Roads Department

of the Ministry of Regional Development and Infrastructure of Georgia

Environmental and Social Impact Assessment of Works for the Improvement of Chumateleti-Khevi Section of E-60 Highway

SECOND DRAFT ESIA REPORT

Prepared by: "Eco-Spectri" Ltd

March 2017

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
MED	Ministry of Economic Development of Georgia
MENRP	Ministry of Environmental and Natural Resources Protection of Georgia
MLHSA	Ministry of Labour, 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

CONTENT

EXECUTIVE SUMMARY

Introduction

The Government of Georgia is implementing 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. Transport of goods into and through Georgia has increased over the past 10-15 years as markets have expanded following the breakup of the Soviet Union, and Georgia is now a major transit country. Almost two-thirds of goods in Georgia are transported by road, and haulage by domestic and international truck companies is very evident on the country's highways. However many roads are poorly equipped to cope with the volume of traffic and the proportion of heavy vehicles, and factors such as insufficient dual carriageways, routing through inhabited areas and inadequate maintenance and repair, hinder throughputs and increase transit times. This creates difficulties for haulage companies and their clients, truck drivers, Georgian motorists and local residents.

The critical target of the program for upgrading major roads in Georgia is the E-60 or the East-West Highway (EWH) - the main route to neighboring Azerbaijan and Russia, also connecting to Turkey and Armenia. For planning purposes, the EWH has been divided into sections of various lengths. The World Bank is providing series of loans to the Government of Georgia for upgrading this highway through East West Highway Improvement Projects (EWHIPs). Three projects of these series are now completed covering the highway section between Agaiani and Agara. EWHIP-4 and East West Highway Corridor Improvement Project (WEHCIP) are currently under implementation covering the sections Agara to Zemo Osiauri and Zemo Osiauri to Chumateleti (shortly before Rikoti tunnel, which takes the EWH from East Georgia to the West).

The next section of EWH targeted for the improvement lies between Chumateleti and Khevi, and includes construction of an additional tunnel through Rikoti mountain pass. Preparatory work for this investment is being financed from EWHCIP and includes conduct of the Environmental and Social Impact Assessment (ESIA) of the proposed infrastructure. Civil works in this section may be supported with the Additional Financing to the EWHCIP as well as from the sources other than the World Bank.

Objective of the ESIA

Objective of the conductedESIA was to identify expected positive and negative environmental and social impacts of the improvement and operation of EWH between Chumateleti and Khevi 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. The ESIA report includes an Environmental and Social Management Plan (ESMP) which 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 the Article 4, Paragraph 1, Subparagraph "j" of the Law of Georgia on Environmental Impact Permit, construction of international and intrastate highways and railways, bridges and underway crossings beneath them, as well as engineering structures for the protection of highways, railways and their territories is subject to the State ecological examination. Therefore, improvement of Chumateleti-Khevi section of the EWH is subjected 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 and Natural Resources Protection of Georgia (MENRP).

According to the requirements of the World Bank's safeguard policy OP / BP 4.01 Environmental Assessment, upgrading of EWH fall under environmental Category A requiring a full-scale ESIA and the development of an ESMP.

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 include:

- Conduct of at least two public consultation meetings for environmental Category A activities: one at the early stage for agreeing on the Terms of Reference (ToR) of the ESIA and the approach to this study and the second – at the final stage of the process to discuss the draft ESIA report;
- 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.

RD carried out the public consultation meeting on ToR for the ESIA on May 6, 2016. As part of the ESIA, consultations were held in September 2016 with the owners and employees of businesses located in the vicinity of the highway corridor, as well as with individual entrepreneurs. Information-sharing meetings were also held with the representatives of Khashuri municipality and population of Khevi village. The 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 Khashuri local self-governments located in the vicinity of the EWH, RD, and the office of Ltd "Eco-Spectri".

RD will organize a public consultation meetings to discuss the draft ESIA report as well as the draft Resettlement Action Plan (RAP). 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

The EWH section covered by this ESIA is 11.2 km long, out of which 2.4 km is the length of two tunnels to be constructed. In terms of environmental and social sensitivities, this section and the adjacent territory may be divided into four categories: (i) section from Chumateleti to the East portal of the Rikoti tunnel (1.5 km, including a smaller tunnel with the length of 0.7 km); (ii) coupled Rikoti tunnel (1.7 km); (iii) section from the West portal of the tunnel up to village Khevi (5 km); and (iv) village Khevi (3 km).

The main environmental impacts are expected at the construction phase and come from clearing of the right-of-way (RoW), establishment/operation of work camps and temporary access roads, operation/servicing of construction machinery, massive excavation works required for the tunnel construction and works near waterway.

Clearing of the RoW will in certain areas will imply de-listing of land plots from the State Forest Fund. Drilling of the new tube of the Rikoti tunnel will generate vast volume of excess material and its disposal in the environmentally decent way will be a challenge both technically and financially. Establishment of

construction camps and access roads will be associated with the generation of solid waste and wastewater, compression of soil, and noise related nuisance. Parking, operating and servicing of construction machinery will carry the risk of operational spills of oils and lubricants (i.e. the risk of soil pollution) and generation of noise, vibration, dust, and emissions. It is expected that the construction material will be purchased from suppliers licensed to operate quarries or borrow pits. License for use of natural resources - in case the contractor decides to use own quarries/borrow pits - will be obtained by the contractor from the National Environment Agency of the MENRP. Construction works will also have implications for the occupational health and safety of workers/personnel.

Impacts of the new road during its operation phase are less diverse. Environmental aspects of the highway operation will be air pollution from automobile emissions, and pollution of soil with litter and drainage from the highway as well as water pollution with liquid/powder cargo and/or fuel and lubricants from the cars as a result of traffic accidents on the road section and runoff from the road. Project design brings the risks of negative impacts on environment to the feasible minimum. Provision for road safety, control over the operation of the Rikoti tunnel, and traffic regulation will contribute to managing risks of accidents. Installation of noise barriers is not required. Traffic safety will be an important issue with health, social, and environmental implications.

Direct social impact of the construction in the first and third sections will affect catering facilities (9) located adjacent to the highway, fueling station (1) and individual road-side vendors whose work is seasonal and lasts for 3 or 4 months a year. As of October 2016, some 14 individual traders were found within the subject section of the EHW corridor. 13 of them were interviewed (1 of them refused). Based on the information obtained from the respondents, the number of vendors is much higher (by 2, 5 or 3 times). They are mainly residents of the adjacent villages and trade with their own harvest (fruit, corn, honey, etc.). All physical and legal bodies affected by the project will receive adequate compensation, amount of which will be specified during preparation of the Resettlement Action Plan.

Village Khevi is located on the both sides of the highway, stretching over the distance of about 3 km. in fact, the highway divides the village into two parts. At present, there are 12 access roads connecting village to the highway. In addition, present configuration of the highway allows pedestrians to cross the highway at any point. This facilitates the movement of the village residents from one part of the village to another. Also, there is a 3 km local motor road branching out from the highway that leads to village Tsakvi. This road provides the only motor access the village with 80 homesteads. Reconstruction of the EWH will result in displacement of road-side small businesses, and alter motor and pedestrian communication within and around Khevi village. Compensation and alternative connectivity will be provided.

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 highway 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 highway improvement, including profits resulting from increased cargo turnover and tourism. Therefore, as the potential positive impacts of the project surpass its possible negative impacts, the “no-project” option was discarded.

Alternatives for placement of Rikoti tunnel tube

Two alternative routes for drilling the additional tube of the Rikoti tunnel were considered. As per the first alternative, the length of the tunnel would be 2,100 m commencing from the starting point of the bypass road of the existing tunnel and following the existing tunnel from the south, with its west portal to be placed on the right bank of river Rikotula. As for the second alternative, the new tube would run south the existing one and in parallel to it, and will have the length of 1,800 m. Comparing these two alternatives showed that the potential environmental impacts of both of them are equal; however under alternative 1, the amount of the excess material to be generated is higher than with alternative 2. This is a disadvantage of alternative 1, as disposal of the excess material will be pretty problematic. In addition, the longer the section of the tunnel, the more vulnerable it will be in a hydro-geological respect. With consideration of these factors, alternative 2 is preferable.

Alternatives of the road corridor

For approximately 7.5 km of the highway westwards from the West portal of the tunnel, feasibility of two alternative routes had been studied for placement of the two additional lanes of the highway. Under alternative 1, these new lanes would be separated from the existing ones passing on the right bank of river Rikotula and follow a new alignment on the left bank of the river. This would require clearing and cutting of the forested mountain slope, and building of additional bridges and overpasses. Alternative 2 implied widening the existing corridor on the right bank of the river Rikotula to place additional two lanes adjacent to the present ones.

The main criterion of selection between these two alternatives was the landscape and its geological structure. Several active landslide areas are registered on the right bank of Rikotula River adjacent to the existing road. The slope here is very steepAnd the bedrock is not strong. Hence the gravitational effects are significant. Several landslides have been activated on this slope quire recently (2014). Several thousand cubic meters of earth and rock collapsed, completely blocking the highway and paralizing the traffic. Collapsed material was used for widening the road towards the Rikotula River bed, since additional cutting of landslide areas was not considered appropriate. In addition to the above, alternative 2 would require cutting larger volumes of rock and earth for widening the road corridor on the right bank as compared to the amount of spoil which would be generated through building corridor for the additional two lanes on the left bank of the river. Given that disposal of excess material is problematic, this argument is also significant. Negative aspect of alternative 1 is that it implies removal of forest cover along the strip of land to be cleared for the construction on the left bank of the river and certain impact on the habitat integrity caused by limiting animal's fee access to the river bank.

Careful assessment of these two alternatives showed overall advantage of alternative 1, as mitigation of its negative impacts is technically more feasible and financially more affordable than coping with the persistent geohazards related to alternative 2.

Project Description

The EWH section to be upgraded between Chumateleti and Khevi is classified as a road of the "international importance", with the design speed fixed at 80 km/h.

Construction of two tunnels is planned within the 11.2 km zone of the project area, the length of which are 0.7 km and 1.7 km. Eight existing and new bridges have been proposed within the framework of feasibility study. Locations and length of these bridges may be changed at the detailed design stage.

The cross section of the road will be 26 m, with 13 m each side. The center mall will be 5 m wide. The shoulders will be 3 m and 0.5 m wide, the edges will have the gradient of 2.5% and the width of the roadway on both sides will be 7 m each. As for the sections of bridges, the one-side bridge will be 13.5 m wide, including the emergency side tracks and zone for repairs.

The minimal parameters of the cross section of the tunnel are as follows:

- Min. vertical size: 5.0 m;
- Lane width: 3.75 ∂ (100 km), 3.50 m (80 km);
- Min. shoulder width:0.25 ∂ (edge line);
- Min. pathway width: 0.75 m;
- Pathway height: 0.15 m.

Approximately 200 people will be employed during the construction stage, with 60-70% of them as local people. Hence no tangible influx of work force is expected.

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 Management Plan.
5 Drafting of the ESIA report.
6 Information disclosure and stakeholder consultation.

Baseline Information

The area of the EHW between Chumateleti and Khevi is located in the high-mountainous part of Georgia and is included in the Trans-Caucasian intermountain geomorphological zone, eastern part of so called Dzirula Massif, which is called Upper Imereti Plateau.

In a hydrogeographical respect, the ground waters formed in a very thick eluvial cover of crystal rocks are important.According to the Seismic Hazard Map of Building Norms and Rules effective in Georgia “Earthquake-resisting construction (SSM III, 21.10.2009 N 128, article 1477)”, the project area is located in the 8-point earthquake zone (MSK 64 scale) (Figure 4.3) with the dimensionless coefficient of seismicity (A) equaling 0.16 (village Khevi) under the same document. In an orographic respect, the road corridor is located in a mid-mountainous, erosive-denudation relief. In a geological respect, the territory is located within the limits of Palaeozoic and Bathonian crystal sub-stratum. The existing road is located at ten bottom of the forested slope of the river Rikotula gorge. It is characterized by a complex dissected relief.

The study area lies in the river Rikotula watershed. Most of it is located on the territory of Kharagauli municipality and broad-leaved forest zone over Rikoti Pass. Here the forest represents the impoverished variant of Colchic vegetation. The total number of relict Colchic species on the territory of the municipality is not very few, but the number of phytocenosis positions of species is not great. However, such Colchic

relicts, as rhododendron (*Rhododendronponticum*), flame azalea (*Rhododendronflavum*), cherry laurel (*Laurocerasus officinalis*), willow (*Buxuscolchica*), ilex (*Ilexcolchica*), Colchic ivy – (*Hederacolchica*) and Israeliruscus **(***Ruscusponticus*) are quite many in number. With their appearance, the forests here more look like the forests in east Georgia than some other forests in west Georgia, even more so that the plant marking xerophytization, as oriental hornbeam (Carpinusorientalis), is not a rarity here. Within the scope of the studied corridor, the plant species with different conservative value (those included in the Red List of Georgia, endemic and rare) and plants with economic value are presented in great numbers.

The protected area located closest to the study corridor is Borjomi-Kharagauli National Park distanced by 6 km.

Settlements are not located in the immediate proximity to the EWH between villages Chumateleti and Khevi. However there are 7 active and 3 abandoned restaurants, 1 inactive repair workshop and and 1 gas station that will fall under the direct impact of road construction. Private roadside vendors are active along the subject section of the highway. They are selling own agricultural produce and non-timber products collected in the forest. The number of such individuals is approximately 35-40 people. Closer to village Khevi, the road runs across several private land plots and residential houses. In addition, a library, a Police office and a kindergarten in village Khevi come under the impact. A public school in village Khevi may also be affected.

There are no known monuments of culture and/or history in the suggested corridor of EWH between villages Chumateleti and Khevi, however chance finds were encoutered on the territory of Khevi community in the past.

Expected Impacts and Mitigation

Based on the analysis of baseline information and study of the preliminary design documents, impacts expected from the construction and operation of the EWH section between Chumateleti and Khevi were assessed using evaluation criteria. This was followed by the development of the measures to mitigate the expected negative impact on each receptor.

Emissions of harmful substances into the atmospheric air and noise:

In the construction phase, there will be different sources of these impacts. The sources of stationery emission and noise may be a grinding-comparison shop or concrete or bituminous concrete unit. The mobile sources of emission of harmful substances into the atmospheric air will be construction vehicles and machinery operated during the intense earthworks and the disposal of excess material. These impacts will have higher importance in terms of nuisance to local communities in the final section of the EHW which runs across village Khevi.

In order to reduce the combustion emissions, the sources of pollution must be equipped with filters; vehicles and machinery must be maintained in good technical condition and idling should be disallowed; driving speeds should be limited near the residential zones. Stationery sources of emission such as, crushers and concrete production units, should be located in as much distance from the settled areas as possible (recommended distance of 500 m or more); earth roads should be sprinkled periodically (in hot and windy weather) once in 4 hours and speed of vehicle movement along the earth roads must be controlled at all times; loading and unloading of trucks should be undertaken with respect to impacts of dust generation and be limited in windy weather.

Negative impacts of air pollution, noise and vibration during the exploitation phase are expected as the traffic intensity increases. However, there will be less traffic jams along the improved and widened road and

the engines of the driving vehicles will be less loaded. Consequently, the exhaust fumes and engine noise will not raise significantly.

Triggering of geological activity:
The hazardous geological processes are expected to activate during the construction phase. The risks of slope destabilization, erosion and landslides will be associated with creation of the new corridor for EWH that implies clearing of vegetation, especially - removal of trees. Such risks are generally high and must be addressed through application of adequate engineering solutions and good construction practice, including: removal of the active layer from the slopes and reducing the slope inclination angle, building protecting walls and arranging effective drainage systems.

The major cause of activation of the hazardous geological processes in the operation phase will be the diminished vegetative cover. In the first years of the road exploitation, it will be necessary to monitor the adjacent slopes and apply additional stabilizing measures as necessary.

Loss of topsoil:
The highest risks of the damage and erosion of the topsoil will be observed during the earthworks and during the movement of heavy machinery. This may lead to the soil compaction and erosion, and reduction of the soil fertility. The risks of deterioration of the soil quality may also be associated with operational/accidental spills/leakage of fuel and lubricants. These risks will be mitigated by stripping and separate stockpiling of the topsoil, and its use for the site reinstatement. Also, adequate waste management on site will be critical for the protection of topsoil from pollution. No impacts on topsoil are expected at the operation phase.

Deterioration of vegetative cover:
Clearing of the RoW for the new alignment will imply removal of vegetation, including cutting of trees. Loss of vegetation will be kept at the possible minimum. Removal of trees for the road construction needs will not cause functional damage to the ecosystem, and will not affect any critical habitats, however compensatory tree planting will be required within the EWH corridor at the ratio of 1:3 (except for the trees cleared from the private land plots). Selection of species for planting will be based on the natural composition of local flora. The new section of EWH planned to construct on the left bank of the river Rikotula, from the western portal of the new tunnel to village Khevi, runs across the forest fund territory. Clearance from the National Forestry Agency will be obtained authorizing tree felling in the forested areas which are registered with the State Forest Fund. Greening of the construction sites along the RoW, as well as maintenance of the re-planted areas for three years will be included in the contractor works. RD will be responsible for further maintenance of plantations. Cultivation of disturbed areas, including re-planting, will enable to mitigate disturbance of animal species.

Disturbance of fauna:
Impact on fauna will be the highest between the western portal of Rikoti tunnel to village Khevi. This 5-km-long section is covered both, with primary and secondary forest stands. Fauna comprises representatives of various types of wildlife ranging from Protozoa to mammals. Construction of additional lanes of the EWH on the left bank of the river will cause fragmentation of terrestrial habitat of animals (including small mammals, reptiles and amphibian). Movement from forested area to the riverbed will be limited. This will affect food extraction and reproductive behavior of animals. In order to reduce impact caused by habitat fragmentation, arrangement of artificial crossings under the road will be required. Such passes should be designed following the conventional standards and be distanced from each other at 200-300 m to 3-4 km (1-3 km for large animals, up to 1 km for average-sized mammals and 200-300 m for small animals).

Impact on protected areas:

Construction and operation of the EWH within Chumateleti-Khevi section will not have impact on the protected areas as the closest national park of Borjomi-Kharagauli is distanced from the road corridor for 6 km and more.

Disturbance of river ecosystem:

The highway corridor passes along Rikotula River and crosses it in six locations. Impacts on the aquatic life are possible during the construction as well as operation phases. Water contamination may occur in case of operational and accidental lickages of fuel/oil/lubricants from cars end machinery Solid waste pollution may occur due to improper management of construction materials and waste. Earthworks may cause sedimentation of riverbed, and construction of engineering structures (bridges, riverbank protection structures and etc.) is likely to result in certain changes of the riverbed profile. Rikotula River is not rich in ichthyofauna. Besides, the construction works are planned along small sections what will enable most of the species to move far from the construction site and return to their original habitats after the construction is over. Increased water turbidity will have a negative impact on the spawning. This is particularly true with the species spawning in low water with a stony bed and oxygen-rich current. Such species are: (i) chub (Leuciscus borysthenicus), which spawns once a season, in April or May, (ii) khramulya (Varicorhinus Capoeta), spawning several times a season, from May through August, and (iii) barbell (Barbus barbus), which spawns in May or June, once a season. Increased water turbidity or spills of hazardous substances during the spawning season of these fish species may lead to the total destruction of hard-roe on the site.

For minimizing impacts on the river ecosystem, fuel, oil, lubricants, construction materials and waste will be placed not less than in 100 metres' distance from the river banks. Hazardous liquids will be kept and handled on impermeable surfaces. Washing of vehicles in the river will be restricted. Emergency response plan for addressing spills should be worked out by the works provider and the staff should receive appropriate training.

Impacts of the operation of work camps and access roads:

In the construction phase, temporary construction camp(s) will be arranged within the project implementation area and will have temporary impacts on the surroundings. Work camp may be used for lodging for the limited number of workforce, for parking of construction vehicles and machinery, and for on-site storage of some types of construction waste. To mitigate impacts from the operation of the work camp, its location shall be properly selected. It is advisable to place the work camp on a degraded site with no or little vegetation. Access to safe drinking water and decent sanitary facilities shall be provided. If the work camp is used for living for a number of workers, residential blocks must be separate from storage facilities, be property ventilated and illuminated. If the dormitory does not provide a separate space for cupboards/locker rooms, the minimum room space shall be 4 square meters per person (assuming a height of 2.4m); If the dormitory provides a separate space for cupboards/locker rooms, the minimum room space shall be 3 square meters per person (assuming a height of 2.4m). Adequate number of toilets and sanitary fittings shall be provided (1 toilet, 1 hand wash basin, 1 urinal and 1 bathroom with bench per 15 male workers), catering and the first medical aid facilities will also be provided.

Already existing access roads will mostly be used for the construction purposes. As for the section that passes along the left bank of Rikotula River and covers the forested areas, it requires the arrangement of several temporary access roads. Existence of temporary roads is necessary for the access of construction equipment and construction material and for removal of topsoil, soil and wood waste from the project zone. Number of access roads will be specified during the detailed design stage. After the completion of the construction works, local authorities will decide which access roads will remain in constant use and which will be restored. Restoration of temporary access road areas shall be conducted in accordance with the requirements of the Law of Georgia and World Bank.

Landscape transformation and visual impacts:

Construction of the additional two lanes on the left bank of the river will create a significant environmental footprint and have irreversible impact on the landscape. Additional impacts on the landscape are expected from quarrying for the construction materials and disposal of the large amounts of excess material generated from slope cutting and drilling of the tunnel(s).

Cut slopes will be carefully reinstated through landscaping, compacting, provision of drainage and creation of enabling environment for the natural regeneration of vegetation. Tree planting may be performed on the terraces as required.

Works provider will be encouraged to purchase natural construction material from the external providers operating on the existing quarries. Alternatively works provider may opt to operate own quarries, in which case license for natural resource extraction must be provided from the National Environment Agency. Disrespected of the terms of the license, works provider will be required to reinstate used-up sections of quarries by terracing, backfilling, compacting, provision of adequate drainage facilities, and stimulating natural regeneration of vegetation. Extraction of sand and gravel from the watercourse must be prohibited.

At the stage of construction of Chumateleti-Khevi EWH, approximately 1.200.000 m^3 excess material is expected to originate. What amount of it will be used for backfilling and building of the roadbed is not known at this stage. Material to be used will be obtained from the sites of its temporary disposal along the highway corridor. However evidently a large amount of spoil will remain and will require adequate permanent disposal. Based on the rough estimation of the excess material volumes, the minimal area of its final disposal must be 10-12 ha, so that the height of piles does not exceed 5 m and impact on landscape as well as a threat of erosion is not excessive. The natural landscape in the vicinity of the Chumateleti-Khevi section of EWH allows no area for the disposal of the estimated amount of excess material. Neither is such area found in Khashuri municipality.

There are two options for disposing the large amounts of excess material and these two ways may be combined as well: spleading material low over 10-12 hectares of agricultural land plots and reinstating the area so that neither land take nor change in the land use pattern occurs, and transporting material to already upgraded section of the EWH for backfilling into the partially reinstated quarries.

Impact on socio-economic environment:

While significant positive social and economic pacts are expected from the improvement of the EWH in the Chumateleti-Khevi section, it is also associated with the physical and economic displacement of local residents. In addition, one of the income sources of the local population - the roadside vending - will be lost. Movement will be limited in the construction phase causing certain discomfort for the local population, etc.

General approach to the resettlement impacts is to minimize a need for land take and displacement to the extent possible, provide fair and equitable compensation to all affected people, and assist them in the restoration of livelihoods at least to the level equal to the pre-project level. More specifically, principles that will apply include: (i) constructing the road to avoid residential areas wherever possible to minimize physical relocation of people, and select alignments that minimize acquisition of privately or publicly held productive land; (ii) adopting design standards that minimize the need to impose land use restrictions on adjoining areas; (iii) developing fair and transparent procedures, as defined in the Entitlement Matrix of Resettlement Policy Framework, to determine compensation for the temporary loss of land/assets during construction, permanent acquisition of land and assets, and restrictions on use of land that may be applied to areas adjoining the corridor; and (iv) acquiring land (or right to use land) through negotiated agreements and with the use of the power of eminent domain only as a last resort.

Works on the EWH will have positive impact on imployment of local population. According to the common practice applied in Georgia and often times specified as a requirement in bidding documents, it is envisaged to have 70% of the workforce deployed from local population, as was the case during construction of Agara-Osiauri section of the EWH.

Impact on cultural heritage:

Impact of the planned works on the visible monuments of the historical-cultural heritage will be insignificant. However, likelihood of chance finds in the project area is higher than average. Various fids have been excavated in village Khevi in the past. Blueprint of action in case of chance finds is provided and must be followed through by all parties involved.

Cumulative impact:

Large section of the EHW corridor within Chumateleti-Khevi section runs across the unsettled area and there are no industrial facilities in its vicinity. As per the existing information, development of no large-scale infrastructure is planned in highway corridor in future. Consequently, no cumulative effect is expected.

Residual impact:

Reconstruction of EWH will have significant residual impact due to landscape transformation through slope cutting and tunnel drilling that will lead to the generation and disposal of large amounts of the excess material. Other residual impacts to be observed early in the operation phase may gradually shrink. This includes impacts on vegetation. Providing favorable conditions for natural regeneration and compensatory tree planting will take long to restore vegetation on the cut slopes, however impacts may decrease to minimal in the long term. To achieve such outcome, application of mitigation measures (maintenance of artificial plantations, replacement of deceased greenery, maintenance of drainage systems, etc.) should be carried on beyond closing of EWHCIP AF.

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, 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 and 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 consultant. However RD will use its in-house capacity to organize environmental monitoring and reporting and will bear overall responsibility for it. Environmental Supervision Department of the MENRP will exercise State control over the compliance with the terms of environmental permit to be issued for the works in Chumateleti-Khevi section of the EWH and with the national environmental legislation of Georgia.

Because EWH is an international road, RD owns and operates it. Once the construction works for upgrading the highway section between Chumateleti and Khevi are completed, RD will be responsible for its operation and maintenance. Ensuring road safety and good environmental performance will be a high priority at the operations stage and will comply with the requirements of the national legislation and the best international practices.

The RD, through an outsourcing arrangement, will permanently maintain greenery planted upon completion of road works for landscape reinstatement and compensation for trees removed during the construction. Regular collection of solid waste will be organized along the highway. State technical control of the highway through regular oversight and inspection will be provided.

1. INTRODUCTION

The Government of Georgia has embarked on a programme 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 isa significant and growing contributor to GDP. The program aims to improvetransportation and transit ofgoods to surrounding countries, which is a significantand growing contributor to GDP. Transport of goods into and through Georgia hasincreased over the past 10-15 years as markets have expanded following the breakup of the Soviet Union, and Georgia is now a major transit country. Almosttwo-thirds of goods in Georgia are transported by road, and haulage by domesticand international truck companies is very evident on the country's highways.However many roads are poorly equipped to cope with the volume of traffic and the proportion of heavy vehicles, and factors such as insufficient dual carriageways, routing through inhabited areas and inadequate maintenance and repair, hinderthroughputs and increase transit times. This creates difficulties for haulage companies and their clients, truck drivers, Georgian motorists and local residents.

The main target of the program for upgrading major roads in Georgia is the E-60, or the East-West Highway (EWH) - the main route from neighboring Azerbaijan and Russia, also connecting to Turkey and Armenia. For planning purposes, the EWH has been divided into sections of various lengths. The World Bank is providing series of loans to the Government of Georgia for upgrading this highway through East West Highway Improvement Projects (EWHIPs). Two projects of these series are now completed covering the highway section between Agaiani and Ruisi. EWHIP-4 is under implementation covering the section between Ruisi and Agara. East-West Highway Corridor Improvement Project (EWHCIP) is under preparation. The project will finance upgrading of the highway from Zemo Osiauri through Chumateleti (shortly before Rikoti tunnel, which takes the East-West Highway from East Georgia to the West.

Transport sector development in Georgia is essential for the achievement of sustainable economic growth, alleviation of poverty, achievement of the government's regional development strategy objectives and promotion of tourism. This is also reflected in four-point Governmental reform plan. Major objective of spatial arrangement considered by this plan is to complete the modernization of EWH, which is esential for Georgia to become a regional transport-logistics hub.

The Government of Georgia has given the highest priority to the completion of the EWH from Tbilisi to Poti and has already obtained various funding for several parts of the EWH. Table 1.1 below outlines the completed, ongoing and planned improvement in upgrading of the East –West Highway.

Table 1.1 Status of EWH Corridor Improvement

Road Section	Length	Planned Upgrading	Financier	Status
Natakhtari-Agaiani	16.7 km	4 lane dual carriageway	State Budget	Completed
Agaiani-Igoeti	11.7 km	4 lane dual carriageway	World Bank	Completed
Igoeti-Sveneti	25.5 km	4 lane dual carriageway	World Bank	Completed
Sveneti-Ruisi	14.3 km	4 lane dual carriageway	World Bank	Completed
Ruisi - Agara	19.5 km	4 lane dual carriageway	World Bank	Completed
Agara-Zemo Osiauri	12.0 km	4 lane dual carriageway	World Bank	Implementation
Zemo Osiauri - Chumateleti	14.0 km	4 lane dual carriageway	World Bank	Implementation
Chumateleti - Khevi	11.0 km	4 lane dual carriageway	World Bank	Preparation
Khevi - Argveta	50.0 km	4 lane dual carriageway	ADB	Preparation
Zestafoni-Samtredia	56.5 km	2 lane due carriageway - 41.3	JICA	Preparation

		4 lane dual carriageway -15.2		
Samtredia-Choloki	70.0 km	4 lane dual carriageway	EIB	Preparation
Choloki - Kobuleti bypass	32.0 km	2 lane dual carriageway	ADB	Completed

Present ESIA report is prepared for Chumateleti-Khevi road section modernization to be supported by the Additional Financing to East West Highway Corridor Improvement Project (Chumateleti-Argveta), and by the European Investment Bank (Samtredia-Choloki) namely from the East portal of Rikoti tunnel (the end of Zemo Osiauri- Chumateleti road section) to Khevi village.

This is one of the most difficult section due to climatic, topographic and geological conditions of the corridor. In addition, its corridor crosses river Rikotula at several places and ravines. It should be noted that this section of the East-West Highway is characterized by the frequent traffic jams and high risk of road traffic accidents, emergency high risks, especially in adverse weather conditions.Therefore its modernization will significantly improve traffic conditions, reduce travel time and risks of accidents.

Objective of the conducted ESIA was to identify expected positive and negative impacts of the improvement and operation of East West Highway between Chumateleti and Khevi on the natural and social environment; 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 perspetives. Environmental and Social Management Plan worked out in the process of ESIA will become part of the contract for the provision of upcoming works and serve as a field guide for good environmental performance mandatory for adherence.

The present ESIA was carried out by “Eco-Spectri” Ltd for the RD of the MRDI.

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 Georgian laws and regulations are applicable to the EWHCIP AF:

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 conditions of the legal agreement between Georgia and the International Bank for Reconstruction and Development for the provision of Additional Financing for East West Highway Corridor Improvement Project prevail over the national legislation in case of contradiction. It also 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 is 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 MoENRP 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 MoENRP.

Specific provisions of the law that may affect the proposed Project are discussed later in this chapter.

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 and Natural Resources Protection 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 East West Highway Corridor between Chumateleti and Khevi.

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 Road Department identified the Project category for Chumateleti-Khevi 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 MoENRP, 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 Environment and Natural Resources Protection, 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 Chumateleti-Khevi road section with the requirements of the Georgian legislation, normative acts and standards.

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 Chumateleti-Khevi road section rehabilitation and operation project, 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 strong negative impact on the river Rikotula 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 a 5-km-long new road is planned to cut on the left bank of the river Rikotula to avoid the risk of origination of new landslide zones.

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 Chumateleti-Khevi section, the requirements of the said law will regulate the level of noise, vibration and emissions on the territory of village Khevi. In addition, the right kind of the noise walls to install on the territory adjacent to the public school in Khevi during the operation phase will be identified. If the requirements of the said law cannot be met, it will be necessary to construct a new building for the school at the safe distance from the autobahn.

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 Chumateleti-Khevi section must hire a duly qualified environmental manager who will be obliged to develop Waste Management Plan and submit it to MoENRP 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 MENRP.

Law on Hazardous Chemical Substances1998

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, following the fact that the construction sites follow the riverbed, full observance of the requirements of the Law is necessary, both in the phases of storage and exploitation of the hazardous substances.

The 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.

The Wildlife Law 1996 (Last amended in 2015)

The law mandates the MoENRP to regulate wildlife use and protection overall territory of the country, including existing protected areas. For now, the Ministry of Energy is responsible for this function also. This law also determines activities on protected areas by the corresponding structural units.

Meeting the requirement of the Law is particularly important along CH 0.00 - 7.00 section of the project when a new road is laid through the forest massif. Before the commencement of the construction activities, additional detailed studies will be necessary.

The 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, hunt, cutting and others, besides special occasions (events) fixed by law".

Within the scope of the project, meeting the requirements of the Law is particularly important along the first 7-km-long project zone. Both, endemic and other Red–Listed flora and fauna species are common along this section.

Forest Code of Georgia 1999 (Last amended in 2013)

The Law establishes legal grounds for protection, restoration, and forth use of the Georgian Forest Fund and its resources. The Law defines property rights to the forests of Georgia, the principles for the protection and use of forest resources and establishes the procedures for their use and the requirement to obtain a license.

Large areas of the forest massif are to cut down within the scope of the project. This process must be accomplished by full observance of the requirements of the Law. The territory needed by the project will be necessary to remove from the forest fund. In addition, the full inventory and other actions will be needed.

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.

The 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 defense 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 EWH 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.

The 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 EWH corridor which are not registered but evidence is present that their legislation may be undertaken, will be registered following the requirements of this Law.

