safety norms at high-risk, heavy, harmful and dangerous work sites as defined by the Law of Georgia on Labor Safety;
- Integration of persons under international protection, aliens 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.

MoILHSA will be responsible for the overall administration, fiduciary functions, environmental and social aspects, communication and outreach for components 1 and 2 of Emergency COVID-19 Response Project.

Labour Conditions Inspecting Department (under Ministry of IDPs from the Occupied Territories, Labor, Health and Social Affairs of Georgia)

Labor Inspection Office is a legal entity of public law under the MoILHSA in order to ensure the effective execution of the labor norms:

- Controls and checks compliance with occupational safety and health in the workplace;
- Prevents forced labor and exploitation;
- Investigates and records work related accidents and occupational illness cases at workplaces;
- From January 1, 2021 supervises labor rights to determine compliance with the Labor Code.

As a result of changes to Occupations Health and Safety (OHS) law in February 2019, the Labor 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 labor rights regulations. The employers are required to inform the labor inspectorate of any accidents at their workplaces within 24 hours according to OHS law, however anyone could inform the labor 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.

LEPL Public registry under the ministry of justice - The governmental office in charge for official registration of land ownership is 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 (PRRC) - 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), the Government of Georgia has established the 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 “Procedure for the Expropriation of Property for Necessary Public Social Needs” can be used as 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 KCIP. 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 Regional Development and Infrastructure

Ministry of Regional Development and Infrastructure (MoRDI) oversees regional and infrastructure development throughout the country, which also includes modification and modernization of the State road network of international and domestic importance. MoRDI 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 MoRDI.

LTD Solid Waste Management Company of Georgia under the MoRDI

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.

Roads Department of Georgia (RD) under the MoRDI

RD is entity subordinated by MoRDI 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 KICP and will carry responsibility for all aspects of the project implementation. Because the KIMP 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.

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

The 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.

The 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 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 WB projects and one for the ADB/EIB projects).
This unit reviews:

- The E(S)IAs and E(S)MPs related to the Roads Department 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 Georgia 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. The 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.

The RD believes that Sustainability is a shared responsibility, best delivered in collaboration with other governmental sectors and the 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 (, WB ADBEIB, 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.

The 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 the RAP documents;
- 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 (RU)** was established two years ago. RU 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 Public Registry 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 in the Public Registry located in the RoW.

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.

Capacity of RD regarding Health and Safety Issues

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 all donor-funded and Georgian budget funded projects 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) issues 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.

2.4 World Bank's Environmental and Social Standards

2.4.1 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 comprises 10 ESSs.

ESSs relevant to the construction works on Sagarejo-Badiauri road section 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: Labor and Working Conditions: labor 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 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 2.4.3 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.

2.4.2 The World Bank Groups' Environmental, Health, and Safety Guidelines

The Environmental, Health and Safety (EHS) Guidelines[2] are technical reference documents with general and industry-specific examples of GIIP and are referred to in the ESF. The EHS Guidelines contain the performance levels and measures that are normally acceptable to the World Bank Group, and that are generally considered to be achievable in new facilities at a reasonable cost by using relevant technology. The World Bank Group requires borrowers to apply the relevant levels and/or measures of the EHS Guidelines. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects will be required to achieve whichever is more stringent. General EHS Guidelines apply to the Project and most relevant of them are listed below:

- EHS 1.1 – Air Emissions and Ambient Air Quality;
- EHS 1.3 – Wastewater and Ambient Water Quality;
- EHS 1.5 – Hazardous Materials Management;
- EHS 1.6 – Waste Management;
- EHS 2.3 – Physical Hazards;
- EHS 2.7 – Personal Protective Equipment;
- EHS 2.8 – Special Hazard Environments;
- EHS 3.5 – Transportation of Hazardous Materials;
- EHS 3.6 – Disease Prevention;
- EHS 4.1 – Environment; and
- EHS 4.2 – Occupational Health and Safety

[2] World Bank Environmental, Health and Safety (EHS) Guidelines
http://documents.worldbank.org/curated/en/157871484635724258/Environmental-health-and-safety-general-guidelines

2.4.3 Summary of World Bank Requirements and Key Gaps with Georgian Legal Requirements

ESS &Topic	Major requirements	Key requirements/gaps in Georgian Legislation	Gap-filling measures to be undertaken in the Project
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts			
E&S Assessment	• E&S screening is required for all activities financing from the budget of WB supported Programs/Projects; • E&S impact assessment (ESIA), is required for all activities involving high and medium risks of impact on social and physical environment; • ESF sets up Equal requirements for assessment and management of social and environmental conditions and impacts; • Application of national framework, ESSs, EHSGs is required; • Offset significant residual impacts; • Sets up differential measures for vulnerable or disadvantaged people; • Consider E&S requirements for primary suppliers	• E&S screening is required only for the listed in Annex II of the EIA Code; • E&S impact assessment (EIA), is required for the activities provided in Annex II of EIA Code, and those included Annex II and determined as subject to EIA according to the screening procedure; • EIA Code has much less emphasis on social conditions and impacts. Other laws partly fill this gap, but do not fully cover community impacts; • Application of EHSGs is not required; • Do not Offset significant residual impacts; • No differential measures for vulnerable and disadvantaged people are provided; • E&S requirements for primary suppliers are not considered	• ES screening is conducted for all activities consistent with ESS1 • ESIA is developed for the project • Social impacts and mitigation measures are included in the ESIA and in the ES management and monitoring plans • Application of EHSGs will be followed in the project • Residual impacts will be offset, as needed, consistent with ESF • The project will undertake differential measures to ensure that vulnerable and disadvantaged groups are not disproportionately affected and can equitably benefit from the project. • The project considers requirements for primary suppliers (should such be identified).
Project monitoring & reporting	• Permanent monitoring of the activities proportionate to nature of project, risks and impacts, and application of measures as per ESMP is required; • Several levels and timing of reporting, including to the World Bank is required	• Permanent monitoring of the activities and application of measures as per ESMP is not required. Monitoring is carried out randomly; • Requirement for reporting and its timing is determined by environmental decision, no permanent reporting on ESMP implementation is required	• Permanent ES monitoring and reporting of all activities will be required as outlined in the present document.
Stakeholder engagement and	• For all projects involving E&S risks of impacts and benefits as well, information disclosure and engagement of the stakeholders is required through the life cycle of the project	• EIA Code requires information disclosure and public engagement during entire cycle of EIA. No requirement for engagement of the stakeholders through the life cycle of the project	• The project will undertake stakeholder engagement throughout the implementation

information disclosure			cycle (as outlined in the project's Stakeholder Engagement Plan)
ESS2: Labor and Working Conditions			
Working conditions and management of labor relations	• Written labor management procedures are required, including: • Terms and conditions of employment; • Non-discrimination and equal employment opportunity is required; • Worker's organizations play an important role	• No Written labor management procedure is required; • Written employment contract is required, procedures and employment conditions to be included; • Non-discrimination and equal employment opportunity is also required • Worker's organizations are allowed but membership is not obligated	• Labor Management Procedures (LMP), developed for the project will be followed, which are anchored in national legislation, as well as include additional requirements of ESS2
Protecting the work force	• Child (age less than 18) labor is forbidden; • Forced labor is forbidden	• Child labor is not allowed. For employment under age 16 or for dangerous jobs under 18 guardian permission is required; • No forced labor is allowed (requires free will)	• No gaps are observed between national law and ESF. Th Project will not employ workers under 18.
Grievance mechanism	• Grievance mechanism (GM) has to be developed and maintained for all direct and contracted workers; • All informal and formal complaints require to be redressed equally. Presence of procedures for anonymous complaints' redressal is required; • For Sexual Exploitation and abuse and sexual harassment (SEA/SH) complaints development and maintenance of sensitive GM is required	• Requirement for establishment of GM is not set out. The grievances are redressed according to the provisions of General Administrative Code of Georgia; • Procedures for anonymous complaints do not exist; • Presence of sensitive GM for treating of SEA/SH complaints is not required	• Grievance mechanisms will be put in place for all Project workers as outlined in the Project's LMP
Occupational Health and Safety (OHS)	• ESF provides detailed requirements for Labor and Working Conditions and application of World Bank Group and sector-specific EHS Guidelines is required; • Clear clarifications of overtime work, compensation and benefits, working conditions is required;	• Georgia's Labor Code and Law on Labor Safety are aligned with the ESF's standard for Labor and Working Conditions, but the Labor Code lacks an enforcement mechanism; • Clear Legal provisions on overtime work, compensation and benefits, assessment of young workers' working conditions are not provided; • No requirement for establishment of grievance mechanisms for employees;	• OHS requirements of national law and ESS2 will be followed as outlined in the project LMP and ESMP

	• availability of grievance mechanisms for employees is required; • Permanent monitoring of OHS performance is required •	• Permanent monitoring of OHS performance is not required	
Community workers	Requirements for working conditions and OHS applied to community labor	No such requirements	The Project will not employ community workers.
Primary supply workers	Depending on level of RD/contractor control/influence, assess risk of child labour, forced labour, and safety issues and require suppliers to address significant risks	Georgian legislation applies to the suppliers, but no requirements to check and monitor their ESHS compliance.	Primary supply workers have not been identified for the project. The Project LMP includes requirements to be followed if primary supply workers will be identified, consistent with ESS2.
ESS3: Resource Efficiency and Pollution Prevention and Management			
Energy use	Adopt measures in EHSGs if project is significant energy use	There are not specific standards and rules for the efficient use of energy.	Project will follow EHSG requirements.
Water use	Assessment of water use needs and related impacts to the environment and communities and adopting relevant mitigation measures is required	National legislation prioritizes municipal water supply for domestic consumption over other types of water use. No specific requirements and principles of water sharing and prioritization (e.g. for irrigation, power generation, etc.) are stipulated explicitly.	Water use needs and related impacts are assessed in the present ESIA and the respective mitigation measures, consistent with ESS3, will be followed.
Pollution prevention and management General			
Management of air pollution	• Requires assessment of potential air emissions and implementation of technically and financially feasible and cost-effective options to minimize emissions for all type activities	• The requirement for assessment of potential air emissions and implementation of relevant mitigation measures for the activities where stationary air pollution sources do not exist, are not established;	• The Project assesses potential air emissions and will implement technically and financially feasible and cost-effective options to minimize emissions for all type activities
Management of hazardous and non-hazardous wastes	• Apply mitigation hierarchy to waste management, Separation of different types of non-hazardous waste and	• Mechanisms for non-hazardous waste separation and management are not developed	• Mitigation hierarchy will be applied to waste management

	development of relevant measures are required		
ESS4: Community Health and Safety			
Community health and safety	• Evaluation of the risks to community health and safety and apply mitigation hierarchy and to reduce risks is needed; • Consideration of third-party safety risks in designing infrastructure and equipment, with regard to high-risk locations is required; • Avoid or minimize potential for disease transmission and communication, considering vulnerable groups; • Address risks to community of hazardous materials management	• Only for the activated, subject to EIA requires assessment and control; • No requirements for third-party safety risks assessment and mitigation; • No specific requirements for labor influx, including gender based violence, communicable diseases, etc. • General health requirements generally meet ESS, but no requirement for vulnerable groups	• Community health and safety risks including of third parties are assessed and will be mitigated throughout project implementation • The project will implement measures to prevent and mitigate spread of transmittable diseases including COVID-19 in line with WB and WHO guidelines, as well as national regulations. • The project will manage risks pertaining management of hazardous materials in line with ESF and GIIP.
Security personnel	• Verification of contracted workers are not implicated in past abuses and are trained; • Monitoring of security personnel and Investigation of the incidents, and reporting on unlawful acts to the relevant authorities is required	• Verification of contracted workers is not required; • Monitoring of security personnel and investigation of incidents is not required. Unlawful acts should be reported to the relevant authorities	• Verification and training for security personnel will be conducted in line with ESS4.
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement			
Applicability	• Assessment of needs for Land Acquisition, Restrictions on Land Use and Involuntary Resettlement during ESIA process is required; • Applies to permanent and temporary displacement, listing types of infringements	• Assessment of needs for Land Acquisition, Restrictions on Land Use and Involuntary Resettlement during EIA process is not required. Only environmental impacts resulting to social impacts are included; • Applies only to the legal and 'legalizable' owners (i.e., ones with legitimate claims to land and property that may be registered under national law), not to illegal land users	• Assessment of impacts, compensation and rehabilitation measures consistent with ESS5 will be applied, as outlined in the Project Resettlement Action Plan.

	• Applies to land users (formal and informal) and owners		
General	• Design project to avoid/minimize displacement; • Provide replacement cost and assistance (including livelihood restoration), disclose standards, offer land-for-land where possible, pay compensation before displacing people where possible; • Engaged with affected communities, including women and other vulnerable groups; • Establishment of GM is required; • Census, cut-off dates, notices; detailed plan and monitoring is required; • Require audit if significant displacement	• No specific requirement to avoid displacement • Provide replacement cost and offer land for-land payments where possible, no requirements for livelihood restoration or other allowances; • No requirements for public consultations, and no additional requirement to women and and other vulnerable groups; • No requirement for establishment of GM (beyond measures envisioned in the Administrative Code of Georgia); • No requirements for cut-off dates, notices; detailed plan and monitoring; • No requirement for displacement audit	• Assessment of impacts, compensation and rehabilitation measures consistent with ESS5 will be applied, as outlined in the Project Resettlement Action Plan • Grievance mechanism will be established and maintained by RD consistent with ESS5
Displacement	• Detailed requirements for assessment of physical and economic displacement, including special consideration for vulnerable people consultations, livelihood restoration and development relevant mitigation measures	• No detailed requirements to address physical and economic displacement, and no special consideration for vulnerable people, consultations, livelihood restoration and development relevant mitigation measures	• Assessment of impacts, compensation and rehabilitation measures consistent with ESS5 will be applied, as outlined in the Project Resettlement Action Plan
Collaboration with other responsible agencies or subnational jurisdiction	• Provides requirements for all involved agencies to be involved and support PIU in Land Acquisition and Involuntary Resettlement procedures, including development and implementation of Resettlement Action Plan (RAP)	• For Land Acquisition and Involuntary Resettlement procedures involvement of other parties are also required, but specific collaboration and support requirements are not provided	• Assessment of impacts, compensation and rehabilitation measures consistent with ESS5 will be applied, as outlined in the Project Resettlement Action Plan
	ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources		
General	• ESS 6 classifies habitats into transformed, natural and critical habitats. ESS requirements apply to all groups equally and requires relevant mitigation and	• Georgia has a strong regulatory framework for protecting, conserving, and restoring biodiversity. However, less attention is given to preserving habitats. There is no differentiated approach for transformed, natural, and critical habitats;	• ESS6 requirements will apply to the Project including with regard to assessment of critical habitats

	compensation measures for expected impacts; • Sets strict requirements for affecting critical habitats, requires Biodiversity Management Plan (BMP)	• No requirements for affecting critical habitats and developing BMP	and preparation of BMP where relevant
ESS8: Cultural Heritage			
General	• • Requires development and following the chance find procedure if a find is encountered; • Requires involvement of Cultural Heritage experts if project provides risks of impacts to the monuments of Cultural Heritage	• Georgian Law on Cultural Heritage provides required procedures in case of chance findings. No requirements for developing project specific chance find procedures	• No impacts on cultural heritage have been identified during project preparation, Chance find procedures will be followed as described in the present ESIA and consistent with ESS8.
Stakeholder consultation and identification of cultural heritage	• Requires identification of and consultation with affected and interested stakeholders • Maintain confidentiality if needed; • Allow continued access to affected sites	• No specific requirements for stakeholder identification and consultations; • No provisions for confidentiality • No requirements to allow continued access to affected sites	• No impacts on cultural heritage have been identified during project preparation, Chance find procedures will be followed as described in the present ESIA and consistent with ESS8.
Provisions for specific types of cultural heritage	• Mitigation of impacts on built heritage, preserve physical and visual context of structures is required	• EIA law requires assessment of impacts on heritage, also requires visual impact assessment although not specific for heritage buildings	•
ESS10: Stakeholder Engagement and Information Disclosure			
Engagement during project preparation	• Requires identification and analysis of stakeholders, including disadvantaged or vulnerable groups; • Development of Stakeholder Engagement Plan (SEP), with detailed requirements for disclosure, timing of consultations, measures for disadvantaged or vulnerable, etc.is required;	• No specific requirements for stakeholder identification and analysis; • Stakeholder engagement and information disclosure requirements are included in screening, scoping and EIA procedure. No requirement SEP development; • No requirement for information disclosure and consultations at early design phase	• Identification and analysis of stakeholders, including of vulnerable and disadvantaged groups, has been conducted during project preparation • Meaningful consultation will be conducted throughout the lifecycle of the project, and information shared with

	• Disclosure of information early to allow consultation on design • Meaningful consultations will be conducted with all stakeholders and their feedback will be taken into account in the project design and implementation stages.		stakeholders, as outlined in the Project SEP.
Engagement during project implementation and external reporting	· Engagement and disclosure of information to continue throughout project life cycle, following the SEP	• No requirement for continuing engagement and information disclosure throughout project life cycle	• Stakeholder engagement will be conducted throughout the lifecycle of the project, as outlined in SEP.
Grievance mechanism	• Establish and implement prompt, effective, culturally appropriate, and discreet GM; • Both informal and formal complaints require to be redressed equally. Presence of procedures for anonymous complaints' redressal is required	• No requirements for establishing and maintenance of GM; • Only formal correspondence and claims are registered and responded according to the provisions of General Administrative Code of Georgia	• RD will operate a grievance mechanism consistent with the requirements of ESS10, and as described in SEP.
Organizational capacity and commitment	· Define roles & responsibilities, assign personnel to implement stakeholder engagement activities	• No requirement for implementation of stakeholder engagement activities and assignment of relevant staff and defining their roles & responsibilities	• RD will designate responsible staff and budget for SEP implementation and monitoring.

3. Project Description

3.1 General Overview

The Project for Modernization of Tbilisi-Bakurtsikhe Section of International Tbilisi-Bakurtsikhe-Lagodekhi - Azerbaijan Border (S5) Road was prepared by the JV AECOM Limited (lead member) and ILF Consulting Engineers Austria GmbH appointed by the RD under the mandate of the MoRDI to undertake the detailed design for upgrading the existing Tbilisi-Sagarejo and Sagarejo-Bakurtsikhe sections of the road. The project was developed with the support of international development partners such as the World Bank, the International Bank for Reconstruction and Development (IBRD) and International Development Association (IDA) under the Forth East-West Highway Improvement Project (EWHIP-4/CS/QCBS-06).

Upon agreement with Client, Tbilisi-Bakurtsikhe road is being divided into several constructional lots, and for each constructional lot, an independent design is prepared. More precisely, the constructional lots are:

Constructional Lot 0 – Lotchini Interchange to Vaziani Interchange

This Constructional Lot (CL) commences at ch. 0+310.22 and ends at ch. 04+040.00. The start of the Lot at ch. 0+310.22 is located to the east of the existing Lochini interchange (I/C). Concurrently with the under-consideration Project of the Tbilisi – Bakurtsikhe road, there is another road Project running regarding the Tbilisi By-Pass, in which the Lotchini I/C is being upgraded. The start of the current Project to the east of the existing Lotchini I/C was the result of discussions with the Roads Department of Georgia (RD), in order for the two Projects to be compatible. The end of the CL 0 at ch. 04+040 is located close After the Vaziani I/C.

Constructional Lot 1 – Vaziani Interchange to Ninotsminda Interchange

The Constructional Lot (CL) 1 commences at ch. 0+4040 and ends at ch. 27+840. The start of the CL 1 at ch. 0+4040 is located to the east of the designed Vaziani interchange (I/C). The end of the CL 1 at ch. 27+840 is located before the Ninotsminda or Sagarejo east I/C. It is noted that there is a chainage fall, namely ch.10+303.862 ≡ ch. 10+100.000.

Constructional Lot 2 – Ninotsminda Interchange to Tokhliauri Interchange

The CL 2 commences at ch. 27+840 and ends at ch. 35+500. The CL 2 is subsequent to the CL 1. The start of the CL 2 at ch. 27+840 is located before Ninotsminda to the Iori railway Station. The end of the CL 2 at ch. 35+500 is located to the east of the new Tokhliauri I/C.

Constructional Lot 3 – Tokhliauri Interchange to Badiauri Interchange

The 3rd CL commences at ch. 35+500 and ends at ch. 52+540. The CL 3 is subsequent to the CL 2. The start of the CL 3 at ch. 35+500 is located to the east of the new Tokhliauri I/C. The end of the CL 3 at ch. 52+540 is located to the east of the new Badiauri I/C.

Constructional Lot 4 – Badiauri Interchange to Chalaubani Interchange

The 4th CL commences at ch. 52+540 and ends at ch. 75+100. The CL 4 is subsequent to the CL 3. The start of the CL 4 at ch. 52+540 is located to the east of the new Badiauri I/C. The end of the CL 4 at ch. 75+100 is located to the east of the new Chlaubani I/C.

Constructional Lot 5 – Chalaubani Interchange to Bakurtsikhe

The 5th CL commences at ch. 75+100 and ends at ch. 84+217.05. The CL 5 is subsequent to the CL 4. The start of the CL 4 at ch. 75+100 is located to the east of the new Chalaubani I/C. The end of the CL 5 at ch. 84+217.05 coincides with the ch. 0+413.20 of the new road from Gurjaani to Tsnori, which is currently under design. The end of the current Project was the result of discussions with the RD, in order for the two road Projects to be compatible.

Figure 3.1.1 – map of the project corridor

The Constructional Lot 3, which will be constructed under the WB loan, the four-lane divided Kakheti Motorway starts after the designed Tokhliauri Interchange (Chs. 35+500) with direction towards East – Southeast and ends after the village of Badiauri, after the designed Interchange (Chs. 52+540) with a total length of 17+040m and lane with of 3.75m. From the begging of the Lot 3, the designed motorway wings its way to the east in parallel to the existing railway line for approximately three kilometers and at approx. Chs. 37+500 due to different geometric requirements and conditions, the motorway turns to Southeast while the existing railway continues Eastward.

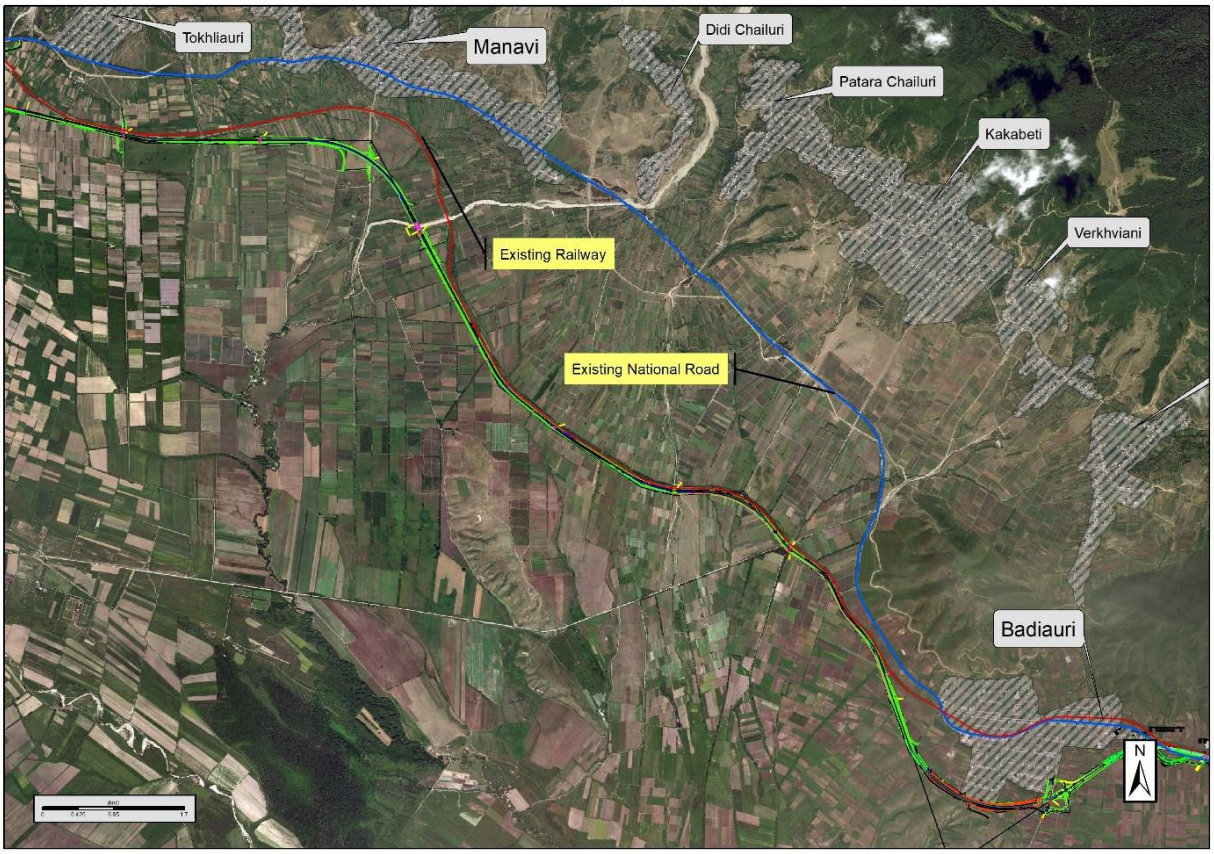
At approx. Chs. 41+500 after the crossing of the Chailuri River, the designed motorway is again oriented parallelly to existing railway corridor about 7km, where it deviates again from the existing railway line in order to by-pass the Badiauri Settlement from the southern side. About Chs. 51+200, the Motorway turns to the Northeast, moving towards the existing National Road and the existing railway line, completing the Badiauri by-pass. In order to reduce the Noise impact on the settlements, the by-pass is mostly located in a double cut section. The Orientation of the motorway remains the same until the end of the Constructional Lot at Chs. 52+540.

The Design foresees new Badiauri I/C at approx. Chs. 51+783 which connects to the existing national road, the village of Badiauri and the road for the settlement of Iormogalo. In addition, the Motorway serves the settlements of Tokhliauri, Manavi, Chailuri, Kakabeti and eliminates the travel time towards the Lagodekhi and Telavi, considering design speed of 120km/h. The design also provides the complete restoration of the existing local road network, which is disrupted by the presence of the Motorway. Significant length of local roads is following the motorway, in order to maintain the access to the land properties.

In addition, at the interchanges, secondary roads - ramps are envisaged for the connection of the new motorway with the local road network. These roads are connected via underpasses and overpasses. More precisely, the design includes two overpass bridges of 180m total length, and eight underpass box structures. Two motorway bridges are envisaged in the design, for the Crossing of Chailuri river and the Badiauri I/C with total length of 125m. In addition, the design envisages the construction of 86 drainage structures – culverts, including the complete restoration of the local Irrigation network. The design also includes significant amount

of ground improvements due to the presence of weak ground, which leads to the application of Flexible Pavement throughout these 17.04 km.

Figure 3.1.2 – map of the lot 3



3.2 Road Design Standards

The German Design Standards are primarily applied to the current design. The RAA ((Richt-linien für die Anlage von Autobahnen) and RAL (Richtlinien für die Anlage von Landstraßen) are two German standards for design of alignment of 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 TEM 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 roads' side formations.

3.3 Motorways Main Project Parameters

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 3.3.1:

Table 3.3.1. Motorways Main Project 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 TEM 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 11.0m. 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 in Table 3.4.1.

Table 3.4.1. Design classes EKL 3 and EKL 4 (RAL) and design parameters' marginal values

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 bridges	[%]	0.7	0.7
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

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:

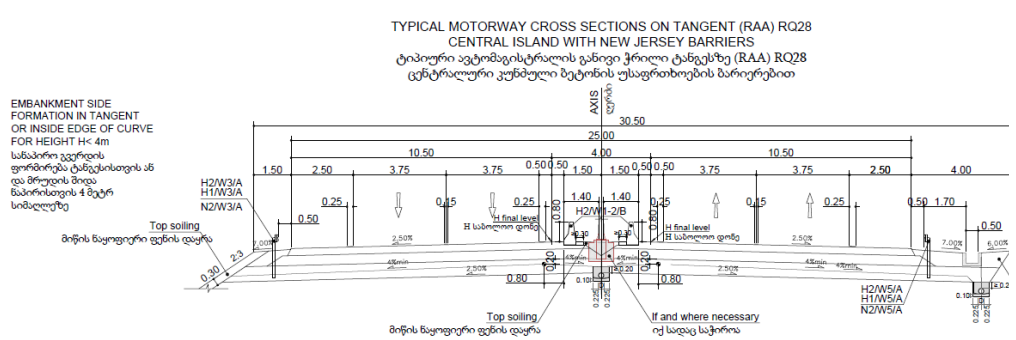
- RQ-28 class cross section along the section from Tokhliauri road junction to Chalaubani. However, the width of the carriageway is selected using the TEM design standard, and
- RQ-25M class cross section in a more complex area (from Chalaubani to Bakurtsikhe). The standard average width is adapted to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

The examples of used typical cross-sections are provided in Figure 3.5.1.
According to the RAL Design Standard, TEM 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 Drawing 3.5.2.

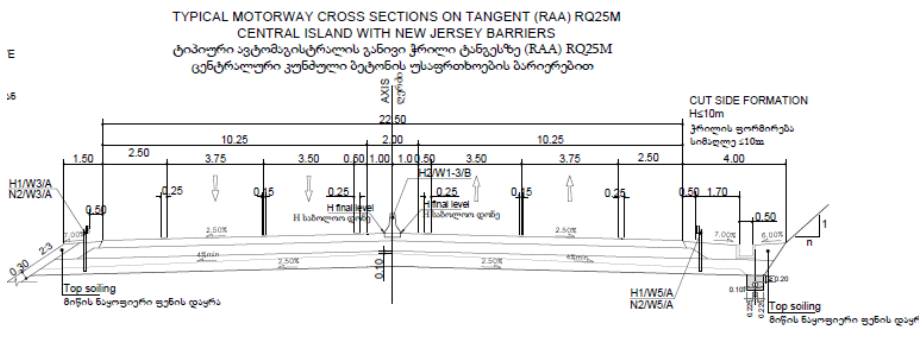
Figure 3.5.1. Typical cross-sections

A

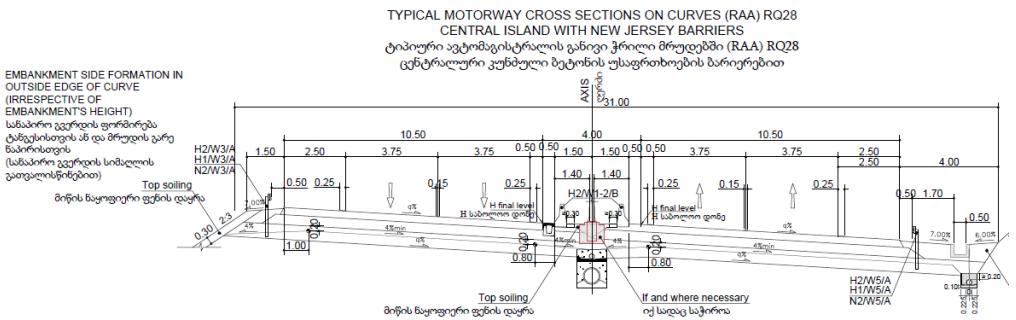
RQ-28 Class

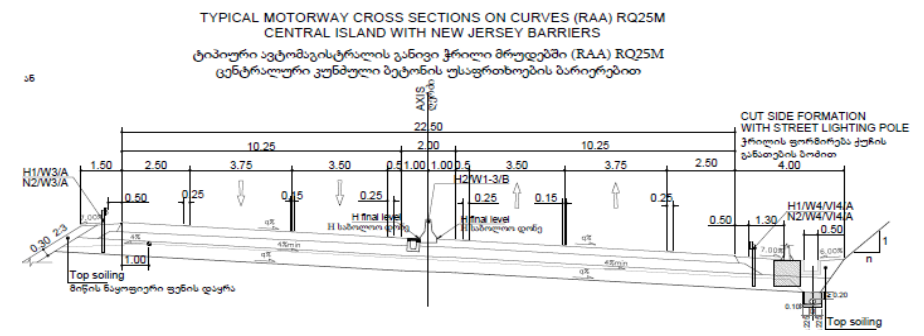


RQ-25M

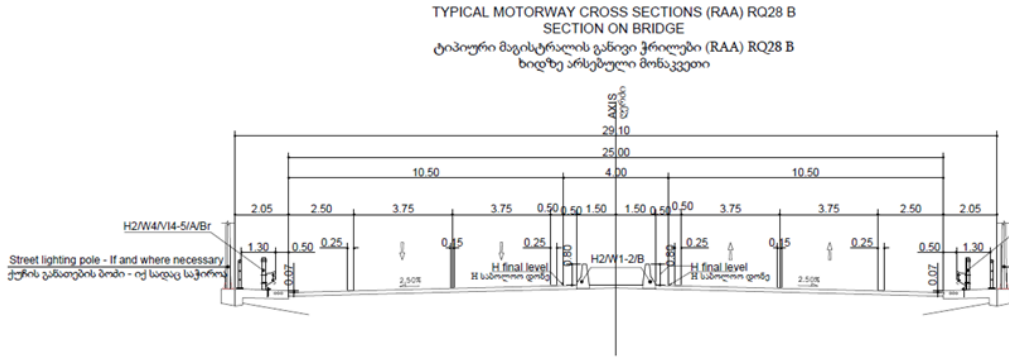


B





C



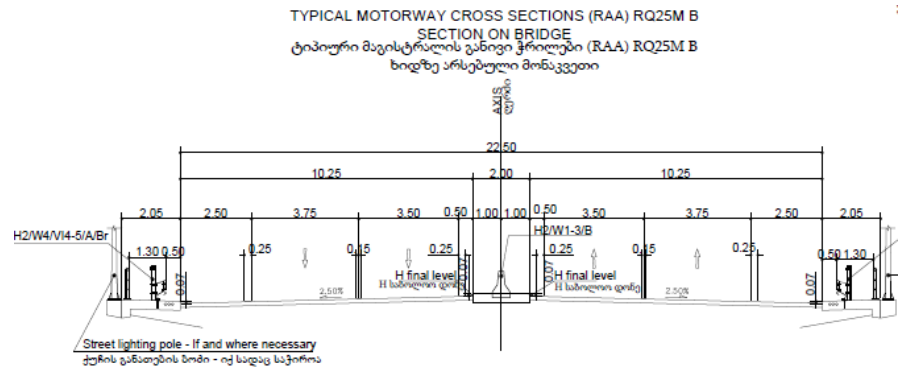
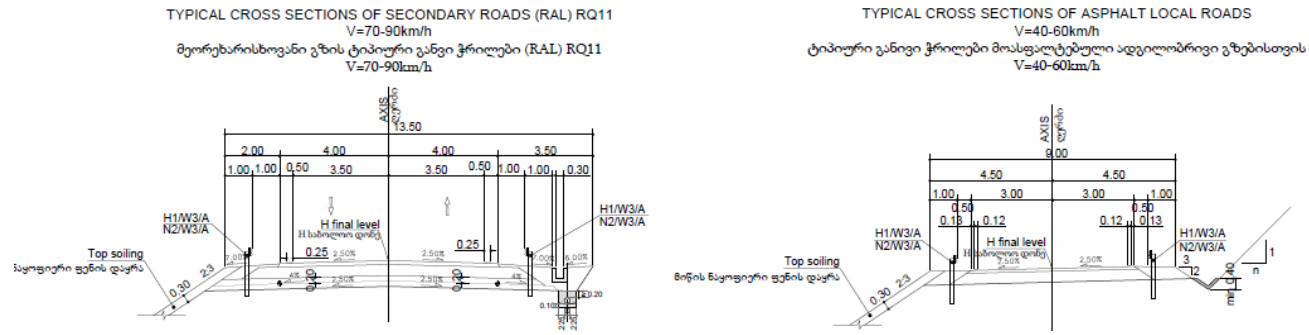
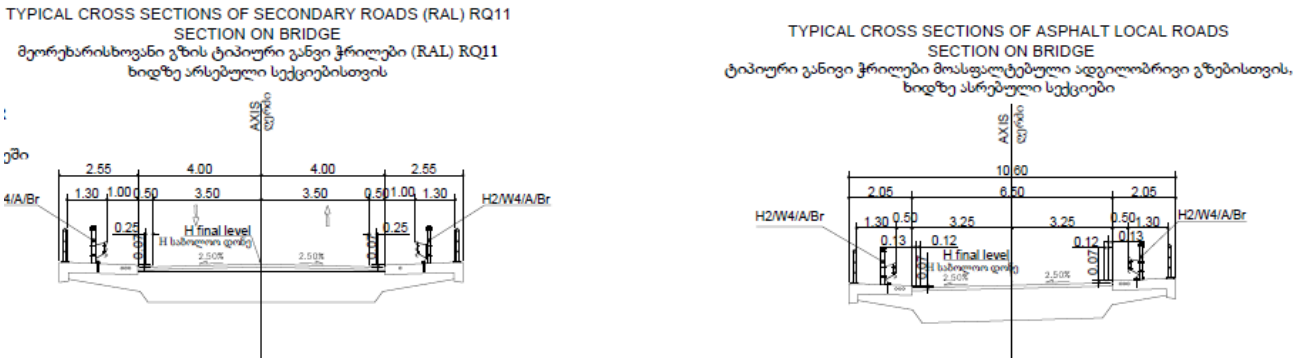


Figure 3.5.2 Typical cross-sections for Secondary and Local roads

A



B



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 3.6.1

Table 3.6.1 Interchanges

Approx. Ch.	Name	Type / Configuration
51+783	IC Badiarui	Symmetrical half-cloverleaf

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 project highway crosses a number of surface water bodies. The main ones are the river Chailuri, Lakbe and the river Chalaubani. Total of 6 bridges are planned to build in this area (one bridge across the rivers of Chalaubani and Lakbe and 4 bridges across the river Chalaubani).

Besides, there are dry gullies and irrigation/drainage channels in the project corridor. Overall, 31 bridge-type structures (including a hydraulic bridge, viaduct, etc.) are planned to provide along the project highway and associated secondary roads.

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 (SSHB), 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 are 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 3.7.2.1 Typical Layout Plan and longitudinal section of a main Road Bridge

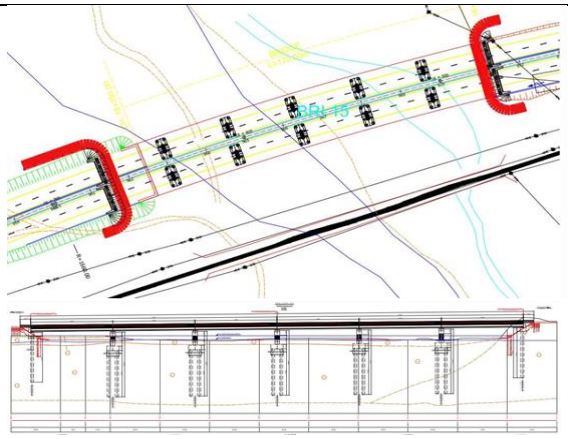
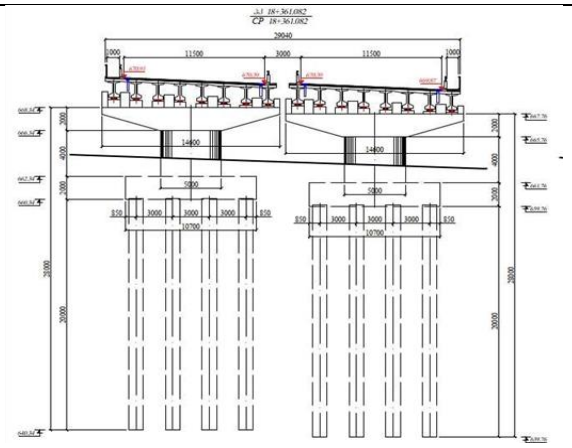
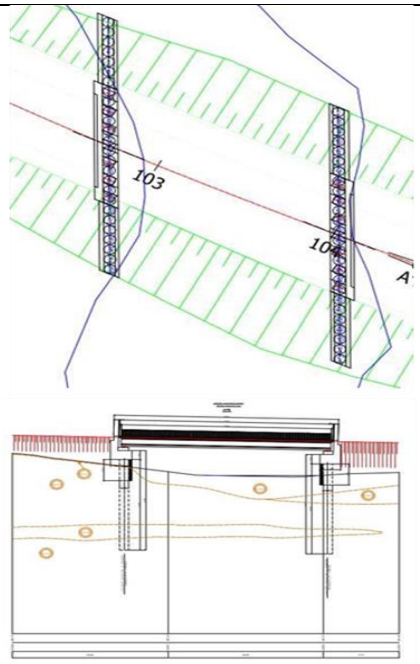
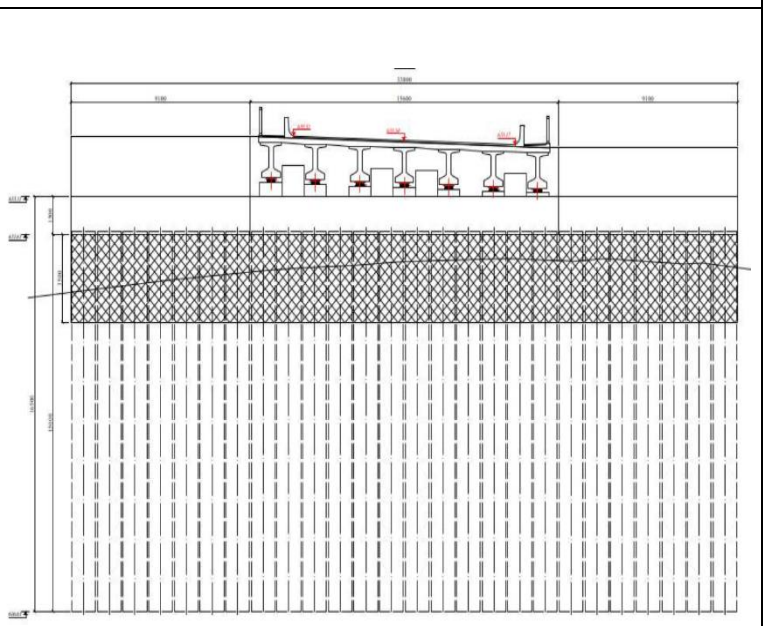


Figure 3.7.2.2. Typical Cross Section of Main Road Bridges



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 3.7.2.3. Typical Layout Plan and Longitudinal Section of a Service Road Bridge	Figure 3.7.2.4. Typical Cross Section of Service Road Bridges
	

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%), the design storm that is used to develop the design of erosion protection is typically based on an assessment of the likely damage that could occur if a certain design flow is exceeded. Consequently, the design of erosion protection of bridge foundations should be based on more severe criteria than the erosion protection of road earthworks. Accordingly, gabion mattresses have been used for the protection of foundations of bridges, while rip rap 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.

3.7.4 The scope of the detailed engineering design for the Construction of Bridges under Lot 3

The scope of the detailed engineering design for the Construction of Lot 3 road section anticipated the design studies for 4 new bridges and structures.

The list of the bridges is given in Table 3.7.4.1 below:

Table 3.7.4.1 - List of Bridges and structures

A/A	Chainage	Road	Structure	Length (m)	Width (m)	Deck Area (m^2)
1	36+696.17	LR03-TB	Overpass - Bridge at LR 03 Chs 0+230.51 - 0+346.784	117.00	10.60	1240.20
2	39+708.92	LR07-TB	Overpass - Bridge	54.00	11.10	599.40
3	40+674.49 - 40+735.74	Motorway	Motorway bridge On Chailuri River	99.00	29.10	2880.90
4	51+770.26 - 51+797.26	Motorway	Underpass - Motorway Bridge	27.00	29.00	783.00
Total Deck Area (m^2):				**Total Deck Area (m^2):**		**5503.50**

3.7.5 Bridge Type Selection

In parallel to the latest developments in bridge construction and materials, an extensive range of bridge types exists which can provide solutions to each project's specific needs. 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.

