Roads Department of the Ministry of Regional Development and Infrastructure of Georgia

Environmental and Social Impact Assessment of Construction Works for the Gurjaani (Chumlakhi) – Telavi Bypass (30 km) Road Section

Draft report

October 2018

LIST OF ACRONIMS

EA	-	Environmental Assessment
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
ESIA	-	Environmental and Social Impact Assessment
ESMP	-	Environmental and Social Management Plan
HSE	-	Health, Safety, Environment
HS	-	Health and Safety
GIS	-	Geographic Information System
GoG	-	Government of Georgia
IPPC	-	Integrated Pollution Prevention and Control
KP	-	Kilometer Post
MESD	-	Ministry of Economy and Sustainable Development of Georgia
MEPA	-	Ministry of Environmental Protection and Agriculture of Georgia
MLHSA	-	Ministry of Labor, Health and Social Affairs of Georgia
NGO	-	Non-Governmental Organization
RD	-	Roads Department of the Ministry of Regional Development and Infrastructure of Georgia
MRDI	-	Ministry of Regional Development and Infrastructure of Georgia
ToR	-	Terms of Reference
WB	-	The World Bank

Contents

EXECUTIVE SUMMARY

Introduction

The Government of Georgia is conducting a program to upgrade the major roads of the country, managed by the Roads Department (RD) of the Ministry of Regional Development and Infrastructure (MRDI). The program aims to improve transportation and transit of goods to surrounding countries, which is a significant and growing contributor to GDP. Georgia is located to the south of the Caucasus mountain range, with Russia located to its north, Armenia and Turkey to its south, and Azerbaijan to its east. With a population of 4.5 million, it is moderately urbanized, with 47 percent living in rural areas as of 2010.

Over the last five years, Georgia has achieved significant economic progress. The country successfully overcame the August 2008 conflict and the 2008-2009 global economic crisis. Although economic growth contracted by 3.8 percent in 2009, it recovered in 2010 to 6.3 percent and an estimated 6.8 percent in 2011. This recovery and growth was due to an increase in exports, and tourism, and continued high levels of public investment. The public investment of the Government was mainly focused on the road network. Increased public investments aimed at boosting economic recovery by improving main road corridors and local connections, and by creating temporary employment. 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 roads network. 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.

In 2011, the Government developed a ten-point economic program with the goal of facilitating job creation and improving welfare of the population. Among the top ten priorities is the improvement of the infrastructure, especially roads. This program puts a special emphasis on the rehabilitation of secondary and local roads.

The Government's ambitious plans to maintain high economic growth by promoting the transportation of goods within the country, increasing tourism, and revitalizing agriculture, pose challenges to the road sector: (a) significant capital investment is needed to bring the road network to a level that can support the economy; (b) scarce resources need to be prioritized to ensure long-term maintenance of the road assets; (c) local connections must be improved to provide the rural population with easy access to markets; and (d) investments in the road sector need to generate employment.

Construction of Gurjaani-Telavi road section is part of the national plan for developing road infrastructure in Georgia. Feasibility studies, engineering design, social and environmental studies for the road construction were carried out on the proceeds of the World Bank-supported Third Secondary and Local Roads Project (SLRP III). Arrangements for financing physical works are being developed. Present Environmental and Social Impact Assessment (ESIA) report was prepared and Environmental and Social Management Plan (ESMP) developed following national legislation of Georgia, safeguard policies of the World Bank, and conventional good international practice.

Applicable Technical and Environmental Standards

The requirements of the Georgian environmental assessment system are set out the laws *On Environmental Impact Permit, Ecological Expertise*, *on Licenses and Permits* and others; and guidance available from the

MEPA. The above-mentioned legislation is no longer in force, but The RD submitted draft report (according to the FS interim report) to the MEPA, which applies to the procedures towards obtaining the environmental permit for the Telavi-Gurjaani (Chumlaki) road section. The World Bank's Safeguards Policies OP/BP 4.01 Environmental Assessment and OP/BP 4.12 Involuntary Resettlement are triggered for SLRP III and will also be applicable to the construction of Telavi-Gurjaani road.

Objective of the ESIA

Objective of the conducted ESIA was to identify expected positive and negative environmental and social impacts of the improvement and operation of the Telavi-Gurjaani (Chumlaki) road section in the construction and operation phases; identify likelihood, magnitude and spread of these impacts; and work out measures for avoiding or mitigating these impacts. ESIA contributed to the analysis of routing and design alternatives and the selection of the solutions most suitable from economic, fiscal, technical, social and environmental perspectives. ESMP included into the ESIA report will become a part of the contract for the provision of upcoming civil works and serve as a field guide for good environmental performance mandatory for adherence by contractor.

Environmental Screening Outcome

Under Article 4, Paragraph 1, Subparagraph "j" of the Law of Georgia on Environmental Impact Permit, construction of international and intrastate roads and railways, bridges and underway crossings beneath them, as well as engineering structures for the protection of roads, railways and their territories is subject to the State ecological examination. Therefore, construction of Telavi-Gurjaani (Chumlaki) road section is subject to the ecological examination and issuance of an environmental permit. The permit is to be issued based on the expert conclusion of the State Ecological examination by the Ministry of Environment Protection and Agriculture of Georgia (MEPA).

According to the requirements of the World Bank's safeguard policy OP/BP 4.01 Environmental Assessment, reconstruction SLRP III fall under environmental Category B. Based on the scope of works, their location, and associated risks, carrying out of the ESIA and the development of ESMP is required,

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 the public consultation for environmental Category B activities include:

- Prior disclosure of the documents to be publicly discussed, and announcement of the time and venue of the consultation meeting through central and local means of public communication; Invitation of written comments/questions on the draft ESIA; and
- Incorporation of public feedback into the ESIA report and re-disclosure of the finalized document.

The initial draft of ESIA report was submitted to the MEPA on 28 December 2017. The RD held public consultation meetings with local population in Telavi and Gurjaani municipalities on 21 February 2018.

The current draft ESIA report will be posted on the web page of the MRDI. Hard copies of the document will be made available at the offices of local self-governments located in the vicinity of the project sites.

RD will organize public consultation meetings to discuss the draft ESIA report as well as the draft Resettlement Action Plan (RAP) developed as part of a separate assignment. Members of the potentially

affected communities, 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.

Sensitive Environmental Receptors and Potential Impacts

Telavi-Gurjaani (Chumlaki) 30 km road section the selected alternative, in terms of reduction of safety, vibration, air and noise pollution constraints will have positive social and environmental effect. Proposed alignment will bypass all settlements from Telavi to Gurjaani (Chumlaki) and forecasted increased traffic flow on the international road Tbilisi–Bakurtsikhe–Lagodekhi–Azerbaijan Border will not affect by-passed populated areas. There are the walnut trees *Juglans regia* (the Red List) at the private land plots that will have to be extracted and, according to the national legislation, the RD should submit all necessary documentation to the MEPA for the issuance of the Governmental Decree that would clear removal of walnut trees as required. Likelihood of chance finds is minimal, but procedure is in place to be followed by various involved parties in case of a find. The present ESIA document covers all these aspects of the upcoming works.

Project Alternatives

- No-project scenario

No “showstoppers” have been identified during ESIA and the anticipated impacts can be managed by application of adequate construction standards and good environmental practices. Nonetheless, a “no-project” option was considered as one of the project alternatives. While it has no environmental and social impacts resulting from the construction works, continuing operation of the roads section in its current poor condition would have negative environmental and social impacts from traffic jams, noise, low speed, and high emissions. In the future, with consideration of the anticipated increase of the traffic flow, the situation will worsen. On the global scale, under the "no-project" scenario, local communities would lose opportunity of benefiting from all positive effects associated with the road 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 “no-project” option was discarded.

- Alternatives of the road corridor

Three alignment alternatives were developed to bypass the villages along the existing road. The alignment alternatives aiming to minimize impacts on arable land especially vineyards and peach plantations.

Three alternative alignments were considered as potential alternative for the existing road section.

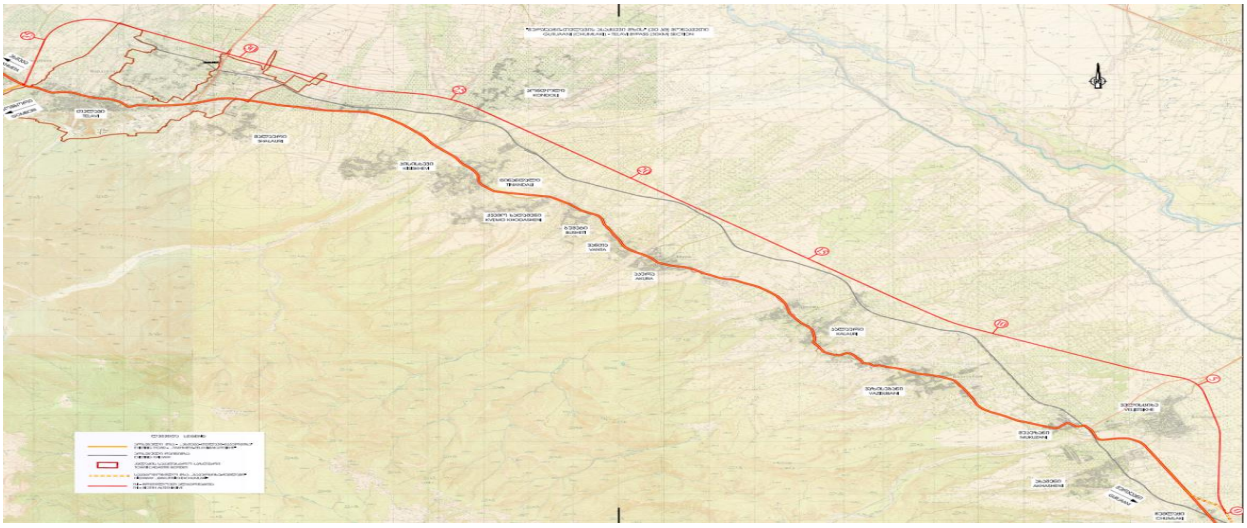
Telavi-Gurjaani road section is expected to bypass the densely populated villages located on that section and Telavi city, where needed and justified, and connect to the existing road in the vicinity of the end of Vaziani-Gombori-Telavi road section of Zhinvali-Bakurtsikhe-Tsnori secondary corridor. Below are described the three alternative alignments selected for Gurjaani (Chumlakhi)-Telavi Road Section.

Alternative TN

The red line shown on Figure 1.1 refers to the Alternative TN. The length of Alternative TN is 36,750 meters. The proposed alternative requires acquisition of 1193 land parcels with cumulative area of 1,082,296 sq.m.

Among them, 378 state-owned land parcels (117, 369 sq.m.) are vacant and belong to the local Municipality. Remaining 815 land parcels (904,927 sq.m.) are under privately ownership and/or possession.

Most of the project affected land parcels along this alternative are agricultural, however 33 (20 534 sq.m.) are of residential designation and 22 land parcels (10, 776 sq.m.) are assigned to category commercial/enterprise.



Alternative TN shown with red line

Alternative TS

The length Alternative TN is 36,003 meters shown on Figure 3.5.2 in light blue line. The proposed alternative requires acquisition of 1,287 land parcels with cumulative area of 1,068, 636 sq.m.

Among them, 419 state-owned land parcels (272,249 sq.m.) are vacant and belong to the local Municipality. Remaining 868 land parcels (796,388 sq.m.) are under privately ownership and/or possession.

Most of the project affected land parcels along this alternative are agricultural, however 21 (18,107 sq.m.) project-affected land parcels are of residential designation, 26 land parcels (25,822 sq.m.) are assigned to category commercial/enterprise, 44 land parcels with total area of 29,044 sq.m. are registered as private non-agricultural and 2 land parcels (124 sq.m.) are attached with the tower owned by mobile telephone company.

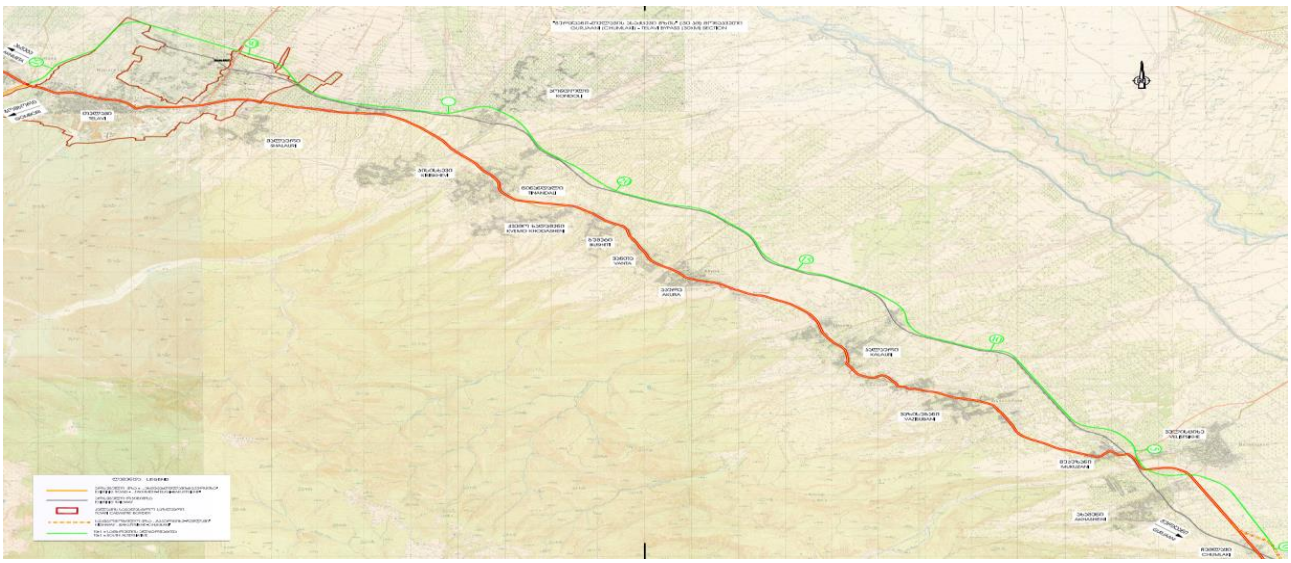
Alternative TS shown with light blue line

Alternative TS_1

The light green line shown on Figure 3.5.3 refers to the Alignment TS_1. The length Alternative TS_1 equals 36,272 meters.

The proposed alternative requires acquisition of 1,298 land parcels with cumulative area of 1,074,474 sq.m. Among these 1,298 land parcels, 426 state-owned land parcels (273,570 sq.m.) are vacant and belong to the local Municipality. The remaining 872 land parcels (800,904 sq.m.) are under private ownership and/or possession.

Most of the project affected land parcels along this alignment are agricultural and used by local households for growing seasonal crops, fruits and vine yards; however, 21 (18,107 sq.m.) are of residential designation and 26 land parcels (25,822 sq.m.) are assigned to category commercial/enterprise, 43 land parcels (29,285 sq.m.) are registered as private non-agricultural and two more small size land parcels attached with mobile company transmission tower.



Alternative TS_1 shown with green line

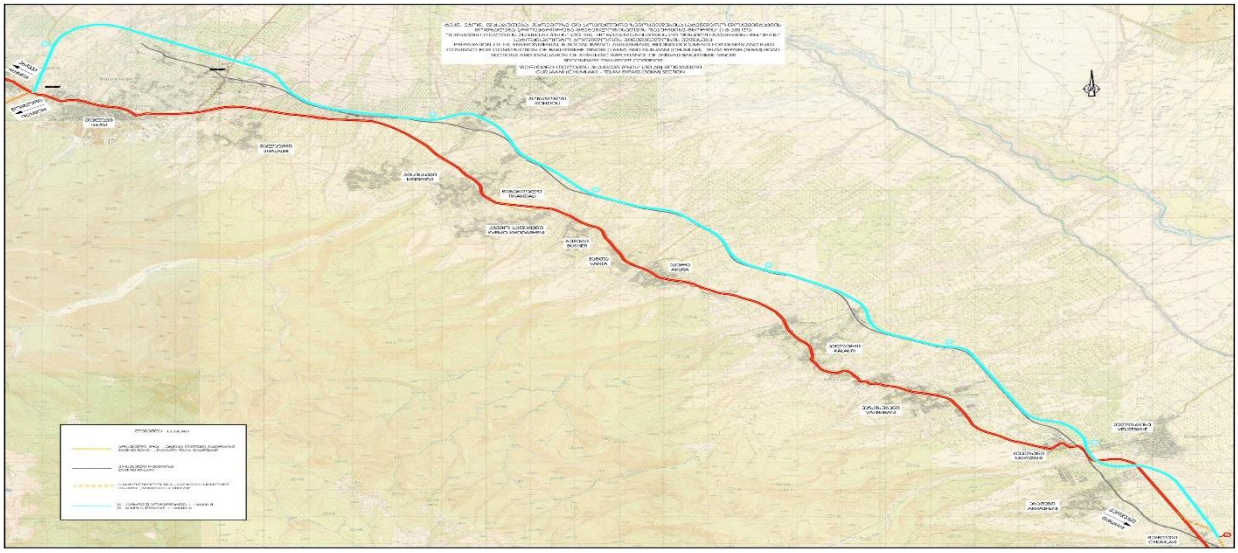
Impact on Land along each alternative

Land Category	Alternative TN		Alternative TS		Alternative TS_1	
	No of parcels	Area (sq.m.)	No of parcels	Area (sq.m.)	No of parcels	Area (sq.m.)
State-owned/Municipality Land						
Unused /vacant	378	177,369	419	272,249	780	727,567
Sub-total of State Land	**378**	**177,369**	**419**	**272,249**	**780**	**727,567**
Private Land						
Arable Agricultural	760	873,617	775	723,291	780	727,567
Residential	33	20,534	21	18,107	21	18,107
Commercial /Enterprise	22	10,776	26	25,822	26	25,822
Non-agricultural	0	0	44	29,044	43	29,285
Mobile Tower	0	0	2	124	2	124
Sub-total of private land	**815**	**904,927**	**868**	**796,388**	**872**	**800,904**
Total Sum	**1,193**	**1,082,296**	**1,287**	**1,068,637**	**1,652**	**1,528,471**

Length of Gurjaani (Chumlaki) - Telavi Alternative

Alternative	Section Length (km)
Existing road Gurjaani (Chumlaki) - Telavi	34.48
Alternative TN (Red Line)	36.77
Alternative TS (Light Blue)	35.95
Alternative TS-1 (Green Line)	36.21

Therefore, the alternative TS (light blue line) was recommended for implementation and the preliminary design based on this alignment alternative. Details of the alignment study are provided in the separate Alignment Study Report.



Gurjaani (Chumlaki) - Telavi Preferred Alignment Alternative

Project Description

Telavi-Gurjaani (Chumlaki) road section is expected to be designed and built in Alazani lowland along the new alignment bypassing the population of the above mentioned settled areas and mountain slopes. It is expected to connect at 104 km of the existing road (passing through the village of Bakurtsikhe) with the section along 120km of the same road (borough of Tsnori). Gurjaani – Telavi road section is expected to bypass the densely populated villages located on that section and Telavi city, where needed and justified, and connect to the existing road in the vicinity of the end of Vaziani-Gombori-Telavi road section of Zhinvali-Bakurtsikhe-Tsnori secondary corridor.

The road corridor continues in a south-easterly direction to Chumlaki and Gurjaani with the Alazani valley to the north and the Tsivi-Gombori Mountain to the south. Velistsikhe junction and Gurjaani provide road connections across the Alazani River valley. The road alignment is generally straight and no more than slightly undulating. As with Akhmeta – Telavi the road consists of a S2 (sometimes WS2) paved road in generally fair surface condition.

Development is almost continuous with a succession of villages and minor settlements strung out along the road, often with only limited depth of development away from the road itself. There are many frontages, accesses and side roads. This semi-urban character of the road forms the main constraint to longer distance traffic and presents a significant risk to road safety through the conflict of long distance/through and local users of the road. Average travel speeds for light vehicles are of the order 60 kph which is high for road sections with significant roadside activity. Daily traffic volumes lie between 6,000 and 7,000, almost 95% of which are light vehicles.

ESIA Methodology

The ESIA process consisted of the six main activities that are common for similar studies conducted according to the international standards:

1. 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.
2. Identification of the expected positive and negative impacts of the proposed works on the road section and of its operation thereafter; assessment of the likelihood and significance of the potential negative impacts; and development of mitigation measures.
3. Analysis of alternatives in terms of location, technology, design and operation, including the "no-project" alternative.
4. Development of the Environmental and Social Management Plan.
5. Drafting of the ESIA report.
6. Information disclosure and stakeholder consultation.

Expected Environmental and Social Impacts

The results of ESIA show that majority of the potential environmental impacts of works on Telavi-Gurjaani (Chumlaki) bypass are associated with the construction phase and are temporary in nature. The main

approach of the ESIA report was to provide adequate recommendations for the prevention or mitigation of the negative environmental and social impacts for the proposed construction and operation phases. These recommendations are applicable during road design, construction, and operation phases. Taking into account the location and sensitivity of human settlements and environmental receptors, the following mitigation measures were developed for mitigating the main risks associated with the road construction:

Impact on vegetative cover: Clearing of the right of way, especially in the re-aligned parts of the road section, will imply removal of vegetation, including cutting of trees. Loss of vegetation will be kept at the possible minimum, and those cleared from private land plots will be compensated in accordance with the Resettlement Action Plan.

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 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 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. As the good practice of Georgia suggests, 70% of local labour is planned to employ in the construction phase what was the case with other WB financed projects. This requirement will be incorporated in the Construction Contractor's Contract.

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 workforce, 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.

Major part of the road alignment passes on the existing highway and settlements. The already existing access roads will be used.

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.

Operation of construction machinery: The technical condition of the construction machinery will be checked on regular basis to minimize air pollution from exhausts oil and soil/water pollution from leakage of fuel.

Earth works: Prior to excavation, top soil 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 maximise 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.

Accumulation of construction waste: Temporary storage of waste will be organized by separating construction debris, household solid waste, and hazardous waste. The latter, comprising of used filters, tires, and lubricants from machinery, will be kept in a closed and isolated storage. Out transportation of waste from the construction sites will follow a time-bound schedule. Formal instructions will be obtained from the Solid Waste Management Company under the MRDI for the final disposal of waste in the existing landfills. Hazardous waste will be removed/utilized by licensed contractor.

Operation of quarries and borrow pits: Purchase of inert construction materials will be allowed only from the licensed legal and/or physical bodies. Extraction of these materials will also be allowed on the grounds of a special license. 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 ravines terraces, will be carried out strictly in accordance with the conditions of a license.

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 Protection (NACHP) will be urgently notified. Works will resume only upon receipt of written communication from NACHP.

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.

Involuntary resettlement: Construction of Telavi-Gurjaani (Chumlaki) road section will require private land take and is likely to lead to the physical relocation of a limited number of households. According to the proposed project design, the ROW will impact 193 State-owned land parcels with a total area of 257,984 sq. m. and 1,045 private land parcels with the total area of 1,290,681 sq.m., to be permanently acquired. Majority of these land parcels (90.05%) are categorized as arable agricultural and are mainly utilized as vineyards and orchards. Some are used for growing annual crops, such as vegetables. Although the alignment was

developed in a way to minimize resettlement impacts, 12 households will still have to be physical relocated. All people affected by involuntary resettlement will be compensated prior to mobilization of the contractor to the work sites according to the Resettlement Action Plan. Compensation will be planned the way to ensure restoration of the affected people's livelihood to pre-existing level.

Environmental and Social Management Plan

The goal of the ESMP is to develop the mitigation measures and monitoring indicators for the impacts identified through the ESIA. It also describes institutional arrangements for applying mitigation measures and exercising control over their implementation. In the construction phase, the works provider to be contracted by RD will be responsible for applying prescribed mitigation measures. This obligation will be contractually binding, as the ESMP will be attached to the works contract to be its integral part. RD will have overall responsibility for environmental monitoring of works and for ensuring full adherence to the ESMP. It is expected that RD will hire a consultant company for the technical supervision of works and will include day-to-day environmental oversight into the tasks of such a consultant. However, the RD will use its own capacity to organize environmental monitoring and reporting and will bear overall responsibility for it.

The Supervision Department of the MEPA will exercise State control over the compliance with the terms of environmental permit to be issued for the works in Telavi-Gurjaani (Chumlaki) road section and with the requirements of the national environmental legislation of Georgia.

1. INTRODUCTION

Roads Department of the Ministry of Regional Development and Infrastructure of Georgia developed Five-Year Rolling Program for Preservation and Improvement of Secondary Road Assets for 2016-2020. Improvement and upgrading of Zhinvali-Bakurtsikhe-Tsnori secondary transport corridor is also part of this Five-Year Rolling Program. The final decision about prioritization of improvement and upgrading of its sections will be informed by the conclusions and recommendations of the evaluation of strategic importance of this corridor included in the scope of this assignment. The concerned corridor is important in connecting several regions of the country and two international transport corridors linking Georgia with Azerbaijan (via S-5 Tbilisi-Bakurtsikhe-Lagodekhi) and Russia (E-117).

Tbilisi-Bakurtsikhe-Lagodekhi international road (S-5) connects Tbilisi with Lagodekhi city, the State border with Azerbaijan, as well as with the cities of Shida Kakheti. Bakurtsikhe-Tsnori section, which is in the south end of the concerned secondary corridor, is located in Tsivgombori ridge and passes through densely populated villages in Gurjaani and Signagi districts and crosses several ravines. The traffic and road safety situation are complicated particularly on Bakurtsikhe-Vakiri section of the mentioned road, where the existing alignment runs through the villages of Bakurtsikhe, Kardenakhi, Anaga and Vakiri. The road parameters are not met and there is no way for their improvement without substantial demolition of the existing infrastructure (houses, plots, etc.).

Similar conditions are observed on Gurjaani (Chumlaki)-Telavi road section, which is further north-west of Bakurtsikhe-Tsnori section on the same corridor. The road section connects two cities of Kakheti region - Telavi and Gurjaani and runs through 19 villages with the total population of 94,000 people, including inhabitants of Telavi and Gurjaani cities. Gurjaani (Chumlaki)-Telavi road also has serious road safety problems and the road parameters (road width, drainage system, etc.) are not met either.

Bakurtsikhe-Tsnori road section is expected to be designed and built in Alazani lowland along the new alignment bypassing the population of the above mentioned settled areas and mountain slopes. It is expected to connect at 104 km of the existing road (passing through the village of Bakurtsikhe) with the section along 120km of the same road (borough of Tsnori). Gurjaani-Telavi road section is expected to bypass the densely populated villages located on that section and Telavi city, where needed and justified, and connect to the existing road in the vicinity of the end of Vaziani-Gombori-Telavi road section of Zhinvali-Bakurtsikhe-Tsnori secondary corridor.

2. LEGAL AND INSTUTUTIONAL FRAMEWORK

This chapter reviews the provisions for environmental protection in the laws of Georgia that are relevant to the proposed Project. It also discusses the potential implications of the international treaties to which the Republic of Georgia is a party. Finally, the administrative framework for environmental management is also described.

2.1 Environmental Policies and Laws of Georgia

Georgian legislation comprises the Constitution, environmental laws, international agreements, subordinate legislation, normative acts, presidential orders and governmental decrees, ministerial orders, instructions and regulations. Along with the national regulations, Georgia is signatory to a number of international conventions, including those related to environmental protection.

The following national laws and regulations of Georgia are applicable to the construction of Gurjaani-Telavi road section:

The Constitution of Georgia 1995 (last amended in 2013)

The Constitution of Georgia is the supreme legal document establishing general principles concerning environmental protection. Article 37 states: "Everyone shall have the right to live in a healthy environment and enjoy natural and cultural surroundings. Everyone shall be obliged to care for the natural and cultural environment." In Constitution are formed the basic requirements about the need of environmental protection and information accessibility for people about environmental conditions.

Also, the Constitution of Georgia states that „the legislation of Georgia shall correspond to universally recognized principles and rules of international law. An international treaty or agreement of Georgia unless it contradicts the Constitution of Georgia, the Constitutional Agreement, shall take precedence over domestic normative acts (change is added by the Constitutional Law of Georgia of 30 March 2001).

This means that in case requirements of the national environmental and social legislation differ from any statement made in the present ESIA report and ESMP included in it, the latter shall prevail, because legal agreement between Georgia and the IBRD makes implementation of ESMP mandatory.

Law of Georgia on Environmental Impact Permit 2007 (Last amended in 2016)

The Law gives a complete list of activities subject to ecological examination (Article 4, Chapter II) and defines environmental examination through the EIA process as an obligatory step for obtaining authorization for implementation of the planned development. The legislation sets out the legal basis for issuance of environmental permits, including implementation of an ecological examination, public consultations and community involvement in the processes. According to the established procedure the granting permission for, or refusal to issue, a permit is based on the findings of the EIA report and associated environmental documentation presented to the MEPA by the project proponent. Paragraph 6 of the law requires the applicant to organize and undertake public consultation of the EIA report prior submission of the final version of the document to the MEPA.

In line with the requirements of the presented Law, Roads Department shall apply for and obtain the environmental impact permit from the Ministry of Environment Protection and Agriculture of Georgia, which will be an integral procedure for the issuance of Construction Permit by the Ministry of Economy and Sustainable Development for works planned towards upgrading of Telavi-Gurjaani (Chumlaki) road section.

Law of Georgia on Licenses and Permits 2005 (Last amended in 2016)

The Law regulates activities which may result in increased hazard to human life or health, involves interests of importance to the State or public, or 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.

By using this law, the Roads Department identified the Project category for Telavi-Gurjaani (Chumlaki) road section, and the list of all documents and stages which are necessary to receive the ecological expertise.

Law of Georgia on Ecological Expertise 2007 (Last amended in 2013)

The Law makes an ecological examination obligatory for issuance of development permits. According to the Low the independent expert opinion is mandatory to adopt a decision on the issuance of an Environmental Impact Permit. The ecological expertise is the responsibility of the MEPA, which undertakes expert examination in accordance with the provisions on the Procedure of Conducting State Ecological Expertise, and the normative-technical and methodological guidance documents and the procedure established under law, through a commission of experts.

The Ministry of Environmental Protection and Agriculture of Georgia, in line with the requirements of the given Law, will identify and invite all independent experts, whose conclusions will be used to fix the compliance of the EIA document developed for the rehabilitation of Telavi-Gurjaani (Chumlaki) road section with the requirements of the Georgian legislation, normative acts and standards. This law has been changed in January 1 2018, but the Roads Department in 28 December 2017 started procedures to obtain Ecological Expertise from the Ministry of Environmental Protection and Agriculture of Georgia.

Law of Georgia on Water 1997 (Last amended in 2015)

The Law regulates the use of water resources, determines the rights and responsibilities of water users, and regulates water abstraction and discharges. Consistent with the legislation, water within the territory of Georgia owned by the State can be abstracted only for consumption. Any actions directly or indirectly violating the State ownership rights for water are prohibited.

Within the scope of Telavi-Gurjaani (Chumlaki) road section, the law regulates the water intake and water discharge processes. In order to meet the requirements of the said law, the actions, which will help avoid, reduce or manage the pollution or negative impact on the river streams and other rivers in the project zone must be identified.

Law of Georgia on Soil Protection 1994 (Last amended in 2015)

The Law aims at ensuring preservation of integrity and improvement of soil fertility. It defines the obligations and responsibility of land users and the State regarding the provision of soil protection conditions and ecologically safe production. The Law sets the maximum permissible concentrations of hazardous matter in soil and restricts the use of fertile soil for non-agricultural purposes, the execution of any activity without prior striping and preservation of top soil, open quarry processing without subsequent re-cultivation of the site, terracing without preliminary survey of the area and approved design, agricultural

activities that could lead to overgrazing, wood cutting, damage of soil protection facilities, and any activity that could potential deteriorate soil quality (e.g. unauthorized chemicals/fertilizers, etc.).