The 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 defense; i) Mining and reserve development. After issuance of the Presidential decree a person seeking for expropriator's right 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 endeavor 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 EWHICP AF, 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.

Labor Legislation

Applicable Labor Laws are as follows:

- Labor Code of Georgia (2006) 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) 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 EWH will be protected in line with the requirements of these laws.

2.3 Requirements for Environmental Assessment in Georgia

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 shall be implemented;
- Volume and classes of emissions expected of stationary pollution sources and hazardous substances discharged and emission and a project of hazardous substances discharged and emission standards allowed to limit);
- A short summary on the activities (as a technical summary)
- A full schedule of the technological cycle to the administrative body issuing a permit even the activity includes commercial and/or state secret.

The law also requires that wherever relevant, the EIA process shall take 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

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 MENRP 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 MENRP. 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 MENRP. 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 MENRP.

- **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 MoENRP 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 MENRP 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 MoENRP. 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

EWHCIP AF will be financed by the World Bank and hence the World Bank's safeguard policies are applicable. The project triggers several safeguard policies: OP 4.01, OP 4.04, OP 4.11 and OP 4.12.

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. EWHCIP AF will support the upgrading of large scale transport infrastructure, most part of which will be built along the new alignment. It may therefore have significant and irreversible impacts. According to the OP/BP 4.01, EWHCIP AF is classified as a category A. It requires a full-scape 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 4.04 – Natural Habitats outlines the World Bank policy on biodiversity conservation taking into account ecosystem services and natural resource management and use by project-affected people. Construction of the re-aligned highway will require creation of a new right-of-way, which will pass through some forested areas. Construction works will include a number of river crossings too. Potential impacts of the project at its construction and operation phases on the natural and critical habitats were explored as part of ESIA according to the requirements of OP/BP 4.04.

Operational Policy 4.11 – Physical Cultural Resources*:* sets out the World Bank requirement to avoid or mitigate adverse impacts resulting from project developments on cultural resources. Project implementation is not expected to negatively affect any known physical cultural resources. However, the portion of the highway to be constructed along a new alignment carries the potential of encountering chance finds in the course of earth works, which have happened in several past projects in neighboring locations. Hence likelihood of encountering chance finds in Chumateleti to Khevi section of the Highway is higher than the country-wide average. The policy is triggered to have adequate arrangements in place for handling such situations.

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 Gaps between National Legislation and WB Requirements

The following gaps/differences between the World Bank guidelines and the Georgian national environmental legislation are relevant to the EWHCIP AF:

- Screening and Classification: The Bank's guidelines provide detailed description of procedures for screening, scoping and conducting EIA and explain a complete list of stages, which are not envisaged under the Georgian national legislation.

- Considering ecological risk, cultural heritage, resettlement and other factors, the Bank classifies projects supported by them under categories A, B and C. As mentioned, in the Georgian national legislation, EIA is carried out only if a developer seeks to implement projects listed in the Governmental Decree on the Procedure and Terms of the Environmental Impact Permit. This list is compatible with the category A projects of the Bank classification. According to the Georgian legislation, EIA is not required in other instances, while the World Bank guidelines may require limited EA or Environmental Reviews for the B category projects as well.

- Environmental Management Plans: The Georgian legislation does not specify format of environmental management plans (EMPs) and stage of their provision for the projects subject to EIA and do not request EMPs for the projects not requiring EIAs. The World Bank guidelines require EMPs for Category A and B projects and provide detailed instructions on the content.

- Involuntary Resettlement: The national legislation does not take into account the issue of involuntary resettlement at any stage of environmental permit issuance. The Georgian legislation considers social factor only with regard to life and health safety (e.g. if a project contains a risk of triggering landslide, or emission/discharge of harmful substances or another anthropogenic impact). Thus, the national legislation does not consider resettlement as an issue in the process of issuing environmental permits, unlike the Bank which takes comprehensive approach to this issue.

- Responsibility for the EIA: While the Bank's document establishes the responsibility of a Borrower for conducting the environmental assessment, the Georgian national legislation provides for the responsibility of a project implementation unit to prepare the EIA and ensure its consultation. According to the Georgian legislation the MoENRP is responsible for monitoring of project implementation and compliance with the standards and commitments provided in the EIA with a less clearly defined role in relation to EMPs. The "Project Proponent" is responsible for implementing "self-monitoring" programs for the projects subject to the EIA. The WB guidelines stress the role of EMPs, which are important for all categories of projects and the Project Proponent is requested to ensure inclusion of monitoring schemes and plans in the EMPs. Monitoring of performance compliance against the EMPs is an important element of the WB requirements.

- Consultation: The Bank policy requires two rounds of public consultation for Category a projects: one at the screening and scoping stage and one at the stage of draft ESIA report. Georgian law does not require consultation at the early stage of ESIA process.

- The Georgian legislation does not establish standards designing and operating workers' camps. IFC Performance Standard 2 (PS2) on Labour and Working Conditions provides guidance for meeting the basic needs of workers, in particular: the practice for changing for accommodation; the provision of minimum amounts of space for each worker; provision of sanitary; laundry and cooking facilities and potable water; the location of accommodation in relation of workplace; any health, fire safety or other hazards or disturbances and local facilities; heating and ventiliation; Standards for nutrition and food safety; Consultation and grievance mechanisms; Workers rights, rules and regulations on workers' accommodation. According to PS 2, Community Relations Management Plan should be prepared addressing issues around community developments, community needs, community health and safety and community social and cultural cohesion. The relevant trainings should also be provided for foreign workforce to enforce the code of conduct adequately.

In order to cover these gaps and differences, environmental due diligence applied to the preparation of EWCHIP AF, followed the World Bank Group policies while meeting also all requirements of the national legislation.

2.6 International and National Environmental Standards and Norms

EWHCIP AF will be implemented in compliance with the national regulations and also in line with the Environment, Health, and Safety (EHS) Guidelines of the World Bank Group. Therefore more stringent requirements of the two are applicable.

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.

2.6.1 Ambient Air Quality Standards

Georgian and IFC guidelines for ambient air quality guidelines are presented in Table 2.6.1.1 and Table 2.6.1.2.

Table 2.6.1.1. 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
Sulfur dioxide (SO_2)	24-hour 10 minute	125 (Interim target-1) 50 (Interim target-2) 20 (guideline) 500 (guideline)
Nitrogen dioxide (NO_2)	1-year 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM_{10}	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 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)

	24-hour	25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 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.

2.6.2 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 Labor, 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

2.6.3 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.Georgian 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 nighttime and 55 dbA for daytime.

2.7 Institutional Framework

Ministry of Environment and Natural Resources Protection

MENRP 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 under EWHCIP AF to the MENRP. 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 MEPNR 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 Environmental Agency under the MENRP 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

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 EWHCIP AF and will carry responsibility for all aspects of the project implementation. Because the EWH is an international motor road, 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 under the EWHCIP AF 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, but 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 favorable conditions for undertaking works necessary for excavation, removal of artifacts from the site and its conservation. Works may resume only upon formal consent of the Ministry of Culture. In rare cases, changes may be required in the project design to bypass the site of exceptional importance and historic value.

Ministry of Agriculture

The National Service for the Food Safety, Veterinary and Plant Protection of the Ministry of the Agriculture 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.

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 decision-making and construction under EWHCIP AF. In addition, local municipalities will play an important role is designated 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. PROJECT DESCRIPTION

The program to upgrade the major roads of the country initiated by the Government of Georgia aims to improve transportation and transit of goods to the neighboring countries. The program is managed by the RD and focuses initially on the EWH which runs from Russia and Azerbaijan, with connections to Turkey and Armenia. Upgrading of the EWH from single lane dual to double lane dual carriageway has already been completed between, Natakhtari-Agaiani, Agaiani-Igoeti, Igoeti-Sveneti, Sveneti-Ruisi, Ruisi-Agara Choloki-Kobuleti Bypass. Works are underway between Agara-Zemo Osiauri, Zemo Osiauri-Chumateleti, Khevi-Argveta, Zestafoni-Samtredia, Samtredia-Choloki, and the EWHCIP AF will cover the section between Chumateleti-Khevi. EIB committed financing of EWH upgrade between Samtredia and Choloki.

The 12 km long section of EWH covered by the present ESIA will pass through Khashuri and Kharagauli Municipalities, namely, from Chumateleti to Khevi village. The East portal of Rikoti Tunnel is located in Khashuri Municipality (Shida Kartli Region), while the West portal and the section of the highway Westwards from that portal belongs to Kharagauli Municipality (Imereti Region).

Figure 3.1. Location of the project area

Rikoti Tunnel has direction from the South-East to North-West. It is a two-lane. Rikoti Tunnel is about 1,782 m long. It was constructed in 1982, in quite difficult geological conditions. Cross section of the tunnel is horseshoe-shaped. Its width ranges within 9.84 – 10.40 m. The technical condition of the tunnel was significantly improved through the rehabilitation carried out as part of the World Bank-financed EWHIP-3 and currently meets European standards. The tunnel may be bypassed with a motor road going across the Kedi range at the Rikoti pass. It connects East and West portals of the tunnel.

After the tunnel, the highway runs towards north-west direction, along the right bank of Rikotula River, which is a left tributary of Dzirula River. About 6 km long section is a three-lane, out of which two lanes are directed towards west-east. After this the highway runs from the East to the West direction till the village of Khevi. Two emergency lanes are arranged on the right side of the road. The major part of the highway passes through unpopulated area. Only the last about 2.5 km long section runs near the residential houses of Tsakva, Grigalati and Khevi villages of Kharagauli Municipality. Technical condition of highway pavement is satisfactory.

EWHCIP AF will finance upgrading of the EWH within the Chumateleti-Khevi section two-lane double carriageway. An additional tube will be drilled through the Kedi mountain range in proximity to the existing tube. After completion of works, each tube will carry two-lane one direction traffic.

The EWH section to be upgraded between Cumateleti and Khevi is classified as a road of the "international importance", with the design speed fixed at 80 km/h.

Construction of two tunnels is planned within the 11.2 km zone of the project area, the length of which are 0.7 km and 1.7 km. Eight existing and new bridges have been proposed within the framework of feasibility study. Locations and length of these bridges may be changed at the detailed design stage.

The cross section of the road will be 26 m, with 13 m each side. The center mall will be 5 m wide. The shoulders will be 3 m and 0.5 m wide, the edges will have the gradient of 2.5% and the width of the roadway on both sides will be 7 m each.As for the sections of bridges, the one-side bridge will be 13.5 m wide, including the emergency side tracks and zone for repairs.

The minimal parameters of the cross section of the tunnel are as follows:

- Min. vertical size: 5.0 m;
- Lane width: 3.75 ð (100 km), 3.50 m (80 km);
- Min. shoulder width:0.25 ð (edge line);
- Min. pathway width: 0.75 m;
- Pathway height: 0.15 m.

Geometric design is the process whereby the layout of the road in the terrain is designed to meet the need of the road users. The principal geometric features are the road cross-section and horizontal and vertical alignments. Geometric design standards are a first approximation to design needs, since it should be accepted that design must be site specific. The optimal design for a given traffic flow will depend on terrain and other characteristics.

The use of geometric design standards fulfills three inter-related objectives. Firstly, standards are intended to provide minimum levels of safety and comfort for drivers by the provision of adequate sight distances, coefficients of friction and road space for vehicle maneuvers; secondly, they provide the framework for economic design; and thirdly, they ensure a consistency of alignment. The design standards adopted also must take into account the environmental road conditions, traffic characteristics, and driver behavior.

During the last years, an emphasis has been placed on existing flexibility in design guidelines and the use of creative design in addressing the site-specific project needs has been encouraged. This philosophy was coined in the USA as context-sensitive design and represents an approach in which balance is sought between safety, environmental, economic and mobility needs.

The geometric design parameters for roads are defined in the Georgian National Standard for Public Motor Roads (SST Gzebi 2009), Geometrical and Structural Requirements, which are the prevailing road design standards in Georgia. However, previously constructed sections of the E-60 Highway were constructed in accordance to the former Soviet Union Standard (SNIP) 2.05.02-85 and the Trans-European North-South Motorway (TEM) Standard.

In accordance to the functional classification system of Georgia, the Project road is classified as an International road, which connects the administrative and significant centers of Georgia and other countries. The design speed is set at 80 km/h.

Figure 3.2. Design speed concept for Zemo Osiauri-Argveta section of EWH

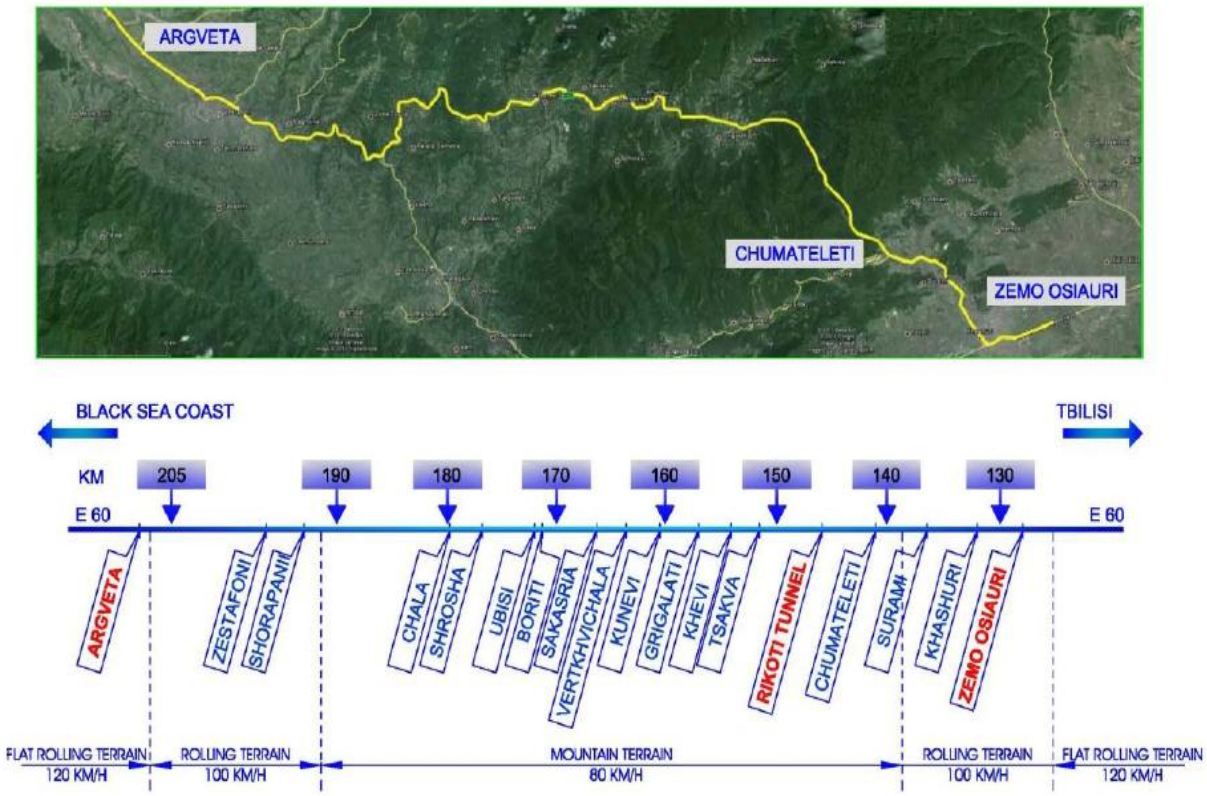
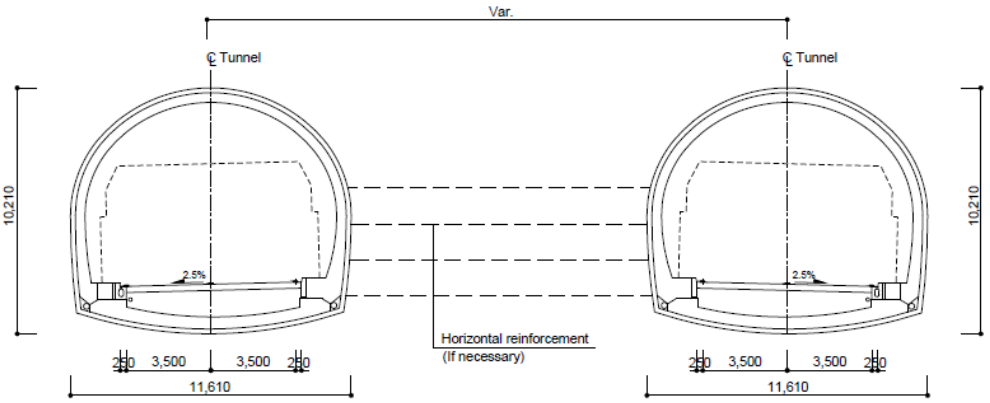
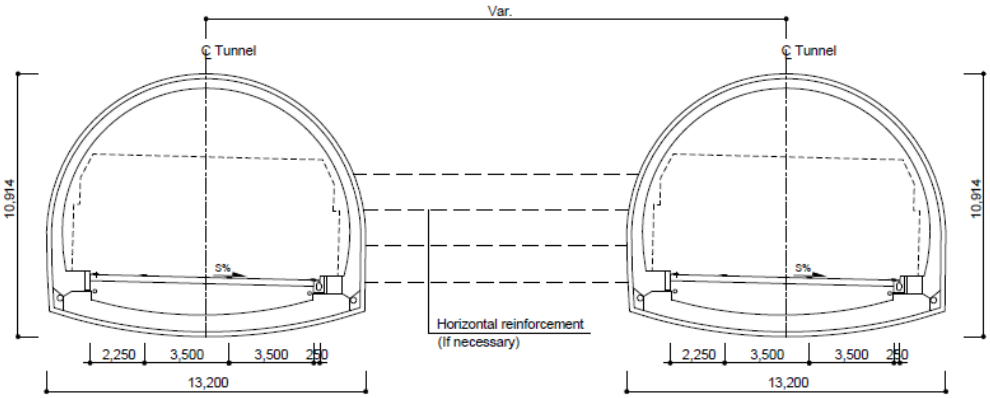


Figure 3.3. Recommended Tunnel Cross-Section



(b) Design Speed 80km/h (R>=450m)



(c) Design Speed 80km/h (R<450m)

4. PROJECT ALTERNATIVES

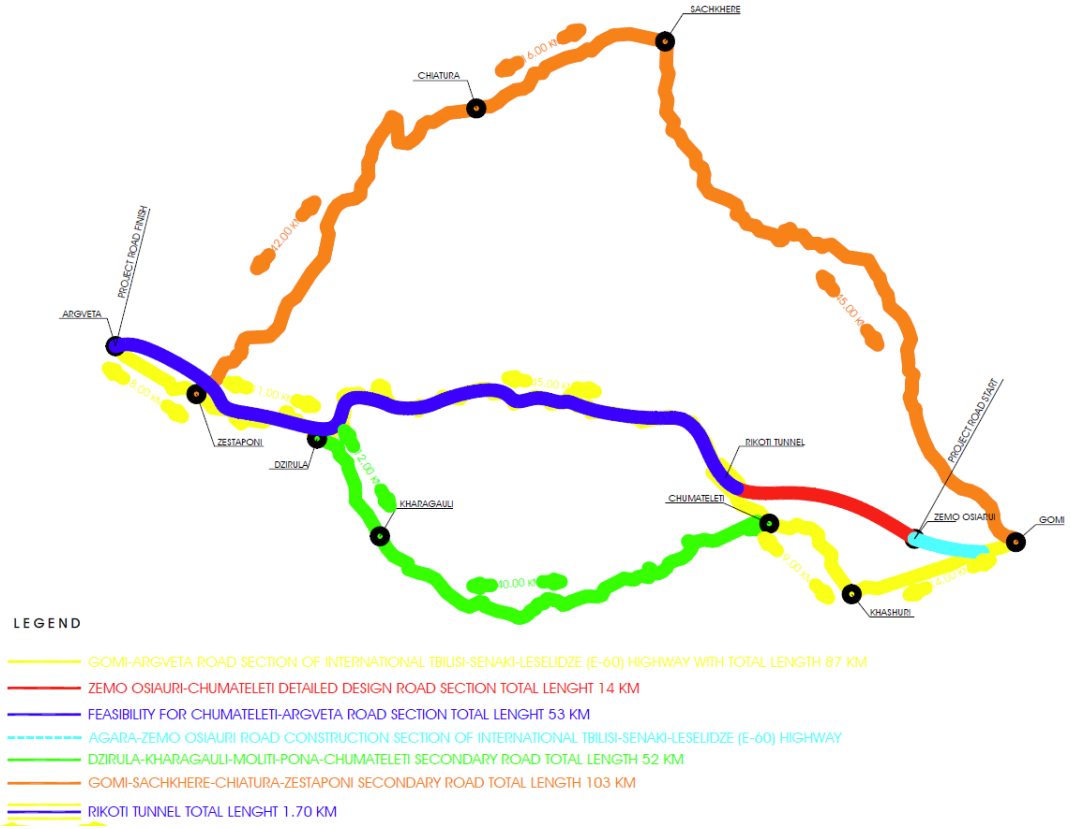
4.1 No-project alternative (no-action/zero alternative)

In case of a zero alternative, four-lane double carriageway of EWH will hit a bottleneck of Rikoti tunnel with two-lane road surface causing congestion and undermining positive impacts of the highway improvement undertaken all way from Tbilisi to Chumateleti (last section under construction). Zero alternative would be environmental and socially neutral in terms of additional impacts, however it would carry a significant cost of lost opportunities.

When analyzing the zero alternative, particular attention must be paid to the possibility of free movement within the limits of the existing highway. As noted in the introductory part, the section of the main under review runs across the severe climatic conditions. 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. In spring and autumn, the reason for the main failure and traffic obstruction is also the landslide processes developed adjacent to the highway. In case of a long-term traffic obstruction, the alternative traffic routes from east to west are as follows (See Figure 4.1.1.):

- Dzirula-Kharagauli-Moliti-Pona-Chumateleti state highway with the length of 52 km, and
- Gomi-Sachkhere-Chiatura-Zestaphoni state highway with the length of 103 km.

Figure 4.1.1. Plan of alternative routes



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 Imereti

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 East to West (which is quite probable with the development of tourism and realization of the announced projects, such as the construction of Anaklia deep-water port, etc.), 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 EHW and will have a negative impact on the expectations of the country population and businesses.

Upgrading of the EWH in Chumateleti-Khevi section will significantly improve free traffic in the eastern and western directions what will reduce the probability to realize the above-listed risks. In addition, the local people will be engaged in the construction works what will have a positive effect on their incomes. Overall, the planned modernization of Chumateleti-Khevi section of the highway will significantly promote the economic development of the country and its positive outcomes will surpass expected negative impacts from modernization after having been mitigated within a reasonable scope. Because of this reason, zero alternative has been discarded at the early stage of the project preparation and the Government of Georgia took the decision to proceed with upgrading of Chumateleti-Khevi section of the EWH.

4.2 Alternatives of Rikoti Tunnel Design

No additional tube

If no additional tube is drilled through the mountain pass, then two lanes would take one direction through the existing tube and two other lanes of the opposite direction would use the existing bypass road of 4.5 km going over the mountain pass. Advantage of this alternative is that it does not expand environmental footprint of the highway, however disadvantages are way more significant.

The present bypass road is of the IV category with approximately 7meterwide asphalt-coated roadway. The road has the sections with high inclinations and deep-lunged torques and fail to ensure safe traffic, particularly for large vehicles. Furthermore, its maintenance during winter season is challenging and it closes in heavy snowfall for all or heavy vehicles. Because of these characteristics of the bypass road, it may not be considered as part of the main road infrastructure for international traffic on the EWH and having no additional tube of Rikoti tunnel is not a feasible option.

The section Chumateleti - West portal of Rikoti tunnel mainly envisages the doubling of the Rikoti tunnel. The rehabilitation of the existing Rikoti tunnel was recently completed, including structural improvements and installation of new lighting, ventilation and other safety equipment. Therefore, the existing Rikoti tunnel should be utilized as one directional tube for the upgraded East-West Highway.

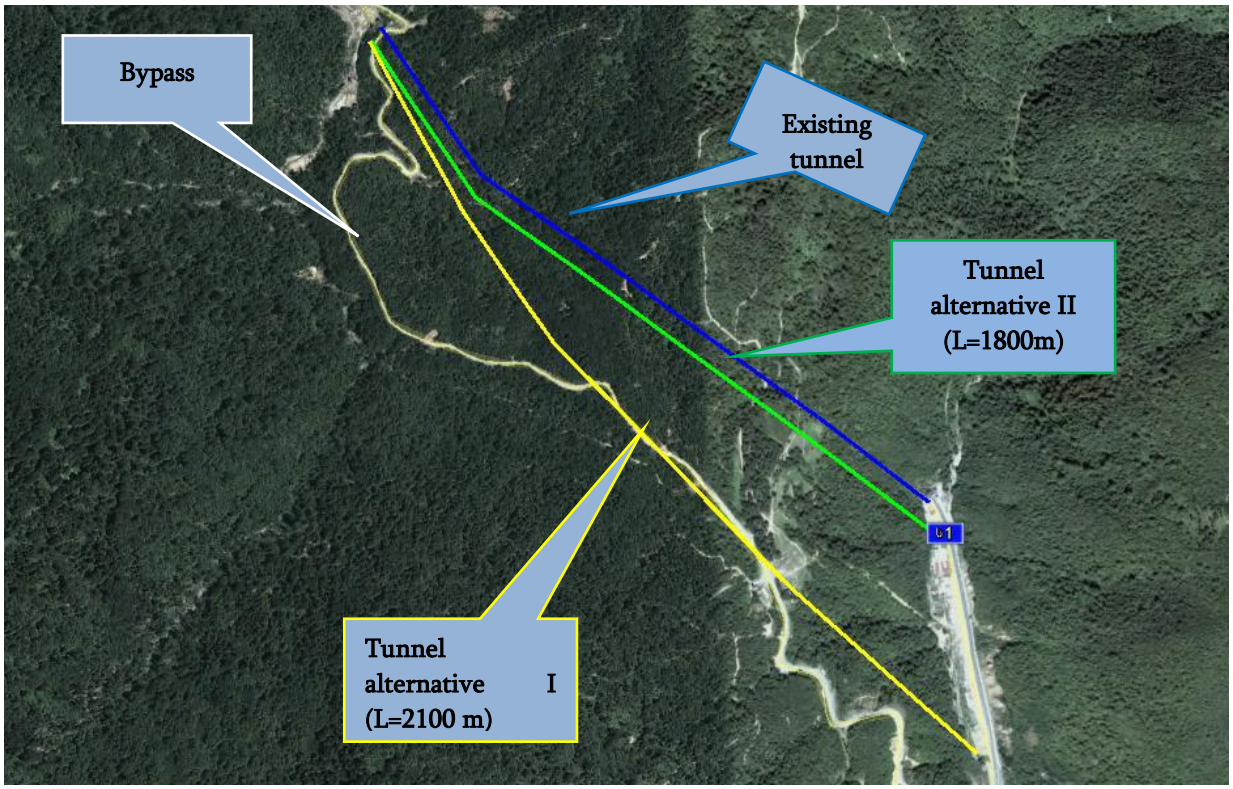
Alternative alignments of additional tube

The alternative options for placement of an additional tube of Rikoti tunnel are seen in Figure 4.2.1 Alternative I, with the length of 2,100 m, starts near the starting point of the bypass. It runs far from the existing tunnel. The western portal is to be arranged on the right bank of river Rikotula, adjacent to the existing portal. Alternative II will run in parallel to the existing tunnel and its length will be 1,800 m.

While comparing these two alternatives, preferance was given to Alternative 2. In fact, this alternative has been confirmed after the approval of eastern portal section of Chumateleti tunnel, without additional consideration and comparison of the optimal alternative.

From environmental point of view, in case of alternative 2 the length of the tunnel is much less and therefore, the volume of generated waste will be also reduced. This alternative is also economically profitable.

Figure 4.2.1. Alternative routes of the tunnel



4.3 Alternatives of new road alignment from West portal to CH7+50

Two main alternatives of placing two additional lanes of the highway are depicted in Figure 4.3.1. and are as follows: Alternative 1 is to construct additional two lanes of the highway on the left bank of the river Rikotula, excluding the need to develop a new corridor on the left bank of the river Rikotula; and Alternative 2 is to construct additional two lanes of the highway on the right bank of the river Rikotula, alongside the existing road. In this case, the highway remains in its present corridor and the road bed gets widened.

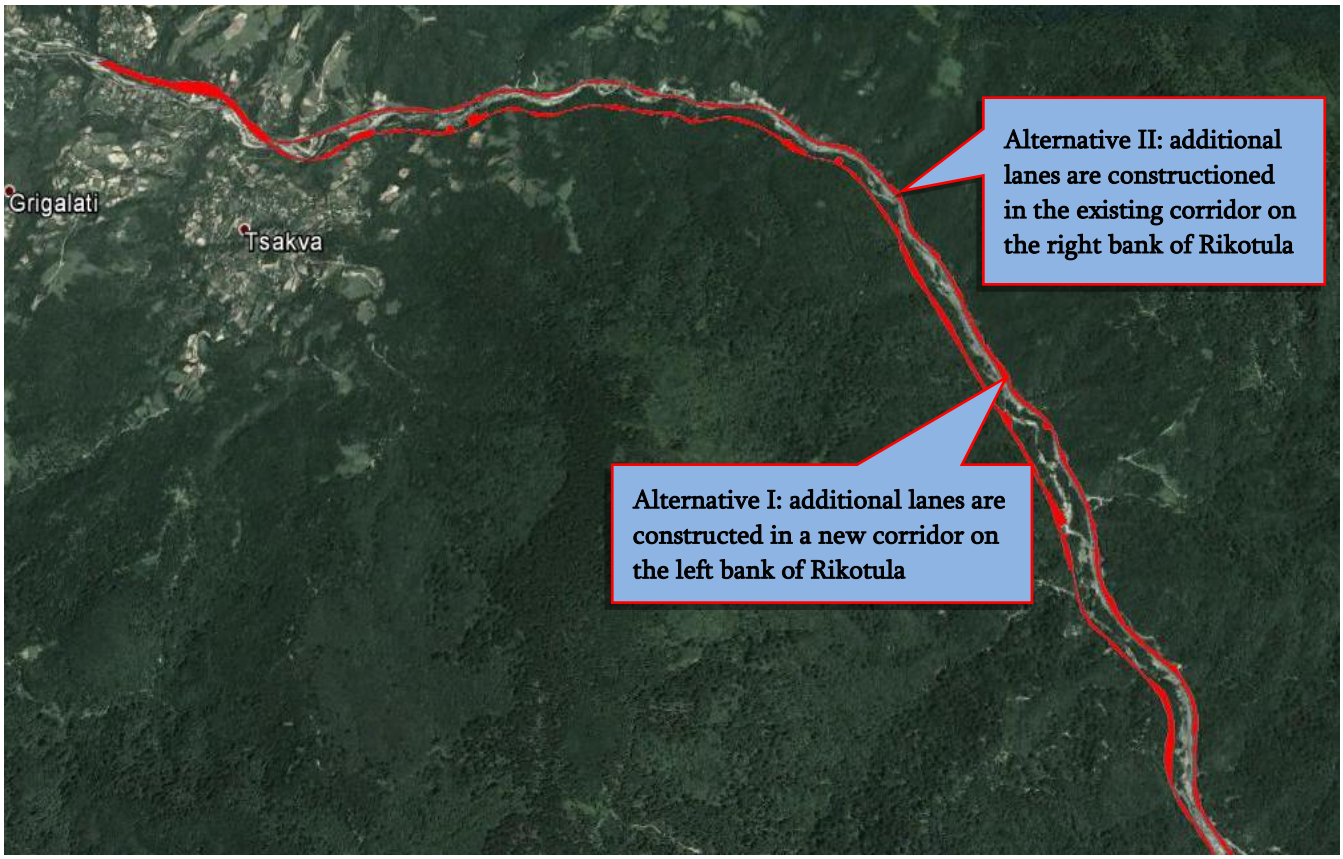
Alternative 1: new corridor

Traffic along the section of EWH from the West portal of Rikoti tunnel through CH7+50 will travel on both banks of the river Rikotula. No significant changes will be required in the existing road corridor on the right bank, but a new corridor will be arranged on the left bank. During the environmental assessment, the left bank was visualized as per alternative I, however due to the complex relief and high vegetation cover, it was impossible to approach all location.

The corridor starts at the West end of the tunnel (CH0+00), at 880 m (sea level) and crosses the river Rikotula with the bridge right at the beginning. Up to CH4+00 (680 m sea level), the corridor is directed

from south-east to north-west; it crosses the relief with a steep inclination covered with dense forest without any engineering communications or agricultural plots. According to the local people, there was a narrow ground road running along this section of the river bank in the past intended for the maintenance of an oil pipeline to construct here as intended in the Soviet era. No pipeline was constructed eventually, but some sections of the earth road have survived.

Figure 4.3. 1. Alternative routes of the highway



For adding two lanes on the left bank, 5 road bridges shall be built at the crossing points of the left tributaries of the river Rikotula and on the eroded sites. The slope varies from 3.5 to 6.0%. Its stabilization will require terracing and building the bearing walls, while on the right side of the road it is planned to make the fills and build the bank protection structures to minimize the risks of erosive action of the river Rikotula.

The sketch map of the above-described section with relevant figures is given below, in Figure 4.3.2.