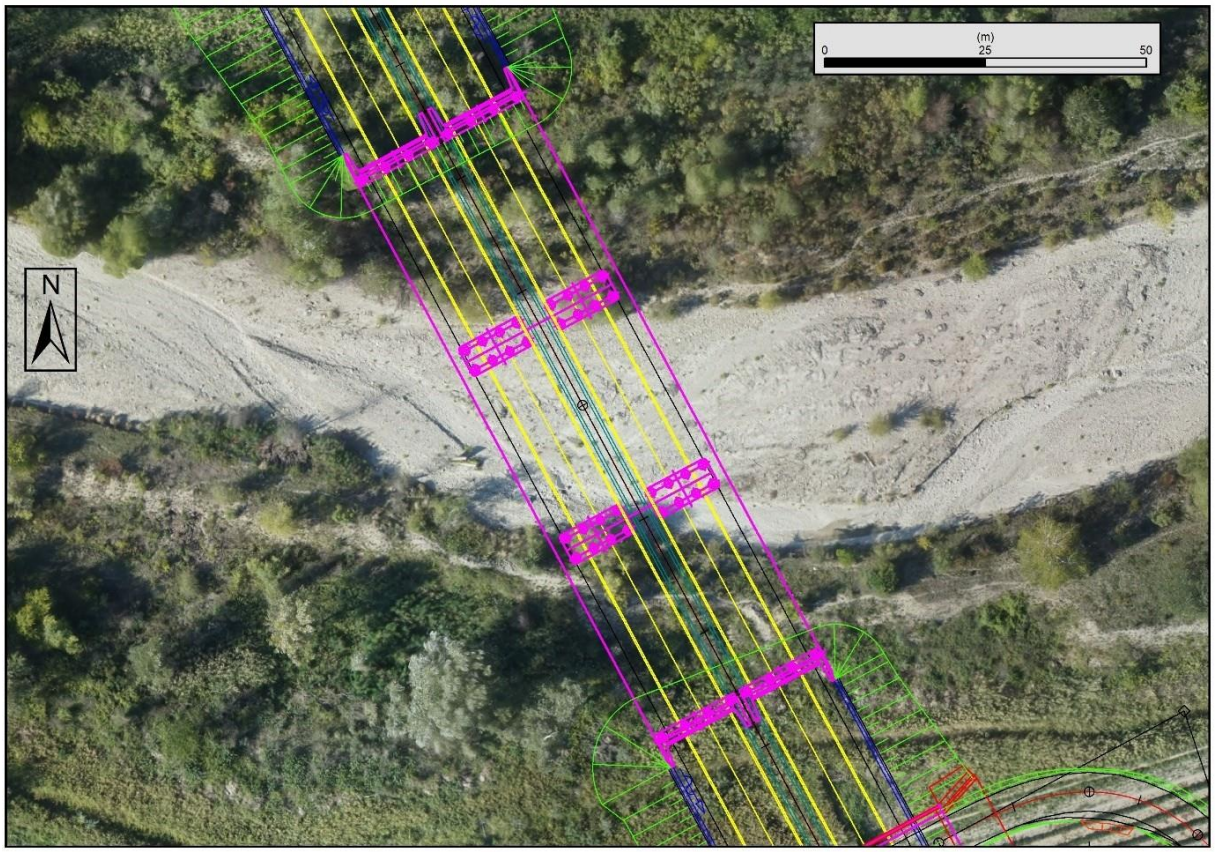
Most common bridge types can accommodate a wide range of platform widths, in this regard the span length has been considered to be the main geometrical criterion in the selection of the bridge type for the project.

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.

Design of New Bridges

Although the types of bridge structures within the scope of the project can be classified under various alternative sub-headings, by considering the overall design of the project, the most practical classification is to itemize the bridges in accordance with their positions along the project alignment.

Figure 3.7.5.1 – plan-view with 3 - Span Motorway Bridge on Chailuri River



Bridge Cross-Section

The below figures, showing the cross-section and layout of a river bridge as an example, indicatethe typical cross-section and layout of the designed main road bridges.

Figure 3.7.5.2 – Longitudinal section of a Motorway Bridge on Chailuri River

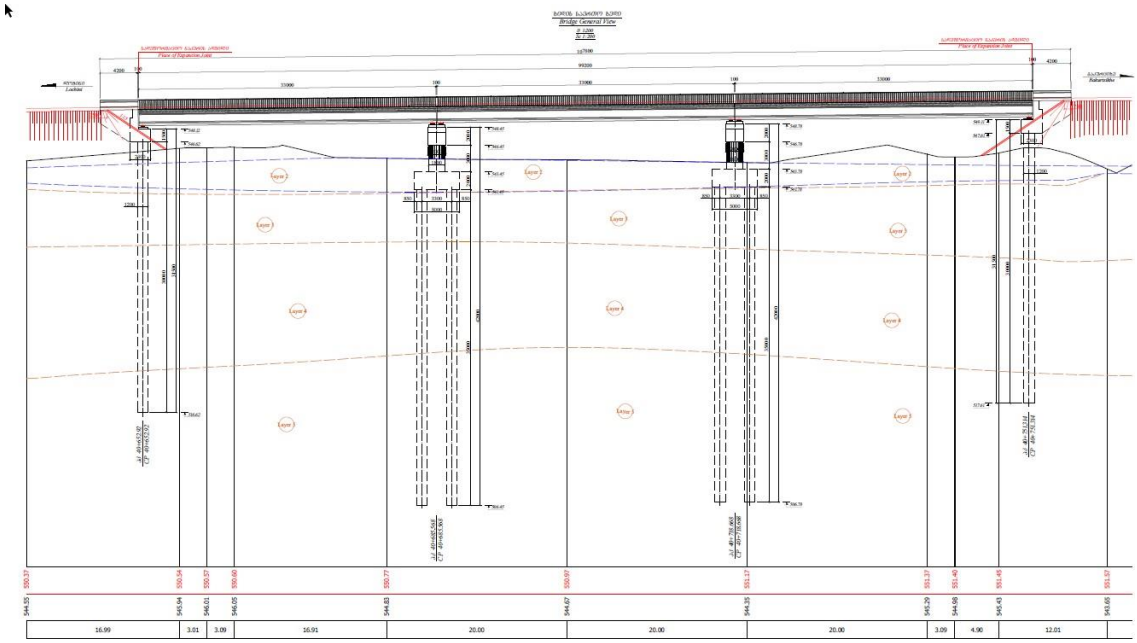
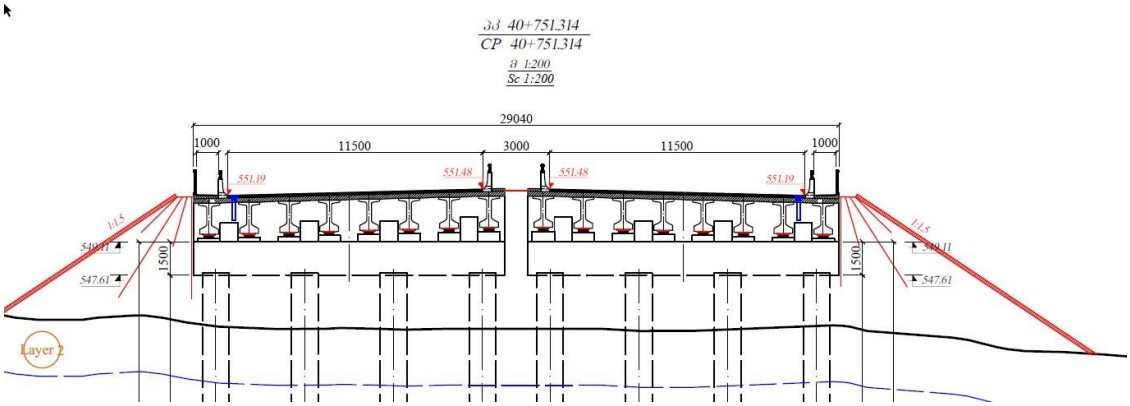
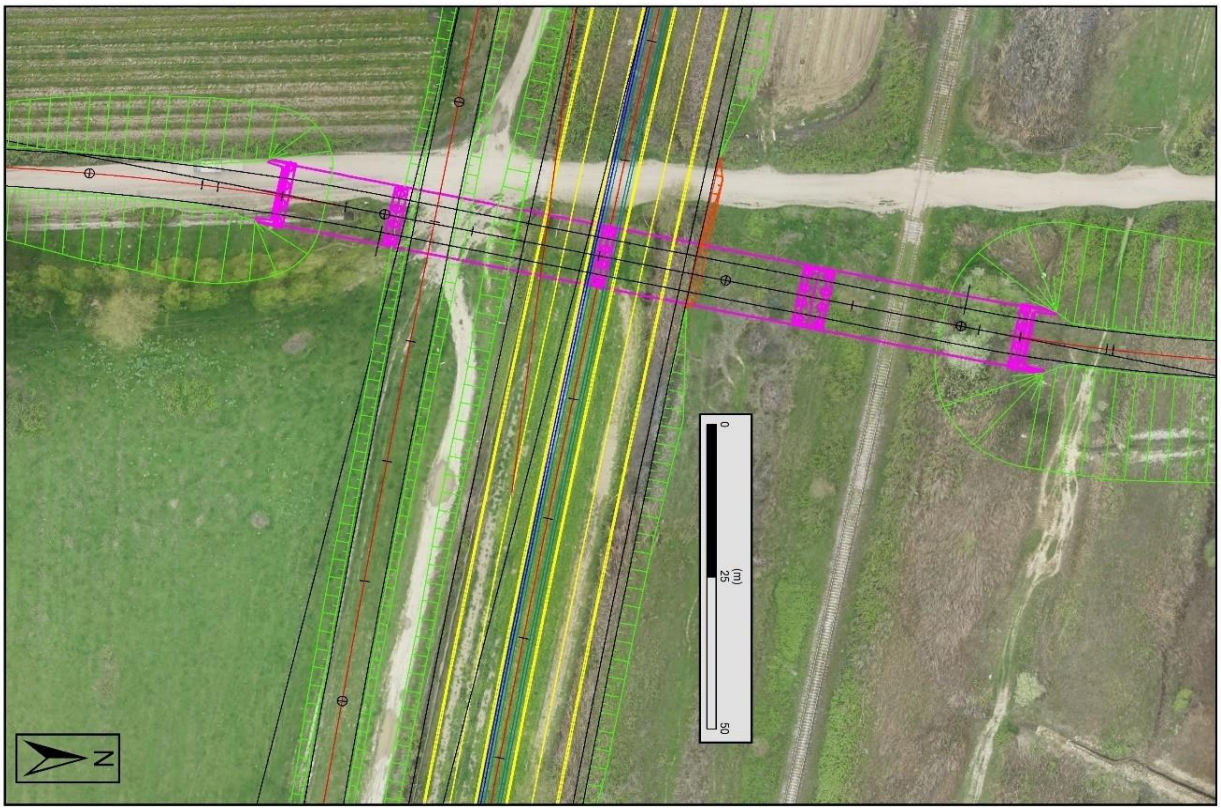


Figure 3.7.5.3 – Typical Cross Section of Motorway Bridge



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

Figure 3.7.5.4 – Planview of LR03 motorway overpass Bridge



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 3.7.5.5 – Longitudinal Section of a LR03 motorway and railway overpass Bridge

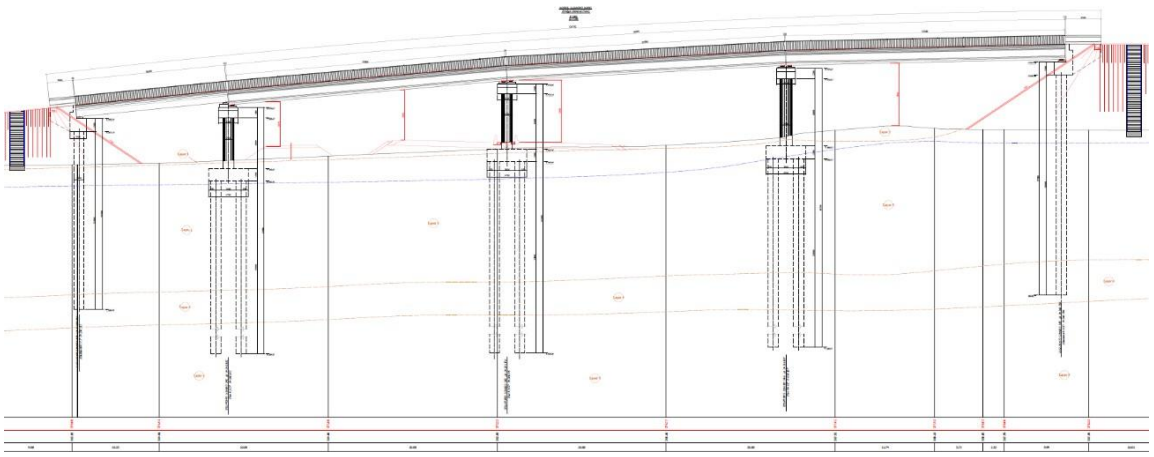
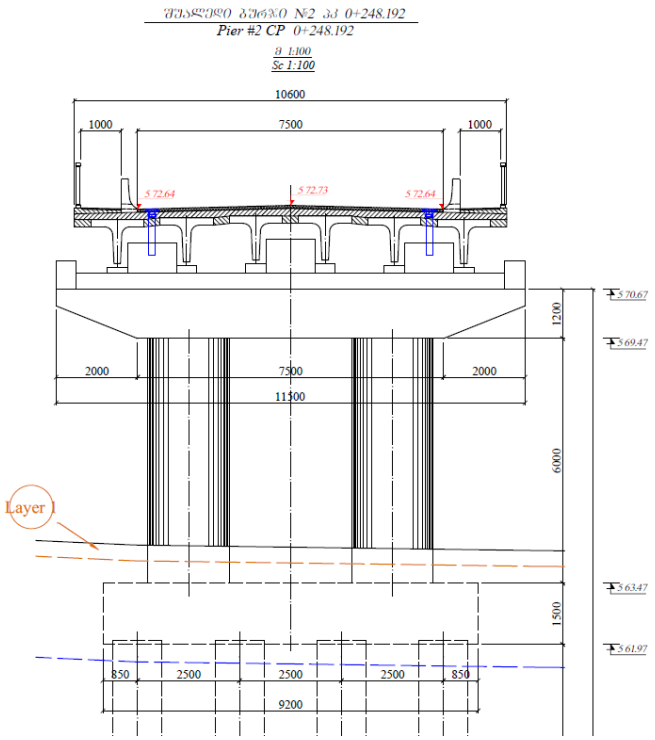


Figure 3.7.5.6 – Typical Cross Section of LR03 Road Bridge



Scour Protection

During periods of high flow, rivers can erode their banks. This process, while destructive can be seen to be a natural process. However, when such processes occur in the proximity of a new road construction, the impacts can be catastrophic if the design does not anticipate the likely scenarios and take measures to prevent damage to the road.

While the hydraulic design of structures is based on the estimated 100-year flood (or Q1%), the design storm that is used to develop the design of erosion protection is typically based on an assessment of the likely damage that could occur if a certain design flow is exceeded. Consequently, the design of erosion protection of bridge foundations should be based on a more severe criteria than the erosion protection of road earthworks. Accordingly, gabion mattresses have been used for the protection of foundations of bridges, while rip rap 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, which in turn is a product of the design storm.

The gabion mattress 500mm thick, has been designed in order to prevent scouring of the foundations of bridges 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), a sidewalk is provided on both sides of the road on the right side of the road (according to the direction of traffic flow). The minimum width of the footpath is 0.6 m. The trail will be separated from the roadway with curbs.

3.9 Railway design

The new motorway crosses the existing railway line at two points: 68+598 and 70+755. A railway underpass is planned to build at the first point and a railway bridge will be built at the second point. It should be noted that each 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 storm water 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 the irrigation network, partially unused and demolished, that might require additional culverts and crossings. This network does not require specific hydrological study and intersections have to be resolved like other utilities (water supply, gas, electricity).

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:

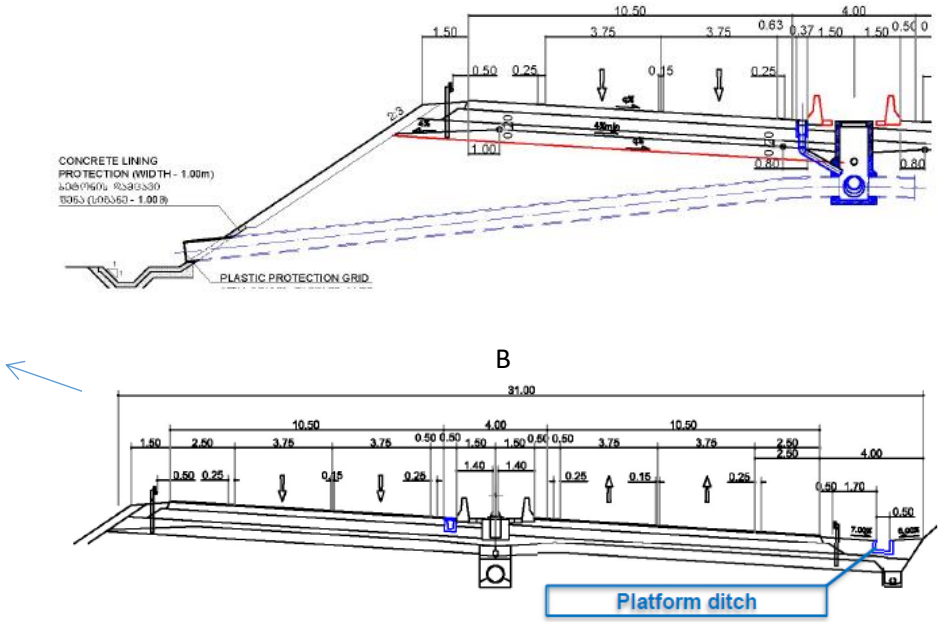
1. Platform gutter: it is needed in curves to drain the runoff of the external carriageway and prevent the flooding of the internal carriageway;
2. Collector pipe: On embankments the platform gutter discharges directly on the side, but in cut sections it is needed a collector pipe of variable (calculated) 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 3.10.2.1.

Figure 3.10.2.1 The drainage scheme of the Motorway

A



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.

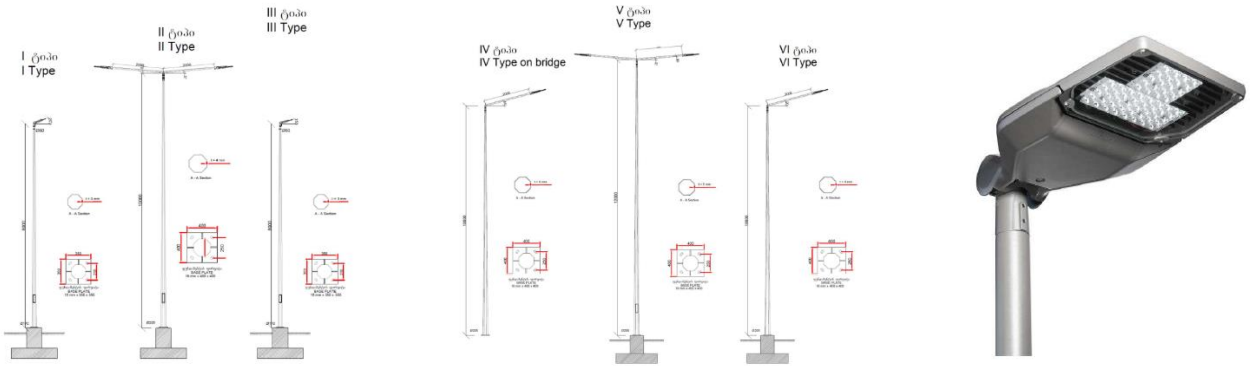
3.12 Road Lighting Design

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 (See Figure 3.12.1).

Figure 3.12.1 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 / leveled 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 Roadside Marketplace

A marketplace will be constructed in the highway corridor near Badiauri interchange, to expand opportunities for local traders who wish to start or continue will need other nearby place to continue business activities closer to the new highway corridor. This special marketplace dedicated for these purposes was designed as part of the Lot 3 road section. Design of the marketplace infrastructure will be developed at a later stage by contractor to be hired by RD for the provision of works for Highway Construction. The marketplace will be provided by RD, but its equipment and maintenance will be an obligation of the local municipality. RD plans to sign a memorandum of understanding with local municipality. It is envisaged that the municipality will provide furniture/minor infrastructure and utilities (electricity, gas, water supply, sanitary facilities etc.) for the marketplace.

3.15 Construction Organization

3.15.1 General overview

Prior to the onset of the core construction works, at pre-construction phase Construction Contractors are responsible to resolve 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 recultivation works will be accomplished all along the road. The preparatory works will

take approximately 1 to 2 months. The improvement and recultivation 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.

3.15.2 Construction Camps

Several sites were identified during the preliminary study conducted within the scope of scoping, which are deemed favourable in an environmental respect and must be preferred by the Construction Contractor.

When identifying the potential sites for the construction camps, the following issues must be taken into account:

- Near location of the highway to the construction corridor.
- Availability of communications (water- and power-supply, existing roads, etc.).
- Satisfactory natural conditions (plane relief, less vegetation, less soil cover).
- Sufficient distance to the sensitive receptors (houses, protected areas, etc.) so that the expected impacts caused by noise, emissions and vibration are minimized.
- Category of the site owner and land plot (state lands must be preferred; however, relevant agreements with private entities are also an option).

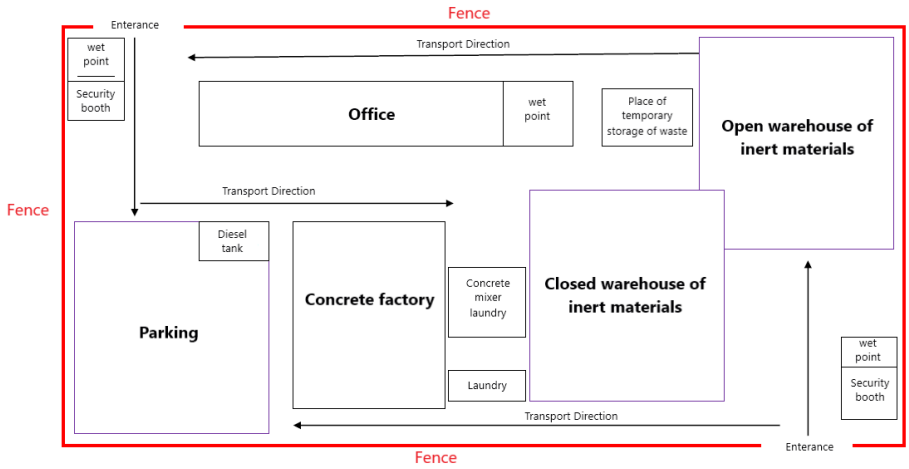
Given these circumstances, the following alternative areas have been identified and proposed by the ESIA consultant to RD:

- 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.

On the territory of the selected construction camp, a vehicle parking area, concrete plant and approximately 5 ton-capacity diesel reservoir 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. No crushing and sorting equipment for inert materials is planned to provide on the territory. Besides, wet patches and relevant cesspits will be provided on the territory of the camp. See the plan of the construction plan in Figure 3.14.2.1

However, the final decision about the location of the camps will be made at further stages, and the Construction Contractor will be also engaged in the decision-making process. The locations will be selected by 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 3.14.2.1 Plan of construction camps



3.15.3 Waste rock spoil grounds

By considering the terrain in the selected alternative corridor, on most of the sites it will be necessary to provide embankments and elevating the roadbed level above the present ground level. However, along some sections, cross sections are also necessary to provide. Such sections are located approximately at last 6-km of the Project road running at Gombori Ridge from village Chalaubani to village Bakurtsikhe. Consequently, the waste rocks mainly originate during the works along the said sections.
In addition, it should be taken into consideration that waste rock generated during excavations will be used for Project purposes, it is required for arrangement of embankments along the road. Besides, in agreement with the state or municipality governments, the ground may be used to level the eroded areas and to restore other types of damaged plots (in line with Clause 51, Article 21). Therefore, there is a probability that no spoil ground as the waste inert material subject to disposal will be originated.

In addition, it may be said that the relief of the project area and other natural factors allow identifying different alternative environmentally friendly areas.

During the ESIA process, an area suitable for the spoil disposal was selected at the following approximate coordinates: X-568696 Y-4609470. The existing ground road runs to this area and it is located at the beginning of the 6-km-long section mentioned above where quite a large volume of spoil ground is originated (See Figure 3.14.3.1).

Figures 3.14.3.1 Areas proposed for the disposal of spoil ground

The spoil ground will be disposed to the landfill at a safe height, with relevant inclination of the pile slopes. The fill surfaces will be re-cultivated and restored to their original state to the extent possible. The drainage channels will be provided along the perimeter of the fills as needed. The issue on allocation of the landfills will be agreed with the local government and consulted/agreed with PAPs .

3.15.4 Supposed list of construction techniques

The construction works will use typical construction machinery commonly used in similar types of projects. Table 3.14.4.1 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 3.14.4.1 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
Derooting 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

3.15.5 Quarries

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

The project region is quite rich in the natural construction materials (sand-gravel). There are several tens of duly licensed quarries operating in the region. Most of them are located in the Mtkvari and Iori riverbeds. Therefore, it will not be necessary to transport the principal construction materials needed for the highway construction to far distances (the distance of transportation will mostly be 10-20 km maximum).

Table 3.14.5.1 Licensed deposits adjacent to the project area

No	**Number and date of the resolution**	**Location of the licensed area, the kind and quantity of the resource**	**License holder**	**Term of validity**	**Note**
1	Resolution №1163/S 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 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	-

Besides, as the project organization suggests, it should be noted that 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, will be imported from the neighboring countries. The potential sources of bitumen import is Turkey and Azerbaijan, as well as Iran. However, it should be noted that in 2020, within the scope of "Enterprise Georgia", a new bitumen plant was put to operation in Rustavi and the probability of bitumen to be supplied from the given plant is high.

3.15.6 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 amount 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 thous. m^3/year.

Water drainage:

The calculation of approximate amount of the domestic-fecal effluents is done by considering 5-10% of the consumed drinking and domestic water. The amount of domestic-fecal waters originated during the construction works will be 1425 m^3/year, i.e. 4,75 m^3/day.The domestic-fecal waters on the territories of the camps 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 fecal masses will be removed with a special vehicle and utilized in the nearest sewage systems (persumably, 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 the Ministry and development of the maximum admissible discharge (MAD) project will be necessary.

3.15.7 Relocation of engineering-utility lines

There are several communication objects in the project road corridor. Noteworthy of them is Baku-Supsa oil pipeline operated by BP, as well as local and international gas pipelines owned by the Georgian Oil and Gas Corporation (GOGC). 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.

3.15.8 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.

3.15.9 Temporary access roads

Roads of local importance in the corridor of the project 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, the project practically does not envisage cutting the temporary ground roads required for construction.

3.15.10 Reclamation 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 the Government of Georgia - "On removal, storage, use and reclamation of the fertile soil layer".

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.

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

In the tables below 3.14.11.1-3.14.11.3 The future traffic indicators compiled according to the feasibility report are given. These data are used to model Air pollutants and noise emissions into ambient air.

Table 3.14.11.1

Current - 2020 y.					
N	Area	Light Auto	Heavy Auto	% of Heavy Auto	Total
1	Manavi - Badiauri	9273	1767	16	11040
2	Badiauri - Mzisguli	8568	1678	16,4	10246
3	Mzisguli - Signagi turn	8837	1691	16,1	10528
4	Signagi turn - Bakurtsikhe	4637	1414	23,4	6051

Table 3.14.11.2

2030 y.					
N	Area	Light Auto	Heavy Auto	% of Heavy Auto	Total
1	Manavi - Badiauri	24431	3150	11,4	27581
2	Badiauri - Mzisguli	22333	3043	12	25376
3	Mzisguli - Signagi turn	22678	3082	12	25760
4	Signagi turn - Bakurtsikhe	15950	2558	13,8	18508

Table 3.14.11.3

2040 y.					
N	Area	Light Auto	Heavy Auto	% of Heavy Auto	Total
1	Manavi - Badiauri	26368	4197	13,7	30565
2	Badiauri - Mzisguli	24214	4003	14,2	28217
3	Mzisguli - Signagi turn	24644	4056	14,1	28700
4	Signagi turn - Bakurtsikhe	16778	3325	16,5	20103

4. Analysis of alternatives

4.1 General

Works subject to ESIA envisage the construction of a four-lane 49-km-long highway from the eastern part of Sagarejo to Bakurtsikhe. The project corridor will cross the territories of Sagarejo and Gurjaani Municipalities, the two self-governing units of the Kakheti region.

Geographically the initial section of the project corridor from the eastern part of Sagarejo to Chalaubani runs across a smooth relief, in the transient zone of Iori Plateau and the south-western slope of Gombori Ridge. Then, an approximately 6-km-long section crosses Gombori Ridge, a watershed of Iori and Alazani Rivers, from south-east to north-west. The landscape of the initial section of the project corridor is significantly transformed by human activities and is mostly provided with agricultural landscapes (vineyards). A section of Gombori Ridge runs across the forest zone, but mostly along the existing road corridor or near it.

Within the feasibility study of the Project the technically feasible and financially more or less profitable alternative corridors were considered:

- No-action alternative;
- Alternative of existing road widening;
- Alternatives for new corridor alignment.

In order to determine more or less realistic options of the new corridor of the highway, following its morphology, the alignment was divided into two sub-sections:

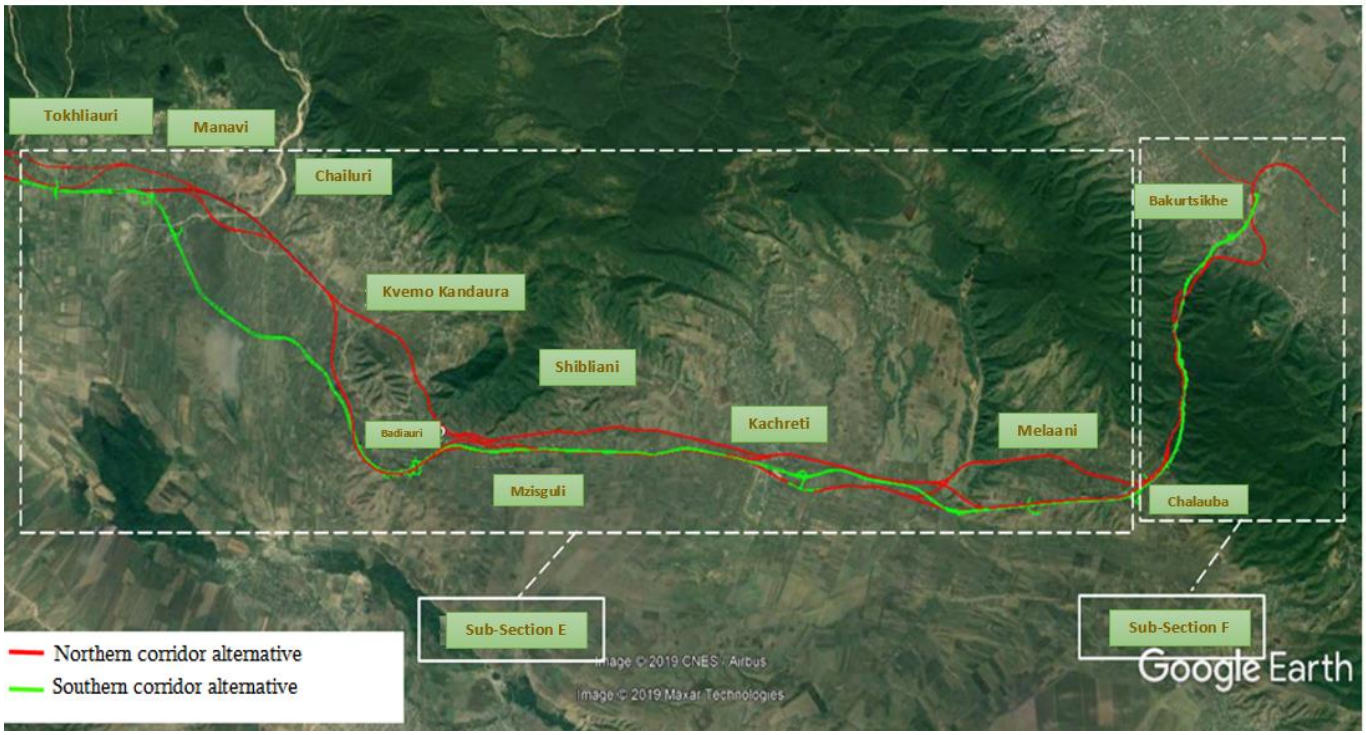
- Sub-section E: Eastern part of Sagarejo-Chalaubani;
- Sub-section F: Chalaubani – Bakurtsikhe.

For the first sub-section (E), two main alternatives were determined, the options to develop the road corridor mostly in the north or south side. Following this principle, additional alternatives were proposed for the individual areas of the given subsection.

The corridor of the second sub-section (F) runs across relatively complex terrain. Therefore, the determination of realistic alternative corridors for mentioned part of the road was limited. Nevertheless, there are 3 alternative options that were proposed.

A general outline is given below for a better understanding of the proposed alternative options and considered sub-sections.

Figure 4.1.1. Alternatives of the road alignments



4.2 No-Action alternatives

Under the No-Action Alternative, the modernization of the Tbilisi-Bakurtsikhe section of the International Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan Border (S5) Road 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 road 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 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.

By considering the above-mentioned, the road-widening alternative was not acceptable construction of a new corridor, which will be maximally distanced from the sensitive objects (residential zones in this instance) was selected.

4.4 Alternative options of the new highway corridor

The implementation of the project 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 Fueling 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.

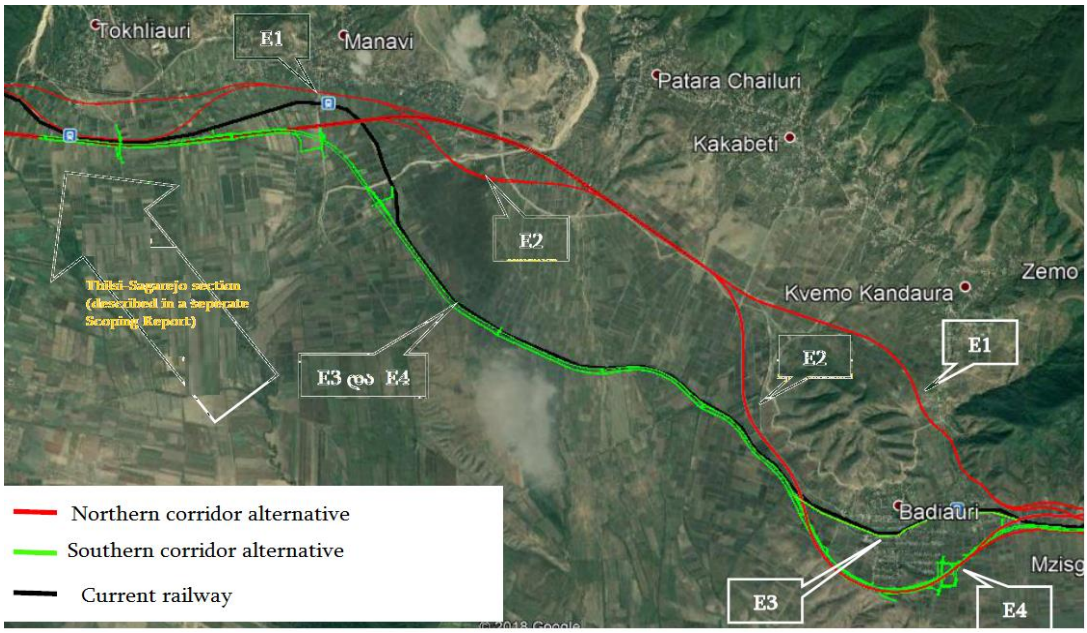
Following the above-mentioned, the project for modernization of the highway will significantly support the sustainable development of the country and there is no alternative to its implementation. As for the expected negative impacts on the environment caused by the implementation of the project, the reduction of their scales and area will be possible at the expense of relevant compensation and mitigation measures.
During the review of the arrangement alternatives for the Sagarejo-Bakurtsikhe part of the Tbilisi-Bakurtsikhe Section of the highway, conditionally it was divided into two sub-sections: E (Tokhliauri- Chalaubani) and F (Chalaubani-Bakurtsikhe) for which different alternatives of directions of corridors have been considered.

4.5 Alternative corridors for sub-section E:

Tokhliauri-Badiauri site

Along Tokhliauri-Badiauri section of sub-section E, four alternative corridors have been considered including options E1 and E2 for so-called northern corridor alternative, and options E3 and E4 for southern corridor alternative. These options are shown in Figure 4.5.1.

Figure 4.5.1. E A plan of alternatives of Tokhliauri-Badiauri area of the sub-section



The decision on selection of Tokhliauri-Badiauri section of E sub-section somehow depends on the configuration of the last section (D) of the previous section (Tbilisi-Sagarejo section) of the international road.

Options E1 and E2 of the subsection are an extension of alternatives D1 and D2 alinement. The corridor will run across the agricultural lands south of village Manavi and then is divided into two as follows:

Alternative E1 continues north, crosses several homestead plots in village Manavi, non-agricultural land plot owned by "Badagoni" Ltd (cadastre code: 55.09.61.010), and then the river Chailuri and reaches the existing road. Option E2 develops more southwards, runs across the agricultural lands, crosses the lower reaches of the river Chailuri, and joins Alternative E1. Then, these two options run together through the existing highway corridor for approximately 2.4 km.

Then the alternatives are divided into two once again:
Alignment E1 runs south-east and then, south of Kvemo Kandaura, bypasses Badiauri from the north, turns east towards village Mzisguli, continues northwards and reaches the existing railway line in the area.
E1 alignment is expected to have major impacts on the agricultural land plots, where mainly grow the vineyards. In terms of impact on agriculture, it is also noteworthy that the alignment will cross the local irrigation channel twice, which is crucial in terms of irrigating the agricultural lands in this area. Besides, E1 alignment will run across a mountainous section that borders the village of Badiauri to the north. At the intersection of E1 alignment and the access road to village Kandaura, the given alternative will run across the settled area. Therefore, social-economic impact on the local population is expected. This option also affects the land plot owned by a prominent Georgian-Italian winery Badagoni Ltd.

E2 alignment develops more southwards, bypasses the hilly terrain there, crosses the railway, passes the agricultural lands south of village Badiauri and turns north. This alternative will cross the railway once again and

then, reaches alignment E1. Before crossing the railway, the impact on several homestead plots in Badiauri is expected.

Putting E2 alignment to operation needs the modernization and renovation of part of the railway corridor. Consequently, it is necessary to upgrade the existing infrastructure in order to build a new highway in the mentioned corridor. Like alternative E1, alignment E2 is expected to have an impact on agriculture, particularly on vineyards. As for the biodiversity, no impact is virtually expected in this regard, as entire alignment E2 will run across cultivated agricultural and homestead lands. There are small patches of natural habitats in the corridor. However, they are intensely modified due to the anthropogenic impacts of the nearby settlements.

Options E3 and E4 of the subsection are extensions of the D3 alternative. These two alternate corridors coincide with one another up to village Badiauri, by running across the agricultural lands, almost parallel to the existing railway corridor (except the area south of village Manavi). As compared to all other alternative corridors, this option is quite distanced from the residential houses and mostly bypasses homestead plots.

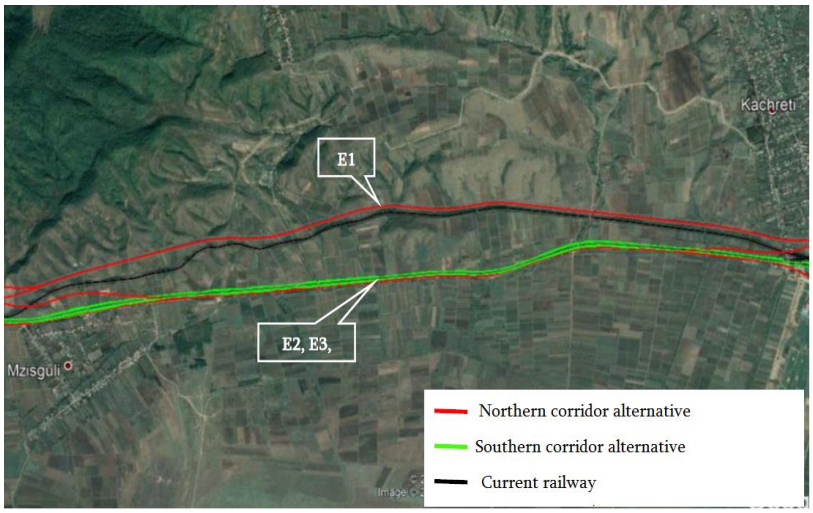
West of village Badiauri, the alternatives are divided into two as follows: option E3 continues through the railway corridor implying building the alignment through the central part of the settled area of village Badiauri. Consequently, the risks of physical resettlement of the population are quite high. In this respect, the E4 option is more favorable, as it will bypass the village from the south along the E2 alignment and will come to alternative E1.

The major impacts of alignments E3 and E4 are expected on agricultural land plots where mainly grow vineyards. In addition, option E3 will have a high impact on the settled area in village Badiauri. However, the solution in this regard is to extend the alignment along alignment E4 what will have minimal impact on the population as a whole. An additional advantage of alignment E4 is that much of it runs across the railway line corridor (without crossing it) what has low risks in terms of habitat fragmentation and is also better in terms of impact on cattle breeding. Virtually, there are no natural habitats in corridor E4 and besides, the terrain conditions are more favourable.

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 4.5.2.

Figure 4.5.2 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.

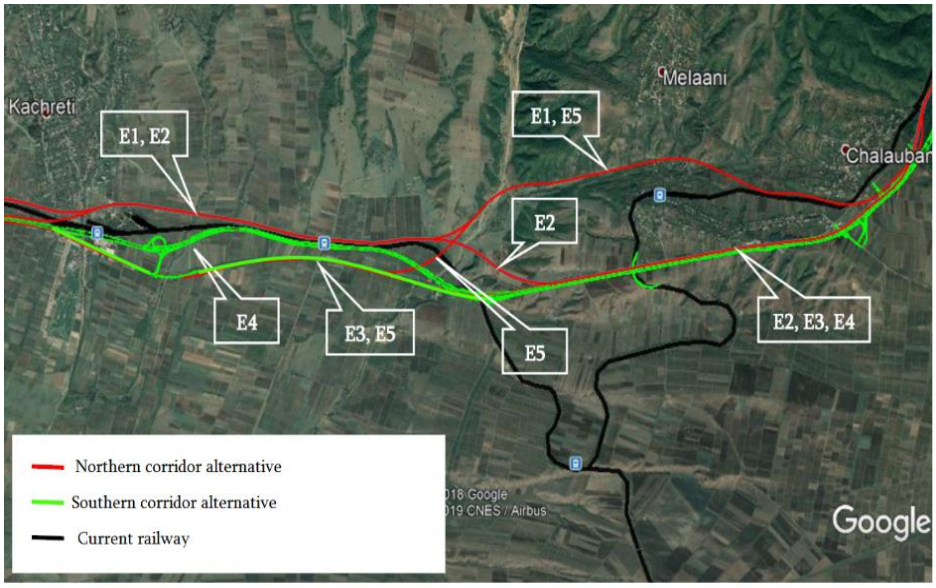
Options E2, E3, and E4 run south of the existing railway. Most of it coincides with the existing highway and implies its widening. As the terrain along this section is favorable and at the same time, there are no settled areas in the area, the extension will not cause a significant impact on geological 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 4.5.3.

Figure 4.5.3. 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 favorable 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” found in the north.

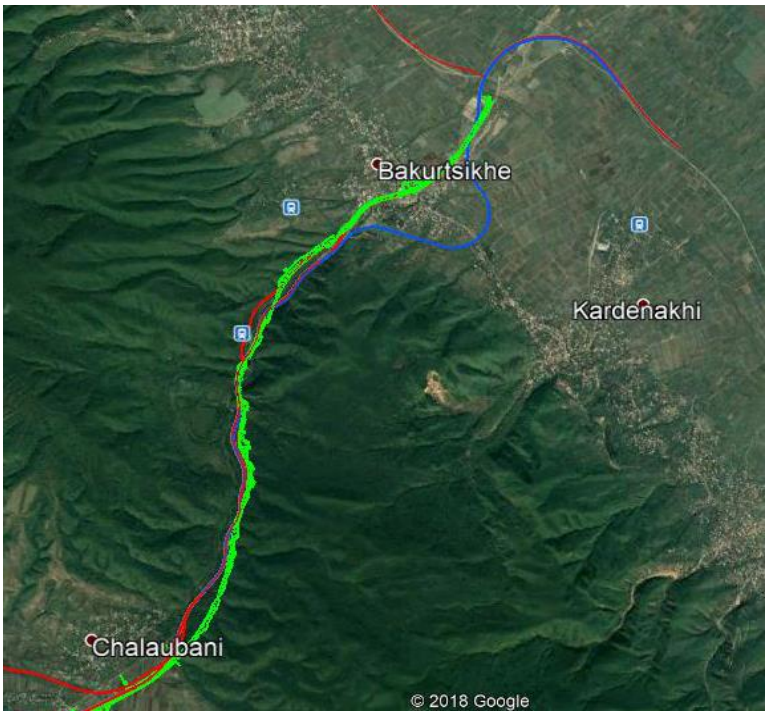
Following certain environmental and social considerations according to the above-described alignment, E4 alternative alignment, which will run south and maximally avoid the sensitive sections, was preferred.

4.6 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 4.6.1.

Figure 4.6.1. 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 actually does not cross the settlements. Consequently, the impact on the social environment is not expected. However, the potential indirect impact on small roadside businesses and local vendors along the Barjiskhevi section of the existing road in the middle of this sub-section is noteworthy. This part of the road is a site where the travellers to Shida Kakheti take a rest and besides, there are several

restaurants along the road near the natural spring, which are likely to be affected by the new road. In respect of the impact on the social environment, F3 alignment is important, which will bypass the Bakurtsikhe crossroad from the east, will follow the right bank of the Chalaubniskhevi River, and will cross the settled area. However, with this alternative, the desired technical parameters of the new road will be difficult to provide and the total length of the sub-section will significantly increase. It is important that this option does not completely exclude the need for physical resettlement.