The law sets general basis for the protection of soil from erosion, contamination, sedimentation, sanitization, secondary swamping, etc., regulation of the open extraction of natural resources and construction materials, impact from human economic activity. The Law sets up norms and standards for allowable concentration limits of pollutants in the soil to ensure human health and better environment.

Within the scope of the presented project, the requirements of the said law regulate the rules of topsoil removal, storage and further management in the process of widening the existing road and/or cutting a new road. It is similarly important to meet the requirements of the law at the stages of planning the widening of the existing road in the landslide zone or during the construction works. By meeting the requirements of the said law, it is necessary to undertake additional geological studies, particularly along the section where the road goes near the streams.

Law of Georgia on Protection of Atmospheric Air 1999 (Last amended in 2016)

The Law regulates protection of the atmospheric air from adverse anthropogenic impact within the whole Georgian territory (Part I, Chapter I, Article 1.1). Adverse anthropogenic impacts are any human induced effect on atmospheric air causing or capable of causing a negative impact on human health and environment (Part II, Chapter IV, and Article II.I).

At the stage of construction of Telavi-Gurjaani (Chumlaki) road section, the requirements of the said law will regulate the level of noise, vibration and emissions on the territory of village Kondoli. In addition, the right kind of the noise walls to install on the settled territory during the operation phase will be identified.

Waste Management Code 2015 (Last amended in 2016)

The purpose of this Code is to establish a legal framework in the field of waste management to implement measures that will facilitate waste prevention and its increased re-use as well as environmentally safe treatment of waste.

The objective of this Code is to protect the environment and human health through:

a) The prevention or reduction of waste and its adverse impact;
b) the establishment of effective mechanisms for waste management;
c) The reduction of damage caused by the consumption and the more efficient use of resources.

In line with the requirements of the said law, the Construction Contractor for Telavi-Gurjaani (Chumlaki) road section must hire a duly qualified environmental manager who will be obliged to develop Waste Management Plan and submit it to MEPA for approval. In line with the requirements of the Waste Code, the Construction Company is obliged to control the process of managing the originated waste through the final disposal of the waste.

Law on Compensation for Damage Arisen from the Use of Hazardous Materials 1999 (Last amended in 2010)

The Law specifies how charges for the use of and/or harmful impact on the environment are to be calculated and levied by the MEPA.

Law of Georgia on Hazardous Chemical Substances 1998

This Law regulates handling of dangerous chemical substances, but it has been stopped by the law of Georgia "on the control technical danger" which regulates processes when activity contains possibility of issue of explosion and intoxication which appears (represents) the increased risk for health of people and environment.

Within the scope of the project, no great amounts of hazardous substances are expected to be stored in the construction sites; however, the fact that the road passing ravines and follows the riverbed, full observance of the requirements of the Law is necessary, both in the phases of storage and exploitation of the hazardous substances.

Law on Minerals 1996 (Last amended in 2015)

The Law establishes the requirement to obtain a license according to the procedures established under this law and the Law on Licensing and Permits (June 25, 2005). According to the current system all quarries and borrow pits require to obtain a license.

If the Construction Contractor opens his own quarries of inert materials, a relevant license will be necessary to obtain. Within the scope of the project, a particular attention must be paid to the restoration of the quarries. The Supervising Consultant must also pay due attention if the requirements of the quarry management are met used within the scope of the present project.

Law on Red List and Red Book of Georgia 2003 (Last amended in 2016)

The Law establishes the legal basis for the preparation and approval of the Red List and Red Data Book to provide these instruments for the protection and restoration of threatened species of flora and fauna. The new **Red List of Georgia** was approved in May 2006 and is as such legally enforceable. The Red List is organized in accordance with the guidelines and principles of the International Union for the Conservation of Nature (IUCN). According to article 4 of the law: „any type of activity is forbidden, including hunting, tree-cutting and others, besides special occasions (events) established by the law".

Within the scope of the project, meeting the requirements of the Law is particularly important along road section.

2.2 Laws and Regulations Related to Social Aspects and Land Ownership

Law of Georgia on Privatization of State-owned Agricultural Land 2005 (Last amended in 2010)

This Law regulates the privatization of state-owned agricultural land. On the basis of this law, either leased or unleased state-owned agricultural land can be subject to privatization. However, the categories of agricultural lands listed as follows are not subject to privatization: a. Grazing lands except grazing lands leased before enacting the law; b. Cattle-driving routes; c. First sub-zone (strict regime zone) for the sanitary protection zone of water supply bodies; d. Forest fund land used for agricultural purposes; e. Recreation lands; f. Lands allocated to historical, nature and religious monuments; g. Protected areas; h. Agricultural lands being used by budgetary institutions and legal entities of public law in the form of usufruct.

Within the scope of the project, all private and legal entities using or illegally owning the property must be identified, and the said property or action must be legalized and compensated.

Law of Georgia on Recognition of the Property Ownership Rights Regarding the Land Plots Owned (Used) by Physical Persons or Legal entities; 2007 (Last amended in 2016)

The Law defines general terms and procedures for entitlement of the right to land ownership. Although ownership rights cannot be bestowed onto the following lands: cattle-driving routes; cemetery and pantheon; water field (stock); sanitary and protection zones; protected areas; historical, nature and religious monuments; recreation parks, forest-parks, squares and others; land containing water reservoir, hydraulic works and sanitary-protection zones of these objects; lands of special purpose (allocated for defence and mobilization); lands accommodating community infrastructure units (transport and underground utilities, water-supply, sewage, communication and power-supply systems); land parcel of public use (playground, street, passage, road, pavement, shore) and recreation sites (park, forest-parks, squares, alley, protected area); lands accommodating state-owned objects, including parcels which contain state property not subjected to privatization according to Georgian Law on Privatization of State Property; lands allocated for construction and operation of oil and gas mains, as well as any associated over- and under-ground structures and facilities.

This Law defines the set of criteria, based on which the affected non-registered land plots used by private owners within the road corridor could be attributed to the category of localizable land (there is legal basis for registering land and paying compensation) or category of non-localizable land not eligible for compensation.

Law of Georgia on Public Registry (2008)

The Law provides an organizational and legal basis for the registration of ownerships rights, encumbrance and mortgage on real estate, as well as the liabilities of the registration authority. Pursuant to this Law, ownership rights related to real property, mortgage, usufruct, servitude, lease, sub-lease, rent, sub-rent, lending are subject to registration in the Public Register.

All land plots within the road corridor which are not registered but evidence is present that their legislation may be undertaken, will be registered following the requirements of this Law.

Law of Georgia on Rules for Expropriation of Ownership for Necessary Public Needs 1999 (Last amended in 2013)

The Law defines terms, rules and procedures for the expropriation of assets necessary in the public interest. Expropriation requires the Presidential decree and a court decision. The decision of the court gives a detailed description of the appropriable property and due compensation to the owner. The Law states the public interests which allow expropriation of assets. These are the construction/installation of: a) roads and highways; b) railways; c) oil, gas and oil product pipelines; d) power transmission and distribution lines; e) water supply, sewage and storm water drainage systems; f) telephone lines; g) premises and objects of public needs; h) works required for national defence; i) mining and reserve development. After issuance of the Presidential decree, a person seeking expropriator's rights announces in the central and local printed media about the project, its scope, area coverage and brief description of the potentially appropriable property. All affected landowners also shall be informed about the dates of application to the court and action proceeding.

An expropriator should endeavour to obtain property in agreement with the owner. Prior to negotiation the expropriator evaluates the property and determines an estimated compensation sum or other property

compensation according to fair market price. Agricultural lands are to be evaluated together with price of crops that could be yielded by the owner throughout the current agricultural year.

Because of the significance of constructing Gurjaaani-Telavi road section, this Law will be applicable as the final instance in case all attempts to purchase the land by means of negotiations are exhausted. After the land plot expropriation, the owner will receive full compensation.

2.3 Labor Legislation

Labor Code of Georgia 2006

The law governs the rights of the employees in all enterprises, institutions and organizations. This law establishes the requirements regarding human rights and creation of safe and healthy working environment including health and safety conditions, social security and insurance. However, there are no established norms and standards related to the workers accommodation.

Law of Georgia on Employment 2001

The law regulates the employment policy of Georgia, including protection of the unemployed in terms of economic, social and legal issues. For the protection of the unemployed, this law promotes employment programs.

The rights of all employees engaged in the construction of road will be protected in line with the requirements of these laws.

2.4 Requirements for Environmental Assessment in Georgia

After January 1, 2018 the new Environmental Assessment Code entered into force in Georgia.

Since the draft of the present ESIA report for the planned development was submitted to the MEPA before enactment of the Environmental Assessment Code, this document is being processed following the law on Environmental Impact Permit described below.

The Law of Georgia on Environmental Impact Permit sets the legal basis for issuance of an environmental permit, including implementation of an ecological examination, public consultations and community involvement in the processes. Granting of permission or refusal to issue a permit is based on ecological examination of environmental documents submitted to the MEPA by the project proponent.

The Environmental Impact Assessment (EIA) is defined under the Georgian Law as: "studying and examination procedure of the planned activities is designed to protect separate components of the environment, human, as well as landscape and cultural heritage. EIA study, identifies and describes the direct and indirect impacts on human health and safety, herbage and animals, soil, air, water, climate, landscape, ecosystems and historical monuments, or all the above factors unity, among the factors that influence the cultural values (cultural heritage) and the social - economic factors".

The law requires that the EIA or its accompanying information shall include:

- A layout (indicating a distance) of the place where the project will be implemented;

- Expected volume and classes of emissions/discharges from stationary pollution sources, including emissions/discharges of hazardous substances;
- Short summary on the planned activities;
- Description of the full technological cycle of the facility to be put in place.

The law also requires that wherever relevant, the EIA process takes into account the environmental principles as listed in Section 3.1.2. This is particularly important for those aspects of the environment for which specific laws, regulations and standards have not been enacted.

The EIA Process

Law of Georgia on Environmental Impact Permit sets the legal basis for issuance of an environmental permit, including implementation of an ecological examination, public consultations and community involvement in the processes. Granting of permission or refusal to issue a permit is based on ecological examination of environmental documents submitted to the MEPA by the project proponent.

Article 6 of the Environmental Impact Permit Law requires the project proponent to organize a public hearing of the EIA prior to submission of the final version documentation to the MEPA. The permit application/issuance procedure for the Project, including EIA coordination, establishment of the timeframes for information disclosure and public review and discussion in accordance with Georgian Law will include the following steps:

- **Step 1:** The project proponent publishes information on the Project in central and regional newspapers. The advertisement has to include the project title, location, place and the date, time and venue of public disclosure meeting(s). It will also identify locations where the ESIA can be reviewed and where comments may be submitted.
- **Step 2:** Within one week after publishing the information in the newspapers, the project proponent will submit the EIA report (hard copy and electronic version) to the MEPA. A period of 45 days is allowed for public comments on the EIA. Between 50 and 60 days after publication, the project proponent will hold a series of meetings to receive comments from stakeholders (which may include government agencies, local authorities, NGOs, community members). Within five days of the meetings, the project proponent will submit minutes of the meetings (summary of comments and discussions) to the MEPA.
- **Step 3:** All comments received from the stakeholders at the meeting or in writing will be reviewed and addressed in the final version of the ESIA. A copy of all written comments, the minutes together with a comment-response section will be included in the final ESIA as an Appendix. The final ESIA will be submitted to the MEPA and made available to the public, along with a project location map, an executive summary, and the any necessary reports on emissions and allowable limits. The permit is to be issued or denied within 20 days from registration of the submission.

According to the Law on Construction Permit, 2004 and Law on Licenses and Permits 2005, construction and modernization of highways requires the Construction Permit. Procedures for obtaining the permit are described in the Law of Georgia on the Construction Permit. The administrative body responsible to issue the permit is the Ministry of Economy and Sustainable Development. Under the law, the Ministry is required to ensure involvement of other ministries including the MEPA in the permitting process. For the projects subjected to the construction permit, the construction permit incorporates elements of environmental impact permit.

Environmental impact permit is also required for running asphalt and concrete batching plant. License for use of natural resources, if own quarries are to be used, is also required. The authority responsible for issuing the

license is MEPA. All other issues such as temporary disposal of inert construction waste and unusable asphalt are regulated with the local municipal authorities and require a formal agreement with them.

2.4 World Bank Policy Requirements

SLRP III is financed by the World Bank and hence the World Bank's safeguard policies are applicable. The project triggers several safeguard policies: OP 4.01 and OP 4.12. These policies are also applicable to the preparation of documentation for the construction of Gurjaani-Telavi road section. Policy requirements of the financier of physical works, if more stringent than the above, will also come to force during road construction.

Operational Policy 4.01 – Environmental Assessment provides the framework for World Bank environmental safeguard policies and defines the project screening and categorization in order to determine the level of environmental assessment required. It may therefore have significant and irreversible impacts. According to the OP/BP 4.01, construction of Telavi-Gurjaani road section is classified as a category "B". It requires a ESIA, and public consultation on at least two stages of the environmental review process. Development of an environmental and social mitigation and monitoring plans for the construction and operation phases is also required by this safeguard policy.

Operational Policy 4.12 – Involuntary Resettlement states that involuntary resettlement shall be avoided to the extent possible. Where the acquisition of land or other assets is necessary, the policy sets out requirements for participation in resettlement planning, mandates compensation for assets at replacement cost, and expects the borrower to see that incomes and standards of living of affected persons are improved or at least restored to what they were prior to displacement. OP 4.12 is triggered as the planned construction works for upgrading the existing road into a two-lane dual carriageway road will require land acquisition.

2.5 International and National Environmental Standards and Norms

Construction of Telavi-Gurjaani road section will follow applicable national legislation of Georgia, triggered safeguard policies of the World Bank, Environment, Health and Safety Guidelines of the World Bank Group, and environmental and social policies of the financier of construction works.

In accordance with the Law of Georgia on Public Health, the environmental qualitative norms are approved by Decrees of the Minister of Labor, Health and Social Affairs of Georgia (Decrees Nos. 297/N of 16.08.2001, including the changes made to it by further decrees of the Ministry Nos. 38/N of 02.24.2003, 251/N of 09.15.1006, 351/N of 12.17.2007). The quality of atmospheric air (pollution with hazardous matter) is also defined by the order of the Minister of Environment Protection and Natural Resources (#89, 23 October 2001) on approval of the rule for calculation of index of pollution of atmospheric air with hazardous pollution.

2.5.1 Ambient Air Quality Standards

Georgian and IFC guidelines for ambient air quality guidelines are presented in Table 2.5.1.1 and Table 2.5.1.2.

Table 2.5.1.1. Georgian Standards for Ambient Air Quality

Substance	Maximum permissible concentration (MAC) mg/m3/average time
Nitrogen dioxide	0.085/30 minutes
	0.04/24 hours
Sulphur dioxide	0.5/ 30 minutes
	0.05/24 hours
Carbon Oxide	5.0/30 minutes
	3.0/24 hours
Inorganic dust	0.3

Table 2.6.1.2. IFC Ambient Air Quality Guidelines

	Averaging Period	Guideline value in μmg/m^3
Sulphur dioxide (SO_2)	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minutes	500 (guideline)
Nitrogen dioxide (NO_2)	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter PM_{10}	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

World Health Organization (WHO) Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile. Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

In general, Georgian standards for ambient air correspond to international IFC/WB standards, however in relation with particular substances there can be minor differences, and in that case, more stringent standards are applicable.

2.5.2 Water Quality Standards

The values of Maximum Admissible Concentrations of the harmful substances in surface and groundwater are provided in the Environmental Quality Norms approved by the Order#297N (16.08.2001) of the Ministry of Labour, Health and Social Protection (as amended by the Order No 38/n of the same Ministry of 24.02.2003). The admissible level of pollutants in surface and groundwater is given in Table 2.6.2.1. Below:

Table 2.6.2.1. Georgian Standards for Water Quality

No	Description	Maximum Permissible Concentration
Surface Water		
1.	pH	6.5-8.5
2.	Diluted oxygen, mg/l	4 – 6
3.	Chlorides, mg/l	350
4.	Oil products, mg/l	0.3
5.	Zinc (Zn^{2+})	1g/kg
6.	Lead (Pb total)	23,0
7.	Chrome (Cr^{6+})	32,0
8.	Cadmium (Cd, total)	6,0
Ground Water		
	TDS, mg/l	
	Sulphates, mg/l	250
	Chlorides, mg/l	250
	Sodium, mg/l	200
	Calcium, mg/l	140
	Magnesium, mg/l	85
	Total coliforms, in 250 ml	Inadmissible

2.5.3. Noise Level Standards

Admissible noise standards of IFC and Georgian national standards for the residential area are similar. The standards about the noise are allowed according to the Decree # 297/N of the Ministry of Health, Labor and Social Affairs of Georgia on Affirmation the Qualitative Norms of the Environment, issued on August 16, 2001. There are defined as the admissible norms of noise as the maximum of the admissible norms for several zones of the territories. For the residential areas the standard requirements for noise are given in the Table 2.6.3.1.

For IFC noise impacts should not exceed the levels presented in Table 2.6.3.2. or result in a maximum increase in background levels of 3 dB at the nearest receptor location off site.

Table 2.6.3.1. National Standards for Noise Levels

Time	The average allowed size of noise (DCB)	The maximum allowed norms of noise (DCB)
7am – 11 pm	55	70
11pm – 7am	45	60

Table 2.6.3.2. IFC Noise Level Guidelines

	One-hour L_{aeq} (dbA)	
Receptor	Daytime 07:00 – 22:00	Nighttime 22:00 – 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

As it shown in the tables 2.6.3.1 and 2.6.3.2 the both (IFC and GEO) standards envisage the same level of admissible threshold of equivalent noise: 45 dbA for night time and 55 dbA for daytime.

2.6 Institutional Framework

Ministry of Environment Protection and Agriculture of Georgia

MEPA is responsible for all environmental protection issues and natural resources. The responsibilities of the Ministry as the competent authority are to: a) intermit, limit, or stop any activity having or likely to have adverse impact on the environment, b) issue a series of licenses and permits (including for environmental impact), c) control the execution of mitigation measures by the developer, and d) receive free and unrestricted information from the developer about the utilization of natural resources, monitoring systems, waste management and explanations from authorities concerning the project.

RD will apply for the environmental permit for works to be undertaken on the Telavi-Gurjaani (Chumlaki) road section to the MEPA. Department of Ecological Examination of this Ministry will undertake expert review of the ESIA report and take decision on the issuance of an environmental permit as well as on the conditions under which the permit is to be granted.

The MEPA consists of several functional departments, which are responsible for different aspects of environmental protection and administration. Department of Permits is responsible for carrying out State Ecological Expertise and issuing environmental permits. Department of Environmental Supervision is responsible for execution of control over the environmental protection and use of natural resources. In particular, responsibilities of this Department cover, among others, control over the adherence to the terms of issued environmental permits and resource use licenses.

The National Service for the Food Safety, Veterinary and Plant Protection of the MEPA is responsible for implementation of complex sanitary protection measures in case of identification of the burial sites of animal carcasses during earthworks. This Service will receive prompt notification about burial sites of animal carcasses discovered during excavation works. The Service will provide guidance to the RD on the subsequent course of action, ensure safe disposal of the carcasses and disinfection of the site. The National Service for the Food Safety, Veterinary and Plant Protection will have to clear the site for the resumption of works once all relevant measures have been taken.

Ministry of Economy and Sustainable Development

The National Agency of Mines under the Ministry of Economy and Sustainable Development issues licenses for the natural resource use (except gas and oil). This includes also licenses for quarries and borrow pits supplying the road projects with the inert construction materials.

Ministry of Economy and Sustainable Development is responsible for carrying out the review of technical documentation (including conclusion of independent experts) and issuing Construction Permits for infrastructural projects, as well as for supervision over constructing activities and for arranging Acceptance Commission after completion of construction.

State supervision of construction and compliance monitoring is provided by the Main Architecture and Construction Inspection under the Ministry of Economy and Sustainable Development of Georgia.

Ministry of Regional Development and Infrastructure

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

Roads Department of the Ministry of Regional Development and Infrastructure

The RD of the MRDI 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 SLRP III and will also carry responsibility for all aspects related to the construction of Gurjaani-Telavi road section. RD will be responsible for its operation and maintenance beyond the Project life. Present ESIA was commissioned by RD 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. RD will perform these functions through its Service of Environmental Protection and Service of resettlement comprising of twelve staff members with relevant education and professional skills. Service of Environmental Protection is supposed to review the EIAs and EMPs related to the Roads Department projects and perform monitoring of compliance of the contractor's performance with the approved EMPs, EIAs, environmental standards and other environmental commitments of the contractor.

A Supervision consultant will be hired by the RD to provide technical control and quality assurance of civil works. Environmental monitoring will be an integral part of the consultant's assignment and information on the compliance with the EMP will be included into the supervisor's regular reporting to the RD. The RD will have an overall responsibility for applying due environmental 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. Works supervisor will be responsible for reporting to the RD on the environmental and social performance of work on the Gurjaani-Telavi road section on monthly basis through including safeguard compliance section into the general reporting. RD will make monthly reports from the works supervisor available to the World Bank upon demand. This reporting will be based on the information received from the works supervisor; and should also reflect results of RD's own due diligence (quality control over the supervisor's work) and RD's assessment of supervisor's performance.

Ministry of Culture and Monument Protection

The Ministry of Culture and Monument Protection 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 Ministry of Culture, Monument Protection and Sport is also required for issuing construction permit.

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

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 a self-governing unit 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. Municipalities are also 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 the construction of Gurjaani-Telavi road section. In addition, local municipalities will play an important role of 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.

3. ANALYSIS OF ALTERNATIVE

Three alignment alternatives were developed to bypass the villages along the existing road. The alignment alternatives aiming to minimize impacts on arable land especially vineyards and peach plantations.

3.1 Alternative Alignments Selected for Gurjaani (Chumlakhi)–Telavi Road Section

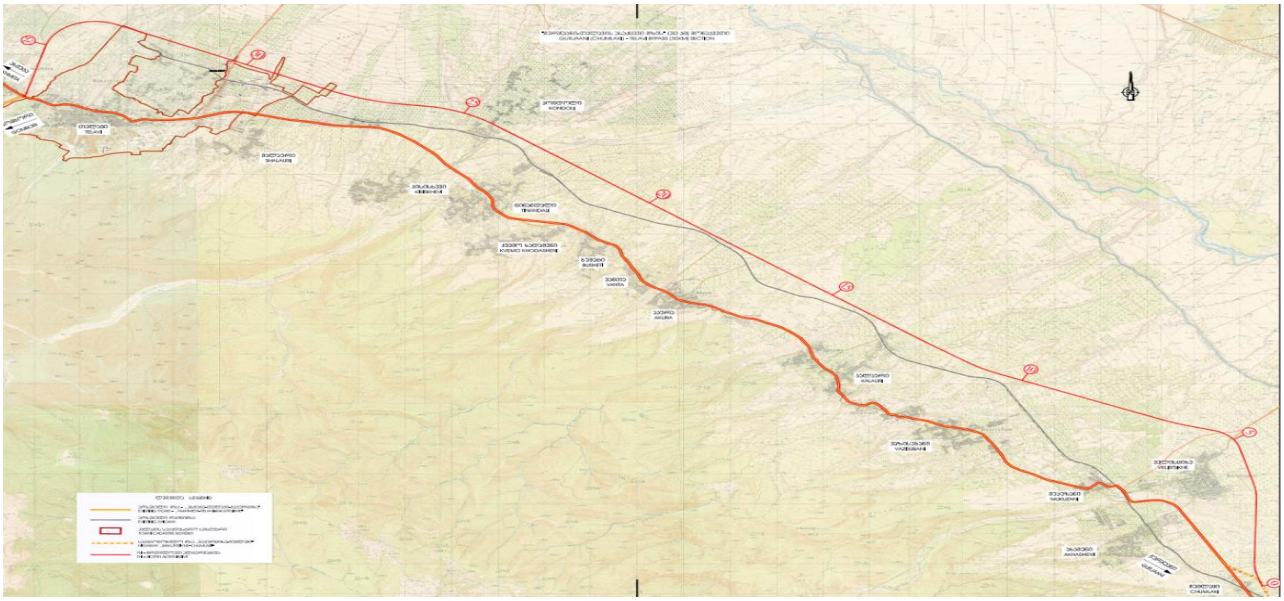
Gurjaani – Telavi road section is expected to bypass the densely populated villages located on that section and Telavi city, where needed and justified, and connect to the existing road in the vicinity of the end of Vaziani-Gombori-Telavi road section of Zhinvali-Bakurtsikhe-Tsnori secondary corridor. Below are described the three alternative alignments selected for Gurjaani (Chumlakhi)-Telavi Road Section.

Alternative TN

The red line shown on Figure 3.5.1 refers to the Alternative TN. The length of Alternative TN is 36,750 meters. The proposed alternative requires acquisition of 1193 land parcels with cumulative area of 1,082,296 sq.m.

Among them, 378 state-owned land parcels (117, 369 sq.m.) are vacant and belong to the local Municipality. Remaining 815 land parcels (904,927 sq.m.) are under privately ownership and/or possession.

Most of the project affected land parcels along this alternative are agricultural, however 33 (20 534 sq.m.) are of residential designation and 22 land parcels (10, 776 sq.m.) are assigned to category commercial/enterprise.



Map 3.1 Alternative TN shown with red line

Alternative TS

The length Alternative TN is 36,003 meters shown on Figure 3.5.2 in light blue line. The proposed alternative requires acquisition of 1,287 land parcels with cumulative area of 1,068, 636 sq.m.

Among them, 419 state-owned land parcels (272,249 sq.m.) are vacant and belong to the local Municipality. Remaining 868 land parcels (796,388 sq.m.) are under privately ownership and/or possession.

Most of the project affected land parcels along this alternative are agricultural, however 21 (18,107 sq.m.) project affected land parcels are of residential designation, 26 land parcels (25,822 sq.m.) are assigned to category commercial/enterprise, 44 land parcels with total area of 29,044 sq.m. are registered as private non-agricultural and 2 land parcels (124 sq.m.) are attached with the tower owned by mobile telephone company.

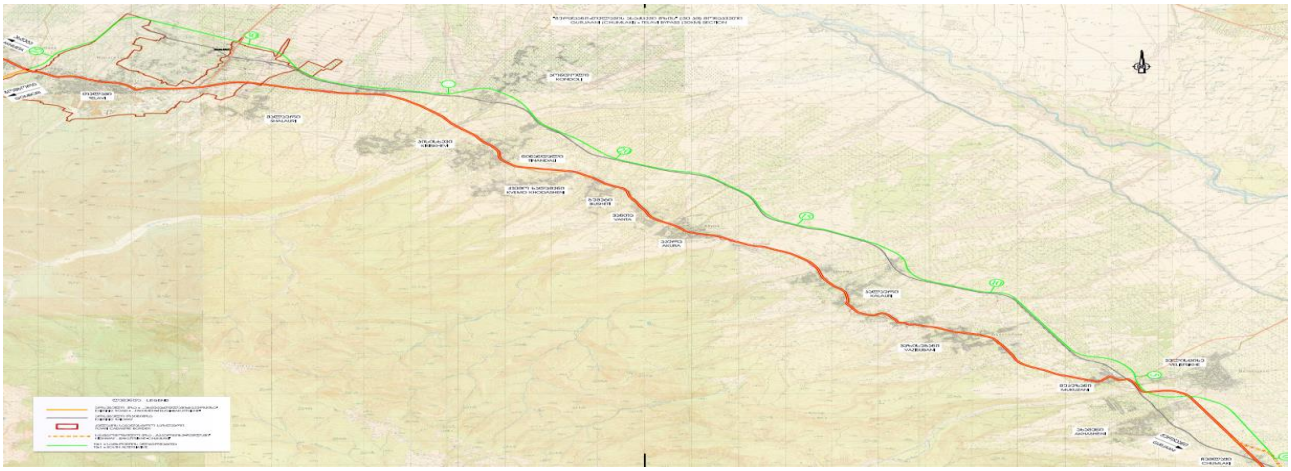
Map 3.2 Alternative TS shown with light blue line

Alternative TS_1

The light green line shown on Figure 3.5.3 refers to the Alignment TS_1. The length Alternative TS_1 equals 36,272 meters.

The proposed alternative requires acquisition of 1,298 land parcels with cumulative area of 1,074,474 sq.m. Among these 1,298 land parcels, 426 state-owned land parcels (273,570 sq.m.) are vacant and belong to the local Municipality. The remaining 872 land parcels (800,904 sq.m.) are under private ownership and/or possession.

Most of the project affected land parcels along this alignment are agricultural and used by local households for growing seasonal crops, fruits and vine yards; however, 21 (18,107 sq.m.) are of residential designation and 26 land parcels (25,822 sq.m.) are assigned to category commercial/enterprise, 43 land parcels (29,285 sq.m.) are registered as private non-agricultural and two more small size land parcels attached with mobile company transmission tower.



Map 3.3. Alternative TS_1 shown with green line

3.2 No-Project (No-Action) Alternative

When analyzing the zero alternative, particular attention must be paid to the possibility of free movement within the limits of the existing road section. During the periods of abundant precipitations in the winter season, traffic obstructions are common, as following the road size, the roadway is difficult to clean off the snow swiftly. For the main failure and traffic obstruction is also the increasing the numbers of the tourists' travel along the Kakheti region during the summer and autumn seasons.

These alternative routes make the journey much longer and contribute to the increased traffic safety risks (particularly for large vehicles). In addition, the alternative routes run across some settled areas of Kakheti region and consequently, the increased traffic flows have a negative impact on the living conditions of the local people.

In the future, with the growing traffic flows from Tbilisi, or other city to Kakheti which is quite probable with the development of tourism. The present status of the road transportation will further deteriorate, and traffic collapse is also possible what may become an important hampering factor on the way of the social-economic development of the country. It should also be said that zero alternative will drastically reduce the positive social-economic effects of the already modernized sections of Tbilisi-Bakurtsikhe-Lagodekhi and will have a negative impact on the expectations of the country population and businesses.

While selecting a better variant out of the suggested alternatives, first of all, geological structure and geological hazards of the project corridor, and anticipated complications during the construction and operation of road should to be taken into consideration.

Three provided alternatives have more or less similar impacts on the natural environment, there are no forest or protected areas, the more impact will be on social environment. At the same time it must be mentioned that the project does not impinge on protected areas, parks or ecologically sensitive areas. No threatened or endangered species inhabit the area. There appears to be no danger of disruption of archaeological remains.

No forest lands or social infrastructure assets, such as health care, educational or sports facilities are to be affected by the proposed alternatives.

The principal concern arising from the social studies associated with preparing the Resettlement Action Plan, which will be prepared after the design will be approved by the RD and WB.

The principles for Analysis of alternatives are as follows:

a) Comprehensive consideration of technical, technological, ecological, social and economic parameters of the project solutions of the planned activity;

b) Variance of project solutions to ensure compliance with the environmental standards and consideration of alternative versions;

c) Comprehensive consideration of regional and local factors.

3.3 Comparative analysis of the alternative alignments

Overall, the selected alignment alternatives are mainly aiming to bypass the villages and settled areas along the study road but also trying to minimise the impact on arable land, especially vineyards and peach plantations.