The new corridor of the road section from CH4+00 to CH7+50 on the left bank is not much different from the section described above. The corridor is directed from east to west and it also runs across the complex relief. Small areas of agricultural plots and fields used as pastures and hayfields will come under the impact of the last section of the road. Consequently, economic resettlement may become necessary. A direct impact of the project implementation on the first and third sections will be seen as an impact on the catering objects (9) located adjacent to the highway, fueling station (1) and individual traders, whose work is seasonal and lasts for 3 or 4 months a year. In October, 14 individual traders were fixed adjacent to the project section. 13 of them were interviewed (1 of them refused). However, as the interview evidenced, their real number is much more (by 2, 5 or 3 times more). They are mainly the residents of the adjacent villages and trade with their own harvest (fruit, corn, honey, etc.).

Six motor road bridges will be constructed within this section. The slope varies from 1.0 to 6.0% (inclination decreases towards the last section). Engineering protecting structures will be required along this section too, to prevent road damage due to hazardous geo-dynamic or hydrological processes. The sketch map of the above-described section with relevant figures is given below, in Figure 4.3.3.

Figure 4.3.2. Alternative 1: Road section CH0+00 to CH4+00 on the left bank of the river Rikotula

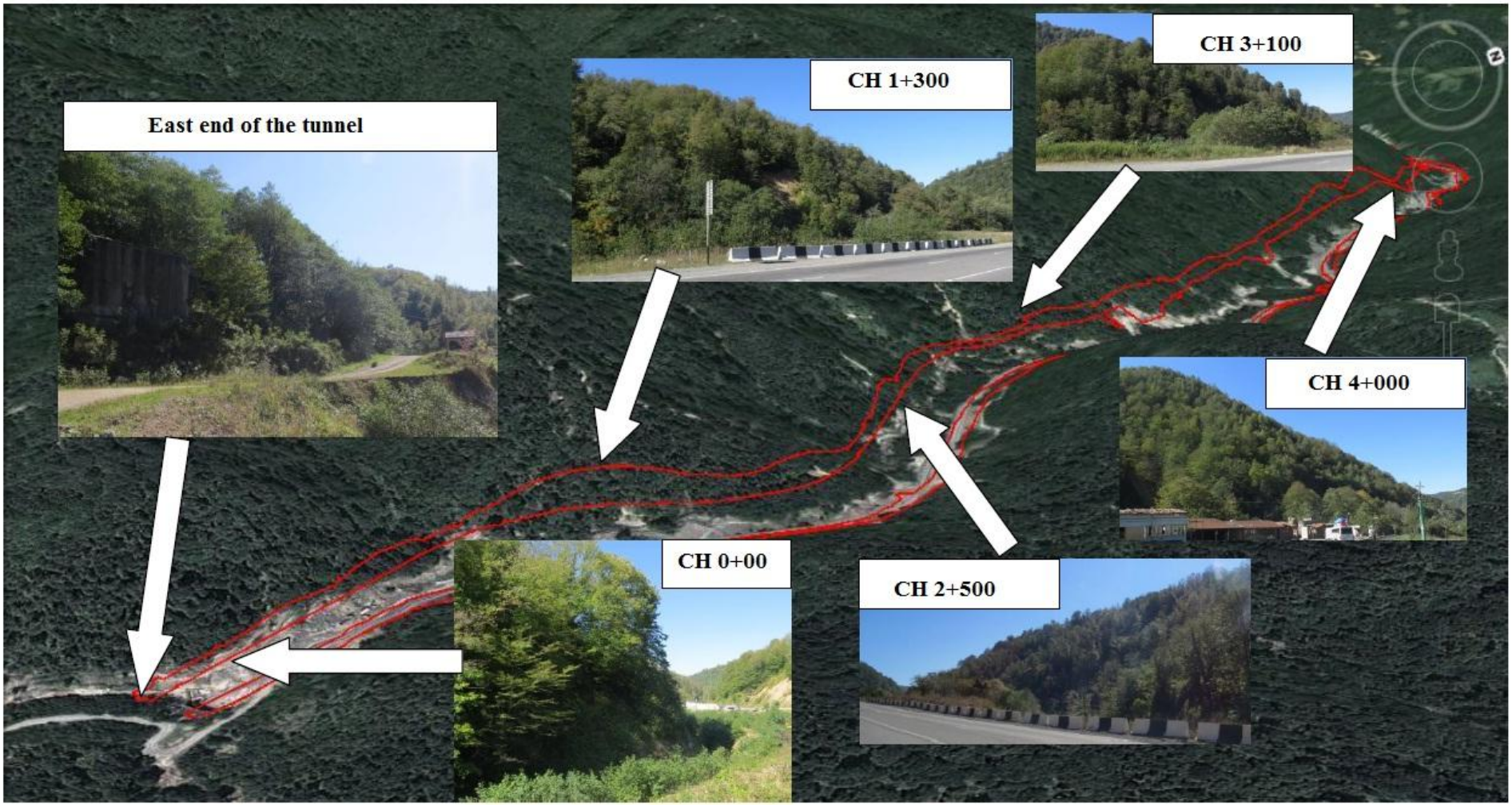
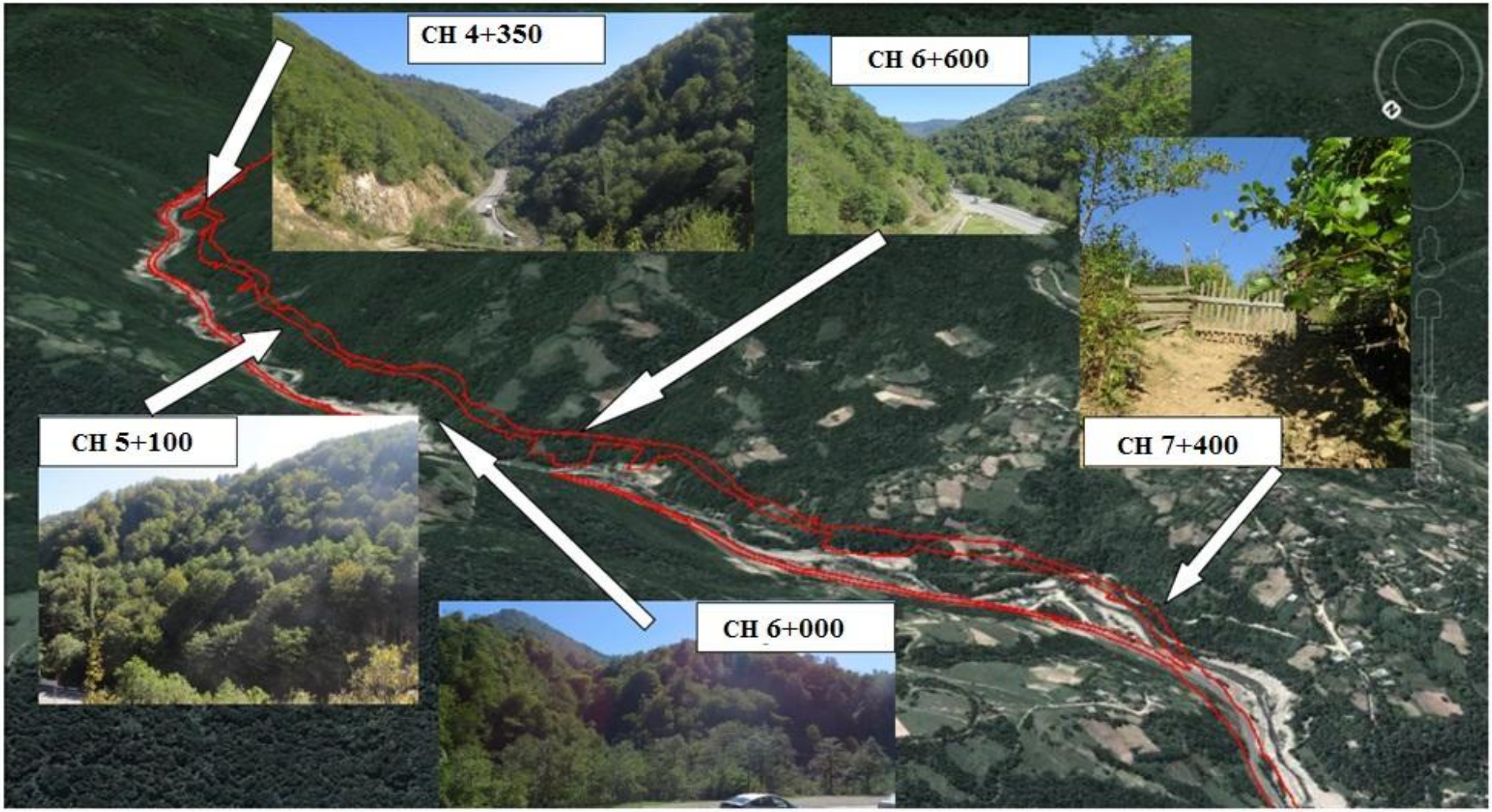


Figure 4.3.3 Alternative 1: Road section CH4+00 to CH7+50 on the left bank of the river Rikotula



Alternative 2: no new corridor

This alternative implies provision of two additional lanes by widening the existing corridor on the right bank of the river. Following the morphological conditions of the existing road corridor, it can be widened mostly from its right side, by cutting the slopes and building additional bridges, tunnels or half-tunnels. From the left, there flows the river Rikotula limiting the possibility to widen the road.

The corridor starts at the western end of the tunnel (CH 0+00). The slope of the initial section up to CH 6+00 is quite inclined, reaching almost 7% at some places. Consequently, during the earthworks, a designed 6% inclination should be targeted. From CH 6+00 to CH 7+50, the slope declines to 1.0-3.5%.

There are two emergency side tracks at CH 4+5 and CH 6+50. The emergency side tracks are isolated from the highway and are designed for the non-controllable vehicles to slow down or stop. The emergency side tracks use a gravitation effect to reduce the vehicle moving speed up to stop. However, the existing emergency lanes need improvement. As per the information from the local people, sometimes the side tracks fail leading to lethal outcomes.

Some sections on the right side of the existing road contain landslide sites. Several years ago, a landslide occurred along these sites and damaged the road. Consequently, as a result of repair works, the carriageway shifted towards the riverbed. There are relevant engineering structures built at some places, but the slope stability is not yet satisfactory and there is probability of similar events to occur in the future. There are several springs with small output flowing on this side of the road. From the side of the river Rikotula, the risks of earth instability are less. There are bank protection structures built at some sites.

The sketch maps of the above-described section with relevant figures are given below, in Figures 4.3.4 and 4.3.5.

Figure 4.3.4. Alternative 2: Road section CH0+00 to CH4+00 on the right bank of the river Rikotula

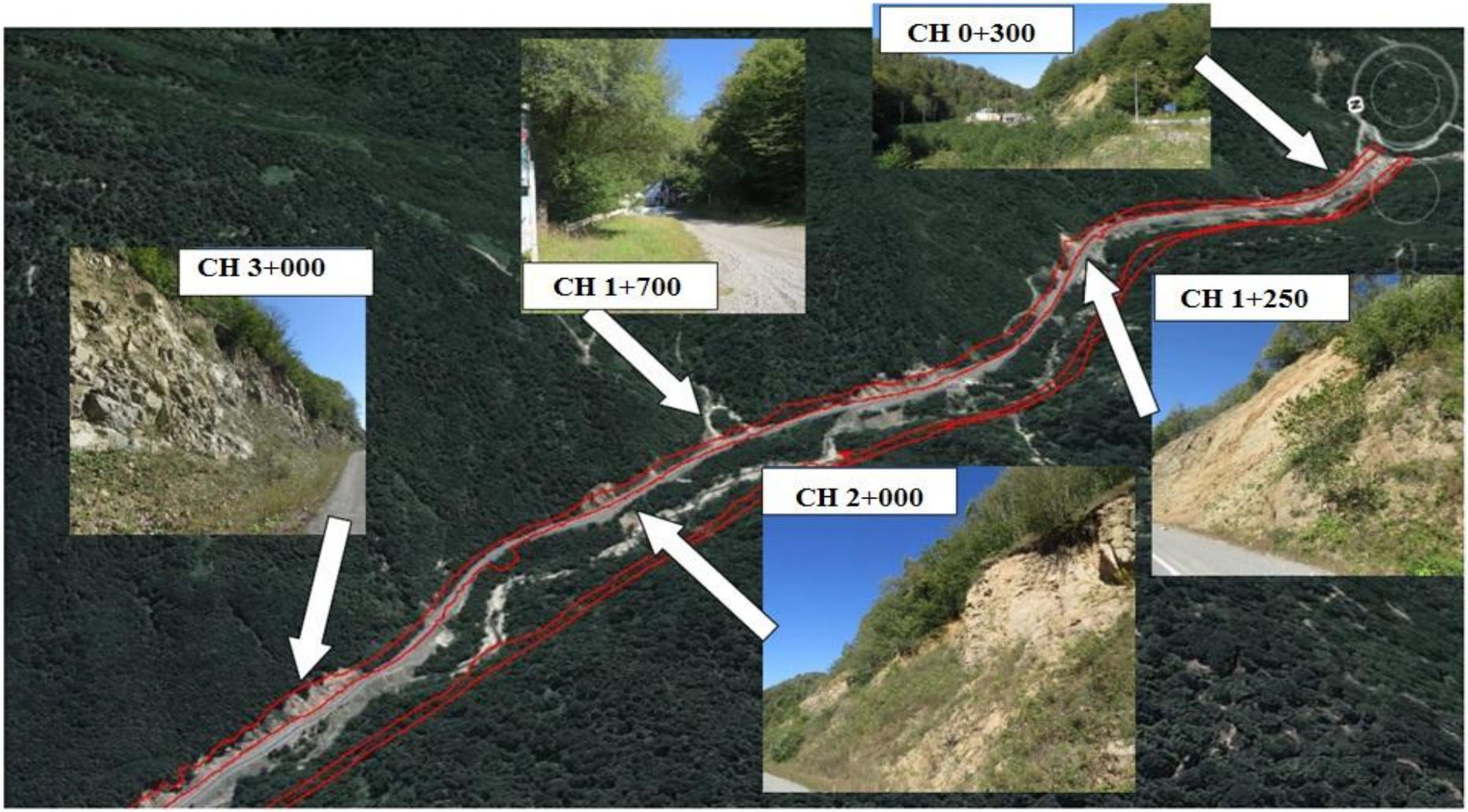
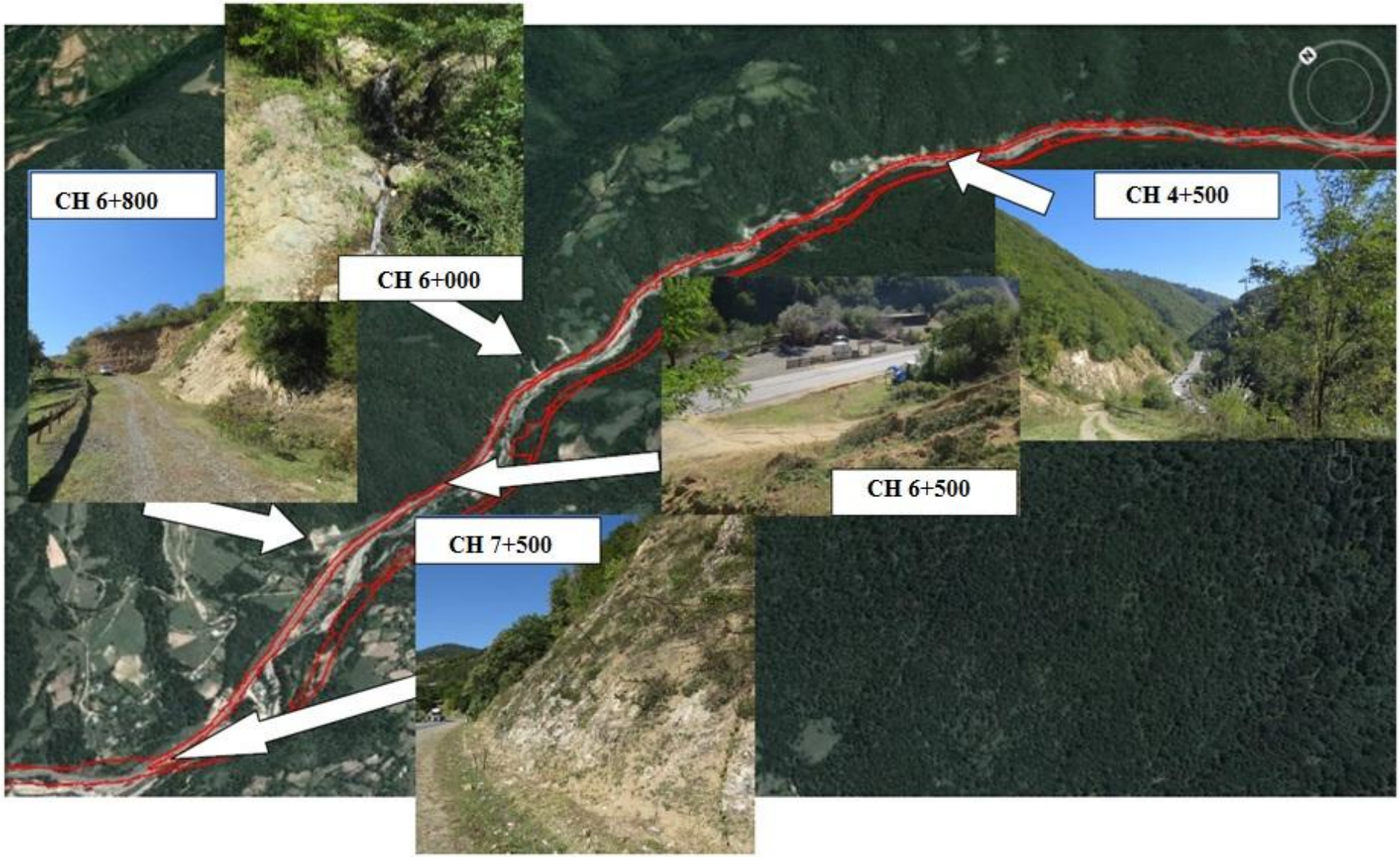


Figure 4.3.5. Alternative 2. Road section CH4+00 to CH7+50 on the right bank of the river Rikotula



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 highway should to be taken into consideration.

Several active landslide areas have been observed on the slope adjacent to the existing road (on the right bank of Rikotula River). Very high steep slopes are represented there. Bedrock is not distinguished by high strength, accordingly, the gravitational effects are quite strong.It should be noted that several landslides have been recently activated (2014). Several thousand cubic meters of earth and rock has been collapsed and completely blocked the highway, due to which a road traffic has been paralyzed for a certain period.Collapsed mass has been used for widening the road towards the riverbed of Rikotula River, since additional cutting of landslide areas was not considered as appropriate.

Having considered noted circumstances, alternative 2 has a significant disadvantage in terms of unfavorable geomorphological conditions and landslide areas. While widening the road, it will be necessary to cut quite high and steep slopes for the purpose of rock stabilization, which will be related to the emergence of a significant amount of waste rock. In circumstances where it is difficult to find spoil ground in the vicinity of the project area, waste rock management will result in additional environmental problems. In addition, slope terracing is unlikely to be enough for the safe operation of the road. Most likely, arrangement of additional, expensive protective structures will be required.

In case of alternative 1, there is less need of removal of landslide bodies adjacent to the existing road and cutting of steep slopes. Protective structures will be arranged only in certain sections during the reconstruction process. The left slope of Rikotula River, where a new two-lane highway is planned to be arranged for the movement from west to east, is forested. Accordingly, landslide areas are less likely to occur within this corridor.Although, deforestation and earth works may result in the emergence of new hotbeds of the landslide, it is likely that there will be no large-scale processes due to relatively quiet relief. In addition, relatively less width of the corridor will be required. Road embankments will be arranged through cutting the slopes and arranging spoil grounds on the side of Rikotula River.Arrangement of overpasses is considered in certain sections (in areas where small gullies are crossed). Based on the above mentioned, it is likely that the risk of development of dangerous geodynamic processes is less in case of implementing alternative 1.
The second important circumstance giving preference to the alternative 1 is the traffic flow management during construction phase:

In conclusion we can say that alternative 1 is preferred in terms of geomorphology and traffic flow management during construction phase. Although in this case forested slope of Rikotula River will be used, the negative impact on the biological environment will be effectively reduced through targeted environmental mitigation measures.

4.4 Alternatives of construction camps

Site no. 1 of the construction camp:
The territory at the eastern portal of Rikoti tunnel, adjacent to the existing road, was selected as the location of the construction camp. There are several buildings on the territory, which can be used to make an office, building for the workers to live in and storage area. The relief of the territory is flat, without topsoil or vegetation cover and with relevant electrical power-supply and water-supply systems. This area is distanced from the residential area by quite a long distance. It should be noted that the territory was used as a construction camp in the process of the tunnel rehabilitation. In case this territory is selected for the

construction camp, it will serve the construction operations of Rikoti tunnel. See the layout and view of the territory below, in Figure 4.4.1.

Figure 4.4.1. Proposed site no. 1 of the construction camp X-375663 Y-4656659

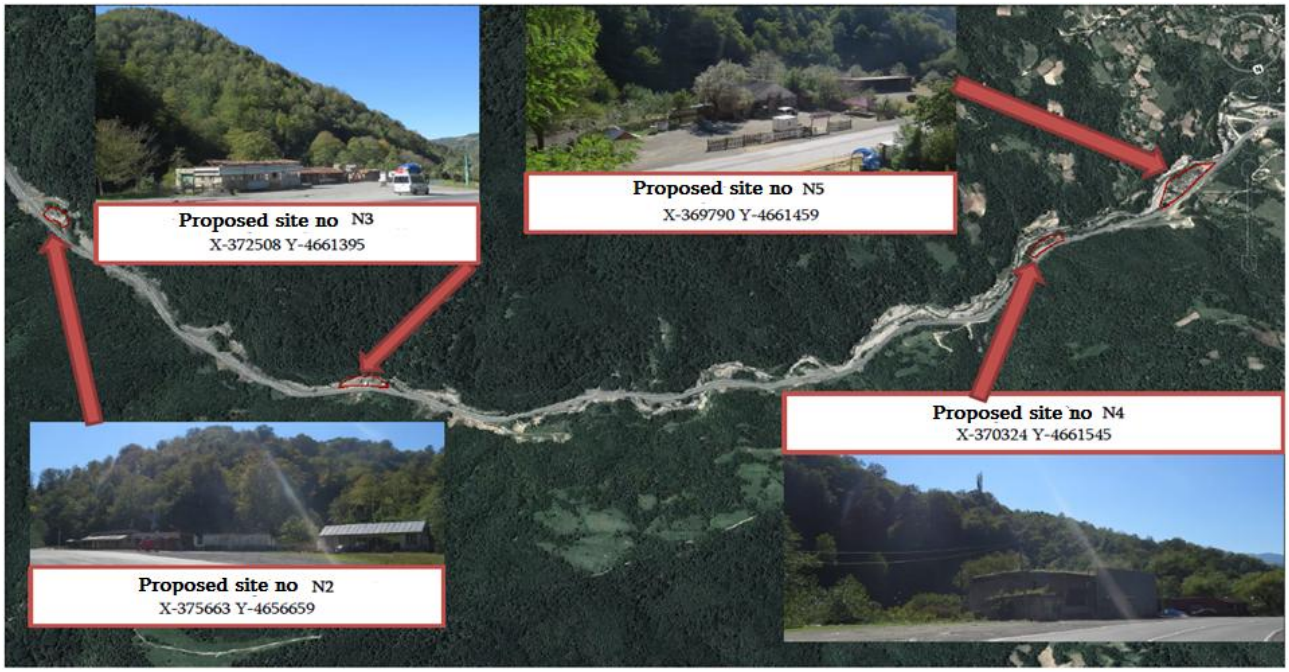
Site no. 2 of the construction camp:
The territory between the existing road and the river Rikotula was selected as the location of the construction camp. There is a catering object supplied with water from the existing springs. There is a power supply infrastructure on the territory. The territory is plain without a vegetation cover. The residential houses and other sensitive receptors are distanced from the territory by quite long distances. In case this territory is selected for the construction camp, a parking area for the techniques and warehouse of the inert materials are feasible to build on it.

Site no. 3 of the construction camp:
The territory between the existing road and the river Rikotula was selected as the location of the construction camp. At present, the territory is used as a catering object with several buildings at it. There are no objects of natural environment (vegetation cover, soil, etc.). The territory can be used to make an office or a room for the workers to have a rest or a dining hall.

Site no. 4 of the construction camp:
The territory between the existing road and the river Rikotula was selected as the location of the construction camp. There are two idling buildings and construction techniques on the territory now. The relief is satisfactory. The vegetation cover is insignificant. The residents are distanced from the territory by quite large distances. Solving the water-supply problems will be quite problematic. The territory can be used as a parking area of the techniques and construction infrastructure (crushing and sorting shop, etc.).

Site no. 5 of the construction camp:
The territory between the existing road and the river Rikotula was selected as the location of the construction camp. At present, the territory is used as a catering object. There is no vegetation cover on the territory. This territory is located relatively near to the residential houses. Consequently, it is not recommended to build the construction facilities with emissions into the atmospheric air.

Figure 4.4.2. Proposed sites of the construction camp



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 Management Plan.
5 Drafting of the ESIA report.
6 Information disclosure and stakeholder consultation.

Botanical survey

The assignment consisted of the desk top review of the primary and secondary data followed by the field works for reconnaissance of proposed road alignment. Survey was conducted in the period of September - October 2016.

The objective of the botanical study was to identify plant communities within the section of interest, reveal sensitive populations and, if found, provide quantitative characteristics thereof. With consideration of expected direct and indirect impact, the corridor of 100 m on each side of the centerline was surveyed. The field works included initial walkover through the corridor by experienced botanist, who was identifying specific habitats within the corridor and describing the extent. During the analysis of collected information, the sensitivity zones were identified for each section. After the information from initial walk over was analyzed, specific zones were identified to carry out more detailed (in depth) study of vegetation cover. This detailed information was used to fill the existing gaps (white spots) and provide full picture of baseline to be used as basis for proper ESIA. The needs for such detailed study were indicated during the screening and scoping process.

After the completion of the botanical survey of the road corridor, the detailed characteristics of sensitive areas have been analyzed. Based on the information gained from literature review and field surveys the moderate and high sensitive areas as well as presence of endemic, rare and other protected species in the project impact zone were identified.

Survey of fauna

Survey methods used for establishment of fauna baseline included a desk study of publicly available reference materials and field surveys along the road alignment, these two having different objectives.

The objectives of the desk study were: description of main wildlife habitats and animal species in the project region, revealing of sensitive habitats and species requiring particular attention or protection, identification of major wildlife data gaps and provision of basic information for proper planning and implementation of field surveys. The desk study was undertaken bearing in mind these objectives, prior to implementation of field surveys.

Fauna field survey has been undertaken in October 2016. It comprised entire project corridor, with the objectives to describe wildlife habitats along the road alignment, identify which sensitive fauna habitats reported/unreported in the literature could fall within the project RoW and determine territories disturbance of which should be avoided not to cause significant impact on wildlife. The "walkthrough" method was used to achieve these objectives. Animal species and signs of their vital activity (traces, droppings, dens, feather, etc.) encountered during the survey within or near the corridor were recorded.

The general faunistic overview of the study area was prepared, as well as the comprehensive description of the wildlife for the highway corridor. The information provided is a combination of the desk review and field survey findings. The results of the field surveys are organized in a way to create clear picture of the project-specific details. Wildlife sensitivity maps are prepared for the project corridor to highlight sensitive wildlife areas.

Cultural heritage and archaeology survey

Information on archaeological and cultural heritage sites was collected from scientific publications and the site reconnaissance field surveys conducted within the framework of the current ESIA, legislative acts of the Georgian Ministry of Culture and Monument Protection, various Internet resources and interviews with local population. Based on this information, the sites were listed and mapped indicating names, categories, location and dates of the sites. Monuments representing immovable monuments of the national importance were identified according to the decree (#3/133) of the Minister of Culture and Monument Protection of 30/3/2006.

Socio-economic study

The socio-economic baseline study along the EWH section was carried out through review of existing information from the Geostat, and the survey conducted by "Eco-Spectri" Ltd in November 2016. It provides information regarding average conditions of local population in two Khashuri and Kharagauli municipalities crossed by the road. The field survey using especially designed questionnaires (see sample questionnaire in Annex 8) was carried out by Keti Dgebuadze, Socio-economic Expert, in the village Khevi and along the highway corridor. The collected data were analyzed, collated, and summary findings were verified against the available statistical data.

Identification of water peak discharges

The values of the water peak discharge of the river Rikotula and other small gorges with their water catch basins not exceeding 400 km^2 are identified by the method developed by the Scientific-Research Institute of the Hydrometeorology Institute of the Caucasus and is published in the source *The Technical Reference Book to Calculate the Peak Discharges of Rivers in the Caucasus*.

According to this method, the peak discharges are calculated by the following formula:

$$Q = R \cdot \left[\frac{F^{2/3} \cdot K^{1,35} \cdot \tau^{0,38} \cdot \bar{i}^{0,125}}{(L+10)^{0,44}} \right] \cdot \Pi \cdot \delta \cdot \lambda \text{ m}^3/\text{sec}$$

where R -is a regional parameter and its value is taken as 1,35 for west Georgia;

F -is the area of the river or gorge catch basin (km^2);

K -is the climatic coefficient of the region, with its value taken from the specially drafted map;

τ -Occurrence in years;

$\bar{i}$ -is the balanced gradient of the river current in units from the mouth to the design section;

L -is the length of the river or gorge from the mouth to the design section (km);

Π -is the coefficient characterizing the soil cover in the river or gorge basin. Its value is taken from the special map and relevant table. In our case, it equals 1 for all rivers and gullies;

λ -is the percentage of forest land, with its value obtained from the expression:

$$\lambda = \frac{1}{1 + 0{,}2 \cdot \frac{F_t}{F}}$$

here F_t -is the area of the basin covered with forest (%).

δ -is the coefficient of the basin shape, with its value obtained from the expression:

$$\delta = 0{,}25 \cdot \frac{B_{\max}}{B_{ave}} + 0{,}75$$

where $B_{\max}$ -is the maximum basin width (km);

B_{ave} -is the average basin width (km), with its value obtained from the expression $B_{ave} = \frac{F}{L}$.

When calculating the water peak discharges of the small rivers and gorges with the area of their catch basins of less than 5 sq.km, the formula above additionally includes the specially designed coefficients for the areas of the catch basin, which are given below.

F km^2	<1	1	2	3	4	5
K	0.70	0.80	0.83	0.87	0.93	1.00

The values of the morphometric elements to calculate the water peak discharges of the rivers and gorges crossing the modernization road taken from the topographic maps scaled 1:25000 and 1:50000 and values of water peak discharges of different provision calculated by the formulae above, are referred to Annex 3.

Noise measurements

The background noise was measured by a Korean device "Wenca". The measurements were done at several points along the design road and on the territory of village Khevi at larger scales. At all design points, the measurements were done by using the following methods: the data of each point were taken (total 10 points) with 5-minute intervals, for half an hour (total 6 data) and the average noise level was calculated at all points (Fig.5.1 and 5.2).

The noise was measured both, along the existing road and on the territory of the design road (on the left bank of the river Rikotula). The distance of different points of the design road to the existing road is different. Measurement was done at the turning point in village Tsakvi, at so called "Tsakvi spring", which is distanced by 126 m from the existing road and is located at the point distanced by 132 m from the road, on the edge of the road running to Tsakvi (this location is forest at present).

Figure 5.1. Noise measuring at the East portal of Rikoti tunnel

Figure 5.2. Noise measuring on the existing road, near a public school in Khevi village

At the border of the residential zone, sound level La (dbA) is identified under SNiP II-12-77M (Building Norms and Rules), which in the open space is calculated according to the following formula:

$$L = L_p - 15\lg r + 10\lg \Phi - \frac{\beta_a r}{1000} - 10\lg \Omega$$

where

Lp– represents the octave-band of the sound wave at the design point, dbA;

L_W - is the octave-band pressure level of noise source, dbA;

r – is the distance between a source and a target point, m;

Φ– is a measureless factor of sound source direction, and its value varies according to acoustic radiation solid angle;

Ω – is solid angle of acoustic radiation (in radians) and for location in open space (on column, pipe, etc.) Ω = 4π, on a half-space (surface, such as floor, ground) Ω = 2π, for location in a dihedral angle Ω = π;

βa– is the octave-band of sound attenuation in the atmosphere (open space) (dbA/km) dependant on the sound frequency. Its values are given in the table below.

Average geometric frequencies of the octave lines, H Hz.	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
βa, dbA/km	0	0.3	1.1	2.8	5.2	9.6	25	83

By considering the table above, the total value noise impact of the equipment and machinery on the construction camp will be 100-105 dbA. The noise levels calculated by using the formula above (50, 100, 200, 500, 100 and 2000 m away) will be as follows:

$$L_{50} = L_p - 15\lg r + 10\lg \Phi - \frac{\beta_a r}{1000} - 10\lg \Omega, = 105 - 15*\lg 50 + 10*\lg 2 - 10.5*50/1000 - 10x\lg 2\ \pi = 74.02\text{dB}$$

$$L_{100} = L_p - 15\lg r + 10\lg \Phi - \frac{\beta_a r}{1000} - 10\lg \Omega, = 105 - 15*\lg 100 + 10*\lg 2 - 10.5*100/1000 - 10x\lg 2\ \pi = 68.98\text{dB}$$

$$L_{200} = L_p - 15\lg r + 10\lg \Phi - \frac{\beta_a r}{1000} - 10\lg \Omega, = 105 - 15*\lg 200 + 10*\lg 2 - 10.5*200/1000 - 10x\lg 2\ \pi = 63.41\text{dB}$$

$$L_{500} = L_p - 15\lg r + 10\lg \Phi - \frac{\beta_a r}{1000} - 10\lg \Omega, = 105 - 15*\lg 500 + 10*\lg 2 - 10.5*500/1000 - 10x\lg 2\ \pi = 54.29\text{dB}$$

$$L_{1000} = L_p - 15\lg r + 10\lg \Phi - \frac{\beta_a r}{1000} - 10\lg \Omega, = 105 - 15*\lg 1000 + 10*\lg 2 - 10.5*1000/1000 - 10x\lg 2\ \pi = 44.53\text{dB}$$

$$L_{2000} = L_p - 15\lg r + 10\lg \Phi - \frac{\beta_a r}{1000} - 10\lg \Omega, = 105 - 15*\lg 2000 + 10*\lg 2 - 10.5*2000/1000 - 10x\lg 2\ \pi = 29.51\ \text{dbA}$$

Background radiation measurements

Measurements of the background radiation were taken on October 15-16, 2016, by using a standard certified Russian appliance RADEX. Continuous measurements were done along the whole route (Figures 5.3 and 5.4) within the limits of the construction corridor and on the territory of village Khevi at larger scales.