As per 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. Consequently, this option is not subject to detailed consideration.

4.7 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 49 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.

5. ESIA Methodology

5.1 Introduction

The present ESIA evaluates potential environmental and social impacts related to the construction and operation of the Sagarejo-Bakurtsikhe highway section. 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 report 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 Monitoring Plan (ESMP);
- Final Draft ESIA report disclosure and arranging 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 3, 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.

March 13, 2020, the MOEPA issued Order #2-245 of the Minister of Environment Protection and Agriculture of Georgia with the # 22 Scoping Conclusion issued March 9, 2020.
October 4, 2021, the MOEPA issued the Order #2-1420 of the Minister of Environment Protection and Agriculture.

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, MOEPA 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[3] Public consultation meetings on the draft scoping report were held on February 4-5, 2020 at six locations of Sagarejo and Gurjaani Municipalities,

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, MOEPA organized public consultation meetings on the draft EIA Report on the construction of Sagarejo-Bakurtsikhe road section. Information about the consultation meeting,

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

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[4].

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 unfavorable 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 (photos 5.5.1, 5.5.2) was used. The noise meter is a 2nd class device of “IEC” 61672-1 standard. It can store 64000 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

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

(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 the same guideline, the noise monitoring is possible to provide 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.

Photo 5.5.1 "REED" R8080 noise meter	Photo 5.5.2 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, 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.

Photo 5.5.3. 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 signaling 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, Sport and Youth Affairs 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.

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 as "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 was covering the whole road corridor, received data via GPS (GARMIN Etrex 20) and filled a special field form. 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, mollusks) 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;
- **Fishes:** 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 the census conducted during the RAP preparation process, the inventory of assets and field study was conducted in 2019. A census of 100% of the directly affected AHs under the RAP (Lot 3) impact available on site was conducted to enumerate the APs. A sample socio-economic survey form/checklist was included in the project area covering 134 randomly selected households which is 40.7% of the

total of directly affected AHs losing their land and connected assets. The face-to face interview method was used during the field survey. The interviewed HHs live in the villages: Tokliauri, Manavi, Kakabeti and Badiauri 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 (Sagarejo and Gurjaani municipalities);
- 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.
- Census of HHs under the impact of RAP.
- Socio-economic survey of randomly selected HHs from four villages along the Lot 3 section.

Social impact assessment addressed the following types of information:

- 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 labor and possible influx, assessment of risks related to labor organization and management health issues, including the risk of transmitted disease to the local population due to labor 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 Information

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 Project 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 badlands with lack of 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 within the borders of Gurjaani and Sagarejo Municipalities are provided on the figures below:

Figure 6.1.1 Location of the study corridor on the physical map of Georgia

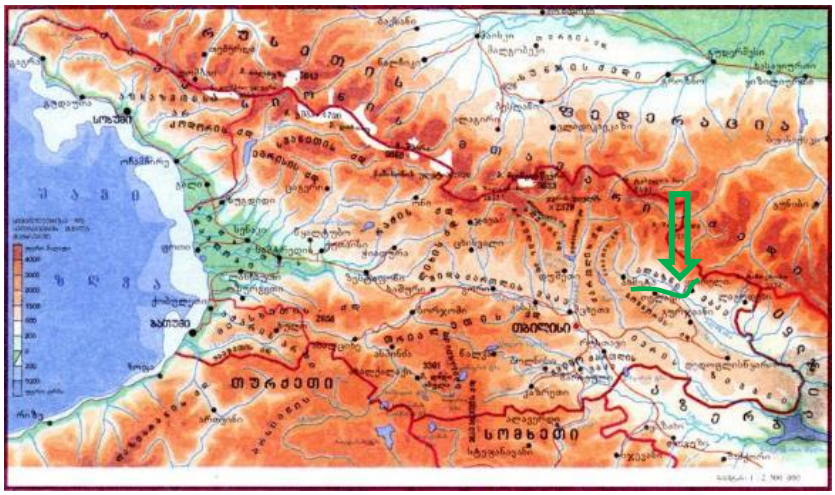
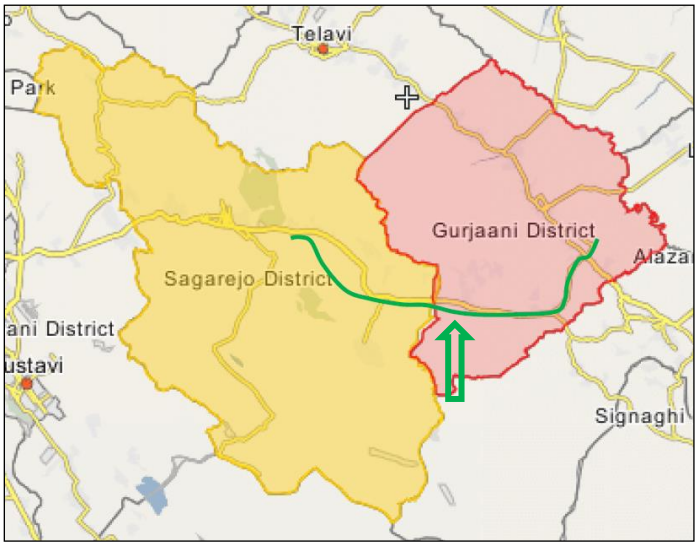


Figure 6.1.2 Location of the project corridor in relation to the administrative units



6.2 General overview of the Project Zone

The Environmental and Social research covers approximately 49km of the selected project section. Its initial section, extending from the east towards village Tokhliauri to village Chalaubani in the west, mainly runs across the smooth terrain and the areas with technogenic load (agricultural plots of field, homestead lands). The section of the highway extends from the southwest to the northeast, runs across more complex terrain's lands, within the limits of a relatively natural landscape. These territories are not used for agricultural activities by the local population.

The road corridor starts south of village Tokhliauri and goes approximately 4 km to the eastern. After the alignment turns right, passes the river Chailuri and about 11,5km goes to the southern (up to the 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, second-, and third-tier irrigation channels, and low-voltage power transmission lines are located along the alignment (see photo 6.2.1.).

Photo 6.2.1 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 (see photo 6.2.2).

Photo 6.2.2 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.

Photo 6.2.3 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.

Photo 6.2.4 General views of the corridor near village Kachreti

Photo 6.2.5 The section from village Kachreti to village Badiauri




Near the village Chalaubani, the corridor runs across the agricultural plots and enters the Gombori Ridge section. Within the boundaries of the Gombori Ridge, the road runs across a rather complex terrain occupied by natural vegetation. The significant environmental issues along this section are geological conditions and biodiversity. Small businesses and local sellers might have potential direct or indirect impacts. Near the settlements, small unauthorized household and construction waste landfills areas were identified (including asbestos-containing materials found within the corridor).

Photo 6.2.6 Illegal landfills near the project corridor


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.

Table 6.3.1. 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 6.3.2 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 <8^{0}C		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 6.3.3. 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

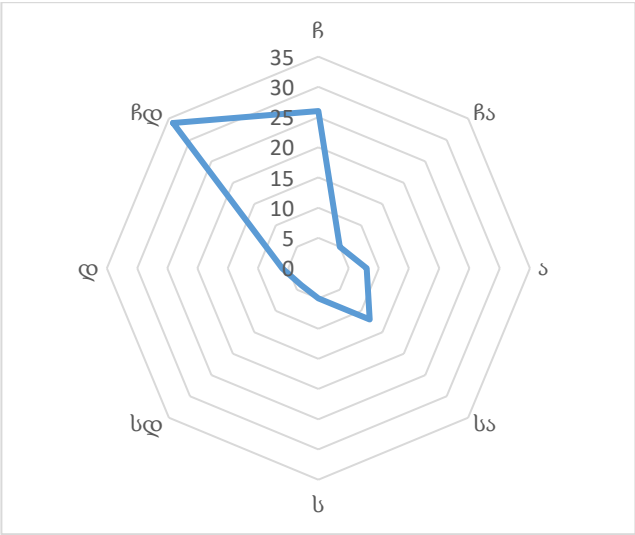
Table 6.3.4. Atmospheric precipitations

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 6.3.5 Wind Characteristics for the OHL Route

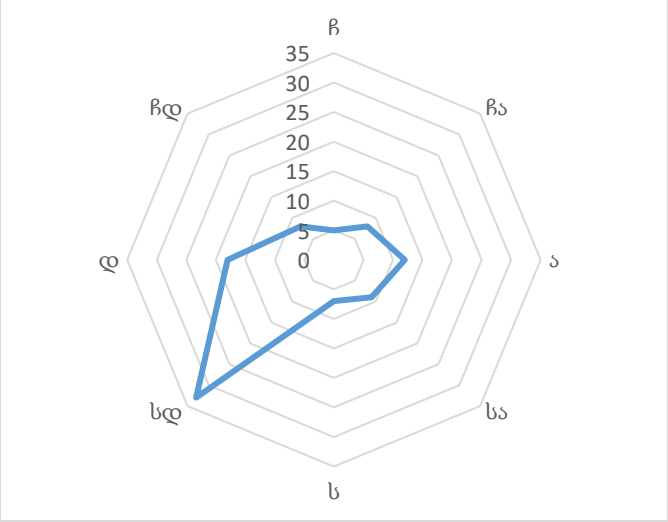
Administrative Unit	Wind Velocity, m/sec								
	January		July		Maximum Likely Wind Velocity (m/sec) for Recurrence Time of:				
	Max	Min	Max	Min	1 year	5 years	10 years	15 years	20 years
Sagarejo	4,6/	0.4	2.7	1.2	19	23	25	26	27
Gombori	4.6	0.4	2.7	1.2	18	22	24	24	25
Gurjaani	3.8	0.8	2.7	1.2	16	19	21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

Wind rose, %:



Still - 18% Sagarejo

Still - 60% Gombori



Still - 8%
Gurjaani

Table 6.3.6 Rated seasonal freezing depth of grounds

Municipality	Argillaceous and loamy	Fine and dust-like sand clay-sand	Large- and average-coarse gravelry 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 and the Road between Tsnori – Lagodekhi and 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 – Bakurtsikhe and the Road between Tsnori – Lagodekhi, 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 alignments corridor.

6.4.1 Geomorphological Conditions

The project area is located in the south-eastern part of the country within the intermontane low land area. Three river basins es occur study area, 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, northwestern 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 s 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.

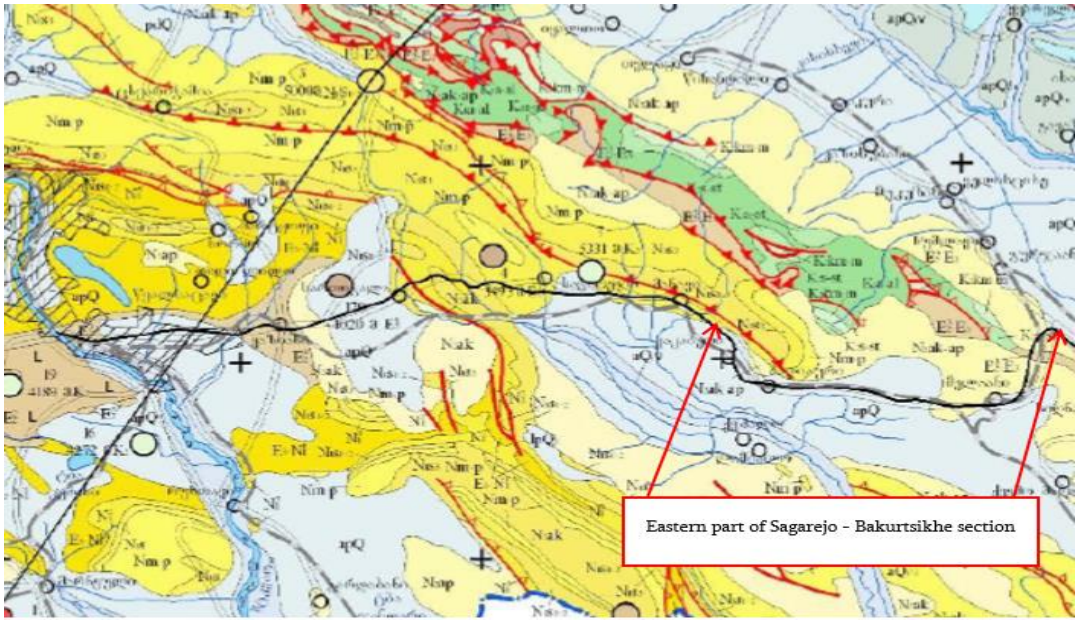
The oldest geological formation is the Middle Eocene sedimentary rocks, which are fixed to the west of the highway corridor. The western part of the corridor to the central and eastern zones of the road, the Upper Eocene, Oligocene, and Neogene sagging rock formations are found, mainly represented by 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).

Map 6.4.2.1 A part of the geological map showing the project corridor, scale: 1:500,000

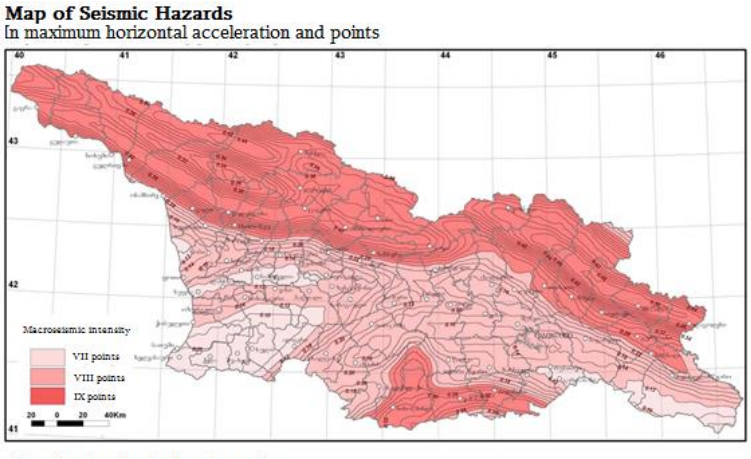


$N_2^2ak\text{-}ap$	The **Aghchagil and Aspheron stages of the Caspian** Sea province, continental and marine molasses, made up of sands, loams, clays and sandstones.
N_2^2ak	The **Aghchagil stage of the Caspian Sea province**, marine and continental molasses, made up of, conglomerates, sandstones, sands, clays with volcanic ash intercalations.
Nm_1p	The **Meotian and Pontian** marine and continental molasses, made up of, conglomerates, sandstones and clays
$N_1^1s_3$	The **Upper Sarmatian** marine and continental molasses, made up of, sandstones, clays, conglomerates and sometimes marls.
$N_1^1s_{1+2}$	The **Lower and Middle Sarmatian** marine molasses occurring at the central part of the corridor, made up of, clays, sandstones, conglomerates, marls and limestones.
N_1^1	The **Middle Miocene** marine molasses formations, made up of, clays, sandstones, conglomerates (sometimes basal conglomerates), marls, oolitic and arenaceous limestones.
$E_3\text{-}N_1^1$	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.
$E_2^3\text{-}E_3$	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.
E_2^3	The **Upper Eocene** sedimentary rock formations, made of shallow marine conglomerates, gritstones, olistostromes, arenaceous limestones, carbonaceous and clay sandstones.
E_2^2	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 Tectonic 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 6.4.3.1.



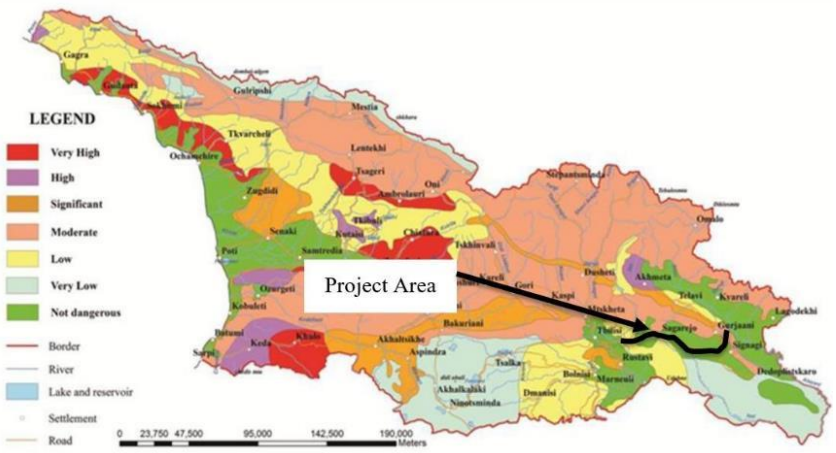
Note: Acceleration is given in *g* units

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 color) and only locally in the "low" (Yellow color) to "moderate" (pink color) 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 6.4.4.1. 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

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.

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.

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.

River Chalaubniskhevi

River Chalaubniskhevi 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 6.6.1. Cumulative areas of the sub-basins of the Chalaubniskhevi River

River	Sub-basin	Cumulative area (km2)	Design flow (peak discharge) (100 years - m3/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 6.6.2 Boundaries of the water catch basins of the principal intersecting watercourses along Tokhliauri-Badiauri section

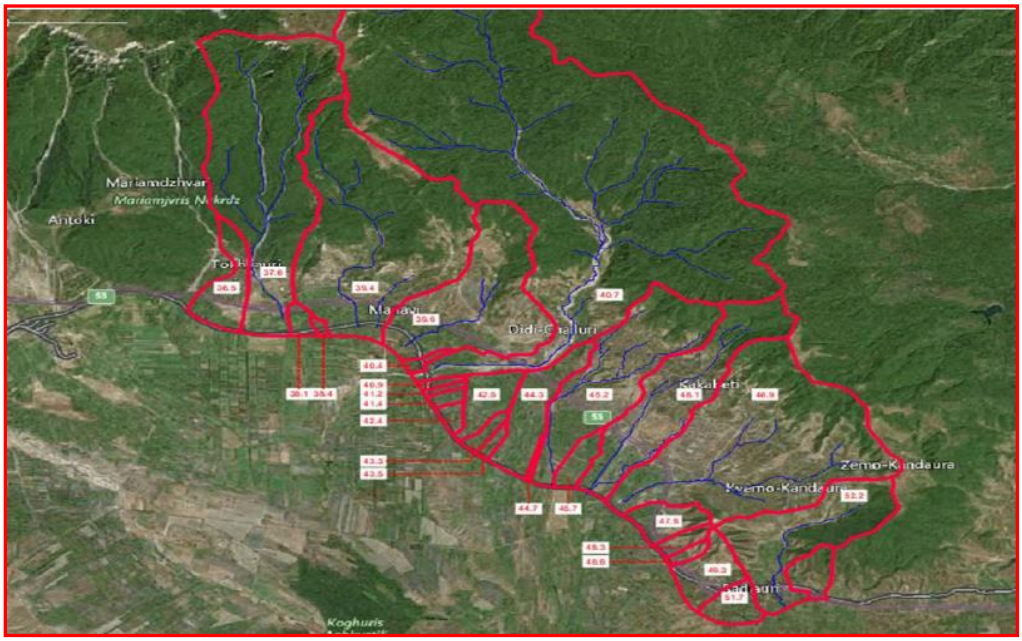
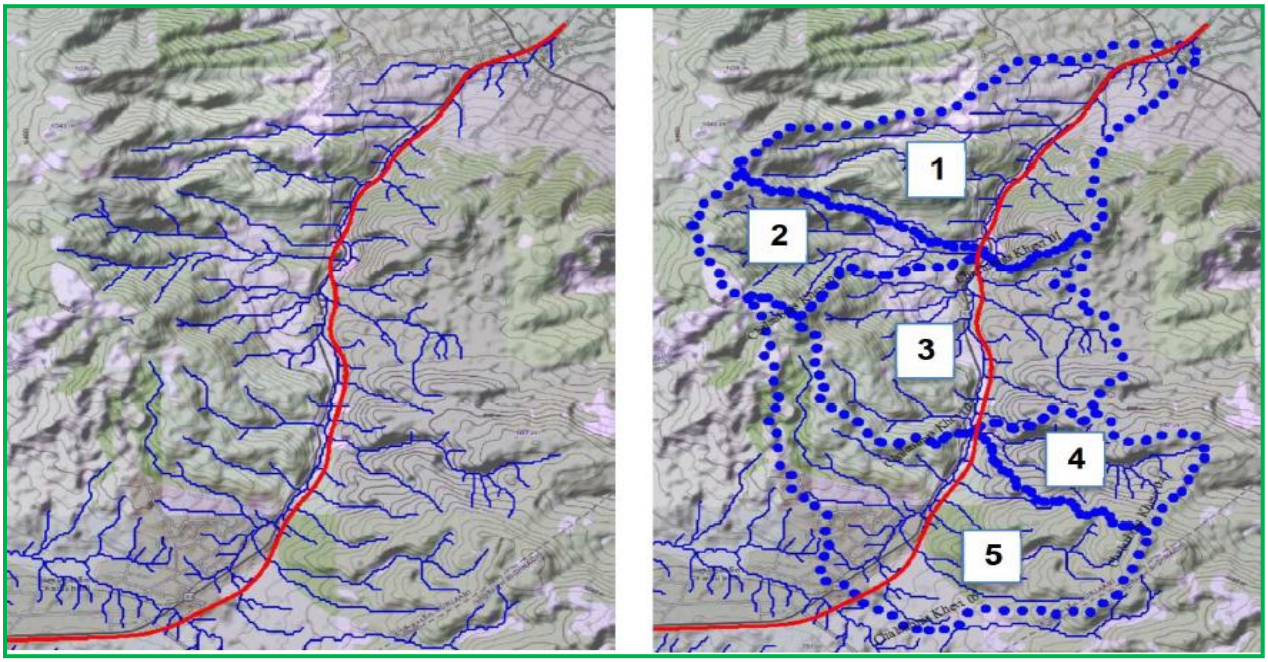


Figure 6.6.3. Boundaries of the water catch basins of the principal intersecting watercourses along Badiauri-Chalaubani section

Figure 6.6.4 Boundaries of the water catch basins of the principal intersecting watercourses along Chalaubani-Bakurtsikhe section



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 6.6.5. 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 6.6.6. Peak discharges of mudflow current of the River Chailuri, m3/sec

Name and number of rivers	year		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.

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 6.6.7. 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 6.6.8. 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 6.6.9. Locations of cross sections assessed during the hydraulic modelling

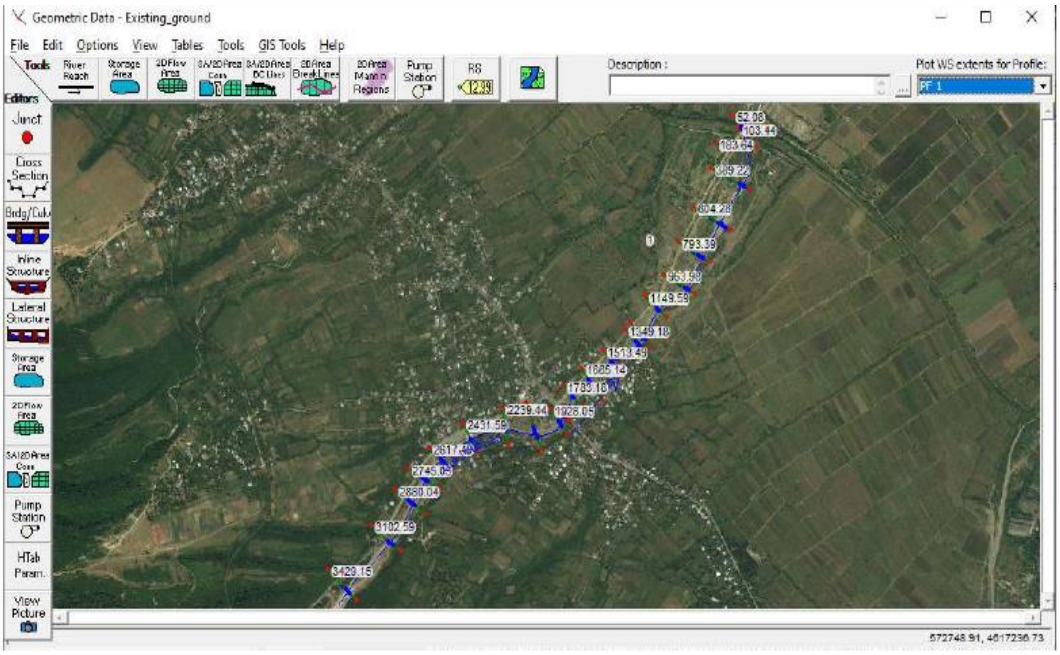


Figure 6.6.10. Boundaries of the flooding zone in terms of design peak discharge

6.7 Biological environment

Biological research was conducted in the Project Corridor S5 of the road (from the area adjacent to the village of Tokhliauri to the village of Bakurtsikhe) in accordance with World Bank ESS6. The biological research included three main components:

1. 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;
2. Study of the faunal environment and assessment of their habitats;
3. Study and evaluation of areas protected by national legislation, international conventions and WB ESS6.

The initial biodiversity studies were conducted in several stages, including scoping and EIA. Furthermore, additional study was carried out under the present ESIA (November-October 2021). 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 form Tokliauri up to Chalaubani (Lot 3 and Lot 4) the natural vegetation is quite modified, approximately 6 km from Chalaubani to Bakurtsikhe goes through forest area (Lot 5).

The agricultural lands are cleared off forests having led to the disappearance of the forest cover. The 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 (Lot 5 – Chalaubani-Bakurtsikhe Section) (Photo 6.7.1.1).

Photo 6.7.1.1. 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 end.

Photo 6.7.1.2. 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 surrounding. The following forest fragmentation are identified at the area:

The project road crosses fragmented forest at coordinates: X-566759; Y-4608635, which is mainly covered by oak-hornbeam. 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 favorable course along the given section: there are about 15 suckers on a 5x5m2 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.

Photo 6.7.1.3 A fragment of the oak-hornbeam forest

Photo 6.7.1.4 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 project corridor crosses forest in Barjiskhevi section, where Chalaubani gully is located as well, and which is mainly a dry gully.

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 on the Barjiskhevi section, which has a negative impact on the riverside of the Chalaubani River gorge. Numerous landfills are arranged in the ravine (photo 6.7.1.5).

Photo 6.7.1.5. The illegal dumpsite at the Chalaubniskhevi

The post-forest habitat project 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 (so-called "site") were studied in the project corridor. Their layout is shown on the map. The tables providing description of plants at investigated sites is provided in attachment 9.1

Figure 6.7.1.6 Location of the studied reference sites in the project corridor

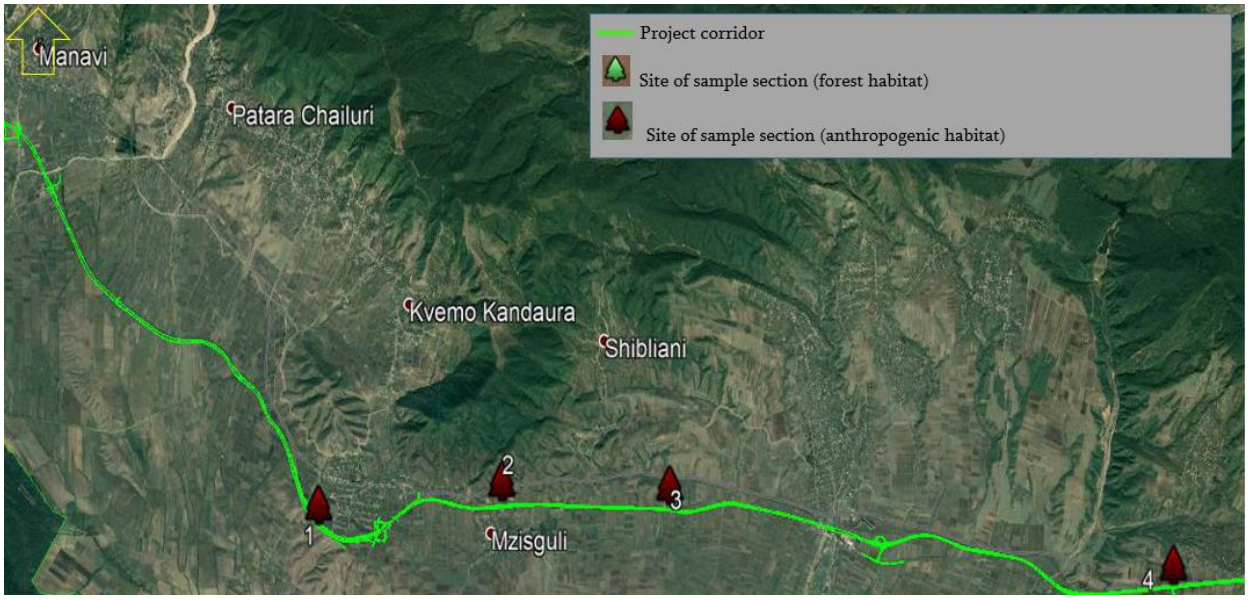
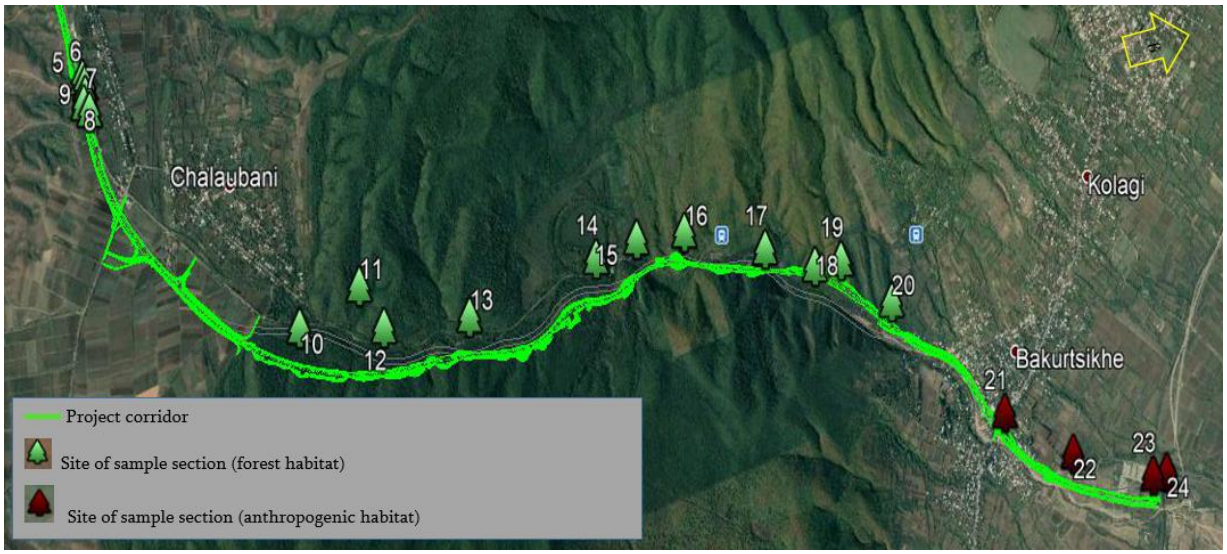


Figure 6.7.1.7 Location of the studied reference sites in the project corridor



Description of timber resources available in the project area

Part of the section to be considered in the present document of the Tbilisi-Bakurtsikhe road (Tokhliauri-Bakurtsikhe road junction), in particular the area on its Gombori ridge, is located at the LEPL Kakheti Forest Service of the National Forest Agency, Gurjaani forest district (Bakurtsikhe) subordinate areas.

During the works, all wood species with a diameter of 8 cm and more were recorded in the taxation area according to the thickness steps. The height order was determined, and their volumes were calculated according to the wood species. All species of shrubs and shoots less than 8 cm in diameter were also recorded.

The table summarizes the timber and non-timber species present in the study area, indicating the number and volume. The results of timber resource accounting in the project corridor are fully presented in the form of an electronic attachment.

Table 6.7.1.8 description of the trees and plants identified during the botanical survey

№	Species		Qty, pcs.	Volume, cub. m.
	English	Latin		
1.	Caspian locust	*Gleditsia caspia*	1	0.14
2.	Acacia	*Acacia dealbata*	667	41.1
3.	Georgian oak	*Quercus iberica*	6090	2319.779
4.	Hornbeam	*Carpinus caucasica*	5369	813.384
5.	Oriental hornbeam	*Carpinus orientalis*	12184	759.913
6.	Hawthorn	*Crataegus microphylla*	507	46.134
7.	Damson	*Prunus insititia*	4	0.143
8.	Field maple	*Acer campestre*	1900	472.494
9.	Ash tree	*Fraxinus excelsior*	655	253.715
10.	European crab apple	*Malus sylvestris*	1	0.484

11.	European pear	*Pyrus communis*	1	0.088
12.	Beech	*Fagus orientalis*	850	167.123
13.	Wild Cherry	*Cerasus avium*	5	0.616
14.	Lime	*Tilia caucasica*	5	3.762
15.	Elm tree	*Ulmus foliacea*	2	0.187
Total			**28241**	**4879.062**
1.	Hawthorn	*Crataegus microphylla*	6241	0.12
2.	European cornel	*Cornus mas*	9712	0.11
3.	Acacia	*Acacia dealbata*	8667	0.18
4.	Blackberry	*Rubus fruticosus*	1980	0.01
5.	Dog-rose	*Rosa chinensis*	350	0.01
6.	Catbriers	*Smilax excelsa*	11658	0.02
7.	Oriental hornbeam	*Carpinus orientalis*	29649	0.51
8.	Ash tree	*Fraxinus excelsior*	1152	0.11
9.	Field maple	*Acer campestre*	21665	0.26
10.	Georgian oak	*Quercus iberica*	17487	0.31
11.	Beech	*Fagus orientalis*	463	0.11
12.	Wild service tree		471	0.05
13.	Hornbeam	*Carpinus caucasica*	4975	0.12
14.	Gaiter-tree	*Swida, Thelycrania*	3758	0.09
15.	Nut	*Corylus avellana*	3426	0.21
16.	Medlar	*Messpilus germanica*	1737	0.06
17.	Lime	*Tilia caucasica*	491	0.08
18.	Wild Cherry	*Cerasus avium*	323	0.078
			124205	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 6.7.2.1 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
1	Otter	*Lutra lutra*	Common Otter	NT	LC	✓	
2	Roe deer	*Capreolus capreolus*	Roe deer	LC	VU		✓
3	Bear	*Ursus arctos*	Brown Bear	LC	NT	✓	
4	Jackal	*Canis aureus*	Golden Jackal	LC	LC		
5	Wild Boar	*Sus scrofa*	Wild Boar	LC	DD		
6	Badger	*Meles meles*	Common Otter	NT	LC	✓	
7	Wolf	*Canis lupus*	Grey Wolf	LC	LC	✓	
8	Fox	*Vulpes vulpes*	Red Fox	LC	LC		
9	Wildcat	*Felis silvestris*	European Wildcat	LC	LC		
10	Weasel	*Mustela nivalis*	Least Weasel	LC	LC		✓
11	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 **commom 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. The otter is closely connected with water by the way of its life, it lives in rivers, lakes, canals, it can be found on the sea shore. Extends vertically up to 2300 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. We could not see the bio-waste sign of the otter in the study area, we could not connect the literary data with what we wanted, the closest distribution is the Iori 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 6.7.2.2 – 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. So we paid special attention to them.

According to literary sources, several species of bats are known in the vicinity of the project area (Table 6.7.2.3). 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 6.7.2.3. 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.

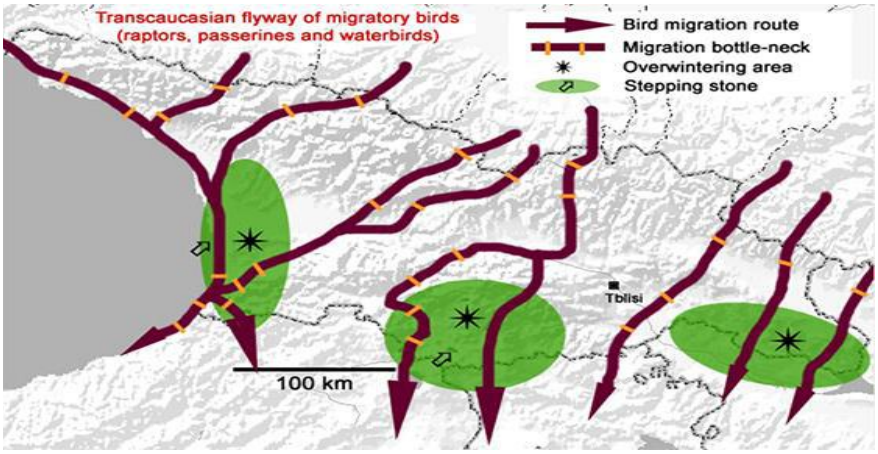
According to the results of the study, habitats suitable for bats directly in the project area are less represented, so it can be said that the species listed in the table live but away from the project area, where the above-

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 6.7.2.4. 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 river banks 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 6.7.2.4. Species of birds known in the literature and identified during field researches 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

Photo 6.7.2.1. European Goldfinch - Carduelis carduelis

Photo 6.7.2.2. Red-backed Shrike - Lanius collurio

Photo 6.7.2.3. Barn Swallow - Hirundo rustica

Photo 6.7.2.4 Eurasian Jay - Garrulus glandarius

Fishes

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.

Table 6.7.2.5. Species of fishes

№	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

Photo 6.7.2.5 Kura loach (*Oxynoemacheilus brandtii*), *Extraction place the river Chailuri*

Photo 6.7.2.6 *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).

Photo 6.7.2.7 . European Glass Lizard (Pseudopus apodus)

Photo 6.7.2.8. European Glass Lizard (Pseudopus apodus)

Photo 6.7.2.9. Eastern four-lined ratsnake (Elaphe urartica), provided by a local, taken near Sagarejo

Photo 6.7.2.10. Steppes ratsnake. (Elaphe Dione), Provided by a local, taken Bakurtsikhe

Table 6.7.2.6 Reptile species known in the literature and identified during field researches

№	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 6.7.2.7. Species of amphibians known in the literature and identified during field researches

№	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

Photo 6.7.2.11. Marsh frog (*Pelophylax ridibundus*)

6.7.2.12 Photo. 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.

Photo 6.7.2.13. Long-horned beetles (*Aegosoma scabricorne*)

Photo 6.7.2.14. Prauing mantis (Mantis religiosa)

Table 6.7.2.8. Species of insects and other invertebrates identified during field researches

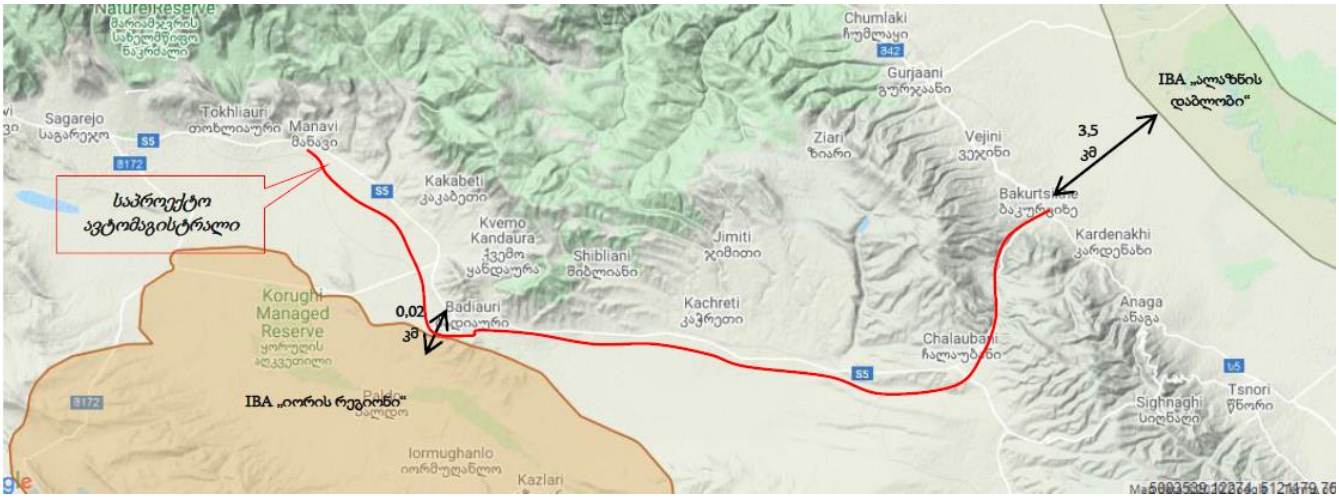
№	English Name	*Scientific Name*	*Common name*	IUCN	RLG
1	Six-spot burnet	*Zygaena filipendulae*	Six-spot burnet	NE	-
2	Painted Lady	*Vanessa cardui*	Painted Lady	LC	-
3	Bath white	*Pontiac daplidice*	Bath white	LC	-
4	Comma	*Polygonia c-album*	Comma	LC	-
5	Green-veined white	*Pieris napi*	Green-veined 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 honey bee	*Apis melifera*	Western honey bee	NE	-
41	Field crickets	*Gryllus campestris*	Field crickets	LC	-
	Others				
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	-

IUCN - International Red List
RLG – Red List of Georgia

DD - The data is not sufficient to grant the status
LC - Least Concern
NE - Not Evaluated

Figure 6.7.2.5 Location of the project territory and Important Bird and Biodiversity Areas (IBA)



6.7.3 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:

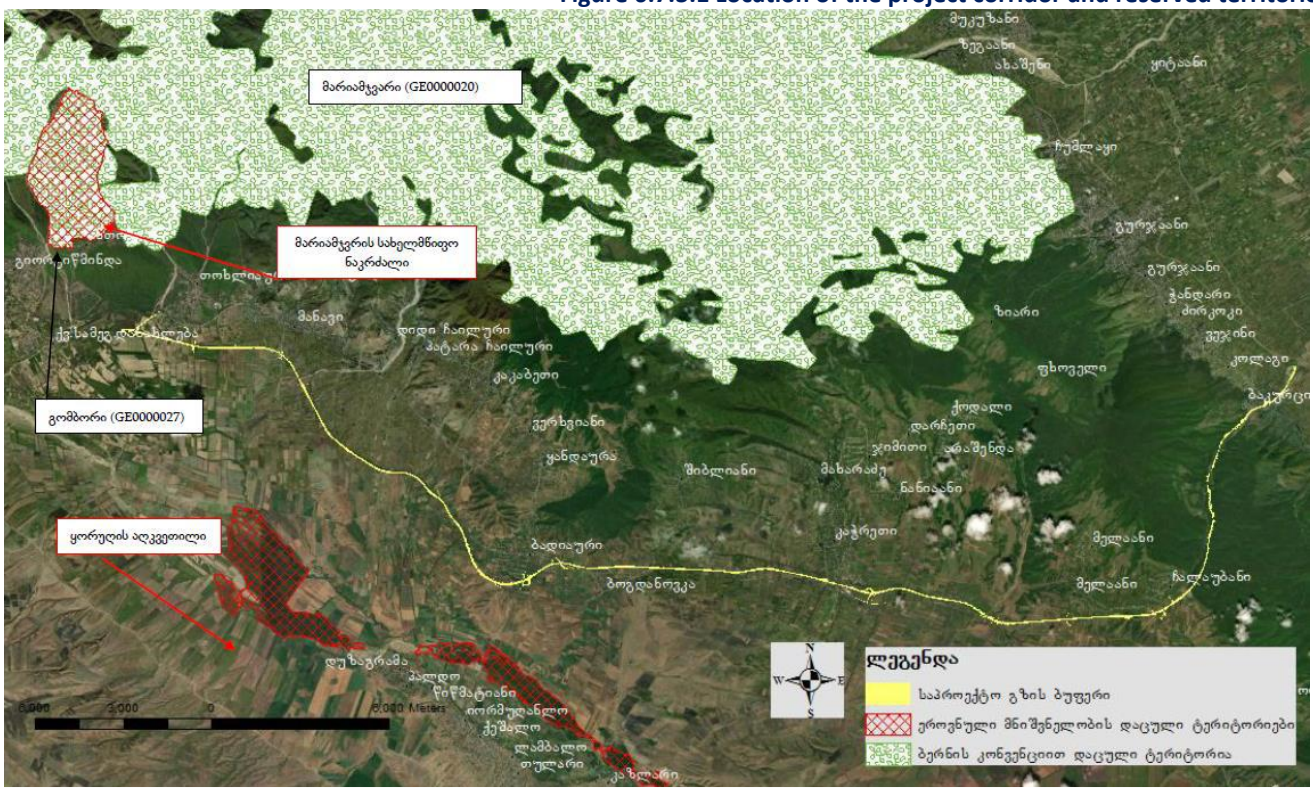
- Protected areas of national importance:
  - Mariamjvari State Reserve (1022.5 ha). Mariamjvari State Nature Reserve is located on southern slopes of Tsiv-Gombori, north-east side of Sagarejo and north of village Antoki. The major aim to establish Mariamjvari Nature Reserve was the conservation and 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 Region 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 project 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, the river floodplain forests given as 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 in the region and it cannot be considered an intact habitat for birds.

Figure 6.7.3.1 Location of the project corridor and reserved territories



6.8 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 the three locations in Telavi, Kakheti region. The four-stage measurements of 26 indicators conducted in 2017 are in table 6.8.1.