Northeast of the existing road and partly near parallel to the old railway track and along the existing water channel, alternative road alignments are proposed. In this area along the alignment alternatives, preliminary site visit investigations were conducted for visual examination of potential impact on private land parcels, assets and infrastructure, to assess the scope of project impact and estimate compensation budget.

Telavi-Gurjaani (Chumlaki) road section is expected to be designed and built in Alazani lowland along the new alignment bypassing the population of the above mentioned settled areas and mountain slopes.

The three main alternatives were defined when working on the engineer design of Telavi-Gurjaani (Chumlaki) road section. All three alternatives proposed in this report are rather similar in terms of land acquisition, income loss, and potential economic impact on livelihood standards of local communities within project affected areas of the preferred alignments. The alternatives have been identified, named, and applied in different colours on the map below.

Presented below is the description of road section alternatives for Telavi-Gurjaani (Chumlaki) road section that have been compared and assessed with regard to the scope of land/assets acquisition and estimated budget for cash compensation calculated in accordance with the compensation entitlements and valuation approach, as proposed in the RPF prepared in accordance with the active legislation of Georgia and WB OP 4.12 on Involuntary Resettlement. The compensation unit rates used for cost estimation for selected alternative alignments the Consultant took into close consideration the objectives of the above mentioned RPF[1] agreed with WB and Ministry of Regional Development and Infrastructure/Roads Department to be used as the base document to address social and resettlement impacts in various road rehabilitation projects in Georgia. Correspondingly, during the assessment of alternatives, the RPF principles have been closely considered in terms of scoping project impact and provision of estimated RAP budget, separately per each alternative road section.

3.4 Summary of project impact of Telavi-Gurjaani (Chumlaki) Alternatives

The so-called TN alternative runs north of the exiting raileay line. After passing north of the village Velistsikhe, the laignment follows nearly a straight line from Chumlaki to Telavi.

The TS alternative runs nearly over the full length parallel to the existing railway line in short distance with some minor exceptions. The sub-alternative TS-1 are aiming to shorten and straighen the TS alignment at certain location.

Photo 3.4.1 Gurjaani (Chumlaki) - Telavi Bypass at approx. design start - km 0+000

The length of the alternative road sections are presented in Table 3.2.1 below.

[1] Resettlement Policy Framework prepared under the SRLR –III by the Road Department for the WB funded projects.

Table 3.4.1 Length of Gurjaani (Chumlaki) - Telavi Alternative

Alternative	Section Length (km)
Existing road Gurjaani (Chumlaki) - Telavi	34.48
Alternative TN (Red Line)	36.77
Alternative TS (Light Blue)	35.95
Alternative TS-1 (Green Line)	36.21

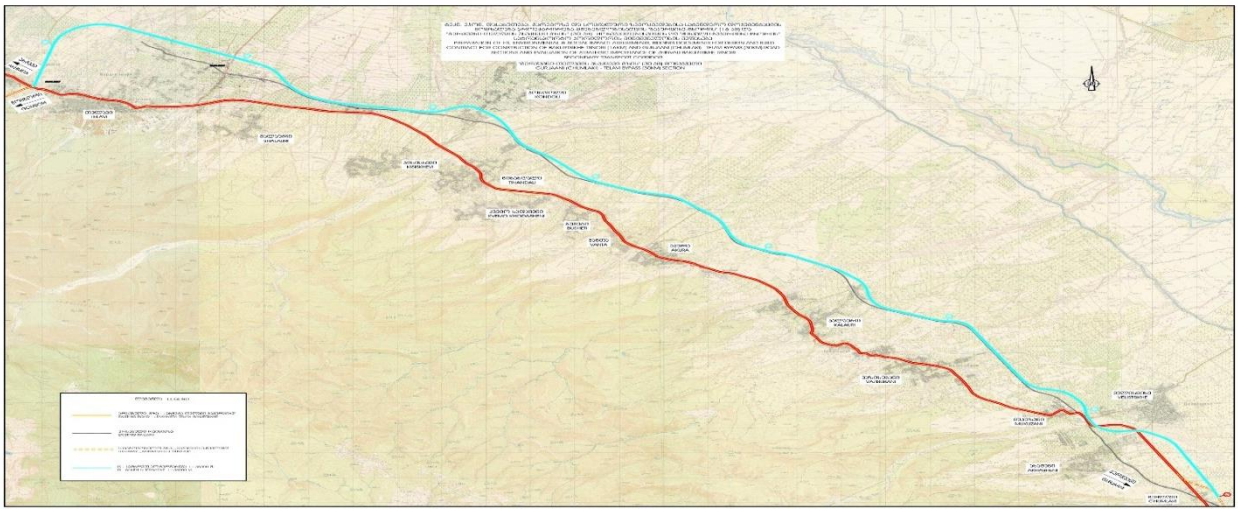
Criteria were developed and used to evaluate the potential impacts of the selected alternatives and determine the alternative, which performs overall best in functional, economic, environmental and social terms. These criteria include:

- Functional Criteria
  - Road length/travel time savings
  - Alignment features/adherence to road design standards
  - Estimated traffic
- Economic Criteria
  - Total Investment cost
  - Economic benefits (Economic Internal Rate of Return)
- Environmental & Social Criteria
  - Impact on environment/biodiversity
  - Community Impact (noise and pollution)
  - Resettlement needs/affected households

On balance of the comparison of the multi-criteria analysis it is recommended to consider for Gujaani (Chumlaki) – Telavi the Alternative TS (light blue line) for implementation.

The selected alternatives perform economically best but needs also to be further refined to optimise construction costs and minimise social and environmental impacts. The recommended alignment alternative follows over long stretches an existing railway line and the combined corridor minimise disturbance of the surrounding landscape.

Therefore, the alternative TS (light blue line) was recommended for implementation and the preliminary design based on this alignment alternative. Details of the alignment study are provided in the separate Alignment Study Report.



Map 3.4.1 Gurjaani (Chumlaki) - Telavi Preferred Alignment Alternative

4 PROJECT DESCRIPTION

Georgia is located to the south of the Caucasus mountain range, with Russia located to its north, Armenia and Turkey to its south, and Azerbaijan to its east. With a population of 4.5 million, it is moderately urbanized, with 47 percent living in rural areas as of 2010.

Over the last five years, Georgia has achieved significant economic progress. Due to very aggressive, broad reforms, its economy rapidly grew at an average rate of over 9 percent a year from 2004 to July 2008. The country successfully overcame the August 2008 conflict and the 2008-2009 global economic crisis. Although economic growth contracted by 3.8 percent in 2009, it recovered in 2010 to 6.3 percent and an estimated 6.8 percent in 2011. This recovery and growth was due to an increase in exports, and tourism, and continued high levels of public investment. The public investment of the Government was mainly focused on the road network. Increased public investments aimed at boosting economic recovery by improving main road corridors and local connections, and by creating temporary employment.

In 2011, the Government developed a ten-point economic program with the goal of facilitating job creation and improving welfare of the population. Among the top ten priorities is the improvement of the infrastructure, especially roads. This program puts a special emphasis on the rehabilitation of secondary and local roads.

The Government's ambitious plans to maintain high economic growth by promoting the transportation of goods within the country, increasing tourism, and revitalizing agriculture, pose challenges to the road sector: (a) significant capital investment is needed to bring the road network to a level that can support the economy; (b) scarce resources need to be prioritized to ensure long-term maintenance of the road assets; (c) local connections must be improved to provide the rural population with easy access to markets; and (d) investments in the road sector need to generate employment.

4.1 Project Introduction

RD of MRDI developed Five-Year Rolling Program for Preservation and Improvement of Secondary Road Assets for 2016-2020. Improvement and upgrading of Zhinvali-Bakurtsikhe-Tsnori secondary transport corridor is also part of this Five-Year Rolling Program. The final decision about prioritization of improvement and upgrading of its sections will be informed by the conclusions and recommendations of the evaluation of strategic importance of this corridor included in the scope of this assignment. The concerned corridor is important in connecting several regions of the country and two international transport corridors linking Georgia with Azerbaijan (via S-5 Tbilisi-Bakurtsikhe-Lagodekhi) and Russia (E-117).

Tbilisi-Bakurtsikhe-Lagodekhi international road (S-5) connects Tbilisi with Lagodekhi city, the state border with Azerbaijan, as well as with the cities of Shida Kakheti. Bakurtsikhe-Tsnori section, which is in the south end of the concerned secondary corridor, is located in Tsivgombori ridge, passes through densely populated villages in Gurjaani and Signagi districts, and crosses several ravines. The traffic and road safety situation are complicated particularly on Bakurtsikhe-Vakiri section of the mentioned road, where the existing alignment runs through the villages of Bakurtsikhe, Kardenakhi, Anaga and Vakiri. The road parameters are not met and there is no way for their improvement without substantial demolition of the existing infrastructure (houses, plots, etc.).

Bakurtsikhe-Tsnori road section is expected to be designed and built in Alazani lowland along the new alignment bypassing the population of the above mentioned settled areas and mountain slopes. It is expected to connect at 104 km of the existing road (passing through the village of Bakurtsikhe) with the section along

120km of the same road (borough of Tsnori). Gurjaani-Telavi road section is expected to bypass the densely populated villages located on that section and Telavi city, where needed and justified, and connect to the existing road in the vicinity of the end of Vaziani-Gombori-Telavi road section of Zhinvali -Bakurtsikhe-Tsnori secondary corridor.

Telavi-Gurjaani (Chumlakhi) road section is part of the Zhinvali-Bakurtsikhe-Tsnori transport corridor.

The existing road is a two-lane carriageway road with a paved width varying between 6.5 and 9.0 m and pass through several settlements, as for instance Mukuzani, Vazisubani, Shashiani, Kalauri, Vachnadziani, Akura, Vanta, Busheti, Kvemo Khodasheni, Zinandali, Nasamkhrali and Telavi.

Traffic increased substantially on the road, creating capacity constraints and safety hazards for motorised traffic and pedestrians. Improvements of the exiting road are required, which would be difficult to implement due to close surrounding private properties and buildings along the road. Therefore, alternative alignments need to be investigated to improve traffic capacity, road safety and environmental condition of the population in the settlements.

The bypass of Bakurtsikhe-Gurjani, which is presently under construction, should be taken into account during identification of alignment alternatives and should be connected to potential bypass alternatives of Bakurtsikhe-Tsnori and Gurjaani (Chumlaki)-Telavi.

The project area is densely populated and highly agricultural used. Therefore, land acquisition and resettlement will be the key issue of concerns in defining alignment alternatives, in particular considering that initial investigation revealed that

- large number of land parcels are not official registered
- large number of fruit trees, grapes, and other trees are affected

Based on the recommended alignment alternatives, preliminary designs and bidding documents for design-build construction contracts for each project road section will be prepared separately. Corresponding environmental, social and resettlement documents will be prepared, required for implementation of the project under Georgian law and World Bank guidelines.

Kocks Consult GmbH has been entrusted with providing consultancy services for preparation of Feasibility Study, Preliminary Design, Environmental and Social Impact Assessment, and Bidding Documents for Design-And-Build Contract for Construction of Bakurtsikhe-Tsnori (16km) and Gurjaani (Chumlaki)-Telavi Bypass (30km) Road Sections and Evaluation of Strategic Importance of Zhinvali-Bakurtsikhe-Tsnori Secondary Transport Corridor.

4.2 Geometrical Road Design Standard and Parameter

Designs should be economically justified and the optimum choice will vary with regard to construction and road user costs. Construction costs will be related to terrain type and choice of pavement construction, whereas road user costs will be related to level and composition of traffic, journey time, vehicle operation and road accident costs.

In 2009 a new Georgian geometric design standard has been introduced[2]. According to the design standard, roads are classified based on the functional classification, the annual average daily traffic (AADT) volume and terrain type.

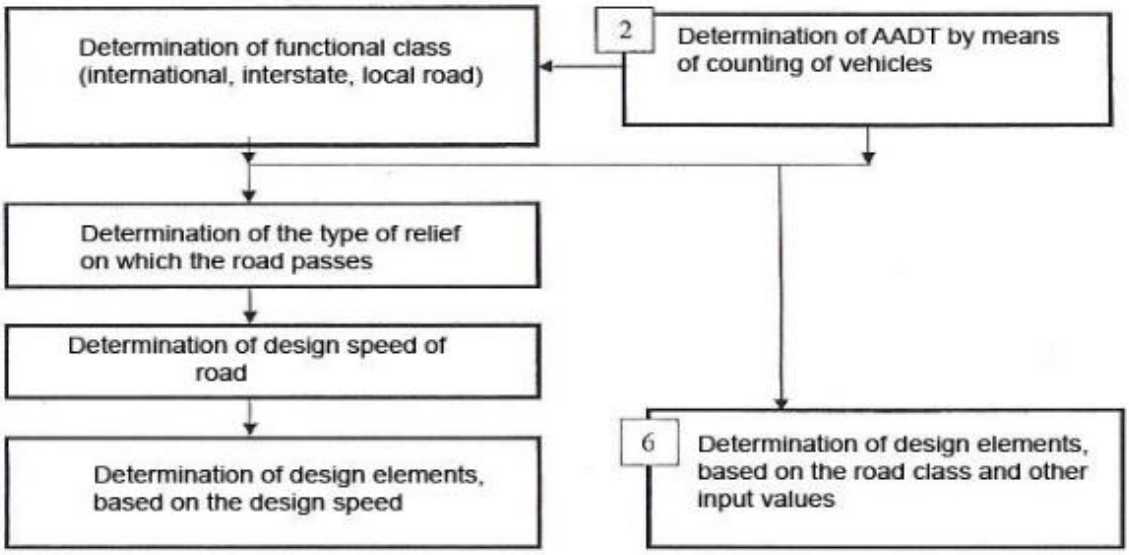


Figure 4.3.1 Flowchart for selection of design parameters
Source: The Georgian National Standard, SST Gzebi 2009

The Gujaani (Chumlakhi) – Telavi road section is part of the SH-42 road from Akhmeta to Bakurtsikhe and classified as interstate road, although in future the road is supposed to connect the international road (S-3) from/to Russia with the S-5 from/to Azerbaijan.

The terrain in the project area is considered to be flat. Referring to the Georgian standard, flat terrain is characterized by natural slope coefficient, less than 1:10 and the natural difference in height per kilometre is less than 30m.

Considering the functional classification and terrain type, the design speed should be set as 100 km/h for sections with AADT less than 8,000 vehicles.

Once the design speed is selected, appropriate values for the geometrical elements that form the road can be defined. This includes the road cross-section, desired horizontal alignment and vertical alignment design parameter.

Cross Section

The width of road on the one hand should be minimised so as to reduce the cost of construction and maintenance whilst on the other hand it shall be sufficient to carry the traffic loading efficiently and that vehicles in opposing directions of travel can pass safely. The width of road is composed of the width of carriageway (sum of the width of lanes) and the width of the shoulders.

[2] Geometrical and Structural Requirements for Georgian Automobile Roads, Ministry of Regional Development and Infrastructure, Roads Department, Tbilisi 2009

In accordance to Attachment 4 of the Georgian Design Standard, the design elements for the cross section of the project road, considering a design speed of 100 km/h should consist of a carriageway width of 7.00 m, paved shoulder width of 2 x 2.5m and 2 x 0.50 m unpaved shoulder. The total road width is 13.00 m.

However, it should be noted that for the Bakurtsikhe – Gurjani Bypass Road Section, which is currently under construction, the total road width is only 12 m with 0.50 m paved shoulder, due to the applied reduced design speed of 80 km/h.

This difference in the cross-section parameter has been discussed with the Road Department and in order to harmonise the cross sections of the Gurjaani (Chumlaki) – Telavi road with the Bakurtsikhe – Gurjani bypass road, it was decided to reduce the paved shoulder for the Gurjaani (Chumlaki) – Telavi road from 2.5 m to 0.50 m. The paved carriageway and shoulder width will therefore correspond to the Bakurtsikhe – Gurjani bypass road, which is under construction, and a design speed of 80 km/h, but will allow a future upgrading of the cross-section parameter to a design speed of 100 km/h.

The selected cross section parameter for the Gurjaani (Chumlaki) – Telavi road are therefore as follows:

Number of lanes:	2
Lane width:	3.50 m
Carriageway width:	7.00 m
Paved shoulder width:	0.50 m
Way side (unpaved shoulder)	2.50 m
Total road width:	**13.00 m**

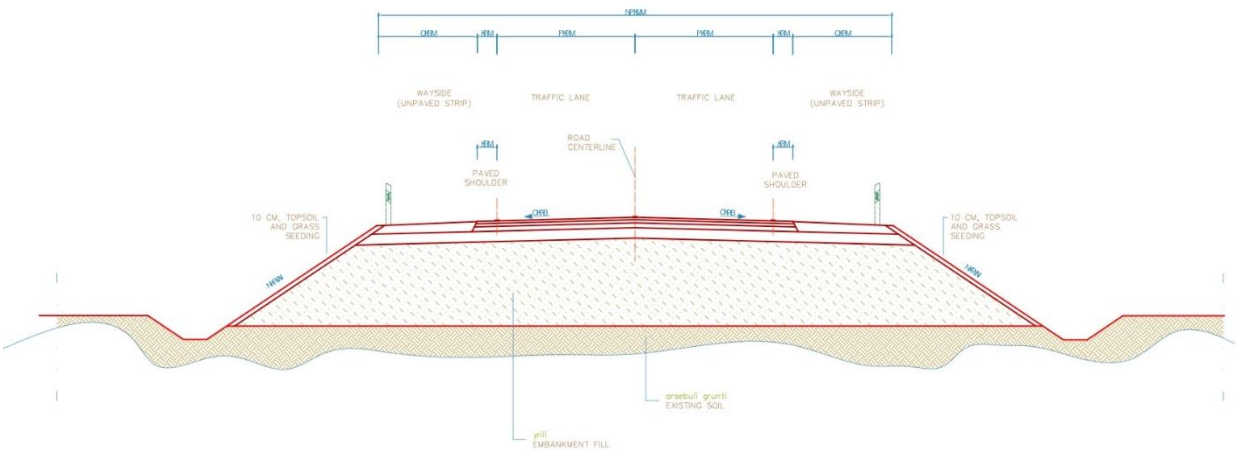


Figure 4.3.2, Typical Road Cross Section

On embankments, where installation of crash barriers is required, minimum 0.50 m 'wayside' (unpaved shoulder) should be considered.

Geometrical Design Parameter

The desired geometrical design parameters for the selected design speed of 100 km/h are as follows:

Min. horizontal radius	450 m

Max. vertical slope (gradient)	5%
Min. longitudinal slope	0.4 %
Min. crest curve	10,000 m
Min. sag curve	4,900 m
Min cross section slope	2.5%
Max superelevation:	7%

The proposed alignment alternatives pass through flat terrain and therefore no geometrical constraints are anticipated which would result lower design parameter, except at the connection to the existing road network.

4.3 Bridge Design Codes and Standards

Before independence, design code SNiP had been used for the design of bridge in the region of Georgia. After independence, development of a separate bridge design code has not been initiated yet. A mixture of American and European codes is generally being used for designing of bridge structure. Highway loading, HL93 of AASHTO/LRFD has been widely used and performance of the already constructed bridges, both by the nationally and internationally funded projects, is found satisfactory.

The use of the bridge design standard was discussed with Road Department, taking also into consideration the request from the RD Consultant to use European standards (Euro Codes). As a result of the discussions, the Road Department confirmed that the use of AASHTO design standards is acceptable for the preliminary design.

Therefore, the Consultant proposes that the bridges shall be designed as per AASHTO/LRFD Bridge Design Specification which includes the following control variables:

- HL-93 design loading - 75 year maximum live load effect
- Earthquake hazard - 7% probability of exceedance in 75 years (1000yr return period)
- Wind load - 50 years return period
- Flood - 100 years return period.

The reasons for proposing AASHTO LRFD Bridge Design Specification are:

- In Georgia, country specific data for traffic load is not available. Structures designed in the recent past with HL93 loading have no complain to its adequacy till to date. In such contest, considering a higher traffic load value shall be too conservative without any specific reason.
- AASHTO/LRFD approach is simple. This consider a Reliability Index of 3.5 on strength calibration for a 75 years life. This is equivalent to probability of failure is only 0.0233% during the stipulated design life. The Consultants' consider that this is more than sufficient for the project;
- This involves less cost (though structural cost is not linearly proportional to the design life);

Withstanding the above discussion, the Consultant feels that a higher 'design life' value (based on other code) may be used if the Road Department wishes so. But at the same time, would like to remind that it will have higher initial cost and the benefit for the investment is not clearly evident.

The design codes proposed to follow for assessing the loads and making preliminary design the structures are:

- AASHTO LRFD Bridge Design Specifications (SI Units)/2007 has generally been used for bridge loading and to design the structural components of the structure.
- AASHTO Guide Specifications for LRFD Seismic Bridge Design –2011
- Construction Norms: Bridge and Culverts SNiP 2.05.03-84 – shall only be used for definition of NK 100 live load for bridge response.
- Construction Norms and Rules "Seismic Resistant Construction" (PN 01.01.09)

For any conflicting provisions among the codes – AASHTO/LRFD Bridge Design Specification - 2007 shall be followed.

Bridge Cross-Sections

Proposed bridge carriageway geometry shall be based on the provisions of the "Geometric and Structural Requirements for Highway Design in Georgia" by the following considerations:

- Lane width: 3.5m has been taken as that of the road design;
- Side lane (safety lane, varies based on road design requirements): 2.5m;
- Minimum Footpath width: 1.5m (0.5+0.75+0.25);
- Height of concrete barrier: 0.80m; and,
- Basic cross fall on carriageway: 2.5 %, has been taken as that of the road design

A 15.0m total bridge width as shown in Figure 2.3 is proposed.

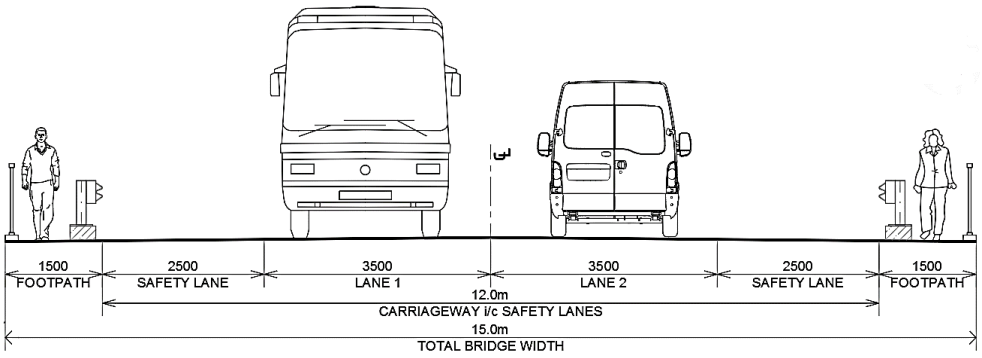


Figure 4.4.1. Proposed bridge cross section

4.4 Pavement Design Standard

Pavement design is a process of selection of appropriate pavement and surfacing materials to ensure that the pavement performs adequately and requires minimal maintenance under the anticipated traffic loading for the design period adopted.

The pavement design for the study road will be based on design method according to *AASHTO Guide for Design of Pavement Structures*, *1993, Volume 1,* Design Procedures for new construction or reconstruction. This method is recommended to be used for the pavement design of the study roads as AASHTO Design Method has already been used in Georgia and is worldwide recognized.

The AASHTO Guide for Design of Pavement Structures is based on precise input numbers for material properties, performance, reliability and Traffic.

In order to determine an adequate technical and economical pavement, a comparisons pavement design using the German Pavement Design Guideline '*Richtlinien für die Standardisierung des Oberbaues von Verkehrsflächen, RStO 12'* has been carried out. German RStO Guide for Design of Pavement Structures is based on experience and scientific evaluation of existing roads and other traffic areas.

The design life used in the pavement design will be 20 years as stated in the Terms of Reference and confirmed by the Road Department.

4.5 Drainage Design Standard

For the detected water crossings, calculations of peak discharges will be carried out with the Rostomov method.

The Rostomov method has been widely used for several projects in Georgia. The calculations for this method follow the chapter IV of the Technical Reference to Calculate River Peak Flows in the Caucasus. This manual is based on long-term records and statistical investigations of precipitation and river discharges of the Caucasus region.

For the present project, one of the most important advantages of the Rostomov method is the fact that no external precipitation data are necessary, because the long-term-precipitation-records are included in the climatic coefficient k, which is presented in the manual as a map with isolines.

It should be noted that the Rostomov method gives the values of water peak discharge 15-18% higher than the boundary intensity formula given by SNiP 2.01.14-83 (Determination of design hydrological properties), which was deduced for the rivers of the USSR in the 1960s. The formula of boundary intensity does not consider the global climate changes of the recent decades and the associated increase in the intensity of precipitations, resulting in lower values of water peak discharge. By considering the increased intensity of precipitations on the background of global climate changes and increased values of water peak discharge, it is recommended to use the Rostomov method for calculation of the discharge. This method is approved in Georgia and meets modern requirements.

The design return period for calculation of the water discharge for crossings will be 50 years in accordance with SNiP 2.05.03-84 and confirmed by Road Department.

With the calculated peak discharge for the watersheds, a hydraulic calculation will be done. For this calculation, the HY8-program of the FHWA[3] will be used. HY-8 is not primarily a water surface profile computation program but is a culvert analysis tool. HY-8 assumes the culvert cross section shape, size, and material does not change in the barrel except in the case of broken back run-out sections.

4.6 Departure from Standard

However, the Terms of Reference emphasise that one of the major concerns of the project is to keep the construction as well as the maintenance costs of the road at minimum in order to suffice the economic viability

[3] U.S. Department of Transportation, Federal Highway Administration, Culvert Hydraulic Analysis & Design

of the project. This implies that departures from the current standard should be considered and alternatives discussed for comparison.

The cost-effective road design requires a thorough understanding of the complex interactions of soils, terrain, climate, and traffic. Moreover, creating sustainable solutions to the problems posed by these interactions requires a significant level of engineering judgment, technical skills, and local knowledge. Standard solutions are often insufficient. Terrain conditions can vary considerably within countries and between regions. Traffic types and needs depend on the circumstances of individual communities. To achieve cost-effective solution, it is important to tailor interventions to the specific situation and not to impose rigid designs

Therefore, the consultant will discuss and agree with the Road Department on departure from standards, where it is economically justified and will have no negative impact on road safety.

Also, the design parameters of adjacent road sections will be taken into consideration when determining the geometrical design parameter in order to provide to the road user a consistent uniform impression over a longer part of the road corridor.

However, while developing the alignment alternatives, the desired minimum geometrical road parameters had been respected and no departure from standard had been considered.

5. ESIA METHODOLOGY

The ESIA process consisted of the six main activities that are common for similar studies conducted according to the international standards:

1 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.
2 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.
3 Analysis of alternatives in terms of location, technology, design and operation, including the "no-project" alternative.
4 Development of the Environmental and Social Management Plan.
5 Drafting of the ESIA report.

Information disclosure and stakeholder consultation

5.1 Botanical and Zoological Surveys

This project consisted of a review of literature including both primary sources and government and consultant reports. Botanical and Zoological surveys have been carried out. Field works were performed environmental team (which includes botanist, sociologist, zoologist, and etc.) from November to December 2017.

An evaluation of botanical resources was conducted to determine if any regional red-listed special-status plants or their habitat occurs along the project area. Special-status species are those listed under the Georgian law “On” Red Book” and “Red list” of Georgia (Georgian legislative bulletin N19 1.07 2013).

The botanical recording took place along the road and road sides within maximum of 4-5 meters. Considering the fact that vast majority of the roadside is covered by cultivated land and croplands not much of the flora territory was recorded. In addition to that, there is a channel on the left side of the road from Telavi to Gurjaani (Chumlaki) direction. That is why the lack of flora territories are identified.

Zoological field survey was organized with the purpose of verifying the data obtained from the literature on the animal species composition and areas of their occurrence. A simple methodology of surveying animal footprints, droppings and dwellings was applied to collect information on key species of mammals and birds.

5.2 Historical Pollution of Road Corridor

Prior to commencement of the works on Telavi-Gurjaani (Chumlaki) road, its corridor must be cleaned off the dumped waste, which is to be collected, transported and disposed on the nearest landfill. Towards this end, the amount and content of the waste was identified, and a waste management plan was developed.

5.3 Pollution (Soil, Air)

Geotechnical, hydrological and hydrogeological conditions, soils composition and properties of the soil have been studied by LtD *Geotechservice*

According to the WB policy, the air pollution impact assessment should be performed relying on guidelines and standards of both the WB and of the borrowing country; in cases they differ, the stricter ones should be applied. Maximum allowable pollutant concentrations according to the Georgian regulations (*Georgian Ministry of Labor, Health Care and Social Welfare (2003) Order 38/n "On approval of qualitative environmental standards: Accept- able limit concentrations of pollutants in atmospheric air of residential areas"*) and the WB recommendations (*EHS guidelines, "Air Emissions and Ambient Air Quality*", based on WHO guidelines) are given below. 30 min onetime maximum concentration under the Georgian standard is assumed to be the strictest and therefore applicable in the evaluation.

It is assumed that if modelled under the worst possible meteorological conditions, 30 min onetime maximum pollutant concentrations will not exceed limit concentrations given below; exceedances of limit concentrations indicated by longer time periods are not likely to occur neither.

5.4 Noise

The current Georgian standards for the noise level are based on former soviet sanitary norms No. 3077-84 and specify different noise levels for different zones. The most relevant standards are the noise limits inside the residential building and outside it (at the wall) which are as follows:

Inside the residential buildings:

For Leq (7a.m. - 11p.m.) the indicative (equivalent) sound = 40dB (A), maximum level = 55dB (A)

For Leq (11p.m. - 7a.m.) the indicative (equivalent) sound = 30dB (A), maximum level = 45dB (A)

Outside the residential buildings (measured at the wall):

For Leq (7a.m. - 11p.m.) the indicative (equivalent) sound = 55dB (A), maximum level = 70dB (A)

For Leq (11p.m. - 7a.m.) the indicative (equivalent) sound = 45dB (A), maximum level = 60dB (A)

International Regulations

Federal road Administration: Exterior Noise Abatement Criteria

Activity Category	Maximum 1-hour Leq
Land where serenity and quiet are of extraordinary importance	57 dBA
Schools, churches, libraries, hospitals, residences, playgrounds, recreation areas	67 dBA (52dBA indoors)
Developed lands	72 dBa

Modelling of Traffic Related Noise

Point-source propagation can be defined as follows: Sound level$_1$ – Sound level$_2$ = 20 log r_2/r_1. This means that for every doubling of distance, the sound level decreases by 6dBA ("inverse square law"). Line-source propagation occurs when there is a continuous stream of noise sources. The reinforcement by the line of point sources makes the propagation field either cylinder shaped or a half-cylinder-shaped area. The line source propagation prediction model is as follows: Sound level1 – Sound level2 = 10 log r_2/r_1; the decrease in sound level for each doubling of distance from a line source is 3 dBA. When noise levels from a busy road are

considered, it is appropriate to utilize the road as an infinite line source and consider a 3-dBA doubling of the distance-propagation rate.

In order to carry out semi-quantitative estimation of noise impacts related to existing and projected traffic, we used measured noise data – average and maximum values provided in the Table 4.5.1. Based on comparison of the maximum and average levels of noise and existing traffic volume data, we can consider that current traffic is not high enough to apply linear source of propagation (3-dBA law) but the attenuation figures are between the point source and linear source (between 3-dBA and 6-dBA values). Increase of the traffic volume will lead to reduction of intervals between the vehicles crossing the given cross-section of the road section. Therefore, we assumed that according to the traffic volumes projected for the 2030, the traffic will be "dense enough" to apply 3-dBA law for the noise attenuation and maximum of currently observed average figures (68 dB A) could be taken as indicative figure for noise at a 5m distance from the road side.