Figure 5.3. Measurement taking at East portal in of Rikoti tunnel

Figure 5.4. Measurement taking at secondary school village Khevi

Radiation background was also measured at several points of the territory of the planned route, on the left bank of the river Rikotula. As per the measurements, the radiation background varied between 6 and 12 mR/h on the said territory.

Chemical analyses of water

Laboratory analysis of surface water and soil were undertaken for compiling baseline information on the quality of environment within the study area. Analyses were performed by the Center for Ecological Expertise and Analysis of the R. Agladze Institute of Inorganic Chemistry and Electrical Chemistry. The laboratory is equipped with the following appliances to do the above-listed analyses: muffle burners, diffraction roentgenograph ДРОН-3М; photocolorimeter КФК-2МП; polarograph ОН-105; derivatograph Q1500D; atomic absorption spectrophotometer С-115; potentiometer, spectrophotometer-16; differential scanning microcalorimeter ДСМ-2М.

Studies of the surface water quality in the river Rikotula were undertaken through collecting samples near the Rikoti tunnel. Water quality analyses included measurement of the following parameters: content of total nitrogen (TN), total phosphorus (TP), and total petroleum hydrocarbons (TPH). In addition, the physical and chemical parameters, such as temperature, pH and conductivity were measured.

The soil samples were taken in about 10 m radius from the road pavement. Total 4 samples were taken. Two samples were taken from the territories of the restaurants located along the road and other two samples were taken on the territory of village Khevi, 8-10 m from the main road. They were analyzed for the content of heavy metals.

Soil Pollution

Evaluation of adverse impacts on soil and soil pollution was performed according to the Georgian laws and regulations (the law applicable to the largest extent is the Law on the Soil Protection, 1994 (amended in 1997 and 2002).

The soil samples were taken in about 10 m radius from the road pavement. Total 4 samples were taken. Two samples were taken from the territories of the restaurants located along the road and other two samples were taken on the territory of village Khevi, 8-10 m from the main road. They were analyzed for the content of heavy metals. Samples were collected in plastic bags, labeled and delivered to the lab for testing. The samples are dried, averaged and sieved.

Table 5.1. Methods of soil analysis

Cu, Zn, Pb, Ni, Co, Co, Cd	ISO 11047, ISO 11466 - Aqua Regia extract Determination of Cu, Mn, Fe, Mn, Co, Pb, Cd, Ni, Zn, Cr, Ni. Al
As	SO 2590 - General method for the determination of arsenic – Silver diethildithiocarbamate photometric method

The sample analysis revealed that concentration of all metals is below relevant maximum allowable concentrations adopted in the EU.

Criteria for Assessing Expected Impacts

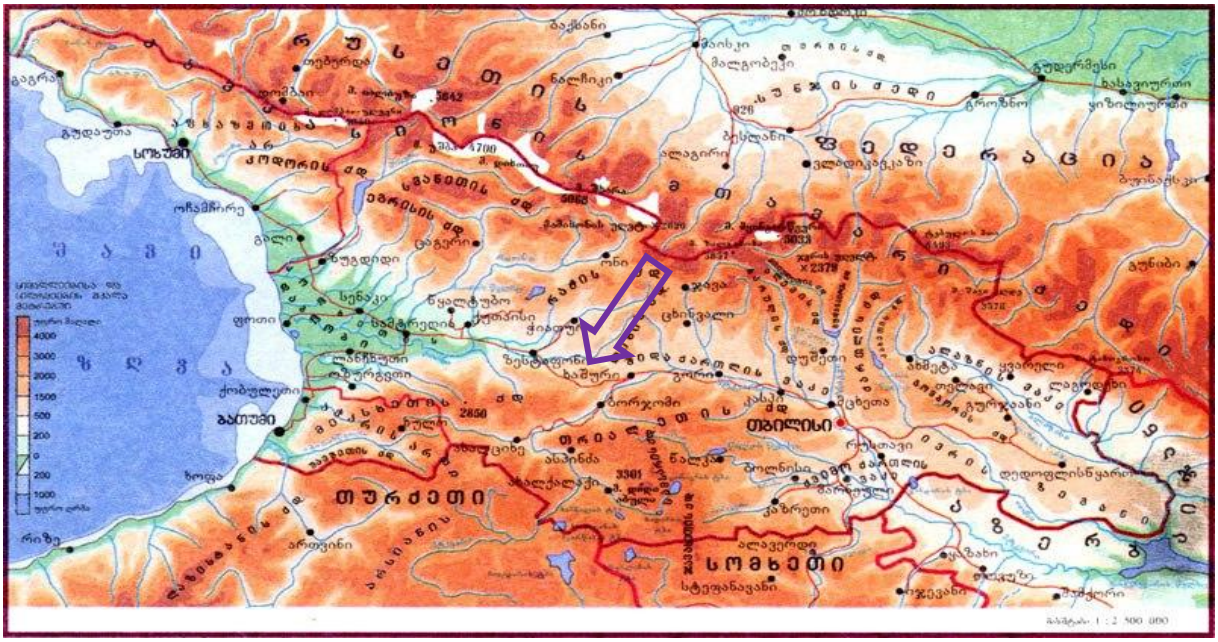
Qualitative and quantitative criteria were used for the assessment of expected impacts on air and water quality, soil and landscape, flora and fauna, ecosystems, social environment and historical-cultural monuments. Impacts were classified as significant, modest and minor, as seen in a table provided in Annex 4.

6. BASELINE INFORMATION

6.1 Biophysical Environment

From physical and geographical point of view, the EWH corridor is located on the hill of Imereti within submeridional range - Likhi Range (Surami Range), which divides Georgia into the eastern and western parts. The length of the range from Ertso mountain pass to Lomi Mountain is 102 km. Rikoti Tunnel runs through under the southern section of this mountain range. Likhi Range is a watershed of Caspian and Black Seas. The middle section tectonically belongs to Dzirula crystalline array, north – to the Caucasus, South – to Lesser Caucasus. It performs the role of climate separator.

Map 6.1. Location of the study area marked on the physical map of Georgia



According to the administrative-territorial division of Georgia, the eastern part of the road corridor (namely, Rikoti Tunnel) belongs to Khashuri Municipality (Shida Kartli region). Most part of the corridor passes within the boundaries of Kharagauli Municipality (Imereti region). Neighboring administrative-territorial units are Baghdadi, Zestaponi, Chiatura, Sachkhere, Kareli and Borjomi Municipalities.

6.2 Microclimate

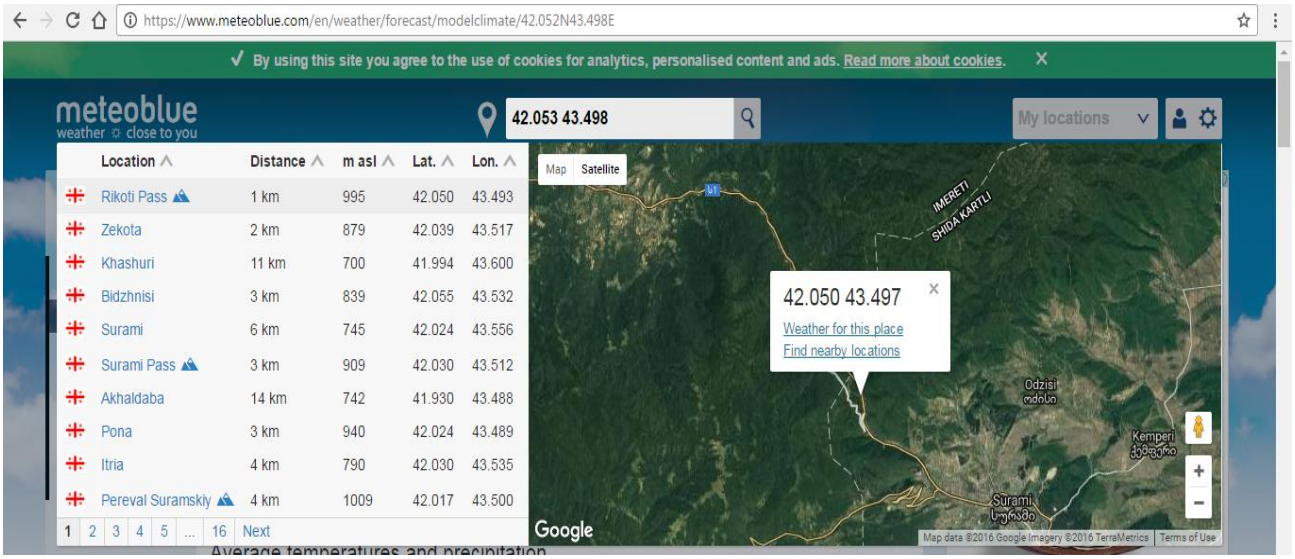
As it was noted, the study corridor is located on the border of climatic districts of east-west Georgia. More specifically, the corridor runs through the eastern periphery of the humid subtropical climate district of Georgia, where the signs typical for a subtropical climate are weakened, climate is relatively continental, precipitation is reduced, annual and daily amplitudes of temperature are increased.

These places are normally characterized by cold winters and warm summers. Average annual air temperature reaches a maximum in August - +26.5 ^{0}C, while the minimum in February - 2.4 ^{0}C. The annual average rate of precipitation is 565 mm. Number of snowy days during the year is 55-60 days, the thickness of snow

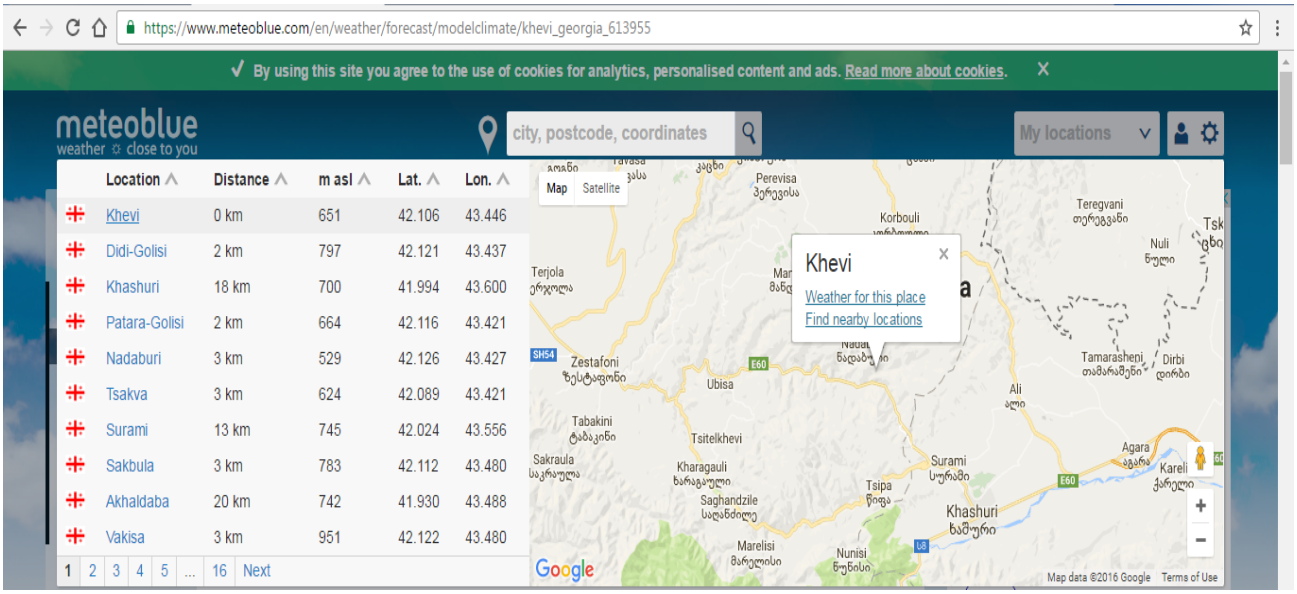
cover near the tunnel is frequently within the range of 0.5—0.7. Like air temperature, soil temperature is the lowest in December-January. Relative humidity is 75%.

Climatic conditions at the eastern portal of the Rikoti tunnel and village Khevi are given on the Maps 6.2.1. and 6.2.2.

Map 6.2.1. The climatic conditions at the eastern portal of the Rikoti Tunnel



Map 6.2.2. Climatic conditions at village Khevi



Detailed meteorological and climatic characteristics of the highway corridor are given in the Annex 2 (source of the information: www.meteoblue.com).

6.3 Geology

Geomorphology

The area of the design section is located in the high-mountainous zone of Central Georgia and is a part of the Trans-Caucasian geomorphological intermountain region, in the eastern part of so called Dzirula Massif

called Zemo Imereti Elevation (Plateau). This territory represents an elevated part of the intermountain lowland of Georgia and geologically, it coincides with Dzirula crystal massif – an intermediary massif located between the Greater Caucasioni and the Lesser Caucasioni folded zones and built with solid Precambrian rocks.

Within the limits of the massif, there are three major types of relief developed over Precambrian, Middle-Jurassic and Upper Cretaceous-Middle-Middle Sarmatic structural stages:

- Allochthone-denudation,
- Allochthone-structural, and
- Autochthonous-erosive

The third out of the three structural types of relief is common in the study area, which, as mentioned above, is built with Paleozoic and Proterozoic crystal rocks: mostly granites, gabbros and their derivatives. These rocks have clear outcrops in the river gorges and along the roads. The relief developed in this area is commonly characterized by low- and middle-mountainous erosive breakdown. The said part of the Plateau of Dzirula massif is complicated by relict and modern gorges with terraces and both, modern and old stable and quasi-stable landslide forms developed in them.

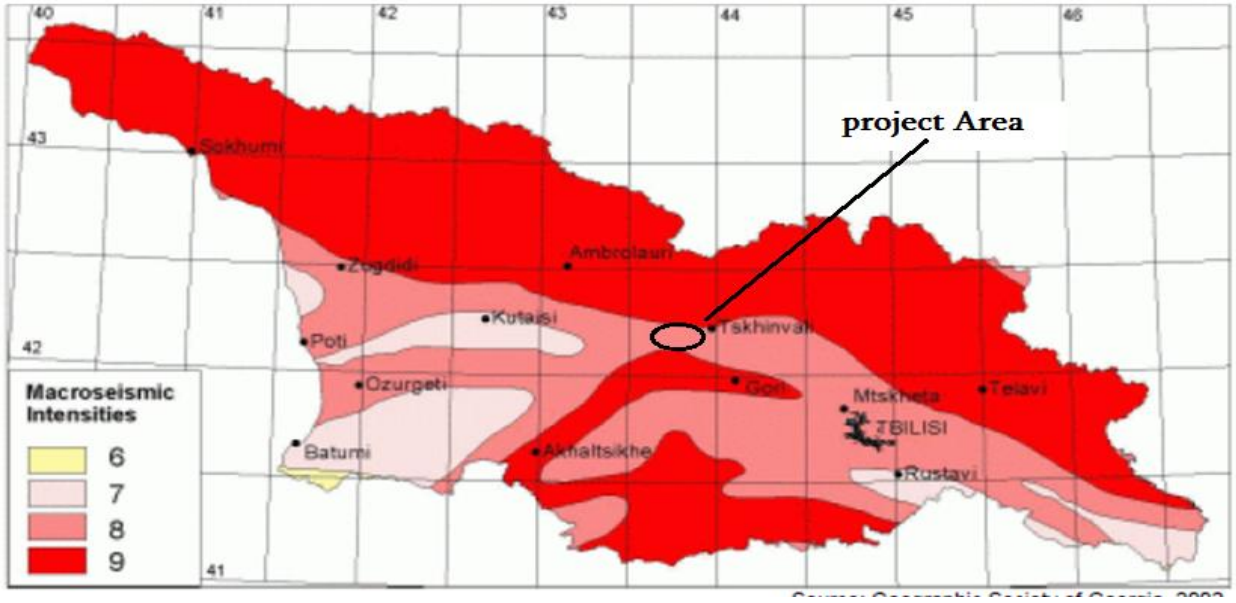
Tectonics and Seismicity

As per the tectonic zoning plan of Georgia (by E. Gamkrelidze, 2000), the study area belongs to Dzirula sub-zone of the Central elevation zone of Trans-Caucasian intermountain region (outcrop of the Paleozoic crystal massif). The long history of the geological development of this area and complex tectonic structure greatly contribute to the geo-morphology of the area and define the nature and intensity of the modern geological processes occurring there.

The study area is characterized with quite intense tectonics seen in the presence of faults of different scales and ages (generations) and tectonic zones, along which the rocks are intensely crashed and fractured. Despite the small dimensions of the study area, it is characterized with contrasting geological structures, which is caused by the location between two geological structures: from the east – sedimentary cover of Dzirula massif and from the west – exposure zone of Dzirula crystal massif.

According to the Seismic Hazard Map of Building Norms and Rules effective in Georgia "Earthquake-resisting construction (SSM III, 21.10.2009 N 128, article 1477) PN 01.01-09)", the study area is located in the 8-point earthquake zone (MSK 64 scale) (Map 7.4) with the dimensionless coefficient of seismicity (A) equaling 0.16 (village Khevi) under the same document.

Map 6.3.1. Seismicity Map of Georgia



Geodynamics

According to the orography, the study area is presented with Middle Mountain, erosive-denudation relief. Geologically the territory is located within the Paleozoic and crystal substrate. Existing road is located is located at the forested bottom of Dzirula river slope and is characterized with complicated dismembered relief.

The main structuring rocks of the area are Paleozoicquartz diorites, quartz-porphyries, pink granites, gabbro and Bathonian granitites. Basic rock material is mostly covered by thick alluvial and overlying deluvial silty clays containing angular cobbles and gravel. The thickness of the deluvium varies within 1.0-6.0 m, while the thickness of the underlying structuring eluvium is much greater and may exceed 10-12 m.

In geodynamics terms, on the segment of the valley where the slopes are steep, stone falls may occur, and in some places even slumping may develop. Where the river sharply changes direction, its erosion action in the form of stream-bank erosion should be taken into account. In case of abundant atmospheric precipitation, considerable rising of the lateral inflows and freshets occur. During winter, when snow cover is high, sometimes small now slides may develop. Geodynamically significant events are landslides which are observed quite many on this segment of the survey area. Some of them are stable, though any impact over it may trigger activation of suspended processes. Active landslide sites reveal on the sites that are close to the motor road, mostly on the left slopes of the river Rikotula. At the first and central sections, 7 active landslide bodies are registered, at the final section a powerful landslide site is observed. Due to the steepness of the right slope of the river valley, on several segments slumping-landslide activity is observed which is a barrier to normal functioning of the motor road (see Fig.6.3.2. and Fig. 6.3.3.).

Figure 6.3.2. Slumping-landslide activity segments on the right bank of the river

Figure 6.3.3. Slumping landslide segments on the left bank of the river

Soils

Within the eastern part of the Dzirula Gorge, three types of soils are observed: grey soils, yellow-grey soils, and humus-grey soils.

Pozdolic grey soils mainly appear on the intensively exhausted clay soils and clays. Their profiles are characterized with thin underlying formation followed by 3-5-cm humus horizon and 15-20-cm obviously fadedpodzolic horizon. The profiles end with alluvial-metamorphic hardened straw-colored and yellow or reddish-yellow horizon turning into the main rock. The humus content is low and the reaction is the acid one. Yellow soils are mainly spread on terrace formations and piedmont plains. The humus soil is represented by a granular soil layer (19-15 cm). Deeper there is anilluvial-metamorhic horizon that gradually turns into the main soil-forming rock. The content of the humus horizon in this type of soil makes 6-10%, and the level of acids prevails higher than the level of base materials.

Humus-calcareous soils are limestones, dolomites and their fission products. Their upper part has dark grey color that fades lower. In the upper part of the profile the reaction is neutral, in the lower part - alkaline. The lower part of the profile is enriched with carbonate. Concentration of humus in the upper part of the horizon is 6-10%. This soil type is met in the limestone rock zones characteristic for Cretaceous rocks along the Caucasus.

Availability of Construction Materials

During the road construction preference will be given to extracting material from existing quarries instead of opening the new quarry by the Contractor.Material purchase will only be permitted from licensed suppliers. It should be noted that major part of waste rock generated during earth works and tunneling may be used in the construction works.

The nearest existing sand and gravel quarries are:

- Ltd "New Space" - sand and gravel quarry of Chkherimela River (Kharagauli Municipality, village Sighandzile);
- Ltd "New Space" - sand and gravel quarry of Chkherimela River (I and II District)(Kharagauli Municipality, village Sighandzile);
- Sole Proprietor "George Kazarashvili" - "Vertkvichala" sand and gravel quarry on Dzirula River (Kharagauli Municipality, village Vertkvichala);

However, it should be noted that reserves of these quarries are not sufficient.Therefore, it is possible that sand and gravel will be transported from a considerable distance, including from existing quarries in Zestafoni, Khashuri and Kharagauli Municipality.Most of them are located on the banks of Mtkvari and Kvirila rivers.

Bitumen and bituminous products are not produced locally in Georgia. Nowadays, bitumen is mainly imported from Iran, Azerbaijan and Romania. Bituminous products, which is necessary for the project (production and construction) must be imported and comply with European standards.

Cement is produced locally by shareholding companies SAQCEMENTI and KARTULI CEMENTI in Kaspi (60 km away from Tbilisi, to the north-west direction) and in Rustavi (30 km away from Tbilisi, to the South-East direction). Cement is produced in sufficient quantity and appropriate quality.

Hydrology

The river Rikotula heads on the north-eastern slope of the western fork of Surami Ridge, at the altitude of 1,100 m and merges with the river Dzirula from its left side, in 33 km from its estuary. The length of the river is 10,1 km, its total fall is 643 m, its mean slope is 64,3 ‰, and the area of the catch basin is 70.4 km^2. The total length of the first-range tributaries of the river is 45 km. The river basin is located on the western slopes of Surami Ridge. Its geology is mainly presented as crystal rocks of Dzirula massif, mostly granites. Mostly mountain and forest soils are common in the basin. The vegetation cover of the basin is presented as dense hardwood forest occupying 65% of the basin. The entire river gorge is a V-shaped, with its slopes having high gradients and merging with the slopes of the adjacent slopes. The riverbed is moderately winding and mostly non-branched. The width of the current is 2-8 m, the width is 0, 3-0, 6 m and its velocity is 2, 5-1, 1 m/sec.

The river is alimented with snow, rain and ground waters. The water regime of the river is characterized by spring floods caused by snow-melt, freshets caused by autumn and winter rains and non-stable summer low water periods. It should be noted that the levels of the freshets caused by rains exceed those caused by snow-melt.

In the low water periods, the water in the river is clean, transparent and drinkable. The river is used to run the village mills. The water regime of other small rivers and gorges is identical to that of the rivers described above. Therefore, their detailed consideration was not considered purposeful at the given stage of design.

6.4 Biological Environment

Flora

The following hardwood species are dominant in the forest massifs in the corridor of the study area: common chestnut (*Castaneasativa*), oriental beech (*Fagusorientalis*), Caucasian hornbeam (*Carpinus caucasicus*), Caucasian lime (*Tilia caucasica*), maple (*Acercampestre*), elm (*Ulmuselliptica*), common nut (*Corylusavellana*), bladder(nut (*Staphylea* pinnata),wild pear (*Pyruscaucasica*), shamrock (*Malusorientalis*), medlar (*Mespilusgermanica*), cherry plum (*Prunusdivaricata*), Caucasian pine (*Pinussosnowskyi*) and eastern spruce (*Piceaorientalis*) are mixed in the forest stand.

The plants typical to dry ecotopes are mostly common over the mountain slopes: Georgian oak (*Quercusiberica*), Imeretian oak (*Quercusimeretina*) (VU), elm Zelkova (*Zelkovacarpinifolia*) (VU) grow mostly over the limestoens; oriental hornbeam (*Carpinusorientalis*),Black Locust (*Robiniafseudoacacia*), elm (*Ulmusfoliacea*), Gleditschia (*Gleditschiatriacanthos*), ash (*Fraxinusexcelsior*), wild pear (*Pyruscaucasica*), shamrock (*Malusorientalis*), medlar (*Mespilusgermanica*), cherry plum (*Prunusdivaricata*), pomegranate (*Punicagranatum*), aspen (*Populus* sp.), Yellow Azalea (*Rhododendron flavum*), etc (see Fig. 6.4.1 and 6.4.2.).

Fig. 6.4.1. Forest massifs in the corridor of the study area

Fig 6.4.2. Slope on the left bank of the Rikotula

The following plants are found along the roads: pine (*Pinus* sp.) and cedar (*Cadrus deodara*). Damaged and withered pine-trees were also found (Fig. 6.4.3. and Fig. 6.4.4.).

Fig. 6.4.3. Damaged pine trees

Fig. 6.4.4.. Slope on the left bank of the river Rikotula

The study corridor and the fragments of its adjacent forest are represented by beech forest with evergreen sub-forest; beech forest with ferns (on the limestone ecotopes) andbeech forest with evergreen sub-forest with gramineous species (on the humid ecotopes).

The following bushes and liana plants are common: blackberry (*Rubus caesius*), hawthorn (*Crataegus* sp.), dog-rose (*Rosacanina*), traveller's joy (*Clematisvitalba*), cat briar (*Smilaxexcelsa*), Italian woodbine (*Loniceracaprifolium*), and Pontic daphne (Daphne *pontica*).

The following species grow in bulk in the forest: male fern (*Dryopteris filix-mas*), Caucasian peony (*Paeoniacaucasica*), waterwort (*Aspleniumtrichomanis*), Pachyphragma (*Pachyphragmamacrophyllum*), sweet fern (*Polypodiumvulgare*), Georgian cyclamen (*Cyclamenvernum*), and violet (*Viola* sp.) mountain fescue (*Festucamontana*), watercress (*Nasturtiumofficinale*), nettle (*Urticadioica*), many associations of series of mixtoherbosa, mountain fescues (*FestucaMontana*) and ferns (*Dryopteris filixmas*).

The dominant species growing in great numbers in the floodplains over the river banks areash tree (*Alnusbarbata*) and different kinds of willow (*Salix* sp.) (Fig. 6.4.5.)

Fig: 6.4.5. Floodplains on the river bank

A pure oak forest grows on the slopes with southern exposition, while over the slopes with more shadow and thin soil, mixed forests of oak-and-hornbeam and oak-and-chestnut occur. Some sections of windbreaks composed of broadleaf and coniferous species are present along the existing carriageway.

Fig. 6.4.6. Windbreak

The major subforest-forming and bush-forming species on the ecotopes are: nut (*Corylusavellana*), hawthorn (*Crataegus* sp), Yellow Azalea (*Rhododendronflavum*), bladder-nut (*Staphyleapinnata*), etc. The sub-forest over the humid ecotopes is formed by: cherry laurel (*Laurocerasus* officin*a*lis), rhododendron (*Rhododendron ponticum*), ilex (*Ilexcolchica*), Imeretian buckthorn (*Rhamnusimeretina*), etc.

The most common mushroom species within the limits of the study corridor and in its adjacent area are: *Amanitacaesarea*, *A.citrina*, *A.rubescens*, *Lactariusacris*, and other high mushrooms in the beech and hornbeam forests are: Amanita caesarea (*Amanitaceae*), orange birch bolete (*Leccinumversipelle*), lurid bolete (*Boletusluridus*), Chanterelle (*Cantharellus cibarius*), wood blewit (*Lepista nuda*), etc. All of them are edible and have nutrition values.

Hardwood forests are characterized with a typical set of pests and diseases. Particularly important is chestnut blight (*Cryphonectria parasitica*) commonly called Endothia parasitica in Georgia. This pathogenic fungus is particularly aggressive to the chestnut trees weakened for various reasons and causes their withering. As a result of such an impact, there are many damaged or faded trees in the forest.

Plant species included in the Red List of Georgia

Plant species with different conservation values are found in great numbers in the impact zone (species included in the Red List of Georgia, Red Book of Georgia, Rare) and plants with economic value. The list of Red Book species are given in Table 6.1 below.

Table 6.1. Red Book species found in the impact zone

Georgian	Latin	Protection Status	Basis for including in the Red List of Georgia
Imeretian oak	*Quercus imeretina*	VU	Endemic, small fragmented area
Common nut	*Castanea sativa*	VU	Tendency of the area reduction and fragmentation
Elm Zelkova	Zelkova carpinifolia	VU	Small fragmented area
Walnut tree	*Juglans regia*	VU	Small fragmented area
Colchic willow	*Buxus colchica*	VU	Tendency of the area reduction and fragmentation
Common bladder-nut	*Staphylea pinnata*	-	Red Book of Georgia, 1982, small area
Common persimmon	*Diospyruslotus*	-	Red Book of Georgia, 1982, small area
Common chestnut	*Castanea sativa*	VU	Tendency of the area reduction and fragmentation
Persian walnut	*Juglans regia*	VU	Small fragmented area

Fauna

Survey results conducted by zoologists in Zemo Imereti region, namely within Rikoti Pass, mountainous massifs of Kharagauli and Zestafoni municipalities are used for description of species composition of animals in the project corridor. Existing information is also filled with the field works carried out in the EWH corridor (Rikotula River gorge).Local fauna comprises representatives of systematic categories of the wildlife, starting from Protozoa and completed with mammals. Over time, fauna of the region was significantly changed by the agricultural activity of human.

Specialists assessed condition of fauna in the adjoining forests of the study area. The fact that complete assessment of the local wildlife is rather difficult should be also considered. During the field works, special attention used to pay animal feces, traces and holes. As for the ornithofauna, it was assessed by visual observation and according to their nests. Together with these methods, information from the literary sources was also used. The conducted surveys, together the literary sources gave us the opportunity to make some certain conclusions.

In terms of biodiversity of animals, initial part of the corridor is noteworthy (from the outlet of the tunnel to the section of Khevi village), where human impact is less noticeable. Study corridor that runs through Khevi village is anthropogenic and natural habitats are less preserved there.

Difference between the right and left slopes of Rikotula River is also noteworthy. Functioning of the highway on the right bank is the main source of disturbance of animals and therefore, this area is not a significant habitat for them. Natural landscape of the left bank is quite undamaged. Due to the dense vegetation cover, impact caused by noise of transport movement and emission of combustion products is relatively low. It is important to note that there is no artificial barrier between Rikotula River and the forested area on its left bank, and animals depending on water can move toward Rikotula River without any obstacle. Hence the left bank of the river sustains more wildlife and is important for their habitation.

Mammals

24 species (even more) of mammals are spread in the region. This group includes the species which are on the verge of extinction. Among the predators we can point out bear – *Ursusarctos,* Caucasian wolf - *Canis lupus,*otter - *Lutra lutra (*CR, IUCN)lynx - *Lynx lunx,* forest cat -*Felis silvestris.* From the hooves are famous roe - *Capreolus capreolus*and from rodents *squirrel (Sciurus anomalius)* (Table 6.2).Red Book species found in the impact zone are Black bear (*Ursus arctos*) and Lynx (*Lynx lunx*) (Table 6.3).

Given the fact that Rikotula river is within the construction zone and after the completion of the construction about 5 km long section of the river will pass between two highways (western portal of tunnel - village Khevi), additional problem will be created on the left bank of the river, namely, animals will have some barriers to water resources.

One of the main mitigation measure is to arrange exits for animals on new highway in accordance with the relevant rules *(Bekker at.al. 2003),* which involves arrangement of crossings with intervals from 200-300 m up to 3-4 km. The distance between these crossings depends on species of local fauna (for large animals - 1-3 km, for medium size animals – 1 km, and for small animals - 200-300 m). After completion of construction works, if migrated animals will be back they will have access to drinking water.

Table 6.2. Mammals of the study area

Species	In Latin	Biotype
Roe Deer	*Capreolus capreolus*	Forest
Sow (wild)	*Sus scrofa*	Forests - shrubs
Black bear	*Ursus arctos*	Forest
Wolf	*Canis lupus*	Forest
Jackal	*Canis aureus*	Forests - shrubs
Fox	*Vulpes vulpes*	Forests - shrubs
Lynx	*Lynx lynx*	Forest
Jungle-cat	*Felis chaus*	Forests
Marten	*Martes spp*	Forests - shrubs
Caucasian squirrel	*Sciurus anomalus*	Forest
White-toothed shrew	*Crocidura russula*	Forest
Badger	*Meles meles*	Shrubs
Common shrew	*Sorex araneus*	Forest

Table 6.3. Red Book species found in the impact zone

Species	Latin	Protection Status
Black Bear	***Ursus arctos***	EN
Lynx	***Lynx lunx***	CR

Avifauna

Avifauna is represented by the species typical for forests, such as sparrows, woodpeckers, owls, does, etc. The variety of birds visits these territories during the spring and summer periods. There is a great doubt that the constructions might damage these species in future. Rocky places should be investigated as the rare birds of prey may inhabit here and the activities outlined in the project might negatively impacts on them.