Table 6.8.1.

Location/phases	Nitrogen dioxide mcg / m^3				Sulfur 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 the petrol stations must be noted, which are not typically characterized by significant volumes of emissions of harmful substances.

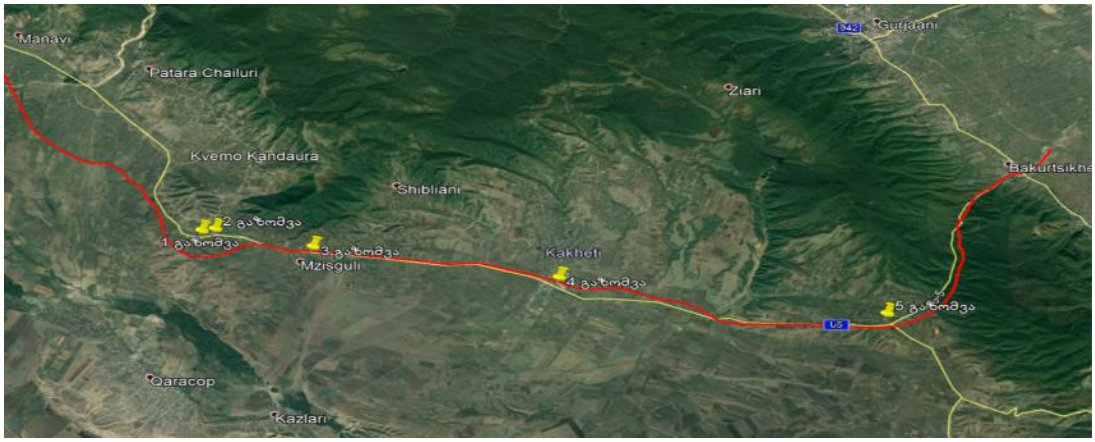
6.9 Noise and Vibration

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:

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

Figure 6.9.1 The Location of the Measurement



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.

6.9.1 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 6.9.1.1 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. For the detailed instrumental vibration measurements (for detailed information, see annex 2).

6.10 Baseline Socioeconomic Conditions

6.10.1 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.

6.10.2 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.

6.10.3 Demography

As of 2019, over 52,2 thousand people live in Sagarejo Municipality, which is 16,7% of the total population of Kakheti region. 10,6 thousand people live in the urban area, 41,6 thousand people live in the rural area.

As of 2019, over 52,6 thousand people live in Gurjaani Municipality, which is 16,8% of the total population of Kakheti region. 7,7 thousand people live in the urban area, 45,0 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 6.10.3.1.

Table 6.10.3.1 Population, thous. people (as of January 1)

Year	1995	2000	2005	2010	2015	2016	2017	2018	2019
Georgia	**4 742.3**	**4 116.8**	**3 917.0**	**3 799.8**	**3 721.9**	**3 728.6**	**3 726.4**	**3 729.6**	**3 723.5**
Kakheti	**432.7**	**369.8**	**341.6**	**329.2**	**318.8**	**317.8**	**315.9**	**314.7**	**312.5**
Sagarejo Municipality	59.4	51.8	50.8	51.3	51.9	52.1	52.1	52.2	52.2
• Urban	12.3	12.6	11.9	11.4	10.9	10.9	10.8	10.7	10.6
• Rural	47.2	39.1	38.9	39.9	41.0	41.2	41.3	41.5	41.6
Gurjaani Municipality	77.7	65.0	59.9	56.7	54.3	53.9	53.5	53.1	52.6
• Urban	10.9	10.4	9.3	8.6	8.0	7.9	7.8	7.8	7.7
• Rural	66.8	54.6	50.6	48.1	46.3	46.0	45.7	45.3	45.0

The population in the settled areas adjacent to the project corridor is given in Tale 6.10.4.

Table 6.10.3.2 Population in villages adjacent to the project corridor, thous. 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.

6.10.4 Employment and unemployment levels

As per the official statistics, as of 2019, the number of employed in Kakheti is 167,3 thous. 96% are of the active population. However, the number of self-employed is pretty high. Most of the self-employed in both regions are busy in agriculture.

Table 6.10.4.1 shows the statistical data of Kakheti Region for the last three years (Source: National Statistics Office of Georgia).

Table 6.10.4.1 Employment rate

	Kakheti		
	2017	**2018**	**2019**
Active population, total	186.4	177.4	174.2
Employed, including:	179.6	170.5	167.3
Hired	50.0	49.5	49.4
Self-employed	129.5	121.0	117.8
Unemployment rate, %	3.7	3.9	4.0

It is easy to assume that from the world pandemic from the beginning of 2020 would have a clearly negative impact on the data given above. Consequently, it may be said that by the moment, the unemployment level in the regions in question and consequently, the number of job seekers are higher than usual.

6.10.5 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 projects (HPPs) 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, in 2019, 760 enterprises were operating on the territory of the municipality, including 16 large, 36 medium, and 708 small enterprises. 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 2018, there are 737 micro-, 805 small, and 1 medium enterprise operating in the Municipality. In 2016-2018, 117 new businesses opened in Gurjaani Municipality. Recently, the volume of investments in the Municipality has increased significantly, with its great portion spent for tourism and industry sectors.

6.10.6 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.

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.

6.10.7 Public Healthcare, Education and Community Infrastructure

There are several multifunctional Healthcare facilities in the city Sagarejo:

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

“Clinic Life”- for maternity services;

“Geo Hospitals” -Sagarejo Multi-profile Medical Centre.

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

There are other infrastructure facilities in the city Sagarejo and nearby villages:

Administration of Sagarejo municipality (includes 25 administration units)

Post, Banks; Theater;

26 schools are located in municipality, 26 kindergartens; 3 sport schools, music school and Youth house for different classes;

6.10.8 Socio-Economic Profile of Project Affected Population for Section Covered by ESIA Report

A socio-economic survey conducted for the RAP for Sagarejo East-Bakurtsike section of the S5 Road, aimed at identifying a socio-economic profile of the population expected to be affected by the Project. A survey included a road section from Sagarejo East (Tokhliauri Interchange) to Bakurtsikhe. The total length of investigated area is

48,72 km which crosses the main settlements of the Tokliauri, Manavi, Badiauri Mzisguli, Shibliani, Kachreti Naniani, Arashenda Melaani, Chalaubani, and Bakurtsikhe. During the socio-economic survey, 470 Affected Households (AHs) were \ interviewed. A sample socio-economic survey covered 470 households which is 56.7% of the total of directly affected AHs losing their land and connected assets. The socioeconomic information of the affected population as per census and socioeconomic survey is presented hereunder. The project impact extends to 3,005 APs comprising 49.65 % female (1,492) and 50.35 % males (1,513): The average family size is 4.0 members per household (Table 6.2.7.1). A large proportion of the production from 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 are exported.

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.

Table 6.10.8.1 Demographic Profile of Aps

Age Group	Male		Female		Total		Average/ Household
	No.	%	No.	%	No.	%	
Children (Below 6 Years)	137	9.1	90	6.0	227	7.5	0.3
Children (6–18 Years)	220	14.5	163	10.9	383	12.8	0.5
Adult (19–65 Years male and 19 – 60 years for female)	976	64.5	919	61.6	1895	63.1	2.5
Pension age (66 Years and Over males and 61 years and over - female)	180	11.9	320	21.5	500	16.6	0.7
	1513	100	1492	100	3005	100	4.0
%	50.35		49.65		100		

6.10.9 Ethnicity of Affected Households (AHs)

The estimated number of AHs is 2,018. In addition, State owned company (JSC Georgian Railways) will experience the project impact as well. AHs are mostly Georgian (99.7%). Out of 2,018 AHs in total, 5 are Armenians, 2 Russian and the rest 2011 are Georgians.

Table 6.10.9.1 Ethnicity of Ahs

Sl.No.	Ethnicity	Total No. of Households	%
1	Georgian	2011	99.7
2	Armenian	5	0.2
3	Other	2 (Russian)	0.1
	Total	2018	100

6.10.10 Level of Education of Affected Persons (APs)

Data from project area in Sagarejo Municipality brought forth that illiteracy is not faced in the area – almost all APs 6 years or older study in schools or university or have already got certain education. About a 36.2% of the population have university level education and 14.7% have got special technical education. All of the rest APs study is secondary schools or have finished school. Level of illiteracy is 01% (Table 6.10.10.1).

Table 6.10.10.1 Level of Education of APs

Sl.No.	Category	Male		Female		Total	
		No	%	No	%	No	%
1	Illiterate	1	0.1	1	0.1	2	0.1
2	Preschool	137	9.1	90	6.0	227	7.6
3	Studies in School	216	14.2	161	10.8	377	12.5
4	Has secondary school education	325	21.5	544	36.5	869	28.9
5	Vocational Education	263	17.3	178	11.9	441	14.7
6	Higher Education	571	37.8	518	34.7	1089	36.2
	Total	1513	100	1492	100	3005	100

6.10.11 Agriculture and Land Resources

The AHs are all land holder of some quantum. According to the census survey and interview results out of the 552 AHs, all of them own residential land plots. They also own and use agricultural land plots. Some AHs own only one land plot others 2, 3 or more land plots. Only one AH uses illegitimately occupied public land plot.

6.10.12 Economy of AHs

Annual Income of AHs

Out of 481 interviewed households, only 428 shared information about the financial conditions of their households. Regular wages, pension subsidies, agriculture, and wage employment are major contributors to the income of the AHs. The survey found that 45.3% of the AHs get income from one single source, 54.6% from double

or more sources. Table 3.7 shows that the more the number of sources, the more is the amount of income feeding to a household. Double sources seem to contribute the highest in the project area. According to the provided information, the main sources of income are wages from the public and private sectors. After comes income from agriculture, temporary works, private business, and pension/state allowances/ remittances. The highest number of AHs have income from pensions, state allowances, and remittances, the highest average value falls on wages.

Household Assets and Durables

According to the survey data possession of durable goods differs from each household depending on the nature of the durable goods. 99% of the households in the project area possess a television, and only 1% has got a radio. Almost all AHs have refrigerators (97 %) and washing machines (92%). About 71% of households reported that they have a car. Out of 455 AHs 269 have reported having bank/MFO debts.

RAP impacts under Lot 3 (World Bank financed Kakheti Connectivity Improvement Project)

The proposed road alignment has impact on private, legalizable and state-owned land, 2 HHs are under the physical resettlement.

The RAP prepared for section Sagarejo East (Tokhliauri interchange) to Badiauri (lot 3) has been prepared to comply with Environmental Social Standard (ESS) 5 on Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement and the Environmental and Social Framework (ESF). Goal of the mentioned document is description of those requirements and rules, according to which negotiations should be conducted with affected persons.

The Summary of impact on land and other assets is presented in summary Table:

6.10.12.1 The Summary of impact on land and other assets

N	Impacts	Unit	
	Land Tenure Patterns		
1	**Total Land parcels affected**	**№**	626
2	**Total land Area to be acquired**	**Sq.m**	1,065,976
3	**Category 1**. Private Registered Plots	**№**	381
		Sq.m	626,964
4	**Category 2.** Legalizable plots (plots used by legitimate users)	**№**	185
		Sq.m	285,450
6	**Category 3.** Plots of JSC Georgian Railway	**№**	47
		Sqm	120,430
7	**Category 4.** Non-legalizable plots (State owned plots used by illegitimate users)	**№**	0
		Sq.m	0
	Category 5. State land not used by private users	**№**	13
		Sq.m	33,132
	Land Use and Compensation Categories		
8	**Type 1** Agricultural (arable land)	**№**	543
	(4.20 GEL/sq.m)	**Sq.m**	882,235
9	**Type 2** Residential land	**№**	23
	(11.5 GEL/sq.m)	Sq.m	30,179

N	Impacts	Unit	
10	Type 3. Plots of JSC Georgian Railway	**№**	47
		Sq.m	120,430
11	Type 4. Non-legalizable plots (State owned plots used by illegitimate users)	**№**	0
		sq.m	0
12	**Type 5.** State land not used by private users	**№**	13
		Sq.m	33,132
Agricultural Patterns			
16	Maize	**Sq.m**	114,328
17	Lucerne (alfalfa)	**Sq.m**	26,047
	Bean		4,981
	Mixed vegetables		1,624
	Potato		393
	Strawberries		20
18	Watermelon	**Sq.m**	4,940
19	Wheat	**Sq.m**	14,636
20	Tomatoes	**Sq.m**	220
28	Affected Trees	№	174,588
Affected Structures			
29	Residential houses	№	2
30	small size buildings (sheds and ancillary structures; cattle-shed, wells etc.)	№	27
31	Fences	№	108
32	Gates	№	9
33	Piles in vineyards	№	296
34	Other minor structures (containers, pool, tank, paved yard etc.)	№	11
Affected Businesses			
35	No	№	0
Affected Households			
36	Severely affected Households	№	310
37	Vulnerable Households	№	14
38	Resettled households	№	2
39	AH losing registered plots	№	243
40	AH losing legalizable plots	№	150
41	AHs losing non-legalizable land plots	№	0
42	AH losing agricultural land plots	№	316
43	AH losing residential land plots	№	16
44	AH with non-agricultural (commercial) land plots	№	0
45	AH losing Jobs	№	0
46	AH losing crops	№	68
47	AH losing trees	№	311

N	Impacts	Unit	
48	Total AH	№	330
49	Total Affected Persons	№	1,316

The RAP for Lot 3 is based on DMS, census and socio economic survey which were conducted from 02 March of 2020 and was terminated on May 10, 2020. For a major part of the affected plots the cut-off date is 02 March of 2020; For the minor part of the plots, which were not affected by project as designed for 2 March of 2020, but fall within the impact zone after introduced changes in design, the additional census studies have been executed and the cut-off date is established accordingly as December 5 of 2020. The valuation of the land and assets is based on a valuation report prepared by the independent licensed valuator on February 8 of 2021. The RAP includes (i) inventory of impacts and AP figures reflecting design; (ii) micro plan for land acquisition and implementation of RAP (iii) update of LAR (Land acquisition and resettlement) budget; and (iv) loss and entitlement profile for individual owners of land plots and APs.

Socio-economical information for particular section Sagarejo East (Tokhliauri interchange) to Badiauri (lot 3)

Affected Population

This Constructional Lot 3, from Sagarejo East (Tokhliauri Interchange) to Badiauri, crosses the main settlements of the Tokliauri, Manavi, kaka and Badiauri. During the socio-economic 134 AHs were interviewed. The interviewed HHs live in the villages: Tokliauri, Manavi, Kakabeti and Badiauri. The two HHs under the physical relocation live in village Badiauri.

A census of 100% of the directly affected AHs available on site was conducted to enumerate the APs. A sample socio-economic survey was included in the project area covering 134 randomly selected households which is 40.7% of the total of directly affected AHs losing their land and connected assets. The objective of the socioeconomic survey was to gather general information on socioeconomic condition of the affected people. The socioeconomic information of the affected population as per census and socioeconomic survey is presented hereunder. The project impact extends to 1,316 APs comprising 48.25% female (635) and 51.75 % males (681): The average family size is 4.0 members per household

Table 6.10.12.2 Demographic Profile of APs

Age Group	Male		Female		Total		Average/ Household
	No.	%	No.	%	No.	%	
Children (Below 6 Years)	47	6.9	42	6.6	89	6.76	0.27
Children (6–18 Years)	90	13.2	86	13.5	176	13.37	0.53
Adult (19–65 Years male and 19 – 60 years for female)	478	70.2	406	63.9	884	67.17	2.69
Pension age (66 Years and Over males and 61 years and over - female)	66	9.7	101	16	167	12.70	0.51
	681	100	635	100	1316	100	4.0

%	**51.75**		**48.25**		**100**		

AH Ethnicity

Affected are 329 AHs and 1 State owned company (JSC Georgian Railways). The majority of AHs are Georgian (98.8%). Out of 329 AHs in total, 4 are Armenians and the rest (325) are Georgians. No Russian, Ukrainian are affected in the project. There is no any language or other barriers for other nationalities living in the project area.

Table 6.10.12.2 Ethnicity of AHs

Sl.No.	Ethnicity	Total No. of Households	%
1	Georgian	325	98.8
2	Armenian	4	1.2
	Total	329	100

Urban Rural Proximity

The project road is mostly located in rural area between the villages Tokliauri and Badiauri. Survey shows that 85% households reside in rural areas and 15% resides in urban areas. Project impact on urban and rural households will tend to change their investment priorities. The road will bring the positive impact to the region and villages located along the new ROW. There will be possibility to quick access to different kind of services in the capital city Tbilisi and larger market and trading opportunities for vine, fruits, and cheese.

Table 6.10.12.3 Urban Rural Distribution of AHs

Sl. No.	Type of Settlement	Total No. of Households	%
1	Rural	116	86.5
2	Town (Urban)	18	13.5
	Total	134	100

Level of Education of APs

Data from project area in Sagarejo Municipality brought forth that illiteracy is not faced in the area – almost all APs, 6 years of age and older, study in schools or university or have already got basic education. About a 32.8% of the population have university level education and 16% have got special technical education. All of the rest APs study is secondary schools or have finished school. (Table 3.4).

Table 6.10.12.4 Level of Education of Aps

Sl.No.	Category	Male		Female		Total	
		No	%	No	%	No	%
1	Illiterate	1	0.15	1	0.16	2	0.15

2	Preschool	47	6.9	42	6.6	89	6.76
3	Studies in School	90	13.2	86	13.5	176	13.37
4	Has secondary school education	120	17.6	287	45.2	407	30.9
5	Vocational Education	159	23.3	52	8.2	211	16.0
6	Higher Education	264	38.85	167	26.34	431	32.82
	Total	681	100	635	100	1316	100

Economy of AHs

Annual Income of AHs

Out of interviewed households, only 110 shared the information about the financial conditions of their households. Regular wages, pension subsidies, agriculture and wage employment are major contributors to income of the AHs. The survey found that 43% of the AHs get income from one single source, 57% from double or more sources. Table 3.7 shows that the more the number of sources, the more is the amount of income feeding to a household. Double sources seem to contribute the highest in the project area.

Table 6.10.12.5 Average Annual Household Income against Number of Sources

Number of sources of Income	No. of AHs	% of AHs	Average household income (GEL)
Single Source	62	44	8488
Double Sources	80	56	13230
Total	110	100	

As per categories of the incomes, even though highest number of AHs reported to have income from pensions, state allowances and remittances with average income of GEL 3181, the highest average value fall on wages – GEL 7973 – 9936 on average.

Table 6.10.12.6 Average Annual Household Income against Type of Sources

Income Source	No. of AHs	Mean	Minimum	Maximum
Wages from Public Sector	37	7973	460	30000
Wages from Private Sector	50	9936	500	36000
Income from Agriculture	15	4547	1200	10000
Pension/State Allowances, Remittances	73	3181	1200	7200
Private Business	19	12276	150	36000
Temporary works	17	6053	300	18000

Average income per household earning from single source is very low compared to the income from multiple sources (Table 6.10.12.6). Average annual income from single sources varies from 4100 to 6500 GEL per household. Property income, pension and subsidy are in the lower echelon of household income.

Household Assets and Durables

Out of 134 interviewed households, 129 shared information about the household's assets and durable goods. Possession of durable goods differs from each household depending on the nature of the durable goods. 97% of the households in the project area possess a television, and only 3% has got a radio. Almost all PAPs have refrigerators (96 %) and washing machine (93%). About 60% households reported that they have a car.

Possession of stock animals includes cows in 44% households, pigs (28%) and poultry in 57% households (Table 6.10.12.7).

Table 6.10.12.7 Possession of Durable Goods and Domestic Animals

Sl. No.	Item	Households No.	%
1	Television	129	97%
2	Radio	4	3%
3	Washing Machine	120	93%
4	Refrigerator	124	96%
5	Motorcycle	5	3.7%
6	Car	82	60%
7	Bicycle	22	16.4%
8	Cow	60	44%
9	Sheep	2	1.5%
10	Pig	38	28.3%
11	Horse/Donkey	0	0%
12	Poultry	74	57%

Debts

Out of 134, providing the information regarding the loans, 71 have reported having a bank/MFO debts (71). (table 6.10.12.8).

Table 6.10.12.8 Debts

Sl. No.	Debts	Household number	%
1	**Yes**	**71**	**52.9**
2	Bank	71	**100**
3	Private lender	0	**0**
5	**No**	**63**	**47.1**
	TOTAL	**143**	**100**

Water and Sanitation

Source of Drinking Water

The major source of drinking water is centralized local source. 82% of households have access to the centralized water supply. Out of the 134 surveyed households, it is noted that only 6 households (5%) have access also to springs and 18 have their own wells (13%) in addition to the centralized water supply, which they use mostly during the shortages in water supply. (Table 6.10.12.9).

Table 6.10.12.9 Source of Drinking Water

Sl. No.	Sources	Number of Households	%
1	Piped water supply	110	82
2	Well	18	13
3	Spring	6	5

Sanitation Facilities

102 of the interviewed households (76%) possess latrine at their house connected to septic reservoirs and 32 households (24%) has flush toilet connected to the centralized sewage. (Table 6.10.12.10).

Table 6.10.12.10 Types of Toilet

Sl. No.	Toilet	Number of Households	%
1	Central Sewage system / flush toilet	32	24
2	Latrine	102	76
3	Total		

Access to Energy and Civic Facilities

Majority of the inquired AHs (about 99%) reported to have a connection to both electricity and gas, however,

many use wood stoves as well. Details are given in Table 6.10.12.11.

Table 6.10.12.11 Type of Fuel Use for Cooking

Sl. No.	Types of Fuel	Number of Households	%
1	Electricity	134	100
2	Gas	132	98.5
3	Bottled Gas	2	1.5
4	Wood	85	63
	Total	134	100

Conclusion

Most of surveyed household (93%) have estimated themselves as not being wealthy, having incomes not sufficient for good quality medical services and education. Literacy rate in the project area high (in fact 100% of the APs 6 year of age and older, are studying or have finished at least secondary school) compared to national literacy level. More than 50% of the affected population are female. Female literacy rate is higher. Women go side by side with the men in the project area and play important role in family economy. The project will have a positive impact on women through increased mobility and due attention will be given them from the project.

6.10.13 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 6.10.13.1

Table 6.10.13.1 - Archaeological monuments in the vicinity of the project area

#	Location	Name	Period
1.	Sagarejo Municipality, Tokhliauri	Idol church	Middle-Ages: 4th - 18th centuries. Late Middle Ages: 16th-18th centuries
2.	Sagarejo Municipality, Tokhliauri	Bat church	Middle-Ages: 4th - 18th centuries. Late Middle Ages: 16th-18th centuries
3.	Sagarejo Municipality, Tokhliauri	Saint Giorgi church	Middle-Ages: 4th - 18th centuries. Developed Middle Ages: 10th-15th centuries
4.	Sagarejo Municipality, Tokhliauri	Mtavarmotsame	Middle-Ages: 4th - 18th centuries. Late Middle Ages: 16th-18th centuries
5.	Sagarejo Municipality, Tokhliauri	Arched Hall Church	Middle-Ages: 4th - 18th centuries. Late Middle Ages: 16th-18th centuries
6.	Sagarejo Municipality, Tokhliauri	Hgonita Valley church	Middle-Ages: 4th - 18th centuries. Late Middle Ages: 16th-18th centuries

7.	Sagarejo Municipality, Tokhliauri	Hgonita Valley church	Middle-Ages: 4th - 18th centuries. Late Middle Ages: 16th-18th centuries
8.	Sagarejo Municipality, Tokhliauri	Kalobani Saint Mariam Church	Middle-Ages: 4th - 18th centuries
9.	Sagarejo Municipality, Tokhliauri	Kalobani Saint Giorgi Church	Middle-Ages: 4th - 18th centuries. Late Middle Ages: 16th-18th centuries
10.	Sagarejo Municipality, Tokhliauri	Trinity	Middle-Ages: 4th - 18th centuries. Late Middle Ages: 16th-18th centuries
11.	Sagarejo Municipality, Tokhliauri	Dedaghvtisa	Middle-Ages: 4th - 18th centuries. Late Middle Ages: 16th-18th centuries
12.	Sagarejo Municipality, Badiauri	Teletisgori Namosakhlari	Bronze Age: BC. 4th-2nd millennia; Late Bronze Age-BC. ֆ. 16th-11th centuries
13.	Sagarejo Municipality, Badiauri	Gorasamarkhi	Bronze Age: BC. 4th-2nd millennia; Late Bronze Age-BC. ֆ. 16th-11th centuries
14.	Sagarejo Municipality, Badiauri	Teleti Church of Saint Giorgi	Middle-Ages: 4th - 18th centuries. Late Middle Ages: 16th-18th centuries
15.	Sagarejo Municipality, manavi	Former church of Natlismtsemeli	Middle-Ages: 4th - 18th centuries
16.	Sagarejo Municipality, manavi	Zeiani N1 Korgan	Bronze Age: BC. 4th-2nd millennia
17.	Sagarejo Municipality, manavi	Former church of Saint Mariam	Middle-Ages: 4th - 18th centuries
18.	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
19.	Gurjaani municipality, Chalaubani	Sadgomi Khutsiskhevi	Stone Age: From ancient times BC. 6th millennium; Paleolithic: from ancient times BC. Up to 12000
20.	Gurjaani municipality, Chalaubani	Sadgomi White Stones	Stone Age: From ancient times BC. 6th millennium; Paleolithic: from ancient times BC. Up to 12000
21.	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
22.	Gurjaani municipality, Chalaubani	Namosakhlari Khosros Gora	Bronze Age: BC. 4th-2nd millennia Iron Age BC 10th-6th centuries
23.	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
24.	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
25.	Gurjaani municipality, Chalaubani	Namosakhlari Didgori	Bronze Age: BC. 4th-2nd millennia; Middle Bronze Age: BC 3rd millennium. 2nd half - BC 17th c

26.	Gurjaani municipality, Chalaubani	Namosakhlari Garetki Gora	Bronze Age: BC. 4th-2nd millennia, Iron Age BC 10th-6th centuries
27.	Gurjaani municipality, Katchreti	Hill graves	Bronze Age: BC. 4th-2nd millennia; Middle Bronze Age: BC 3rd millennium. 2nd half - BC 17th c
28.	Gurjaani municipality, Katchreti	Samarovani	Middle Ages: 4th - 18th centuries. Early Middle Ages 4th-9th centuries
29.	Gurjaani municipality, Katchreti	Sadughara Valley hill graves	Bronze Age: BC. 4th-2nd millennia; Early Bronze Age BC. 3500-2500
30.	Gurjaani municipality, Katchreti	Sadgoi Karaliskhevi	Stone Age: From ancient times BC. 6th millennium; Paleolithic: from ancient times BC. Up to 12000
31.	Gurjaani municipality, Katchreti	Namosakhlari	Bronze Age: BC. 4th-2nd millennia
32.	Gurjaani municipality, Katchreti	Grave	Antiquity: BC. 5th - A.D. 3rd c. Late Neolithic (Late Roman): A.D. 1st-3rd cc
33.	Gurjaani municipality, Katchreti	Archangel church	There is no information
34.	Gurjaani municipality, Bakurtsikhe	Samarovani	Bronze Age: BC. 4th-2nd millennia; Middle Bronze Age: BC 3rd millennium. 2nd half - BC 17th c
35.	Gurjaani municipality, Bakurtsikhe	Gorasamarkhi	Bronze Age: BC. 4th-2nd millennia
36.	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: Tokliauri, 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 on 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 to the restoration of the landscape components. Over the time, the new infrastructure is adaptable and discomfort caused by visual changes will be less disturbing for the population. The impact of operation phase can be assessed as low.

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 resource extraction will be tracked by RD through technical supervisor and overseen by MOEPA.
- Demobilization of the temporal infrastructure and re-cultivation works following the completion of the works is required.

Operation phase

An important mitigation measure in the operation phase is -cultivating the areas adjacent to the highway and their landscaping to the extent possible and taking care of and maintaining the infrastructure.

The impact to the commuters caused by new views will be short-term and limited to the travel time only.

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.

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, impact degree 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 road operation is usually related to soil pollution by 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.

Impact 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/fueling 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, bermed wash areas for cleaning activities shall be established. The wash area may be sloped to facilitate collection of wash water and evaporative drying;
- Cultivated areas should be avoided from draining the water;
- 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 Approval the Rules for Removal, Storage and Use of Topsoil and Re-cultivation ", approved by the decree №424 of the Government of Georgia 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.

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 principle 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.

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 stopp the works with the 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 emitions 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:
  - Excavator (3 Units);
  - 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 HydrocarbonsC12-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 (NO_X), Small dust particles (PM_2), Benzoil (BZL), Sulfur dioxide (SO_2). 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.
- It should be noted that the new 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 7.1.4.1 Pollutant concentrations were evaluated at the border of the nearest residential house and in 500-m radius from road boundaries.

Table 7.1.4.1 modeling 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	NO_X	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	SO_2	<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	NO_X	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	SO_2	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Kachreti							
1	NO_X	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
4	SO_2	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Chalaubani 1							
1	NO_X	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	SO_2	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Chalaubani2							
1	NO_X	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	SO_2	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Bakurtsikhe							
1	NO_X	0.502634	10.329552	0.726545	12.004419	0.532218	14.348109

No/Y	Pollutant	500 m radius	Nearest residential house	500 m radius	Nearest residential house	500 m radius	Nearest residential house
		2020		2030		2040	
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	SO_2	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000

Results of modelling enable to conclude that no specific air pollution mitigationmeasures 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.

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 MOEPA 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 Sagarejo-Bakurtsikhe highway will not 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 due to 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 7.1.5.1.

Table 7.1.5.1 Construction equipment noise emission levels

Equipment	Typical noise level (dBA) 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 Ministry of Health, Labor and Social Affairs of Georgia “on Proving the Qualitative Norms of the Environment” of 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 7.1.5.2.

Table 7.1.5.2 The Georgian standard requirements for noise in the residential and commercial areas

Receptor	Time interval	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 hrs.	60	75

As per the IFC guidelines on noise management, the noise impact should not exceed the levels given in Table 7.1.5.3 and the maximum admissible increase in the background noise levels must be of 3 dB at the nearest receptor. It should be noted that the Georgian standards apply to the allowable limits inside the buildings and premises, not on the building facades.

Table 7.1.5.3 IFC Noise Level Guidelines

Receptor	One hour L_{aeq} (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 and adjacent to the project zone are buildings and premises used either, temporarily, or permanently by the local population.

Noise propagation modelling was done on the buildings within the radius of 500 m from the project zone. These buildings were given conventional numbers to facilitate their identification and demonstration of the modelling results for concrete buildings. The **umbering of Buildings for noise modeling is provided in Figure: N belowThe details of Noise pnopagation each section is attached to present ESIA as Annex 9.2.** The study of the project corridor identified six sections (Badiauri, Mzisguli, Kachreti, Chalaubani 1, Chalaubani 2, Bakurtsikhe) with buildings and premises. The agricultural land plots are found near the remained section of the buffer and consequently, conducting of noise modelling was not considered expedient for them. In order to Identify sensitive areas along the road aliment monitoring of the noise propagation will be implemented during the construction works. After finishing the construction works, RD will conduct additional Noise investigation, to identify where installation of the noise barriers are reasonable.

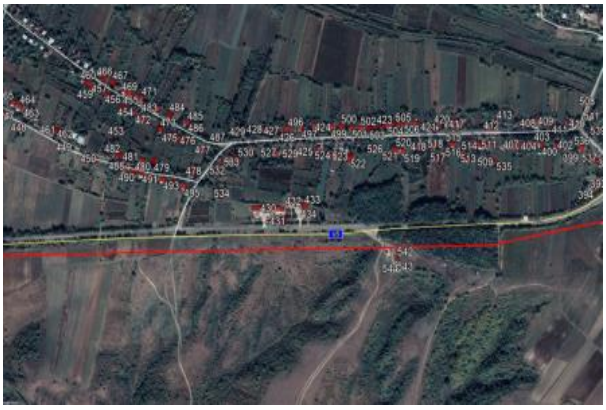
Figure: 7.1.5.1 numbering of buildings for noise modeling

Badiauri area

Mzisguli area

Kachreti area

Chalaubani 1 area



Chalaubani 2 area

Bakurtsikhe area

The noise modelling was conducted for construction and operation phases, considering the proposed barriers, the noise level during the day and night time will be significantly reduced. However, there are risks of exceeding the noise standards at night lightly. The locations of the noise barriers will be selected after post- construction survey.

Assessment of noise propagation for the construction camps in the construction phase

The noise modelling was conducted for three camp locations proposed by this ESIA. Their location plan and levels of the noise propagation level are same.

Table 7.1.5.1. Shortest distances from the construction camps to the residential houses

Shortest distances from the construction camps to the residential houses		Distances of the modeled sections	equipment was admitted to operate simultaneously on the sites
Camp №1: 160 m; Camp №2: 2000 m and more; Camp №3: 950 m and more		1 Area: 2500 X 2100 m; 2 Area: 2200 X 2100 m; 3 Area: 2500 X 2500 m;	Concrete plant - 100 dB; Excavator - 88 dB; Dump truck - 85 dB.

Other permanent or temporary noise sources (river, road, etc.) could not be considered as important noise sources. Consequently, they could not influence the modelled noise level. Noise modelling was done for the worst scenario when all three sources operate simultaneously.

The noise modelling results are presented in Table 7.1.5.2.

Table 7.1.5.2. Expected noise levels at conventional points (dBA)

Recipient N	Direction from the camp	Distance from the camp (m.)	Camp №1	Camp №2	Camp №3
1	North	20	74,5	75	74,8
2		50	66,3	65,9	66,1
3		100	59,8	59	59
4		200	54,7	49,4	52,2
5	East	20	75	74,9	74,8
6		50	65,6	65,8	65,8
7		100	58,9	59,4	59,5
8		200	52,2	54,7	48,2
9	South	20	75,6	74,8	75,3
10		50	65,7	65,7	67,6
11		100	58,8	60	60,8
12		200	50,9	52,2	48,6
13	west	20	75,3	74,5	75
14		50	65,4	65,7	66,1
15		100	59,7	56,8	61,1
16		200	52,1	51,5	52,1

The nearest building (160 m from camp № 1)	56,7	-	34,1

As the table shows, the noise level generated from the construction camps will reach the maximum admissible level after 150 m distance. Overall, in the construction phase, it is not necessary to take special mitigation measures for the construction camps.

Noise propagation assessment 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 engines operation; tires and road surface friction, as well as loud signals.

The trucks movement and equipment operation in the project corridor the noise level will exceed the permissible level at 194 buildings, during the construction phase. When implementing the works along a sensitive section, the construction contractor will need to take the measures set out in the following paragraphs of this ESIA.

During Operation, the noise level will exceed the admissible level near 215 buildings during daytime and near 282 buildings at night. As for the modelling results by 2030, which relied on quite a high ratio of the traffic growth along the highway, the noise level exceeded the set standard near 43 buildings during the day and near 74 buildings at night. RD will conduct noise investigation to doublecheck the noise levels and identify additional sensitive areas where installation of noise-attenuating barriers will be required.

Even with the proposed noise-attenuating barriers, it is expected that the noise would exceed the rated level near 55 houses.

Due to the size of the existing highway, 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 on the project corridor as noise sources will be limited. The operation of the modernized road will change the baseline noise favourably.

Mitigation measures

Construction phase

Noise attenuation measures should be taken mainly on the construction camps and construction corridor near the settled areas. The noise propagation mitigation measures include:

- 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:** Accomplishing the intense construction works during the day as far as possible. Construction Contractor will consider holidays and banking holidays. Night-time working in the close vicinity of the settlement will be prohibited.

- **Concrete noise-attenutating 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

In the operation phase of the highway, the main measure to mitigate noise is an efficient use of noise barriers at relevant locations. The type of noise barriers must be selected by observing ISO 11654 requirements.

However, the given measure may not reduce the noise to the required level at some locations. In such a case, additional mitigation measures will be proposed, such as:

- Growing green noise attenuating barriers: plant screens bushes, trees are efficient only if the wind breaking belt of a great width is provided. Green plantings of coniferous species have better noise-protecting properties than hardwood species and their characteristic do not change in different seasons. However, following the site of location of the project railway, mostly hardwood species must be grown. It should be considered that noise-attenuation effect of the green plantings is felt only in the shade created by them. This means that noise will b reduced only in a certain part of the territory and in the lower levels of the landscape;
- If necessary, providing noise-protective windows.

Maximum effect can be attained by monitoring of noise levels. According to the results, the parameters of the noise-attenuating measures proposed by the present ESIA report for operation phase should be specified and corrected.

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.

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:

- Baseline examination of the structural conditions of the buildings located at a distance of 50 m. from road edge and premises adjacent to the main working sites to determine impact of vibration on cracks and damages through observation and marking of cracks and taking relevant mitigation measures, as necessary.
  - Replacement of heavy machinery with lighter techniques;
  - Use of Manual labor in particularly sensitive areas;
  - Operation of more than one equipment being a source of vibration must be admissible on the construction site.

In case of accidental damage of buildings, the Construction contractor will evaluate the damage, compare it to the baseline information of houses located in 50 m from road edge, which will be collected before the start of construction works and determine relevant corrective measures (e.g. refurbishment or other), which it must offer to the affected party. If it is impossible to mitigate and assess the damage, the measures established by the RAP will be followed for the damaged buildings and other premises, while they will be totally compensated at the full value envisaged for the building notwithstanding the degree of impact in the given case.

Operation phase

The monitoring of vibration caused by traffic will be operation phase.d.

7.1.6 Potential impact on surface water and groundwater

Construction phase

Impact on water quality

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.

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.

Impact 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 MoEPA;

- 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. For all works located within 50 m of a watercourse sediment management plan will be developed;
- 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.

7.2 Impacts caused by 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.

Inert waste (earth, soil, spoil, demolished structured) does not decompose or produce leachate or other products harmful to the environment. 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 campsites and work bases operations (office, canteen, etc.) and at work sites (PET bottles used by onsite staff).

Assuming that the quantity of domestic waste generated per capita per year totals 0.7m^3, the approximate total amount of the above-mentioned waste produced during the construction will equate 200x0.7=140 m^3/year.
It should be noted that if during construction activities the buildings and premises roofed with asbestos-containing slates and asbestos-containing pipes will be identified for Asbestos utilization Asbestos management plan should be developed and implemented.

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.

Mitigation measures

Construction and operation 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 100m). 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 Sagarejo-Bakurtsikhe section of the Highway, should be handed over to licensed companies for treatment (deactivation, incineration) or re-use in other technological processes. 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 Forestry Code of the 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 regulations (#424, dated 31 December, 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 MOEPA. 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 and roofing slates will be identified, procedures of their collection, removal and final disposal must be accomplished by using internationally accepted methods and requirements specified by Technical Regulation "Special Requirements for collecting and treatment of hazardous waste" approved by Resolution №145 by the Government of Georgia.

Operation phase

A fine for littering has been introduced in Georgia. However, the littering along the highway is rather difficult to manage. One way of its reduction is education. Itis necessary to:

- 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 10km intervals to repeat the message in different ways.

Management of waste during operation will be responsibility of the contractor identified by the Roads Department for maintenance works.

7.3 Potential Impacts on the 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.

7.3.1 Habitat loss-fragmentation

Construction phase

Habitat loss

When assessing the impacts of habitat loss as a result of road construction, the types of habitats present in the project corridor and their cost, as well as the area of the corridor to be developed within the project, should be taken into account. Based on the data of the performed researches and the information collected in the field, it can be said that the project corridor mainly crosses 2 different types of habitats, including:

- Plain-hilly arid-denudation type habitat, including agricultural lands and anthropogenic meadows with small ravines, in some places with shrubs, with different windbreaks. Most of these types of areas are currently intensively cultivated and are highly anthropogenic. Part is used for grazing and is characterized

by scarcity of tree-vegetation cover. Includes most of the project corridor from Tokhliauri to Chalaubani, including the small length area with bypass hill-relief terrain at the village Badiauri. It is noteworthy that in the same habitat, very fragmentarily along only a few crossing water bodies are represented the communities of plants characteristic of the floodplain. The anthropogenic impact of such sites appears to be significant. Under such conditions, the separation of these types of sites into separate habitats was not considered appropriate;

- Foothill oak-hornbeam forest type habitat (NH) according to EUNIS terrestrial habitat classification: G1.A1 Quercus - Fraxinus - Carpinus betulus forest on eutrophic and mesotrophic soils. This section includes the part leading to the Gombori ridge and a relatively small area in the South of village Chalaubani. Project will affect a 6 km strip which calculated on the width of RoW (40m) equals to 24 ha. The affected area makes about 0.047% of the entire natural habitat of oak-hornbeam forest in this region of Georgia.

Figure 7.3.1.1 Location of the studied reference sites in the project corridor

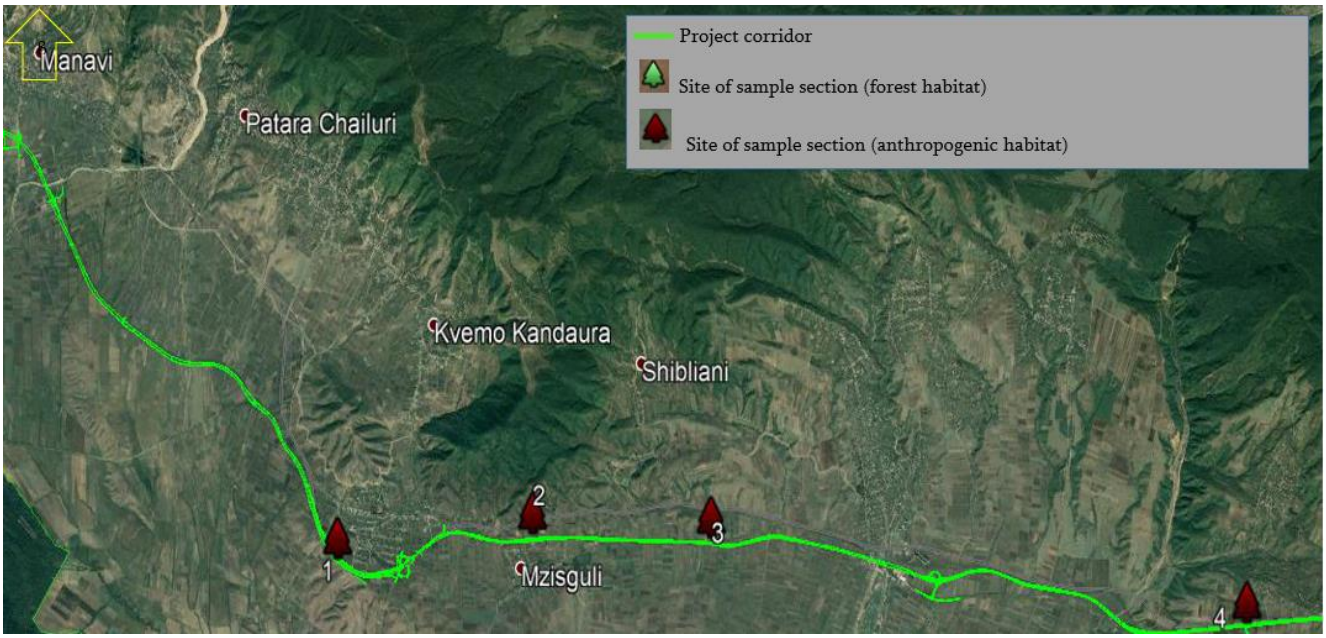
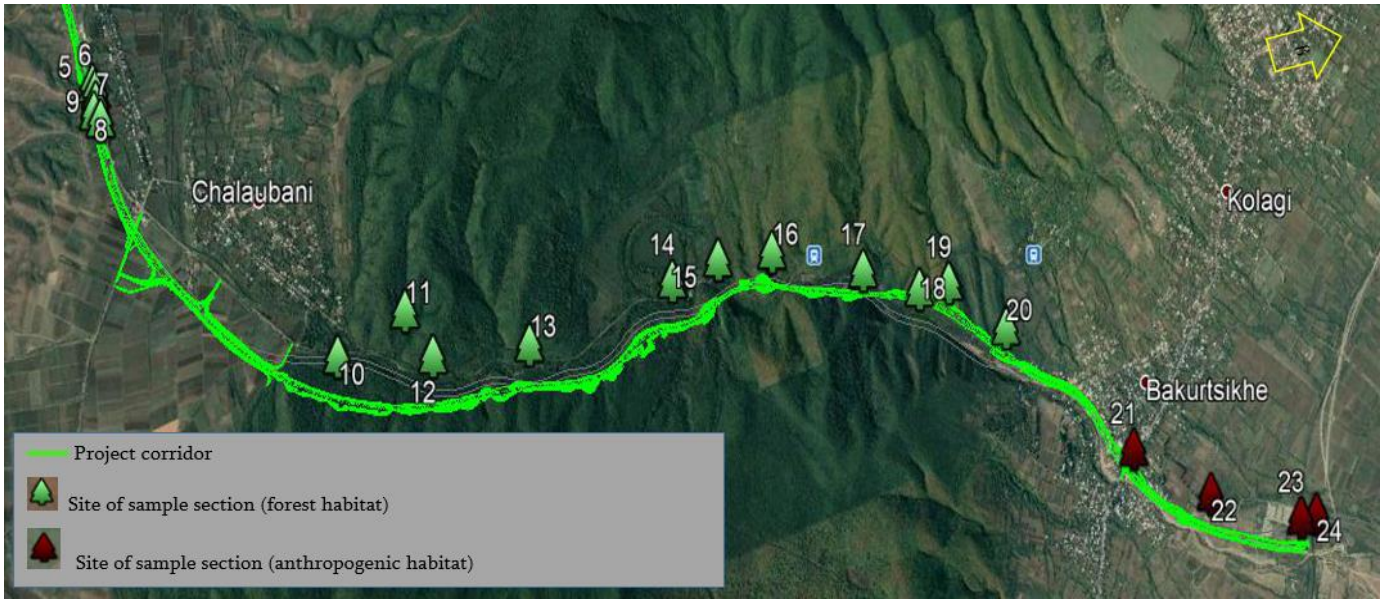


Figure 7.3.1.2 Location of the studied reference sites in the project corridor



In addition to the above, the last section of the corridor will pass through the populated area of Bakurtsikhe, which belongs to a very high-quality anthropogenic area and it cannot be distinguished as a natural-like habitat.