5.5 Methodology for Analysis (Ranking) of Alternatives

The principles for Analysis of alternatives are as follows:

a) Comprehensive consideration of technical, technological, ecological, social and economic parameters of the project solutions of the planned activity;

b) Variance of project solutions to ensure compliance with the environmental standards and consideration of alternative versions;

c) Comprehensive consideration of regional and local factors.

4. 6. BASELINE INFORMATION

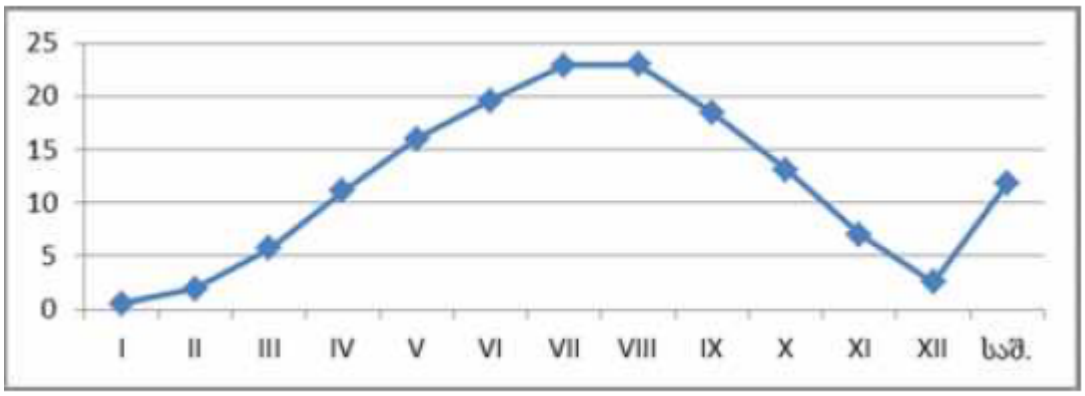
6.1 Biophysical Environment

6.1.1 Climate and Meteorological Conditions

Telavi Municipality is within a moderately humid subtropical climate zone. There is a moderately humid climate within Alazani Valley, with moderately cold winters and hot summers. The average annual temperature is 11-12₀C, in January – 0,2₀C, in July - 22-24₀C. The absolute maximum temperature is 39₀C, while the absolute minimum -21₀C. Precipitation - 700-800 mm per year. Tables and diagrams below provide specific characteristics of the climate within the study area and parameters describing their recurrence, according to the data obtained from Telavi meteorological station (source: Construction Climatology PN 01.05-08).

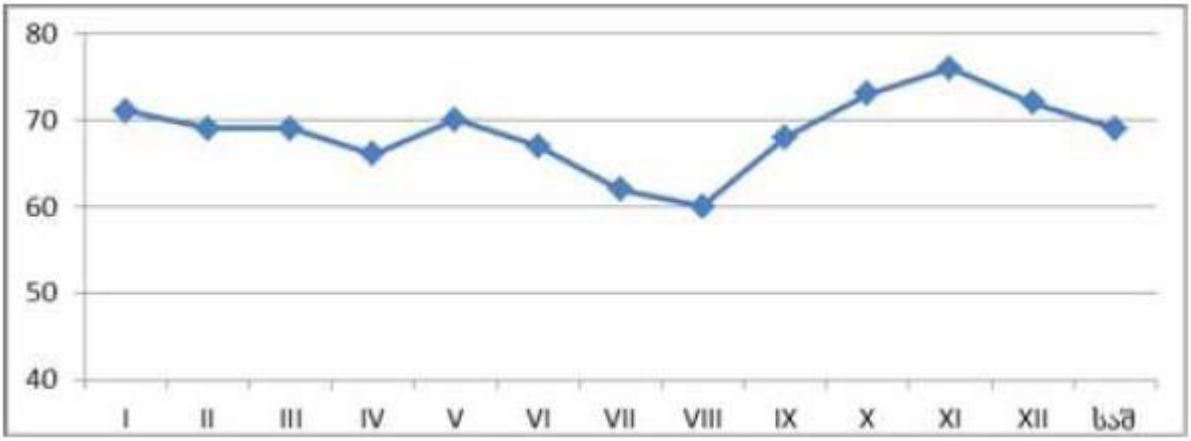
Ambient air temperature

month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Average annual	Abs. min. annual	Abs. max. annual
⁰C	0.5	1.9	5.7	11.1	16	19.6	22.9	23	18.5	13.1	7	2.5	11.8	-23	38



Relative humidity - %

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Average
%	71	69	69	66	70	67	62	60	68	73	76	72	69



Relative humidity - %

Average relative humidity at 13:00		Average daily amplitude of relative humidity	
The coldest month	The hottest month	The coldest month	The hottest month
69	46	14	31

Precipitation, mm

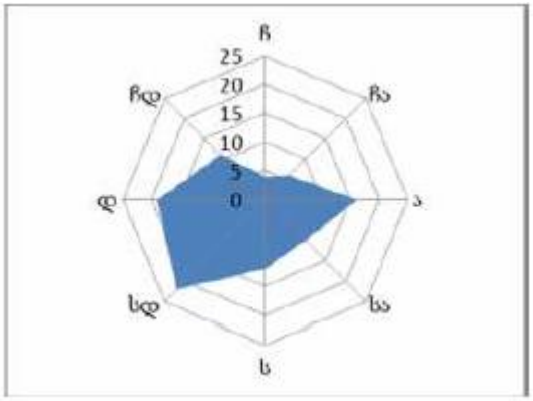
Annual precipitation, mm	Daily maximum of precipitation, mm
794	147

Wind characteristics

Highest wind speed, possible once in 1,5,10,15,20 years. m/s				
1	5	10	15	20
17	21	23	24	25

Average highest and lowest wind speed, m/s	
January	July
3,3/0,7	3,2/1,1

Annual repeatability of wind direction and calm (%)								
North	Northeast	East	Southeast	South	Southwest	West	Northwest	Calm
4	6	16	10	12	22	19	11	23



Source: Construction climatology PN 01.05-08

6.1.2 Topographical Data

A digital terrain model will be developed based on photogrammetry of existing topographical maps for the purposes of alternative route investigation and preliminary planning.

The topographical maps provide representation of the shape of the land, and natural and built features on the land. It allows the user to obtain measurements (within map scale limits) of distance, direction and quantity. In addition, the maps are enhanced to highlight natural characteristics.

Data collection is performed through digitalisation of existing locations and elevation of enough break lines, vertices, and spot elevations to form an accurate mathematical model of the terrain. The Digital Terrain

Model (DTM) is a mathematical model of the earth's surface formed by digitized three dimensional coordinates (x, y, and z). Using the Consultants design software, contours, cross sections, profiles, and other terrain displays and data could be generated from the DTM and directly used into the Computer Aided Road Design program (CARD/1).

The photogrammetric digital terrain model data provides accuracy to meet the needs of evaluation of alignment alternatives, but critical consideration should be given to the fact that the topographical maps used for development of the digital terrain model are might be outdated. Therefore, the topographic data from the photogrammetry will be verified in the field for the preferred alternatives as soon as weather condition allows field works.

6.1.3 Geotechnical and Pavement Design Study

Alazani Valley is an intermountain accumulative plain between Gombori range and Iori slope. It is located at 200–470 m a.s.l. The plain is inclined towards South-East and it is extended as Agrichai plain on the territory of Azerbaijan. The total length of the plain is 200 km. the length of the plain on the territory of Georgia is 110 km. Its greatest width is 28-30 km.

The major characteristic of physiographic unit of Alazani Valley is its relief, which is typical continental geosyncline. Alazani Valley is a flat plain, but in fact it is complicated by fans of left and right tributaries of Alazani River and by formations with little depth and rare erosions.

Telavi is located at 550-800 m a.s.l. relief of the city (mostly its southern part) is inclined and deeply fragmented by V-shaped steep valleys. Absolute elevations of the relief decrease consistently towards the north of the city and are 350-360 m a.s.l. near Alazani riverbed. Sharply expressed negative or positive forms of relief have not been observed along the study corridor.

From Geomorphological point of view, the project area is included in Transcaucasian intermountain zone. Folded complex, Alpine, late orogenic (collisional), the late collisional (Quaternary) slightly folded. It is a geological complex of sedimentary rocks. Geologically it is built up by Alluvial-Proalluvial sediments, rocky and semi-rocky sediments of Cretaceous age.

6.1.4 Geological Overview of the Project Area

Geologically, Alazani Valley is very peculiar tectonic unit of Georgia. This is a zone of intense immersion - continental geosyncline accumulating sediments. Formation of geosyncline has begun since Pliocene. Evolution of Alazani-Agrichai depression began since Upper Pliocene. Immersion still continues, which is approved by the stratigraphic and geomorphological facts. Caucasus foothill is built up by folded Upper Jurassic and Cretaceous sediments. Gombori range is built up by Mesozoic and Cenozoic suits, which are clearly divided into two different complexes from tectonical and lithological point of view. Older complex combines formations of diverse composition (clays, sandstones, limestones), while younger complex is represented Neogene (Sarmatian-Kimmerian) molasses series. The series is called Alazani Series.

Along the Alazani valley, existence of various-level alluvial terraces is observed on different sites. On the right bank, at about 140-150 m height from the Alazani level, morphologically well-expressed terrace steps are observed at the territories of Telavi, Tsinandali, Akhasheni, Gurjaani, Bakurtsikhe and Tibaani. These terrace fragments, having survived from denudation of the Gombori range North slope, are covered with deluvial deposits and proluvial sandy clayey and rounded cobble deposits drawn out by the rivers flowing down the

slopes. At some places, under the deluvial-proluvial deposits, sometimes alluvial deposits of the Alazani are exposed.

The project road is located in the transitional line between the Gombori range north-western slope and the Alazani plain, which is a south-eastward (i. e. directed toward the Alazani) gentle slope. The gullies are deeply cut in the Gombori range with V-shaped cross profiles, big inclinations of the channels and steep slopes, while after coming out of the steep Gombori slopes, channels depth and inclination of the lengthwise sections decreases. On the area of their intersection with the project road, the depth of the channels is so small that in many of them mudflows (very typical of almost all the gullies) come out at the banks. Along the sides of the gullies, mudflow debris cones are developed, due to which the western slope of the Alazani Depression and the relief of the road deployment line are undulating, with smoothed surface and shallow channelling.

According to the Seismic Zoning Scheme currently effective in Georgia, seismicity of the survey site is intensity 9 by MSK64 scale with dimensionless seismic coefficient A=0.28 (Construction Rules and Regulations "Antiseismic Construction", PN 01.01-09, Annex No. 1, Populated Locality # 1557 "Gurjaani").

6.1.5 Frost Depth

Considering the cohesive subgrade along the study road attention has to be paid to the influence of freezing temperatures to the pavement layers and subgrade.

For the region along this road section, the normative depth of soils' seasonal freezing is as follows:

Normative depth of soils' seasonal freezing:

Clay and lean clay	0cm
Fine and silty sand/silty clay	0cm
Coarse and medium grained gravelly sand	0cm
Coarse fragmental	0cm

No frost penetration has to be considered, based on the above listed seasonal freezing values for the pavement design for the road from Gurjaani (Chumlaki) to Telavi.

6.1.6 Geomorphology and Soils

Along the end proposed alternative road alignments, the following investigations and tests have been carried out during the initial and second feasibility phase:

The proposed alignment alternatives are mainly aiming to bypass the villages and settled areas along the study road but also trying to minimise the impact on arable land, especially wine yards and peach plantations. Proposed alternative alignments are presented on the attached map in Appendix 6.

All alternative alignments are running north of the existing road and general in varying distances parallel to the Railway track.

The so-called North alignment alternative runs north of the railway line. After passing north of the village Velistsikhe, the alignment follows nearly a straight line from Gurjaani (Chumlaki) to Telavi. The distance to the railway line is varying as the railway follows a winding alignment.

The south alternative alignment runs nearly over the full length parallel to the railway line in short distance with some minor exceptions. Sub-alternatives to the southern alignment are aiming to shorten or straighten the main alignment at selected locations.

Along the alternative alignments, nine (9) boreholes were sunk to a depth of 5.0m below surface. At the initial investigation stage, the aim of the preliminary investigations with boreholes was to collect data about the general ground conditions, the soil profile and type of soils and extraction of samples for laboratory testing.

Based on the initial investigation results and assessments with regard to economy, environment and land acquisition issue a preferred alignment had been chosen.

Following the selection of the preferred alternative, detailed soil investigations were carried out including investigations at proposed bridge sides.

During drilling works, the stratigraphy revealed by boreholes is carefully logged with special note taken to the thicknesses and conditions of the soil layers and ground water level.

Undisturbed core samples and disturbed bulk samples taken from each of the different soil layer and delivered to the laboratory.

For each borehole, a borehole log is prepared showing the thicknesses and conditions of the soil layers and ground water level as well as number, depth and type of samples extracted. Borehole locations for the preferred alignment are shown on the map in Appendix 6.

In selected boreholes Standard Penetration Tests were performed during the drilling works.

Locations of initial investigation points along alternative alignments are shown on the attached trial pit and borehole location map in Appendix 6.

Laboratory Testing

Laboratory tests have been performed by the laboratory of GTS GeoTechService in Tbilisi. Routine laboratory testing to obtain the relevant material properties required for the pavement design were carried out on soil samples of the base/sub-base and subgrade material recovered from the trial pits and boreholes.

The samples taken from trial pits are tested to determine the following characteristics and values:

- Natural moisture content
- Grain size distribution by sieving and hydrometer test
- Plasticity (Atterberg limits)
- Specific gravity
- Moisture density relation/Compaction test (MDD, OMC)
- California bearing ration (CBR)

The compaction tests are carried out using the modified Proctor.

CBR tests for cohesive soils are performed according ASTM method. The saturation of the subgrade during certain times cannot be excluded. To determine the influence of water on the cohesive soil CBR tests shall be soaked for 4days in water prior to performing the test.

The samples taken from boreholes were tested to determine the following characteristics and values:

- Natural moisture content
- Grain size distribution by sieving and hydrometer test
- Plasticity (Atterberg limits)
- Bulk/Dry density
- Unconfined compressive strength
- Shear resistance (angle of friction, cohesion)
- Consolidation/ Stiffness Modulus

In addition to the soil mechanic tests, chemical tests are performed as follows:

- Soil chemical analysis
- Determination of aggressiveness to concrete (sulphate and chloride content)

Locating and Sampling of Road Construction Materials

The material investigation program includes locating sources of suitable construction materials for the road and structures within economic hauling distances.

Existing borrow pits and quarries have been located and assessed for their suitability to meet contract requirements regarding adequate quality and quantity. All available data and laboratory test results of existing borrow areas and quarries including results from previous studies have been reviewed.

Investigation and Test Results

Field Investigation Results

The results of the preliminary field investigations by trial pits and boreholes carried out along the existing road alignment, alternative alignments and the preferred alignment are described separate for existing road and the alignment alternatives.

Borehole and Trial pit locations are shown on the attached map in Appendix 6.

The proposed alignment alternatives were mainly aiming to bypass the villages and settled areas along the study road but also trying to minimise the impact on arable land, especially wine yards and peach plantations.

Geotechnical investigations along the alignment alternatives include nine (9) boreholes to a final depth of 5.0m below surface. The borehole logs BH1 to BH-9 in Appendix 7 show the following subsoil structure:

With boreholes BH1 below a thin topsoil layer lean clay with sand and silty clay lenses has been encountered to the final depth of the borehole at 5.0m below surface. The about 1.2m direct below the topsoil have been visually described as dark brown and of hard consistency, as the deeper lean clay has a brown color and a very stiff condition.

The borehole logs for boreholes BH2, BH4, BH8 and BH9 show below the surface layer consisting of topsoil and/or "road building material" a granular material described as cobbles, fine to medium grained. The cobbles contain 20 to 25% sand and lenses of silty clay. The cobble material in these boreholes was recorded to the final depth of the boreholes at 5.0m below surface.

Locations of boreholes for alignment alternatives placed on the proposed road alignments coincided at some places with existing local roads, ways and paths mainly used for agricultural purposes. This is reflected in the borehole logs showing some "road building material" as surface layer.

Below the surface layer consisting of topsoil and/or "road building material" the borehole logs for BH3, Bh6 and BH7 show brownish lean clay with a very stiff to hard consistency. The lean clay extends to a depth between 2.3 and 3.0m below surface. Below the lean clay cobbles have been recorded to the final depth of the boreholes.

With borehole BH5 below the surface layer cobbles have been recorded to a depth of 1.50m underlain by lean clay to the final depth of the borehole.

No water or ground water table has been encountered in the boreholes during the drilling works.

Assessment of the soil profiles of the boreholes along the alignment alternatives has not resulted in advantage or disadvantage of a certain alignment alternative with regard to ground conditions. A preferred alignment has been chosen based on a number of other factors.

Following the determination of the preferred alignment additional investigation have been carried out consisting of six (6) boreholes Soil-1 to Soil-6 to 5.0m depth and thirteen (13) Br-1 to Br-13 to 15m depth, taking into consideration the Boreholes BH1, BH3 to BH7 and BH9 of the previous investigation phase which are on or near the preferred alignment. The boreholes Br-1 to Br-13 were sunk to 15.0m at proposed locations for new bridges.

Two additional boreholes Soil-7 and Br-14 are located on a variation to the preferred alignment bypassing the town of Telavi.

The previous and additional borehole logs show the following subsoil structure along the preferred alignment:

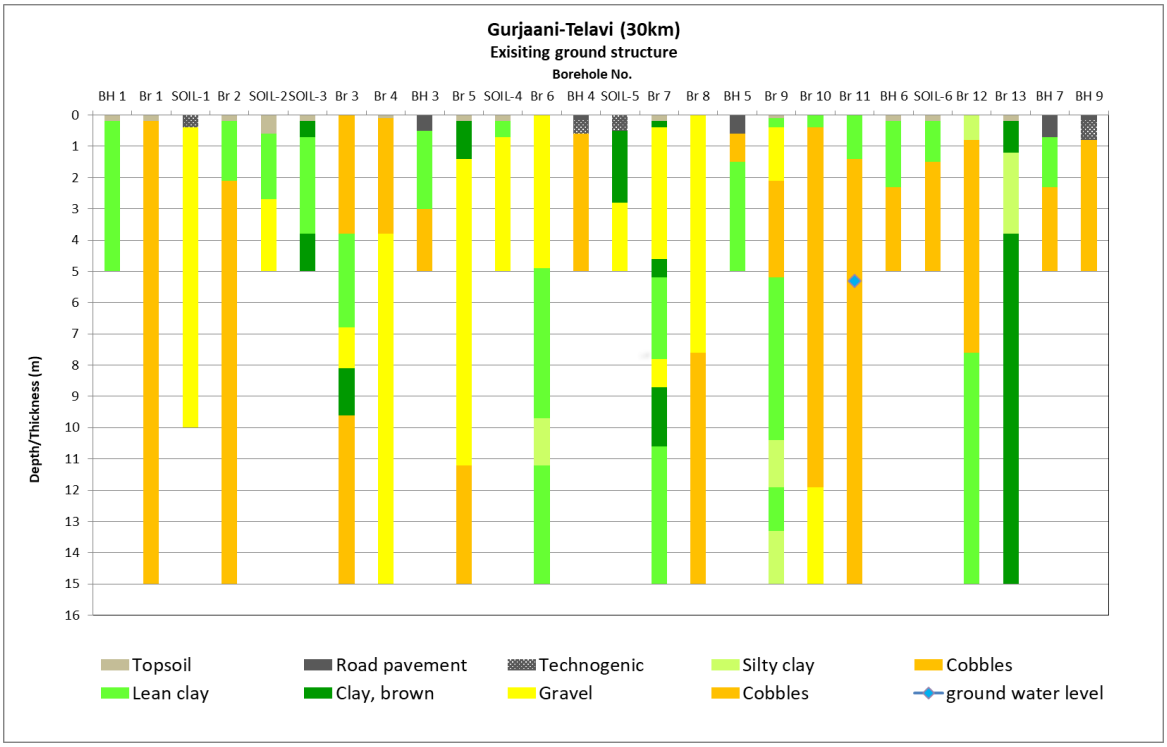


Figure 6.1.6.1, Existing ground structure preferred along preferred alignment

Nearly all borehole logs, with a few exceptions at BH1, BH Soil-3 and BH Br13 show granular material, gravel and cobbles often in change with lean clay and clay. The cobble and gravel material has mostly been encountered below a thin surface layer or underlying cohesive material in shallow depth between 1.0 and 3.0m. At several boreholes the granular material reaches from the surface to the final depth of the boreholes. At a few boreholes the gravel and cobbles are underlain by lean clay or clay.

Lean clay encountered from the surface to shallow depth of 1.0 to 3.0m is mostly underlain by granular material. The lean clay was described during drilling works as containing varying amounts of granular material

With boreholes BH1, BH Soil-3 located on the preferred alignment near Gurjaani only clean clay and clay has been recorded to depth of 5.0m below surface. Towards the end of the alignment with BH Br13 clay and silty clay has been encountered from the surface to the final depth of the borehole at 15.0m.

Standard Penetration tests

In selected boreholes along the preferred alignment Standard penetration tests (SPT) have been executed with the following results:

Table 6.1.6.1. Summary SPT test results in boreholes along the preferred alignment

Borehole	Depth (m)	Soil	Raw SPT N values	Consistency/Density acc. corrected values
Br 1	2.15 to 15.0	Cobbles	>50	dense, very dense
Br4	3.15 -3.45	Cobbles	>50	dense, very dense
	3.80 -15.00	Gravel, sandy	>50	dense, very dense
Br7	2.15 - 2.45	Gravel, sandy	>50	dense, very dense

	4.15 - 4.45		>50	dense, very dense
	6.15 -6.45	Lean clay	19	stiff
	8.15 – 8.45	Gravel, sandy	45	dense
	10.15 – 10.45	Clay, brown	44	very stiff
	12.15 – 12.45	Lean Clay	18	stiff
	14.15 – 14.45		16	firm

The cohesive soil along the preferred alignment has based on the SPT results a firm to stiff, locally very stiff consistency. The granular soils along this alignment section are based on corrected SPT results in a dense to very dense state.

During drilling works, ground water has been encountered only in borehole Br11 in depth between 5.3 and 5.8m below surface.

Details of the existing ground structure along the preferred alignment is shown in borehole logs in Appendix 8 and an overview of the ground structure along preferred alignment.

Laboratory Test Results

Boreholes were sunk along proposed alignment alternatives and along the preferred alignment to greater depth at selected locations and at proposed locations of new bridges and undisturbed and disturbed samples taken.

All samples extracted from trial pits and boreholes were delivered to the laboratory for testing and determination of characteristic soil values.

The main laboratory tests are classification tests, compaction tests, determination of strength and shear strength as well as compression tests. Testing was performed according European (EN-BS) and American (ASTM/AASHTO) Standards.

Based on the encountered type of soils the following laboratory tests were conducted:

- Moisture content;
- Atterberg limits
- Grain size distribution
- Specific gravity
- Proctor tests;
- CBR tests
- Compression tests
- Consolidation test
- Shear tests

Along the proposed alternative alignments, an initial soil investigation was carried out with nine (9) boreholes to a depth of 5.0m to provide general information about the ground structure and soil conditions in the area.

Following the determination of a preferred alignment, the second phase of geotechnical investigations along the chosen alignment was carried out. Laboratory test results of the previous investigations as far as relevant to the preferred alignment are included in the following tables

Samples of the encountered different soil types were tested in the laboratory as follows.

Cohesive subgrade materials

Lean clay, with sand and gravel

The fine content (<0.063mm) of the tested lean clay samples was determined in the laboratory, in a range from 29.5 to 48% with a sand content between 32 and 46%. The gravel content in the brown lean clay was 34 to35% in the tested samples but only 16 to 19% in the yellowish-brown and reddish-brown lean clay.

Table 6.1.6.2. Laboratory test results lean clay, brown, sandy

Type of subgrade	Plasticity LL	Plasticity PI	Maximum dry density	Optimum moisture content	Laboratory CBR value at at 95% MDD
	(%)	(%)	(kN/m³)	(%)	(%)
Lean clay, brown sandy	32.4 – 38.9	9.5 – 16.5	17.7	13.7	10.7
Lean clay, yellowish-brown, sandy	36.8 – 38.1	14.7 – 16.9	-	-	-
Lean clay, reddish-brown, sandy	33.6 - 35.1	12.3 - 13.3	17.2	15.3-	9.3

The consistency of the brown and yellowish-brown sandy lean clay material has been determined as firm to stiff based on laboratory test results. The reddish-brown clay has a soft consistency.

Based on the plasticity the cohesive material has been classified as sandy clay with low to medium plasticity.

Testing of samples of the lean clay has resulted in an unconfined compressive strength between 0.19 and 0.39MN/m².

According the AASHTO soil classification system the sandy gravelly clay falls into groups A-4, A-6 and locally A-2-4. The rating of the cohesive soil as subgrade is fair to poor.

Clay, brown, hard, with gravel and sand interbeds

The fine content (<0.063mm) of the tested clay samples was determined in the laboratory, in a range from 56.2 to 62% with a sand content between 23 and 31% and 11 to 14% gravel.

Table 6.1.6.3. Laboratory test results clay, brown, gravelly, sandy

Type of subgrade	Plasticity		Maximum dry density	Optimum moisture content	Laboratory CBR value at 95% MDD
	LL	PI			
	(%)	(%)	(kN/m³)	(%)	(%)
Clay, brown	34.6-40.1	17.1-23.3	16.3-16.5	20.4-21.2	6.5 -7.2

The consistency of the brown clay material has been determined as stiff to very stiff based on laboratory test results.

The brown clay has an unconfined compressive strength of around 0.5MN/m² according laboratory tests.

Based on the plasticity the clay material has been classified as sandy clay with medium plasticity.

According the AASHTO soil classification system the clay falls into group A-6. The rating of the cohesive soil as subgrade is fair to poor.

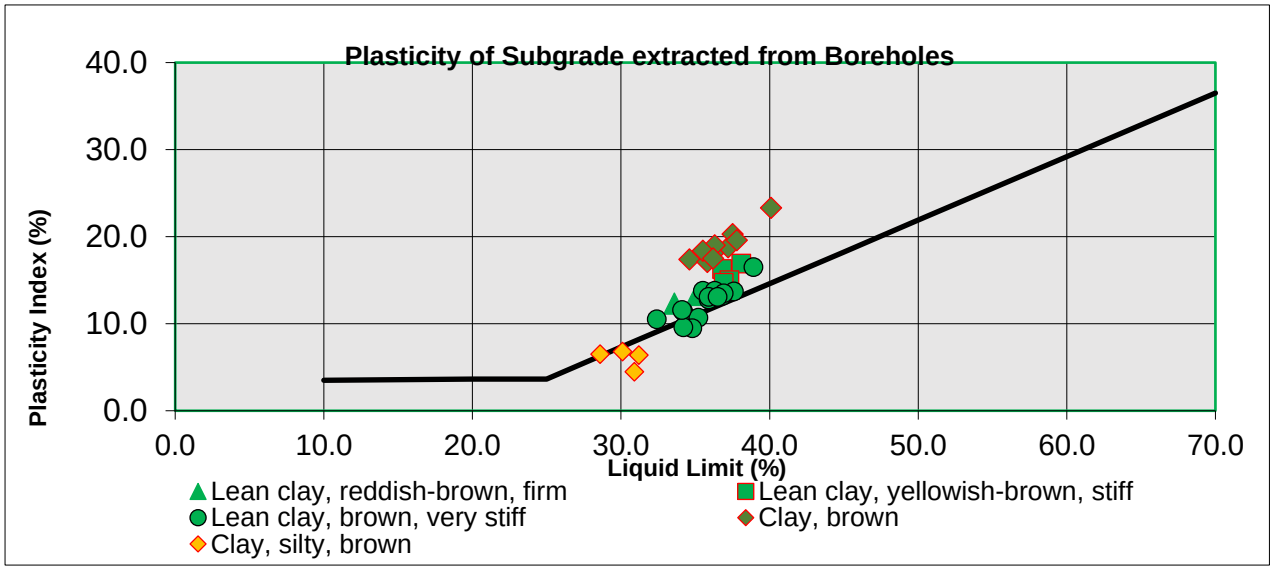


Figure 6.1.6.2. Plasticity chart cohesive of subgrade along preferred alignment

Clay, silty, and Silt, sandy, brown

The silty clay contains a varying amount of sand and about 20 to 25% gravel.

Table 6.1.6.4. Laboratory test results silty clay with gravel inclusions

Type of subgrade	Fine content (<0.063mm)	Sand content	Plasticity	
			LL	PI
	(%)	(%)	(%)	(%)
Clay, silty, brown with gravel inclusions	20.4 - 24.7	51.8 - 55	28-6 – 31.2	4.5 – 6.8

The consistency of the silty, sandy clay material has been determined as firm to stiff based on laboratory test results.

Based on the plasticity the material has been classified as sandy silt with low plasticity.

According the AASHTO soil classification system the clay falls into group A-2-4. The rating of the cohesive soil as subgrade is fair to good.

Granular Subgrade Materials

Cobbles, with sand and silty clay filling

The sand content of the tested samples of cobbles was determined in the laboratory, in a range from 19.4 to 22.9% with a fine (<0.063mm) content between 1.5 and 4.9%.

Table 6.1.6.5. Laboratory test results cobbles, sandy (subgrade))

Type of subgrade	Maximum dry density	Optimum moisture content	Plasticity		Laboratory CBR value at 95% MDD
			LL	PI	
	(kN/m^3)	(%)	(%)	(%)	(%)
Cobbles, sandy	21.7	6.2	22.1 - 38.2	4.6 - 16.4	36

Based on the grain size distribution and plasticity the cobble material has been classified as sandy gravel with rounded stones and little fines.

According the AASHTO soil classification system the Cobbles falls into group A-2-4 and A-2-6. The rating of the granular soil as subgrade is fair to good.

Gravel, with sand and silty clay filling

The sand content of the tested samples of cobbles was determined in the laboratory, in a range from 4.7 to 17.7% with a fine (<0.063mm) content between 2.1 and 20.4%. The material in borehole Br3 in 7.6m depth has a high sand content of about 55% and could be better described as gravelly sand.

Table 6.1.6.6. Laboratory test results gravel, sandy (subgrade))

Type of subgrade	Maximum dry density	Optimum moisture content	Plasticity		Laboratory CBR value at 95% MDD
			LL	PI	
	(kN/m^3)	(%)	(%)	(%)	(%)
Gravel, sandy	16.5 - 22.7	7.2 - 9.2	21.7 - 36.9	14.5 - 20.6	29 - 38

Based on the grain size distribution and plasticity the gravel material has been classified as sandy gravel with varying sand and fine content.