During the field survey, the following species were observed (Table 6.4):

Table 6.4. Avifauna species recorded in the project area

Species in Georgian	Species in English	Biotype
Hawk	Accipiter gentilis	Forests
Pigeon	Columba palumbus	Forests
Forest owl	Strix aluco	Forests
Cuckoo	Cuculus canorus	Forests
Green woodpecker	Picus viridis	Forests
Dunnock	Prunela modularis	Forest edges
Blackbird	Turdus merula	Forests and steppes
Titmouse	Parus caeruleus	Forests and steppes
Jay	Garrulus glandarius	Forests
Finch	Fringilla coelebs	Forests
Goldfinch	Carduelis carduelis	Forest edges

Reptiles

The herpetological fauna of the region is not diverse. According to the data eight species of lizards and six species of snakes inhabit on these territories. Adjarian lizard –*Lacertarudis*, Caucasian lizard - *L.caucasica* (VU) Dagestan lizard - *L.dagestanica* (VU) are Caucasian endemic species. Snakes: Caucasian nedder - *Vipera kaznakovi* (VU), *Vipera transcaucasiana, Elaphe longissima eskulapes, Natrix tessellata, Natrix natrix, Coronella austriaca*.

Amphibians

From the amphibians the following species are spread: various species of efts-*Triturus sp.*, *Hyla arborea, Rana macrocnemis, Rana ridibunda*. Caucasian endemic species: *Pelodytes caucasicus* and Bufo verrucosissimum.

Invertebrate

The following families are spread in the study area: *Nematoda, Oligocheta, Hirudinea, Mollusca, Crustacea, Arachnida, and Insecta.* From the univalves is famous *Helis buchi,* which is of therelict form and represends the endem of the South Caucasia. It is a vulnerable VU taxon and should be included in the red list. Invertebrate fauna is mostly of mesophilic species which are spread in forests. Some of them inhabit in high zones of the Caucasian mountain. Butterflies are most interesting species inhabited in high mountains. Local butterflies are diverse. Among them there are many endemic, relic and rare species: *Parnassius apollo* VU and *Allancastria caucasica* VU.

Aquatic life

Fish fauna and hydrofauna (plankton, benthos, peryphiton and macrophytes) of 10.2 km long Rikotula River is not studied. Study of fish fauna and hydrofauna has been conducted in lower, middle and upper reaches of Kasleti River, including the project influence zone. The study included the history of local, experienced fishermen (interview method).

The small rivers and springs existing in the corridor of the road construction site are water aboundand during melting the snow they cause flood sna landlines, therefore the rivers are less rich in fish fauna.

84 species of freshwater fish are spread on the territory of Georgia. Fish fauna of the study area is represented by following species: Loach (Cobitis aurata); Mtkvari nase (chondrostoma curi); Dnieper chub (Leuciscus borysthenicus); Caucasian goby (gobius cephalarges constructor); common barbel(Barbus barbus) and Khramulya (Varicorhinus Capoeta).Fish species in the study area have a certain value for population in terms of fishery and additional food.

Protected Areas

Protected areas are not presented in the target area. The closest protected area is Borjomi-Kharagauli national park. The distance from the project area is 6 km and more.

Borjomi-Kharagauli Protected area is located in the central part of Georgia and comprises the eastern part of Lesser Caucasus. Its total area is 85,083 hectares, i.e. more than 1 % of the total territory of Georgia. Borjomi-Kharagauli protected areas comprisessix regions: Borjomi, Kharagauli, Akhaltsikhe, Adigheni, Khashuri and Baghdati. Administrative and visitor centersof the national parks are located in Borjomi and Kharagauli. Administration of the National park monitors four separate protected areas – Borjomi reserve, Borjomi-Kharagauli national park, Nedzvi Managed Reserve and Goderdzi Petrified Forest Natural Monument.

Borjomi-Kharagauli National Park is located in the center of Caucasian eco-region. Due to its vulnerability and rich biodiversity the Ecoregion is included in World Wide Fund for Nature's priority list of 35 most outstanding natural places and Conservation International's list of 34 biodiversity hot spots.

6.5 Quality of Environment

As per the measurement data, the background radiation in the study corridor is lower than the existing radiation background in Georgia and varies between 6 and 12 mR/h. The nearest point, where the background radiation indicator was measured in September of 2016 by the National Environmental Agency, was in the city of Zestaponi. As per the Agency's information, the radiation background was 11 mR/h.[1]

Background noise along the study corridor is provided in Table 6.5 below. As described in chapter 2.6.3, the maximum permissible level of noise during daytime is 70 dB. However, based on National Legislation „10 dB A- higher levelsare permitted on highways of urban and regional importance". thus, basic level of noise in the project area is within the norm.

Table 6.5.1 Results of the measurements of background noise in the project zone

Point of measurement	**I datum**	**II datum**	**III datum**	**IV datum**	**V datum**	**VI datum**	**Mean value**
East end of Rikoti tunnel $42^0 03^{II} 11.33^{II}$ N: $43^0 25^{II} 50.88^{II}$ E;	81.8	76.0	82.8	79.2	75.4	77.8	**78.8**
West end of Rikoti tunnel $42^0 03^{II} 50.48^{II}$ N: $43^0 28^{II} 54.61^{II}$ E	80.4	77.8	81.2	77.5	78.0	80.2	**79.1**
Restaurant "Jargveti" $42^0 05^{II} 36.57^{II}$ N; $43^0 25^{II} 21.62^{II}$ E	79.2	79.6	81.2	78.8	81.4	80.7	**80.1**
Restaurant "Khevi" $42^0 05^{II} 41.50^{II}$ N; $43^0 25^{II} 34.71^{II}$ E	78.8	79.0	80.2	75.8	78.9	79.3	**78.6**
"Tsakvi spring" at 126 m from the existing road $42^0 05^{II} 32.18^{II}$ N; $43^0 25^{II} 20.42^{II}$ E	55.2	55.6	56.4	55.6	55.4	56.1	**55.7**
Adjacent to the new road (132 m) $42^0 05^{II} 34.51^{II}$ N; $43^0 25^{II} 26.92^{II}$ E	52.4	53.2	53.4	52.7	52.4	52.5	**52.8**
Village Khevi; on the existing road $42^0 05^{II} 44.55^{II}$ N; $43^0 25^{II} 51.74^{II}$ E	77.5	76.9	76.8	77.3	77.4	76.9	**77.1**
Village Khevi;adjacent to school $42^0 05^{II} 44.55^{II}$ N; $43^0 25^{II} 51.74^{II}$ E	55.7	56.9	55.6	57.2	56.8	57.1	**56.5**
Village Khevi; on the existing road $42^0 05^{II} 50.22^{II}$ N $43^0 24^{II} 19.46^{II}$ E	78.2	79.1	78.8	80.2	79.4	78.6	**79.0**
Village Khevi; on the existing road $42^0 05^{II} 49.35^{II}$ N; $43^0 24^{II} 08.72^{II}$ E	79.4	78.7	78.2	78,4	80.2	78.6	**79.0**

Results of chemical analyses of the surface water quality in the river Rikotula are provided in Tables 6.5.2. and 6.5.3. below. Generally, the water quality is good and the river water can be used both, for drinking (after relevant treatment) and for the technical purposes during construction works.

[1] Information Bulletin #9 - http://nea.gov.ge/ge/service/garemos-dabindzureba/7/biuleteni/

Table 6.5.2. Physical parameters of the river water

River	Temperature	PH	Turbidity	Electrical conductivity
Rikotula	**18.4**	**7.8**	**0.29**	**0.084**

Table 6.5.3. Chemical parameters of the river water

River	Cl	CO_3	SO_4	Ca	Mg	Na	K	DO	TDS
Rikotula	5.1	37.7	7.4	9.0	4.1	6,0	0.4	9.6	79

Soil quality along the existing section of the highway was determined by measuring content of heavy metals. Results are provided in Table 6.5.4 below. The chemical study of the soil evidenced that the content of heavy metals in the soil other than lead (PB) meets the effective Dutch and world standards for soil. An increased content of lead was found not only along the project section of the main road, but also along the entire highway as a result of using leaded petrol for the vehicles for decades. Due to a very long impact period, legacy pollution from the 20th century is still present in the highway corridor.

Table 6.5.4. Metal content in soil along the EWH corridor

#	Sampling point	**Cu**	**Pb**	**Zn**	**Co**	**Ni**
1	$42^0 05^{II} 36.57^{II}$ N; $43^0 25^{II} 21.62^{II}$ E	50	80	170	40	35
2	$42^0 05^{II} 41.50^{II}$ N; $43^0 25^{II} 34.71^{II}$ E	50	80	180	40	35
3	$42^0 05^{II} 44.55^{II}$ N; $43^0 25^{II} 51.74^{II}$ E	50	70	180	40	30
4	$42^0 05^{II} 49.35^{II}$ N; $43^0 24^{II} 08.72^{II}$ E	50	80	150	40	35

Atmospheric air quality

Before 1991, the atmospheric air quality was permanently monitored in large cities was Georgia. As for the project area, due to great distances from it to the settled areas, the degree of pollution of the atmospheric air with harmful substances was never measured.

The present data of the air are needed to totally evaluate all possibilities of the atmospheric air impact associated with the atmospheric air pollution in the road area adjacent to Rikoti tunnel.

As there has never been a station near Rikoti tunnel to observe the atmospheric air, the degree of pollution of the atmospheric air in the study area can be measured by using the methodology guidelines, in particular, "Background concentrations for cities and settled areas with no observations over the atmospheric air". The values of concentration of harmful substances depending on the number of population are given in Table 6.5.6.

Table 6.5.6. Background pollution of atmospheric air near settlements

Number of population, thousand	Background concentration, mg/m3			
	Nitrogen dioxide	Sulfur dioxide	Carbon monoxide	Dust

men				
250-125	0,03	0,05	1,5	0,2
125-50	0,015	0,05	0,8	0,15
50-10	0,008	0,02	0,4	0,1
<10	0	0	0	0

There are no settled areas with more than 10,000 inhabitants adjacent to the study section of the highway. Hence the background data may be considered as equaling to 0.

6.6 Social-Economic Situation

General

Kharagauli municipality (with the area of 913,9 km^2) is located in the geographical center of Georgia, in the south-eastern part of Imereti. From the east, the municipality is bordered by Khashuri and Sachkhere municipalities, by Zestaphoni and Baghdati municipalities from the west, by Chiatura and Sachkhere municipalities from the north and by Borjomi and Baghdati municipalities from the south. The center of Kharagauli municipality is settlement Kharagauli. The distance from Tbilisi to Kharagauli is 180 km. Kharagauli municipality includes 20 territorial units. The number of villages in Kharagauli municipality is 78.

The area of Khashuri municipality is 585,2 km^2. Form the east and north it is bordered by Kareli municipality, from the north it is bordered by Sachkhere municipality, by Borjomi municipality from the south and west and by Kharagauli municipality from the west. The total length of the municipalities is 118 km. The distance from the country capital to the Khashuri is 120 km and it is 47 km to the regional center. The municipality includes one city (Khashuri), one settlement (Surami) and 11 rural administrative units including 84 villages.

The following villages are located in the community of Khevi of Kharagauli municipality, near the highway: Khevi, Grigalati, Tsitskiuri and Tsakva. The area of the administrative units of Khevi is 858,66 ha. The population of Khevi is 395 homesteads with 1349 residents. The distance from Kharagauli to the administrative center is 47 km and 37 km to the nearest railway station Dzirula.

Village Khevi is located on the western slope of Likhi Ridge, on the bank of river Rikotula, at 520 masl. The old name of the village is Khevijvari.

Village Tsakva is located on the western slope of Likhi Ridge, on the left bank of river Rikotula, at 650 m (sea level), 48 km from Kharagauli.

Village Grigalati is located on the northern slope of the dividing ridge of the rivers Dzirula and Rikotula, at 600 masl, 48 km from Kharagauli.

Village Tsitskiuri is located on the western slope of Likhi Ridge, on the left bank of river Dzirula, at 540 masl, 50 km from Kharagauli

Local Population

As per the data of 2016, the population of Kharagauli municipality is 19,4 thousand people making 0,52% of the total population of Georgia and 3,64% of Imereti region. The number of residents in Khashuri municipality makes 1,41% of the total population of Georgia and almost 20% of Kartli region. As compared

to the previous year, the number of population in Kharagauli municipality has decreased and it has increased in Khashuri municipality. The absolute majority of the population in both municipalities is the Georgians.
As per the official statistics (source: National Statistics Office of Georgia), the number of the population in Kharagauli and Khashuri municipalities is shown in Table 6.6.1.

Table 6.6.1. Population index, thousand people

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015**	2016
Georgia	4 401,3	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
Imereti	700.1	697.6	694.2	693.5	700.4	704.5	707.5	703.9	703.3	533.6	532.9
Kharagauli municipality	27.6	27.5	27.4	27.4	27.5	27.5	27.4	27.2	27.1	19.5	19.4
Shida Kartli	314.0	313.6	312.8	313.0	310.6	313.0	314.6	313.5	313.8	263.4	263.8
Khashuri municipality	61.8	61.6	61.4	61.4	62.3	62.5	62.6	62.4	62.5	52.6	52.7

Note. The data with ** are based on the general population census of November 5, 2014 and sum of the total population growth for the last two months of 2014 (natural increase + migration balance).

As per the census data of 2002, there were 1362 residents in the community of the Khevi, with their absolute majority being the Georgians. The number of population of the community, by villages and sex is given in Table 6.6.2.

Table 6.6.2. Number of population of the villages under the project impact

Village	Number of population		
	Total	Men	Women
Khevi community	**1362**	**665**	**697**
Khevi	269	137	132
Stakva	369	186	183
Grigalati	469	226	243
Tsitskiuri	255	116	139

Employment

The specific weight of the self-employed in the total number of the employed in Imereti region is high constituting mainly the rural population with 1 ha or more land plot area. As per the official statistics (source: National Statistics Office of Georgia), by 2015, the number of the active population (labor force) in Imereti region was 376,5 thousand people, including 343,5thousand employed. The number of self-employed is 229,8 thousand men. The unemployment level is 8.8.%.

The economically active population of Kharagauli municipality is mainly employed at public bodies, in education, timber industry, production, sales and processing of agricultural products and tourism.

The number of active population in Shida Kartli is 148,9 thousand people, with 93,1 thousand people being self-employed. The unemployment level is 9.0%.

As for the residents of the villages near the project highways, their absolute majority is self-employed and the unemployment level is high. The main source of income is agriculture (mostly, cattle-breeding, corn-growing and bee-raising). The population sells the agricultural products at the municipal centers. It should also be noted that a certain proportion of the rural residents takes the agricultural products (maize, honey, etc.) at the roadsides to sell them. In addition, there are some public outlets located along the road.

Industry

During the Soviet times, industry was well-developed in Kharagauli municipality, with food enterprises, mining industry and timber plants, wine, milk and furniture complexes of enterprises. At present, the industrial scales have declined a lot. They produce stone blocks, process the timber and bottle mineral water "Zvare". Out of the industrial enterprises of the municipality, a bentwood furniture factory in Marelisi (working under full load at present) and exploitation sites of mineral resources, such as marble (in Khoriti), granite (in Vakhani, Moliti), curb and building stone (in Khandebi, Kozmani), JSC "Imeri" operating with the resources of a former wine factory "Samtresti" and several small timber processing enterprises are worth mentioning.

Folk trade is highly developed in the municipality: the residents of Sakasria, Vertkvichala, Tsikhisdziri Makatubani and Khevi weave baskets, vintage baskets, flower bowls and breadbaskets with lime-tree and cherry-tree bark and nut wicker with high techniques and make pots, jugs, wine bowls and pitchers with clay. They decorate the clay ware by glazing, painting, scratching and with relief figures.

No entrepreneurial objects are found near the project corridor.

Agriculture

The major branch of economic activity in the study area is agriculture. 1.5% of the total area of Kharagauli municipality is used for agricultural purposes. 70.9% of this territory is occupied by pastures and 29.1% is used for ploughing and sowing, annual crops grow over 22.5% of the area, permanent plantings grow over 11,5% and perennial plants grow over 6,6% of the area. Out of agricultural branches, cattle-breeding and bee-raising are developed the best. Kharagauli municipality is the leading municipality of bee-raising in Georgia. The branches of specialization are: vine-growing, fruit-growing, maize-growing and cattle-breeding.

The qualitative properties of agricultural production are quite high in the municipality. Despite the fact that the processing industry is less developed in the municipality, virtually with no medium or large farms there, the region has very high basic indicators in the qualitative and ecological respects of the agricultural production.

As mentioned above, the main source of income of the population on the villages adjacent to the study area is the sales of agricultural products.

Tourism

Tourism plays an important role in the economics of the municipality, with Borjomi-Kharagauli National Park and Nunisi resort on the territory of the municipality being major destinations promoting the development of tourism there. The project area, in tourism respect, is less valuable. There are no tourist routes or internationally important historical-cultural monuments or tourist facilities (hotels) in the municipality.

6.8 Historical and Cultural Heritage

No historical or cultural heritage has been observed adjacent to the project zone. Nearest historical monuments are located in 1 km from the project area and the project will not have impact on them.

The ancient archeological remainders found on the territory of Kharagauli municipality prove that the people here lived a seeing life for the whole history. There is a cave named "Devis Khvreli" in the municipality, where the primate man lived in the Early and Upper Paleolithic Ages.

A treasure of bronze items in Bezhatubani dated by the XI-X cc. B.C., a famous necropolis in Sargveshi where the archeologists found golden things dated by the Antique epoch, a miniature monument of a ram found on the territory of village Lashe dated by the VII-V c. B.C. and the treasure of Bori dated by approximately the I c. B.C.-III c. A.D. are worth mentioning. A rich antique tomb was found in village Sargveshi where the archeologists found a silver cup, rings, bracelets and beads. These items belong to the I c. A.D. A great number of monuments of the feudal age are found in the municipality: a three-nave Basilica in Ubisa, a Church of Godmother of Nunisi, a church of St. George in Vani and the Kozman church in Boriti. Important monuments of the XI-XIII centuries are the Gedsamania, Tbeti, Lashe and Nebodziri churches and many others. There are many ancient spiritual, secular and fortification buildings and castles and towers in the area.

As of the historical-cultural monuments in the villages near the project corridor, they are as follows:
"Okoni" Church of St. George in village Khevi built in the XIX century where the people celebrate the "Day of Okoni".

There is St. George Church in village Tsakva. In Tsakva, during the earthworks, they accidentally found a clay pot with silver Arab coins of the VII-VIII century evidencing the link of this region to the old world.

There is St. Nicholas Church in village Grigalati and there is a Church of Godmother in Nebiereti district built in the middle centuries. There is St. George Church on Rikoti Pass. The recent excavations in village Grigalati revealed clay and metal items. The oldest piece of this collection is the clay makes with Asomtavruli (old Georgian script) inscriptions dated by the XI-XIII cc.

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. 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 highway area between Chumateleti and Khevi 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, the last, 2-km-long section of the corridor is most sensitive. This section runs across the settled area of village Khevi. In some cases, MAC may be exceeded estimated as average values.

Impacts in the operation phase

The modernization of EWH will increase its capacity and with a greater 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 MENRP 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

Based on the best possible estimates, operation of the upgraded section of EWH will not tangible increase nuisance from dust and emissions. However these parameters should be periodically measured and in case of

unacceptable increase, mitigation measures be worked out. Overall, maintaining vegetation in the road corridor will serve as an effective tool for dust control.

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[2] will 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-km-long section of the EWH section between Chumateleti and Khevi is of higher sensitivity. During the intense works along this section, the noise in excess of 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.

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

Noise and vibration propagation 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 last, 2-km-long section of the EWH between Chumateleti and Khevi is likely to have a negative impact on the residents of adjasent houses and the school located close to the road. According to the SNiP 2.05.02-85 the distance from the edge of the mainline roads (highways) till the border of the residential area should be taken not less than 50m, and in case of application of the noise protective facilities, not less than 25m. At the stage of developing the detailed design, the list of buildings and premises to be relocated at the project implementation stage will be specified accurately.

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 Khevi 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:

- Explosions near the sensitive sites must be prohibited.
- Heavy technique is to be replaced by the light one.
- Hand labor is to be used in particularly sensitive areas.
- Maximum one unit of techniques, which is a source of vibration, must operate on the construction site.

In case of accidental damage of buildings and premises Construction contractor will conduct assessment of damages, compare with existing baseline information and corresponding remedial actions (e.g. reparations, etc.) proposed to the affected party. If damages can't be mitigated or fixed the affected houses and other buildings will managed in accordance to the principles of the RPF[3] and it will be compensated in full for the whole building irrespective of the specific degree of impact. Compensation will be provided in cash at replacement cost free of deductions for depreciation, transaction costs or salvaged materials. All relevant PAPs are entitled to this provision by default irrespective of the registration status of the affected item. Salvaged materials after demolition of the building are deemed to be owned by the AH.

[3] RESSETTLEMENT POLICY FRAMEWORK (RPF) = Update of Feasibility Studies for E-60 Highway Section from Zemo Osiauri to Argveta and Undertaking Detailed Design for E-60 Highway Section from Zemo Osiauri to Chumateleti

Mitigation measures in the operation phase

Once the highway section enters into operaiton, RD should conduct monitoring of noise levels and depending on the outcome, consider placement of noise barriers within the Khevi village, while local municipal authorities should give priority to greening of the school area.

7.3. Geohazards

Impact in the construction phase

As it was already mentioned in the geological baseline description, the project corridor passes through a quite complex terrain. Some sections are damaged by landslide and other gravitational processes, as well as by water erosion. Landslide processes are endangering the stability of the road. A few years ago, a large mass has been collapsed due to which the movement towards east-west direction has been paralyzed.

Activation of dangerous geological processes is expected at the construction phase. Risks of destabilization of the rocks will be primarily related to the removal of vegetation cover and felling, grounding works (in order to expand road embankment). Besides, activation of dangerous geodynamic processes may be caused by the preparation of a new corridor roadbed, by the arrangement of road-engineering structures and improper management of waste rocks.

Dangerous geodynamic processes are likely to rise, especially in rainy days and during the snow melt. Disorganized management of surface runoff will be an additional factor for intensification of the erosion processes, therefore significant attention must be paid to the arrangement of draining channels and their proper operation.

In general, at the construction phase, the risk of dangerous geological processes can be assessed as high, for which appropriate engineering solutions are required, including: removal of active layer from the slopes and reduction of slope tilt angle, arrangement of protective walls, mine drainage channels, etc.

Impact in the Operation Phase

The major reason of activation of geodynamic processes during the operation of the road is lack or malfunctioning of draiage system on the cut slopes and failure in bringing back the vegetative cover.

Mitigation measures in the construction phase

In order to maintain geological stability, special attention should be paid to the earth works. In order to ensure stability of the slope, it is required to remove active landslide bodies as far as possible and to terrace the slope, as well as to drain rain and spring waters through bypassing the steep slopes and other sensitive areas. Site reinstatement, including landscaping, compacting of slopes, and providing adequate drainage must be an integral part of construction works and a contractual obligation of works provider.

Mitigation measures in the operation phase

Erosion of cut slopes is the main threat at the operation phase. This impact may be mitigated by proper design, arrangement and maintenance of drainage on the cut slopes, proper planning and executing of compensatory planting/greening, and providing enabling environment for the natural regeneration of vegetation. In case of unexpected activation of deep geological activity, additional measures for slope stabilization may be required.

7.4. Hydrology and Aquatic Environment

Impacts in the construction phase

Tunnel construction may influence ground water system. During tunneling, there is the probability of crossing water-bearing horizons, which may result in drying of individual springs. In addition to the tunnel construction, intensive earth works may also have an impact on groundwater debit. It is difficult to forecast such impact. The impact may be considered significant, taking into account the length of the tunnel, amount of earth works to be carried out, and hydrogeological conditions of the area. However, the area of impact is rich in springs usable for drinking purposes and significant reduction of water resources is not expected.

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

Building up a strip of land on the left bank of the river will limit to some extent feeding of groundwater with precipitation (rain/snow). However, the impact will be insignificant. Other expected impacts are also low and typical for the operation of any road. These include pollution of the highway corridor with the trash thrown from the passing vehicles, pollution with construction waste generated during maintenance works, and pollution with oil products and other contaminants carried by the storm water runoff. Accidents involving cargo vehicles may result in dumping or spillage of the carried matter, due to proximity of this section of the highway to the river, pollution may easily enter the watercourse. However reconstruction of the EWH 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 Rikotula River 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 MENRP.

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.

7.5. 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 building 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.

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 7.

Mitigation measures in the operatin phase

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

7.6. Vegetative Cover

Impacts in the construction phase

During the modernization of the Highway significant impact is expected on vegetation cover and forest ecosystem, namely both direct and indirect impacts are expected during construction works.

Direct impact is vegetation removal from the right of way of the road. In this regard, forested areas including artificial forest plantations should be noted, which is also observed within the project corridor. Forests are considered as special environmental protection areas, from ecological, aesthetic, cultural, historical and geological point of view as the unique and most important ecosystems. 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 protecteda areas."It should be noted that several species included in the Red List of Georgia may be also impacted. Species and quantities of palnts to be cutted will be specified as a result of detailed botanical study.

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 forest ecosystem during construction phase can be considered as high.

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

Prior to cutting the trees, it is required to obtain permit (Decree of the Government of Georgia on the "exclusion of certain areas from the State Forest Fund"; tree-cutting works shall be implemented under the supervision of specialists of the National Forestry Agency.

The forest use procedure under the legislation of Georgia is envisaged by Decree of Government of Georgia No 242 of 20 August 2010 on Forestry Regulations, under which the project area must be de-listed from the State Forest Fund of Georgia.

A permit to de-list trees and plants from the State Forest Fund of Georgia is issued by the National Forest Agency excepting the vegetation species protected by the Red List of Georgia. A decision to de-list trees and plants from the Red List of Georgia is made by the Ministry of Environment and Natural Resources of Georgia.

A body issuing a permit to use the timber resources of the state forest fund sets the compensation measures the user has to accomplish after withdrawing the trees and plants from the environment.

As a compensation measure, a user shall undertake to restore (reproduce) the resources of Red-Listed species with 1:10 ratio and with 1:3 ratio in other cases at his own expenses.

The State Forest Fund registration is the function of the authorized bodies of the National Forest Fund.

Based on the agreement with them, the registration of the State Forest Fund can be done at the expense of a physical or legal entity.

In case of withdrawal of the Red-Listed trees and plants from the environment, the concerned party shall apply to the Ministry of Environment and Natural Resources Protection of Georgia in writing regarding the presence of the Red-Listed species in the project area.

The Ministry of Environment and Natural Resources Protection of Georgia (Forest Agency or Agency of Protected Areas) shall examine the information about the presence of the Red-Listed species in the project area and shall 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). In the above-mentioned case, a decision on obtaining (withdrawing from the natural environment) the threatened wild plants or their parts is made by the Government of Georgia (clause 23, article 24).

Within the scope of the project in question, the forest inventory will be carried out and the forest management plan or forest use plan will be developed by the Consultant after the detailed design of the project is developed.

For conservation and restoration of the vegetation cover, instead of damaged forest the same species of plants should be cultivated and maintained on the free areas adjacent to the project corridor, which will reduce the residual impact up to theaverage value.

Arrangement of artificial vegetation cover on pre-selected areas within the EWH corridor can be considered a significant mitigation measure.

In order to compensate for the damage to vegetation, compensatory planting shall be carried out within the proposed highway corridor in agreement with the Ministry of Environment and Natural Resources Protection of Georgia (in particular with the "National Forestry Agency") and local self-government bodies. Plant maintenance to be carried out for at least 2 years. Recommended compensatory measures are - planting 3 roots of the same species for each damaged (removed from the environment) specie. Compensatory measures for red list species (Imeretian oak, Common nut, Elm Zelkova, Walnut tree and Colchic willow) shall be carried out at a ratio of 1/10. The Red-Listed seedlings are available at the following nursery-

gardens: (a) Gori nursery-garden, (b) LEPL Sartichala nursery-garden, and (c) nursery-garden Green Service Ltd.

7.7 Wildlife

Impacts in the construction phase

Works on the EWH will be implemented in a fairly dense forested area and near the forest, which is a significant habitat of numerous animal species (including the Red List species).

Impacts during the construction phase are:

- As a result of vegetation cover removal and earthworks habitats (nests, holes) may be lost. Tree-vegetation cuts will also affect the food base;
- Construction of additional two lanes of the EWH on the left bank of the river along approximately 5 km will cause fragmentation of terrestrial habitat of animals (including small mammals, reptiles and amphibian). Movement of some species of animals from forested area to the riverbed will be limited. This will affect their reproduction, food extraction;
- 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, as well as human intensive activities will cause animal disturbance and migration to other places;
- 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 should be assessed as high. Construction work carried out under the conditions of appropriate mitigation measures, as well as the completion of the construction works for recultivation, somewhat 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 highway, 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.

Due to habitat fragmentation is expected in the first section of the EWH corridor between Chumateleti and Khevi. This is where the newly constructed carriageway on the left bank of the river will separate from each other the forested zone and Rikotula riverbed.

Natural ravines crossing the highway corridor are charachterised with low waters and fish fauna is 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. Impact on fish fauna is expected during the maintenance works of the road in case of pollution of Rikotula River.

Overall, during the operation of the Highway, impact on animals may be assessed as medium.

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 color 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. Light shouldn't be directed toward the forest zone
- 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 highway, all mitigation measures should be considered (developed for the construction phase), which will reduce emission of harmful substances and water pollution.

7.8 Fisheries and Aquatic Habitats

Impacts in the construction phase

Temporary impacts on fisheries may include direct contact by construction equipment with, sedimentation and water turbidity in the immediate vicinity of the construction work area, and the potential for minor introduction of pollutants from construction operations. As already mentioned, the river Rikotula is not distinguished for rich in Ichthyofauna. Besides, the construction works are planned along small sections what will enable most of the species to move far from the construction site and return to their original habitats after the construction is over. Moreover, as most of the species present here, except Caucasian goby (gobius cephalarges constructor), have the migration ability. Increased water turbidity will have a negative impact on the spawning. This is particularly true with the species spawning in low water with a stony bed and oxygen-rich current. Such species are: (i) chub (Leuciscus borysthenicus), which spawns once a season, in April or May, (ii) khramulya (Varicorhinus Capoeta), spawning several times a season, from May through

August, and (iii) barbell (Barbus barbus), which spawns in May or June, once a season. Increased river water turbidity or spills of hazardous substances during the spawning season of these fish species may lead to the total destruction of hard-roe on the site.

Mitigation measures in the construction phase

Mitigation measures will be implemented to reduce impacts to fisheries and aquatic habitat during construction. Placement of machinery in at least 50 m from the water bodies (wherever possible. If this seems impossible, permanent control over and safety measures are necessary to avoid water pollution):

- Avoiding blocking the river bed during the works on the riverbed or near it.
- Prohibiting washing and fueling the vehicles near the riverbed.
- Ensuring a trouble-free operation of all vehicles to avoid the risk of fuel/oil spills in the water.
- Ensuring the right management of materials and waste.
- Ensuring proper management of the originated wastewaters. The wastewaters can be discharged into the surface water bodies only after their preliminary treatment.
- The waste originated during the works will be collected and temporarily stored in the specially designated area on the site, distanced from the water bodies.

7.9.Landscape

Impacts in the construction phase

Within the assessment of landscape impact and visual changes of the sight, the value of the selected territory, its natural quality and human impact on the mentioned territory are the most important issues. Consideration should be given to how noticeable is the EWH 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, as well as wildlife. The initial part of the corridor runs along the unpopulated areas. These sites are not under the visual sight of the population and the construction work will just impact on the animals and passengers. Situation is quite different in the corridor of the last road section. Main impact receptors will be population of Khevi village community (existing highway is well observed from the local villages).

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.

Drilling of the two tunnels will result in the generation of large amount of excess material. Its exact mount must be calculated at the stage of detailed design. Estimation of the volume and physical nature of the excess material is needed to understand how much of it may be used as a natural construction material and for backfilling, and how much will require permanent disposal.

There are two tunnels designed along Chumateleti-Khevi section of the HEW, with the total length of 2, 5 km. As per the preliminary calculations, approximately 600.000 m^3 cut-to-spoil material will be generated

from tunnel drilling. About the same mount will come from the construction of the new roadbed on the left bank of the river. Hence the total rough estimate of the excess material amount is 1.200.000 m^3.

Impacts in the operation phase

Main source of the visual impact is the traffic movement on the operation phase. Considering the current baseline condition (frequent traffic jams, emergency situations and so forth), operation of the road will have positive impacts. Planting of trees and plants along the road corridor will support restoration of the landscape components. Over time, the new infrastructure is adaptable and visual discomfort caused by visual changes will be less disturbing for the population. The impact can be 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 Khevi 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 cutting of slopes and drilling the tunnels will be placed 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 MENRP 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. Areas adjacent to the section of EHW between Chumateleti and Khevi offers a lot of locations for the temporary storage, but none for the permanent disposal of excess material.

Additional challenge related to the management of excess material is that part of it will be generated during construction of the new road bed on the left bank of Rikotula River, while the existing bridges over this river are not of capacity sufficient for carrying heavy vehicles loaded with cut-to-spoil material. Hence at the stage of the detailed design, a strong bridge of relevant parameters should be included. The preliminary design does not envisage construction of such bridge. Figures 7.1-7.6 show the sites proposed for temporary storage of the excess material.

Fig. 7.1: ($42^0 05^{II} 36.57^{II}$ N; $43^0 25^{II} 21.62^{II}$ E) and ($42^0 05^{II} 41.50^{II}$ N; 43025II34.71II E)

Fig. 7.2: $42^0 05^{II} 42.51^{II}$ N; $43^0 25^{II} 52.91^{II}$ E

Fig.7.3: $42^{0}03^{II}39.46^{II}$ N; $43^{0}27^{II}25.60^{II}$ E

Fig.7.4: $42^{0}05^{II}14.74^{II}$ N; $43^{0}27^{II}56.55^{II}$ E

Fig.7.5: $42^{0}03^{II}57.85^{II}$ N;$43^{0}28^{II}47.61^{II}$

Fig.7.6: $42^{0}04^{II}02.54^{II}$ N;$43^{0}28^{II}47.96^{II}$ E

The total area marked on these pictures is approximately 2,5-3,0 ha and it is sufficient for the temporary disposal of excess material.