The project corridor is mainly represented by human-intensive agricultural activities significantly altered habitats. Relatively valuable can be considered the plant communities present in the corridor of the section leading to the Gombori ridge. Considering the length, width and therefore the usable area of the project road, it is possible to estimate the habitat loss in quantitative terms. Quantitative estimates of impacts caused by habitat loss are given in the table 7.3.1.1

Table 7.3.1.1 Impacts caused by habitat loss as a result of the construction of the projects road

Habitat type	A section of road that will pass through the appropriate type of habitat				Total area of similar habitat in Georgia According to the monograph "Spatial-temporal analysis of Georgian landscapes", ha	Percentage assessment of habitat loss,%
	Approximate length, m	Approximate width, m	Area of the corridor to be used for the arrangement of the road, m2	Approximate loss of habitat, ha		
Habitat 1 - Plain-hilly arid-denudative type habitat, agricultural lands and anthropogenic meadows.	40 000	35	1 400 000	140 (Strongly anthropogenic)	114 000	0.12
Habitat 2. - Foothill oak-hornbeam forest type habitat, which according to the EUNIS terrestrial habitat classification belongs to: G1.A1 Quercus - Fraxinus - Carpinus betulus forest on eutrophic and mesotrophic soils 2. Mukhtar - on average h Habitat according to EUNIS Terrestrial Habitat Classification: G1.A1 Quercus - Fraxinus - Carpinus betulus forest on eutrophic and mesotrophic soils.	6 000	40	240 000	24,0 The degree of anthropogenic is noticeable	51 000	0,047

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-type 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 (Lot 5) will pass within it. The alteration of this natural habitat will be noticeable in about 24 hectares, that makes 0.047% of the total area of oak-hornbeam natural habitat present in this region of Georgia.

Overall, the impacts caused by habitat loss within the WB financed section (Lot 3) 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

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. Highway underpasses to be designed by works contractor during the construction phase, will provide free passage for animals from one side of the carriageway 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 to take significant compensatory measures. 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.

Appropriate crossings will be provided under the road at the appropriate locations during the operation phase.

7.3.2 Impact on vegetation

Construction phase

Direct as well as indirect impacts on vegetation and floristic environment are expected during the construction of the project road.

The direct impact is the clearing of the road alienation strip from vegetation. 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 (12184 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 6090 and 5369. In addition, 124205 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 the cultivated, artificially cultivated and secondary species will be mainly directly affected. Impacts on plant species composition can be assessed as of low significance. Significant mitigation and compensation measures for the floristic environment will not be required.

However, relatively valuable species such as the oak Quercus iberica and the hornbeam Carpinus caucasica should be considered relatively valuable. Quite a large number of these species are directly 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 the construction-operation of this part of the project. It is important that the slopes treated after completion of the work are properly recultivated to maximize the natural restoration of vegetation and habitats. In the process of preparing the corridor, the project boundaries will be observed in order to prevent excessive damage to the vegetation. Vegetation cleaning works will be agreed with the relevant agency and compensatory measures will be taken in accordance with the current 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.

Impact mitigation measures

Construction phase

- Protecting the boundaries of the project corridor to prevent excessive damage to plants;
- Protected species (in case of such detection 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 MoEPA;
- 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 tree 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.

7.3.3 Direct and indirect impact on the 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 it turns out that they are very rarely and less frequently noted 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 above mentioned 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. Development and implementation of BMP;
- 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 the species and the appropriate sanctions in case of illegal hunting and fishing;
- 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.

7.4 Risks of 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.

7.5 Summary of impacts on the biological environment

Based on the above, below is a summary table, where by species is given:

- 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 7.5.1 which will ultimately ensure that the expected impact on biodiversity is minimized as a result of the project implementation.

Table 7.5.1 - Biodiversity Impact Summary and Mitigation Measures by Species

#	Affect 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 Cleanup; • 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 species are known from the bordering protected areas	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; • Placing planks in pits and trenches for easily trapped animals; • Thorough inspection of ditches and pits;	• Before starting work; • In the process of works; • During transport operations; • In the process of earthworks; • Before filling ditches and pits; • Upon completion of the works

					• Carry out reclamation measures, including restoration of fertile soil layer	
		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 is vegetative From the 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; • Protection of the Georgian environment in case of detection of Caucasian squirrel (Sciurus anomalus) Inform the Minister of Environmental protection and Agriculture of	• 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

					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	• 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

					fertile soil layer.	
		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	• 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 starting the

					should be expressed only by giving the animals a corridor to escape; • Prohibition of any direct impact on trees with birds nests in the period from April to July; • Carrying out reclamation measures, including measures to restore the fertile layer of the soil	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 about appropriate sanctions in the event of dishonesty; •	• 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: • 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;	• Cleaning the project corridor from vegetation; • Land 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 behavior of turtle species; • Construction personnel should be instructed that they are not allowed to kill or otherwise expos this species if 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	• Before starting work; • Before starting work; • Before the start of the works and during the works; • 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;

		• Poaching/vandalism by staff			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.	
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 damaging 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
	Fish and aquatic living organisms	Direct impact - not expected; Indirect impacts due to the risks of deteriorating water quality due	• Land and riverbank works; • Construction of	• River crossing areas (bridge construction sites)	• Take measures to reduce erosion processes along the river bank;	In the process of earthworks

		to mismanagement of waste, discharge of wastewater into the river and intensification of erosion processes in the coastal zone	bridge piers; • Use of contaminants, waste; • Functioning of construction camps.			

7.6 Potential Impacts on Socioeconomic Conditions

The project will have a positive impact on Georgia's economy on the global scale. Modernization of Sagarejo-Bakurtsikhe section of the S-5 highway, as a part of the program to upgrade the major roads of the country launched by the Government of Georgia will contribute to improvement of transportation and transit of goods between surrounding countries, which is a significant outcome for GDP growth of the country.

However, as any other development projects along with positive impact the project (construction and operation stage) will have a range of negative effects on socio-economic environment in the project area.

7.6.1 Pre-Construction and Construction phases

Road construction will have both, negative (such as dust, noise, vibration, loss of roadside businesses and property/land/harvest) and positive impact (temporary employment, improved transportation conditions, supporting small businesses) from social-economic standpoint. Impacts during construction will be limited to duration of construction works, mainly reversible and local.

Impacts and mitigation measures related to the land acquisition and involuntary resettlement, including restrictions on business and land use, as well as physical displacement, are covered under the RAPs developed by ILF CONSULTING ENGINEERS hired by RD with involvement of AECOM Ltd. As mentioned in project description (chapter 3), Sagarejo –Bakurtsikhe Road Section of S-5 highway was divided into three sub-sections and three independent RAPs have been developed. RAP prepared for road section from Tokhliauri Interchange to Badiauri will be financed by WB, RD has harmonized RAP of the mentioned section to the requirement of WB ESS5 on Land Acquisition, Restrictions on Land Use and Involuntary Resettlement.

The following impacts have been identified within RAPs:

- Impacts on various types of land parcels
- Impacts on residential and auxiliary structures
- Impacts on Trees and vineyards
- Impacts on Crop
- Impacts on Businesses

The information about the number of AHs, resettled households, businesses, , APs and their vulnerability and severity is summarised in the table 7.6.1.1.bBelow. The details are available in the RAPs.

Table 7.6.1.1 date on Affected Households (AHs), resettled HHs, businesses (AB) Affected Persons (APs)

Impact Receptors	Lot 3	Lot 4	Lot 5
AHs to be physically relocated	2	2	15
Project 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

Other social impacts

Certain negative impact during construction works will occur due to release 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.

In addition to the above, the trading objects located along the existing road will lose their current function, change their profile and focus on local people. The detailed information regarding the impact of roadside vendors will be presented in Socio-Economic study which is under the finalization and is prepared by independent Consultation Company DEPA. It is important to have properly conducted engagement with the business owners in advance about the possible direct/indirect impact of the project so that he/she can take time to get prepared for the expected changes. As it was described above, the special market place as part of the road section design, will be provided for roadside vendors. The place will be arranged by RD and further maintenance of the market place will be obligation of local municipality. In this regard, RD plans to sign the memorandum of understanding with local municipality. Also, the municipality will provide the furniture/minor infrastructure and utilities (electricity, gas, water supply, sanitary facilities etc.) for mentioned market place.

Negative impacts during construction can also occur due to failed expectations of employment for local resident.

Local small businesses will benefit by provision of accompanying services (food, small maintenance works, etc.). In case contractor decides to rent accommodation in the village instead of running construction camp, this will provide additional temporary income for community.

Possible negative impacts during the construction period can also happen due the dissemination of infectious diseases (Including Covid -19) and/or sexually transmitted diseases by workers living in camps and/or renting houses in nearby villages. The negative impact of diseases dissemination can be minimized if the contractor will be obligated to apply prevention measures and conduct training on spread and prevention of infection and sexually transmitted diseases. Also, the Contractor shall provide health insurance coverage for foreign workers and local staff which will supplement depending on the specific job risks.

The Contractor should develop measures to address the COVID-19 situation in Country, based on WHO recommendations and relevant national decrees, the contingency plan should be developed and updated (if necessary). All Covid-19 related risks should be identified and mitigated, the following mitigation measures can be applied:

Establish good sanitary conditions for workers at working places and accommodation areas, assure all employees were vaccinated against Covid-19, provide cleaning/disinfection service and ensure the proper disposal of medical waste (masks, gloves etc.), ensure medical service in camps and check the availability of medical service in nearby areas, the local community should be made aware of procedures put in place at site to address issues related to COVID-19. This should include all measures being implemented to limit or prohibit contact between workers and the community as needed.

According to the LMP, approximately 450-500 **workers** will be employed during this main construction phase. The exact number of project workers to be engaged in relation to the Project is currently unknown. Based on experience gained from the Highway projects undertaken in Georgia and worldwide, approximately 450-500 are expected to be engaged in the project (around 350 would be construction workers; around 80 will be engaged in overall project management and around 20 for Engineer's staff for project monitoring, reporting, and supervision). The project will use mostly local workers recruited by international contractor as well as by sub-contractor firms.

The estimates for different skill categories are yet to be developed for the Project as its design is progressed. It is expected that the construction workers will reside in the **worker's camp** next to the ROW. This worker camp will accommodate a car parking, some storage areas, sanitary areas and facilities for camp waste sanitary water/waste, as well as includes offices for the site management that will coordinate activities during the construction period.

Workers accommodation standards have to be applied to the provision of workers' accommodation in relation to projects funded by the EBRD (as best practice) or IFC. The key standards that need to be taken into consideration, as a baseline, are those contained in national/local regulations. These can include the following requirements: Good quality of buildings/ housing constructions and providing enough space for living and working, General health, safety and security, including fire safety; supply of electricity and heating; drinking water and sanitation and toilet facilities; canteen/dining halls and cooking facilities; laundry service of facilities; apply standards for nutrition and food safety.

Workers' rights and Company obligations regarding labor management and monitoring as well as establishment of workers Grievance Redress Procedure are described in LMP (Labor management procedure) developed for the project.

Likelihood of impacts on community during construction will be medium. Under condition of efficient communication, information disclose and cooperation with residents and local authorities the impact will be manageable.

Operation phase

After shifting the traffic from the existing road dust, noise, vibration and emission impact on the residents of the settlement will be reduced. For the same reason, community safety in the villages along old alignment will improve. Modernisation of the road will result in higher traffic safety as the highway will bypass the residential areas reducing the risk of traffic accidents and fatal injuries.

Mitigation measures

Construction phase

To mitigate impacts of land acquisition and involuntary resettlement, and business operation and land use restrictions the separate RAP was developed and harmonised to the requirement of WB ESS5 on Land Acquisition. The elaborated documents provide requirements and rules for assessing expected impacts and determining relevant mitigatory/compensation measures and conducting negotiations with affected persons. Other objectives of the Plan are to compensate affected households 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:

- To avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement
- by exploring project design alternatives.
- To avoid forced eviction
- To 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.

- To 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.
- To 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.
- To ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected.

The Contractor will be obliged to prepare and agree program of works and traffic management plans to reduce and manage the nuisance. Warning signs and fencing will be installed to ensure public safety. Working hours, in particular during operation near the residential areas will be kept. Noise, dust, and vibration impacts can be mitigated by implementation of mitigation measures set for air emissions, noise and vibration reduction. Local roads, 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.

The community will be informed about the schedule of works, any inconvenience related to the work process and potential duration of the impact in advance.

Exact location of cattle passages and culverts will be agreed with the local stakeholders.

To resolve challenges related to the reduction of local small businesses arrangement of agricultural markets along the new highways will be used. A similar practice was already realized in Georgia, when an agricultural market was built along Ruisi-Agara section of the East-West (E-60) Highway, where the locals can rent space for a token amount and sell their products. Preparation of a Socio-Economic Study for Improving Local Market Development Opportunities for the Sagarejo - Badiauri Road Section of the Kakheti Highway is being conducted by DEPA Consulting, commissioned by WB. According to the study results, the needs and locations for arrangement of agricultural markets along the new highways will be identified and included in the project.

Operation phase

Measures to reduce/mitigate impact on socio-economic environment during operation of the road include:

- signs, barriers to reduce access of pedestrians to the carriageway;
- allowing adequate passages and routes for non-motorized transport and pedestrians;
- establishment of leisure zones along the route to support the development of local businesses and businesses affected by diversion of the traffic from the existing road;
- development of alternative possibilities for employment through developments of additional tourism infrastructure due to increased touristic flows (guest houses and small hotels, restaurants).
- Improve access to local markets for agricultural farmers.

7.6.2 Expected impact on agriculture

The project corridor 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 be needed

to consider and the construction must 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.

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.

7.6.3 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.

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;

Impacts on transportation conditions

The intense transportation of construction materials and structures in certain periods of the construction phase may result to traffic jams and limited access to properties and other resources.

The beneficial impact of the project implementation will improved traffic conditions (including transit traffic) and decreased risks of traffic accident.

Mitigation measures

The most part of the highway corridor does not coincide with the existing highway. In addition, secondary roads are quite developed and various alternative alignments to access the construction sites are available that would minimize impacts related to free access restrictions.

A higher-risk areas where section the existing road and the project corridor run through a relatively narrow gorge and densely populated sites alternative roads should be used.

In addition, the construction contractor will be responsible develop a traffic management plan agree with the Patrol Police, local authorities and RD. The Construction Contractor has to developed proper and efficient communication procedures and to follow the already developed SEP, to ensure awareness of local population and enable their free and safe movement. The construction sites would be isolated from the road with proper barriers and traffic controlled by the contractor's relevant staff.

7.6.4 Human health and safety risks

Both, in the construction and operation phases, the risks of impact on personnel health and safety may be associated mainly with unforeseen cases, in particular:

- Communicable diseases
- Noncommunicable diseases
- Disturbance effects
- Accidents and emergencies

Mitigation measures

In the construction phase, human health and safety risks should be duly managed. Construction contractor is responsible to develop health and safety management plan, assign qualified health and safety officers and deliver occupational health and safety trainings to the works.

The safety measures on the territories of the construction camps and construction sites should include the following:

- Provision of the appropriate technological equipment and appliances, in a good operational condition;
- provision of fire control, water supply and lighting systems meeting the set standards;
- Installing warning signs on the sites hazardous for health, including instructions on observance established safety standards;
- All sites involving hazards to health should be fences and restricted form unauthorised access;
- Provision of warning signs and barriers will be near the settled areas;
- The personnel should be equipped with PPE and trained.
- The personnel should be provided with training on the risks of communicable infectious diseases and measures to avoid them

7.6.5 Activities that result from labor Influx

The workers inappropriate behaviour can lead to disruption of local community cohesion, especially smaller communities. This can occur through unaccustomed or violent behaviour, including gender-based violence, and/or an increase in communicable diseases.

In order to predict and mitigate the labour risks the LMP is developed for the project. All employment under the project is required to follow the provisions of the national legislation of Georgia and the LMP. The LMP also provides requirements and recommendations on workers occupational health and safety to be strictly followed during project implementation.

The 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.

The works contractor is responsible to have on place Code of Conduct which should prescribe certain behaviours and requirement. Code of Conduct should be introduced to all staff involved in project implementation, including filed workers. Workers should be controlled that they adhere to the requirements of Code of Conduct; the contractor is required to enforce the Code, with penalties leading up to dismissal. In addition, RD, the Supervision Consultant, and the contractor will consult with local authorities and community leaders, which will ensure they (that is, project managers) are aware of incidents and can take appropriate action if the issue arises. Finally, RD (through the Supervision Consultant) and the 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 with similar projects the risk of gender-based violence under this project is assessed to be low, availability of GBV-related legislation and support services in the country, and lack of precedents that indicate such risks in Georgia. The assessment is based on a review of national legislation and available information on SEAH aspects in the country. The project works will be implemented away from residential areas. The 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 gender-based violence survivors, and enforcement mechanisms, introducing clearer definitions and penalties for sexual violence and harassment. Prohibition of SEAH will be introduced in the Code of Conduct to be acknowledged and signed by all workers. Training on SEAH issues and the available protocols for handling SEAH complaints in sensitive and confidential manner will be provided to all workers and communities in the project corridor. The protocol for handling SEAH grievances will involve referral mechanism to the appropriate specialized service providers identified with SEAH service provider mapping. 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 Codes of Conduct for all project workers. Information regarding the workers GRM and GBV grievance redress is presented in LMP.

7.6.6 Impacts on historical and archaeological monuments

The project corridor does not intersect with any of the above visible, immovable monuments of cultural heritage. Consequently, no negative impact is expected during the construction 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 ultimately excluded and the preventive measures against the damage of the artefacts in the deep earth layers with the historical value must be taken.

Measures to mitigation impact risks

In case of chance finding of the archaeological artefacts, the Contractor should immediately cease all physical activities and inform the Roads Department about the chance finding. The Roads Department ensures swift notification of the National Agency for Cultural Heritage Preservation of Georgia a thereof, which will assume the general responsibility for the activities. The works are allowed to resume only after receiving a relevant written permit from the Ministry of Culture and Monument Protection of Georgia."

Contractor is responsible to develop procedure for chance finds and deliver trainings to the workers involved in earth work on required action if any chance find would be identified.

7.7 Summary environmental and social risks and impacts

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & duration of impact	Significance
Landscapes and views				
Residents	Medium	Disturbance to current landscape views due to construction, vegetation corridor in forests, and presence of highway, interchanges, bridges	Low permanent	Minor adverse
Residents near construction site	Low	Disturbance to current views of agricultural land due to construction, roads, interchanges, bridges	Low permanent	Negligible adverse
Tourists/travellers/visitors	medium	Disturbance of natural views due to construction	Medium permanent (temporary for individuals)	Moderate adverse
Land use				
Residential areas	High	Relocation and demolition of houses and buildings	Medium	Moderate
Forests	High	Cutting trees, bushes; vegetation cleared at RoW	Medium permanent	Moderate adverse
Areas protected for biodiversity value	High	No direct impact except sections may be visible from a few locations in Emerald Sites	Very low permanent (temporary for individuals)	Negligible adverse
Areas protected for cultural or natural heritage	High	See Tourists under "Landscapes and views" above. No direct effects, but Highway will be visible in the distance from some monuments, the access road to the monuments might be restricted.	Medium permanent (temporary for individuals)	Moderate adverse
Agricultural land used for annual crops	Medium	Private land plots within the buffer zone	Medium permanent (temporary for individuals)	Moderate adverse
Agricultural land not cultivated	Low	Private land plots within the buffer zone	Medium permanent (temporary for individuals)	Minor adverse
Perennial crops	High	Private land plots within the buffer zone	Medium permanent (temporary for individuals)	Minor adverse
Other land (developed)	Low	Restrictions on use of land in safety zone	Very low permanent	Negligible adverse
Soils and geological conditions				
Ground surface (rock & soil) at Highways and local roads,	High	Significant erosion of soil, impaired ability to support vegetation	High permanent	Major adverse

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & duration of impact	Significance
cutting slopes (affected by land- clearing)				
Ground surface (rock & soil) Highway and roads in vegetation control zone on cutting slopes (affected by vegetation control)	High	Soil erosion, impaired ability to support vegetation	Medium permanent or permanent	Moderate adverse
Ground surface on slight slopes and flat land	Medium	Slight to moderate erosion of topsoil, impaired ability to support vegetation	Medium temporary	Moderate adverse
Air quality				
Residents and visitors	High	• Fugitive dust generation during construction and maintenance; • Vehicle emissions during construction and maintenance; • NOx emissions during operation;	Low temporary Very low temporary	Minor adverse Negligible adverse
Vegetation	Medium	Fugitive dust settling on plant and interfering with growth	Low temporary	Minor adverse
Noise				
Residents and visitors in rural areas	High	Highway/ local roads construction noise	Low permanent (in corridor) Negligible (away from corridor)	Minor adverse in corridor, Negligible outside
Fauna within 100-200m	Medium to High	Highway/ local roads construction noise	Medium temporary	Moderate adverse
Water supplies and quality				
Rivers	Low- Medium	• Sedimentation of rivers/gullies from erosion due to compaction and soil disturbance; • Disruption of flood flows; • Contamination from spills.	Low temporary Negligible permanent Low temporary	Negligible adverse
Drainageways	High	• Sedimentation of streams from erosion due to compaction, soil disturbance, rutting, road crossing; • Disruption of flood flows; • Contamination from spills.	Medium temporary Low permanent	Minor adverse Negligible adverse

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & duration of impact	Significance
Groundwater	High	• Reduced recharge due to compaction of soil; • Contamination from spills; • Reduced availability due to withdrawals	Low temporary	Minor adverse
Flora				
Common tree species	Medium	The Trees, which will be cut for Highway construction, access roads	Medium permanent	Moderate adverse
Common shrub species	Medium	Plants clarence for Highway construction, access roads	Medium permanent	Moderate adverse
Tree species of conservation concern	High	The Trees, which will be cut for Highway construction, access roads	High permanent	Major adverse
Shrub species of conservation concern	High	Plants clarence for Highway and access road construction	High permanent	Major adverse
Fruits (orchards), crops and vineyards	High	Plants clarence for construction Highway and access roads	Medium permanent	Moderate adverse
Habitats				
Critical habitat	High	Reduction in populations of one or more flora/fauna species of conservation concern	N/A	No change
Natural habitat	Medium	• Loss of natural habitat; • Modification of primary ecological functions and species composition; • Introduction of or increase in invasive species	Medium permanent Medium permanent Low permanent	Moderate adverse Moderate adverse Minor adverse
Modified habitat	Low	Reduction in biodiversity value	Low permanent	Minor adverse
Fauna				
Common species of terrestrial fauna	Medium- low	• Animal death due to crushing or direct impact; • Abandonment of home territories due to construction disturbance; • Nest abandonment/disruption of breeding animals due to construction disturbance; • Change in species composition due to change from tall trees to lower vegetation; • Worker interference with animals or nests	Low permanent	Minor/Moderate adverse
Terrestrial fauna of conservation concern	High	• Animal death due to crushing or direct impact; • Abandonment of home territories due to construction disturbance;	Low permanent	Moderate/Minor

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & duration of impact	Significance
		• Nest abandonment/disruption of breeding animals due to construction disturbance; • Change in species composition due to change from tall trees to lower vegetation; • Worker interference with animals or nests		adverse
Bats	High	Loss of hibernating and nesting places in mature trees	Low permanent	Moderate adverse
Migratory birds (raptors, waterfowl, wading birds)	Low-medium	Death or injury due to construction of the Highway	Low permanent	Minor adverse
Large birds (raptors, cranes, etc.)	Medium	Death or injury due to construction of the Highway	Low permanent	Minor adverse
Community health and safety				
Community	Medium	• Worker influx: community disruption, crime, etc. • Direct impacts: pressure on services, emergencies etc.	Low temporary	Minor adverse
Community members (individuals)	High	• Infectious disease (including COVID19); • Tensions between community and workers including issues related to sexual exploitation, abuse, or harassment (SEAH); • Nuisance and safety: noise, dust, etc. • Accidents, emergencies	Medium permanent	Moderate adverse
Physical and economic displacement				
HHs under physical relocation	Medium- Low	Permanent loss residential houses for highway construction	Medium permanent	Minor/Moderate adverse
Land owners	Medium- high	Permanent loss of land for highway, local roads and interchange construction	Medium permanent	Minor/Moderate adverse
Vendors	Medium- Low	Temporary loss of income	Medium permanent	Minor/Moderate adverse
Worker health, safety, and welfare				
Workers (contractors and Supervision Consultant)	High	• Poor labor management practices; • Unsafe working conditions; • Inability to express concerns; • Substandard accommodations; Unsanitary conditions	Medium permanent	Moderate adverse

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & duration of impact	Significance
Economic conditions				
Income	Low-Medium	• National and regional income due to increased employment; • Local income due to increased employment • Increased income by local suppliers • Decreased income for commercial timber companies	Very low to low temporary	Negligible positive Minor positive
Key economic sectors	Low-high	• Reduced agricultural output; • Reduced tourism	Low temporary	Minor/ Negligible adverse
Infrastructure	Low- medium	• Damaged public roads; • Damaged rural unpaved roads/tracks; • Damaged rail line & train traffic	Low/Medium temporary	Minor/ Moderate adverse
Cultural heritage				
Cultural and Natural Monuments	High	Noise from construction; Direct impacts (vandalism)	Low/very low temporary	Moderate/Minor adverse
Chance finds	High	Damage or destruction of an archaeological site or individual artifacts	Low permanent	Moderate adverse

7.8 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.

Valued Environmental and Social Components (VEC)

The ESIA has defined the environmental and social components, on which the planned activity, due to its specifics, will have a certain impact. The sensitivity of VEC to the expected impacts and value were analyzed and the gained results were used as a basis to assess the scale and value of the environmental impact. The environmental and social aspects reviewed within the scope of the ESIA report and the description of their sensitivity and value are given below which is important for the assessment of the cumulative impacts.

Table 7.8.1 The environmental and social component, their sensitivity and value

VEC subject to the direct project impact and which must be considered in the assessment of cumulative impact	VEC to the expected project impact	VEC established by the scientific studies or VEC valuable following the public needs
Emissions of harmful substances into the atmospheric air, noise propagation, vibration propagation	Low	Low
Quality of surface and ground waters, water resources	Low	Average
Soil fertility, stability and cultivation resources, soil quality	Average	Average
Geological environment	Low	Low
Biological environment, landscape, terrestrial species and habitats	Low	Low
Employment	Average	Average
Historical-cultural and archaeological monuments	Low	Low

Other projects with potential impacts on certain environmental and social components

Together with the Highway Project to consider, in assessing the cumulative impact, similar linear projects planned within the conventional time and space boundaries must be taken into account. Extension of the considered highway - Eastern part of Sagarejo-Bakurtsikhe highway project. The length of this section is approximately 61.5

km. Like the section of the eastern part of Tbilisi-Sagarejo, the given highway is designed for a design speed of 80-100 km/h. The technical parameters of the project highway, the estimated terms/duration of the construction works are the same. The corridor runs across the Iori plateau, will pass partly across Gombori Ridge, and its small section covers Alazani Valley. The section of the eastern part of Tbilisi-Sagarejo covers the territories of Sagarejo and Gardabani municipalities and connects Kakheti and Kvemo Kartli regions.

The environmental procedures for the eastern part of Tbilisi – Eastern part of Sagarejo highway project are almost at same stage as with the present project. As for the last two projects, the Ministry of Environment Protection and Agriculture of Georgia has already made an environmental decision.

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 must be built within the boundaries of two large, independent watersheds, River Iori and partly Alazani catchment basins. The project highways intersect at a number of sites and reach small and large rivers entering the mentioned basins. Noteworthy of them are the Rivers Mtkvari, Lotchini, Tchailuris Tskali, Chailuri, Lakbe and Alazani. It should also be noted that the project corridors cross the irrigation water main channels and secondary control valves.

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 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 ESIA Reports, the estimated amount of stripped topsoil for all four projects is 255 thousand m^3. 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 the 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, the section of Sagarejo eastern part-Bakurtsikhe 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 ESIA 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 ESIA 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-descrbed 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.

7.9 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 project road is completely located in Kakheti Wine production zone. The several parts of the project corridor run along the Manavi microclimate zone characterized with specific species of grapes. The second microclimate zone considered to be impacted by the project is located near village Bakurtsikhe. This zone is considered as Gurjaani DPO. No other zones important and specific for the wine production is impacted by the project. To minimise impacts on vineyards, during detailed design all recommendations of the feasibility study were considered and routes were selected and optimised to avoid plantations damage as much as possible.

The project will have significant impact on agricultural and residential other lands as well as on business. The compensations 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 S-5 highway, will help to AHs in livelihood restoration.

If compensation measures will be properly realized, the residual impact on socio-economic environment will be low.

8. Environmental and Social Management and Monitoring Plan

Following the requirements of the Georgian environmental legislation and World Bank ESF and associated standards, an important component of an ESIA report is the ESMP. The main goal of the ESMP is development of measures to mitigate impacts identified within the scope of the ESIA. ESMP determines environmental and social requirements for project implementation and is to be used in practice by the project implementing agency - the RD, and thus, bring its activities into compliance with the environmental and social requirements of national legislation and ESF.

Table 8.1 describes and outlines the ESMP for the project. It has been developed to clearly identify measures that must be implemented to avoid, reduce, or otherwise mitigate potential moderate and major adverse impacts identified in the ESIA. It also identifies best management practices (BMPs) 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 the contractors, although RD will have responsibility for some of the actions. All works by the contractors, including implementation of mitigation measures, will be overseen and supervised by the Supervision Consultant (also known as the Consulting Engineer, Owner's Engineer, or other names).

It is important to note that RD, in part through its contractors, will also be responsible for complying with relevant requirements of Georgian law, the World Bank Environmental and Social Framework, the World Bank Group's General Environmental, Health, and Safety (EHS) Guidelines, and the EHS Guidelines for Highway construction, which may be have much more detailed requirements than the Plan presented here.

Following this table of mitigation measures, Table 8.2 provides the Environmental and Social Monitoring Plan. This Plan is necessary to ensure there is close scrutiny over actual environmental and socioeconomic performance so that prompt action can be taken if mitigation measures are not being implemented or if the measures are not adequately mitigating actual impacts. Since the Supervision Consultant will oversee all actions by the contractors, most of their monitoring responsibilities are not shown in the Table. The objectives of the monitoring program are to:

- Meet legal, World Bank, RD, and community obligations;
- Identify project impacts during preconstruction, construction, demobilization, and operation;
- Verify that mitigation measures are being implemented as required;
- Evaluate the effectiveness of mitigation measures and identify any shortcomings;
- Allow refinement and enhancement of mitigation measures if needed to further reduce impacts;
- Allow development of mitigation measures to deal with unforeseen issues or changes in operations;
- Allow RD, Georgia authorities, and the World Bank to verify that their respective requirements are being met.

The Roads Department of Georgia will oversee the Supervision Consultant, 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 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.

8.1 Estimated cost of ESMP implementation

ESMP value can be calculated after drafting the detailed design. At this stage, the unit prices of necessary infrastructure are presented.

The compensation value of the trees will be calculated after the inventory of the plantings. Price of one seedling is 2 USD on average, and the cost of their planting and growing is 2 USD as well. Consequently, the cost of planting 1 tree is 4 USD. At the stage of developing the detailed design, the length of the mitigation barrier (linear meters) needed in the project zone will be determined. Unit price of the protecting barriers including their installation cost is as follows:

1. The cost of anchoring or panelling one square meter is 500 USD.
2. The cost of installing one square meter of a bearing wall is 350 USD.
3. The price of one square meter of the protecting wall is 2000 USD

8.2 Environmental and Social Management Plan

8.2.1 Procurement 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, for the project (that is, not corporate-level): • 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, for the project (that is, not corporate-level): • E&S manager • Safety manager • Community liaison/social specialist • HR manager	• Bidders understand E&S requirements and prepare responsive proposals; • Higher E&S capacity by bidders	RD WB (approval)
1.3	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	RD

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
				MSIP (that is, inadequate understanding of requirements)	
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)

8.2.2 Project preparation phases ("pre-construction")

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
1.1	Implementation of Stakeholder Engagement Plan	• Uninformed local people and other stakeholders; • Unrealistic expectations by local people and others; • Long-term distrust of contractors and RD; • Protests or other disruptions; • Vandalism.	• Outreach to identified stakeholders; • Realistic information on employment opportunities; • Meetings with community leaders and citizens as appropriate; • Implementation of Grievance Redress Mechanism; • Train contractor workers and supervisors in relevant requirements of SEP, including receiving and reporting grievances.	• 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- day basis during construction
1.2	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	Qualified staff in sufficient numbers to implement/ oversee C-ESMP	Contractor

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			• Develop registers for recording grievances from external stakeholders and from workers		
1.3	• 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. • 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	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 • Noise disturbances to communities; • Community disruption, violence, crime, disease due to worker influx • Unsafe and/or unsanitary accommodations	• 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 • All activities in accordance with C-ESMP; • No unacceptable or unpredictable impacts	Contractor (prepare) SC (approve) RD Review
1.4	Recruit and employ workers and subcontractors	• Unqualified contractors and workers; • Poor labor practices (substandard pay, uninformed workers, etc.) • Excessive staff turnover	Implement Contractor's Labor Management Plan (LMP) • Preference for local hiring, with PAPs given preference • Written contracts with workers per LMP and Georgia law • Other provisions per Labor 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 (nondiscrimination, equal opportunity, income, etc.) • Low staff turnover	Contractor
1.5	Establishment of construction camps/laydown areas, storage areas,	• Contractor trespasses on land • Placement of construction zones in	• 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	• Compliance with approved C- ESMP • No unexpected or unacceptable impacts	Contractor (prepare) SC (approve)

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
	nonpermanent access roads, quarries/borrow areas, etc. and other land contractor will need for temporary use/possession	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	• 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 • 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	• All work within marked boundaries	RD Review

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			- 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.		
1.6	Establishment of accommodations, 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 • 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	• Sanitary and compliant facilities and amenities; • Healthy workers • Toilets in place where needed	Contractor
1.7	Access road planning and 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
1.8	Identify risks to migratory birds	No knowledge of potential risks to migrating birds from collisions Potential bird mortality due to collisions	• Appoint expert to develop program to monitor passage of raptors and water birds in river valleys • Appoint consultant(s) to implement monitoring program during autumn migration throughout the construction period • Based on results, expert to prepare summary report that includes recommendations on (a) if bird diverters (spinners, flashers, etc.) should be installed at valley crossings to reduce significant risk of collisions and (b) if additional monitoring is needed before final recommendations can be made.	• Expert appointed and monitoring program developed • Consultants appointed and program implemented • Results reviewed and recommendations developed • Recommendations implemented (no action,	RD

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
				continue monitoring, or install diverters)	

8.2.3 Construction Phase

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
1.1	Deployment of workforce	• 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; - 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.)	• Tasks completed with no worker injuries or death; • Tasks completed with no damage to vegetation, land or property outside construction zone	Contractor

#	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	Periodic update and implementation of C-ESMP	Excessive impacts on people and environmental resources	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	Management of subcontractors	• Subcontractors not aware of E&S; • Poor labor 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 (see row 3.15 below).	• 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 & vegetation cutting, land clearing, earth- moving in some places, equipment/building placement, etc.)	• Worker injury or death; • Excess damage to surrounding areas, including biodiversity and private land and property	• 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. • 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 behavior of fauna species of conservation concern; • To extent possible, micro-locate construction boundaries to minimize cutting/clearing flora of conservation concern	• Minimum biodiversity damage due to land clearing; • 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	Contractor

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			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 Implement Biodiversity Management Plan, 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; • 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	Vegetation 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 behavior of fauna species of conservation concern, bats;	• No excessive damage to vegetation and wildlife	

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			• 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: - 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. • Implement Biodiversity Management Plan, including at a minimum: • 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 • 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;	• Works completed safely; • No damage outside boundaries; • Safe and efficient operations	Contractor

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			- 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.		
1.7	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
1.8	Extraction of natural construction material	• Damage to landscapes and natural environment; • Erosion; • Water pollution; deformation of riverbed, and disruption of aquatic life; • Loss of aesthetic value of the area	• Give preference to purchasing of natural construction material from external suppliers as opposed to opening new quarries; • Purchase natural construction material from licensed suppliers; screen suppliers for incompliance with the terms of held licenses, use of child/force labor; recent sanctions imposed for poor environmental and social performance; • Open quarries only upon obtaining of an extraction license from the NAMR and strictly follow license conditions; • Develop site reinstatement plan satisfactory for NAMR and implement it on the rolling basis as extraction proceeds from one worked location to another; • While operating in riverbeds, do not extract sand/gravel from the stream; arrange sediment barriers between extraction site and the water stream; • While operating in riverbeds, do not enter water stream with construction vehicles and machinery.	• No informal extraction of natural construction material; • Minimal impact on morphology and aesthetic appearance of landscape; • No erosion of slopes; • No deformation of riverbeds; • No significant increase in water turbidity and disruption of aquatic life.	Contractor
1.9	Handling of chance finds	• Damage to cultural heritage	• If change find is encountered, take all physical activity at the site on hold and immediately inform engineer/employer • Do not resume works until receiving formal notice from engineer/employer	• No loss of cultural heritage	Contractor
			• Upon encountering of chance find, immediately order holing of all physical activity on site, and inform NACHP		RD

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			• Allow time and create enabling environment for archaeologists from NACHP to undertake excavation, packing, and transporting of artifacts, and conserving the archaeologic site. • Give formal notice for resumption of works upon agreeing such decision with NACHP		Supervision engineer
1.10	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	Implement Security Plan: • 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
1.11	Purchase of goods from primary suppliers	Child labor, forced labor, 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 labor safety practices or remedies in case of child or forced labor	No child labor or forced labor or serious safety issues at primary suppliers	Contractor (supported by RD if RD has significant influence or control)
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
1.13	Stakeholder engagement and grievance management	Uninformed stakeholders Stakeholder distrust of Contracting Authority Worker distrust of employers Worker dissatisfaction, unrest	RD to implement Stakeholder Engagement Plan with support from Supervising Engineer and Contractor as agreed/required Supervising Engineer and/or Contractor to notify local authorities of ongoing activities RD to implement GRM for external stakeholders (project-affected parties and other interested parties), with day-to-day support as agreed from Supervising Engineer and Contractor: record, address, and communicate resolutions Involvement of community liaison officer(s) as appropriate and required RD, Supervising Engineer, and Contractor implement single or separate worker GRMs: record, address, and communicate resolutions RD monitors Supervising Engineer worker GRM, Supervising Engineer monitors Contractor's worker GRM	Informed stakeholders Public support Worker satisfaction Grievances addressed and resolved	RD Supervising Engineer Contractor

8.2.4 Demobilization phase

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
1.1	Closure of construction areas camps, accommodations, etc.	• 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, improper drainage, etc.	• Withhold 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 restored to former use as required	SC RD

8.2.5 Operation and maintenance

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Responsible Body
1.1	Updates of LMP and Occupational Health and Safety Plans	• Lack of compliance with new safety law; • Worker injuries and deaths • Poor labor relations	• RD Safety Manual updated per new OHS Law	Road Maintenance Contractor RD
1.2	Routine maintenance and security patrols	• Worker injury or death; • Damage to ground surface and cover vegetation, soil erosion; • Traffic accident; • Damage to private property (trees, crops, etc.)	• Workers trained in requirements of RD Safety Manual specific to their jobs; • Workers trained in requirement of Traffic Management Plan; • Compensation per RAP	Road Maintenance Contractor RD
1.4	Accidental fuel/oilspill and/or roadside litter	• Surfacewater	• The trained Maintained Contractor during the operation phase willhave emergence respond 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 sand, after the sandwill absorb the contamination sand will be taken to the	Road Maintenance Contractor RD,

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Responsible Body
	washed off/blownoff into the river		specializedlandfill areas; • But if the spilled oil/fuel accidently will be run to the culverts, the spilled oil/fuel is going to the sediment trap with filter (during cleaning of the culverts no water is used). The contaminated soil isexcavated and is taken to the specialized landfill areas; • During the ordinary cleaning the Maintained Contractor will clean the culvert from the sediments mechanically without water usage; • Control over truck traffic to minimize spills;	Traffic Police
1.5	Road resurfacing	• Water bodies pollution by heavy metals, hydrocarbons anddebris	• 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 can 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.	Road Maintenance Contractor RD
1.6	Noise	Disturbance of local residents by traffic related noise	• Undertake instrumental monitoring of noise in the settlements located in proximity to the highway after entering it into operation; • In case of noise levels exceeding permitted level or in case of complaints from local communities, design and arrange noise barriers, plant protective vegetation, or apply other specialised mitigation measures as suggested by designer consultant.	Construction contractor during DLP, RD through Road Maintenance contractor
1.7	Littering	• Possible negative impact on wildlife,water pollution, aesthetic impact	• Ensure that the community is aware of the range of ways todispose of their waste correctly; • Inform the community of the level of fines that littering incurs; • Signage may be an element of a roadside litter prevention program, educating the community that littering is illegal, fines apply and behaviour are monitored. The signs may be suitable forplacement in a series of two to four signs at 10 km intervals to repeat the message in different ways. • Cleaning up	Road Maintenance Contractor RD,
1.8	Status of biodiversity	Impact on vegetation, Road kills ofanimals	• Remove faded plants, replace them with new • Keep records of accidents.	Road Maintenance Contractor

#	Activities	Potential adverse impact	Mitigation measures/Best management practice	Responsible Body
			• If accident hot spots with large mammals is identified, appropriateprotective measures shall be elaborated (e.g. reflectors /local fencing, warning signs, speed reduction)	RD,
1.9	Traffic	Accidents due towinter typical hazards (snow, ice, fog)	• Installation of warning signs • Maintenance of tunnel to ensure safety • Informing	Road Maintenance Contractor RD,
1.10	Presence of the road structure, traffic redirection	Restricted access because of the highway acting asa barrier, Safety issues, impact on non-motorized transport	• Smooth operation of underpasses, overpasses, road junctions, andsecondary roads within the highway area	Road Maintenance Contractor RD,
1.11	Operation of the Badiauri marketplace	Littering of area, accumulation of excessive volumes of waste, poor sanitary conditions	• Provision of adequate utility service to the marketplace (water and power supply), waste collection • Provision of toilets for men and women, handwashing facilities • Arrangements in place for cleaning and periodic disinfection of marketplace	Local municipality

8.3 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

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 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	• Observations; • Inspections; • Inspections	• 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 Spot checks (at least once every site monthly)	Ensure workers are trained to work safely	Supervisor Contractor safety manage 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;	Before allowed to vehicles/equipment – Annually	Trained drivers	Contractor PM & safety manager

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?)*
			• Check with traffic police if needed • Skills test as needed			Supervision Consultant
	Mobile plant/vehicle safety (horns, backup alarms, lights, tires, safety belts, fire extinguisher, cleanup 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: • At least once during each stage of construction works	• Limit areas of impacts • Verify no off-site damage	Contractor supervisors & E&S personnel Supervision Consultant
Air quality	Visible dust – Dust coating leaves on nearby vegetation;	Unpaved roads & other construction areas	Observations	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

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?)*
Land clearing activities (roads, construction areas)	Compliance with Land Management and Erosion Control Plan, including: • Boundary marking before construction begins; • Working within boundaries Topsoil storage and spoil storage • Drainage control to prevent erosion Condition of land/vegetation at boundary	• 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 • Verify drainage controlled and erosion avoided • Verify implementation of LC&EC Plan	Contractor E&S personnel Contractor PM (spot checks) Contractor E&S personnel Supervision Consultant
			• Observations and photography	• Before clearing begins	• Allow verification of working within boundaries	Contractor E&S personnel Supervision Consultant
	Site restoration	• Construction sites	• Inspections	• When construction ends at that site	• To 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 ground broken,	• 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 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?)*
	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&Spersonnel
Vegetation cutting	Implementation Biodiversity Management Plan • Boundary of vegetation control zone marked; • Flora species of concern logged, photographed, & marked; • Mature trees with bats/birds logged, photographed, & marked; • Trees to be cut marked	• Areas where trees and shrubs are to be cut	• Observation	• Immediately prior to cutting/clearing	Verify species and specimens of concerns are identified	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 maintenance of plantations		• Observation and photography	• During spring following cutting • Prior to demobilization • Annually for 2 years after planting	Verify plantings Verify success to allow final payment Verify success or identify need for replanting	Botanist appointed by contractor Supervision Consultant RD
	Survival of minimum 80% of plantings					
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

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?)*
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 and photography	• 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
Identify need for bird diverters at the corridor	Migration of raptors and water birds across the road corridor	• Main river valleys	• Observations (monitoring plan to be developed)	• Autumn migration season (as recommended by expert) for two seasons	• Identify if bird diverters are needed to avoid collisions	Contractor E&S personnel Supervision Consultant RD
Noise generation	Noise levels	• Workplaces • Off-site locations	Noise meters, per Noise Management Plan	• 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
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

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?)*
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 behavior 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
Resettlement and compensation	• Compliance with RAP	• As specified in RAP				Supervision Consultant RD
Erosion control, land stability	• Effectiveness of erosion control and land restoration	• site location points	• Observations during routine maintenance patrols	• Semi-annually during operation	• Identify need for further land stabilization and erosion control	Contractor Supervision Consultant

9. Information Disclosure and Stakeholder engagement

9.1 Stakeholder engagement

RD has been engaging with various project stakeholders since the beginning of 2020, which coincided with the preparation phase of EIA. Several stakeholder engagement activities took place to date:

- Scoping public hearings and initial informal meetings (January 2020);
- EIA public hearings according to the Georgian Legislation (June 2021);
- Informal communication with government agencies (throughout 2020-2021); and
- RD's RAP consultant and Social team meetings during the RAP preparation and disclosure (from June 2020 - till end of RAP implementation);
- Stakeholder activities are planned and will be implemented in frame of SEP.