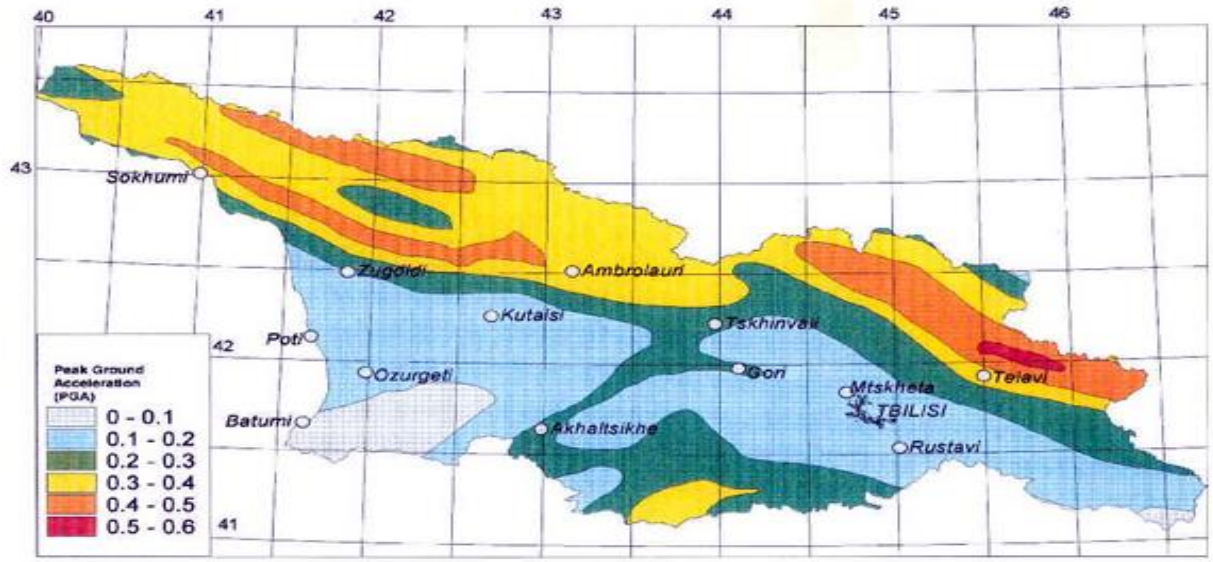
According the AASHTO soil classification system the gravel falls into group A-2-4. The rating of the granular soil as subgrade is fair to good.

A summary of laboratory test results of samples along the preferred alignment is presented in the Engineering-Geological Investigation report in Appendix 11.

Geological Structure and Seismicity

In terms of geological structure, the road alignment is laying in two different parts (see Annex- 1, General Geological Map of the Area), where one part is structured by main marine and marine- continental deposits, whereas the second part represents the Quaternary deposits resulting from the weathering and denudation of the first part deposits.

Map of the seismic hazard of Georgia - Peak Groun Accelerations



The bottom of the north-eastern slope of the Gombori Range is formed by Neogene, Paleogene and Cretaceous deposits. Deposits of different age are represented by the following rock varieties:

- **Neogene** (Aghchagil and Apsheron stages - N_2^3ak+ap) – Continental and marine molasses - conglomerates, sandstones, clays;
- **Paleogene** (Upper Eocene and Oligocene - P_2^3-P3) – clays, sandstones, argillites;

Geo-hazards are defined as geological phenomena or conditions, either natural or man-made that are dangerous or potentially dangerous to the environment and its habitants. Landslides, caused by heavy rainfall, flood, earthquake, erosion, and human activities, are the most common geo-hazards on land.

In terms of geological hazards along the study road and preferred alignment there are no hazardous processes or events observed, except for periodic mudflows taking place in almost all channels of the rivers that are crossed at a right angle by the road. For the rivers the majority of which becomes dry due to lack of water, it is characteristic to have very high waters during abundant precipitation and mudflows that originate at such times, move at high speed due to considerable inclination of the channel.

The mudflow streams contain water and stones or mud. Such streams originate in the zone of their source and transit areas due to existence of large amounts of loose, cohesion less cobble/gravelly and clayey material. For determining mudflow hazard degree and risk assessment for some of the gullies, it will be necessary to conduct hydrological/hydraulic survey of their valleys and in accordance with the obtained conclusions, plan appropriate project actions on each crossing.

Soils

Alluvial strongly calcareous clay soils are developed on the right plain of Alazani River, while on the right side - meadow-forest Alluvial not calcareous clay soils. The same type is developed in fragments in foothill zone, brown soil developed on conglomerates and sandstones weathering products. Forest brown soils are developed in Kakhetian Caucasus and lower part of Gombori range, under mixed deciduous forest, on clay shales and sandstones weathering crust; above the forest zone, under subalpine herbaceous vegetation - mountain meadow lawn, in some places peat soils and primitive mountain meadow soils.

Land plots adjacent to the study area are agricultural lands and they are actively cultivated. Thickness of the topsoil within the influence zone is 20 cm.

6.1.7 Pollution

The road corridor was cleared and small some construction works was undertaken (ROW clearance and artificial structures) in the late 80's. The project area was abandoned for more than 20 years and it was considered by locals as a no-one's land, ease access cased appearance of spontaneous dumping places. The total amount of solid waste along the ROW is estimated as 50-60 m3. About 10-15% of the waste is asbestos sheeting; approximately 5% is plastic bottles and other plastic remaining; 10%-15% is remaining from the household repairs, 5% old tires, biggest part of the illegally dumped waste is household non-hazardous waste.

Waste Management Waste management is provided by special service (Solid Waste Management Company of Georgia LLC) in the municipality, which serves Telavi city and adjacent villages. There is no sanitary landfill in the municipality. Waste Management Service provides waste disposal on areas near Telavi. Leachate and gases are not controlled on landfill. The information on number and volume of waste, disposed on the landfill by the above-mentioned service is not available to the Working Group. There are many illegal landfills in the municipality, because the majority of the villages do not have the official landfill, and the population disposes waste in so-called ravines. Composting is not introduced in the municipality. According to the Working Group, in recent years the central government has not implemented waste management improvement projects.

6.1.8 Hydrology

Hydrogeology Central part of Georgia is covered by hydrogeological district of Georgian and Azerbaijan belts. The major aquifers are Tertiary rocks, which built up artesian basins of Alazani and Iori.

Among Tertiary sediments highest waters are observed in continental series of Aghchagil Apsheron and in loose formations of Middle Miocene. Aghchagil Apsheron series have been studied in artesian basins of Alazani and Iori. It contains a large amount of calcium bicarbonated fresh water. The second one is common in artesian basin of Kartli and from hydrogeological point of view, it is relatively less studied.

According to the engineering-geological studies, conducted within the study area, the groundwater level is 9.5-10.5 m.

The Alazani River –the second largest river of the east of Georgia, originates from the south slopes of the Caucasus Mountains, in the north of near Mount Borbala (3294 m) 0.6 km, at 3060 m a.s.l. and joins Mingechauri basin at the south end of Outer Kakheti plateau. The length of Alazani River is 351 km, total drop –3000 m, average slope - 8,55 % basin area –11 800 km2.

Different 1803 tributaries join the river, their total length is 6851 km. In Georgia the large tributaries are as follows: Samkuristsqali Riv. (length 18 km). Ilto Riv. (43 km), Khodasheniskhevi Riv. (31 km), Stori Riv (38 km), Turdo Riv. (28 km), Lopota Riv. (33 km), Chelti Riv. (28 km), Kisiskhevi (37 km), Duruji Riv. (26 km), Cheremiskhevi Riv. (35 km), Bursa Riv. (27 km), Papriskhevi Riv. (32 km), Avaniskhevi Riv. (28 km), Kabali Riv (48 km), Chartliskhevi Riv. (39 km), Matsimi Riv (39km) and others.

Catchment basin of the river is asymmetric by the shape. 65,3% of the basin is situated on the left bank of the river. The upper part of the basin, from its head to Akhmeta town, is situated in the high and medium mountainous zone of the Caucasus Mountains. The other part of the basin, approximately 330 km length, from Akhmeta town to its head, is located on the intermountain lowland of Kakheti.

The River Valley is the box shape, its slopes merge to the slopes of the nearby ranges. The River Valley is not shaped distinctly below Akhmeta town. The width, depth and speed of the flow are changed from the head to the confluence. Width of the flow varies from 10-12 m (at Birkiani village) to 60-80 m (below the confluence of Agrichai River), depth –from 1,0-1,5 m to 4,5-5,8 m, speed –from 1,5-2,5 m/sec reduced to 0,8-1,2 m/sec. Bottom of the stream is gravelly at the head, while the bottom is sandy below the Chiauri bridge. The River is fed by groundwater, rain and snow waters. Its water regime is characterized by the floods caused by the snow melt in spring, by high water caused by summer-autumn rains and by more or less expressed water shallow of winter.

The river runoff is 65-72% of the annual runoff (spring - 35-40%, summer - 30-32%) during the flooding period of spring-summer. 20-23% of the annual runoff flows in autumn that is frequently changed in accordance with the river water amount and in some certain years it equals to the summer runoff. Just 8-18% of the runoff is observed in winter period.

According to classification, defined by national legislation, Alazani river belongs to the industrial- household water use category. According to the classification, defined by EU Council Directive 91/271/EEC –on “Urban (Industrial-Fecal) Wastewater Treatment", dated as May 21, 1991, Alazani river affected areas should be considered as riparian waters that are not subject to eutrophication and are not exposed to oxygen deficit, or above-listed processes (eutrophication, oxygen deficit) are not expected due to urban wastewater discharges. Therefore, Alazani river should belong to a less sensitive water object and in case of discharge of urban wastewater, first of all, reduction of BOD (up to 25 mg/l), COD (125 mg/l) and Suspended Solids (35 mg/l) should be considered.

6.2 Biological Environment

Flora

Natural vegetation within Telavi-Gurjaani (Chumlaki) 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, corn fields and pastures. Territory in front of Gombori ridge is covered by Thorn, hornbeam, hawthorn, dog rose, buckthorn and more.

Botanical survey for the Telavi-Gurjaani (Chumlaki) road section located in city Telavi and Gurjaani districts, Kakheti Region, was conducted in October 2017. The entire project site is approximately 16km.

Also, vast majority of the site is occurred by shrubs like Rubus sp. and Rosa sp.

There are some endemic tree species on the site.

Fauna

Wildlife of the Region According to literary sources, following animal species can be found within the municipality area: Chamois, wolves, foxes, jackals, wild boars, rabbits, weasels, voles, the normal mouse, rat, etc. There are a lot of bird species. Following fish species can be found in Rivers: Cyprinid, ray-finned fish, Chub, Barbell, catfish, carp, Barbel, Asp, etc.

Animal Species Common within the Study Area Inspection of the project area revealed that the forest is extremely anthropogenically impacted. Major part is deforested for the purpose of obtaining wood. However, still it is the favourable shelter for animals. The proximity to the river, flat terrain, understory - Open and dark place at the right is tailored to different species of animals inhabiting there. Most likely, the territory is used as a migration corridor by large mammals, as Alazani River groves and surrounding forest areas are probably the best area for animal migration.

Existence of mammals has not been identified during the preliminary study; neither animal - traces, faces nor other signs were found. According to the locals, there are many wolves - Canis lupus, Jackals - Canis aureus, Pine marten - Martes martes, least weasel - Mustela nivalis, fox - Vulpes vuples, Badger - Meles meles, European Hedgehog - Erinaceus concolor, Caucasian mole - Talpa caucasica, Small Forest Mouse - Sylvaemus uralensis; During snowfall local population has observed Roa - Capreolus capreolus and Wild boar - Sus scrofa. The project area is not attractive for above-mentioned sensitive animal species considering high anthropogenic load and the fact that adjacent arable lands are intensively cultivated and the disturbance factor is high. The area itself is favorable only for small mammals: Hedgehog – (Erinaceus concolor), Caucasian mole –(Talpa caucasica), Small Forest Mouse –(Sylvaemus uralensis);

Birds: The survey observed distribution of the following bird species in the region: Lesser Spotted Eagle –(Aguila pomarina), Peregrine –(Falco biarmicus VU), common kestrel –(Falco tinnunculus), Kite – (Milvus migrans), Forest Owl –(Strix aluco), great spotted woodpecker –(Dendrocopos major), lesser spotted woodpecker –(Dendrocopos minor), Jays –(Garrulus grandarius), common cuckoo –(Cuculus canorus), common blackbird –(Turdus merula), Wood pigeon –(Columba palumbus), great tit –(Parus major), Eurasian wren –(Troglodytes troglodytes), common chaffinch –(Fringilla coelebs), Magpie – (Pica pica), Rook –(Corvus frugilegus), Spades –(Corvus cornix), Seagull –(Larus sp.), Hoopoe – (Upupa epops), European bee-eater –(Merops apiaster), Quail –(Coturnix coturnix), etc. During field works within the Telavi-Gurjaani (Chumlaki) road section project area following small bird species have been identified: Jay, blackbird, bearded tit, magpie; within adjacent agricultural lands - pigeon, orn rook, crow. The habitat for large size predatory birds (especially Red List species) is significantly restricted within the area and they are not inhabited here. WWTP area is not a significant migratory corridor of birds and it is unlikely that such birds can get within the site.

Following should be singled out from Amphibians distributed in the region: Green Toad –(Bufo viridis), Common Toad –(Bufo bufo), Caucasian parsley frog –(Pelobates caucasicus), as well as forest Fog – (Rana rididunda), for which favourable habitat conditions are created within the project area. Due to significant

distance from Alazani River and other important water bodies, populations of various amphibians should not be large on the project area. That is why the number of animals preying them is small.

Fish. Information on fish species in Alazani River is based on literary data and interviews with local communities and fishermen. Freshwater fishes are widespread within the section of Alazani River where it is bordered to the project area. Alazani River in the upstream is a mountain river, which according to the inclination is an ecosystem zone of trout, where fish populations, characteristic to wide riverbed and slow stream rivers are widespread. The following fish species have been identified in Alazani River: Alazani Nase – (Ghondrostoma nasus), ray-finned fish –(Barbus mursa), common carp - (Cyprinus carpio), Barbel - (Barbus capito), Sevan khramulya - (Varicorhinus capoeta), Barbel - (Barbus barbus), Danube bleak - (Chalcalburnus chalcoides), Chub - (Leuciscus cephalus), Bleaks - (Alburnus filippi), Roach - (Rutilus rutilus), River Goby - (Gobius cephalarges), common carp - (Cyprinus carpio), Barbel - (Barbus capito), Catfish - (Silurus glanis), Trout (Salmo fario), (lives in upper reaches of the river) etc. Based on literary sources and interviews with local fishers, there are no habitats for river trout within the impact zone (downstream from effluent discharge point).

Invertebrate animals: following groups of invertebrate animals are represented within the study area: Nematodes – (Nematoda, Oligocheta), Leeches – (Hirudinea), Molluscs – (Mollusca), Crustacea, Arachnida and Insects – (insect).

Protected areas: There is no any protected area in the vicinity of the study corridor.

6.3 Social-Economic Situation

Telavi municipality is an administrative-territorial unit in eastern Georgia, Kakheti region. Its area is 1095 sq. km. It is bordered by Akhmeta municipality from the north and west (area of 2208 sq. km), Dagestan Republic from the north-east, Kvareli Municipality from the east (area of 1000 sq. km), Gurjaani Municipality from the south-east (area of 846 sq. km) and Sagarejo Municipality from the south-west (area of 1491 sq. km).

Until 1917 the Telavi Municipality territory was part of the Telavi district of Tbilisi province, but since 1930 it has been established as a separate district. Since 2006 it has been called "municipality", and from 2014 the city of Telavi has been separated from the municipality. It is the administrative center of the Kakheti region. Located in the north-east slope of the Gombori Range and Alazani Plateau - at an 550-800 m above sea level, at the distance of 158 km from Tbilisi. It was declared a city in 1801.

There are 30 villages in Telavi municipality, including villages: Lapankuri, Napareuli, Saniore, Pshaveli, Artana, Lechuri, Laliskuri, Tetri tsklebi, Pantiani, Ikalto, Vardisubani, Ruispiri, Karajala, Gulgula, Kurdgelauri, Shalauri, Nasamkhrali, Kisiskhevi, Kondoli, Tsinandali, Kvemo Khodasheni, Busheti, Vanta, Akura.

Villages in Telavi Municipality: Kondoli and Akura are located near the project highway. The village of Kondoli is located in the Alazani Plain on the left bank of the river Kisiskhevi, 460 meters above the sea level, at 6 km from Telavi.

Village Akura is located at the foot of the east slope of Gombori Range, on the banks of the river Vantiskhevi at 12 km from Telavi, and 60 km from Tbilisi.

Indirect impacts may also be experienced by other villages in Telavi municipality, for example;

Vanta - located in the north-east foot of the Gombori ridge, on the bank of the river Vantiskhevi, 600 m above the sea level and 13 km from Telavi;

Busheti is located on the north-east slope of the Gombori Range (Kvemo Khodasheni Community Sakrebulo), on the bank of the river Tsinandlikhevi, 610 meters above the sea level, 11 kilometers from Telavi;

Kvemo Khodasheni - located on the north-east slope of the Gombori Range, on Telavi-Gurjaani roadway (Sakrebulo center), 460 meters above the sea level, 11 kilometers from Telavi;

Tsinandali - located at the north-east foot of the Gombori Range, 560 meters above sea level, 10 kilometers from Telavi. The village is known to be the place of house museum of Aleksandre Chavchavadze and the unique wine cellar of XIX century;

Kisiskhevi - located on the north-east slope of the Gombori Range, 600 meters from sea level, 5 kilometers from Telavi. The church of the Virgin Mary of VI-VII centuries is preserved in the village;

Shalauri - located on the north-east slope of Gombori Range, 650 meters above sea level, 2 kilometers from Telavi.

Gurjaani is an administrative-territorial unit in the Kakheti region. Until 1917 the Gurjaani Municipality territory was part of the Telavi district of Tbilisi province, since 1921 by administrative-territorial division of Georgia it was included in Telavi province, since 1930 it was an independent district in the Kakheti region, then it became a separate district and is now a municipality.

Gurjaani municipality is bordered by five administrative municipalities: from the west – by Sagarejo Municipality, from the south-east - Sighnaghi Municipality, from the north-west – Telavi Municipality, from north – Kvareli Municipaliry, and from the east – Lagodekhi Municipality. Within the Kakheti region Gurjaani Municipality is the smallest administrative-territorial unit. Its area is 846.0 km². The agricultural lands are 39 430 ha, while the total area covered by forest is 27 730 ha. Gurjaani is the administrative center.

The villages of the Gurjaani municipality are located in proximity of the project roadway: Chumlaki (located on the north-east foothills of the Gombori Range, 420 meters above the sea level, 4 kilometers from Gurjaani) and Velistsikhe (located on the Alazani plain, on the banks of the river Chermiskhevi, 380 meters above the sea level, 11 km from Gurjaani).

Indirect impacts may also be experienced by other villages in Telavi municipality, for example;

Akhasheni, located on Alazani Plateau, between the river Chermiskhevi and Papriskhevi, 510 meters above the sea level, 14 km from Gurjaani.

Mukuzani - on the north-east slope of Gombori Range, 450 meters abobe the sea level, 12 km from Gurjaani;

Vazisubani - on the north-east slope of the Gombori ridge, on on Telavi-Bakurtsikhe road, 500 meters above sea level, 14 km from Gurjaani;

Shashiani is located on the existing road of Gurjaani-Telavi on the north-east of Gombori Range, 530 meters above the sea level, 16 km from Gurjaani;

Kalauri, located on the north-east slope of Gombori Range, 550 meters above sea level, 18 km from Gurjaani;

Vachnadziani (former Sroma) - Located in the north-east of Gombori Range on Gurjaani-Telavi road, 560 meters above sea level, 18 km from Gurjaani. In this village there is Amidasturi St. George Church, in the courtyard of which the archaeologists have found an unknown Svetitskhoveli Church, which was completely covered with soil. According to archaeologists, the monument dates back to VII-XIII century.

Population

According to the data of 2017 (according to the official website of the local self-government authorities of Georgia) the population of Telavi municipality is 71,000 people (which is about 1.9% of the Georgian population), while by the 2014 general census, according to official data, Telavi municipality population was 38 721 people.

Table: 6.3.1.

The main demographic indexes of the Georgian population											
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
The number of population by January 1 (thousand person)	4 394.7	4 382.1	4 385.4	4 436.4	4 469.2	4 497.6	4 483.8	4 490.5	3 713.7	3 720.4	3 718.2

Including in **Telavi** municipality (which is about 1.9% of the Georgian population)	
Year	The number of population by January 1 (thousand person)
2007	70.4
2008	70.0
2009	69.8
2010	70.5
2011	71.0
2012	71.2
2013	70.9
2014	70.9
2015	58.3
2016	38.7
2017	38.6

According to the data of 2017 (according to the official website of the local self-government authorities of Georgia) the population of Gurjaani municipality is 70000 people (approximately 1.8% of the Georgian population), while by the 2014 general census, according to official data, Gurjaani municipality population was 54 337.

Table: 6.3.2

The main demographic indexes of the Georgian population											
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
The number of population by January 1 (thousand person)	4 394.7	4382.1	4 385.4	4 436.4	4 469.2	4 497.6	4483.8	4490.5	3713.7	3 720.4	3 718.2

Including **Gurjaani** municipality:	
Year	The number of population by January 1 (thousand person)
2007	70.5
2008	70.2
2009	69.9
2010	69.9
2011	69.9
2012	69.7
2013	69.2
2014	69.0
2015	54.3
2016	53.9
2017	53.6

Note: These data are based on the results of the general census of November 5, 2014, the annual data published by the National Statistics Office of Georgia and the official website of the local self-government authorities of Georgia.

Migration

There is a natural decrease of population in Kakheti, both in cities and villages. Therefore, in- and outmigration of the population is obvious. Based on surveys, carried out in the region and according to the obtained information, there is a whole number of deserted villages in Kakheti.

Feminization of out-migration is observed in Kakheti as well as in whole Georgia, which has a sharp negative impact on the demographic indicator of population. Due to the lack of prospects for finding a job, young people often leave the region. This leads to the ageing of population, especially in villages.

Employment

According to official data, by January 1, 2017 there are 651 392 registered economic subjects in Kakheti region, while unemployment rate by the latest data of 2016 is 11.8%, which is quite high. Most of the population in this region is self-employed. These are mainly the villagers who have sufficient number of land (about 1 ha) in ownership or in use. According to official statistics distribution of population of 15 years old of age and older according to economic activities in Kakheti region according to data from 2006-2016 is as follows:

Table: 6.3.3.

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total active population (workforce)	214.9	208.0	205.3	206.9	196.0	195.0	199.7	196.4	196.3	192.0	192.7
Employed	201.0	197.1	186.2	184.1	174.2	177.6	186.6	183.9	186.2	180.7	182.3
Hired	46.3	42.0	44.3	48.0	44.8	41.8	44.2	47.2	45.6	53.2	49.7
Self-employed	154.6	155.0	141.5	136.0	129.3	135.8	142.4	136.6	140.6	127.4	132.5
Uncertain	0.1	0.0	0.4	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.1
Unemployed	13.9	10.9	19.1	22.8	21.8	17.4	13.1	12.5	10.1	11.3	10.4
Population outside workforce	90.7	78.7	86.7	86.7	81.0	82.7	78.4	73.4	76.4	77.1	71.6

Unemployment rate (in percentages)	6.5	5.3	9.3	11.0	11.1	8.9	6.5	6.4	5.2	5.9	5.4
Activity level (in percentages)	70.3	72.5	70.3	70.5	70.8	70.2	71.8	72.8	72.0	71.4	72.9
Employment level (in percentages)	65.8	68.7	63.8	62.7	62.9	64.0	67.1	68.2	68.3	67.1	69.0

Villagers in the vicinity of the project road are mainly self-employed. The level of unemployment is quite high. Vineyards in villages are usually owned by wine producing companies. Although these companies employ local residents, but not by the amount that the residents do not need to find an additional income. As usual, this income comes from the roadside trade. The local population mainly sells products of their land plots. Besides, there are several public catering facilities located on the road.

Industry

Leading field of the region is viticulture; gardening, cereals farming, horticulture, production of oilseeds, meat and dairy are also developed. Significant enterprises are wineries, food and light industry facilities.

Highway passes through the territory of the region.

Manufacturing is not well-developed in Telavi. Small processing factories, wineries, small bake houses and others operate on the territory of the municipality. Certain amount of enterprises uses energy efficient installations.

Road construction companies are actively operating in the construction field. Rural Areas Assistance Program and infrastructural works funded by the Municipal Development Fund significantly supported activation of the construction field. But number of locals employed in the construction works is not considerable and doesn't exceed 5%. Basic income source of the population is trading, agriculture and service field (population trade with wine, vodka, vegetables and meat).

There are no large industrial facilities in the vicinities of Telavi-Gurjaani (Cgumlaki). Population is mostly employed in agriculture (viticulture) sector. It should be also noted that there is a fish farm near the project territory.

Agriculture

38% of Georgia's agricultural land is in the Kakheti region, where arable lands and pastures occupy the largest area. Kakheti ranks first in Georgia in this category of lands and is therefore a leading region in the production of cereals and livestock.

Agriculture is one of the leading fields of economy in Telavi-Gurjaani municipalities. The administrative unit is mostly distinguished by viticulture. According to the local government, land resources of the municipality have not reduced in the last 10 years and they have not been degraded as well. Certain amount of agricultural lands is in the ownership of the population, while the other part is leased.

Table: 6.3.4.

Livestock and poultry number in Kakheti region, by the end of the year (thousand head)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Cattle stock (including buffalo)	97.0	87.5	89.2	82.8	87.2	94.1	105.7	123.2	110.0	110.6	97.2

Cow and buffalo stock	52.3	43.9	49.3	48.2	47.3	49.4	53.9	63.0	58.0	60.7	49.3
Pig stock	46.8	7.4	10.4	22.8	14.6	15.3	25.5	35.3	30.1	27.3	25.5
Mother pig stock	10.2	1.2	2.5	4.6	2.5	5.3	7.2	8.2	5.8	5.9	5.1
Sheep stock	266.1	313.9	300.2	269.4	276.0	294.3	368.5	468.6	494.1	474.4	482.0
Mother sheep stock	176.8	196.2	174.6	181.4	188.2	199.2	262.6	335.8	388.2	327.4	369.3
Goat stock	11.8	14.4	14.3	15.7	14.3	16.1	16.2	20.8	16.9	13.8	23.3
Mother goat stock	7.4	9.8	9.7	10.7	9.0	11.1	10.9	13.6	11.5	8.6	17.3
Number of all kinds of poultry (thousand bird)	878.7	804.8	1,004.4	1,088.5	1,088.0	1,025.4	945.4	1,117.2	1,177.5	1,201.7	1,186.8
Number of bee families (thousand tons)	28.6	41.7	57.4	52.9	39.0	37.3	34.4	46.9	35.7	45.4	45.4

Note: The main source for 2006-2015 research sampling base was the 2004 agricultural account, and the research sampling base for 2016-2017 was revised and has been founded on the 2014 agricultural account. Based on that and for the purpose to ensure the comparability of the 2014-2017 indexes the calculation has been made of 2014 and 2015 data. Accordingly, the data for 2014-2017 is not comparable with data from 2006-2013.

Table: 6.3.5. Livestock production in Kakheti region (thousand tons)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Meat production, total	12.2	10.5	8.8	8.3	7.8	7.3	7.9	9.1	9.8	10.6	9.6
Production of bovine cattle meat	4.7	3.3	3.0	4.1	2.5	2.5	2.5	3.0	2.5	2.5	3.1
Pork meat production	3.3	2.7	1.2	0.9	1.8	1.5	2.2	3.2	3.7	3.8	2.5
Sheep and goat meat production	2.9	3.1	3.3	1.8	2.1	1.9	1.3	1.4	2.3	2.6	2.6
Poultry meat production	1.3	1.4	1.3	1.5	1.4	1.4	1.8	1.3	1.2	1.5	1.3
Milk production (mln liter)	40.0	40.9	42.6	39.5	42.2	45.2	46.6	54.3	56.0	60.1	53.7
Cow and buffalo milk production (mln liter)	37.4	37.9	40.0	36.9	39.5	42.3	43.2	49.5	50.6	54.8	48.5
Sheep and goat milk production (mln liter)	2.6	3.0	2.6	2.6	2.7	2.9	3.4	4.8	5.4	5.3	5.2
Egg production (mln pcs)	45.0	60.5	67.9	65.0	60.4	83.0	85.0	87.6	92.2	101.4	115.9
Wool production (thousand tons)	0.7	0.8	0.8	0.8	0.6	0.8	0.8	0.9	1.2	1.4	1.1
Honey production (thousand tons)	0.3	0.3	0.4	0.1	0.5	0.4	0.5	0.6	0.6	0.7	0.8

Note: the first table note also applies to this table.

Vendors mainly supply the local population, rarely there are cases where a citizen of Georgia or a tourist buys a meat or other goods on the shopping stalls on the road.

Vine is the priority in the municipality. As for the other cultivated cultures, decrease of their productivity is observed in the recent years, basic reasons of such processes are ineffective farming, insufficient irrigation and bad weather conditions. In addition, reduction of productivity is also caused by the high costs of equipment and fuel. Due to the lack of agricultural equipment, their failure and absence of funds, considerable part of the

arable lands is not cultivated on the territory of Telavi-Gurjaani municipalities. Approximately 80% of arable lands of the municipality need irrigation, but the lack of irrigation system and their failure hamper the irrigation process. In addition, 5 % of the arable lands are required drainage, but there is no drainage system in the municipality.

One of the main income sources of the population is also animal husbandry. Grazing of the cattle from other municipalities on Telavi or Gurjaani pastures is not observed. Cattle breeding, as well as sheep and goats farming is basic fields of animal husbandry.

Agricultural services such as veterinary services and mechanization centres are poorly developed in the municipality. There is the Agricultural Service in Telavi-Gurjaani, but the non-governmental sector mainly carries out introduction of new technologies in this field. Both, males and females participate in the management of the agriculture.

As it was mentioned, agriculture is well developed near the project territory. Nearby agricultural lands are intensively cultivated and locals also follow the viticulture. They also have cattle.

Healthcare and Social Welfare

There are 16 medical institutions in Telavi municipality, including hospitals, out-patient clinics and emergency centers. Main data about healthcare in the region is given below:

Table: 6.3.6. Main Indicators of Healthcare in Kakheti Region

	Year	
	2014	2015
Number of physicians of all specialties total, thsd.	1.1	1.2
Number of paramedical personnel total, thsd.	0.7	0.7
Number of hospitals, unit	16	16
Number of hospital beds, thsd.	0.4	0.5
Number of medical institutions rendering out-patient services to population, unit	251	260
Number of visits in medical institutions rendering out-patient services to population (including prophylactics), thsd.	645.4	531.4

Tourism

Tourism has an important place in the economy of the municipality. This is propmoted by the city of Telavi, which is an important transport hub, as well as an industrial, agricultural (wine) and cultural center. Here is the State University (former Pedagogical Institute), theater, Historical-Ethnographic Museum. The city has many attractions: Basilica of Deity (VI-VII cc), the fortress, the old fence (X-XI cc). The residence of the Alaverdi diocese is also in Telavi.

For the promotion of tourism no less importance has the village Tsinandali, which is located at the north-east slope of the Gombori Range, 560 meters above the sea level, in 10 kilometers from Telavi. The village is known as the place of house museum of Aleksandre Chavchavadze and unique wine cellar of the 19th century. There is also a hotel "Chateau Mere" located near Telavi, which hosts many foreign tourists or Georgian holidaymakers. Also, in Kakheti region and particularly in Telavi and Gurjaani municipalities there are many old historical temples and monastery complexes that attract tourists with interest to antiquity and architectural

value. The project area is less interesting and valuable from the touristic viewpoint. There are no touristic routes here and there are no historical and cultural monuments of international importance and tourist attractions (temples, museums, hotels, restaurants, etc.).