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. risks of causing floods, waterlogging, ground subsidence, landslides and avalanches;
4. destruction of vegetative cover;
5. need for taking productive agricultural land and pastures.

The estimated area of 10-12 ha will be required for the final disposal excess material. This implies limiting the height of stockpiles to 5 m, which is optimal for mitigating risks of instability and negative visual impacts. The natural landscape in the vicinity of the Chumateleti-Khevi section of EWH allows no area for the disposal of the given mount of excess material. Niether is such area found in Khashuri municipality.

Following the visual examination of the territory and consultations with the local authorities, renting or buying up to 20 ha of agricultural lands on the left bank of Mtkvari River along Khashuri-Bakuriani road is one of the proposed options (Figures 7.7 and 7.8).

Figure 7.7 and 7.8. Possible sites for excess material disposal

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 Chumateleti-Khevi section of the HEW 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 Resettlement Action Plan (RAP) must be developed and diligently implemented.

Alternatively, excess material may be used for backfilling of partially reinstated quarries along other EWH sections. 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 the waste management planning is provided in Annex 6.

Mitigation measures in the operation phase

Significant mitigation measure for visual and landscape impact during operation phase is planting of greenery adjacent to the EHW corridor and its maintenance.

7.10 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 these, it is good practice to design a thorough community relations management plan. This plan should incorporate fidings of the preliminary community impact assessment and also provide tools to identify, manage and mitigate any additional nageive 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 prefious 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 save 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 unliskely 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.

7.11 Social Environment

Introduction

The 11.2 km long section of the EWH between Chumateleti and Khavi, in respect of social impact, can be divided into several sections with varying scales and types of social impact:

1. Section from Chumateleti to the east tunnel portal (1,5 km).
2. Coupled Rikoti tunnel (1,7 km).
3. Section from the west tunnel portal to the starting point of village Khevi (5 km).
4. Village Khevi (3 km).

The first and third sections are similar. Along these sections, there are mostly catering objects and individual traders who are local residents trading with their own harvest seasonally found in the area adjacent to the highway. The second section is a design tunnel and no social impact is expected on it. As for the fourth section, where village Khevi is located on both sides of the highway, the project will affect some infrastructure and privately owned buildings and premises. As a result of the project implementation, the number of acccess roads to the private houses will be drastically reduced. The major social issues to consider at the stage of project detailed design are: (a) small and private businesses, (b) access roads, and (c) public establishments.

Small private businesses

A direct impact of the project implementation on the first and third sections will be seen as an impact on the catering objects (9) located adjacent to the highway, fueling station (1) and individual traders, whose work is seasonal and lasts for 3 or 4 months a year. In October, 14 individual traders were fixed adjacent to the project section. 13 of them were interviewed (1 of them refused). However, as the interview evidenced, their real number is much more (by 2.5 or 3 times more) (Fig. 7.1 and 7.2). They are mainly the residents of the adjacent villages and trade with their own harvest (fruit, corn, honey, etc.).

The owners of the trading objects and their employees were also interviewed (Questionnaire for socio-economic study is given in Annex 8). During the interview, all interested persons were informed about the planned project and their questions about the topics interesting to them were answered (Fig.7. 3 and 7.4).

Fig. 7.1 and 7.2. Meeting with the street vendors


Fig. 7.2 and 7.3. Meeting with the representatives of small businesses


The information about the small businesses and prepmisess adjacent to sections 1 and 3 is given in Annex 5.

Due to the construction of the road junction planned in village Khevi, which, as per the project proposals, must be located in the center of the village, both, public establishments and private businesses and plots will be under the impact.

The detailed information about the land plots, business structures and premises in village Khevi, which will be under the impact, is given in Figure 7.4.

In addition, there is a turning point to village Tsakvi along the project road, at: $42^{0}05^{II}36.57^{II}$ N; $43^{0}25^{II}21.62^{II}$ E, 3 km from the highway. At present, this turning point is the only motor road to access the village with 80 homesteads.

Brief analysis of social survey

22 private and legal entities having businesses in the project zone were interviewed during the accomplished preliminary social research. 8 out of the 22, or 36% are legal entities, while other 14 (64%) are private entities. The number of the interviewed is presumably approximately 25-30% of the businessmen in the project area. Most of the legal entities (87,5%) own restaurants and catering objects, while one of them owns a gas-filling station. As for the individual traders, 4 (28.5%) of them sells honey, while others 8 (67.5%) sell the agricultural products grown by them (corn, pumpkin, nut, etc.) or products gathered in the forest (mushrooms, chestnut, etc.). A detailed social research will be carried out at the stage of developing the project resettlement action plan.

100% of the inquired people are ethnic Georgians. 86% of them live in adjacent villages and only 14% (two owners of the restaurant and gas-filing station) live in other regions of Georgia.

For 3 street traders out of the 14 interviewed people (31.5%), this business is the only source of income. 6 of them also receive a pension, while other 5 traders (27,5%) have alternative income sources.

As for 8 legal entities, for 5 of them (62,5%) business is the only source of income, while 3 (37,5%) have alternative income sources.

The overarching objective of the Project in relation to land and asset acquisition is to assist the project affected people (PAPs) in restoring their livelihoods at least to the level equal to the pre-project level. The measure applied along the EWH Ruisi-Agara section, when with the help of the local municipalities, the area for individual traders was selected and trading objects were built for the individual traders who formerly ran their business in an unorganized manner and now were given the possibility to run the same business in the area specially designed for them can be considered the best practice. It is desirable to accomplish a similar action in the project zone with the help of Kharagauli and Khashuri Municipalities so that the private entities should not lose their existing sources of income.

Also specific principles that apply include:

- Construct the road to avoid residential areas wherever possible to minimize physical relocation of people, and select alignments that minimize acquisition of privately or publicly held productive land;
- Adopt design standards that minimize the need to impose land use restrictions on adjoining areas;
- Develop fair and transparent procedures, as defined in the Entitlement Matrix in this RPF, to determine compensation for: (i) temporary loss of land/ assets during construction; (ii) permanent

acquisition of land and assets; and (iii) restrictions on use of land that may be applied to areas adjoining the corridor;

- Acquire land (or right to use land) through negotiated agreements and with the use of the power of eminent domain only as a last resort.
- Upon completion of construction, restore land as best as possible to its original condition in the event of temporary disruption so as to enable land owners/users/lessees to resume their pre-project activities;
- Keep affected people and communities fully informed about the project, the process that will be followed to acquire and compensate for land, and their related rights and avenues for redress.
- Ensure that grievances PAPs may have will be redressed adequately, and that solutions in line with principles laid out in this RPF be employed;
- All Project Affected People (PAP), without regard to legal status of property, will receive support of various kinds, as per the principles set out in the Entitlement Matrix, to assist them in their efforts to maintain their livelihoods and standards of living prevailing prior to the Project. Those who illegally own land will not be compensated for loss of land, but will receive compensation for loss of other assets which had been established on their own finance and for loss of income such that they are also assisted in their efforts to maintain their livelihoods. Detailed measures to be implemented will be determined based on the census and socio-economic survey to be carried out when Resettlement Action Plan is developed.
- PAP will be notified of the project implementation schedule and consulted regarding the principles of land acquisition and loss of or damage to assets.
- Damages to assets, such as standing crops, trees, fences and kiosks, and loss of income, including loss of harvest, will be minimized, and where inevitable, will be compensated without regard to legal status of ownership according to the Entitlement Matrix provided in this RPF.
- A RAP will be developed as per this RPF and Bank OP 4.12 as well as Georgian legislation for each section of the Project itinerary that defines detailed compensation packages and implementation schedule. Since, as discussed above, there are gaps between OP 4.12 and Georgian legislation and practice on expropriation, any land acquisition required for the Project will be carried out as per the principles and procedures laid out in this RPF.
- A market survey will be conducted to assess the prevailing market prices of land, construction materials for affected structures, crops and other relevant items, which will be used as the unit prices to determine compensation. This will additionally ensure that the market prices will allow PAPs to purchase replacement land.
- Loss of income and assets will be compensated on a net basis without tax, depreciation or any other deduction.
- The final RAP should be submitted to and cleared by the Bank prior to the execution of civil works for relevant sections.

The details of land acquisition procedure will be spelled out in RAP(s), but they will include:

- Initial consultation with PAP to notify the project and board impact
- Census, geographic survey and socio-economic survey of PAP
- Determination of PAP and types/ scale of impact
- Development of compensation package and drafting of RAP
- Consultation with PAP
- Negotiation with PAP and payment of compensation
- Expropriation process where negotiation fails

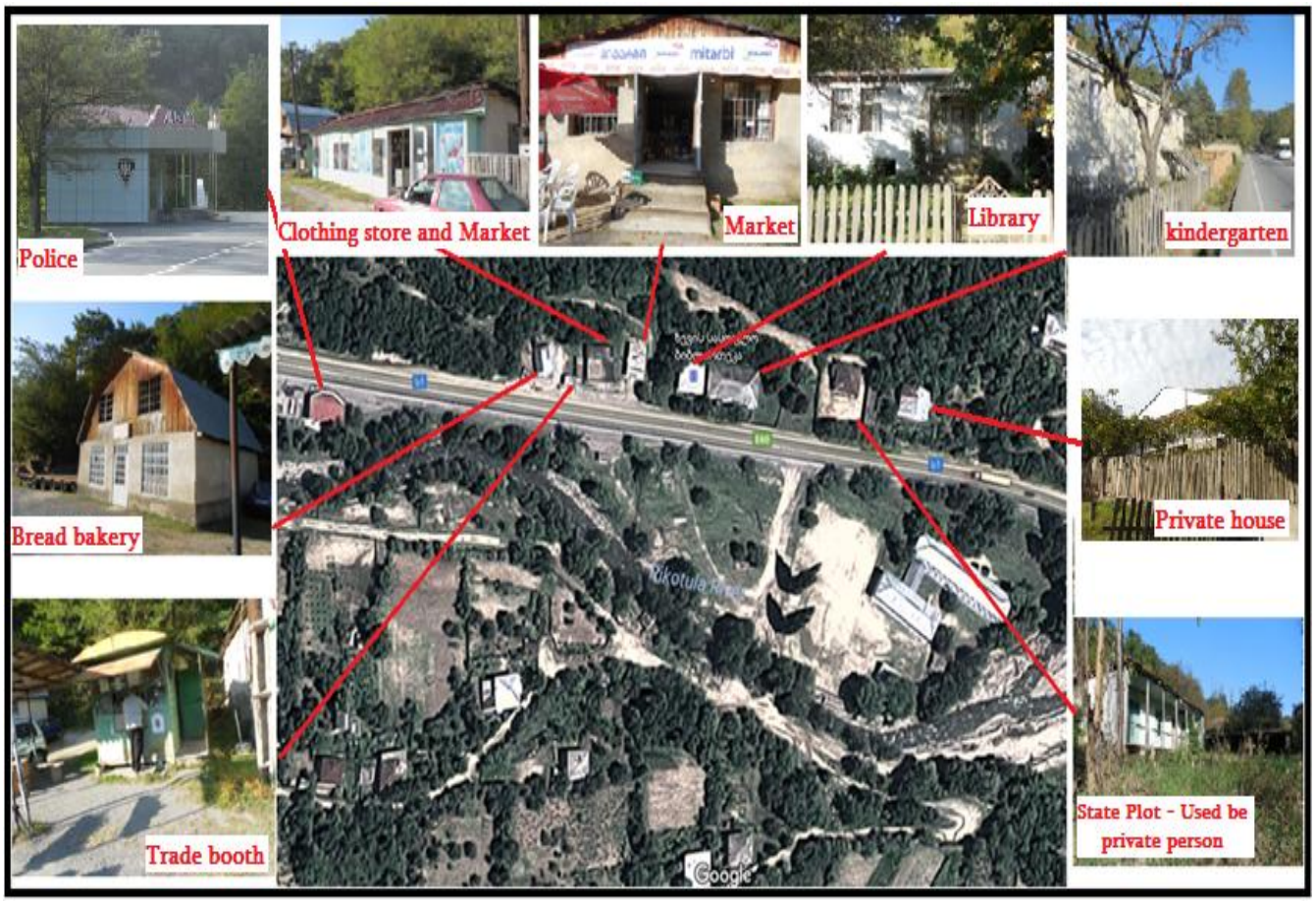
Village Khevi – access roads

As already mentioned, village Khevi is located on the both sides of the highway, covering the distance of about 3 km. in fact, the highway divides the village into two parts. At present, there are 12 motor turning roads from the highway to the village. In addition, following the technical parameters of the existing highway, it is possible to cross the highway by the pedestrians at any point. This facilitates the movement of the village residents from one part of the village to another.

After completion of works, the village residents will be able to get on the highway with their vehicles through the junction planned in the center of village Khevi. As for the pedestrians, they will be able to move from one part of the village to another only through the underground passage to be constructed in the center of the village. Following the parameters of the speed highway, neither the vehicles, nor the pedestrians will have the possibility to move from the autobahn to village Khevi or from one part of the village to another.

During Detailed Design stage it is necessary to implement mitigation measures for avoiding of worsening living conditions of the affected population.

Figure 7.4. Business structures and premises under the impact in village Khevi



Impact on Infrastructure – Restriction of Free Movement

Within the construction process in frames of the project section of E-60 highway, probability of impeding the transport movement is especially high. Movement between the villages will be complicated that will cause discontent of the local population.

Access Limitation on Local Natural Resources

Within the road modernization process, local water resources can be used. But as it was mentioned, project area is rich in high quality potable waters. Expected impact will be insignificant in this regard.

As a result of impeding transport movement, accessibility on forest resources for local population may be limited. Proper regulation of traffic flows is necessary to prevent such risks.

Security and Health Care

Within the road upgrading process, risks of impact on health and security of the personnel and local population may be related to unforeseen circumstances. Other impacts, such as noise, deterioration of air quality and others won't be considerable in case of proper mitigation measures.

Unforeseen circumstances imply accidents, falling from height, accidents during working with installations and machinery, etc. In order to prevent such risks, implementation of security rules should be paid great attention.

In the operation phase of the highway, risks of transport accidents are noteworthy. Highway will be widened as a result of the project implementation, inclination angles and turning radius will be sharply reduced,

quality of the road cover will be improved, traffic signs will be renovated and added, and pedestrian crossings will be arranged as well. All the above mentioned issues will significantly reduce risks of accidents that should be considered as positive impact.

7.12 Positive Socio-Economic Effect

Benefit gained as a result of project implementation covers the entire population of the country. Increase of traffic flows (including transit) and simplification of movement, as well as sharp reduction of accidents are expected.

The project will also have positive impact on imployment of local population. According to the best practice shown in Georgia it is envisaged to hire 70% of workforce from local population as it took place in Agara-Osiauri section under the EWH Project financed by the WB. This requirement was included in the agreement of the construction contractor.

Considering the all above mentioned issues, impact on socio-economic impacts can be considered as positive and high value.

1.13 Chance Finds

Impacts in the construction phase

Archeological material (clay pots, silver coins, etc.) was discovered in the adjoining territories of the villages under the impact zone. Based on this, we can suppose that there is probability of late discovering archetypes during the planned earth works. Due to this, corresponding conclusion on late discovering of archeological monuments should be prepared within the granting procedures of the construction permit. Construction works should be planned implemented in compliance with the mentioned conclusion.

Mitigation measures in the operation phase

In case chance find is encountered in the course of earth works, the contractor must immediately stop any physical activity on site and informs the RD. The RD promptly notifies the Ministry of Culture and Monument Protection, which takes over responsibility for the following course of action. Works may resume only upon receipt of written permission from the Ministry of Culture and Monument Protection.

7.14 Cumulative Impact

Large part of the project corridor runs through the unpopulated area. There are no significant sources of industrial or municipal pollution in Khevi community. According to the current information, construction of no other large-scale infrastructure than the EWH is planned in future. Based on the above, cumulative impact is not expected.

7.15 Residual Impact

Building up the left bank of Rikotula River will create a new environmental footpring through cutting of slopes, constructing embankment and several bridges over the river. This will result in significant visual impacts and partial fragmentation of habitat. Visual impacts will also originate from the disposal of large amounts of excess material generated through drilling of tunnels. Residual impacts therefore may not be avoided, however their mitigation to the acceptable level is possible through good landscaping, restoration of vegetation, and provision of access to river for the fauna of the left bank of the river.

8. ENVIRONMENTAL 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 environmental and social management plan (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 given 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 World Bank.

The ESMR 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 this Department is an implementing entity for EWHCIP AF as well as operator of the EWH. 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 MENRP.

8.2 Environmental documents and records

It may be said that an important and perhaps, absolutely necessary mechanism of EMP realization is putting the relevant environmental documents to order and ensuring their permanent update. 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 MENRP 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;
- Emergency response 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

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

At the construction stage, 1200,000 m^3 excess materials are expected to originate. A certain portion of it will be used for backfilling at the construction stage, while the remained amount will be placed on the preliminary selected site agreed with the local authority. A presumable cost of disposal of 1 m^3 excess material is 8 USD (transportation, disposal and area restoration).

The compensation value of the trees will be calculated after the inventory of the plantings. Price of one seedling is 2 USD on average, and the cost of their planting and growing is 2 USD as well. Consequently, the cost of planting 1 tree is 4 USD.

At the stage of developing the detailed design, the length of the mitigation barrier (linear meters) needed in the project zone will be determined. Unit price of the protecting barriers including their installation cost is as follows:

1. The cost of anchoring or paneling 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

Negative impact	Mitigation measure	Supervising body	Approximate value
Emissions of harmful substances into the atmospheric air, propagation of dust, noise and vibration	– Selecting the sites for construction camps and concrete unit far from the settled area of Khevi community. The stationary sources of pollution are recommended to place in the initial part of the project corridor. – The sources of emission and noise must be placed as far as possible from the surface water zones; – Treatment (crushing and sorting) of inert materials must be done on the mining site as far as possible.	Roads Department of Georgia	Extra costs may be associated with the greater distances of transportation; however, these costs will not be too great.
Disturbance of the stability of the geological environment	– Selecting geologically stable areas with least possible inclination for ground disposal.	„--------“	
Impact on aquatic environment	– The priority for the collection of industrial and fecal waters must be given to cesspools and UD toilets. Discharge of the wastewater into the surface waters must be brought to minimum. – Sites for the sedimentation pools must be planned at the tunnel ends. – Water supply reservoirs must be considered on the construction camps in order to ensure the rational use of water resources. – A drainage system must be arranged on the construction camp.	„--------“	To be considered in the total contract value
Waste	– Maximum use of waste rocks in the construction process (shall be decided based on the relevant laboratory studies).	„--------“	The costs are expected to decline
Visual-landscape change	– Selecting the sites for temporal construction infrastructure and waste storage at maximally invisible locations, far from the settled area of Khevi community. – Selecting the color and design of the temporal construction infrastructure suitable for the natural environment.	„--------“	Extra costs may be associated with the greater distances of transportation and price differences
Impact on private property/ business	– Developing the Resettlement Action Plan and giving out compensations/compensating the damage.	„--------“	Costs may be associated with hiring the consultant
Impact on traffic flows	– Developing the traffic management plan to consider the interests of the local people.	„--------“	To be considered in the total contract value

8.4 Construction stage

Type of work	Location	Expected negative impact	Mitigation measure	Responsible entity	Controlled by
Preparatory works: mobilization of the temporal infrastructure, transport and construction appliances and equipment and mechanisms needed for construction.	The area of the construction camps	Emissions of harmful substances into the atmospheric air, propagation 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	Roads Department, Ministry of Environment and Natural Resources
		Risks of pollution of surface and ground waters and soils	– Use of non-faulty construction techniques and vehicles. – The machines/equipment and potentially polluting materials will be placed far from the surface water objects, in the areas protected against the atmospheric precipitations. – Equipping the territory with sewage, storm-water and treatment systems at the initial construction stages. – Limiting the perimeter of the oil products supply reservoirs to prevent the propagation of the pollutants in case of emergency spills. – Discharge of any kind of untreated wastewater into the rivers is to be prohibited. – Making the water-proof layers over the surfaces of the storing areas.		
		Negative visual-landscape change	– Temporal structures, materials and waste will be placed at locations far and not visible from the visual receptors. – The color and design of the temporal structures will be chosen to suit the environment. – Demobilization of the temporal infrastructure and recultivation works following the completion of the works.		
		Risks of safety of local people and personnel	– Use of non-faulty construction techniques and vehicles; – Fencing the camp territories right at the initial stage of the construction; – Installing the safety signs along the perimeter of the territory. – Protecting the perimeter of territory and controlling the	Construction Contractor	Roads Department

			movement of foreign people in the area. – Equipping the personnel with PPE. – Equipping the camps with first aid kits; – Ensuring electrical safety. – Keeping an incident registration log. – Personnel training at the initial stages.		
Cleaning the corridor off the vegetation cover and accomplishing the earth works. The removal of the topsoil is meant. Putting the area topography to order (terracing, making sections and fills) making foundations	Project road corridor	Cutting down the vegetation cover, habitat loss/fragmentation.	– Obtaining the permit from LEPL National Forest Agency before the onset of the works; – Cutting down the trees and plants under the supervision of the specialists an authorized agency (LEPL National Forest Agency); – The expected impact is partly compensated at the expense of recultivation and landscaping works.	Construction Contractor	Roads Department, LEPL National Forest Agency
			– Protecting the project perimeter to prevent excess harm to the plants.		
		Noise propagation, emissions of dust and combustion products	– Use of non-faulty construction techniques and vehicles; – Accomplishing the noisy works during the day as far as possible; – Running the vehicle drives at minimal speed;	Construction Contractor	Roads Department
		Loss of topsoil and degradation of sites	– Cutting the topsoil and piling it in isolation from the lower soil layer and other materials. – In order to avoid the topsoil erosion, the height of fill must not exceed 2 m and the inclination of the fill slope must not exceed 45^{o}. – Water-diversion channels will be made along the perimeter of the topsoil fill and will be protected against the scattering by the wind blow; – In case of storing the topsoil for long, measures must be taken to maintain its qualitative properties. Periodic loosening or grass sowing is meant.	Construction Contractor	Roads Department, Ministry of Environment and Natural Resources
		Development of hazardous geo-dynamic processes	– Control over the clearing off the trees and vegetation cover; – Diverting the rain- and spring waters by bypassing highly	Construction Contractor	Roads Department, Ministry of

			sloped and other sensitive sites by using relevant water diversion techniques (channels, pipelines, temporal berms, settling basins); – Removing the active bodies in the landslide-prone areas to the extent possible and terracing the slopes to ensure their stability; – Compacting the ground fill properly to avodi slope collapse. – Limiting or stopping the works over the slope in the periods with precipitations. – Recultivating the damaged areas after the completion of the works, sowing grass and planting the trees over the slopes.		Environment and Natural Resources
		Erosion and deterioration of esthetic view.	– The topsoil and subsoil must be placed far from the surface water objects. – The sites will be immediately filled and compacted and the surfaces and slopes will be graded. If needed, the slope stabilization techniques will be used. – Site restoration by scattering the topsoil from above and creating the conditions favorable to restore the vegetation cover.	Construction Contractor	Roads Department
		Risks of pollution of surface and ground waters.	– Use of non-faulty construction techniques and vehicles; – In case of spills of oil/lubricants, the spilled product will be localized/cleaned in the shortest possible time. – The appliances creating the risk of ground water pollution when in operation will be equipped with drip pans; – The vehicles must be preferably washed at private car washing areas; – Using temporal water diversion channels; – Filling the holes in a timely manner.	Construction Contractor	Roads Department, Ministry of Environment and Natural Resources
		Damage or harm to animals.	– Observing the borders of the working area; – Bordering the ditches to prevent the animals from falling into them and getting harmed; – Efficient use of the mitigation measures for the pollution	Construction Contractor	Roads Department, Ministry of Environment and

			of the environment (air, water, soil); – Accomplishing the ground works within limited terms.		Natural Resources
		Accidental damage to the archeological monuments	– In case of finding any strange item, stopping the works immediately and informing the technical supervisor or the Client; – Renewing the works only after the formal instruction is received from the technical supervisor or the Client.	Construction Contractor	Roads Department, National Agency to protect cultural environment
Laying tunnels	Tunnel, tunnel portal and exit	Noise and vibration propagation	– Doing explosions with little changes.	Construction Contractor	Roads Department, Ministry of Environment and Natural Resources
		Pollution of surface waters with the waters flowing out of the tunnel	– Making cesspools at the tunnel portals and ensuring their proper exploitation.		
		Personnel safety risks	– Using relevant ventilation system during tunneling; – Observing labor safety rules during the drilling and explosion works; – Equipping the personnel with PPE; – Reducing the working time of the personnel in the tunnel.		
Building bridge piers and accomplishing other works in the / near the riverbed	Construction grounds near the riverbeds	Pollution of surface waters	– Use of non-faulty construction techniques and vehicles; – Equipping the oil equipment with dripping systems; – The works to be accomplished in active riverbeds must be done within the limited time; – Prohibiting car wash in the riverbeds.	Construction Contractor	Roads Department, Ministry of Environment and Natural Resources
Transportation	Corridors of the roads used to transport necessary materials, temporal structures, labor and waste. The routes running near the settled areas are also significant. The transport operations will	Noise propagation, emissions of dust and combustion products	– 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.	Construction Contractor	Roads Department
		Damage to the local road surfaces	– Limiting the movement of heavy techniques along the public road as much as possible;	Construction Contractor	Roads Department, local

	continue for the whole construction period.		– Restoring all damaged road sections as much as possible to make the roads available to the people;		authority
		Overloaded transport flows, limited movement	– Selecting an optimal bypass to the working area; – Installing road signs and barriers at necessary locations; limiting the movement of heavy techniques along the public road as much as possible; – Using flagmen in case of intense traffic; – Making temporal bypasses; – Informing the population about the time and periods of intense transport operations.	Construction Contractor	Roads Department, local authority
		Risks of safety of local people and personnel	– Use of non-faulty construction techniques and vehicles; – Driving the vehicles with admissible speeds. – Minimizing the use of the roads crossing the settled areas; – Limiting the traffic on holidays	Construction Contractor	Roads Department
Paving the road surface and facing works	Design corridor	Pollution of soil and surface waters	– Laying the road surface only in dry weather; – The road surface must be laid only by taking the relevant safety measures: the materials or waste must not dissipate over the site, etc.	Construction Contractor	Roads Department, Ministry of Environment and Natural Resources
Waste management	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.	Construction Contractor	Roads Department, Ministry of Environment and Natural Resources

8.5 Exploitation phase

Type of work	Location	Expected negative impact	Mitigation measure	Responsible entity	Controlled by
Exploiting the road in a common mode	Along the road	Noise propagation	– Making noise barriers in the sensitive areas;	Contractor	Roads Department
		Waste propagation; propagation of oil products.	– Regular cleaning of the roadside zone; – Regular cleaning and repairing of water channels and pipes	Contractor	
		Development of hazardous geo-dynamic processes	– Monitoring the trouble-free performance of the protective engineering facilities for slopes and riverside zone and regular repairs.	Contractor	
		Emergency risks	– Equipping the road with relevant road signs; – Equipping the road with the night illumination system; – Permanent control of the technical state of the road cover and other road infrastructure (road signs, crossings, etc.), and accomplishing the relevant rehabilitation measures immediately after any damage.	Contractor	
		Biodiversity	– Replacing the damaged/weathered plants along the road with new ones.		
Planned repairs and preventive works	Along the road	Propagation of polluting substances (water, soil pollution) during the repairs and replacement	– The road surface must be repaired in dry weather to avoid the pollution of the surface flow; – In order to avoid the dissipation of the materials used to repair the damaged road sections, the relevant works must be planned in an expedient manner.	Contractor	

9. ENVIRONMENTAL MONITORING PLAN

9.1 Introduction

As the previous chapters of the EIA report note, there are risks of certain impacts on some environmental receptors during the activity. One of the preconditions for reducing the negative nature and value is the correct management of the strict and well-planned activity under strict supervision (environmental monitoring).

The monitoring methods incorporate visual observation and measurements (if needed). The monitoring program describes the monitoring parameters, time and frequency of monitoring, and collection and analysis of monitoring data. The size of monitoring depends on the value of the expected impact/risk.

The environmental monitoring plan in the project base must cover the issues, such as:

- Assessment of the state of environment.
- Identification of the reasons for changes in the environment and evaluation of the outcomes.
- Identification of the correction measures when the target values cannot be reached.
- Regular supervision over the degree and dynamics of the impact of the activity on the environment.
- Compliance with the legal requirements for impact intensity.
- Control over the set parameters associated with significant ecological aspects.
- Prevention and timely identification of the possible violations related to ecological aspects or emergencies during the activity.

The following are subject to the regular observation and evaluation in the course of environmental monitoring:

- Atmospheric air and noise;
- Water;
- Soil;
- Biological environment;
- Labor conditions and meeting the safety standards, etc.

9.2 Environmental monitoring plan in the construction phase

What? (Is the parameter to monitor)?	**Where?** (Is the parameter to monitor)?	**How?** (Must the parameter be monitored)?	**When?** (frequency or duration of monitoring)	**Who** (Is responsible for monitoring)?
1	**2**	**3**	**5**	**6**
Dust propagation, exhaust fumes	– Construction camps; – Construction corridors; – Transportation routes; – The nearest residential houses	– Instrumental measurement (How)	– Checking dust propagation – during the intense operations and vehicle movement, particularly in dry and windy weather. – Checking the technical state - at the start of the working day; – Instrumental measurement - in case there are complaints	Roads Department
Noise propagation	– Construction camps; – Construction corridors; – Transportation routes; – The nearest residential houses	– Control over the tehcnical performance of machines and equipment; – Instrumental measurement.	– Checking the technical state - at the start of the working day; – Instrumental measurement – in case of filed complaints	Roads Department
Engineering-geological stability	– Sensitive instable sections identified in the project corridor.	– Visual observation; – Controlling the efficiency of the protective buildings; – Periodic examinations by the engineering geologist.	– Every day before the onset of the groudn works; – Particularly after the periods with precipitations;	Roads Department
Soil and ground quality	– Areas adjacent to the construction camps; – Design corridor; – Materials and waste storage areas; – Corridor of the access road	Visual observation: – No significant oil spills are observed; – Laboratory control	– Visual observation - at the end of the working day; – Laboratory examination - in case of large oil spills	– Visual observation - By anenvironmental manager – Laboratory control - with the help of the Contractor

Temporal storage of the removed ground and topsoil	– Construction corridor; – Ground storage areas.	Visual observation: – The lower soil layer and topsoil are piled separately. – The height of the topsoil pile does not exceed 2 m. – The inclination of piles does not exceed 45^{o}. – The soil is placed far from the surface water objects. – There are water diversion channels along the perimeter of the storage area; – The soil is stored temporarily at places preliminary agreed with the technical supervisor.	Every day following the completion of ground works.	Roads Department, by an environmental manager
	– Construction Contractor's office	Examining the documented agreement about the temporal use of soil.	Shortly after the ground works are complete	
Vegetation cover and fauna	– Construction corridor	Visual observation: – The works within the limits of the marked zone and no additional harm or plants or illegal cuttings take place. – No harm or death of animals is fixed.	– Visual observation - at the end of the working day;	By an environmental manager
Management of industrial and fecal waters	– Construction camps	– Discarging the industrial and fecal waters into the assenization pools; – The assenization pools are cleaned and their technical state is satisfactory; – No untreated wastewater is discharged into the rivers;	– Visual observation - on every working day;	By an environmental manager

Waste management	– Construction camps; – Construction corridor; – Temporal waste storage areas;	Visual observation: – The sites of temporal waste disposal are assigned in the construction area and are duly marked. – The storage areas for hazardous waste are protected against the penetration of strangers and against the weather impact; – On the territory, at due locations, there are marked containers to collect domestic waste. – The sanitary condition of the territory is satisfactory – no dissipated waste is observed. – The waste is not stored on the territory for long;	– Visual observation - at the end of each working day;	By an environmental manager
	– Construction Contractor's office	– Checking the waste registration log, – Checking the documented agreement about waste disposal	– Document check - once a month –	By an environmental manager
Oils and oil products management	– Construction camps; – Warehousing facilities	Visual observation: – The protected areas for oils, oil products and other liquid products marked in a due manner;	– Visual observation - at the end of each working day;	By an environmental manager
Technical state of the access roads, possibility of free movement	– Corridors of the transportation routes	Visual observation: – The vehicles move along the routes specified in advance, bypassing the settled areas as far as possible. – The state of the driving routes is satisfactory. – Free movement is not limited.	– During the intense transport operations	By an environmental manager

		– Driving speeds are observed.		
Labor safety	– Working area	Visual observation: – The territory is fenced and protected against the illegal penetration of strangers, – The personnel are equipped with PPE. – The technical state of the exploited equipment and mechanisms is satisfactory. – Electrical and fire safety is ensured. – The 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. – Smoking areas are specially assigned.	– Visual observation- before the onset of each working;	By an environmental manager
		Unscheduled control (Inspection): – The personnel observe the safety rules and use the PPE.	– Inspection - regularly.	By an environmental manager

9.3 Environmental monitoring plan in the exploitation phase

What? (Is the parameter to monitor)?	**Where?** (Is the parameter to monitor)?	**How?** (Must the parameter be monitored)?	**When?** (Frequency or duration of monitoring)	**Who?** (Is responsible for monitoring)?
1	**2**	**3**	**5**	**6**
Hazardous geological processes	– Sensitive sections in the main road corridor; – Sites of the protective buildings.	– Visual observation; – Controlling the efficiency of the protective buildings.	– Twice a year, at the end of winter and in autumn	Roads Department
Vegetation cover	– Vegetation in the RoW.	– Visual observation	– Several times a year;	Roads Department
Safe drive	– In the road corridor	Visual observation: – Checking the presence of the relevant road signs; – Examining the technical state of the road cover.	– Several times a year;	Roads Department
Proper operation of the drainage system	– In the road corridor	– Examining the technical state of the drainage system.	– Several times a year;	Roads Department
Waste	– In the road corridor	Visual observation:	– On a periodic basis	Roads Department, Contractor.