9.1.1 EIA public hearings and initial informal meetings

As part of the requirements of Georgian legislation, identifying and informally engaging with stakeholders were started by RD in late 2020 during the preparation of Scoping Report and the EIA. On February 4-5, 2020 and June 14-16, 2021, MOEPA held public hearings 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. The Minutes of the Meetings are provided in annex 1.

Table 9.1.1.1 Summary of Public hearings held to date by MOEPA with RD's involvement

N	date	time	location	Place of meeting
Public hearings of the scoping report organized by MOEPA				
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 hearing of the EIA report organized by MOEPA				
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

Beside to EIA report, additional individual and collective meetings and discussions with different groups of stakeholders and affected persons have been conducted in the frame of Resettlement Action Plan (RAP) and Stakeholder Engagement Plan (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 continiue 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 WB.

9.1.2 Public Disclosure of and Consultations for the ESIA

After World Bank for review and clearance, the present draft ESIA report will be disclosed in Georgian and English languages through the web page of RD and discussed with stakeholders. ESIA report will be finalized through incorporation of the public feedback and records on the consultation process will be attached. During the ESIA disclosure period, hard copies as well as the electronic version of nontechnical summary of ESIA will be available at the following addresses:

- Local government of Sagarejo Municipality;
- Local government of Gurjaani Municipality
- Roads Department of Georgia – Address: Tbilisi, #12 Al. Kazbegi str.

Also, the draft ESIA report and later – its finalized version will be available for downloading from the following web sites:

- Roads Department of Georgia: www.georoad.ge
- Website of the MOEPA: www.MoEPA.gov.ge

During ESIA disclosure period, stakeholders will have an opportunity to send comments at the following email addresses: maya_vashakidze@yahoo.co.uk; mbegiashvili2@gmail.com

Beside to the public consultation meetings described below, based on WB ESF) and standards (ESS 10), the SEP document was prepared and will be disclosed after the WB clearance. In order to ensure the proper mapping of interested parities, the process of stakeholder engagement and identification will continue after the project preparation, as well as be continuously updated in the course of implementation. For SEP smoothly implementation, dedicated budget and manpower will be obtained from EA (Executive Agency).

9.2 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 Grievance Redress Mechanism (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 Labor 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.

9.2.1 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 GRC is an eight-member committee comprising of the following:

- Roads Department of Georgia (RD) representative as a Committee coordinator;
- Regional/municipal representative (from "Gamgeoba") as a Committee secretary;
- Village attorney ("Rtsmunebuli") as a Committee member;
- Elected two Representative of a Project Affected Persons (PAP) of which at least one is woman as a Committee member;
- Representative of local non-government organization (NGO) taking into account the grievance character – as a Committee member;
- Local specialist of social and environmental safeguards from the Supervision Consultant – as a Committee member;

- Local specialist of social and environmental safeguards from the Construction Company – as a Committee member.

To ensure GRC's effective functioning, there is no necessarily to have all 8 members on board, at least 3 members: such as representative of local municipality, PAPs representative 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.).

9.2.2 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.

9.2.3 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

1) Head of Roads Department of Georgia (Head RD's Problematic Issues (Social and Environmental) Redress Commission);
2) Deputy Head of Roads Department of Georgia Deputy Head of Permissions Department (member);
3) Deputy Head of Roads Department of Georgia Deputy Head of Permissions Department (member);
4) Deputy Head of Roads Department of Georgia Deputy Head of Permissions Department (member);
5) Deputy Head of Roads Department of Georgia Deputy Head of Permissions Department (member);
6) Head of Legal Division (member);
7) Deputy Head of Legal Division (member);
8) Head of Resettlement Unit (member);
9) Head of Roads Maintenance Division (member);
10) Head of Highway Projects Construction Division (member);
11) Head of Internal Roads Construction Division (member);
12) Head of Environmental and Social Issues Division (member)
13) Deputy Head of Social and Environmental Issues Division (member)
14) Head of Technical Supervision and International Projects Planning Division (member);
15) Resettlement and social issues consultant (invited member);
16) Head of Environmental Unit (member).

9.2.4 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 then, will 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 a 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.

9.2.5 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 a 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 received complaints, and ways and 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).

9.2.6 Protocol for Handling Sensitive Complaints including Gender-Based Violence and SEA/SH Related Complaints

RD will establish a protocol for confidential survivor-centered approach to handling sensitive complaints, including those related to gender based violence, sexual exploitation, abuse or harassment 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.

9.2.7 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 Labor 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 labor 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 the 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.

9.2.8 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 IA/PIU 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-centered 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.

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11. Annexes

11.1 Annex Description of sample plots:

Site №1 X-544974; Y-4609950. Exposition: E Slope gradient: 5° Plant projection coverage: 70% Habitat: anthropogenic meadow			
List of species / Projection coverage (%)			
Celtis glabrata	1	*Xeranthemum annuum*	1
Rubus sp.	2	*Bromus briziformis*	2
Cirsium ciliatum	2	*Stipa cappillata*	1
Populus canescens,	1		

Site №2 X-549233; Y-4610311. Exposition: S Slope gradient: 3° Plant projection coverage: 70% Habitat: Adjacent to the economic plots			
List of species / Projection coverage (%)			
Paliurus spina-christi	2	*Rhinanthus minor*	+
Prunus spinosa	2	*Achillea millefolium*	+
Rubus sp.	1	*Hordeum murinum*	3
Papaver corniculatum	+	*Euphorbia seguieriana*	1
Aegilops cylindrica	1	*Stipa pennata*	1

Site №3 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 №4 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 №5 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 №6 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 №7 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 №8 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 №9 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 №10 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 №11 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 №12 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 №13 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 №14 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 №15 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 №16 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 №17 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 №18 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 №19 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 №20 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 №21 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

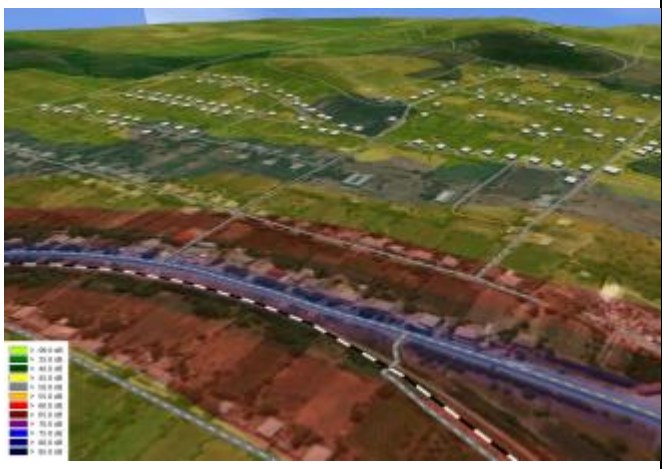
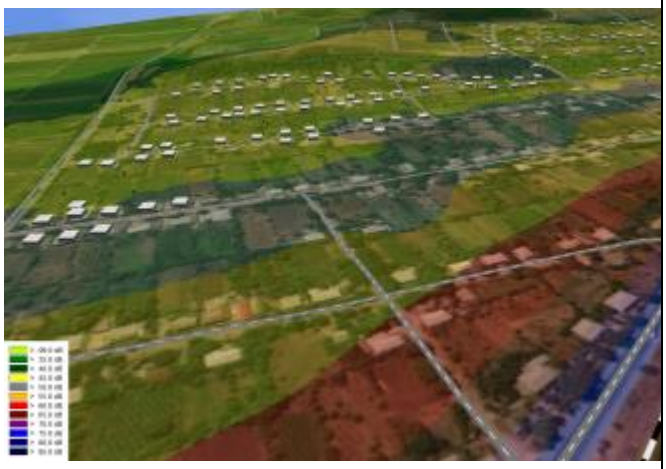
Site №22 X-572084; Y-4616386. Exposition: E Slope gradient: 5° Plant projection coverage: 60% Habitat: anthropogenic meadow			
List of species / Projection coverage (%)			
Cedrus libani)	1	*Dactylis glomerata*	1
Punica granatum	1	*Atriplex micrantha*	1
Rubus sp.	2	*Hordeum murinum*	1
Robinia pseudoacacia	2	*Carex canescens*	1
Aegilops cylindrica	+	*Amaranthus retroflexus*	1

Site №23 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 №24 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

11.2 Annex: Graphical Results of Noise modeling - Operation Phase

Noise propagation images for each section

Badiarui	
Current Scenario - 1	**Current Scenario - 2**
	
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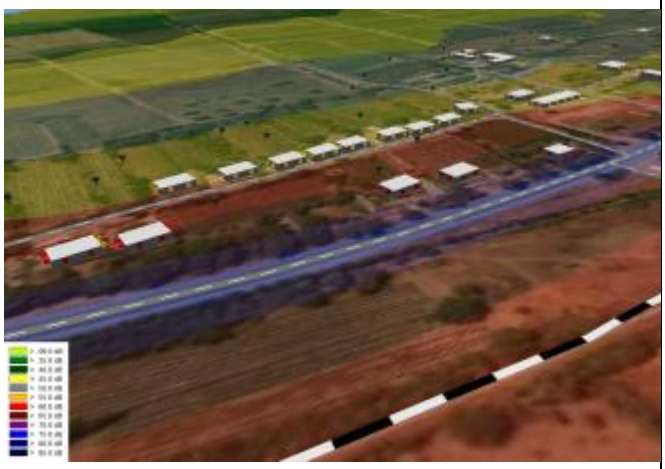
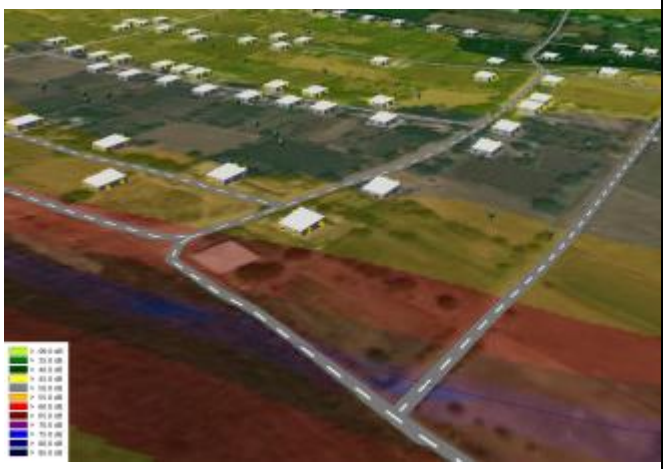
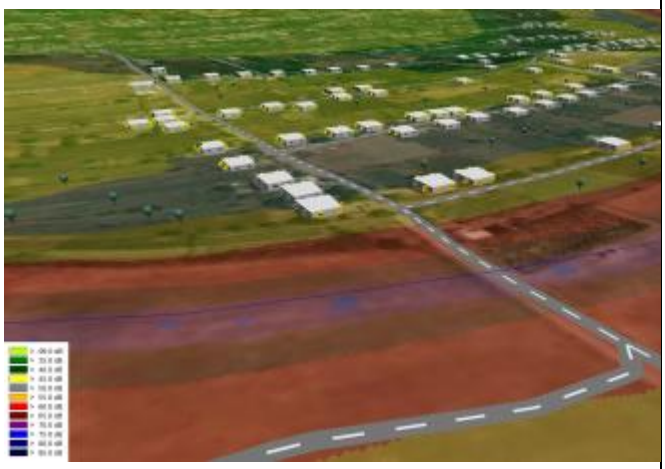
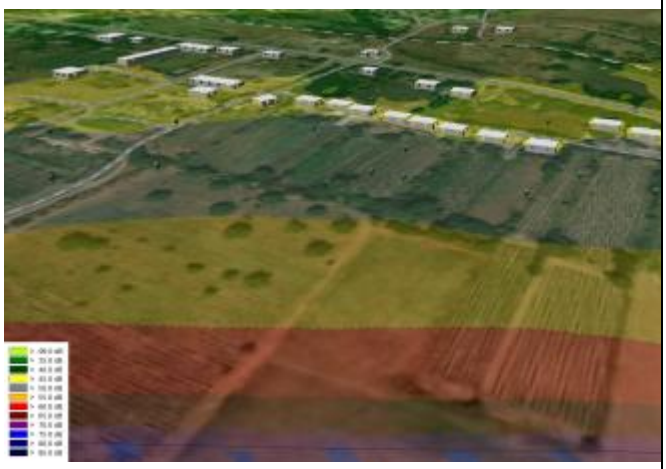
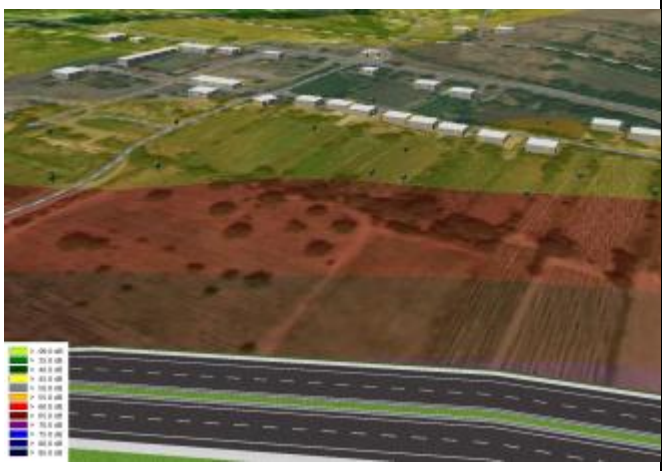
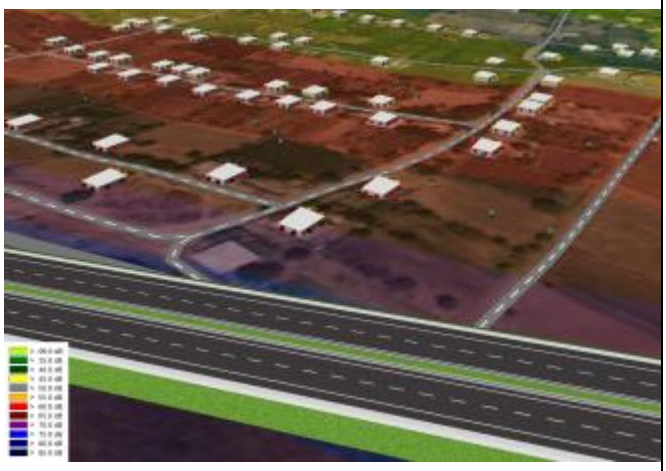
	
Construction Scenario -2	**Construction Scenario -3**
	
Operation Scenario 2020 -1	**Operation Scenario 2020 -2**

Operation Scenario 2020 -3

Operation Scenario 2030 -1

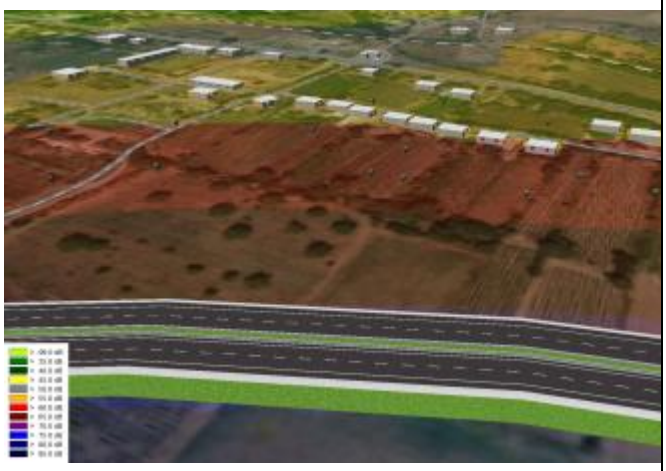


Operation Scenario 2030 -2

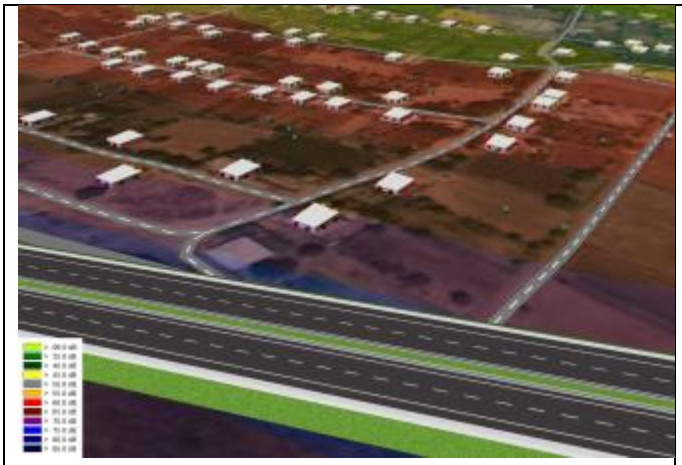


Operation Scenario 2030 -3

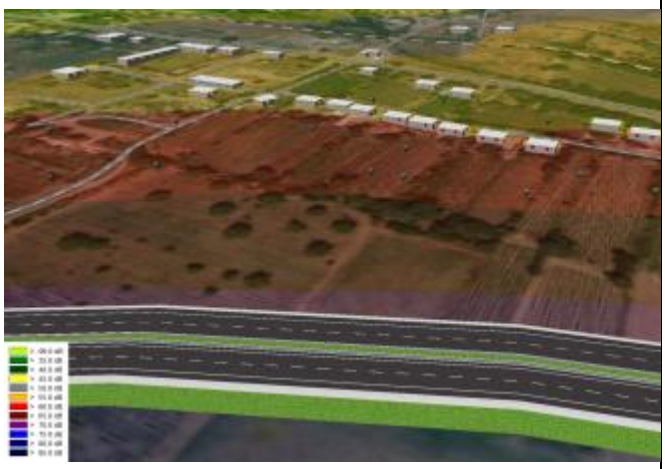
Operation Scenario 2040 -1



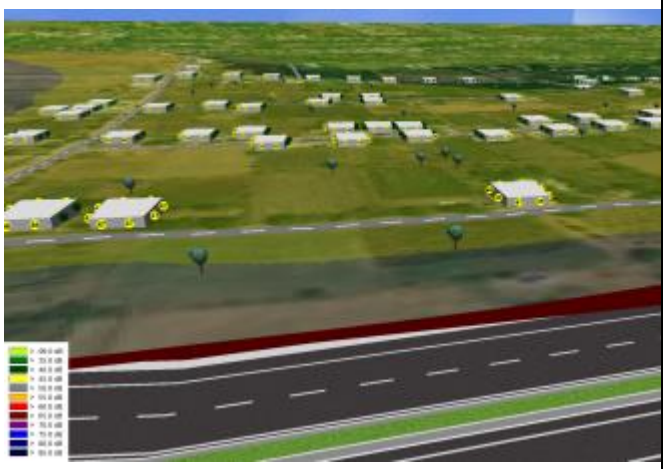
Operation Scenario 2040 -2



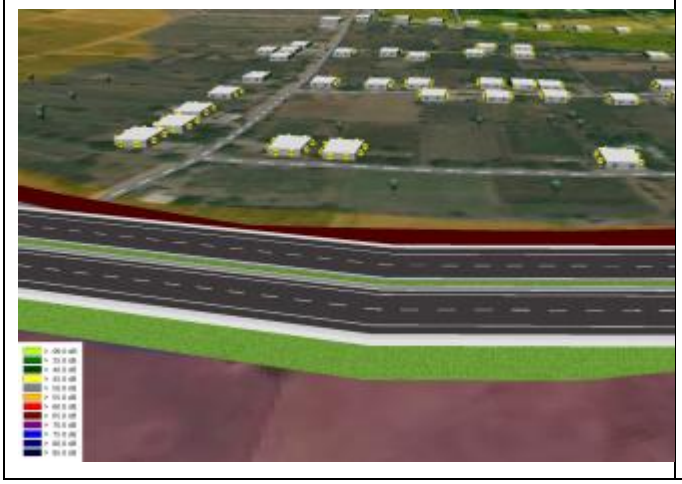
Operation Scenario 2040 -3



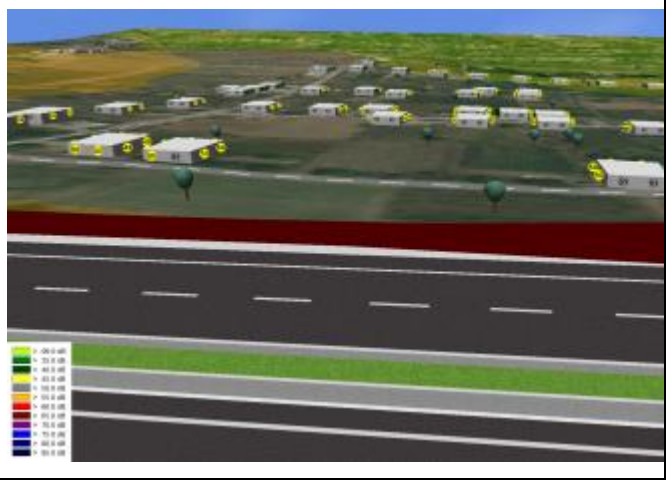
Barriers - Operation Scenario - 2020

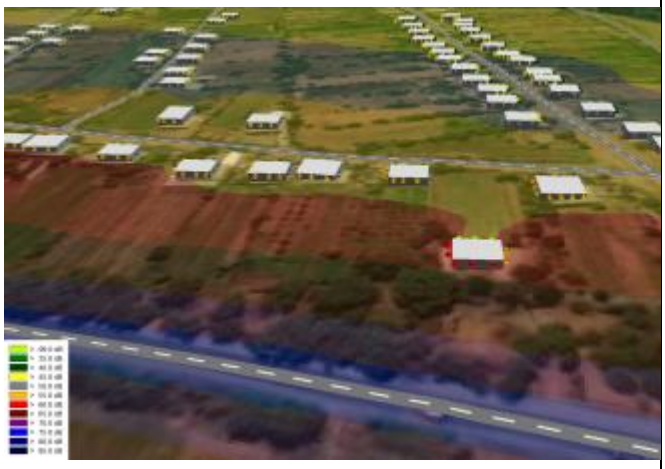
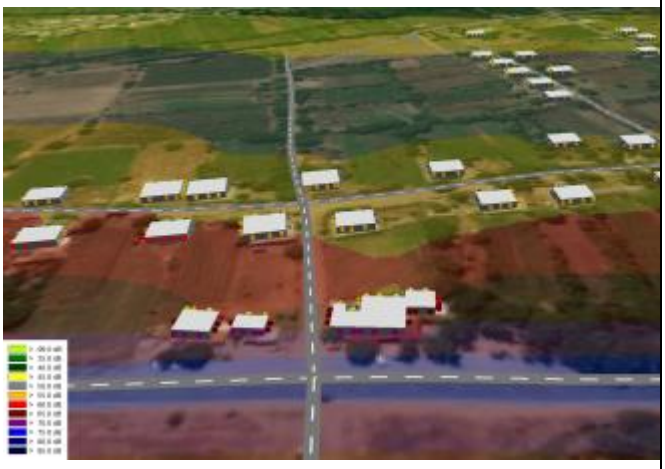
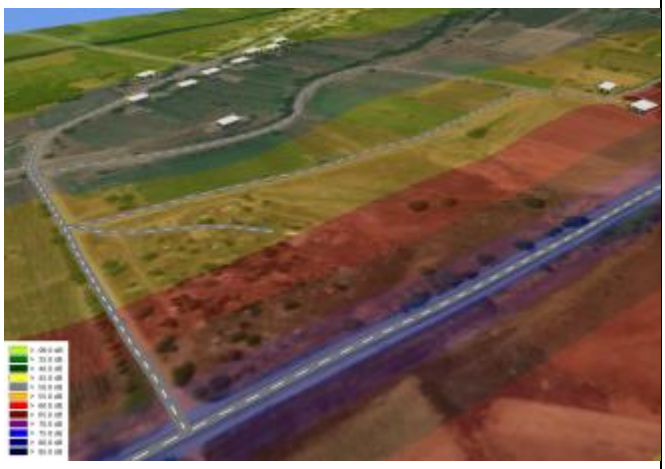
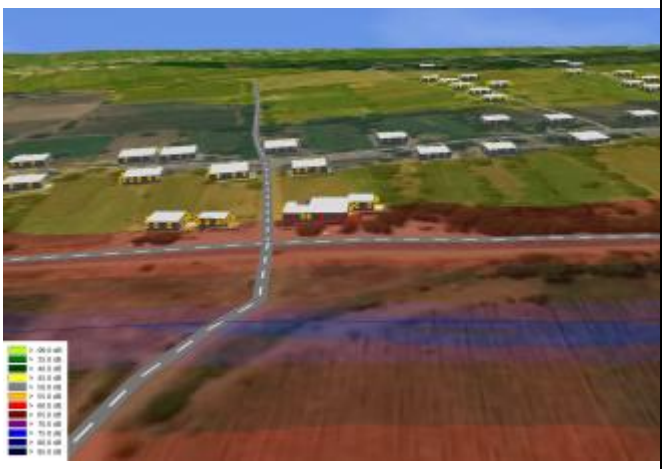
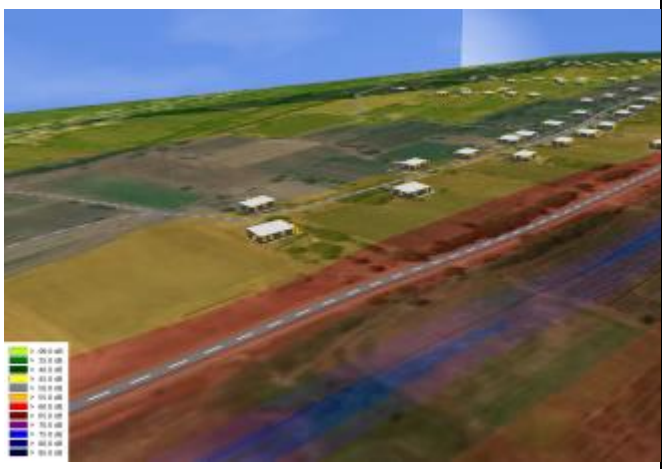
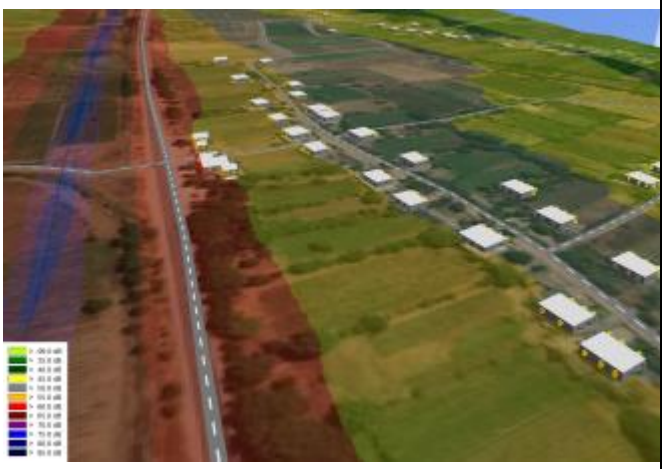


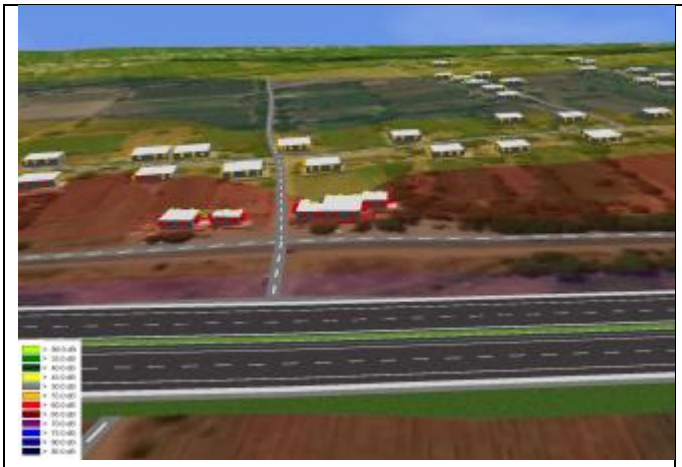
Barriers - Operation Scenario - 2030



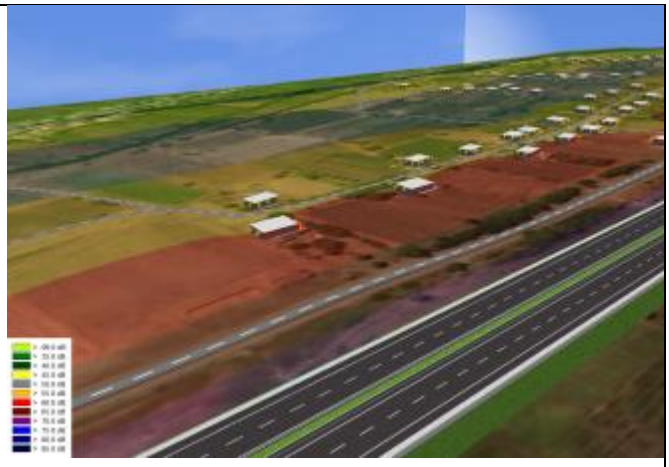
Barriers - Operation Scenario - 2040



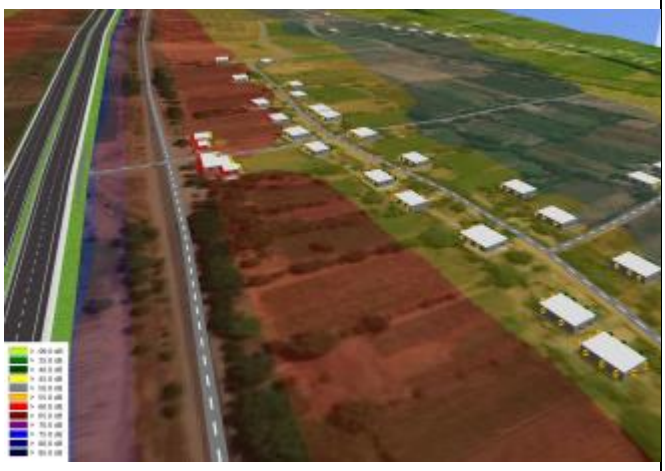
Mzisguli	
Current Scenario - 1	**Current Scenario - 2**
	
Current Scenario - 3	**Construction Scenario -1**
	
Construction Scenario -2	**Construction Scenario -3**
	
Operation Scenario 2020 -1	**Operation Scenario 2020 -2**



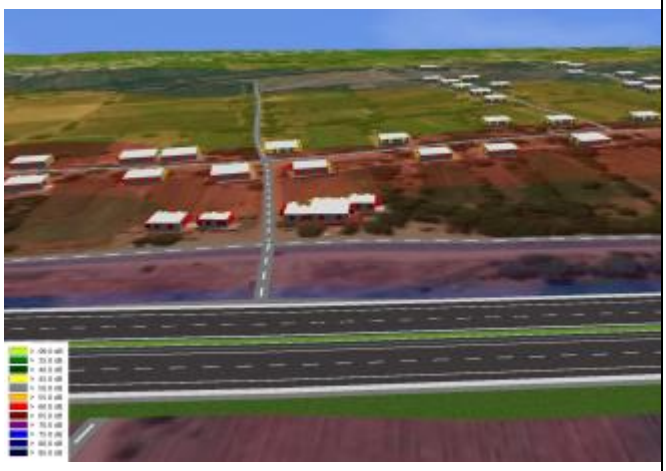
Operation Scenario 2020 -3



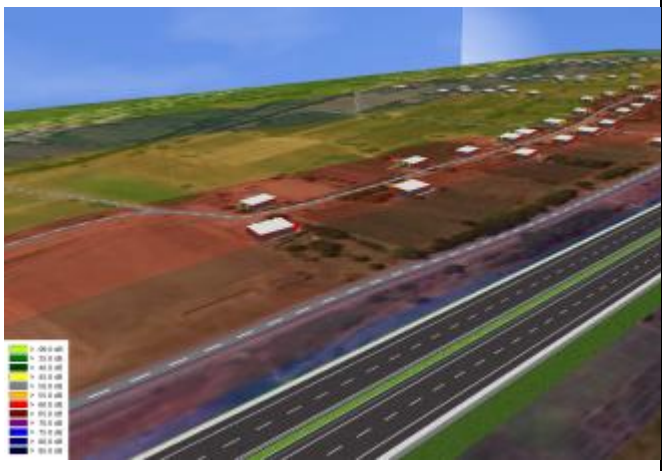
Operation Scenario 2030 -1



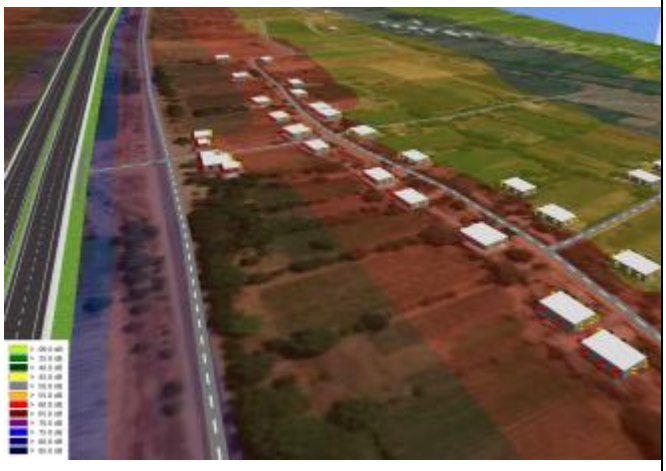
Operation Scenario 2030 -2



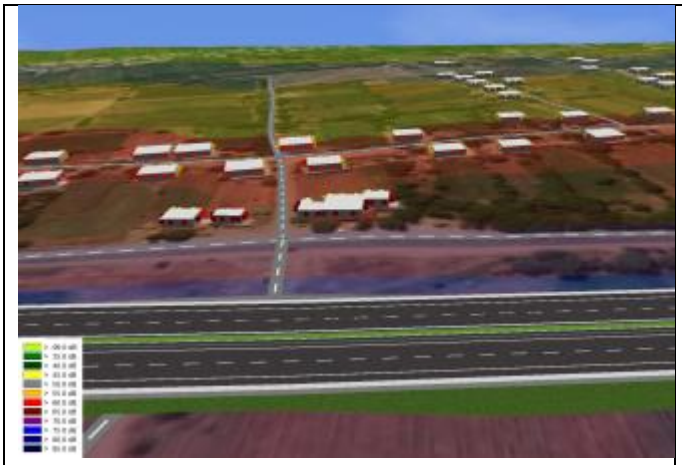
Operation Scenario 2030 -3

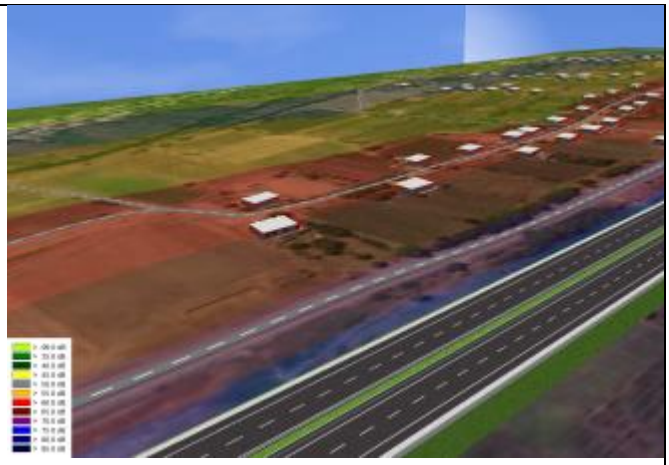


Operation Scenario 2040 -1



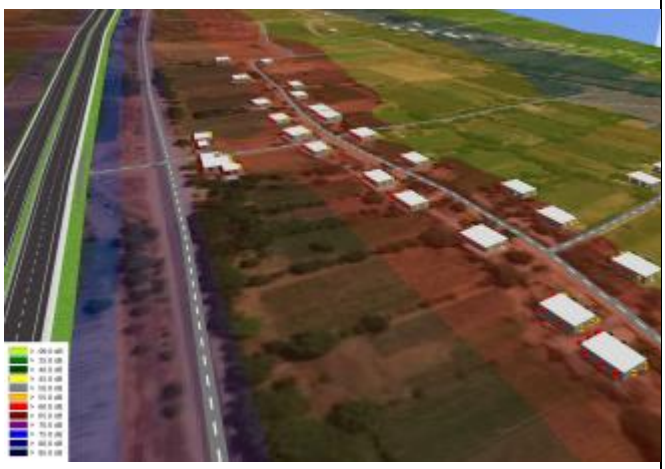
Operation Scenario 2040 -2

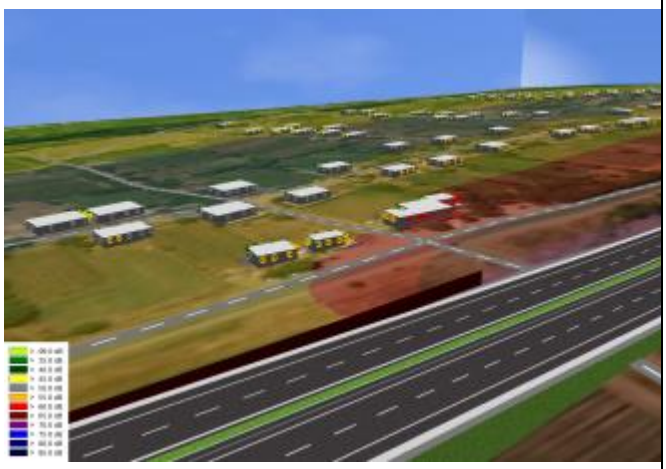




Operation Scenario 2040 -3

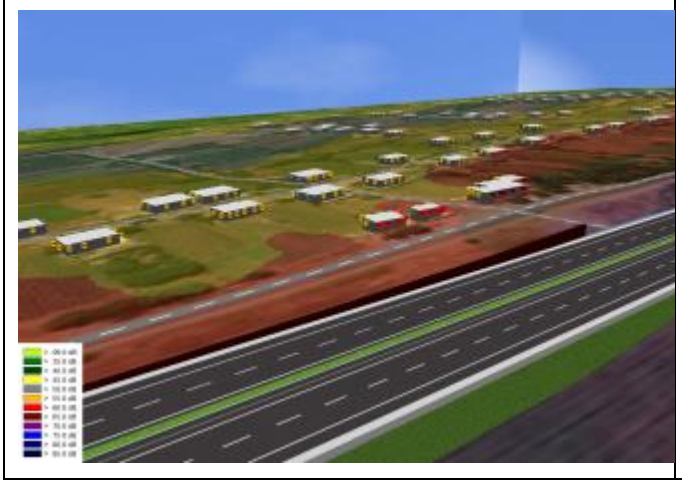
Barriers - Operation Scenario - 2020

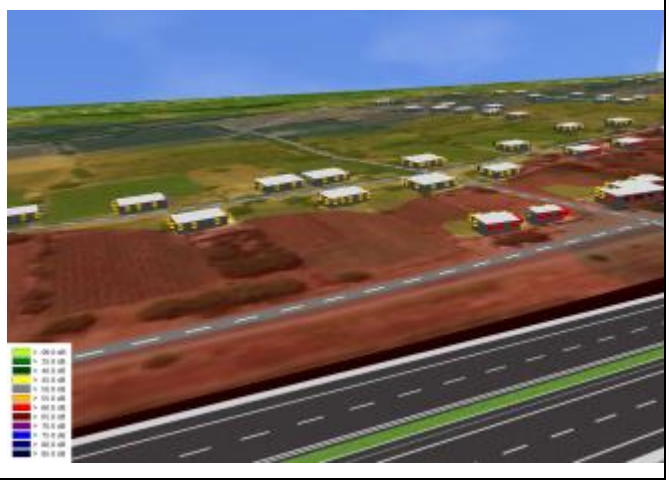


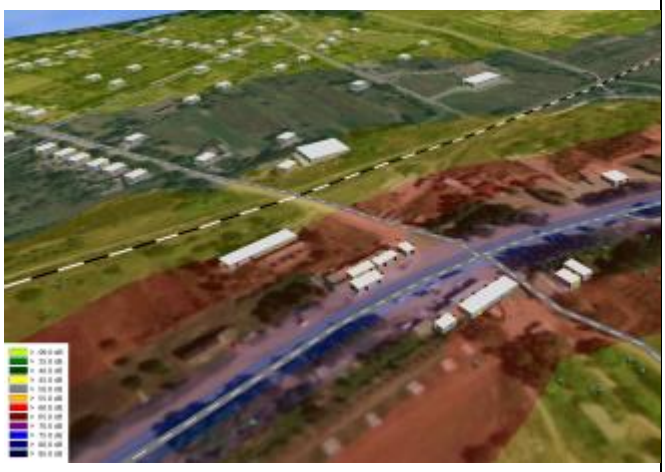
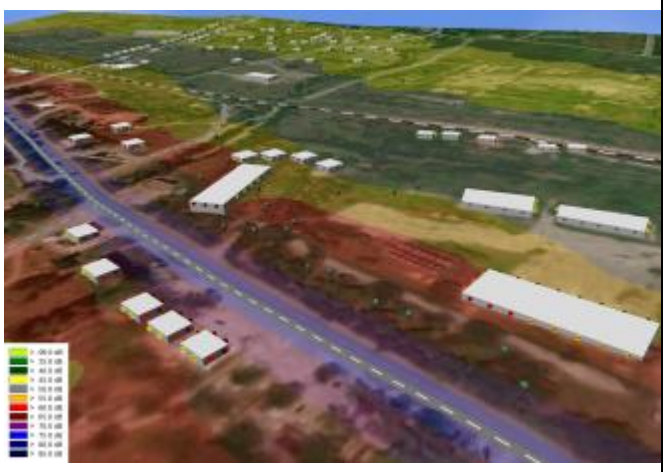