6.4 Historical and Cultural Heritage

Ikalto Monastery Complex is noteworthy from architectural monuments of Telavi municipality. Old Shuamta Monastery is also noteworthy. The ensemble includes the Basilica of V century, domed and small domed church. In XVI century the old Shuamta Monastery was abandoned. Not far from it a New Shuamta Monastery was built by Tinatin Gurieli, the wife of King Kakheti Levan II.

The ancient (VI-VII centuries) church of Virgin Mary is located in Kisiskhevi village. Mamadaviti Monastery is in Akura village. Historical monuments are also preserved in Ruispiri village. Other monuments are also there: Vanti Palace Complex, Adamant Fortress and others.

There are no historical-cultural monuments in the vicinities of the project territory. Due to the anthropogenic loading of the territory, possibility of chance finding of archeological monuments is quite low.

7. IMPACT ASSESSMENT AND MITIGATOIN

Present ESIA included identification and weighting of positive and negative environmental, social, and cultural impacts at the construction and operation phases. It was based on the background information, design documents, and pre-defined quantitative and qualitative criteria of assessment.

7.1 Impact on the atmospheric air quality

Impacts in the construction phase

In the construction phase, various types of emissions of harmful substances are expected. The stationery sources of emission may be concrete or bituminous concrete unit (depending on whether works provider will opt to purchase these materials of produce and process construction materials in-house). In case these units operate, the main type of air pollutant will be inorganic dust. During the operation of the bituminous concrete shop, saturated hydrocarbons C12-C19 will also be emitted. Most of the Telavi-Gurjaani (Chulaki) road section is distanced from the settled areas. Therefore, in case of selecting the relevant site for the construction camp, severe negative impacts on settlements is unlikely. The impact may be average or low. The scale of impact on the atmospheric air depends on the mode of operation and output.

The mobile sources of emission will be construction machinery and vehicles (bulldozers, excavators, lorries, etc.). Combustion products ((carbon monoxide (CO), sulfur dioxide (SO_2), soot (C), nitrogen dioxide (NO_2), nitrogen oxide (NO), hydrocarbons (CH) and inorganic dust) will comprise the pollutants. Inorganic dust will also be emitted during the intense earthworks and management of the inert materials/waste rocks.

In respect of impact in the middle of the road approximately 1.5km-long section of the corridor is most sensitive. This section runs across the settled area of village Kondoli.

Impacts in the operation phase

The construction of the road will increase its capacity and with volumes of traffic, exhaust fume will also grow. However, at the same time, the occurrence of traffic jams will reduce significantly, and the loads of the vehicle motors will not be so great in case of overtake at the expense of the extended roadbed and reduced slopes and steering angles. Depending on the considered policy reforms towards controlling vehicle fleet and technical condition of individual cars, as well as enhancing quality control of fuel, emissions in future may even decrease or, at least, do not climb tangibly as a result of forecasted increase of traffic.

Mitigation measures in the construction phase

Stationary sources of emissions (e.g. concrete plant, aggregate crushing-sorting machine) shall be located away from the human settlements and equipped with appropriate filters. Plants must be registered and fall under control of the MEPA as required by the national legislation.

In addition, the technical condition of vehicles and machinery shall be regularly controlled. Idling of engines should be restricted. In order to reduce dust propagation, it is required to protect the limited speed of the vehicles and to properly manage the dusty materials. An effective way of reducing dust emission is regular watering of the road in dry weather. Overall, emission preventive measures will not be associated with significant costs.

Mitigation measures in the operation phase

Mitigation measures for air pollution have been developed for the construction and operation phases.

- Mitigation measures for air pollution during the repair and maintenance work are identical of measures considered for the construction phase;
- Planting of trees within the perimeter of the project area should be considered at the construction stage;
- In order to prevent the spread of unpleasant odor, a systematic control of a proper operation of the plant is required;
- Recurrent monitoring will be set on spread of unpleasant odors. If necessary, appropriate adjustment measures should be implemented.

7.2. Noise and vibration

Impacts in the construction phase

Two main sources of noise and vibration in the construction phase will be crushing equipment to be used for processing of natural construction materials and operation of construction vehicles and machinery.

Expected needs for deploying various types of construction machinery and the related levels of noise per unit are provided in Table 7.2.1

Table 7.2.1. Noise levels of the construction machines and machinery

Machines and machinery	Noise level (dbA) 10-15 m from the source
Equipment and machines to produce road construction materials (crusher, grating, mixer, etc.)	100 and more
Pile fixing	100 and more
Bulldozer	90
Excavator	88
Dump truck	85
Truck mixer	85
Pneumatic hammer	88
Pneumatic equipment	85
Crane	88
Compressor	81

Output and duration of operation of the units to produce the construction materials needed for the road construction are to be decided by the works provider. The present state and conditions of the highway corridor allow locating the major stationery sources of noise quite far from the settled areas.

As the calculations show, if the stationery sources of noise are located 500 m or more from the sensitive receptors, no noise in excess of the maximum admissible levels established by national legislation[4] will

[4] Environmental Quality Norms approved by the Order#297N (16.08.2001) of the Ministry of Labor

occur. These calculations do not consider the natural barriers (relief and vegetative cover), which further reduce the noise propagation.

As for the noise caused by vehicle movement and construction works, the last 1,5-km-long section of the Telavi-Gurjaani (Chumlaki) road section has higher sensitivity. During the intense works along this section, the noise exceeding the maximum admissible levels is expected to occur near some residential houses and the school. The impact will be significant, but short-term. It will discontinue immediately upon completion of works. Operation of machinery beyond conventional working hours shall not be allowed. Because of the configuration of the landscape, earth works near the residential area will be of considerably lesser magnitude than those away from settlements. Hence, minimal levels of vibration will be experience by local residents, which is unlikely to compromise structural integrity of their houses.

Impacts in the operation phase

The sources of noise during operation phase will be running engines, friction between tires and the road, and sonic signals.

When evaluating the impact, the existing state is to consider, in particular: following the sizes of the roadway, angles of inclination and turning radii, the traffic is hampered at some time moments leading to the increased load of the vehicle motors, more intense use of sonic signals, etc. Following the reconstruction and modernization of the road, the sources of noise will be limited, and the impact on the animals in the forest zone will diminish as a result of the facilitated traffic. The exploitation of the modernized road will change the noise and vibration background for better.

On the other hand, due to the increased traffic capacity of the highway, the traffic intensity will increase. The noise caused by the vehicles driving with the speed of 80 km/h along the middle, 1.5-km-long section of the road between Telavi and Gurjaani (Chumlaki) is likely to have a negative impact on the residents of adjasent houses. Exact inventory of residential houses in the excessive impact zone and respective need for resettlement will be known once the detailed design of the road is developed.

Mitigation measures in the construction phase

Stationary installations causing noise and vibration shall be placed away from the settlement as much as possible. All construction equipment and vehicles must be in a good technical condition. Intensive construction works shall be implemented during the daytime. Arrangement of temporary noise barriers may be required prior to the intensive construction works in the vicinity of settlement of Kondoli village. Condition of nearby buildings should be periodically checked and the impact of vibration on cracks and damages should be determined through observation. If it is established that the existing level of vibration damages the nearby buildings and premises, a number of mitigation measures will be necessary:

- Heavy technique is to be replaced by the light one.
- Hand labor is to be used in particularly sensitive areas.
- Maximum one unit of technique generating vibration must operate on the construction site.

In case of damage to buildings and premises caused by vibration, Construction Contractor will conduct assessment of damages, compare with existing baseline information and propose remedial actions (e.g. reparations, etc.) to the affected party. If damages cannot be fixed, resettlement will be considered, planned and implemented all in accordance with the guiding principles provided in the RPF[5]. Compensation will be provided in cash at replacement cost free of deductions for depreciation, transaction

[5] RESSETTLEMENT POLICY FRAMEWORK (RPF) = Preparation of the Feasibility Studies for Telavi-Gurjaani (Chumlaki) road section

costs or salvaged materials. All affected households are entitled to this provision by default irrespective of the registration status of the affected item. Salvaged materials after demolition of buildings can be claimed by the affected people.

Mitigation measures in the operation phase

Construction contractor will be required to assess noise propagation pattern for Kondoli village using modelling technique once the detailed design is produced. Residential houses that fall in the range of excessive impact will be resettled prior to commencement of works. Actual levels of noise will be monitored by Construction Contractor during defect liability period for the residential houses closest to the roadsides. Depending on the outcome of monitoring, installation of sound barriers may be considered, planned and undertaken as part of the contract for the provision of road construction works.

7.3. Hydrology

Impacts in the construction phase

Pollution of surface and groundwater is expected as from the generated solid and liquid construction waste, operation and accidental spills of fuel and lubricants, and from household sources of liquid waste generated at the construction camps. Operation of concrete plants and drilling of the tunnel 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.

Impacts in the operation phase

The impact will be insignificant. Other expected impacts are also low and typical for the operation of any road. These include pollution of the road 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, pollution may easily enter the watercourse. However, construction of the Telavi-Gurjaani road section is expected to sharply decrease traffic accidents and minimize needs for road repair. Hence the risks of operation phase are considered low.

Mitigation measures in the construction phase

In order to maintain the groundwater flow and its quality, it is required to use technically sound construction equipment and vehicles; efficient use of spring waters through arrangement of reservoirs.

All measures for the protection of the quality of ravine water and its tributary valleys should be also taken. In this regard, adequate management of wastewater is instrumental, implying collection of industrial-fecal waters. For sanitation purposes, preference should be given to sewage pits / biological toilets, while for other types of wastewater - relevant treatment facility should be arranged, for insatnce, 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 equiped 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 submitted to the MEPA.

In order to prevent unforeseen contamination of surface waters, following appropriate environmental measures shall be taken: Arrangement of fuel tanks and other potential sources of contamination away from surface water bodies as much as possible; arrangement of water drain channels throughout the polluting sites perimeter; arrangement of road cover in dry weather.

Mitigation measures in the operation phase

In order to avoid water contamination, it is necessary to equip the drainage channels with stone filters considering the amount of precipitation and the treeain of the given area.

7.4. Impact on Soil Fertility and Quality

Impacts in the construction phase

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 usage.

The areas for arrangement of construction camps can be selected so that there will be no topsoil layer or the topsoil layer will be very poor. Topsoil removal-storage works will be mainly provided in the project corridors and spoil ground areas. However, considering the high degree of relief defragmentation of the study area and slope gradient, these works are unprofitable and technically difficult to be implemented. Topsoil layer can be removed only in separate sections of the corridor. The average thickness of the topsoil layer is 20 cm. According to the preliminary assessment, in both cases, the amount of topsoil layer to be removed will not exceed 500 m^3 (the amount of topsoil layer to be removed will be clarified during detailed design). Removed soil cover will be stored on pre-selected areas and after completion of works it will be used for cultivation of marginal zones.

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.

Soil quality deterioration 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 is depended on performance of the ESMP.

Impacts in the operation phase

Destruction and destabilization of topsoil layer is not expected on operation phase. Road operation is usually connected with pollution of soil, located at the road line. The second reason of the pollution can be considered the waste at the road.

Impact degree on soil during road operation phase can be assessed as low. Impact management at this stage is difficult, as impact is caused by movement of passengers on the road.

There is no significant difference between the discussed alternatives.

Mitigation measures in the construction phase

One of the environmental commitments of the Construction Contractor during the implementation of earth works will be minimal impact on the fertile soil layer. In addition, erosion and damage of soil should be prevented and measures should be taken to maintain the quality of soil fertility, namely: Routes determined for transport and equipment must be protected; Topsoil should be removed and disposed separately from other materials, on pre-selected areas protected from surface runoff. Temporary water drain channels should be arranged on the perimeter of bulk soil. In case of long-term storage of topsoil, its maintenance shall be considered. After completion of the construction works, pre-excavated topsoil shall be used for restoration of

the damaged areas and improve productivity. Detailed guidance on the topsoil and subsoil management is provided in Annex 2 of this ESIA report.

In order to avoid soil contamination, sound construction equipment shall be used. The fuel tank should be placed in areas protected by berms and embankments in order to prevent spills in case of necessity. Spill should be immediately contained and cleaned up from absorbent material. Accidentally contaminated ground / soil shall be removed and disposed as soon as possible. After the completion of the construction works, recultivation of the area and restoration of sanitary conditions will reduce the probability of impact on soil quality and stability. In case of emergency spills detailed guidelines are provided in Annex 4.

Mitigation measures in the operatin phase

Good maintenance of drainage system is instrumental in avoiding erosion and degradation of soil. Phyto-remediation can be considered as one of the most effective mitigation measures of soil pollution.

7.5. Vegetative Cover

Impacts in the construction phase

During the construction of the road section significant impact is expected on vegetation cover and agricultural lands, namely both direct and indirect impacts are expected during construction works.

Direct impact is vegetation removal from the right of way of the road is minimal, the road section mostly goes through agricultural lands. According to the Forest Code of Georgia (2000), Chapter 41, " resort and green areas of the state-owned forests, as well as riparian forests and subalpine stripes of forests are protected. Walnut trees *Juglans regia* included in the Red List of Georgia may be also impacted. Trees are planted by the local population and are at the private land plots. Species and quantities of plants to be cleared will be known precisely after the detail design.

Indirect impact is also expected on vegetation cover. For example: pollution of the surrounding areas with construction material waste; Soil damage / compaction, oil spills during construction; Air emissions of harmful substances. As a result of such impacts recovery of the natural functioning of the vegetation can take several years, which will have negative impact on the ecosystem.

Impact on vegetation cover and ecosystem during construction phase can be considered as medium.

Impacts in the operation phase

Risk of damage and destruction of vegetation cover during the operation phase is minimal. Possible indirect impacts may be related to the dust and exhaust emissions from transport movements, or to the pollution with surface runoff.Contaminants from the road surface may affect the development of the green cover.

Mitigation measures in the construction phase

A decision to extract specimen of plants belong to the Red List of Species of Georgia will be made by the MEPA. In case of extraction of the Red-Listed trees and plants from the environment, RD shall apply to MEPA. National Forest Agency under MEPA will examine the information about the presence of the Red-Listed species in the project area and will apply to the Government of Georgia in the manner envisaged in case of realizing state and public projects (sub-clause “f”, clause 1, Article 24 of Georgian Law on the Red List and Red Book of

Georgia). Decision on the extraction of the threatened wild plants or their parts is made by the Government of Georgia (clause 23, article 24).

7.6 Wildlife

Impacts in the construction phase

Works on the Telavi-Gurjaani road section will be implemented mostrly through the agricultural lands. Impacts during the construction phase are:

- As a result of vegetation cover removal and earthworks habitats (nests, holes) may be lost.
- Small-sezed animals may fall in trenches and pits and may be injured;
- During the movement of vehicles and construction equipment, collision with animals may be expected;
- Emission of noise, dust and combustion products;
- Unsystematic spread of waste, unproper management of waste (change in environmental quality indicators) will cause a further deterioration of the living conditions of terrestrial and aquatic animals;
- Night lighting systems at construction camps may cause disturbance of animals and disorientation of birds;
- There may be the cases of poaching by staff.

Considering the above, impact on animal species is assessed as high. Construction works carried out under the conditions of appropriate mitigation measures, as well as the completion of the construction works for recultivation, will mitigate the impact. After completion of construction works, there will be no more sources of a certain kind of impacts (construction camps, equipment, construction workers), which will contribute to some species to return to their old habitats.

Impacts in the operation phase

During the operation of the road section, some sources of direct and indirect impact on wild life (for instance: earthworks and construction works, camps and son on) will be suspended and will no longer exist. However, the intensity of traffic movement will be increased. Therefore, the risk of collision with animals and impacts related to noise propagation will be increased as well.

Natural ravines crossing the road corridor are charachterised with low waters and fish fauna is not scarcely presented there. Also important is the fact that there will be no discharge of wastewater into surface water bodies and therefore the risk of the impact on aquatic biological environment is minimal.

Overall, during the operation of the road section, impact on animals may be assessed as minimum.

Mitigation measures in the construction phase

Following mitigation measures should be carried out in order to minimize impact on wildlife during the construction phase:

- Protection of working borders to prevent excess damage of vegetation cover;
- Inspection of project corridors (specified) on the preparation stage and reveal animals inhabiting zones (nests, holes) within the corridors;

- Restriction of speeds of machinery and transport;
- Fencing of holes and trenches with sharp colour things in order to avoid falling of animals in them;
- Filling of holes and trenches in limited terms. Before launching filling works, holes should be checked probability of being animals in them should be excluded;
- Arrangement of small boards on trenches to provide artificial crossings for small animals;
- Minimum usage of light on the construction camps. Proper management of wastes;
- Implementation mitigation measures of noise propagation, emission of harmful substances and water contamination;
- Providing instruction for the personnel and establish fines against poaching;
- After construction the construction works, providing the reinstatement works.

Mitigation measures in the operation phase

Following issues should be considered during the operation phase:

- In order to reduce impact caused by habitat fragmentation, arrangement of artificial crossings under the road should be installed;
- Recurrent collection of wastes accumulated along the road line;
- Planting and caring of plants and trees in the corresponding zones in order to compensate damage on the vegetation cover;
- During maintenance works of the road section, all mitigation measures should be considered (developed for the construction phase), which will reduce emission of harmful substances and water pollution.

7.7 Ladscape

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 Telavi-Gurjaani (Chumlaki) road section 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, temporary units will be located on the construction camps, vegetation cover will be cut, and significant amount of removed soil will be produced. Its temporary and permanent disposal will cause deterioration of the aesthetic view.

Potential receptors of visual-landscape changes may be local population and passengers. The initial part of the corridor runs along the agricultural lands. Main impact receptors will be population of Kondoli village community.

After the completion of the construction works, machinery and vehicles, construction materials and wastes will be removed from the territory. In addition, temporary structures will be demolished, labor force will leave the project zone, reinstatement of the temporary developed territories will be carried out that will reduce the impact.

Impacts in the operation phase

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 (if advisable) will be required.

The impact is assessed as low.

Mitigation measures in the construction phase

In order to maintain the visual and landscape conditions as much as possible, construction camps and temporary infrastructure should be arranged in the initial part of the project corridor. Arrangement of such infrastructure in the vicinity of Kondoli community is not recommended. Colors of temporary structures shall be in harmony with the environment (green, brown). Temporary structures, materials and waste (including spoil) should not be placed in visible places as far as possible. It is necessary to constantly pay attention to sanitary and environmental conditions. After completion of the construction works, restoration of damaged areas and removal of temporary structures will significantly improve the visual landscape of the environment.

Excess material generated from removal of soil and placing in the temporary storage locations and then – the mount which may not be used as a construction material or backfilling – will be moved out to the permanent disposal sites. Both types of storage locations: temporary and permanent, will be agreed with MEPA and local authorities prior to generation of waste. Selection of the disposal sites will be based on multiple criteria, including environmental, aesthetic, economic, and financial.

While selecting sites for the final disposal of the amounts of excess material not utilized during construction, the guiding principle must be minimizing of:

1. distance from the point of waste generation;
2. transformation of the landscape;
3. destruction of vegetative cover;
4. need for taking productive agricultural land and pastures.

The given area is the agricultural land with its largest part handed down to the private ownership of the local population, who grow cereal crops on them.

Excess material originated from the construction works in Telavi-Gurjaani (Chumlaki) road section may be disposed in this area without taking land and/or converting land use pattern. To achieve this, (i) the topsoil shall be stripped and stored separately in line with the requirements of the legislation of Georgia, (ii) the execss material shall be spread out at the height not exceeding 5 m, and (iii) the area shall be covered with topsoil again. As a result, land owners should be able to resume common use of their plots. Reinstatement of the edges of plots under deposited material may include tree planting, which will reduce visual impact and serve as a windbreak for agricultural plots. Due to temporary restriction of land use, a RAP must be developed and diligently implemented.

Alternatively, excess material may be used for backfilling of partially reinstated quarries along Alazani valley. This will imply transportation of excess material to relatively long distances at an extra cost. However, these costs should be compared with the costs of RAP and conclusions should be drawn thereafter. Combining the two alternatives is also possible (using part of the material for backfilling quarries and placing the rest of it over the agricultural land plots). This work will be carried out once an advanced draft of the road design is delivered.

Detailed guidance on waste management is provided in Annex 2.

7.8 Construction Camps

The establishment of contractor's work camp may cause adverse impacts if various aspects such as liquid and solid waste management, equipment maintenance, materials' storage, and provision of safe drinking water are

not addressed properly. The site for the work yard will be selected by the Contractor in agreement with the Municipality, RD and the supervisor.

Workers' living facilities may have various impacts on the adjacent communities. In order to manage community impacts, Construction Contractor will be obligated to develop community relations management plan. This plan should incorporate findings of the preliminary community impact assessment and also provide tools to identify, manage and mitigate any additional negative impacts on the surrounding communities that may arise during operation of workers' accommodation facilities. Development of the community relations plan is recommended despite the fact that no instances of discontent of local population with influx of workers in the area has been reported from any previous project financed by the World Bank. Community relations plan should be developed based on the IFC Performance Standard 2 (PS2) on Labour and Working Conditions and comprise the following:

- Layout plan of the work camp including a description of all precautionary measures proposed to avoid potential adverse impacts on the receiving environment (surface and ground water, soils, ambient air, human settlement);
- Waste management plan covering the provision of garbage bins, regular collection and disposal in a hygienic manner, as well as proposed disposal sites for various types of wastes (e.g., domestic waste, used tires, etc.) consistent with applicable national regulations; and
- Description and layout of equipment maintenance areas and lubricant and fuel storage facilities including distance from the nearest surface water body. Storage facilities for fuels and chemicals will be located at a safe distance to the water body. Such facilities will be bounded and provided with impermeable lining to contain spillage and prevent soil and water contamination;
- Methodology for identifying and addressing community needs related to the arrival of specific infrastructures such as telecommunications, water sanitation, roads, health care, education, housing community health and safety – addressing and reducing the risk in the increase in communicable diseases, corruption, trade in illegal substances such as drugs, alcohol (in the Muslim context), petty crimes and other sorts of violence, and road accidents.

In an unlikely case of the presence of large numbers of foreign workers, especially males, with different cultural and religious background, the plan should also include measures to mitigate the possible shift in social, economic and political structures due to changes in access to income generation opportunities. Community relations plan will be subject for review and approval by the RD prior to beginning of construction activities.

8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Introduction

Following the requirements of the Georgian environmental legislation and environmental policies of the international finance organizations, an important component of an ESIA report is the ESMP. The goal of the ESMP is to develop the mitigation and monitoring measures for the impacts identified within the scope of the ESIA procedures 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 envisaged by the national legislation as well as with the environmental and social policies of the international finance organizations.

The present ESMP is based on the information given in the previous chapters, in particular, activity specifics, and background properties of the natural and social environment of the working area, expected negative impacts during the activity and their propagation area. The SEMP is drafted for different stages of activity, including designing and preparatory works planning phases (SEMP for designing and preparatory works planning phases see tables 8.2, 8.3 and 8.4). The ESMP is a live document and it can be detailed immediately during the accomplishment of the activities following the monitoring outcomes or other practical terms. Any changes or corrections to this ESMP will be done based on the formal agreement between RD and the financier of works.

The ESMP document will be incorporated in the work tender documents and the tender participants will have the possibility to specify their environmental protection duties in their proposals. After the onset of the construction works, the ESMP will be the part of the agreement between the client and the construction Contractor and it will be necessary to accomplish in the course of the construction works.

Responsibility for the implementation of ESMP in construction and operation phases will be carried by RD because it will be an implementing entity for works for the construction of Telavi-Gurjaani road section as well as its operator. Service of Environmental Protection under RD consists of 4 environmental specialist (staff) and 2 consultants. Service of resettlement consists of 7 staff members and 1 consultant. In addition, State control over the implementation of various aspects of ESMP will be undertaken by the Environmental Supervision Department of the MEPA.

8.2 Environmental Documents and Records

Implementation of ESMP should be diligently recorded by the Construction Contractor. After identifying the Construction Contractor and issues of building organization, the Roads Department of Georgia, in line with the national legislation, is obliged to develop the following environmental documents and submit them to the MEPA to reach an agreement:

Developing the project for the maximum allowable discharge (MAD) standards of polluting substances discharged into the surface waters together with the waste water (if necessary);

- Technical report of the stationary sources of harmful substances emitted into the atmospheric air (if necessary);
- Detailed plan of waste management;
- Results of taxation of the vegetation cover in the project corridor;
- Documents envisaged by the terms of the Permit issued under the conclusion of the ecological expertise (quarterly reports of the environmental monitoring and the like may be implied).

The Construction Contractor must be engaged in the development of all above-listed documents.

On its turn, the contract concluded with the Builder must envisage his obligation to submit and agree the following documents and records to the Client:

- Traffic management plan;
- Health and safety management plan;
- Community relations management plan;

In addition, the Implementer (and the Construction Contractor on his errand) shall keep and use the following records in practice during the construction:

- Plan and schedule of the works to accomplish;
- List of the machines and equipment needed for construction;
- Records related to the occurring environmental problems;
- Records about the waste management issues;
- Written marking of the areas of waste disposal and waste transportation instructions issued by the local authority;
- Records about the supplies of necessary materials and their consumption;
- Complaints log books;
- Incident registration logs;
- Reports about the correction actions;
- Logs of equipment control and technical maintenance;
- Reports about the personnel training.

8.3 Costs of ESMP Implementation

The compensation value of the Red List walnuts *Juglans regia* will be calculated after the inventory of the territories by the MEPA and the Contractor will be responsible to pay.

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.
4. The cost of prevention measures against mudflow, following the scale of the territory, varies between 500.000 and 1.000.000 USD.

8.4 Planning stage of construction organization

Impacted to be Mitigated	Mitigation Measure	Responsible Entity	Controlling Entity
Emissions of harmful substances into the atmospheric air, propagation of dust, noise and vibration	– Select sites for construction camps and concrete batching units as far from the settlements as possible. Consider placement of stationary sources of pollution in the initial part of the road corridor. – The sources of emission and noise must be placed as far as possible from the surface water bodies; – Processing (crushing and sorting) of natural construction materials must be done at the mining site to the extent possible.	Construction Contractor	Roads Department of Georgia
Stability of piles of the disposed excess material	– Select geologically stable areas with least possible inclination for permanent disposal of excess material.		
Impact on aquatic environment	– Give priority to collection of industrial and fecal waters into cesspools and UD toilets. Minimize discharge of the wastewater into the surface waters; – Consider water supply reservoirs on the construction camps in order to ensure the rational use of water resources; – Drainage system must be arranged on the construction camp.		
Excess material	– To the extent possible, plan for reuse of excess material and stripped asphalt in the construction process (shall be decided based on the relevant laboratory studies).		
Impact on private property/ business	– Develop and submit Community Relations Management Plan for approval to the Employer; – Prevent entry to site prior to receipt of the Employer's formal notice on the completion of compensation of the project-affected people.		
Impact on traffic flows	– Develop traffic management plan with full consideration of community health and safety of communities within the impact zone.		
Health and safety at work site	– Develop and submit Health and Safety Management Plan for approval to the Employer; – Ensure adherence to the national Labor Code while making arrangements with personnel and subcontractors.		

8.5 Construction stage

Type of Work	Location	Impact to be Mitigated	Mitigation Measure	Responsible Entity	Controlling Entity
Preparatory works: establishment of temporary infrastructure, Mobilization of transport and construction appliances and equipment and mechanisms needed for construction.	Area of construction camps	Emissions of harmful substances into the atmospheric air, and noise propagation	– Equipping the concrete unit with relevant air-cleaning systems. – Making noise-protection barriers if necessary between the noise sources and the receptors (population).	Construction Contractor (CC)	Roads Department of Georgia (RD) Ministry of Environment Protection and Agriculture of Georgia (MEPA)
		Pollution of surface and ground waters and soil	– Use of non-faulty construction equipment and vehicles. – Place machines/equipment and potentially polluting materials away from surface water bodies; in the areas protected against the atmospheric precipitations. – Equip territory with sewage, storm-water and treatment systems at the initial construction stages. – Limit perimeter of the oil products supply reservoirs to prevent release of pollutants in case of emergency spills. – Discharge of any kind of untreated wastewater into the ravines and/or rivers is to be prohibited. – Arrange water-proof layers over the surfaces of the storing areas.		
		Visual impact on landscape	– Place temporary structures, materials and waste away from the visual receptors. – Choose colour and design of temporary structures to suit the environment. – Demobilize temporary infrastructure and re-cultivate are shortly upon completion of works.		
		Damage to health of Contractor's personnel and local community	– Use of non-faulty construction equipment and vehicles; – Fence the camp territories right at the initial stage of the construction; – Install safety signs along the perimeter of the territory. – Protect perimeter of work camp territory and control movement of outsiders in the area. – Equip personnel with PPE and enforce its use. – Equip camps with first aid kits; – Ensure safety of all electric appliances. – Introduce and maintain incident registration log. – Train personnel in health and safety techniques and ensure operators of complex machinery hold adequate licenses.		

Cleaning vegetation in the road corridor and removal of topsoil	Road corridor	Excessive damage of vegetative cover	– Extract trees under the supervision of representatives of the National Forest Agency, especially of species entered into the Red List. – Confine vegetation clearance to the area required for use and prevent damage outside this area	CC	RD, National Forest Agency
		Noise propagation, emissions of dust and exhaust	– Use non-faulty construction machinery and vehicles; – Undertake noisy works during the daytime	CC	RD
		Loss of topsoil	– Remove topsoil and pile it in isolation from the lower soil layer and other materials. – Keep height of topsoil piles below 2 m and the inclination – below 45°. – Make water diversion channels along the perimeter of the topsoil fill and protected against scattering by wind; – In case of storing the topsoil an extended time, undertake periodic loosening of pile or seed grass over it.	CC	RD
Extraction of natural construction materials	Borrowing sites	Negative impacts on landscapes, terrestrial and aquatic habitats, Damage to the health and safety of workers and affected communities	– Extract natural construction materials form licensed areas only and strictly adhere to all terms of licenses; – While extracting sand and gravel from river beds, do not enter and otherwise affect water stream; – Apply safety measures preventing entry of quarry site by community representatives and their cattle, safeguard personnel from falling into depressions, ensure organized and safe movement of construction equipment and machinery within the quarry area; – Undertake quarry reinstatement in the areas where material has been exhausted shortly upon exist from such areas.		
Construction of road base and surface	Road corridor	Noise propagation, emissions of dust and exhaust	– Use non-faulty construction machinery and vehicles; – Prevent idling of engines; – Sprinkle construction site during dusty works near settlements		
		Triggering of erosion from slope-cutting	– Undertake landscaping of slopes through avoiding steep cuts, terracing, compacting, construction of retention walls, and provision of drainage as required;		

			– Create adequate vegetation on slopes (grass seeding, tree planting) or provide enabling environment for natural regeneration of vegetation (spread of topsoil, fencing, etc.) applying site-specific approach.		
		Damage/disturbance of flora and fauna	– Confine movement of construction vehicles and machinery to the designated access roads and/or temporary servicing roads; – Delineate, mark, fence as appropriate, and respect boundaries of the construction site; – Prevent placement of construction materials and waste outside designated construction site; – Use only formally allocated locations for the final disposal of construction waste and ensure organized out-transporting of household waste; – Minimize time of having open ditches/holes at work site and prevent falling of wild animals/cattle into them while open; – Prohibit hunting and collection of forest resources by workers; – Prevent fire by adherence to safety rules and proper waste management		
		Harm to community health and safety	– Adhere to the Community Relations Plan approved by the Employer; – Notify affected communities on the commencement of each phase of works, as well as on the expected disruption in the provision of utility services that may be required for conduct of specific types of works. Identify timing and duration of such disruptions; – Post contact information at work site and maintain efficient grievance redress mechanism for receiving and handling communication from the affected communities.		
		Damage of archaeological assets	– In case of chance finds, immediately stop all physical activities on site and promptly notify Employer; – Resume works upon formal notice of Employer.		
			– Submit written communication on chance find to the National Agency of Cultural Heritage Preservation (NACHP) and keep all activities at works site on hold until formal clearance from NACHP to proceed; – Cooperate with NACHP for rapid assessment of chance find area and found items, removal of finds from the site, conservation of find site, or conduct and additional excavations as required.	RD	NACHP

Building bridges and accomplishing works in ravines	Waterway crossings and construction sites near in ravines	Pollution of surface waters	– Use non-faulty construction equipment and vehicles; – Restrict machinery entry into water stream; – Prohibit car wash in waterways and ravines; – Prohibit dumping of excess material and waste into watercourse; – Undertake works within shortest time possible.	CC	RD MEPA
Transportation	Corridors of the roads used to transport construction materials and waste.	Noise propagation, emissions of dust and exhaust	– Use of non-faulty construction techniques and vehicles; – Limiting the driving speeds; – Maximally limiting the use of public roads and searching for and using alternative routes. – Watering the working surfaces in dry weather. – Duly covering the vehicle body during the transportation of dusty materials. – Informing the population about the forthcoming intense vehicle movement.	CC	RD
		Damage to the local roads and nuisance to communities	– Strictly adhere to the Traffic Management Plan approved by Employer; – Limit movement of heavy machinery along the designated access roads and temporary servicing roads; – Install and maintain road signs and barriers at necessary locations; – Use flagmen to regulate traffic as required; – Restore all damaged road sections to initial or better quality as compared to pre-project condition.	CC	RD, Local authority
Generation of waste	Temporal waste storage areas, transport corridors and final storage areas	Irregular propagation of waste, environmental pollution	– Delivering the construction and other necessary materials only in needed quantities. – Re-using the waste as much as possible, including the use of inert materials for make the roadbed. – Arranging the temporal waste storage areas and equipping them with relevant signs. – Assigning the duly qualified personnel for waste management. – Instructing the personnel.	CC	RD, MEPA
Demobilization from site	Road corridor and areas of work camps	Area pollution with residual waste; Incomplete reinstatement and landscaping	– Clean work site and surrounding area from any residual construction and/or household waste; – Timely demobilize work camps/bases, clean their sites, remove any remaining waste, and create enabling environment for natural regeneration to the quazi-natural condition.		

8.6 Operation phase

Type of Activity	Location	Expected Negative Impact	Mitigation Measure	Responsible entity	Controlling Entity
Road operation and maintenance	Entire length of the road	Noise propagation	– Install noise barriers in case of justified complaints of local residents	Construction Contractor (in DL period)	RD
		Pollution of road surface	– Clean road and shoulders on regular basis Make and maintain arrangements for the disposal of waste generated through maintenance and repair works on the road.		
		Development of hazardous geo-dynamic processes	– Monitor condition of retention walls, gabions and surface of cut slopes for early identification of compromised stability and structural integrity; – Design and undertake repair/retrofitting works required for restoration of slope stability and structural integrity of protective engineering structures.		
		Waterlogging and flooding of road surface	– Regularly clean and maintain surface water drainage infrastructure along the road; – Promptly repair drainage infrastructure in case of damage; – Immediately communicate with utility service providers and cooperate with them for trouble-shooting in case of waterlogging of road surface in result of damage of water supply, wastewater collection, or irrigation infrastructure within the road corridor.		
		Traffic accidents	– Maintain proper road signage at all times; – Install warning signage and additional speed limits during conduct of road repair works;	RD	Traffic Police
			– Based on the statistics of traffic accidents on the road, consider provision of additional road safety measures at particular locations.		
Emergencies on the road	Entire length of the road		– Promptly notify relevant bodies and public on emergency situations on the road resulting from significant traffic accidents, extreme weather, and natural disasters	RD	Government of Georgia

9. ENVIRONMENTAL AND SOCIAL MONITORING PLAN

9.1 Introduction

As the previous chapters of this ESIA report note, there are risks of certain impacts on some environmental and social receptors during construction and operation of the road and mitigation measures must be applied for reducing scale and scope of such impacts. Regular monitoring of the application of prescribed mitigation measures is critical for their enforcement as well as for timely introduction of any revisions required in the environmental and social mitigation plan due to emergence of new circumstances or ineffectiveness of the existing mitigation measures.

Monitoring methods include visual observation and instrumental measurements (if needed). The monitoring plan describes types of activities that are likely to have negative impacts, locations where such impacts are likely to occur, monitoring parameters, time and frequency of monitoring, and responsibility for monitoring. Monitoring effort depends on the nature and magnitude of an expected impact/risk.

9.2 Institutional framework

The RD of the MRDI is responsible for general oversight of environmental compliance of works through ensuring quality performance of the technical supervisor and of the contractor. RD will perform these functions through its Resettlement and Environment Division comprising twelve staff members with relevant education and professional skills, as well as the safeguards consultants with international experience hired for the technical supervision of operations. This in-house capacity will be supported by external individual consultants upon demand.

The supervisor of works commissioned by the RD will be charged with the responsibility to establish strong field presence in the project area and supervise the works. Along with ensuring consistency with the design and quality of works, the supervisor is mandated to track the implementation of the EMP by the contractor, reveal any deviations from the prescribed actions, and identify any environmental / social issues should they emerge at any stage of the works.

Monitoring will include visual observation and measurements as appropriate. Field testers and hand-held equipment shall be used to monitor short-term impacts. Calibrated equipment and approved methods of monitoring must be used. Calibration must be done regularly, all calibration records and monitoring results, along with the copies of the site records, certificates, permits and documents shall be submitted and kept by the RD.

Works supervisor will be responsible for reporting to the RD on the environmental and social performance during works for the construction of Telavi-Gurjaani (Chumlaki) road section on monthly basis through including safeguard compliance section into the general progress reporting. Supporting photo material shall also be attached. RD will make monthly reports from the works supervisor available to the World Bank upon demand. Also, RD will include analytical sections on the ESMP implementation and overall safeguard performance into the regular project progress reporting to the project financier. This reporting will be based on the information received from the works supervisor and will also reflect results of RD's own due diligence (quality control over the supervisor's work) and RD's assessment of supervisor's performance.

Table 9.1: Environmental and Social Monitoring Plan
Construction Phase

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?)
Supply of construction materials	Purchase of the construction materials from licensed providers	Offices and warehouses of material suppliers, and borrowing sites	Checking documents; Inspection of material quality	In the process of signing the agreements for material provision	Ensure technical quality of construction; Protect human health and environment	RD
Clearing of vegetation at work base and construction sites	Vegetation clearance is confined to the designated areas; Trees are not extracted without preliminary marking and entry to the log book; Trees, especially red-listed species, are extracted in presence of the representatives of MEPA	Work base site Construction site	Visual observation; Inspection of log books	During establishment of work bases and clearing of the right of way	Prevent unnecessary damage to vegetative cover	RD, MEPA
Stripping and storage of topsoil and subsoil	Stripping and stockpiling of topsoil and subsoil is undertaken separately; Stockpiles are shaped and maintained as prescribed in the mitigation plan.	Work base site Consruction site	Visual observation	During establishment of work bases and earth works	Prevent	RD
Transportation of construction materials and waste Movement of construction vehicles and equipment	Technical condition of construction vehicles and machinery; Adequacy of the loading trucks for transported types of cargo, and canopy coverage of cargo transported in open trucks; Movement of construction vehicles and machinery along pre-defined routes.	Routes for transportation of construction materials and construction wastes	Inspection of roads adjacent to the construction site and included in the agreed-upon routes of transportation	Unannounced checks during the working hours	Avoid air and road pollution eith dust and solid matter; Reduce traffic disruption	RD, Traffic Police

Operation of construction machinery on site	Proper technical condition of construction machinery: • no excessive exhaust, • no fuel leakage, • respect of working hours	Construction site	Inspection	Within and off working hours	Reduce air and soil pollution caused by equipment operation; Reduce noise and dust nuisance to local population	RD
Servicing of construction machinery	Washing vehicles and machinery off-site of in the location sufficiently distant from water bodies; Servicing vehicles and machinery with oils and lubricants off-site or in an especially arranged location on-site; Technical adequacy of the servicing location: – solid, insulating floor or adsorbent layer (sand, gravel, membrane), – containment barriers allowing enough sapce for holding fuel over the maximum amount expected on the location at a time, – emergency fire-fighting kit, – sedimentation pool at car wash area.	Construction site and construction base (if applicable)	Inspection	Entire period of machinery operation	Avoid land and water pollution with oil products due to servicing of vehicles and machinery; Be ready for fire emergency action to promptly localize fire source and minimize material damage	RD
Extraction of natural construction material	Purchase of inert material from the existing providers if possible; Obtaining license for extraction of material by the Contractor and strict adherence to the terms of such license; Terrace processing of the borrow pits, backfilling of excess material, and harmonization with landscape; River bed gravel extraction away from water flow, arrangement of gravel barriers for isolating extraction area from water flow, prevention of water flow entry by vehicles and machinery; Demarcation of borrow areas with warning signs	Borrow areas	Checking documents Inspection of activities	The period of material extraction	Reduce slope erosion and damage to the ecosystem and landscape; Reduce river bank erosion, water pollution with suspended particles, and impact on the aquatic life; Protection of animals and people from accidents	RD, National Agency of Mines

Works in the waterways and ravines	Construction machinery and equipment does not enter water stream; Vehicles and machinery are not washed within river bed; No waste or excess material is duped into the watercourse.	Watercourses	Works in and near the watercourses	During bridge construction works	Avoid surface water pollution Prevent negative impact on the aquatic life	RD
Generation of construction and household waste	Segregated temporary storage of various types of waste at designated locations in the work site and/or work bases; Disposal of construction waste at the formally designated landfills or sites; Arrangements in place and followed for disposal of household waste through local utility services. Hand-over of hazardous wastes to licensed deactivating and processing companies.	Construction site and base (if applicable); Locations designated for waste disposal	Checking documents; Visual observation	Entire period of construction	Avoid pollution of the environment	RD, Local Municipality
Generation of liquid waste	Arrangement and operation of toilets compliant with sanitary norms on-site; Arrangement of drainage system for storm water collection and periodic cleaning of the system from silt; Arrangement of sedimentation pool for waste water collection on-site.	Construction site and base (if applicable)	Visual inspection	Entire period of construction Increased frequency of inspection in periods of high precipitation	Avoid flooding of construction site and base; Reduce pollution of surface and ground water	RD
Operation of asphalt-concrete plant	Obtaining permit for impacting environment by Contractor and strict adherence to its terms; Placement of plant in the location permissive for minimal disturbance of local population; Arranging sedimentation pool for capturing of liquid discharges from plant	Construction site and base (if applicable)	Checking documents Inspection	Before establishment of plant and during entire period of its operation	Reduce inconvenience for local population due to plant operation; Reduce air and surface water pollution from emissions and discharges from plant	RD, Environment Protection Agency

Safety of labor	Delivery of training on Emergency Action Plan, ESMP implementation and safe working environment to personnel; Placement of safety signage, instructions and barriers at work site as required; Provision of PPE to personnel and enforcing its disciplined use; Ensuring good technical condition of equipment, vehicles and appliances: – Electrical and fire safety is ensured. – Safety, prohibiting and information signs are installed on the territory and along its perimeter. – There is a banner on the territory with the basic safety rules.	Construction site	Inspection of the activities	the whole construction period	reduce the probability of accidents	RD
Works near privately-owned land, buildings and other assets	Precaution measures to avoid trespassing or incidentally damaging of private property (using small-size machinery or manual labour near walls and fences; stockpiling of construction material and waste away from private property; etc.); Notification of local communities on the commencement of each phase of works and on the scheduled interruption in the provision of utility services due to works on the road; Confinement of noisy operations to daytime; No blocking of people' access to private property and public institutions; Fencing and signing of work sites, adhering to Traffic Management Plan, placement of contract information at work site, logging and reacting to grievances of affected people.	Works near privately-owned land, buildings and other assets	Inspection	Entire period of construction	Reduce the probability of damage to private property; Reduce nuisance to local communities	RD
Demobilization of contractor	Work base and construction sites are cleaned from residual waste and fully reinstated; Enabling environment is provided for natural regeneration of work base and construction sites to quarry-natural condition.	Work camp sites Construction site	Inspection	Towards completion of works	Avoid pollution of area and loss of its aesthetic value	RD

Operation Phase

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?)
Cleaning road surface and shoulders from waste	Trash deposited from moving vehicles timely colleacted and removed; Bodies of animals overrun by vehicles timely collected and removed	Carriageway and shoulders of the road section	Inspection	Quarterly	Prevent road littering; Road safety	RD
Keeping road drainage system operational	Periodic cleaning of drainage ditches from silt and trash	Drainage system long the road section	Inspection	Quarterly	Road safety and durability	RD
Confinement of accidental spills and clean-up	Timely confinement, deactivation, and removal of liquid or powder spills of cargo in case of road accidents	On the road and its immediate surroundings	Inspection	Upon occurenace of accidents, as required	Prevent pollution of soil and water	Traffic Police; RD
Disposal of waste from regular road maintenance works	Collection and timely disposal of waste from maintenance works to the designated landfill	On the road and its immediate surroundings	Inspection	Towards completion of scheduled maintenance works	Prevent enviornment pollution	RD

10 PUBLIC CONSULTATION AND GRIEVANCE REDRESS MECHANISM

10.1 Public Consultations

Process of public consultation on the construction and operation of Telavi-Gurjaani (Chumlaki) road section commenced at the early stage of conceptual design, once the environmental and social screening and scoping of the proposed works had been undertaken. The draft of the present ESIA report will be disclosed through the RD's web page prior to public consultation, and the finalized document will be re-disclosed by RD and be posted on the World Bank's external web page. The RD will arrange public consultation meeting on the draft ESIA report and ensure incorporation of stakeholders' feedback. The minutes of the public consultation meeting will be attached to the finalized ESIA report (Attachment 1).

During the ESIA report disclosure period, hard copies as well as the electronic version of non-technical summary of ESIA will be available at the following addresses:

- Local government of Gurjaani Municipality – address: №13 Noneshvili Aveniu;
- 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 MEPA: http://www.mepa.gov.ge

During ESIA disclosure period, stakeholders will have an opportunity to send comments at the following e-mail addresses: maya_vashakidze@yahoo.co.uk

10.2 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 will be set up for the Project to deal with both the environmental and social issues of the Project.

The present chapter specifies the procedures of establishing Grievance Reddress Mechanism (GRM) and its structure and composition. The Safeguard Units of the IA has important role for establishing the GRM.

The GRM consists of temporary, project-specific units established at the municipal level in project affected municipalities and regular system established at IA. *Grievance Reddress Committee (GRCE)* established at municipal level as a project-specific instrument, which is functional only for the period of the project implementation. *Grievance Redress Commission (GRCN)* is formed as permanently functional informal structure within the IA to ensure grievance review, resolution and record.

Grievance Redress Commission

Grievance Redress Commission (GRCN) is formed by the order of the Head of RDMRDI as a permanently functional informal structure, engaging personnel of RDMRDI from all departments having regard to the environmental and resettlement issues and complaint resolution. This includes top management, Environmental and Social Safeguards Units, Legal Departments, PR department and other relevant departments (depending on specific structure of the IA). The GRCN is involved at the Stage 2 of grievance resolution process. The Order shall also state that if necessary representative of local authorities, NGOs, auditors, representatives of APs and any other persons or entities can be engaged in a work of GRCN.

Grievance Redress Committee

Grievance Redress Committee (GRCE) is an informal, project-specific grievance redress mechanism, established to administer the grievances at Stage 1. This informal body will be established at community level in affected Municipality (village/community authority). The GRCE shall include representatives of Municipal LAR Teams and local communities. The RD representative in the Municipal LAR Team shall coordinate the GRCE formation. He/she will then be responsible for the coordination of GRC activities and organizing meetings (Convener). In addition, GRCE shall comprise village Rtsmunebuli or his/her representative, representatives of APs, women APs (if any), and appropriate local NGOs to allow voices of the affected communities to be heard and ensure a participatory decision-making process.

Representative of the Resettlement and Environment Division of RD is coordinating the work of the Committee and at the same time he/she is nominated as a contact person for collecting the grievances and handling grievance log. The local authorities at the municipal level, civil works Contractor, Supervising Company (Engineer), as well as APs (through informal meetings) will be informed about the contact person and his contact details are available in offices of all mentioned stakeholders.

The Contact Person collects and records the grievances, informs all members of the Committee and the management of RD regarding the essence of the problem, engages the relevant stakeholders in discussions with the applicant of grievance, handles the process of negotiation with AP at the stage 1 of the grievance resolution. The Contact Person prepares the minutes of meetings and ensures signatures. In case if the grievance is resolved at the stage 1, the Contact Person records the fact of closing the grievance in his log and informs RDMRDI management about this in written. If the complainants are not satisfied with the GRC decisions, they can always use the procedures of Stage 2 of grievance resolution process. In that case the Contact Person helps the AP in lodging an official complaint (the plaintiff should be informed of his/her rights and obligations, rules and procedures of making a complaint, format of complaint, terms of complaint submission, etc.).

The APs should be informed about the available GRM. This could be achieved through implementing information campaigns, distributing brochures (e.g. Communication Plan), keeping all focal points up-to-date & maintaining regular communication with them, allowing multiple entry points for complaints, introducing forms for ease of reporting complaints.

10.3 Grievance Redress Procedures

Brief description of all stages of Grievance Resolution Process are given in the Table 10.1 below.

Table 11.1. Grievance Resolution Process

Steps	Action level	Process
Stage 1 (GRCE Level)	Step 1: Informal negotiations with APs	The complaint is informally reviewed by the GRCE Contact Person – Representative of Environmental and Resettlement Unit of IA/PIU, which takes all necessary measures to resolve the dispute amicably. At this stage, Contact Person engages in discussions with AP only those members of the GRCE, who have direct relation to the issue.
	Step 2: Formal negotiations with APs GRCE levelresolution of grievance	If the oral grievance is not solved during the negotiations, the GRCE will assist the aggrieved APs to formally lodge the grievances to the GRCE. The aggrieved APs shall submit their complaints to the GRCE within 1 week after completion of the negotiations at the village level or later, as he wishes. The aggrieved AP shall produce documents supporting his/her claim. The GRCE Contact Person will review the complaint and prepare a Case File for GRCE hearing and resolution. A formal hearing will be held with the GRCE at a date fixed by the GRCE Contact Person. On the date of hearing, the aggrieved AP will appear before the GRCE at the Municipality office for consideration of grievance. The member secretary will note down the statements of the complainant and document all details of the claim. The decisions from majority of the members will be considered final from the GRCEat Stage 1 and will be issued by the Contact Person/Convenor and signed by other members of the GRCE. The case record will be updated and the decision will be communicated to the complainant AP. After implementation of the agreed action the Protocol of Grievance Closure is prepared by the Contact Person. The protocol will be signed by the Chairman of GRCE and by the claimant.
Stage 2	Step 3	If any aggrieved AP is unsatisfied with the GRCE decision, the next option will be to lodge grievances to the IA/PIU at the national level. GRCE should assist the plaintiff in lodging an official compalint to GRCN (the plaintiff should be informed of his/her rights and obligations,

Steps	Action level	Process
	Decision from central IA/PIU GRCN	rules and procedures of making a complaint, format of complaint, terms of complaint submission, etc). The aggrieved AP shall produce documents supporting his/her claim, in accordance with the legal requirements (Administrative Code of Georgia). The GRCN of the IA shall review the complaint in compliance with the procedures specified in the Administrative Code of Georgia. If needed, a formal hearing will be held with the GRCN at a date fixed by the GRCN member secretary. On the date of hearing, the aggrieved AP will appear before the GRCN at the IA office for consideration of grievance. The Contact pperson will note down the statements of the complainant and document all details of the claim. The plaintiff shall be informed of the decision.
Stage 3	Step 4 Court decision	If the IA/PIU decision fails to satisfy the aggrieved APs, they can pursue further action by submitting their case to the appropriate court of law (Rayon Court). The aggrieved AP can take a legal action not only about the amount of compensation but also any other issues, e.g. occupation of their land by the contractor without their consent, damage or loss of their property, restrictions on the use of land/assets, etc.

10.4 Grievance Log

The Grievance Logs will be developed at both – GRCE and GRCN levels.

The Grievance Logs will be developed and managed by the RD representative at site (Convenor of the GRCE/Contact Person) and will be kept at site (in the IA/PIU office or Engineer'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)
- Minnutes 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

The copies of the records/documents may be also kept in the municipal office.

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21. გურიელიძე ზ. 1996. საშუალო და მსხვილი ძუძუმწოვრები. წიგნში: "საქართველოს ბიომრავალფეროვნების პროგრამის მასალები". თბილისი.
22. Otar Lortkipanidze, At the origins of the ancient Georgian civilization, Tbilisi, 2002.

ANNEX 1. Records of Public Consutlaiton

MINUTES
of Public Consultation Meeting
on the Draft Environmental and Social Impact Assessment Report
for Telavi-Gurjaani (Chumlaki) Road Section

21.02.2018 Telavi Municipality

Chairman of meeting – Maya Vashakidze, Environmental Safeguard Consultant Roads Department of Georgia

Secretary of meeting – Rusudan Elizbarashvili Senior Specialist of the Environment Protection Division of the Roads Department of Georgia

Speakers: Maya Vashakidze

Attendees of the Meeting: See attachment 1

The goal of the public discussion was to inform the local communities about the purpose of the upcoming works, their timeline; temporary inconvenience expected from the construction works; and planned measures for mitigating the expected negative environmental impact.

Local stakeholders had possibility to ask questions and express their opinion during the public discussion, so that their comments could have been considered in the final version of the Environmental Management Plan.

Ms. Maya Vashakidze, Environmental Consultant and Rusudan Elizbarashvili Senior Specialist of the Environment Protection Division of the Roads Department of Georgia were representatives of the Roads Department of Georgia.

Ms. Maya Vashakidze informed attendees about the Environmental and Social Environment Impact Assessment report of construction works under Secondary and Local Roads project III. The ESIA was carried out based on the World Bank's safeguard policies: OP/BP 4.01 Environmental Impact Assessment and OP/BP 4.12 Involuntary Resettlement. The project is classified as environmental category "B", since it covers new construction, what may have significant and irreversible impacts on the natural and social environment. Pursuant to the national legislation, an environmental permit needs to be obtained.

Ms. Maya Vashakidze made a presentation of ESIA draft report. She covered the scope of planned works, their possible impact on the natural environment and human health. Also, overviewed was mitigation measures proposed to reduce negative environmental impacts of the project in the construction and operation phases.

№	Question	Answer
1.	When will the road construction start?	The FSs' final document is under preparation. When the preparation of the study will be approved by the WB, the RD will announce tender for design-build project.
2.	How will the dust problem be reduced during the construction works?	The company who will be implementing the construction works will be obligated to prevent dust prevention by watering the territory.
3.	Will the local population be employed during the construction works?	The local population will be employed during the construction works. Works contractor will be hired on the competitive basis and will have a discretion to recruit work force upon own discretion. The Construction Company's contract will envisage the prioritized employment of the locals and supervision Company and local authorities will take care that these conditions are met.
4	Will the cattle passages and access roads be constructed with the project support?	The Construction Company, which will be identified after tender will prepare detail design of the road section and the exact number of the cattle passages will be known afterword. But the construction company will work close with the local municipalities and population to identify their needs for access roads and cattle passes.
5	The road is crossing village Kondoli, are there any noise and vibration disturbance included in the project?	The Roads Department will ensure implementation of mitigation measures to prevent the noise and vibration disturbance during the construction works. In addition, it will be required to follow the restrictions of the working activities during the non-working hours. The Contractor will work during the daytime (from 07:00 am to 07:00 pm), which will be monitored by the supervisor and will describe the situation in their monthly report.

Representatives of Roads Department of Georgia:

Maya Vashakidze (signed)

Rusudan Elizbarashvili (signed)

საერთაშორისო მნიშვნელობის თელავი-გურჯაანი (ჩუმლაყი) საავტომობილო გზის ბუნებრივ და სოციალურ გარემოზე ზემოქმედების ანგარიშის საჯარო განხილვა

[illegible]

21 თებერვალი 2018

№	სახელი, გვარი	საკონტაქტო ინფორმაცია (მისამართი, ტელეფონი და სხვა)	ხელმოწერა
	თეონა ჩოველაშვილი	თელავი, 599 851401 t.chowelashvili@yahoo.com	[signature]
	ზურაბ ბურდულაძე	[illegible] 577-95-19-33 zura-burduladze@mail.ru	[signature]
	თამარ აჩუაშვილი	[illegible] 598-38-36-31 achuashvili12@gmail.com	[signature]
	ხათუნა ჯაშიაშვილი-გულიაშვილი	ვაზისუბანი 557-400-970 xatuna.jashiashviliguliashvili@mail.ru	[signature]
	მაია [illegible]	შალაური 598-24-09-35 shalauri.tenabi@gmail.com	[signature]
	[illegible]	[illegible] 599 857767	[signature]
	გიორგი [illegible]	ვანთა 599-85-77-40	[signature]
	თინათინ [illegible]	[illegible] 599 85 7760	[signature]
	[illegible]	ნასამხრალი 599 85 77 54	[signature]

საერთაშორისო მნიშვნელობის თელავი-გურჯაანი (ჩუმლაყი) საავტომობილო გზის ბუნებრივ და სოციალურ გარემოზე ზემოქმედების ანგარიშის საჯარო განხილვა

თელა

21 თებერვალი 2018

№	სახელი, გვარი	საკონტაქტო ინფორმაცია (მისამართი, ტელეფონი და სხვა)	ხელმოწერა
	[illegible]	[illegible] 595 53 35 33	
	მარიამ თანდილაშვილი	[illegible] 598 41 41 31	
	[illegible]	[illegible] 599-85-77-61	
	[illegible]	[illegible] 598-511-4[illegible]	
	[illegible]	551 12 12 00 [illegible]	

Photos of public consultation:

MINUTES
of Public Consultation Meeting
on the Draft Environmental and Social Impact Assessment Report
for Telavi-Gurjaani (Chumlaki) Road Section

21.02.2018 Gurjaani Municipality

Chairman of meeting – Maya Vashakidze, Environmental Safeguard Consultant Roads Department of Georgia

Secretary of meeting – Rusudan Elizbarashvili Senior Specialist of the Environment Protection Division of the Roads Department of Georgia

Speakers: Maya Vashakidze
Attendees of the Meeting: See attachment 1

The goal of the public discussion was to inform the local communities about the purpose of the upcoming works, their timeline; temporary inconvenience expected from the construction works; and planned measures for mitigating the expected negative environmental impact.

Local stakeholders had possibility to ask questions and express their opinion during the public discussion, so that their comments could have been considered in the final version of the Environmental Management Plan.

Ms. Maya Vashakidze, Environmental Consultant and Rusudan Elizbarashvili Senior Specialist of the Environment Protection Division of the Roads Department of Georgia were representatives of the Roads Department of Georgia.

Ms. Maya Vashakidze informed attendees about the Environmental and Social Environment Impact Assessment report of construction works under Secondary and Local Roads project III. The ESIA was carried out based on the World Bank's safeguard policies: OP/BP 4.01 Environmental Impact Assessment and OP/BP 4.12 Involuntary Resettlement. The project is classified as environmental category "B", since it covers new construction, what may have significant and irreversible impacts on the natural and social environment. Pursuant to the national legislation, an environmental permit needs to be obtained.

Ms. Maya Vashakidze made a presentation of ESIA draft report. She covered the scope of planned works, their possible impact on the natural environment and human health. Also was overviewed mitigation measures proposed to reduce negative environmental impacts of the project in the construction and operation phases.

№	Question	Answer
1	When will the construction works of the road start?	The FSs' final document is under preparation. When the preparation of the study will be approved by the WB, the RD will announce tender for design-build project.
2	Will the local population be employed during the construction works?	The local population will be employed during the construction works. Works contractor will be hired on the competitive basis and will have a discretion to recruit work force upon own discretion. The construction Company's contract will envisage the prioritized employment of the locals and supervision Company and local authorities will take care that these conditions are met.
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5	How can we be able to see the detailed design once it is developed	Our today's meeting is one of the meetings planned to conduct with all interested parties within the scope of the project. Once the Final version of Feasibility Study is available, the Resettlement Action Plan will be prepared. A meeting with the local population will be organized to discuss it with the affected people. Besides, the Resettlement Action Plan will be made available at local municipalities and the web site of the Roads Department of Georgia, where all of you will be able to see it.

Representatives of Roads Department of Georgia:

Maya Vashakidze (signed)

Rusudan Elizbarashvili (signed)

საერთაშორისო მნიშვნელობის თელავი-გურჯაანი (ჩუმლაყი) საავტომობილო გზის ბუნებრივ და სოციალურ გარემოზე ზემოქმედების ანგარიშის საჯარო განხილვა

21 თებერვალი 2018

№	სახელი, გვარი	საკონტაქტო ინფორმაცია (მისამართი, ტელეფონი და სხვა)	ხელმოწერა
1.	[illegible]	599 85 21 73	
2.	[illegible]	599-85-21-98	
3	[illegible]	577-62-95-08	
4.	[illegible]	577157118	
5	[illegible]	577 157 195	
6	[illegible]	595 42 56 14	
7	[illegible]	555-37-96-61	
8.	[illegible]	593 44 09 54	
9.	[illegible]	[illegible] 5-98-511-460	

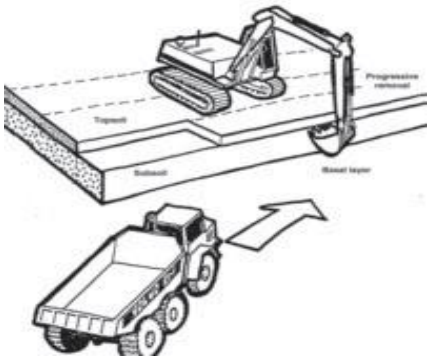
საერთაშორისო მნიშვნელობის თელავი-გურჯაანი (ჩუმლაყი) საავტომობილო გზის ბუნებრივ და სოციალურ გარემოზე ზემოქმედების ანგარიშის საჯარო განხილვა

21 თებერვალი 2018

№	სახელი, გვარი	საკონტაქტო ინფორმაცია (მისამართი, ტელეფონი და სხვა)	ხელმოწერა
10	თეიმურაზ ქავსიშვილი	599 65 13 54	[signature]
11	[illegible]	599 24 13 71	[signature]
12	ქაჩალელიშვილი ვასილი	579 19 19 64	[signature]
13.	ნ.ა.შ. გ/მ ვასილი [illegible]	599 487 486	[signature]
14	ნ.ა.შ. გ/მ თამარ ხიზანიშვილი	577 157 128	[signature]
15	ვიქტორ [illegible]	599 852 240	[signature]

Photos of public consultation:

ANNEX 2. Recommendations for Topsoil and Subsoil Management



Topsoil must be removed prior to commencement of works until reintroduction during revegetation of disturbed sites,

Stripping should be undertaken by the excavator standing on the surface of the topsoil, digging the topsoil to its maximum depth and loading into site or off-site transport vehicles.

Appropriate equipment and work practices must be used to avoid adverse impact on the topsoil properties. Topsoil will normally be stripped to a thickness defined by depth below the surface and/or a distinct colour change.