Barriers - Operation Scenario - 2030

Barriers - Operation Scenario - 2040





Kachreti	
Current Scenario - 1	**Current Scenario - 2**
	
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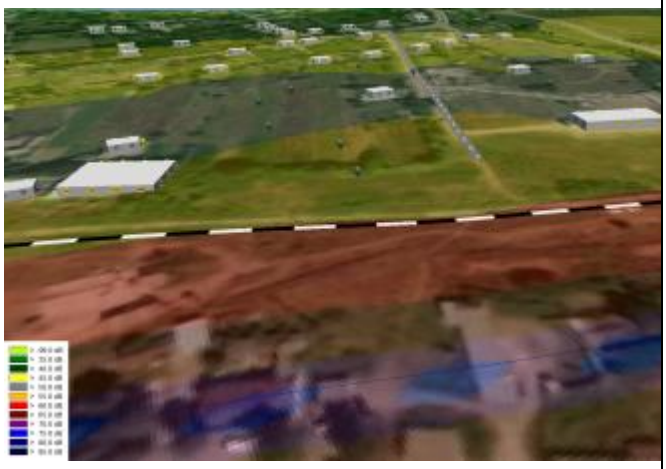
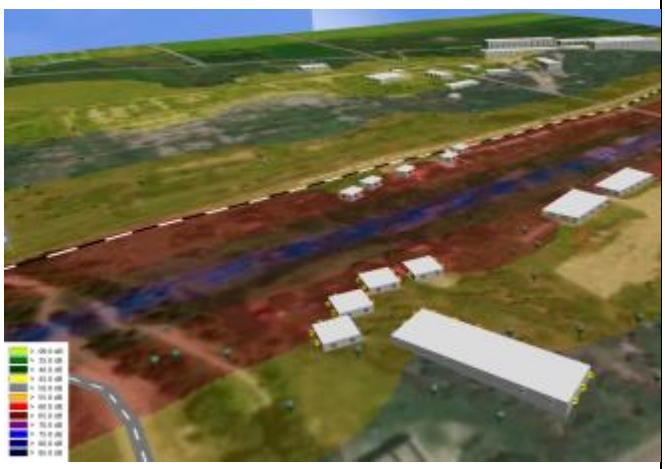
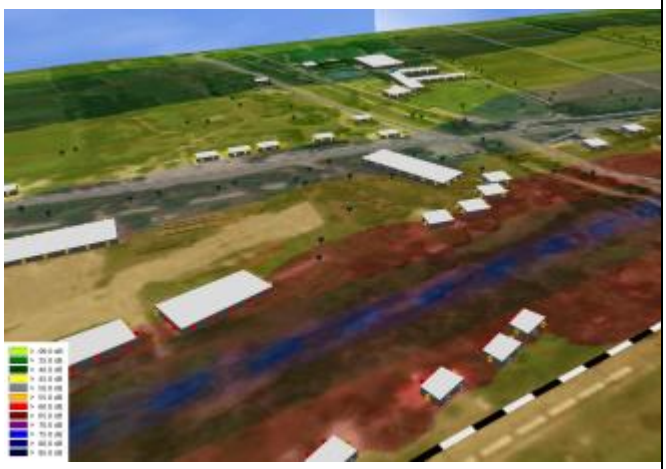
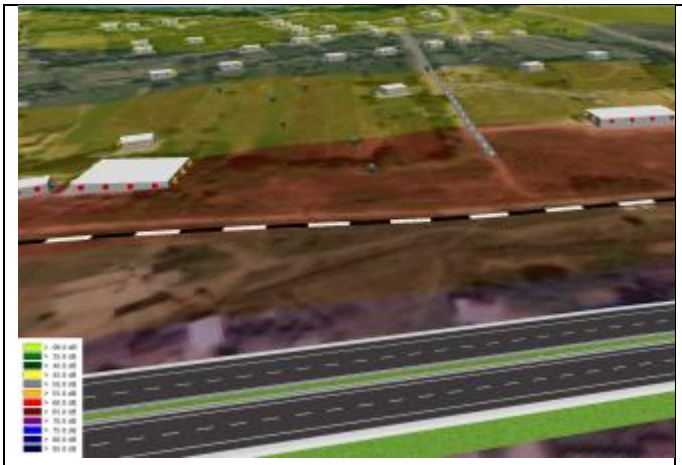
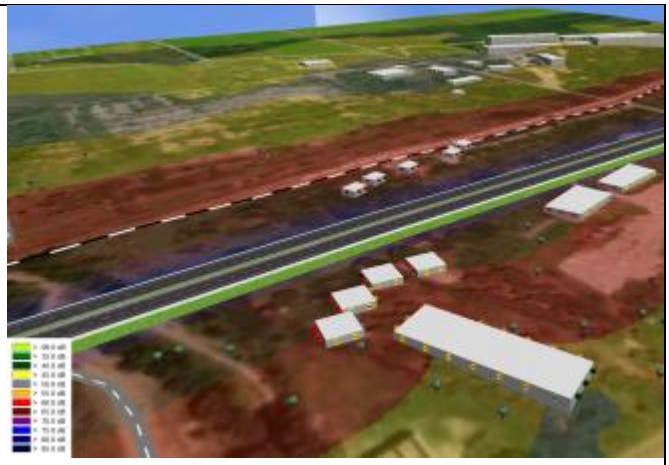
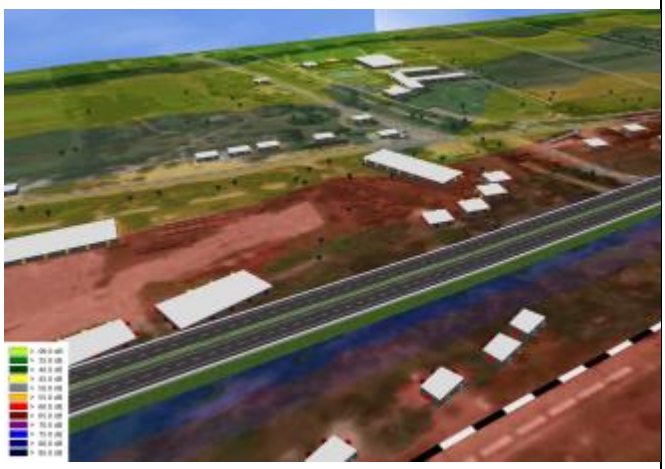
	
Construction Scenario -2	**Construction Scenario -3**
	
Operation Scenario 2020 -1	**Operation Scenario 2020 -2**



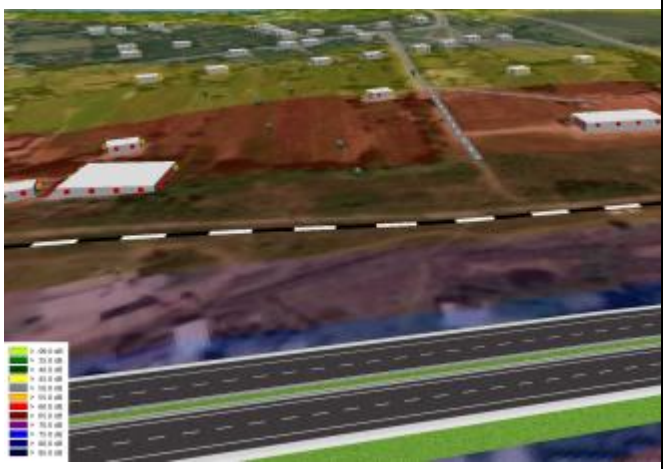
Operation Scenario 2020 -3



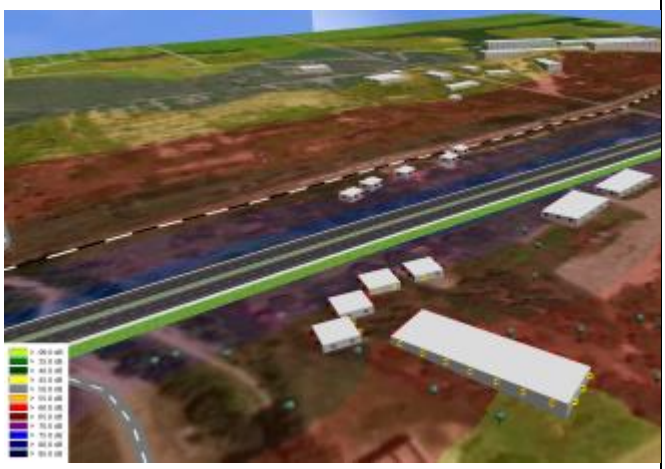
Operation Scenario 2030 -1



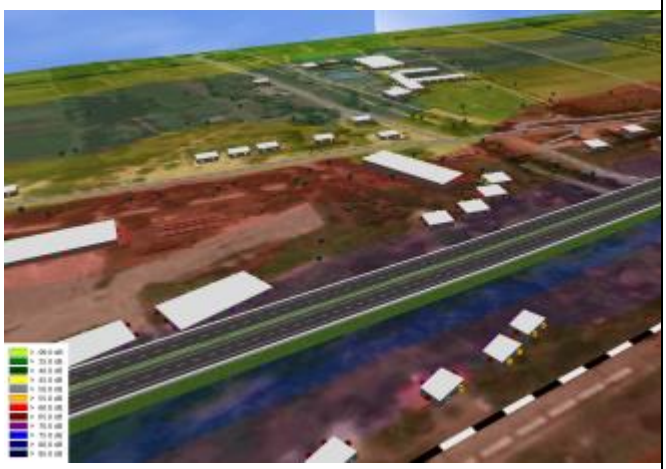
Operation Scenario 2030 -2



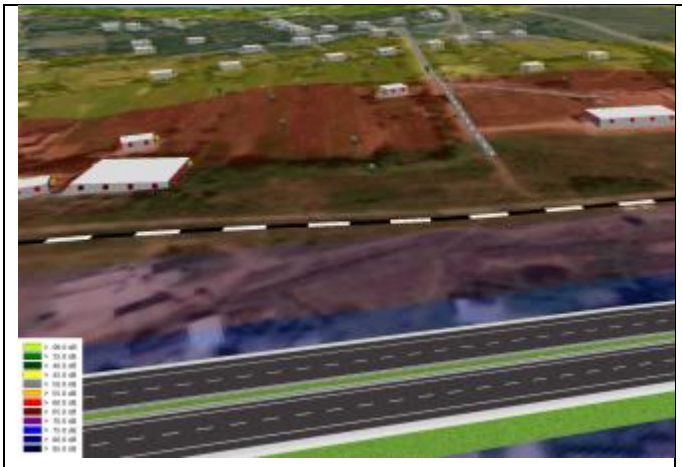
Operation Scenario 2030 -3

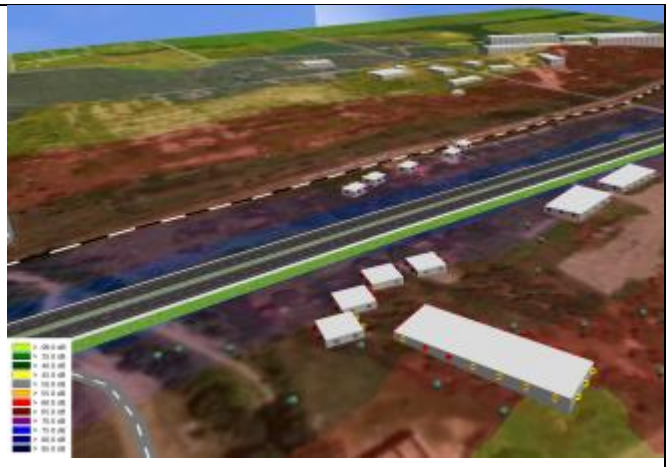


Operation Scenario 2040 -1



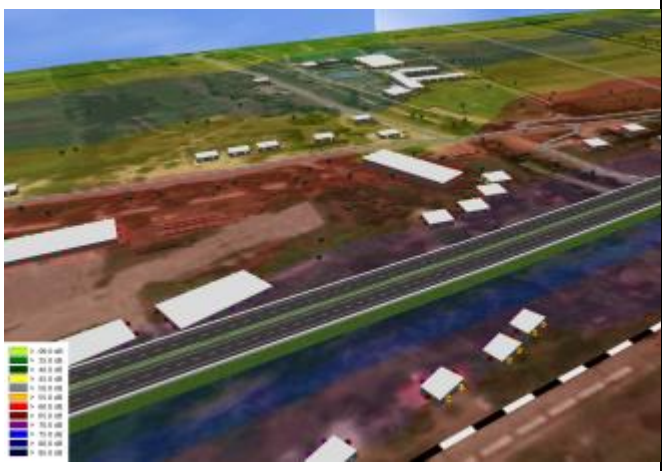
Operation Scenario 2040 -2

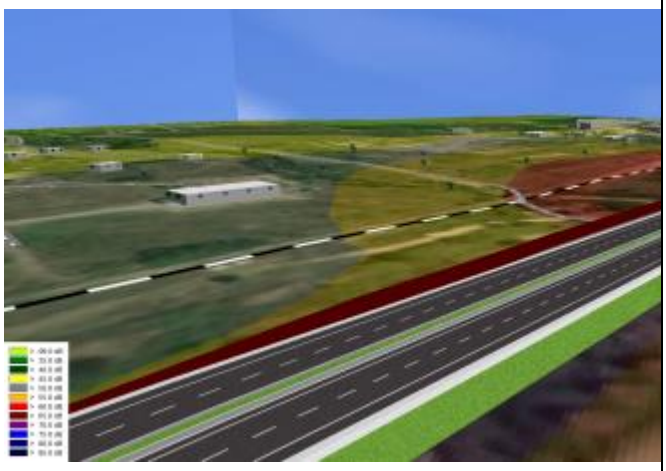




Operation Scenario 2040 -3

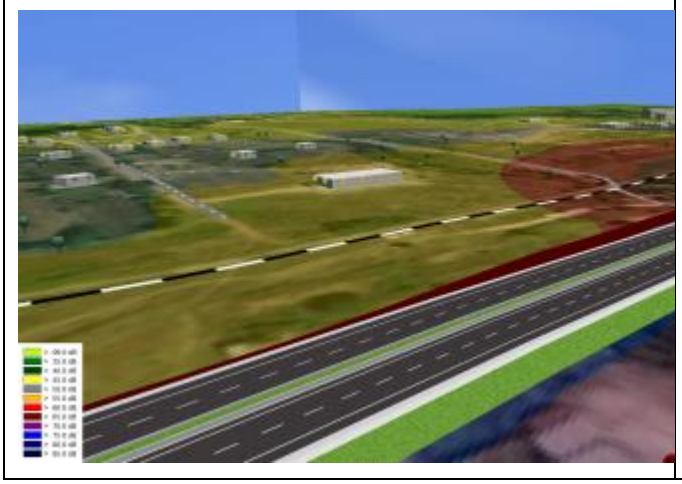
Barriers - Operation Scenario - 2020

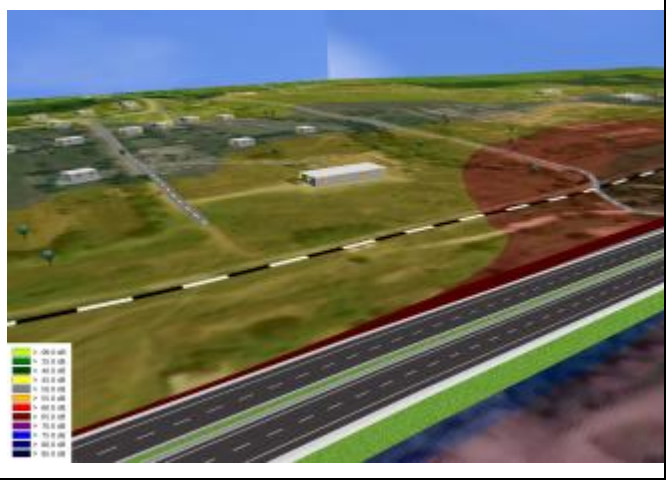


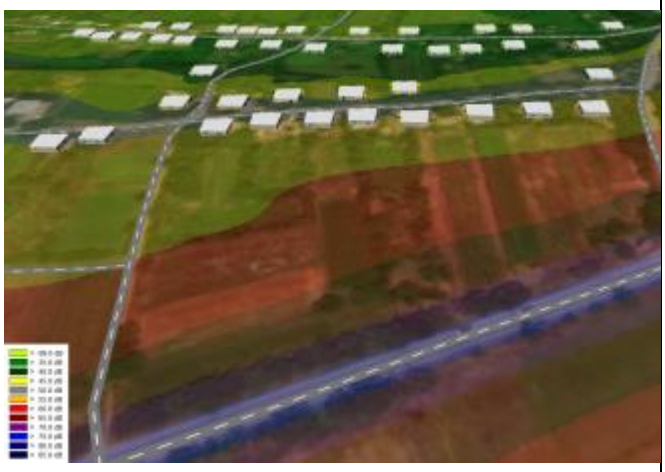
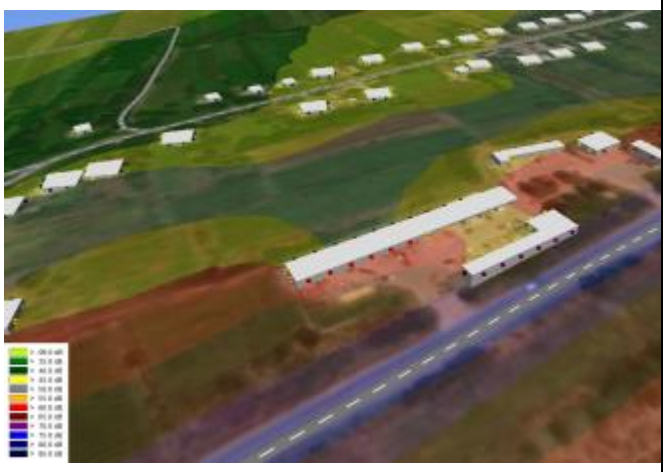
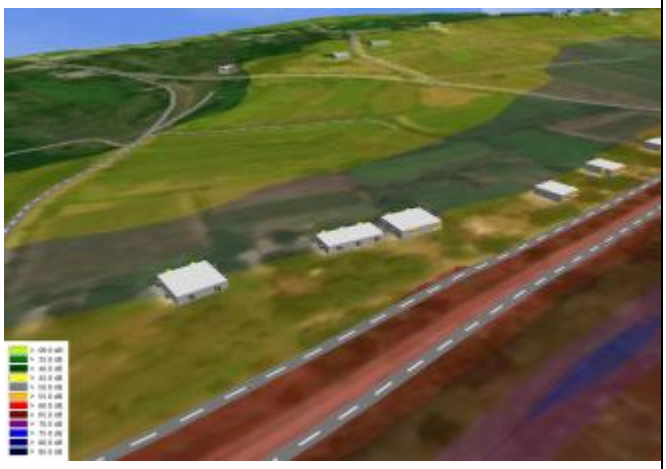
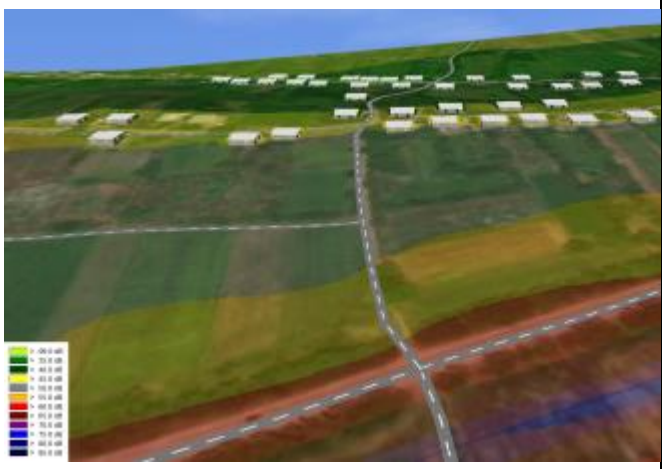
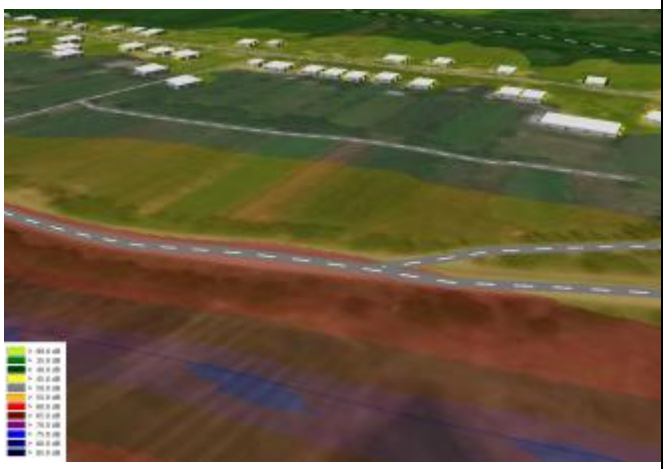


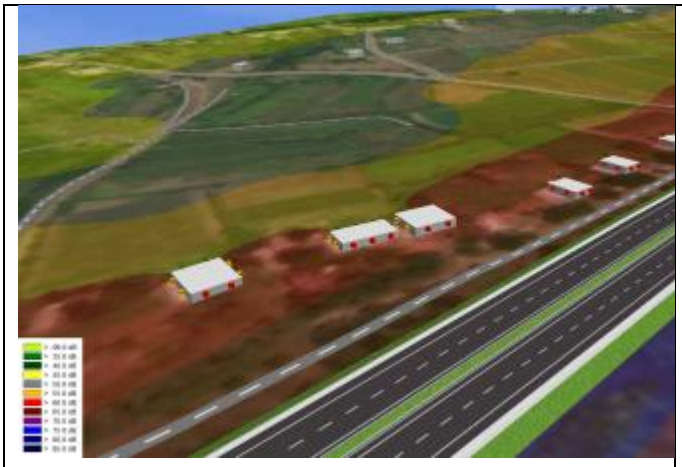
Barriers - Operation Scenario - 2030

Barriers - Operation Scenario - 2040

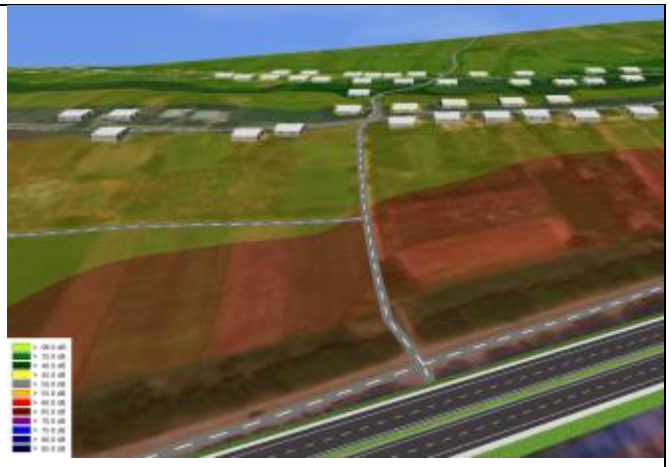




Chalaubani 1	
Current Scenario - 1	**Current Scenario - 2**
	
Current Scenario - 3	**Construction Scenario -1**
	
Construction Scenario -2	**Construction Scenario -3**
	
Operation Scenario 2020 -1	**Operation Scenario 2020 -2**

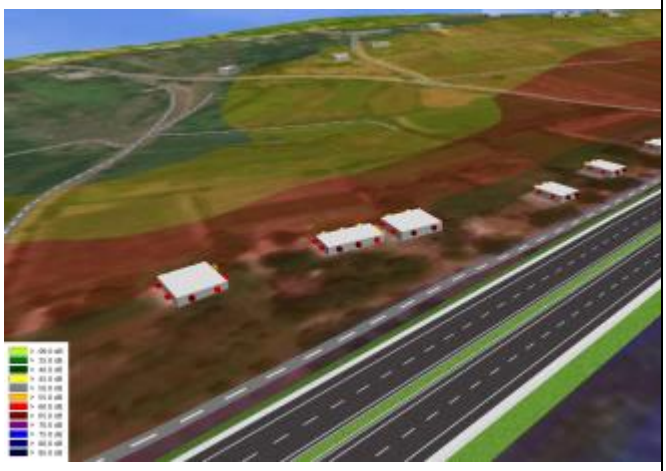


Operation Scenario 2020 -3

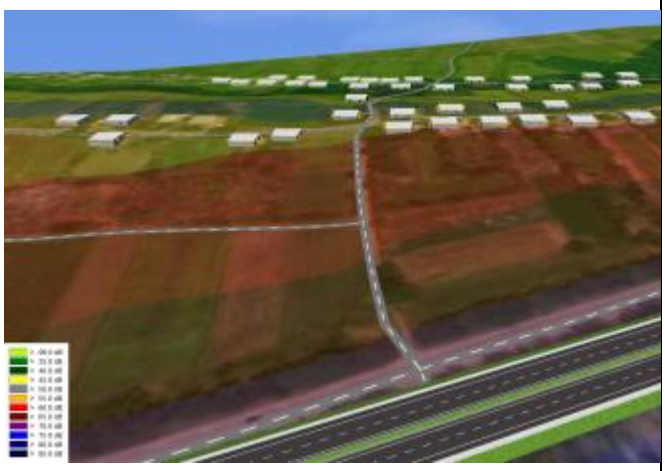


Operation Scenario 2030 -1

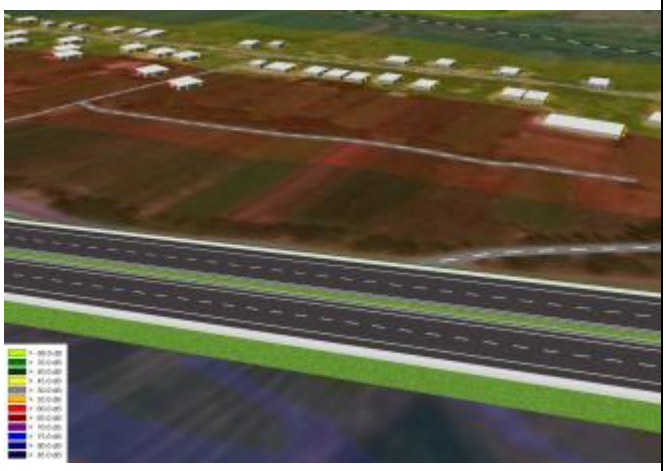
Operation Scenario 2030 -2



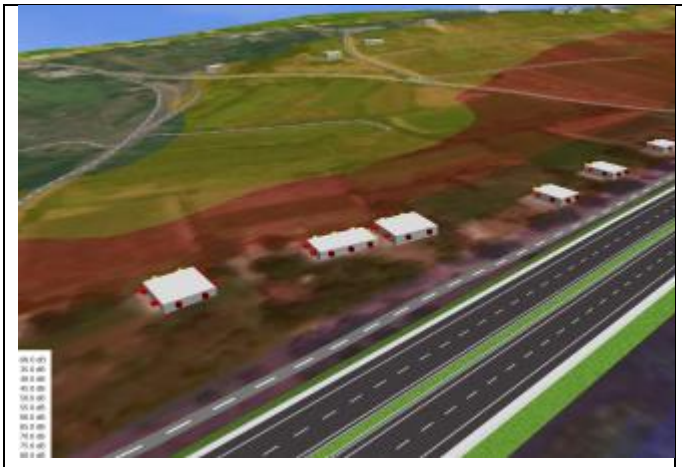
Operation Scenario 2030 -3

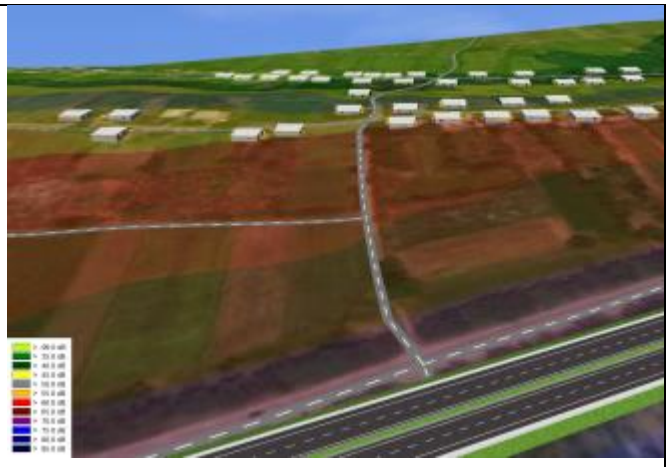


Operation Scenario 2040 -1



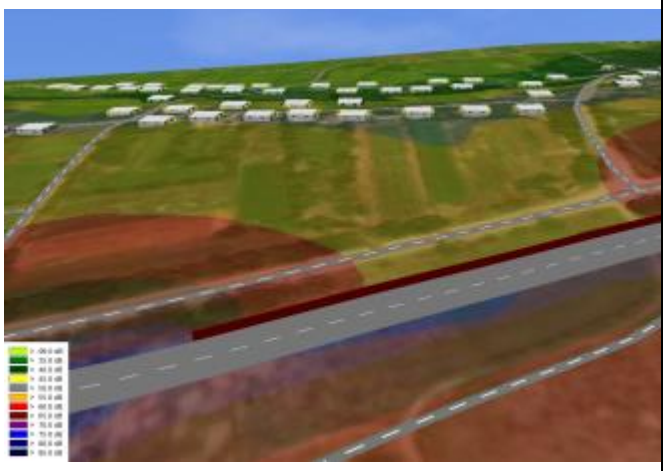
Operation Scenario 2040 -2



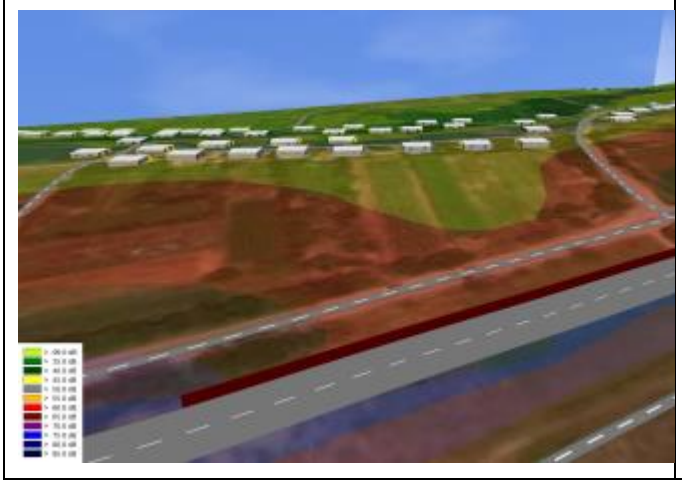


Operation Scenario 2040 -3

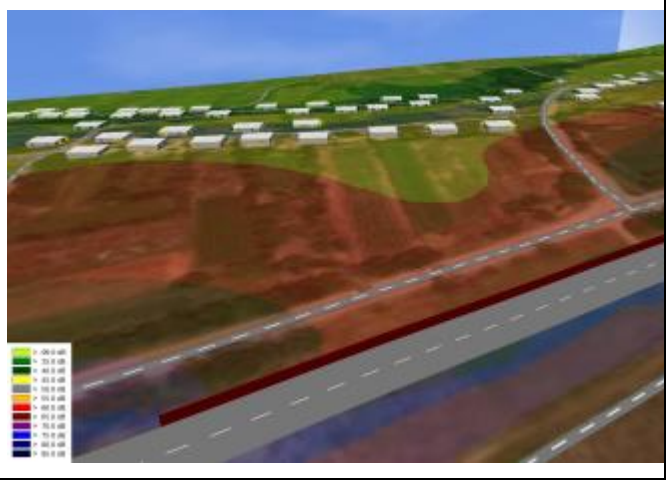
Barriers - Operation Scenario - 2020

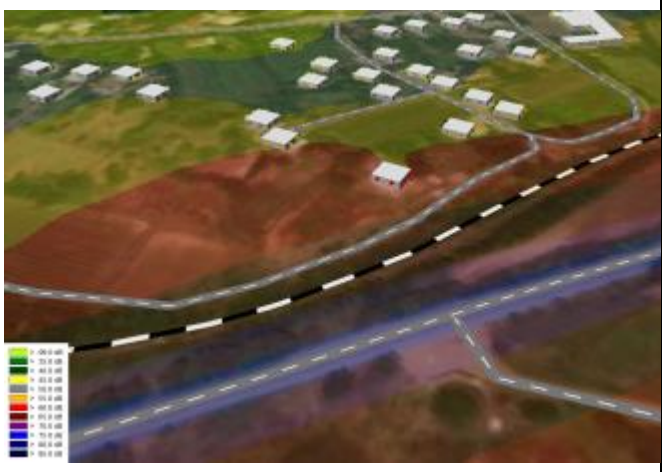
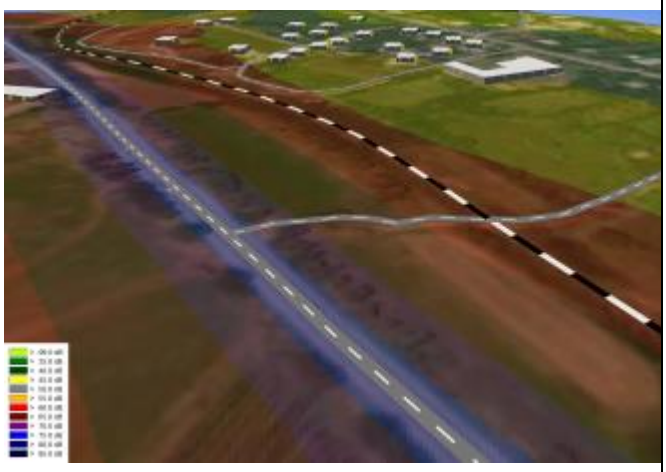
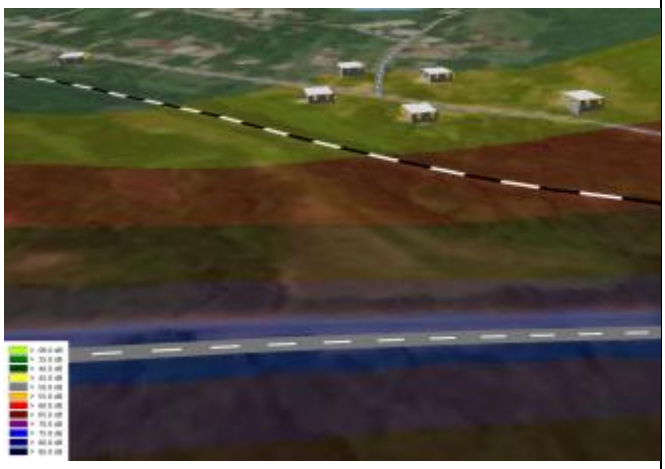
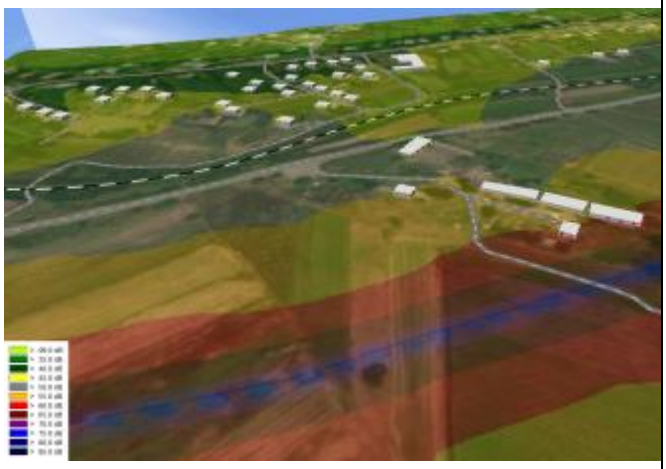
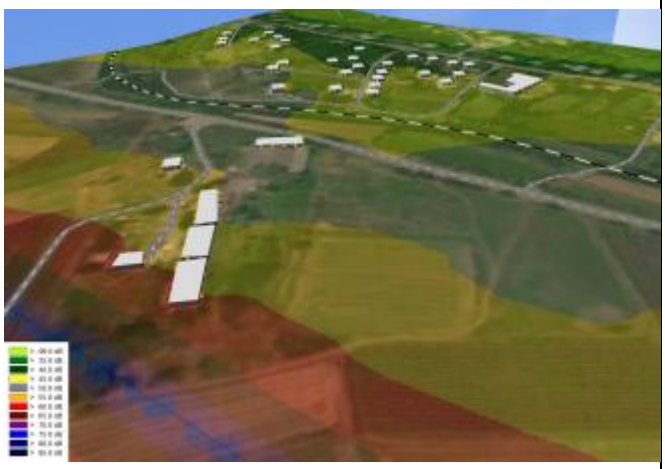
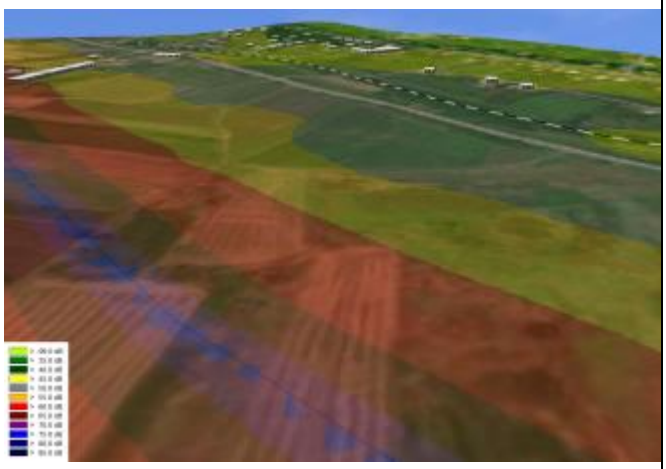


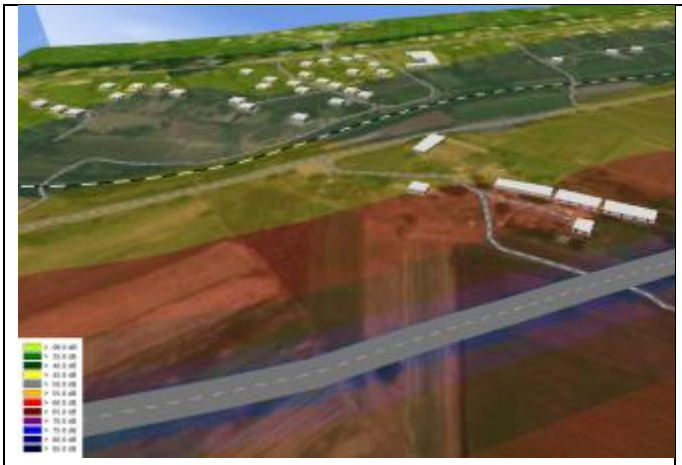
Barriers - Operation Scenario - 2030



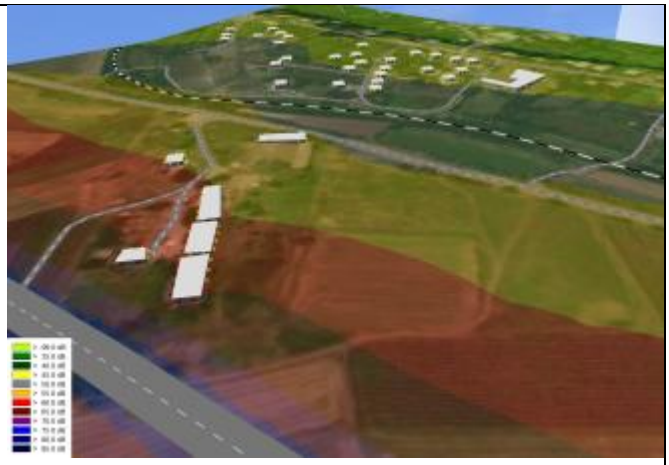
Barriers - Operation Scenario - 2040



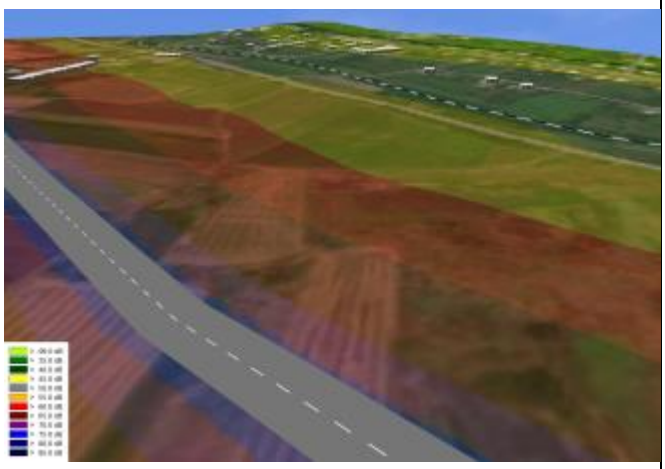
Chalaubani 2	
Current Scenario - 1	**Current Scenario - 2**
	