Mixing topsoil with subsoil must be avoided to reduce impact on quality and fertility of the topsoil.

Special attention is to be paid to topsoil storage. The way topsoil is handled (collected and stored) can also affect soil characteristics and reduce its revegetation value. For instance, reduction of oxygen content in the stockpiled topsoil reduces its quality; soil structure deteriorates if topsoil is collected when saturated or if the soil is compacted during handling.

Recommended universal practice for topsoil management applicable to all sites.

Avoid stripping topsoil when it is saturated or when very dry.

Stockpile must not exceed two metres in height

Minimise handling of topsoil.

Keep top soils separate from overburden, gravel and other materials.

Protect topsoil stockpiles from erosion.

Avoid burying topsoil.

Store topsoil above or beside the excavation, depending on which direction the deposit is being worked, to allow for easier re-spreading.

Avoid long term stockpiling of topsoil by using it to rehabilitate worked out areas immediately.

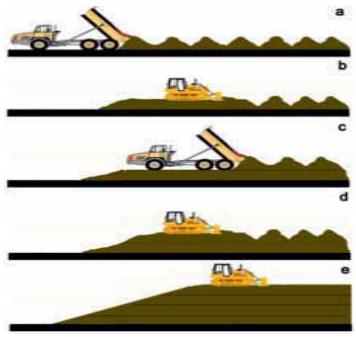
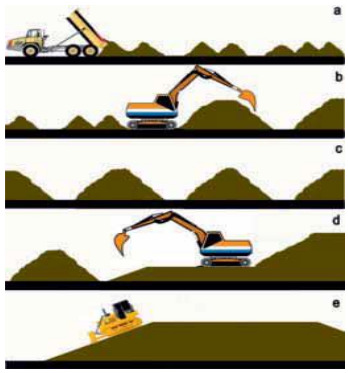
Locate topsoil stockpiles away from traffic, waterways and sources of pollution.

Install drainage measures to allow drainage through or around large soil stockpiles.

Grow vegetation on stockpiles (shrubs and grasses) – for long term stockpiles.

Avoid driving on stockpiles and compaction. (Soil in a dry and non-plastic state is less prone to compaction, tends to retain a proportion of its structure.)

Stockpile heights of 2m are commonly used for topsoil that can be stripped and stockpiled in a dry state. Stockpiles may need to be higher where storage space is limited. Management of dry non-plastic and wet plastic soil can be done as described below:

Method 1– Dry non-plastic soils	
	The soil is loose-tipped in heaps from a dump truck, starting at the furthest point in the storage area and working back toward the access point. When the entire storage area has been filled with heaps, a tracked machine (excavator or dozer) levels them and firms the surface in order for a second layer of heaps to be tipped. (c) and (d) This sequence is repeated until the stockpile reaches its planned height. (e) To help shed rainwater and prevent ponding and infiltration a tracked machine compacts and re-grades the sides and top of the stockpile to form a smooth gradient.
Method 2 – Wet plastic soils	
	The soil is tipped in a line of heaps to form a 'windrow', starting at the furthest point in the storage area and working back toward the access point. Any additional windrows are spaced sufficiently apart to allow tracked plant to gain access between them so that the soil can be heaped up to a maximum height of 2m. To avoid compaction, no machinery, even tracked excavator, crosses the windrow. Once the soil has dried out and is non-plastic in consistency (this usually requires several weeks of dry and windy or warm weather), the windrows are combined to form larger stockpiles, using a tracked excavator. The surface of the stockpile is then regraded and compacted by a tracked machine (dozer or excavator) to reduce rainwater infiltration.

Site selection for topsoil and surplus soil disposal must be selected carefully. Recommendations for site selection are as follows:

Seek a stable site where sediment cannot reach the stream during any high water event.

Avoid riparian corridors or any area within the 100-year floodplain.

Avoid all wetland sites

Avoid placing spoil on unstable slopes, where the added weight could trigger a land movement. Excessive loading of clay or silt soils could also trigger a failure.

Use wide, stable locations (e.g. rock pits, ridges, benches) as places to dispose of fill.

Avoid locations where ground water emerges or a thick organic layer is present.

Avoid sites of archaeological importance and the areas with endangered or threatened plant species.

Consult biologist and archaeologist prior to and during the site selection

ANNEX 3. Interviews with Community and Roadside Businesses

The implementation of the project will have direct impact on the food facilities, petrol stations and individual traders located near the main road, whose work is seasonal and lasts for 3-4 months a year, when they sell products which they produce by themselves, and for the remained months try to sell seasonal fruit and/or other products. During November, 35 individual traders were observed in the proximity section, 28 of those took part in the polls by their own will, while 4 refused any questions. The survey showed that the number of vendors are a little bit higher (about 2-3 times). They are mostly residents of adjacent villages and trade with their harvest and food-stuff (fruit, churchkhela, pumpkin, garlic, etc.).

Photo №1. №2: Meetings with outdoor vendors

It should be mentioned that all business is active only from spring to autumn (May to October). Most of them are not operating during the winter time, or operate at very limited scale. All shop owners mentioned that reduction transit movement will not affect their business, about 90% of customers are from the local neighbourhood.

Effect of the traffic diversion on large shops will be low. According to the owners, the sales are not dependent on the traffic flow and/or the season.

Keeping the mentioned above in mind, fruit and vegetable sellers as the most vulnerable to the change were interviewed.

All respondents except one refused to say approximate daily income.

The interviews were carried out on November-December 2017.

Owners of those trade that are located in the middle of the villages are happy with the new project, because the movement of trucks and intensive traffic on the village road damage their homes and they mainly work for local population and passenger drivers rarely enjoy their services.

(Photos №3. 4. 5. 6 Meetings with the shop owners)

Note: most of private business owners have refused to take photos of their business activity or a personal.

There are also such (mostly owners of bakeries) who are not interested in the new project. In their opinion, the new road does not have any sense for them and whatever business income they had before, it would remain all the same.

As for the opinion of the small business owners and workers of gas stations (furniture stores, household stores) - they think that their business will suffer by the reduction of traffic intensity on the existing road.

The main concern of the residents is lack of employment in particular for youth. The attitude toward the project is dual. They agree that the road is necessary, are happy that diversion of traffic will reduce the risk of car accidents and improve air and noise quality in the settlement, but fear that they will have to stop their business as the number of customers reduces. In their opinion they or their family members must have priority during temporary employment. Most of the respondents are sceptical that establishment of alternative businesses will be feasible is short term prospective. In their opinion this will be possible only in case of support from the state.

Brief Analysis of Social Survey

During the preliminary social survey 28 private and legal persons were interviewed, who has a business nearby the existing road. 2 persons out of 28 (7%) are legal entities and 26 (98%) are private individuals. The number of

respondents is estimated to be 20% of business producers in Telavi and Gurjaani municipalities. The surveyed legal entities have a gas station, furniture store and food stores. As for individual traders, 6 of them trade with meat, and the rest - their agricultural products and their food-stuff (pumpkin, garlic, fruits, and churchkhela and other). A detailed social survey will be conducted at the stage of elaboration of the Project Resettlement Action Plan.

100% of interviewed persons are ethnically Georgian and live in adjacent villages. For 4 out of the interviewed 26 private traders (15%) this business is the only source of income. 20 of them (77%) additionally receive pensions, while the other 2 traders (8%) have other sources of income. As for the 2 legal entities, their business is the only source of income.

In relation to the land and assets purchases, the overall objective of the project is to assist the affected population (AP's) in order to ensure their living conditions at least on the current level of project implementation. It will be good practice if the outdoor traders will be able to sell their products not in an open spot but into specially allocated spaces in an organized manner. This measure will also be useful if the specially arranged facility for outdoor traders will be located between existing road and project road, because in this case the intensity of traffic will no longer cause the reduction of "clientele". Their products will be available for vehicles moving on the existing road, as well as for cars moving on the new road. In addition, it is necessary to take into account specific principles, such as:

- Implementation of road construction in maximal distance from residential areas to minimize the physical movement of people and selecting routes that require the acquisition of the minimum amount of productive agricultural lands owned by private and public ownership;

- Developing such design standards that will reduce the limitations of the land use of the adjacent territories;

- Development of fair and transparent procedures, in accordance with the matrix of the powers of the present Resettlement Policy Framework to compensate: in case of temporary loss of land/property during construction, in case of permanent acquisition of land and property and possible prohibition of land use at the adjoining site of the corridor;

- Purchase of land (or land use right) on the basis of a bilateral agreement, as for the state's right to use expropriation procedures for the necessary public need - this should only happen only after the exhaustion of all mediators with owners, only in extreme cases.

- Maximum restoration of the original condition of the land after completion of the construction, so that landholders/beneficiaries/leaseholders should be able to renew the activity they were engaged in before the start of the project;

- Fully informing the project affected people and societies on further land acquisition and compensation prodedures; As well as informing them about the land rights and the mechanisms of appealing.

- Consideration of the complaints of the affected persons, decision making and gratification should be done in accordance with the provisions of the Resettlement Policy Framework.

- All affected persons, regardless of the legal status of their property, shall have the appropriate compensation in order to be able to maintain substinence funds and provide a better standard of living than he had before the project implementation. Persons who illegally own the land parcels are not granted compensation for loss of land, but they

will receive compensation for loss of property that they have created with their own funds and also because of loss of income in such a way that to help them to maintain survival funds. The detailed measures to be taken are based on the survey and socio-economic research that will be carried out in the preparation of the Resettlement Action Plan.

- AP's will be informed of the Project Implementation Schedule and will be consulted on land acquisition and issues related to the loss and damage of assets.

- Loss of such assets such as fruit-bearing agricultural plants and trees, fences and booths and loss of income, including loss of harvest, will be minimized, and if such damage is inevitable, it will be compensated despite the legal status of property, according to the matrix of the authority given in the RPF document.

- The Resettlement Action Plan will be developed in accordance withy the Resettlement Policy Framework, World Bank OP 4.12 and Georgian legislation on each section of the Project route and the plan will provide detailed compensation packages and project implementation schedule. Due the differences, as noted above, between OP 4.12 policy and the Georgian legislation regarding the expropriation methods, the land required for the project will be purchased with the Principles and Procedures under this RPF document.

- The market will be studied to determine the market price of the land, impacted building materials, agricultural crops and other necessary products. Estimated prices will be used as unit prices to determine the volume of compensation. The above mentioned measure is needed in order to make it possible for the affected persons to buy a substitute land in accordance with the market prices.

- Loss of income and assets - remuneration with clear calculation without taxes, depreciation and other deductions.

- The final project of the Resettlement Action Plan will be submitted to the bank, which will approve it on the relevant sections before the commencement of construction works.

Details of land acquisition procedure will be included in the Resettlement Action Plan. However, the following included aspects should be noted:

- Consultation at the initial stage with informing Affected People's (AP) about the project and the impact of the project

- Survey of AP's, geographical and socio-economic research

- Determination of APs and identification of impact types/zones

- Preparing compensation package and creating Resettlement Action Plan

- Consultation with APs

- Negotiation with APs and paying compensation

- The process of alienation in case of futile negotiation.

ANNEX 4. Emergency Resonse Plan

Goals and Objectives of the Plan

Goal of the emergency response plan is to determine and establish guidelines for workers employed for the road construction works in order to ensure rational and coordinated actions of personal during techno genic accidents or incidents, as well as protection of personnel, population and environment.
Objectives of this plan are:

- Determination of possible emergency situations during the road construction;
- Determination of groups responsible for response to each type of emergency situation, their equipment, emergency action plans and responsibilities;
- Determination of internal and external alarm systems;
- Immediate activation of internal resources and, if necessary, mobilization of additional resources and relevant procedures;
- Provision of emergency management system;
- Ensure compliance with legislative, regulatory and safety requirements during emergency situations.

Expected emergency response plan envisages the requirements of Georgian laws and legislative acts.

Types of Emergency Situations

Considering specificities of planned activities, following types of emergency situations are expected:

- Traffic accidents;
- Accidental spills of pollutants;
- Fire;
- Personnel traumatism and incidents related to their health safety.

It is noteworthy, that emergency situations, listed above, may be subsequent and development of one emergency situation may initialize another one.

Traffic Accidents

Trucks and heavy machinery will be used during construction works. During their movement on public and access roads, following are expected:

- Collision with transport means, real estate or livestock of local population;
- Collision with local population;
- Collision with project personnel;
- Collision with other project machinery;
- Collision with local infrastructure facilities;

High risk of traffic accidents will be related to relatively intensified traffic. A number of preventive measures should be taken in order to minimize the risks of traffic accidents, including: limitation of traffic speed, arrangement of warning signs, selection of optimal routes for vehicles, regulation of traffic by standard-bearer, etc.

Accidental Spills of Pollutants

Oil spill risk may be related to a violation of the conditions of their storage, fuel or oil leakage from vehicles and equipment and so forth.

Fire

The main factor of accident may be anthropogenic, namely: indifference of personnel and violation of safety norms, violation of storage rules for fuels, oils and other explosive substances and etc. in order to prevent fire eruption, strict supervision over fuel and lubricants storage rules, provision of fire fighting means on the construction site, periodic training of personnel on fire prevention and elimination of its consequences will be required.

Personnel Traumatism and Incidents Related to their Health Safety

Except incidents related to other emergency situations, personnel traumatism may also be related to:

- Incidents related to heavy machinery/equipment used for project implementation;
- Fall from large heights;
- Poisoning with used chemical substances;
- Electric shock, during working near aggregates under high voltage.

General Preventive Measures

Preventive measures for traffic accidents:

- Selection of optimal transport movement routes and speed restrictions;
- Installation of warning, prohibiting and pointing road signs at access roads and construction camps;
- During movement of special and oversized machinery they should be escorted by specially equipped machinery and trained experienced personnel.

Preventive measures for hazardous substance spill:

- Strict supervision over implementation of fuel and chemicals' storage and use terms. Fitness of storage vessel must be checked before storing;
- The technical functionality of oil containing equipment should be periodically monitored;
- Termination of works / suspension of equipment and machinery operation and implementation of maintenance work after detection of minor spill, so that incident would not become large-scale.

Preventive measures for fire/explosion:

- Periodical training and testing of personnel on fire prevention issues;
- Storage of easily flammable and explosive substances at safe places. Installation of corresponding warning

signs at their warehouses;

- Implementation of fire safety rules and arrangement of functional fire fighting equipment at the territory;

Preventive measures for personnel traumatism/injury:

- Periodical training and testing of personnel on labour safety issues;
- Provision of personnel with individual protection means;
- Warning signs should be arranged within the dangerous zones;
- Preparation of special staff, which will control implementation of safety norms at construction sites and will register facts of violation

Approximate Scale of Accidents

According to expected emergencies, liquidation resources and legislative requirements, accidents and emergency situations are sorted in 3 groups. Table 1 gives description of emergency situations according to their level, indicating corresponding reaction.

Accidents	Level		
	I level	II level	III level
General	The internal resources are sufficient for emergency liquidation	External resources and workforce are needed for emergency liquidation	Involvement of regional and country resources for emergency liquidation
Damage of other structures	Minor damage of road structures that is temporary but will not interrupt significantly road operation. The provocation of other emergencies is less expected. Road service personnel will manage to liquidate emergency.	Hydraulic structures damage, which significantly impede the functioning of the traffic and the other risks provoking an emergency situation.	Significant damage to road structures (bank protection structures injury, significant damage to the roads, bridges, tunnels, etc.). There is a high risk of flooding and damage to infrastructure facilities. It is needed to mobilize external resources for rapid elimination of the accident.
Hazardous substance spillage	Local spillage, which does not need external interference and can be eliminated with internal resources. The risks of spreading of the substance on large areas and ravine contamination do not exist.	Large spills (spills of hazardous substances 0.3 tons to 200 tons). There are risk of substance spreading in the area and the risk of the ravine pollution.	Large spills (more than 200 tons)
Fire /Explosion	Local fire, which does not need any external interference and is easily controlled. The meteorological conditions are not conductive to the rapid spread of the fire. There are no inflammable and explosive sections/ warehouses and materials.	Large fires, which spread quickly due to the weather conditions. There are inflammable/explosive areas/ warehouses and materials. It is necessary	A large fire, which spread rapidly. The ignition risk of surrounding neighbourhoods and provocation of other emergencies is high. The approach to the territory is complicated. The inclusion of the regional fire service for the liquidation of the incident is necessary.

		to call the local fire squad.	
Road accidents	The damage of equipment, vehicles, infrastructure and non-valuable items takes place. Human health is not in danger.	The damage of the equipment, vehicles, infrastructure and valuable objects takes place. There is the threat to human health or II level traumatism is registered.	The damage of the equipment, vehicles, infrastructure and valuable objects takes place. There is the high risk of development of other emergencies. There is the threat to human health or III level traumatism is registered.
Personnel injury / Traumatism	• One incident of traumatism; • Light fracture, bruises; • I degree burns (skin surface layer damage); • Assistance to injured personnel and the liquidation of the incident is possible by local medical service.	• Individual cases of accidents; • Severe fracture - a fracture of the joints of the middle; • II degree burns (deep layer of the skin lesions); • There is the need to move injured personnel to the local medical facility.	• Several traumatic accidents; • Severe fracture - Articular fracture etc.; • III and IV degree burns (skin, hypodermic tissues and muscle lesions); • There is the need to move injured personnel to the regional or Tbilisi medical service centres with relevant profile.

Note: Considering the scale of the project, its duration and specificity of location, the anticipated emergency situations will be mainly of I levels and less likely of II level, except hydraulic structures damage.

Emergency Response

Response During Traffic Accidents

During the accident of road transport, it is necessary to implement the following strategic actions:

- To stop vehicles/equipment;
- Transmission of information in accordance with the emergency report scheme;
- In case if there is no danger for human health and there are no risks of provoking other emergency situations (for example: collision of other vehicles, explosion, fire, oil spill, hydrodynamic accident or others), then:
  - Get out of the vehicle/equipment or get away from the accident place and stand on a safe distance;
  - Wait for the police/rescue team to come.
- In case of further threats, act as follows:
  - Get out of the vehicle/equipment or get away from the accident place and stand on a safe distance;
  - If the vehicle accident has occurred on the dangerous section of the road of public use (for example: in the turning, there visual field on the road is limited), then ask to the accident witness to stop the cars moving in direction of an accident location;
  - If you are alone on the accident place, place the warning signs or sharp colour safe signs on the road away from the place of an accident, so that those signs will be visible for the drivers moving in direction of an accident place and will ensure the car stop;
  - In case of explosion, fire, oil spill, hydraulic accident and others, ac in accordance with the strategy given in the relevant paragraphs;

- In case if there is a threat on the health of a person, do not try to move the body;
- If the injured person is lying in the middle of the street, cover him with something and confine the accident location, so that it will be seen from a distance;
- Remove everything from him, which might be making asphyxia (belt, scarf);
- First aid to the injured in accordance with the first aid strategy given in the relevant paragraphs (but remember, by extra movement of the injured person, you might create additional risks to his health).

Response to Hazardous Material Spill

This section discusses only I scale emergency response strategy. The types of hazardous substances spill response are significantly determined by ground surface, also, the initial condition.

In case of hazardous substances spill on the pervious surface, it is necessary to implement the following strategic actions:

- Information transfer according to the other personnel and emergency service;
- Stopping every device-equipment working on the site;
- Ask personnel to mobilize equipment and personal protection means for emergency response;
- Block the entrances of household-fecal sewage systems (lids of wells);
- Absorbents should be placed together in such way to create continuous barrier (fence) in front of the edge of moving oil products. Ends of the barrier must be folded in front, so that it will have a shape of a horseshoe;
- Spilled oil products containment place must be covered with polyethylene membrane sheets, in order to prevent the oil occurrence in the lower layers of soil;
- It should be noted, that if it is not available to lay down the polyethylene sheets, then the barrier arrangement will cause the oil accumulation on one place, which in turn will cause soil saturation with oil and oil products occurrence in the lower layers;
- For drying in the spilled substances, absorbent pads usage is necessary;
- Gather the oil products in such way, that it will be possible to collect them in container and then remove;
- After absorption of the oil, these pads should be placed in polyethylene bags (if needed, these pads might be reused);
- The site should be completely cleaned from residual oil products, in order to exclude the wash-off of the pollutants by the rain water;
- After completion of cleaning operations, every cleaning material must be collected, wrapped and warehoused in relevantly safe areas.
- Processing of vegetation and upper layer of the soil on existing on the ground surface must begin right after removal of the pollution source or after stopping the leakage;
- When the whole spilled oil products will be cleaned, removal and remediation works implementation must start under supervision of construction works manager/head of the facility and invited specialists with a relevant competence.

Response During Fire

The strategic actions of the person and the personnel working in the vicinity, who detected fire or smoke, are as follows:

- Termination of works on every site, except for safety measures;
- Assessment of the situation, reconnaissance of fire hearth and adjacent territories;
- Withdrawal of the equipment-devices from the areas, where the fire spreading is possible;
- Electrical equipment should be turned out from the circuit;
- In case if fire is strong and it is hard to approach the fire hearth, some kind of fire or explosive hazardous sites/substances are located adjacently, then:
  - Get away from the danger zone:
  - Inform senior manager/operator about the accident;
  - Wait for rescue team and when they appear, inform them about the fire reasons and the situation in the vicinity of fire hearth;
- In case if the fire is not strong, the fire hearth is easily approachable and getting near to it is not dangerous for your health. At the same time, there are certain risks of fire distribution on adjacent territories, then, act as follows:
  - Inform senior manager/operator about the accident;
  - Search for the nearest fire stand and supply yourself with necessary fire inventory (fire extinguisher, axe, crowbar, bucket and etc.);
  - Try to liquidate fire hearth with fire extinguisher, in accordance with the instruction shown on the fire extinguisher;
  - In case if there is no fire stand on the site, use sand or water for fire hearth liquidation or cover it with less flammable thick cloth;
  - In case if the electrical equipment turned into the circuit are near the fire hearth, it is prohibited to use water;
  - In case of fire in the closed space, do not window the room (except for special needs), because the fresh air supports fire and fire scale growth.

Strategic actions of site manager/chief operator in case of fire:

- Gathering detailed information on fire hearth location, existing/stored devices-equipment in the vicinity and substances;
- Information transfer in accordance with the notification scheme;
- Visiting the accident place and reconnaissance of the situation, risks analysis and assessment of expected fire scales (I, II or III scale);
- Ask whole personnel to use vehicles and fire extinguishing equipment;
- Controlling and managing the personnel actions.

Response during Accidents Related to Human Injuries and Incidents Related to Their Health and Safety

The person, who is taking care of injured person, must notify ambulance about an accident as a first action. Before the rescue will appear, injured person must receive first aid service in accordance with the tactics given below in following chapters. Before carrying out medical service, it is necessary to assess the situation and determine if approaching and helping an injured person might create some threat.

First Aid during the bone fracture

Open and closed bone fractures are being distinguished:

- For the open fracture is characterized the violence of skin cover integrity. In this case, there is wound and bleeding in the damaged area. There is a high risk of infection in case of open fracture. In case of open fracture:
  - Promptly call helper, so that helper will immobilize the damaged area of the injured person, while you will process the wound;
  - Cover the wound with clean cloth and directly press on it to stop the bleeding. Do not press directly on broken bone fragments;
  - Without touching the wound with fingers, surround the damaged area with a clean cloth and fit ix;
  - If the broken bone fragment is seen in the wound, place the soft cloth around the bone fragment in such way, that the cloth will not be removed and the bandage would not impact on bone fragments. Fix the bandage I such way, that it will not disrupt the blood circulation below the wrapped place;
  - Carry out a broken bone immobilization, in the same way as during covered fracture;
  - Check pulse, capillary filling and sensitivity below the wrapped place once in every 10 minutes.
- We are dealing with a closed fracture, if the ski integrity is not damaged in the injured area. In this case, haemorrhage and edema are observed in the injured area. In case of closed fracture:
  - Ask injured person to stay still and fix the damaged part of the fracture above and below it by hand, before it will be immobilized (fixed);
  - For a good fixation, fix the injured part of the body on uninjured part. If the fracture is on the hand, fix it on the body with triangle bandage. If the fracture is on the leg, fix the damaged leg on another leg;

Check pulse, sensitivity and capillary filling below the wrapped place once in every 10 minutes. If the blood circulation or sensitivity is reduced, make a less tight bandage.

First Aid During Wounds and Bleeding

There are three types of bleeding:

- There is a little blood. In this case is risk of infection:
  - Clean the wound of injured person with any colourless liquid suitable for drinking;
  - Wrap the wound with clean cloth.
- There is a lot of blood. In this case there is a risk of blood loss:
  - Cover the wound with several layers of cloth and make press bandage;
  - If the blood is still leaking, tight the cloth to the wound again (do not take of the blood-drenched cloth) and strongly press on blood source area.
- The blood is pouring like a fountain from the wound. In this case the blood loss is very fast. In this case you must push finger (or fingers) on the artery projection area to avoid this and then put a bandage.

  The areas of load on the artery are: the lower third of an arm and upper third of the thigh. The bandage should be fixed like this:
  - The bandage is fixed only in extreme case, because often it leads to irreversible damage;
  - The bandage is fixed above wound;
  - The location where the bandage will be fixed must be covered with cloths. If the wound area is bare, we should place clean cloth under the bandage;
  - First bandage must be tight (fixed as possible), then the bandage is getting tight and in addition placed 3-4 times (rope, belt and etc. can be used instead of bandage);

- The bandage should be fixed for 1 hour in the winter and for 2 hours in summer. Then we should release and after 5-10 minutes fix it slightly above from the original location;
- Check if the bandage is properly fixed – if it is properly fixed, there should be no pulse on limb;
- What we should not do;
- Do not put a hand in the wound;
- Do not take anything from the wound. If some foreign body is seen in the wound, we should try to maximally fix it (put a bandage around this body).

- Internal bleeding is hardly determinable damage. Suspect internal bleeding, when the shock signs are observed after getting injured, but there is no significant blood loss. In case of internal bleeding:
  - Lay injured person on his back and rise his legs up;
  - Remind tight clothes on neck, chest, waist;
  - Do not give food, medicine or drinks to injured person. If injured person is conscious and is very thirsty, just wet his lips;
  - Warm injured person – cover with blanket or cloth;
  - Check the pulse in every 10 minutes, as well as breathing and consciousness. If the person is losing mind, place him in safe location.

First Aid in Case of Burn

The burn might be developed by hot objects and steam impact (thermal burn), by chemical substances impact on the skin (chemical burn), electricity impact (electrical burn). In order to properly carry out first aid, you must determine the degree of burn, which depends on damage depth and damage area (on what part is the burn distributed).

- The first aid measures during the burn are:

- It is dangerous to breath in the smoke, so if there is a smoke in the room and it is not available to window fast, remove the injured person on a safe place, on a fresh air;
- If the clothes are burning on the person, do not start to roll his body, pour the water on the body (in case of electrical burning, usage of water next to the equipment in the circuit, is prohibited);
- If there is no possibility to use water, cover the body with non-synthetic cloth;
- It is necessary to start cooling the burnt area in time with cold water (in case of I and II scale burn, water it for 10-15 minutes, in case of III and IV scale burn wrap it with clean wet cloth and then cool it in the water in such wrapped conditions);
- Remove the cloth and other objects, from the damaged area, which may interrupt blood flow. Do not remove cloth pieces, which are stick to the damaged area;
- Cover the damaged area with sterile wrapping. This would reduce the likelihood of infection;
- Breathing in a hot air is possible when burnt, which leads to the burning of respiratory tracts. If the victim has hard noisy breathing, facial or neck burn, singed hair cover of face and nose, swelled mouth and lips, swallowing difficulty, cough, hoarseness voice – suspect the respiratory tracts burn and wait for the medical service;
- Constantly check breathing and pulse before the medical service will come, be ready to carry out reanimation measures;

- It is not allowed to take off the clothes particles from the burnt skin, cause this may lead to the deepening of the damage;
- It is not allowed to destroy the integrity of blebs, because the skin cover is damaged and it makes a favourable conditions for the invasion of infection in the body;
- Do not use ointments, lotions or oils for processing the damaged parts;
- It is prohibited to process the chemical burn areas with neutralizing solutions/ For example, alkaline caused burn treatment with acid.

First Aid in Case of Electrical Trauma

There are three types of electrical trauma:

- The trauma caused by high-voltage electricity. The damage developed as a result of high voltage traumas, are fatal in most cases. Severe burns are being developed at this time. Due to the strong muscle compression the injured person is often threw away on a significant distance, which leads to serious injuries. In case of high-voltage power trauma:
  - It is prohibited to get close to the injured person, before the electricity will be turned off and if necessary, the isolation will be made. Remain 18 m radius safe distance. Do not let other witnesses to approach the injured person;
  - After receiving electric trauma, as soon as approaching the injured person, open the breathing ways without moving head back, by moving the lower jaw in front;
  - Check breathing and circulation signs. Be prepared to make reanimation measures;
  - If the injured person is unconscious but is breathing, place him in a safe location;
  - Carry out first aid in case of burns and other injuries.
- The electrical trauma caused by low-voltage electricity. Low-voltage electricity trauma may turn into serious damages and even death reason. Often, this kind of electrical trauma is caused by damaged plugs, wiring and equipment. When standing on a wet floor or touching undamaged electrical wiring with wet hands, the risks of getting the electrical trauma are sharply increasing. In case of low-voltage power caused trauma:
  - Do not touch the injured person, if he is touching the power source;
  - Do not use metal object for removing the power source;
  - If you are able, stop power supply (turn off the power switch). If it is not available, turn off the electrical equipment from the power source;
  - If you are not able to switch off the electricity, then stand on dry insulation thing (for example: a plank of wood, on rubber or plastic pad, on book or pile of newspapers);
  - Remove the victim's body from the power source by broom, stick, and chair. You can move the victim's body away from the power source, or vice versa, the power source away from the body, if it is more convenient;
  - Without touching the body of injured person, tie a rope around his foot and shoulders and move away from the power source;
  - At least, grab the injured person in dry not-tight cloth and move him away from the power source;
  - If the victim is unconscious, open the airways, check the breathing and pulse;

- If the victim is unconscious, is breathing and has a pulse, place in a safe location. Cool the burned areas and wrap it;
- If the visible injuries are not seen on the victim and feels good, advice to take a rest.

- The electrical trauma caused by lightning/thunder:
  - Various traumas, burns, face and eyes damage is often by the electrical trauma. Sometimes the lightning may cause a sudden death.

Quickly move damaged person form the place of the accident and serve with first aid as in case of different type of the electrical trauma.

Equipment Necessary for Emergency Response

Personal protection means are:

- Helmets;
- Safety glasses;
- Uniforms with reflective stripes;
- Waterproof boots;
- Gloves.

Fire extinguishing equipment:

- Standard fire extinguisher: on every site, as well as on every special machines and equipment;
- Buckets, sand, shovels and etc.;
- Properly equipped fire stands;
- Fire truck – the nearest fire fighters team truck will be used.

Emergency medical service equipment:

- Standard medical boxes: Standard medical boxes for vehicles: on every project vehicle and equipment;
- Ambulance car

Spill response equipment:

- Heavy duty plastic bags;
- Absorbent pads;
- Gloves;
- Drip trays;
- Buckets;
- Polyethylene film.

Necessary Qualification and Personnel Training

Testing of each system of emergency response must be periodically implemented, obtained experience must be documented and weak spots should be improved (the same should take place in case of accident realization).

The whole staff, employed on treatment facility construction and operation, must undergo introductory training, which includes emergency response course. Personnel additional training registration system should exist and be kept at offices of customer or contractors.