Current Scenario - 3	**Construction Scenario -1**
	
Construction Scenario -2	**Construction Scenario -3**
	
Operation Scenario 2020 -1	**Operation Scenario 2020 -2**



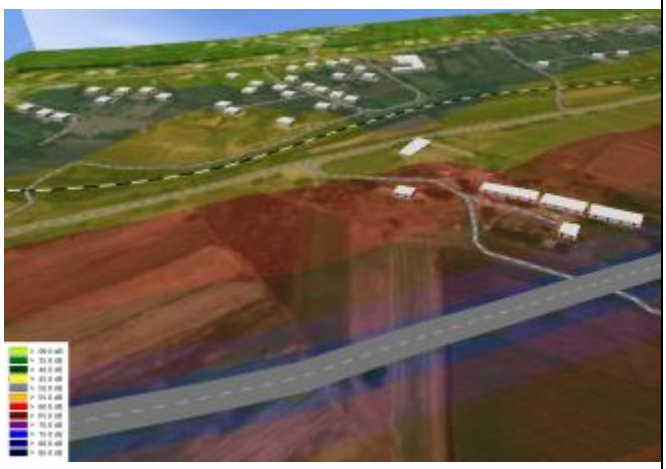
Operation Scenario 2020 -3



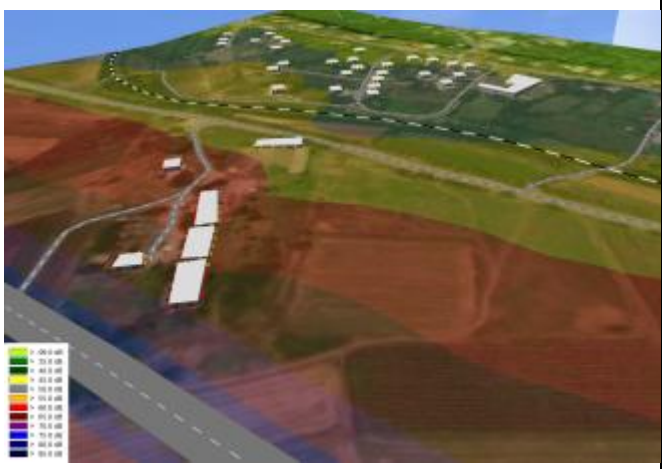
Operation Scenario 2030 -1



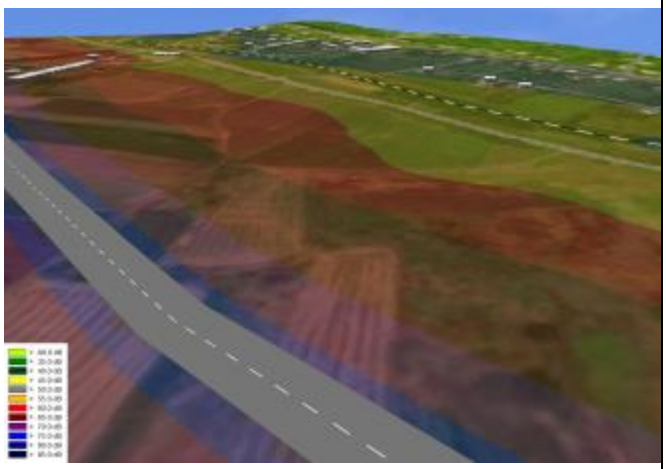
Operation Scenario 2030 -2



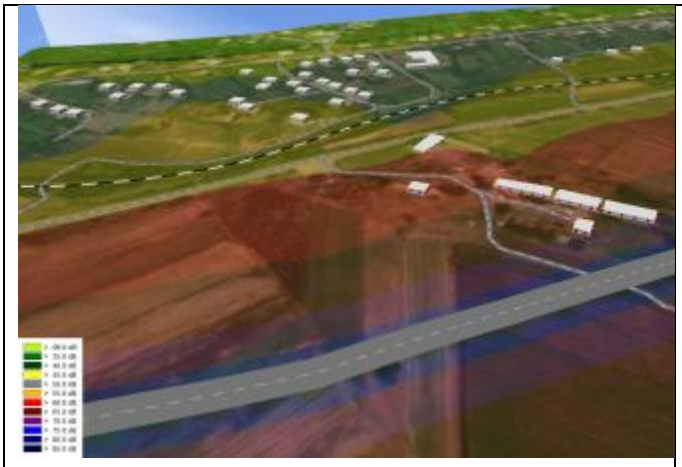
Operation Scenario 2030 -3

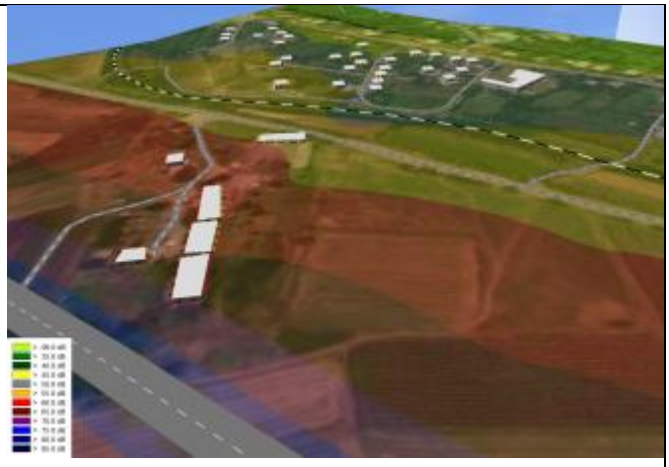


Operation Scenario 2040 -1



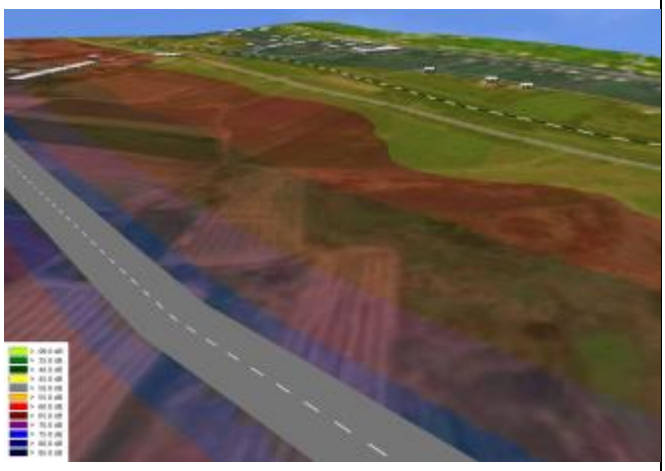
Operation Scenario 2040 -2

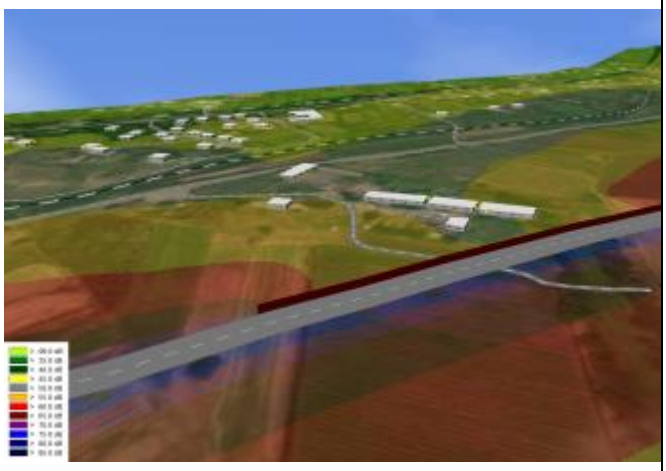




Operation Scenario 2040 -3

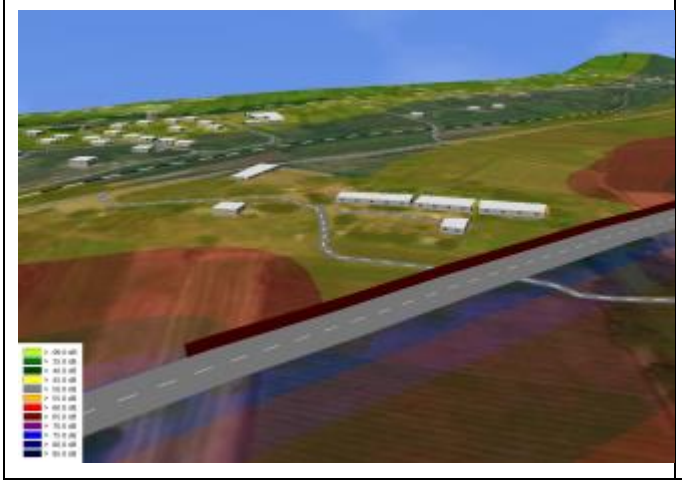
Barriers - Operation Scenario - 2020

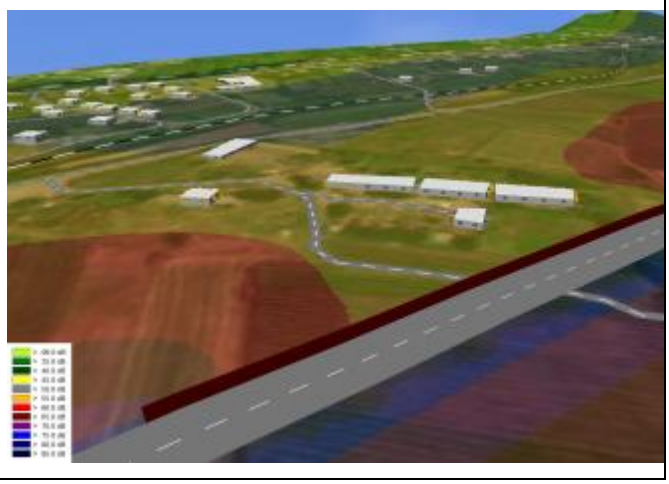


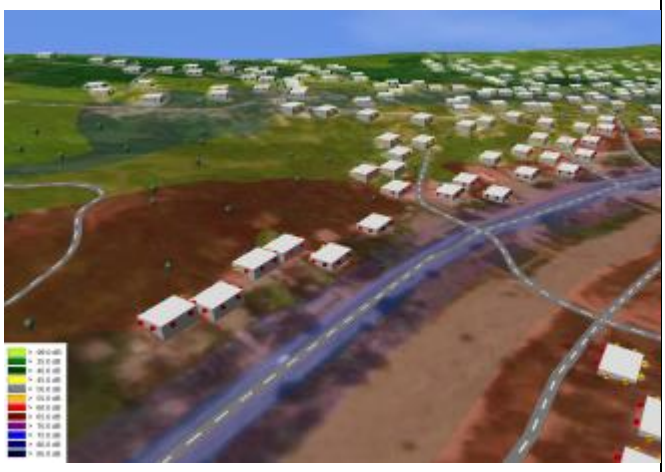
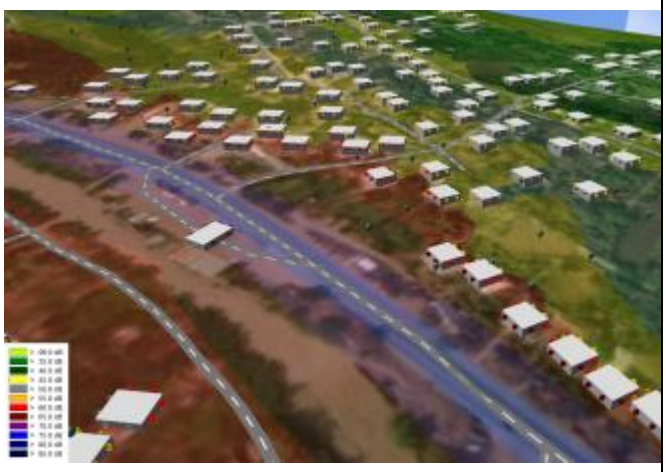
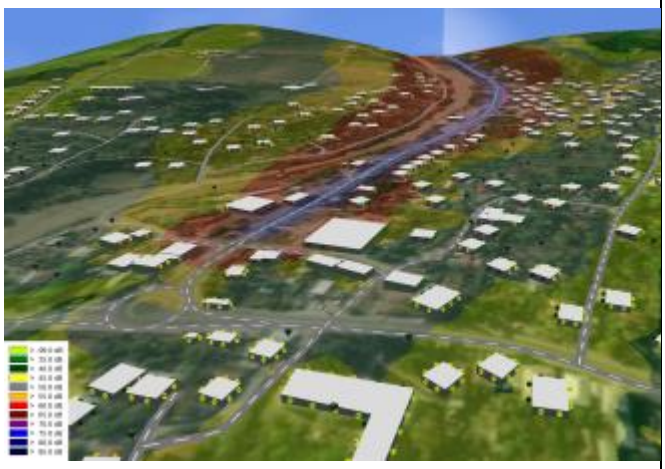
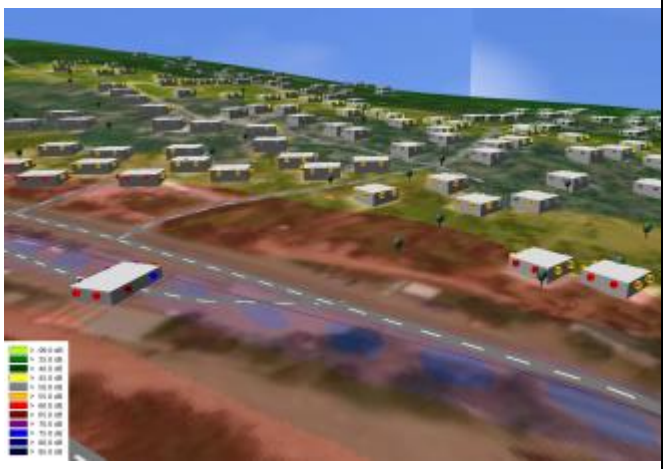
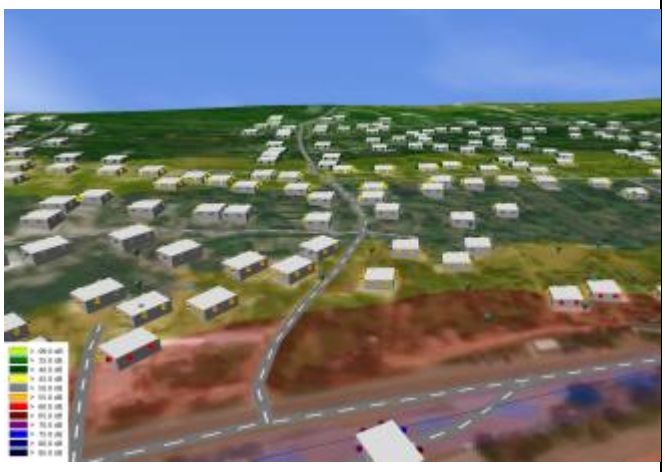
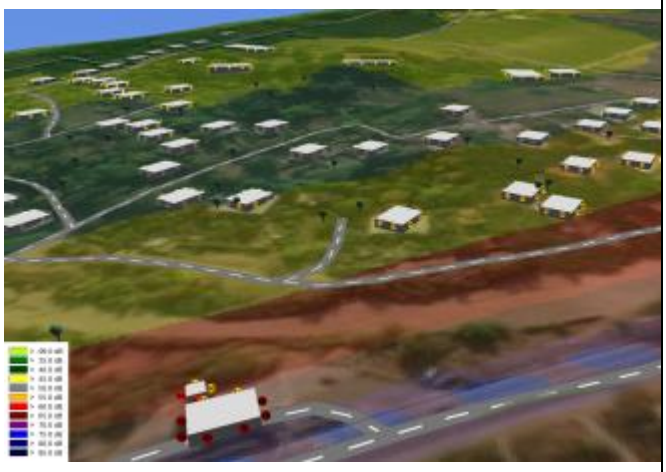


Barriers - Operation Scenario - 2030

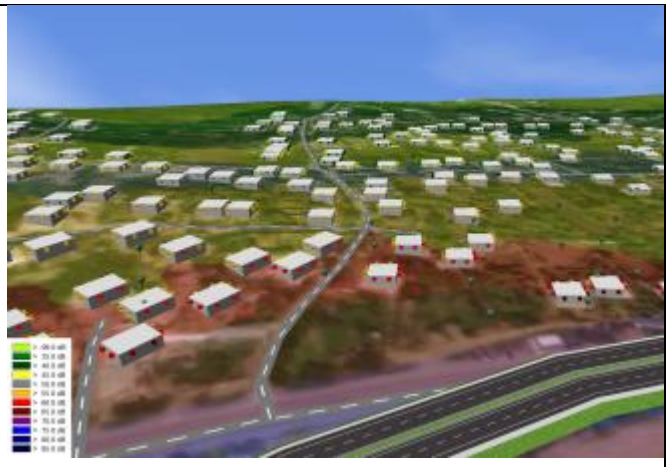
Barriers - Operation Scenario - 2040



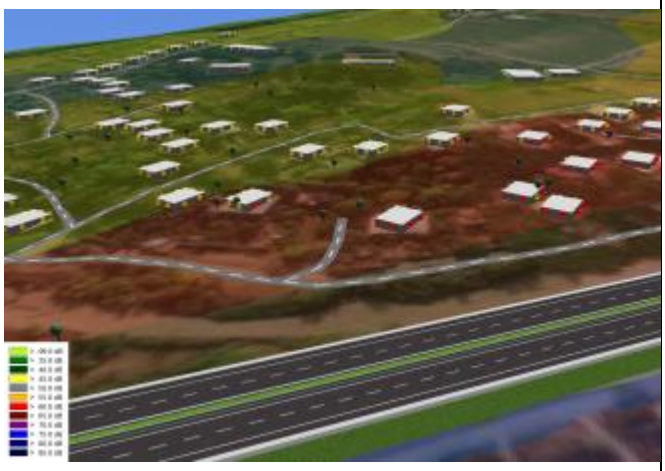


Bakurtsikhe	
Current Scenario - 1	**Current Scenario - 2**
	
Current Scenario - 3	**Construction Scenario -1**
	
Construction Scenario -2	**Construction Scenario -3**
	
Operation Scenario 2020 -1	**Operation Scenario 2020 -2**

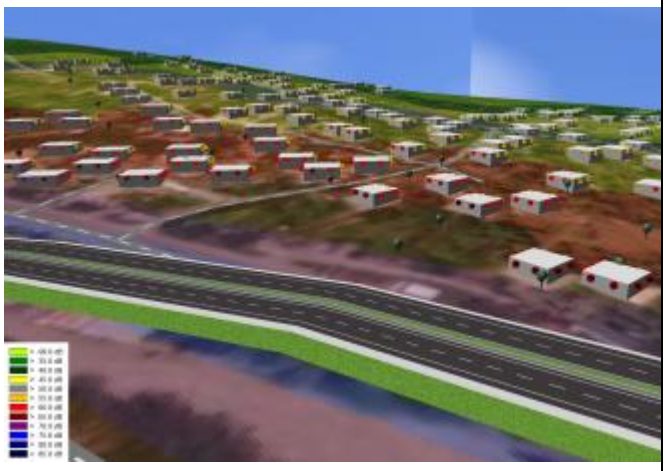
Operation Scenario 2020 -3



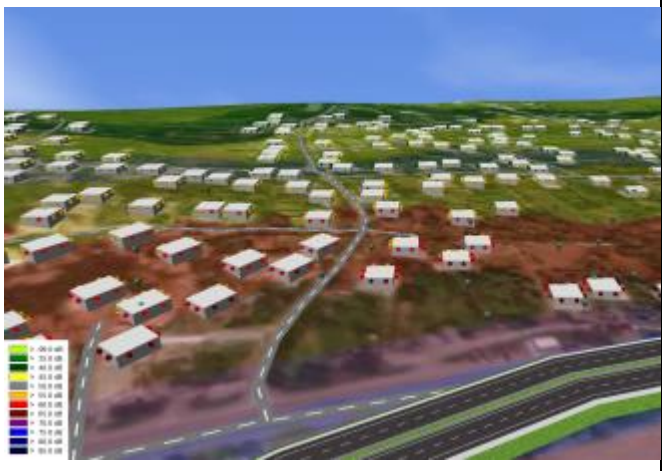
Operation Scenario 2030 -1



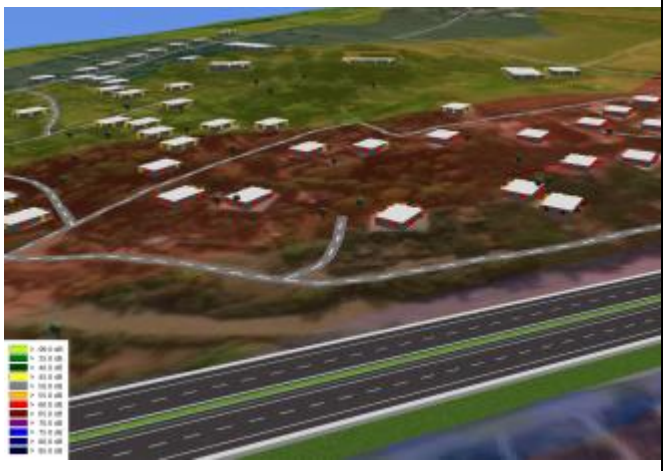
Operation Scenario 2030 -2



Operation Scenario 2030 -3

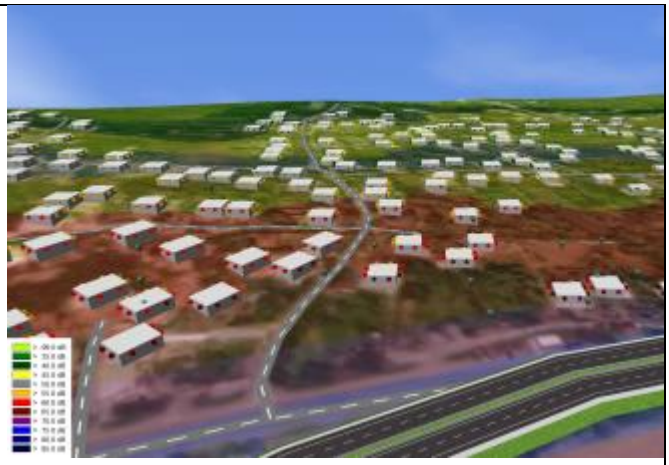


Operation Scenario 2040 -1

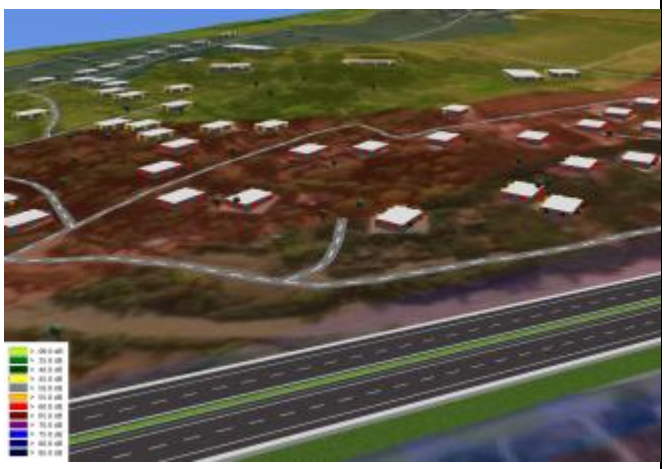


Operation Scenario 2040 -2

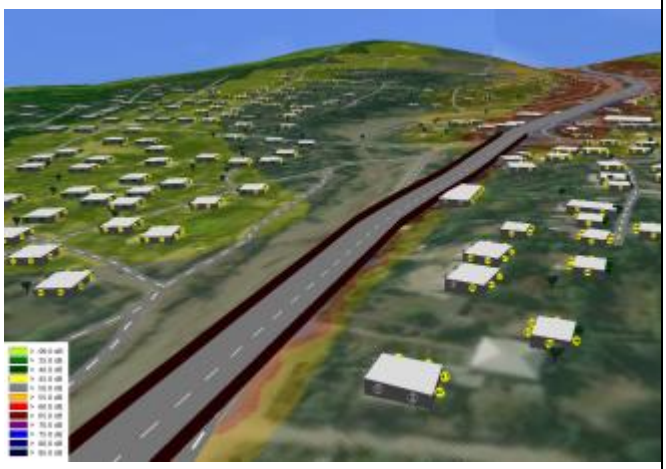
Operation Scenario 2040 -3



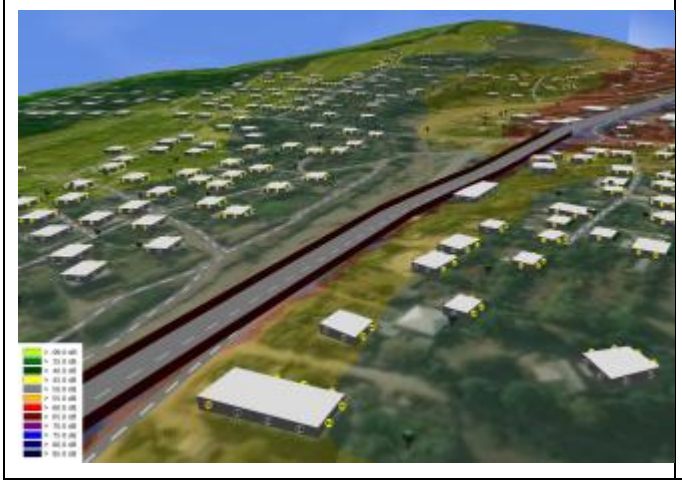
Barriers and 80 km/h- Operation Scenario - 2020

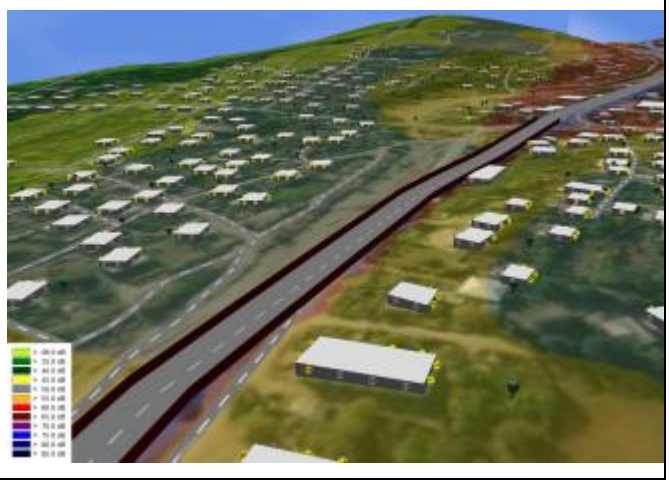


Barriers and 80 km/h- Operation Scenario - 2030



Barriers and 80 km/h- Operation Scenario - 2040





11.3 Minutes of Public Consultations

11.3.1 Public consultation in Badiauri

Ministry of Regional Development and Infrastructure of Georgia

Roads Department of Georgia

Minutes of Public Consultation Meeting held at Gurjaani and Sagarejo Municipalities on

Environmental Impact Assessment for construction and operation of Lot 2 of Tbilisi-Bakurtsikhe section (East part of Sagarejo-Bakurtsikhe) of Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan border (ს5) international road

Village Badiauri

Public consultation related to the review of Environmental Impact Assessment for construction and operation of Tbilisi-Bakurtsikhe section (Lot 2) (East part of Sagarejo-Bakurtsikhe) of Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan border (ს5) international road of Roads Department of Georgia was held on June 14, 2021 at the administrative building of Badiauri village of Sagarejo Municipality.

The representatives of the Municipality, Roads Department, Ltd "Eco-Spectri", Ministry of Environmental Protection and Agriculture of Georgia and local community interested in the project, attended the meeting.

The meeting was opened by ------ Second Category Senior Specialist of the Environmental Impact Assessment Department of the Ministry of Environmental Protection and Agriculture of Georgia

At the meeting, the representative of the Ministry introduced the agenda of the public discussion (the sequence of presentation and question-answer mode), the subject of the discussion. He also spoke about the environmental impact assessment procedure and its importance in the environmental decision-making process in accordance with the relevant legislation. He also noted that Roads Department of Georgia is the project implementing entity and Eco-Spectri Ltd has prepared the Environmental Impact Assessment.

Based on the EIA report, the representative of Eco-Spectri Ltd made a presentation on the important aspects of the project for the audience and noted that the project area is located in Sagarejo and Gurjaani municipalities. The total length of the project road is about 49 km, which is divided into two sections: E and F sections.

The project road starts at KP 35 + 500 (from the last point of the Tbilisi-Tokhliauri road), the corridor at KP 52 + 540 will pass new Badiauri road interchange, then at KP 75 + 100 - Chalaubani new interchange. The alignment then crosses the relatively difficult terrain of the Gombori Range and ends in the village of Bakurtsikhe, at KP 84+217.05

According to the design, four alternative options are being considered for the first Tokhliauri-Badiauri (E) section, which includes northern corridor (E1, E2) and southern corridor (E3, E4) alternatives. Given the assessment of the alternative corridor and less impact on environmental and social issues, priority was given to E4 alternative corridor, which mainly goes to the south and bypasses sensitive areas;

According to the design, 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 shoulders. Total width of each way of the road is 11.0m, and there is the 3.0m wide central reserve between the ways. Width of road on each bridge structure is 11.0m. On bridges, roads have 1.3m wide pedestrian walkways on one side. Pedestrian walkways and utility galleries are separated from road paving with protective barrier. Distance between parallel structures of bridges is 3.0m.

Based on the EIA report, the following are the main interchanges of the project road: Badiauri interchange KP 51+783, Kachreti interchange KP 63+891, Chalaubani interchange KP 74+300 and Bakurtsikhe Interchange KP 82+560.

Representative of Eco-Spectri Ltd noted that according to the environmental impact assessment report, the project area was surveyed. As a result of the conducted research-works, types, sources and objects of the expected main impacts on the environment and human health were identified, based on which the expected positive and adverse impacts of the project and their mitigation measures were presented and explained in details to the attendees.

The question related to the resettlement and compensatory measures was raised by the attending society, whereon the representative of the Ministry of Environment Protection and Agriculture of Georgia clarified that the public discussion did not concern the resettlement and related procedures. However, the representative of Roads Department of Georgia noted that in addition to resettlement and compensatory measures, individual meetings will be held with the local population. The community attending the public discussion did not have any comments in relation to the project.

I, ------ Second Category Senior Specialist of the Environmental Impact Assessment Department of the Ministry of Environmental Protection and Agriculture of Georgia have drawn up a Minutes and confirm its authenticity by signature.

18 June 2021

11.3.2 Public consultation in Bakurtsikhe

Ministry of Regional Development and Infrastructure of Georgia

Roads Department of Georgia

Minutes of Public Consultation Meeting held at Gurjaani and Sagarejo Municipalities on Environmental Impact Assessment for construction and operation of Lot 2 of Tbilisi-Bakurtsikhe section (East part of Sagarejo-Bakurtsikhe) of Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan border (ს5) international road

Village Bakurtsikhe

Public consultation related to the review of Environmental Impact Assessment for construction and operation of Tbilisi-Bakurtsikhe section (Lot 2) (East part of Sagarejo-Bakurtsikhe) of Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan border (ს5) international road of Roads Department of Georgia was held on June 15, 2021 at the administrative building of Bakurtsikhe village of Gurjaani Municipality.

The representatives of the Municipality, Roads Department, Ltd "Eco-Spectri", Ministry of Environmental Protection and Agriculture of Georgia and local community interested in the project, attended the meeting.

The meeting was opened by ------ Second Category Senior Specialist of the Environmental Impact Assessment Department of the Ministry of Environmental Protection and Agriculture of Georgia

At the meeting, the representative of the Ministry introduced the agenda of the public discussion (the sequence of presentation and question-answer mode), the subject of the discussion. He also spoke about the environmental impact assessment procedure and its importance in the environmental decision-making process in accordance with the relevant legislation. He also noted that Roads Department of Georgia is the project implementing entity and Eco-Spectri Ltd has prepared the Environmental Impact Assessment.

Based on the EIA report, the representative of Eco-Spectri Ltd made a presentation on the important aspects of the project for the audience and noted that the project area is located in Sagarejo and Gurjaani municipalities. The total length of the project road is about 49 km, which is divided into two sections: E and F sections.

The project road starts at KP 35 + 500 (from the last point of the Tbilisi-Tokhliauri road), the corridor at KP 52 + 540 will pass new Badiauri road interchange, then at KP 75 + 100 - Chalaubani new interchange. The alignment then crosses the relatively difficult terrain of the Gombori Range and ends in the village of Bakurtsikhe, at KP 84+217.05

According to the design, three alternative options are being considered for the second Chalaubani-Bakurtsikhe (F) section; Based on the comparative analysis (F1; F2; F3), priority was given to F1 alternative alignment. It will pass in the better terrain conditions and compared to other options, there is less risk of impact on the geological environment and generation of spoil material. It is noteworthy that F1 alignment follows the river valley and is designed to deviate as much as possible from the existing road in order to minimize traffic delays on the highway and the avoid the need for traffic flow active management during construction. Accordingly, the main advantage of the selected alternative is less impact on the sensitive receptors of the natural environment (geological environment, biodiversity) presented in these sections.

According to the design, 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 shoulders. Total width of each way of the road is 11.0m, and there is the 3.0m wide central reserve between the ways. Width of road on each bridge structure is 11.0m. On bridges, roads have 1.3m wide pedestrian walkways on one side. Pedestrian walkways and utility galleries are separated from road paving with protective barrier. Distance between parallel structures of bridges is 3.0m.

Based on the EIA report, the following are the main interchanges of the project road: Badiauri interchange KP 51+783, Kachreti interchange KP 63+891, Chalaubani interchange KP 74+300 and Bakurtsikhe Interchange KP 82+560.

Project road corridor crosses a number of surface water bodies. The main ones are the Riv. Chailuri, riv. Lakbe and riv. Chalaubniskhevi. Total of 6 bridges will be constructed in these areas (one over the river Chailuri and one over the river Lakbe, while 4 bridges will be constructed over the river Chalaubniskhevi). According to the design, it is

planned to arrange 1 hydraulic bridge at KP40+674.49-40+735.74, which will be 61 m long and 29.10 wide. At KP67+928.500-67+961.500 33 m. long hydraulic bridges will be constructed over the river Lakbe, width of which is 29.10 m, while 198 m long and 26.60 m. wide bridge over the river Chalaubniskhevi will be constructed at KP 78+865.00-79+063.00; 210 m long and 26.60 m wide bridge at KP 79+355.00-79+565.00; 230 m. long and 26.60 m wide bridge at KP 80+035.00-80+256.00; 99 m long and 30.10 wide hydraulic bridge at KP 81+377.38-81+467.38. Total of 35 structures (including hydraulic bridges, overpasses and other) are planned to build on the project highway and secondary roads connected to it. 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. Gabion type protective measures are considered for protection of the bridge foundation, while the rip-rap or gabions will be used in the ravines, taking into account the river and ravine runoffs.

Representative of Eco-Spectri Ltd noted that according to the environmental impact assessment report, the project area was surveyed. As a result of the conducted research-works, types, sources and objects of the main impacts expected on the environment and human health were identified, based on which the expected positive and adverse impacts of the project and their mitigation measures were presented and explained in details to the attendees.

The question related to the resettlement and compensatory measures was raised by the attending society, whereon the representative of the Ministry of Environment Protection and Agriculture of Georgia clarified that the public discussion did not concern the resettlement and related procedures. However, the representative of Roads Department of Georgia noted that in addition to resettlement and compensatory measures, individual meetings will be held with the local population.

The community attending the public discussion did not have any comments in relation to the project.

I, ------ Second Category Senior Specialist of the Environmental Impact Assessment Department of the Ministry of Environmental Protection and Agriculture of Georgia have drawn up the Minutes and confirm its authenticity by signature.

21 June, 2021

11.3.3 Public consultation in Chalaubani

Ministry of Regional Development and Infrastructure of Georgia

Roads Department of Georgia

Minutes of Public Consultation Meeting held at Gurjaani and Sagarejo Municipalities on

Environmental Impact Assessment for construction and operation of Lot 2 of Tbilisi-Bakurtsikhe section (East part of Sagarejo-Bakurtsikhe) of Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan border (ს5) international road

Village Chalaubani

Public consultation related to the review of Environmental Impact Assessment for construction and operation of Tbilisi-Bakurtsikhe section (Lot 2) (East part of Sagarejo-Bakurtsikhe) of Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan border (ს5) international road of Roads Department of Georgia was held on June 16, 2021 at the administrative building of Chalaubani village of Gurjaani Municipality.

The representatives of the Municipality, Roads Department, Ltd "Eco-Spectri", Ministry of Environmental Protection and Agriculture of Georgia and local community interested in the project, attended the meeting.

The meeting was opened by ------ Second Category Senior Specialist of the Environmental Impact Assessment Department of the Ministry of Environmental Protection and Agriculture of Georgia

At the meeting, the representative of the Ministry introduced the agenda of the public discussion (the sequence of presentation and question-answer mode), the subject of the discussion. He also spoke about the environmental impact assessment procedure and its importance in the environmental decision-making process in accordance with the relevant legislation. He also noted that Roads Department of Georgia is the project implementing entity and Eco-Spectri Ltd has prepared the Environmental Impact Assessment.

Based on the EIA report, the representative of Eco-Spectri Ltd made a presentation on the important aspects of the project for the audience and noted that the project area is located in Sagarejo and Gurjaani municipalities. The total length of the project road is about 49 km, which is divided into two sections: E and F sections.

The project road starts at KP 35 + 500 (from the last point of the Tbilisi-Tokhliauri road), the corridor at KP 52 + 540 will pass new Badiauri road interchange, then at KP 75 + 100 - Chalaubani new interchange. The alignment then crosses the relatively difficult terrain of the Gombori Range and ends in the village of Bakurtsikhe, at KP 84+217.05

Three alternative options are being considered for the second Chalaubani-Bakurtsikhe (F) section; Based on the comparative analysis (F1; F2; F3), priority was given to F1 alternative alignment. It will pass in the better terrain conditions and compared to other options, there is less risk of impact on the geological environment and generation of spoil material. It is noteworthy that F1 alignment follows the river valley and is designed to deviate as much as possible from the existing road in order to minimize traffic delays on the highway and the need for traffic flow active management during construction. Accordingly, the main advantage of the selected alternative is less impact on the sensitive receptors of the natural environment (geological environment, biodiversity) presented in these sections.

According to the design, 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 shoulders. Total width of each way of the road is 11.0m, and there is the 3.0m wide central reserve between the ways. Width of road on each bridge structure is 11.0m. On bridges, roads have 1.3m wide pedestrian walkways on one side. Pedestrian walkways and utility galleries are separated from road paving with protective barrier. Distance between parallel structures of bridges is 3.0m.

Based on the EIA report, the following are the main interchanges of the project road: Badiauri interchange KP 51+783, Kachreti interchange KP 63+891, Chalaubani interchange KP 74+300 and Bakurtsikhe Interchange KP 82+560.

Representative of Eco-Spectri Ltd noted that according to the environmental impact assessment report, the project area was surveyed. As a result of the conducted research-works, types, sources and objects of the main impacts expected on the environment and human health were identified, based on which the expected positive and adverse

impacts of the project and their mitigation measures were presented and explained in details to the attendees. The community attending the public discussion did not have any comments in relation to the project.

I, ------ Second Category Senior Specialist of the Environmental Impact Assessment Department of the Ministry of Environmental Protection and Agriculture of Georgia have drawn up a Minutes and confirm its authenticity by signature.

22 June, 2021

11.3.4 Public consultation in Giorgitsminda

Ministry of Regional Development and Infrastructure of Georgia

Roads Department of Georgia

Minutes of Public Consultation Meeting held at Gurjaani and Sagarejo Municipalities on

Environmental Impact Assessment for construction and operation of Lot 2 of Tbilisi-Bakurtsikhe section (East part of Sagarejo-Bakurtsikhe) of Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan border (ს5) international road

Village Giorgitsminda

Public consultation related to the review of Environmental Impact Assessment for construction and operation of Tbilisi-Bakurtsikhe section (Lot 2) (East part of Sagarejo-Bakurtsikhe) of Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan border (ს5) international road of Roads Department of Georgia was held on June 14, 2021 at the administrative building of Giorgitsminda village of Sagarejo Municipality.

The representatives of the Municipality, Roads Department, Ltd "Eco-Spectri", Ministry of Environmental Protection and Agriculture of Georgia, Vetsanhig-Ecology Ltd and local community interested in the project, attended the meeting

The meeting was opened by ------ Second Category Senior Specialist of the Environmental Impact Assessment Department of the Ministry of Environmental Protection and Agriculture of Georgia

At the meeting, the representative of the Ministry introduced the agenda of the public discussion (the sequence of presentation and question-answer mode), the subject of the discussion. He also spoke about the environmental impact assessment procedure and its importance in the environmental decision-making process in accordance with the relevant legislation. He also noted that Roads Department of Georgia is the project implementing entity and Eco-Spectri Ltd has prepared the Environmental Impact Assessment.

Based on the EIA report, the representative of Eco-Spectri Ltd made a presentation on the important aspects of the project for the audience and noted that the project area is located in Sagarejo and Gurjaani municipalities. The total length of the project road is about 49 km, which is divided into two sections: E and F sections.

The project road starts at KP 35 + 500 (from the last point of the Tbilisi-Tokhliauri road), the corridor at KP 52 + 540 will pass new Badiauri road interchange, then at KP 75 + 100 - Chalaubani new interchange. The alignment then crosses the relatively difficult terrain of the Gombori Range and ends in the village of Bakurtsikhe, at KP 84+217.05

According to the design, four alternative options are being considered for the first Tokhliauri-Badiauri (E) section, which includes northern corridor (E1, E2) and southern corridor (E3, E4) alternatives. Given the assessment of the alternative corridor and less impact on environmental and social issues, priority was given to E 4 alternative corridor, which mainly goes to the south and bypasses sensitive areas;

According to the design, 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 shoulders. Total width of each way of the road is 11.0m, and there is the 3.0m wide central reserve between the ways. Width of road on each bridge structure is 11.0m. On bridges, roads have 1.3m wide pedestrian walkways on one side. Pedestrian walkways and utility galleries are separated from road paving with protective barrier. Distance between parallel structures of bridges is 3.0m.

Based on the EIA report, the following are the main interchanges of the project road: Badiauri interchange KP 51+783, Kachreti interchange KP 63+891, Chalaubani interchange KP 74+300 and Bakurtsikhe Interchange KP 82+560.

Representative of Eco-Spectri Ltd noted that according to the environmental impact assessment report, the project area was surveyed. As a result of the conducted research-works, types, sources and objects of the expected main impacts on the environment and human health were identified, based on which the expected positive and adverse impacts of the project and their mitigation measures were presented and explained in details to the attendees.

Due to the fact that the earthworks during the construction phase of the project road may lead to the spread of anthrax (bacillus antracis), representatives of Vetsanhig-Ecology Ltd expressed their position in relation to the prevention of the spread of anthrax during the construction and operation phase of the project road.

The question related to the resettlement and compensatory measures was raised by the attending society, whereon the representative of the Ministry of Environment Protection and Agriculture of Georgia clarified that the public discussion did not concern the resettlement and related procedures. However, the representative of Roads Department of Georgia noted that in addition to resettlement and compensatory measures, individual meetings will be held with the local population.

The community attending the public discussion did not have any comments in relation to the project.

I, ------ Second Category Senior Specialist of the Environmental Impact Assessment Department of the Ministry of Environmental Protection and Agriculture of Georgia have drawn up a Minutes and confirm its authenticity by signature.

18 June, 2021

11.3.5 Public consultation in Kachreti

Ministry of Regional Development and Infrastructure of Georgia

Roads Department of Georgia

Minutes of Public Consultation Meeting held at Gurjaani and Sagarejo Municipalities on

Environmental Impact Assessment for construction and operation of Lot 2 of Tbilisi-Bakurtsikhe section (East part of Sagarejo-Bakurtsikhe) of Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan border (ს5) international road

Village Kachreti

Public consultation related to the review of Environmental Impact Assessment for construction and operation of Tbilisi-Bakurtsikhe section (Lot 2) (East part of Sagarejo-Bakurtsikhe) of Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan border (ს5) international road of Roads Department of Georgia was held on June 15, 2021 at the administrative building of Kachreti village of Gurjaani Municipality.

The representatives of the Municipality, Roads Department, Ltd "Eco-Spectri", Ministry of Environmental Protection and Agriculture of Georgia and local community interested in the project, attended the meeting.

The meeting was opened by ------ Second Category Senior Specialist of the Environmental Impact Assessment Department of the Ministry of Environmental Protection and Agriculture of Georgia

At the meeting, the representative of the Ministry introduced the agenda of the public discussion (the sequence of presentation and question-answer mode), the subject of the discussion. He also spoke about the environmental impact assessment procedure and its importance in the environmental decision-making process in accordance with the relevant legislation. He also noted that Roads Department of Georgia is the project implementing entity and Eco-Spectri Ltd has prepared the Environmental Impact Assessment.

Based on the EIA report, the representative of Eco-Spectri Ltd made a presentation on the important aspects of the project for the audience and noted that the project area is located in Sagarejo and Gurjaani municipalities. The total length of the project road is about 49 km, which is divided into two sections: E and F sections.

The project road starts at KP 35 + 500 (from the last point of the Tbilisi-Tokhliauri road), the corridor at KP 52 + 540 will pass new Badiauri road interchange, then at KP 75 + 100 - Chalaubani new interchange. The alignment then crosses the relatively difficult terrain of the Gombori Range and ends in the village of Bakurtsikhe, at KP 84+217.05

According to the design, four alternative options are being considered for the first Tokhliauri-Badiauri (E) section, which includes northern corridor (E1, E2) and southern corridor (E3, E4) alternatives. Given the assessment of the alternative corridor and less impact on environmental and social issues, priority was given to E4 alternative corridor, which mainly goes to the south and bypasses sensitive areas;

According to the design, 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 shoulders. Total width of each way of the road is 11.0m, and there is the 3.0m wide central reserve between the ways. Width of road on each bridge structure is 11.0m. On bridges, roads have 1.3m wide pedestrian walkways on one side. Pedestrian walkways and utility galleries are separated from road paving with protective barrier. Distance between parallel structures of bridges is 3.0m.

Based on the EIA report, the following are the main interchanges of the project road: Badiauri interchange KP 51+783, Kachreti interchange KP 63+891, Chalaubani interchange KP 74+300 and Bakurtsikhe Interchange KP 82+560.

Representative of Eco-Spectri Ltd noted that according to the environmental impact assessment report, the project area was surveyed. As a result of the conducted research-works, types, sources and objects of the

expected main impacts on the environment and human health were identified, based on which the expected positive and adverse impacts of the project and their mitigation measures were presented and explained in details to the attendees.

The question related to the resettlement and compensatory measures was raised by the attending society, whereon the representative of the Ministry of Environment Protection and Agriculture of Georgia clarified that the public discussion did not concern the resettlement and related procedures. However, the representative of Roads Department of Georgia noted that in addition to resettlement and compensatory measures, individual meetings will be held with the local population.

Locals also raised the issue related to the dust and pollutants generated during the operational and construction phase. Representative of Eco-Spectri Ltd explained in details the materials presented in EIA report in relation to air emission during operational and construction phase, survey methods and presented graphical results of air pollutant emission. However, it was noted that the movement of heavy equipment during the construction phase might generate dust on roads and road watering will be carried out to avoid dust issues

The community attending the public discussion did not have any comments in relation to the project.

I, ------ Second Category Senior Specialist of the Environmental Impact Assessment Department of the Ministry of Environmental Protection and Agriculture of Georgia have drawn up a Minutes and confirm its authenticity by signature.

21 June, 2021

11.3.6 Public consultation in Melaani

Ministry of Regional Development and Infrastructure of Georgia

Roads Department of Georgia

Minutes of Public Consultation Meeting held at Gurjaani and Sagarejo Municipalities on

Environmental Impact Assessment for construction and operation of Lot 2 of Tbilisi-Bakurtsikhe section (East part of Sagarejo-Bakurtsikhe) of Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan border (ს5) international road

Village Melaani

Public consultation related to the review of Environmental Impact Assessment for construction and operation of Tbilisi-Bakurtsikhe section (Lot 2) (East part of Sagarejo-Bakurtsikhe) of Tbilisi-Bakurtsikhe-Lagodekhi-Azerbaijan border (ს5) international road of Roads Department of Georgia was held on June 16, 2021 at the administrative building of Melaani village of Gurjaani Municipality.

The representatives of the Municipality, Roads Department, Ltd "Eco-Spectri", Ministry of Environmental Protection and Agriculture of Georgia and local community interested in the project, attended the meeting.

The meeting was opened by ------ Second Category Senior Specialist of the Environmental Impact Assessment Department of the Ministry of Environmental Protection and Agriculture of Georgia

At the meeting, the representative of the Ministry introduced the agenda of the public discussion (the sequence of presentation and question-answer mode), the subject of the discussion. He also spoke about the environmental impact assessment procedure and its importance in the environmental decision-making process in accordance with the relevant legislation. He also noted that Roads Department of Georgia is the project implementing entity and Eco-Spectri Ltd has prepared the Environmental Impact Assessment.

Based on the EIA report, the representative of Eco-Spectri Ltd made a presentation on the important aspects of the project for the audience and noted that the project area is located in Sagarejo and Gurjaani municipalities. The total length of the project road is about 49 km, which is divided into two sections: E and F sections.

The project road starts at KP 35 + 500 (from the last point of the Tbilisi-Tokhliauri road), the corridor at KP 52 + 540 will pass new Badiauri road interchange, then at KP 75 + 100 - Chalaubani new interchange. The alignment then crosses the relatively difficult terrain of the Gombori Range and ends in the village of Bakurtsikhe, at KP 84+217.05

Three alternative options are being considered for the second Chalaubani-Bakurtsikhe (F) section; Based on the comparative analysis (F1; F2; F3), priority was given to F1 alternative alignment. It will pass in better terrain conditions and compared to other options, there is less risk of impact on the geological environment and generation of spoil material. It is noteworthy that the F1 alignment follows the river valley and is designed to deviate as much as possible from the existing road in order to minimize traffic delays on the highway and the need for traffic flow active management during construction. Accordingly, the main advantage of the selected alternative is less impact on the sensitive receptors of the natural environment (geological environment, biodiversity) presented in these sections.

According to the design, 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 shoulders. Total width of each way of the road is 11.0m, and there is the 3.0m wide central reserve between the ways. Width of road on each bridge structure is 11.0m. On bridges, roads have 1.3m wide pedestrian walkways on one side. Pedestrian walkways and utility galleries are separated from road paving with protective barrier. Distance between parallel structures of bridges is 3.0m.

Based on the EIA report, the following are the main interchanges of the project road: Badiauri interchange KP 51+783, Kachreti interchange KP 63+891, Chalaubani interchange KP 74+300 and Bakurtsikhe Interchange KP 82+560.

Representative of Eco-Spectri Ltd noted that according to the environmental impact assessment report, the project area was surveyed. As a result of the conducted research-works, types, sources and objects of the expected main impacts on the environment and human health were identified, based on which the expected positive and adverse impacts of the project and their mitigation measures were presented and explained in details to the attendees.

The community attending the public discussion did not have any comments in relation to the project.

I, ------ Second Category Senior Specialist of the Environmental Impact Assessment Department of the Ministry of Environmental Protection and Agriculture of Georgia have drawn up the Minutes and confirm its authenticity by signature.

22 June 2021