10. PUBLIC CONSULTATION AND GRIEVANCE REDRESS MECHANISM

10.1 Public Consultations

Public consultation process on the works to be undertaken under EWHCIP commenced at the early stage of conceptual design. Once the environmental and social screening and scoping of the proposed works had been undertaken, a ToR for the ESIA was drafted and disclosed. RD discussed the ToR with stakeholders and finalized thereafter (Minutes of meeting and List of participants are given in Annexe 1).

Upon delivery of the final draft of the present ESIA report, it will be disclosed in Georgian and English languages through the web page of RD and discussed with stakeholders on February 15, 2017. ESIA report will be finalized through incorporation of the public feedback and the full account on the consultation process will be attached (minutes of the consultation on ToR for ESIA are already available in the attachment to the present ESIA report). During the ESIA 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 Kharagauli Municipality – address: settlement Kharagauli, #15 9 April str;
- Local government of Khashuri Municipality – address: c. Khashuri, #2 Tabidze str;
- Information center of Khevi community
- 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 MoENRP: www.moe.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 10.1. 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** Decision from central IA/PIU GRCN	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, 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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ANNEXES

ANNEX 1. Minutes of Consutlation Meetings

MINUTES

of public consultation meeting on

Terms of Reference

for Environmental and Social Impact Assessment for construction of the E-60 highway bypass between Chumateleti-Khevi

06.05.2016 Tbilisi

Chairman of meeting: Gia Sopadze, Head of Environment Protection Unit, Ressettlement and Environment Protection Division

Secretary of meeting: Maya Vashakidze, Environmental Consultant Roads Department of Georgia

Speakers: Gia Sopadze, Maya Vashakidze

Attendees of the Meeting: See attachment 1

Agenda of the Meeting:

- Introduction and context
- Presentation of TOR
- Questions & answers

Topic presented: Introduction made by Gia Sopadze about construction of the E-60 highway. The speaker mentioned that Georgia, located along the transit corridor and connecting Europe and Asia, has a potential to connect some countries in the region with global economy. 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 World Bank is providing series of loans to the Government of Georgia for upgrading this highway through East West Highway Improvement Projects (EWHIPs). Two projects of these series are now completed covering the highway section between Agaiani and Ruisi. EWHIP-3 and EWHIP-4 are under implementation covering the section between Ruisi and Zemo Osiauri. A new project will finance upgrading of the highway from Chumateleti through Khevi, which takes the East-West Highway from East Georgia to the West. TOR currently under consideration is for consulting services sought by the RD to carry out Environmental and Social Impact Assessment (ESIA) of works for upgrading East-West highway from Chumateleti to Khevi. The RD is hiring consultant for detailed design separately, but these two teams (the Consultant for ESIA and the Consultant for Detailed Design) will cooperate and share information with each other to find best solution, the consultants will take into account the World Bank's Safeguards Policies and Georgian Legislation and final decision will be made for environmental and social friendly alignment.

ESIA report will be developed based on the World Bank's safeguard policies: OP/BP 4.01 Environmental Impact Assessment, OP/BP 4.04 Natural Habitats, OP/BP 4.11 Cultural Heritage, OP/BP 4.12 Involuntary

Resettlement and OP/BP 4.20 Gender and Development. The project is classified as environmental category "A", since it covers new construction which may have significant and irreversible impacts on the natural and social environment. Pursuant to the national legislation environmental permit need to be obtained.

The content of ToR was presented by Maya Vashakidze. She explained how the consultant will approach the upcoming assignment, what would be the scope of various thematic studies under ESIA, and how the ESIA process will be informed by engagement of various stakeholders. It was mentioned that ESIA will incorporate a range of desktop studies and field surveys. Sensitive receptors will be identified. Direct and indirect; short term, medium and long term; negative and positive; reversible and irreversible (if any)impacts on biodiversity, physical and social environments in the project impact zone during construction and on operation stage, will be evaluated. It has been stressed that the ESIA team will cooperate with design team and resettlement specialist to ensure avoidance, minimization and/or mitigation of potential impacts on recipients. Mitigation measures for medium and high impacts will be recommended; residual and cumulative impacts - ranked. The ESIA will be carried out with consideration of the national environmental legislation/regulations and the Works Bank requirements. Transparency of information will be ensured throughout the ESIA process. Information will be posted to the RD website and remain in public domain for familiarization and review. Feedback mechanisms will be explained to community to make stakeholder engagement process efficient.

Ms. Maya Vashakidze also provided information concerning the World Bank OP/BP 4.01 Environmental Assessment, OP/BP 4.04 Natural Habitats, OP/BP 4.11 Physical Cultural Resources, OP/BP 4.12 Involuntary Resettlement and OP/BP 4.20 Gender and Development. She explained World Bank Guidelines for environmental and social management.

Below is a summary of Q&A session which followed presentations by RD:

Question	Answer
Does the ToR cover studies regarding the landslides or other geodynamic processes?	The ToR is covering geological, hydrological and hydrogeological research to provide detail information about potential impact during construction or operation phases
Does the ToR cover studies about Eco-corridors for animal migration? Red list data?	After final alignment the consultant will make detail research of the territory, which will give us clear understanding of whether the Red List species and/or routs of animal migration are likely to be affected.
Will the ESIA look at the expected impacts of the project on the traditional lifestyle and economic activity of the affected communities (e.g. animal husbandry)?	As part of the social impact assessment, the ESIA will explore all potential impacts that the project may have on the local communities. The overall goal of the project is to facilitate economic activity and growth. As for the local communities in particular, the Roads Department is obligated to ensure that no one is left worse of as a result of the project implementation. Therefore, if ESIA reveals potential issues that highway construction may cause to movement of cattle within the highway corridor, then adequate cattle passes will be arranged.
Will the local population be protected from the noise?	According to the previous ESIA reports, the consultant will prepare noise and vibration modelling for the operation phase, which will show impacts to the local population and develop mitigation measures to prevent negative impacts (if

	any).
Does the ToR include planning compensation for the cut trees?	According to the presented ToR, the consultant will prepare compensatory tree planting plan and a special annex to the ESIA report will be the forest inventory in those parts of the State Forest Fund that are found in the Right of Way and need to be de-listed. If the inventory shows presence of the species entered into the Red List of Georgia, then this annex should include documentation needed to apply for a tree cutting permit applicable to such species according to the national legislation. The annex should include full package of documentation required for de-listing required areas from the State Forest Fund, as well as a compensatory tree planting plan that suggests and characterizes the planting area, species and age composition of seedlings, plating and plantation tending techniques, etc. The plan should be designed for the theoretical scenario of all trees falling in the de-listing plots being extracted with an understanding that actual felling needs may be lesser.

Chairman of meeting: Gia Sopadze (signed)

Secretary of meeting: Maya Vashakidze (signed)

List of Attendees:

მონაწილეთა სია

სახელი, გვარი	საკონტაქტო ინფორმაცია	შენიშვნა
მარინა ქალდაგიშვილი	551 70 11 15	
[illegible]	599 09 28 68	
მაია [illegible]	599 47 67 17	
ვახტანგ თავართქილაძე	568 274774	
[illegible]	595 88 00 37	
[illegible]	591 180 790	
ქეთევან გოლეთიანი	599 27 88 39	
[illegible]	595 11 92 11	
[illegible]	551.29.28.14	

მონაწილეთა სია

სახელი, გვარი	საკონტაქტო ინფორმაცია	შენიშვნა
[illegible]	593 630 840	
ანა ჭიჭინაძე	592 16 43 43	
[illegible]	595 88 88 880	
[illegible]	599 366-703.	
[illegible]	595 049-738	
[illegible]	555-94-54-30	
[illegible]	595 21 91 41	[illegible]
[illegible]	574. 486748	
[illegible]	577 466446	

მონაწილეთა სია

სახელი, გვარი	საკონტაქტო ინფორმაცია	შენიშვნა
მაია ვაშაკიძე	593.32.30.77 maya_vashakidze@yahoo.co.uk	
მარიამ ბეგიაშვილი	555 400 - 205 mbegiashvili2@gmail.com	

Photos:






MINUTES
of Public Consultation Meeting on

the Draft Environmental and Social Impact Assessment Report

for the Modernization of Chumateleti-Khevi Section of East-West (E-60) Highway

10.03.2017 Village Vertkvichala, Kharagauli Municipality

Chairman of meeting: Mariam Gogishvili, Deputy Head, Environmental Service, Roads Department of Georgia

Speakers: Maya Vashakidze, Environmental Consultant, Roads Department of Georgia
Mariam Begashvili, Social Consultant, Roads Department of Georgia
Irakli Kaviladze, Director, Environmental Expert, "Eco-Spectri" Ltd.

Attendees of the Meeting: local population, representatives of local authorities, media representatives, etc. (see list attached - Annex 1).

Agenda of the Meeting:

- Introduction and content
- Consideration and presentation of the ESIA report
- Questions & answers

Topic presented: Mariam Gogishvili delivered an introductory note regarding the construction of E-60 highway. She noted that Georgia, the country located along the transit corridor and connecting Europe and Asia, has a potential to link several countries of the region with the regional economy. For years, the World Bank financed a series of East-West highway corridor improvement projects. At present, the preparatory works for East-West highway corridor improvement project is under way. The outcome of these works will be the rehabilitation of the highway between Zemo Osiauri and Chumateleti. In the process of designing the works, "Eco-Spectri" Ltd., the consultant company hired by the Roads Department, commented about the natural and social environment impact assessment. The ESIA was carried out based on the World Bank's safeguard policies: OP/BP 4.01 Environmental Impact Assessment, OP/BP 4.04 Natural Habitats, OP/BP 4.11 Physical Cultural Resources, and OP/BP 4.12 Involuntary Resettlement. The project is classified as environmental category "A", 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.

Mr. Irakli Kaviladze explained how "Eco-Spectri" Ltd. approached the assignment, what was the scope of various thematic studies under ESIA, and how the ESIA process was informed to the various stakeholders. It was mentioned that ESIA incorporated a range of desktop studies and field surveys. The background study covered a series of components, such as: climate and meteorology; geology, geomorphology; hydrology, hydrogeology; soils, landscape and land use; air quality and noise; seismic conditions and hazardous processes; habitats, flora and fauna; historical and archeological sites and social environment. The sensitive receptors were identified; direct and indirect; short-term, medium- and long-term; negative and positive; reversible and irreversible (if any) impacts on biodiversity, physical and social environments in the project impact zone during the construction and on operation stage were evaluated. It was stressed that in the process of developing the ESIA report, the ESIA team must closely cooperate with design team to ensure avoidance, minimization and/or mitigation of potential impacts on

recipients. Mitigation measures for medium and high impacts will be recommended; and residual and cumulative impacts should be ranked. The ESIA was carried out considering the national environmental legislation/regulations and the Works Bank requirements.

The transparency of information was ensured throughout the ESIA process. The said document was posted to the RD website and remains in public domain for familiarization and review. The feedback mechanisms were explained to the community to make the stakeholder engagement process more efficient.

Ms. Maya Vashakidze also informed the meeting attendees about the World Bank OP/BP 4.01 Environmental Assessment, OP/BP 4.04 Natural Habitats, and OP/BP 4.11 Physical Cultural Resources.

Ms. Mariam Begashvili informed the interested participants about the World Bank's social safeguard policy OP/BP 4.12 Involuntary Resettlement.

The speakers explained the meeting attendees the World Bank Guidelines for environmental and social management.

Note: The interested parties and local population were informed about the date and venue of the consultation meeting on the draft ESIA report in advance. In particular, the relevant information was distributed via the e-bases of NGO "Caucasus Environment NGO Network" (CENN) on March 2, 2017 and via Roads Department of Georgia web-site on March 1 2017.

Below is a summary of Q&A session. During the meeting, the questions and comments of various participants were answered by the representatives of the Roads Department and representatives of "Eco-Spectri" Ltd.

#	Question/Comment	Answer
1.	When will the construction start?	Presently, a detailed design is being developed and will be presumably finalized by September of the current year. This will be followed by announcing tender for construction works.
2.	Can you give an exact list of project-affected families and plots so that we should plan our activities accordingly, e.g. I wonder if it is meaningful to do any agricultural works for me.	As already mentioned, a detailed design is being developed at present. Only after this process is over, it will be possible to exactly identify the project-affected land plots and businesses. After the registration and inventory process is over, the affected persons' property and plantings will be inventoried by the given moment, and their loss will be compensated within the scope of the resettlement action plan.
3.	If project-financed works require take of a part of someone's land plot and the remaining piece of the plan is useless for the owner, how will compensation work?	In case the project affects part of the land plot and the remaining part turns out to be useless for the owner - in particular, it is impossible to continue using the remaining portion of land following previous land use pattern because of the small size of the remaining plot or because of limited access to the plot, the project will purchase the plot in full, and the perennial plants on such plots will be compensated in full.

4.	There is no natural gas supply system in the village. Isn't such a system planned to lay for the village residents under your project?	Construction of the gas supply system falls within the competence of the local municipalities and should apply to your local municipality to clarify this question.
5.	The construction companies usually have their own labor. We would like to know if the local people will be employed within the scope of the project.	Under the World Bank safeguard policy, the best practice is maximum employment of local labor within the scope of the project. Based on the experience gained from similar projects for the construction of highway (other sections of E-60), we can assume that 60-70% of the local labor will be employed. Both, average-skilled and unskilled local labor will be hired during the construction process. It should be noted, though, that local workforce does not mean the population of your village, but may be presented by the people of nearby villages or municipalities.
6.	How much will you pay for 1 sq.m. of land?	While developing of the Resettlement Action Plan, a professional evaluator will be deployed for setting the value of land plots to be taken.
7.	To whom we should apply if the construction company damages our property?	Based on the Resettlement Action Plan and ESIA report developed in line with the World Bank policy, a Grievance Redress Committee will be organized which, in addition to the participant organizations, will include the representatives of local self-governing bodies and various groups of population. It is this committee obliged to consider all claims and proposals regarding the project impact at the first stage.
8.	At present, there is a direct car access road from the existing highway to my house. Will this access road remain in place after the project is implemented?	At present, there are 12 access roads linking the existing highway to the territory of village Khevi. Following the technical requirements of a high-speed highway, 12 car passages along a 3-km-long section is inadmissible. Under the preliminary design, one car passage is planned to construct leading to the center of village Khevi. As for the pedestrian passages, their number and locations will be determined during the development of the detailed design.
9.	In total, how many houses will be relocated?	At this stage, we can provide only rough information regarding his issue. This information may change during the development of the detailed design. In particular, mostly commercial and public buildings are subject to physical relocation. Under the existing design, only one residential house is under the direct impact. It should also be noted that after the development and approval of the detailed design, an independent consulting company will develop a resettlement action plan. Thereafter, the scale of resettlement and exact information about the affected economies will become clear.

10.	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 detailed design 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.
11.	Will the river be polluted during the construction?	The presented document describes all mitigation measures to be applied by the Construction Contractor to avoid the river pollution. For example, the Construction Contractor will be prohibited to dispose hazardous substances or waste nearer than 50 m distance from the riverbed.
12.	Will the cattle passages be constructed with the project support?	Once the detailed design is available, the Resettlement Action Plan will be developed. The consultant company working on the Resettlement Action Plan will work out measures needed to restore the living conditions of the local population to at least the same level as they had before the implementation of the project. Consequently, if the construction of the highway blocks access rout for the cattle, the remedial action will be proposed in the form of arranging cattle passages.
13.	Will the trees cut down during the construction?	As mentioned, according to the preliminary design, the highway will be constructed from the western tunnel portal to village Khevi on the left bank of the river Rikotula. This will require cutting of trees. Within the scope of the project, a compensation planting plan will be developed as an individual document, under which instead of every cut-down tree, 3 trees will be planted, and if the cut-down tree is red-listed or is endemic, 10 new trees will be planted instead.
14.	How the noise, vibration and dust generated during the construction affect the settlements?	This problem is quite severe on the territory of village Khevi, particularly where a vehicle interchange is to be built. After the detailed design is developed, relevant measurements of possible impacts of noise, vibration and dust will be conducted and relevant mitigation measures will be elaborated, such as tree planting, installing additional noise-reflecting barriers, etc. If this action is not sufficient, temporal or permanent resettlement may apply.

Chairman of meeting: Mariam Gogishvili (signed)

Secretary of meeting: Maya Vashakidze (signed)

List of attendees:

აღმოსავლეთ-დასავლეთ მაგისტრალის (E-60) ჩუმათელეთი-ხევის მონაკვეთის მოდერნიზაციის პროექტის

გარემოზე ზემოქმედების შეფასების დოკუმენტის

საჯარო განხილვა

(10 მარტი 2017 წელი)
დამსწრეთა სია

#	Name/სახელი	Address მისამართი	Contact Data/საკონტაქტო ინფორმაცია	Signature /ხელმოწერა
1.			577671523	
2.				
3.			599-776948	
4.			595 40 44	
5.			577 77 49 16	
6.			599 25 30 71	
7.			595 45 76 83	
8.				

1

9.	[illegible]	[illegible]	593767424	[illegible]
10.	[illegible]	[illegible]	551-54-96-00	[illegible]
11.	[illegible]	[illegible]	599272512	[illegible]
12.	[illegible]	[illegible]	557636875	[illegible]
13.	[illegible]	[illegible]	551-13-26-93	[illegible]
14.	[illegible]	[illegible]	558972395	[illegible]
15.	[illegible]	[illegible]	577671524	[illegible]
16.	[illegible]	[illegible]	59811249	[illegible]
17.	[illegible]	[illegible]	577671519	[illegible]
18.	[illegible]	[illegible]	577609516	[illegible]
19.	[illegible]	[illegible]	571090511	[illegible]

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Photos:

ANNEX 2. Microclimatic Characteristics

Fig. 1. Average temperatures and precipitation

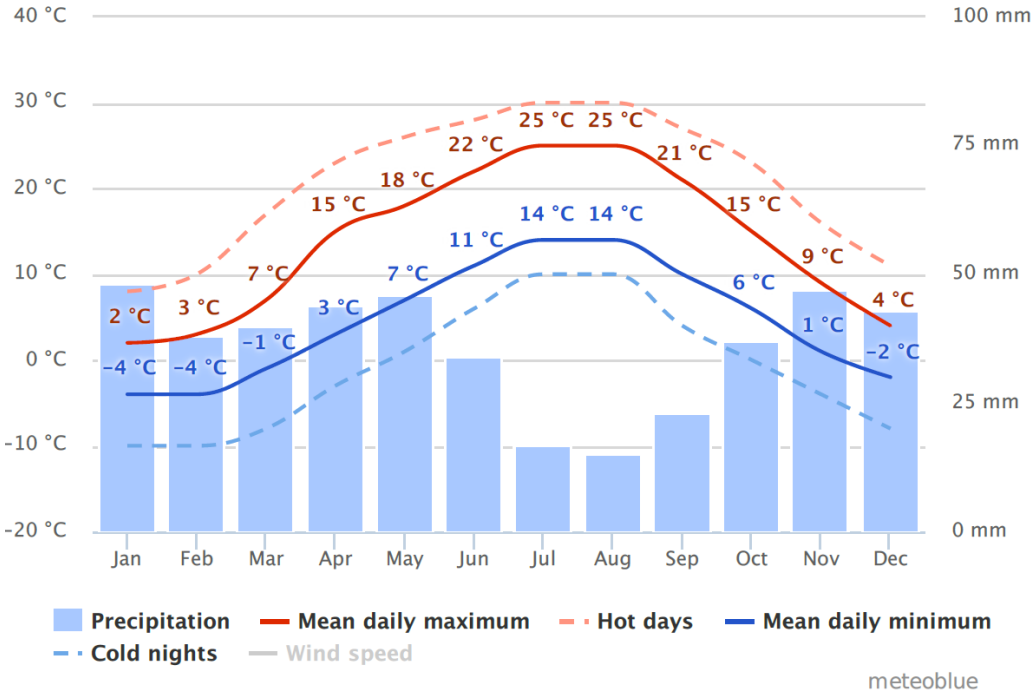


Fig. 2. Cloud, sunny and precipitation days

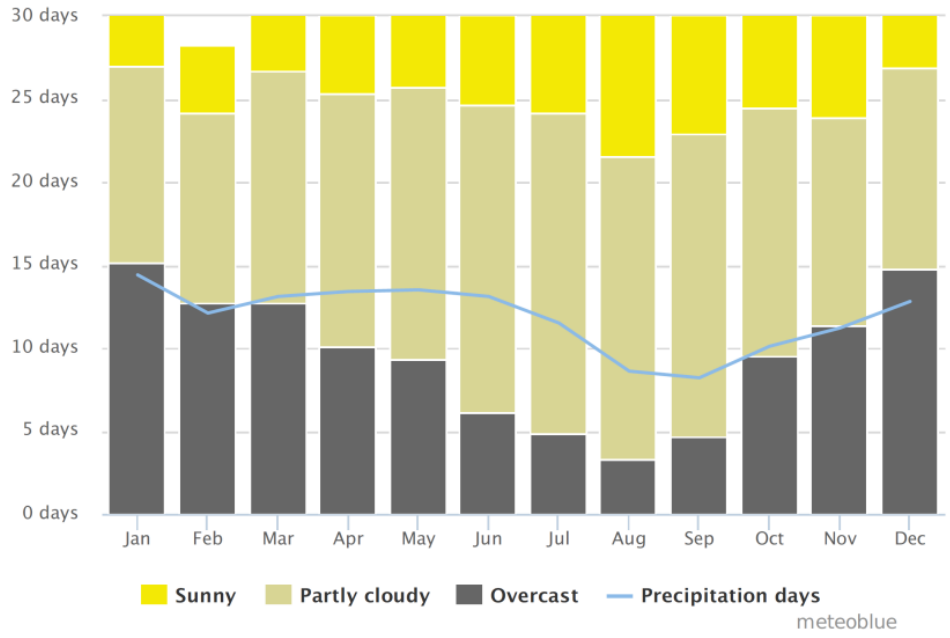


Fig. 3. Maximum temperatures

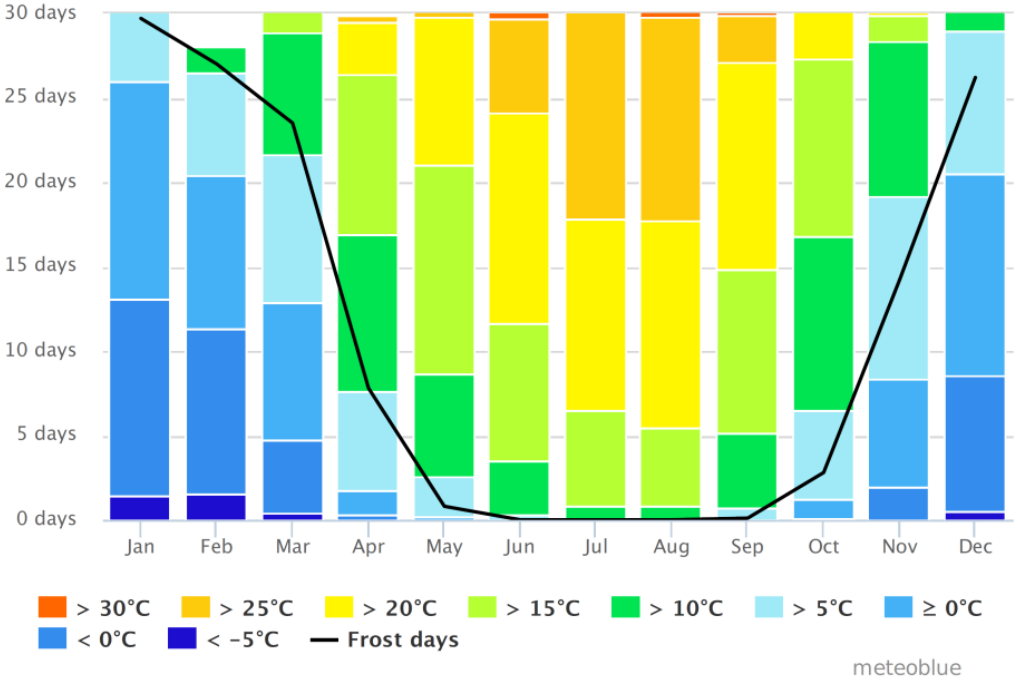


Fig. 4. Precipitation amount

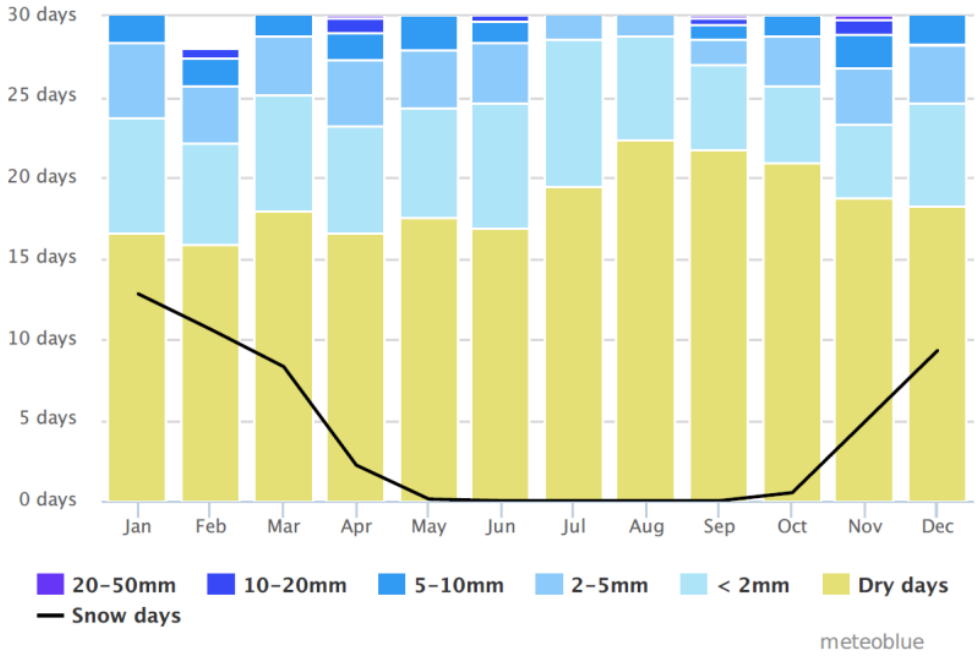


Fig. 5. Wind speed

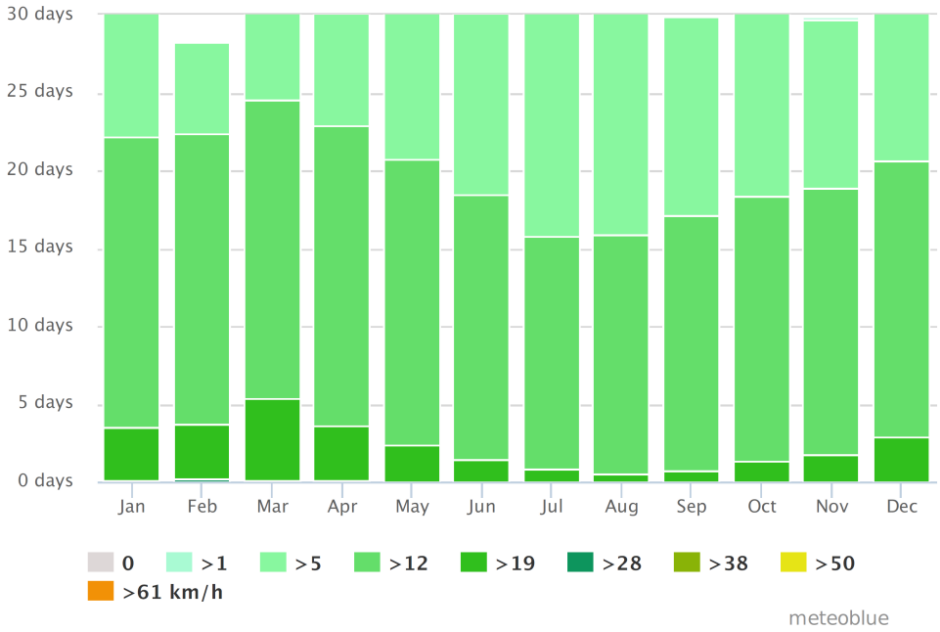


Fig. 6. Wind rose

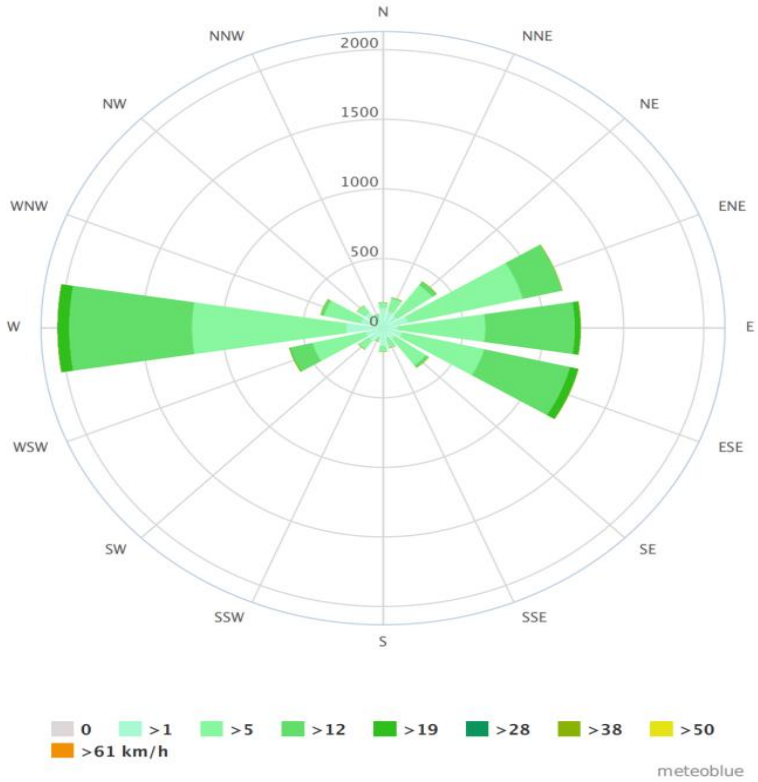


Fig.7.Average temperatures and precipitation

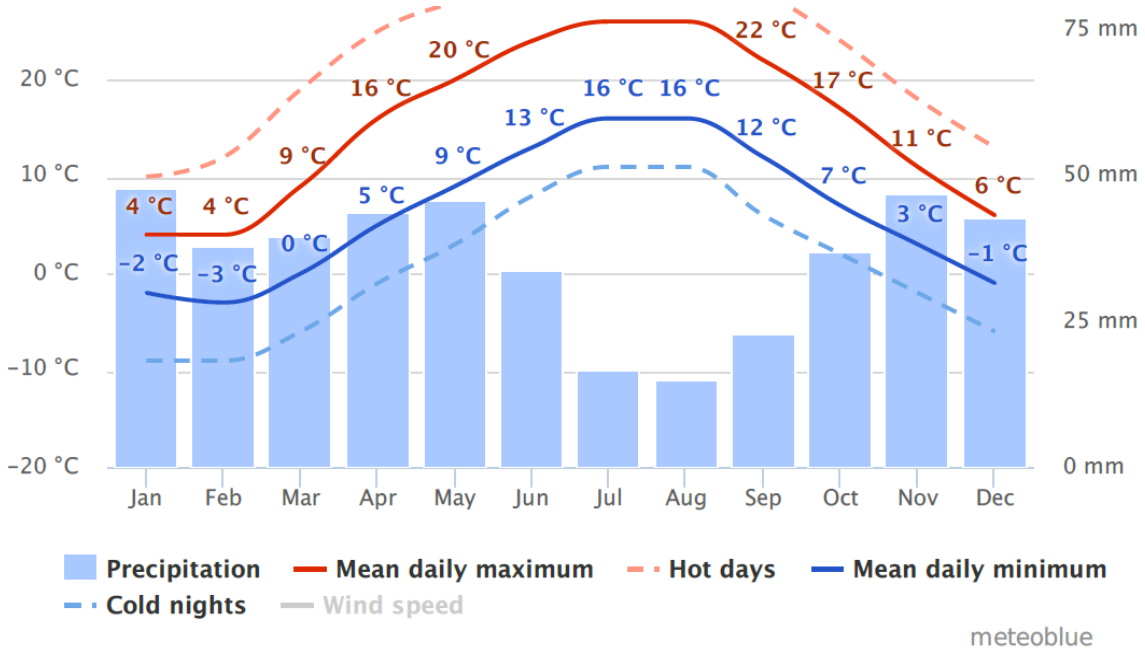


Fig.8.Cloud, sunny and precipitation days

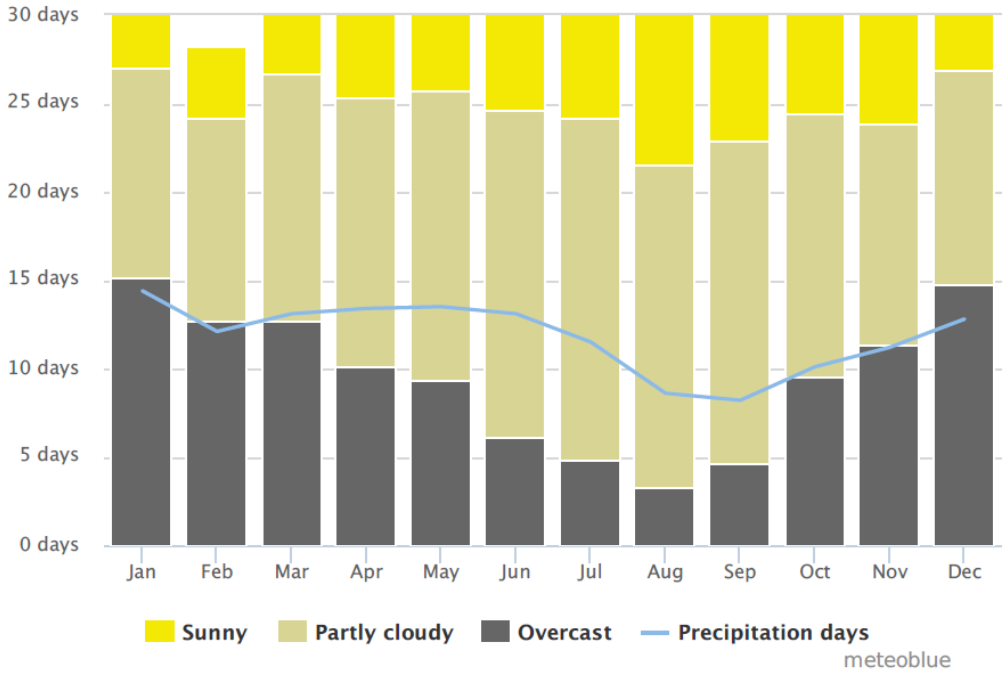


Fig. 9. Maximum temperatures

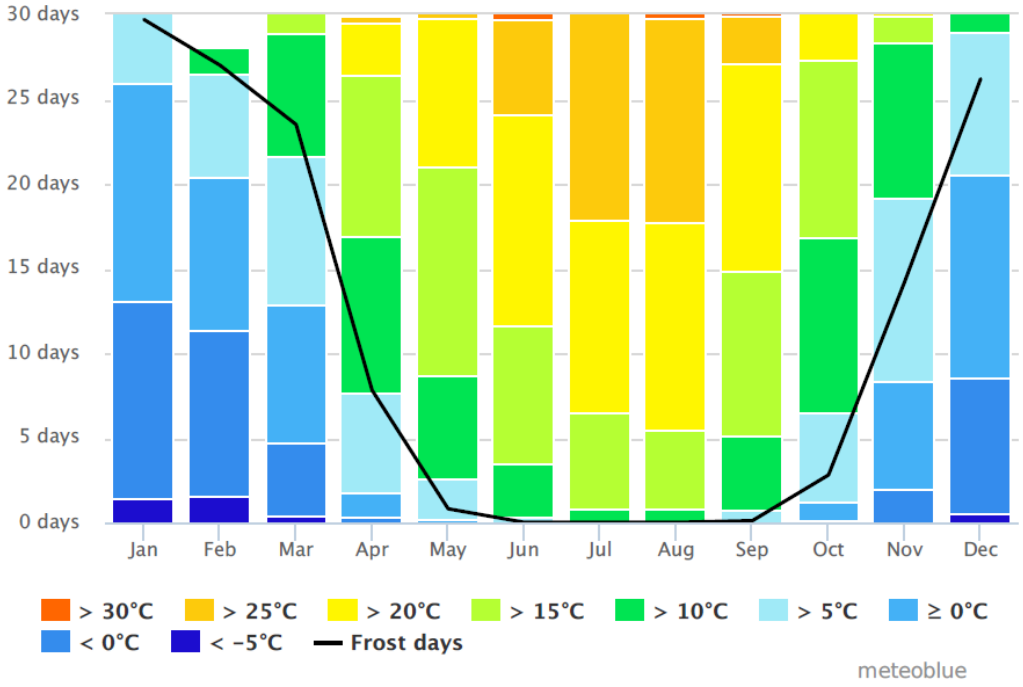


Fig.10. Precipitation amount

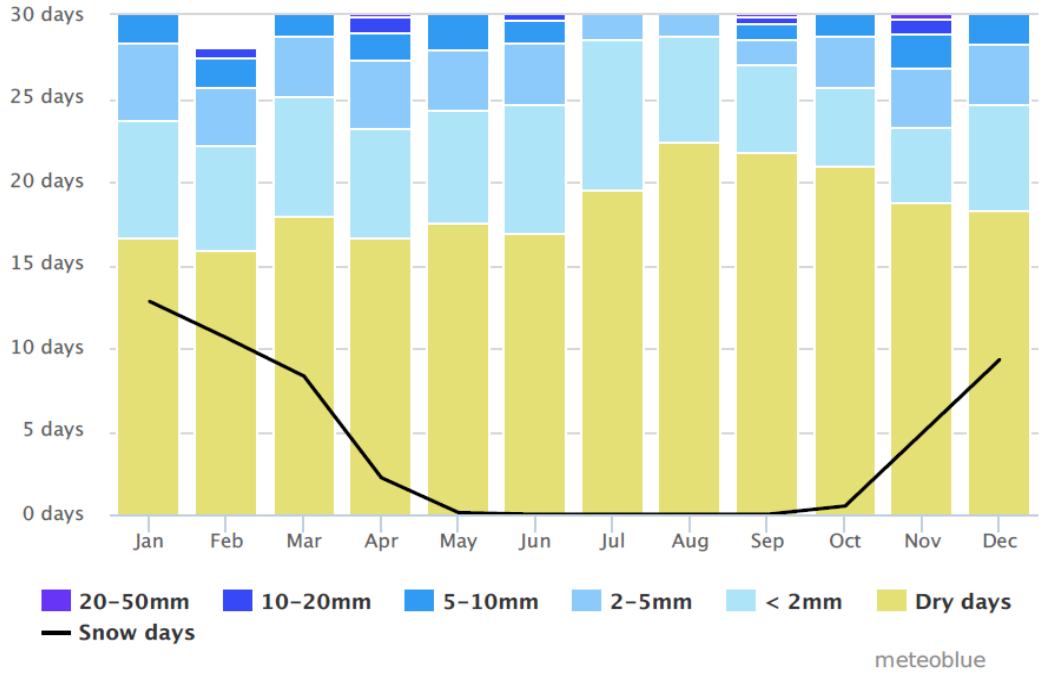


Fig.11. Wind speed

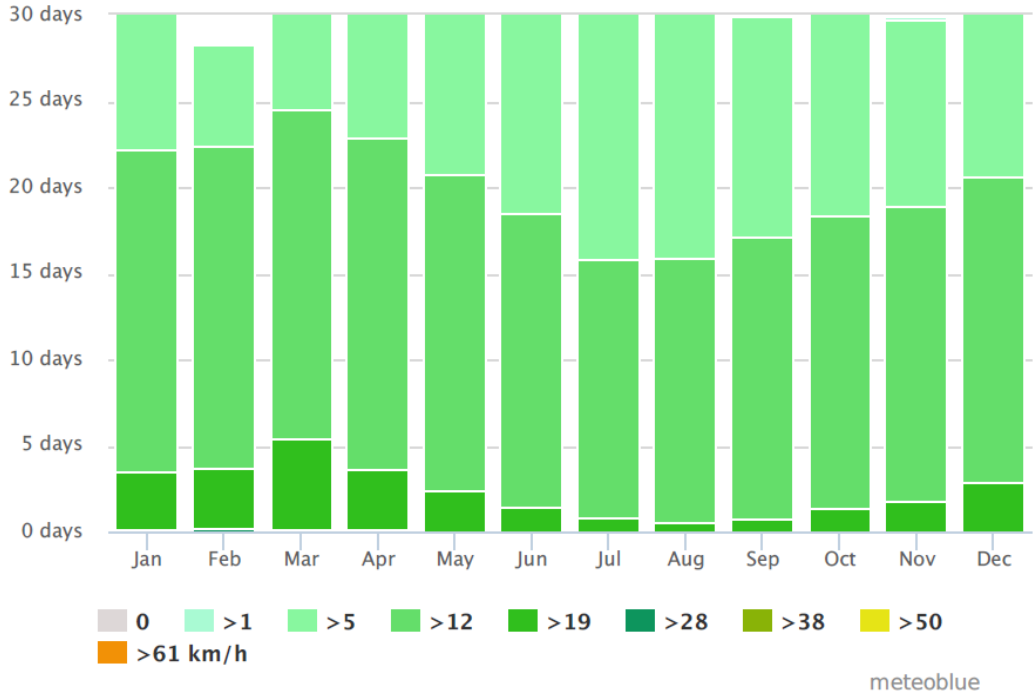
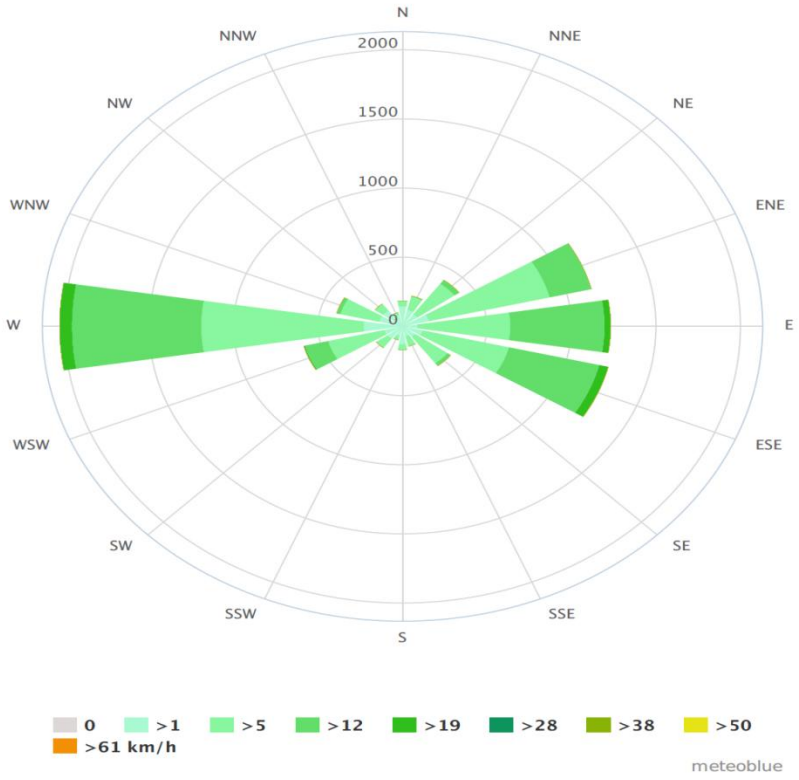


Fig.12. Wind rose



ANNEX 3: Water Peak Discharges

Table 1. Water peak discharges of the rivers and gorges crossing the modernization road from Rikoti Pass to village Argveti

(the option marked with the right blue line is marked as #1″ in the map)

Section No. and name of the river	F km^2	L km	i Bed	K	δ	λ	K^{I}	Peak discharges			
								$\tau =$ 100 years	$\tau =$ 50 years	$\tau =$ 20 years	$\tau =$ 10 years
Rikotula #1[I]	5.85	3.75	0.164	5.00	1.07	0.84	-	48.6	37.4	26.4	20.3
Rikotula #2[I]	6.36	4.00	0.160	5.00	1.07	0.84	-	50.8	39.0	27.6	21.2
Gorge #3[I]	0.59	1.42	0.246	5.00	1.11	0.84	0.70	8.66	6.66	4.70	3.61
Gorge #4[I]	0.16	0.55	0.273	5.00	1.01	0.84	0.70	3.45	2.65	1.87	1.44
Gorge #5[I]	2.92	2.70	0.176	5.00	1.10	0.84	0.87	28.5	21.9	15.5	11.9
Gorge #6[I]	0.17	0.85	0.394	5.00	1.15	0.98	0.70	4.93	3.79	2.68	2.06
Gorge #7[I]	0.36	1.20	0.354	5.00	1.14	0.83	0.70	6.66	5.12	3.61	2.78
Gorge #8[I]	0.70	1.80	0.300	5.00	1.10	0.85	0.70	9.84	7.56	5.34	4.11
Gorge #9[I]	1.16	2.00	0.285	5.00	1.12	0.85	0.81	16.0	12.3	8.68	6.68
Gorge #10[I]	0.21	0.65	0.454	5.00	1.00	0.93	0.70	4.81	3.70	2.61	2.01
Gorge #11[I]	0.16	0.80	0.406	5.00	1.09	0.90	0.70	4.15	3.19	2.25	1.73
Gorge #12[I]	0.25	0.77	0.416	5.00	1.06	0.90	0.70	5.46	4.20	2.96	2.28
Rikotula #13[I]	21.1	8.80	0.091	5.00	1.15	0.86	-	102	78.4	55.3	42.6
Gorge #14[I]	0.08	0.40	0.462	5.00	1.09	0.94	0.70	2.81	2.16	1.52	1.17
sakbeula #15[I]	26.7	12.5	0.060	5.00	1.20	0.85	-	108	83.0	58.6	45.1
Gorge #16[I]	0.08	0.41	0.524	5.00	1.01	0.84	0.70	2.37	1.82	1.29	0.99
Gorge #17[I]	0.22	0.80	0.400	5.00	1.02	0.88	0.70	4.68	3.60	2.54	1.95
Gorge #18[I]	0.16	0.98	0.326	5.00	1.15	0.91	0.70	4.28	3.29	2.32	1.79
Nikraula #19[I]	0.46	1.18	0.305	5.00	1.05	0.90	0.70	7.70	5.92	4.18	3.21
Gorge #20[I]	0.14	0.60	0.242	5.00	1.02	0.88	0.70	3.28	2.52	1.78	1.37
Satevze #21[I]	1.44	1.78	0.177	5.00	1.03	0.88	0.81	16.8	12.9	9.12	7.01
Rikotula #22[I]-16[II]	69.5	12.3	0.076	5.00	1.00	0.90	-	187	144	101	78.0
Tsiskvileburi #19-23[I]-17[II]	3.15	4.80	0.166	5.00	1.13	0.85	0.88	29.3	22.5	15.9	12.2
Gorge #20-24[I]-17[II]	0.22	0.70	0.250	5.00	1.11	0.86	0.70	4.71	3.62	2.56	1.97
Rikotula	73.8	13.6	0.070	5.00	1.00	0.90	-	189	145	103	79.0

#21-25[I]-18[II]											

Table 2. Water peak discharges of the rivers and gorges crossing the modernization road from Rikoti Pass to village Khevi

(the option marked with the left blue line is marked as #1″ in the map)

Section No. and name of the river	F km^2	L km	i Bed	K	δ	λ	K^1	Peak discharges			
								$\tau =$ 100 years	$\tau =$ 50 years	$\tau =$ 20 years	$\tau =$ 10 years
Rikotula #1[II]	5.85	3.75	0.164	5.00	1.07	0.84	-	48.6	37.4	26.4	20.3
Gorge #2[II]	0.16	0.60	0.308	5.00	1.12	0.83	0.70	3.83	2.94	2.08	1.60
Gorge #3[II]	0.25	0.80	0.319	5.00	1.05	0.83	0.70	4.82	3.71	2.62	2.01
Gorge #4[II]	2.26	2.50	0.240	5.00	1.09	0.83	0.84	23.7	18.2	12.9	9.89
Gorge #5[II]	0.39	1.05	0.371	5.00	1.08	0.83	0.70	6.74	5.18	3.66	2.81
Gorge #6[II]	1.36	1.90	0.303	5.00	1.08	0.84	0.81	17.2	13.2	9.33	7.18
Gorge #7[II]	0.23	0.73	0.432	5.00	1.05	0.84	0.70	4.81	3.70	2.61	2.00
Gorge #8[II]	0.68	1.62	0.346	5.00	1.10	0.85	0.70	9.89	7.60	5.37	4.13
Gorge #9[II]	0.41	1.30	0.346	5.00	1.14	0.85	0.70	7.39	5.68	4.01	3.08
Gorge #10[II]	0.15	0.62	0.484	5.00	1.01	0.90	0.70	3.80	2.92	2.06	1.59
Gorge #11[II]	0.13	0.48	0.406	5.00	1.05	0.85	0.70	3.33	2.56	1.81	1.39
didi Rele #12[II]	0.84	2.10	0.317	5.00	1.06	0.84	0.70	10.6	8.15	5.75	4.42
Gorge #13[II]	0.37	1.22	0.316	5.00	1.07	0.90	0.70	6.81	5.23	3.70	2.84
Gorge #14[II]	0.10	0.45	0.333	5.00	1.03	0.92	0.70	2.90	2.23	1.57	1.21
Rikotula #15[II]	51.3	11.0	0.083	5.00	1.12	0.88	-	174	134	94.4	72.6
nikraula #19[I]	0.46	1.18	0.305	5.00	1.05	0.90	0.70	7.70	5.92	4.18	3.21
Gorge #20[I]	0.14	0.60	0.242	5.00	1.02	0.88	0.70	3.28	2.52	1.78	1.37
Satevze #21[I]	1.44	1.78	0.177	5.00	1.03	0.88	0.81	16.8	12.9	9.12	7.01
Rikotula #22[I]-16[II]	69.5	12.3	0.076	5.00	1.10	0.90	-	206	158	112	86.0

Table 3. Water peak discharges of the rivers and gorges crossing the modernization road from Rikoti Pass to village Khevi

(the option marked with the yellow line is marked as #1 in the map)

Section No. and name of the river	F km2	L km	i Bed	K	δ	λ	K_{I}	Peak discharges			
								$\tau =$ 100 years	$\tau =$ 50 years	$\tau =$ 20 years	$\tau =$ 10 years

Rikotula #1	5.85	3.75	0.164	5.00	1.07	0.84	-	48.6	37.4	26.4	20.3
Gorge #2	0.16	0.60	0.308	5.00	1.12	0.83	0.70	3.83	2.94	2.08	1.60
Gorge #3	0.25	0.80	0.319	5.00	1.05	0.83	0.70	4.82	3.71	2.62	2.01
Gorge #4	2.26	2.50	0.240	5.00	1.09	0.83	0.84	23.7	18.2	12.9	9.89
Gorge #5	0.39	1.05	0.371	5.00	1.08	0.83	0.70	6.74	5.18	3.66	2.81
Gorge #6	1.36	1.90	0.303	5.00	1.08	0.84	0.81	17.2	13.2	9.33	7.18
Gorge #7	0.23	0.73	0.432	5.00	1.05	0.84	0.70	4.81	3.70	2.61	2.00
Gorge #8	0.68	1.62	0.346	5.00	1.10	0.85	0.70	9.89	7.60	5.37	4.13
Gorge #9	0.41	1.30	0.346	5.00	1.14	0.85	0.70	7.39	5.68	4.01	3.08
Gorge #10	0.15	0.62	0.484	5.00	1.01	0.90	0.70	3.80	2.92	2.06	1.59
Gorge #11	0.13	0.48	0.406	5.00	1.05	0.85	0.70	3.33	2.56	1.81	1.39
Big Ghele #12	0.84	2.10	0.317	5.00	1.06	0.84	0.70	10.6	8.15	5.75	4.42
Gorge #13	0.37	1.22	0.316	5.00	1.07	0.90	0.70	6.81	5.23	3.70	2.84
Gorge #14	0.10	0.45	0.333	5.00	1.03	0.92	0.70	2.90	2.23	1.57	1.21
Tsakura #15	15.6	6.50	0.103	5.00	1.13	0.85	-	87.2	67.0	47.3	36.4
Gorge #16	0.05	0.27	0.370	5.00	1.02	0.90	0.70	1.80	1.38	0.98	0.75
Gorge #17	0.05	0.20	0.475	5.00	1.00	0.92	0.70	1.86	1.43	1.01	0.78
Gorge #18	0.06	0.33	0.364	5.00	1.05	0.95	0.70	2.20	1.69	1.19	0.92
Tsiskvileburi #19-23I -16II	3.15	4.80	0.166	5.00	1.13	0.85	0.88	29.3	22.5	15.9	12.2
Gorge #20-24I-17II	0.22	0.70	0.250	5.00	1.11	0.86	0.70	4.71	3.62	2.56	1.97
Rikotula #21-25I-18II	73.8	13.6	0.070	5.00	1.10	0.90	-	208	160	113	86.8

ANNEX 4: Assessment Criteria for Ranking Expected Impacts

Table 5.1: Assessment criteria of the expected impact on the air environment

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Propagation of combustion products	The MAC portionof the polluting substance concentrations in a 500 m zone and at the border of the populated area exceeds 1 and exceeds or almost equals 0,8 at other sensitive receptors (hospital, recreational zone, etc.). The impact is long or constant.Population's dissatisfaction is inevitable.	The MAC portion of the polluting substance concentrationsis less than 0,8 at sensitive receptors (hospital, recreational zone, etc.). Excess MAC in a 500 m zone and at the border of the populated area is fixed only in some cases (technological failure); however, the impact will be temporal and can be easily abolished.	The MAC portion of the polluting substance concentrationsis less than 0,8 in the design points. Insignificant deterioration of the background quality of the atmospheric air is expected.the population's dissatisfaction is not expected.
Dust propagation	The MAC portionof inorganic or organic dust in a 500 m zone and at the border of the populated area exceeds 1 and exceeds or almost equals 0,8 at other sensitive receptors (hospital, recreational zone, etc.). The impact is long. The population's dissatisfaction is inevitable.	Dust concentration in excess of MAC in the design points is less likely. Significant dust-formation is expected only in some cases (transportation, windy weather). The impact is controllable and provided the mitigation measures are taken, no population's dissatisfaction is expected.	Insignificant increase in dust propagation is expected only in case of vehicle movement or in a windy weather. The impact is controllable provided standard mitigation measures are taken.
Odor propagation	Objectionable odor spreads towards the settled area and sensitive receptors (hospital, recreational zone, etc.) either constantly, or in the windy weather. Population's dissatisfaction is inevitable.	Provided the technological processes are duly accomplished, the odor propagation towards the settled area and sensitive receptors (hospital, recreational zone, etc.) will be minimal. the population's dissatisfaction is not expected.	There is no risk of objectionable odor propagation towards the settled area and sensitive receptors. Objectionable odor spreads over the area adjacent to the unit.
Condition of the working area (combustion products, dust, odor)	It is impossible to work. Using self-contained breathing apparatus or other protective equipment is inefficient.	Combustion products, dust or odor propagates in the work area, but working is possible provided the relevant protective equipment are used or other measures are taken (e.g. cutting the working hours and the like).	The quality of atmospheric air in the work area is satisfactory. There is no need for PPE to use.

Table 5.2: Noise and vibration propagation – Impact Assessment Criteria

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Noise propagation	Noise levels at the border of the settled area exceed 55 DbA during the day and 45 dBA at night, or exceeds50 dBA during the day and 40dBA at night at sensitive receptors. Excess noise levels are intense. Population's dissatisfaction is inevitable.	Noise levels at the border of the settled area little exceed 55 DbA during the day and 45 dBA at night; however, the impact is expected only in some cases or is temporal. The noise levels at the sensitive receptors are admissible; however, additional preventive measures are recommended.	The noise background levels have deteriorated a bit near the settled areas or sensitive receptors. In any case, no levels in excess of the admissible levels are expected. It is sufficient to take standard mitigation measures.
Vibration	Due to the use of heavy technique and other methods, vibration spreads to great distances. There is a probability of damage or destruction of buildings and premises, monuments of cultural heritage or disturbance of geological stability.	Vibration does not spread to far places, or the impact is short-term. The probability of damage of buildings and premises, monuments of cultural heritage or disturbance of geological stabilityis very little. Minor and periodic discomfort is expected.	Vibration propagates only in the working zone. No damage of buildings and premises, monuments of cultural heritage or disturbance of geological stability is expected. No addiitonal mitigation measures are needed.
Condition of the working area (noise and vibration)	It is impossible to work. Using ear-plugs or other protective equipment is less inefficient. It is necessary to change the service staff frequently.	Noise and vibration is a nuisance in the working area; but working is possible provided the relevant protective equipment are used or other measures are taken (e.g. cutting the working hours and the like).	The noise and vibration levels in the working zone are not high. No PPE is needed, or if needed only for short periods. An 8-hour-long working day is permitted.

Table 5.3:Assessment criteria of the expected impact on water

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Changed flow rate of the surface waters	Under the project impact, the natural river flow rate is strongly changed (either for the year, or temporarily); it is difficult to maintain the present state of the water eco-	Under the project impact, the natural river flow rate reduced to 70%(either for the year, or temporarily); however, the water eco-system is mostly maintained. The access of another water-	Under the project impact, the natural river flow rate reduced to 70% (either for the year, or temporarily). The access of another water-consuming unit to water

	system. Other water-consuming unit has a limited access to water, or due to the increased water flow, the risk of developing hazardous hydrological events has increased.	consuming unit to water has not changed, or Under the project impact, the natural river flow rate increased to 110%. The risks of developing the hazardous - hydrological events are possible to eliminate by using relevant protective measures.	has not changed, or the unit is not used for other purposes. The river flow rate will not increase under the impact of the project.
Deterioration of the surface water quality, origination of the sewage	Fishing or drinking-and-industrial water object is under the impact, or Significant amount of sewage is expected. Despite building the treatment plant, there is a probability of discharging the excessively polluted waters, or the probability of emergencies is high. Due to the near location of the water body, there is a possibility for the solid remains and liquid mass to enter the water body.	An industrial-household water unit is under the impact. Sewage is originated; however, at the expense of relevant preventive measures (arranging the duly efficient treatment plant, etc.) it is possible to maintain the qualitative state of the surface water. The existing quality may be changed a bit what will have a minor impact on the water biodiversity, or the probability of emergencies to occur is not high. In such a case, the distances are so great that the risks of the polluting substances flowing into the water are minimal.	There are no surface waters near the water object. Therefore, there is only the possibility of indirect impact, which is not major. No sewage is expected to originate, or the small amounts of liquid remains can be managed by using the methods safe for the water environment (e.g. by an evaporating pond, recycling the liquid remains, etc.).
Ground water pollution	The activity implies using the methods creating the risks of excess pollution of the ground waters (e.g. burying the materials containing polluted substances, etc.); mitigation measures are less efficient, or the probability of emergencies to occur is quite likely with the infiltration of the large amounts of oil products or other polluting substances into the ground layers.	The activity implies using the methods creating certain risks of pollution of the ground waters; however, using the mitigation measures is efficient and significantly reduce the risks, or there is probability of emergencies to occur; however, relevant preventive measures are taken.	The risks of the ground water pollution are associated with the unforeseen cases only (minor oil product leakages from technique or equipment and the like.). No large amounts of liquid polluting substances are stored or used in the area threatening the ground waters in case of accidents.
Impact on the flow rate of the	The activity envisages arranging deep engineering facilities, with which it is	The activity does not envisage arranging deep engineering facilities, and in addition, there are no	By considering the small project area, used building and exploitation methods

ground waters, changed infiltration properties of the grounds	possible to cross the underground water-bearing infrastructure. As a result, the outflows of the underground waters may decrease, or The activity envisages using large land areas/cutting down the forests what will deteriorate the ground infiltration properties. This may reduce the intensity of the underground water alimentation with the atmospheric precipitations.	particularly significant water-bearing horizons spreading on the territory. Despite this, cultivation of land areas or the used building and exploitation methods may have a certain impact on the outflows of less valuable springs.	and existing hydro-geological conditions, the impact on the flow rate of the underground waters will be minor. No impact on either drinking, or industrial water is expected.

Table 5.4: Assessment criteria of the expected impact on the soil

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Damage and erosion of the fertile soil layer	The project envisages using over 12,5 ha of agricultural plots or other land areas highly valuable in respect of fertility, or the methods used during the building and exploitation promote the activation of the soil erosion processes over significant areas.	The project envisages using less than 12,5 ha of agricultural plots or other land areas valuable in respect of fertility, or the area to manage is more than 12,5 ha, but this is not an agricultural land or is not otherwise valuable, or The methods used during the building and exploitation promote the activation of the soil erosion processes in some areas, but they can be prevented by using the relevant mitigation measures.	The project envisages using less than 12,5 ha of non-agricultural plots or other land areas less valuable in respect of fertility. Provided the fertile soils layer is duly managed, the impact will be minimal. No erosion beyond the used perimeter is expected.
Soil/ground pollution	Due to the methods used during the building and exploitation, the risks of polluting the fertile layer of the agricultural land of any	Due to the methods used during the building and exploitation, there are risks of polluting the less valuable surface layer of lands (exceeding MAC)	Only minor local pollution of soil/ground is expected, mostly in unforeseen cases. The technology of local cleaning the

	area (exceeding MAC) are quite high or virtually inevitable or the probability of developing such emergencies leading to the pollution of over 100 m^2 area or over the depth of 0,3 m of soil and ground is quite high.	or there is a probability of developing such emergencies leading to the pollution of less than 100 m^2 area or less than the depth of 0,3 m of soil and ground.	polluted soil can be used.

Table 5.5: Assessment criteria of the expected impact on the geological environment

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Violation of the stability of the geological environment under the project impact, activation of hazardous processes	The project is planned to implement in the relief with the III degree of complexity in engineering-geological respect. During the earthworks, the probability of activation of such hazardous geodynamic processes, as landslide, rock fall, mudflow, etc. exists, or the risks of activation of the same processes exist in the operation phase of the object (hydrotehcnical facilities, tunnels, etc. can be considered as such object). It is necessary to build the protective facilities of complex structures or to make corrections to the project.	The project is planned to implement in the relief with the II degree of complexity in engineering-geological respect. During the earthworks or in the operating phase, the probability of activation of hazardous geodynamic processes. However, provided the protective measures in terms of simple-structure facilities these can be prevented.	The project is planned to implement in the favorable relief. No significant resources to build protective structures are needed. Only local, minor erosive processes may develop.
Impact of the existing engineering-geological conditions on the project facilities	The engineering-geological properties of the grounds are not favorable needing building deep foundations to establish the facilities on the cliffy rocks, or hazardous geodynamic processes threaten	The engineering-geological properties of the grounds allow founding the object, but under certain conditions. The degree of the environment (ground and ground waters) aggressiveness to the reinforced concrete is satisfactory,	The object is not a facility of a complex structure. The engineering-geological properties of the territory-constituent grounds are satisfactory. Consequently, there is no need for either deep foundations, or significant measures to protect the

	the stability of the object. It is necessary to build the protective facilities of complex structures or to make certain corrections to the project.	or hazardous geo-dynamic processes pose a certain threat to the object's stability; however, the risk may be eliminated by taking protective measures of a simple structure.	engineering facilities.

Table 5.6: Assessment criteria of the expected impact on the biological environment

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Generic and quantitative changes in the vegetation cover	The project implementation will lead to the destroy of the endemic or Red-Listed species or the project implementation will lead to the use of the forested area over 1 ha or there is a risk for invasive kinds to spread	Following the project implementation, the risks of direct or indirect impacts on the endemic or Red-Listed species are minimal or the project implementation will lead to the use of the forested area less than 1 ha	Following the project implementation, there is no risk of impact on the endemic or Red-Listed species. Only the destruction of the homogenous low-value vegetation cover is expected. There is no risk for invasive species to spread.
Deterioration of the animal habitats, habitat loss or fragmentation	The project implementation will lead to the destroy, reduction or fragmentation of the area of the endemic and Red-Listed animal species or certain species may be reduced or certain population may disappear in the project implementation area or the object is a linear object creating a kind of barrier for migrating animals or there is a risk for invasive kinds to spread.	Following the project implementation, the impact on the endemic or Red-Listed species is less likely. The area of such living organisms with no ability to migrate to long distances may decrease, or quantitative changes of certain species are expected in the project implementation area, but their destroy is not likely.	The project area is under the anthropogenic impact and is not a shelter for animal species. Only the animals adapted to the human activity live in the area with high ecological valency. The object is not a barrier hampering the migrating animals.
Immediate impact	Due to the project implementation, there	Due to the project implementation, there are few	Perish of the animal species is less likely.

on fauna specie s	are some cases of animal perish (including endemic or Red-Listed species) during the year, or increased probability of poaching.	cases of animal perish (less valuable species) during the year	The impact is short-term. The probability of increased poaching is minimal.
Direct or indirect impacts on the protected areas	Due to small distance and following the methods used at the building and exploitation stages, there are risks of long-term direct or indirect impacts on the territory.	Following the methods used at the building and exploitation stages, there is a risk of indirect impact on the protected area, but the impact is not long.	Due to a great distance, an impact on the protected area is less likely.

Table 5.7: Assessment criteria of the expected impact on the visual-landscape environment

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Landscape impact	The project implementation is planned within the limits of the rare and high-value landscapes, or the landscape and its components are in fact intact and have high degree of naturalness.	The project implementation is planned within the limits of a regional or local landscape or the landscape and its components are partially transformed due to the human actions. They have an average degree of naturalness.	The project implementation is planned within the limits of a low-value landscape, which can be substituted, or the landscape and its components are quite devastated due to the man's economic activity.
Visual changes	The project area is easily seen from many locations. Implementation of the activity will have a significant impact on the visual effect for the local people or tourists.	The project area is seen from some observation points having no touristic value.	The project area is almost invisible. The building and exploitation will have a minimal impact on the visual effect for the local people or tourists.

Table 5.8: Assessment criteria of the expected impact on the social environment

Kind of impact	Assessment criteria		
	Significant (high) impact		*Significant (high) impact*
		Positive impact	
Increased budgetary flows	Increased central budgetary flows	*Increased budgetary flows*	Increased central budgetary flows
Employment and growing income of the population	The possibility to employ totally 100 or more people, or the possibility to employ30 or more local rural residents or the possibility to employ10 or more local residents in the high-mountain villages.	*Employment and growing income of the population*	The possibility to employ totally 100 or more people, or the possibility to employ30 or more local rural residents or the possibility to employ10 or more local residents in the high-mountain villages.
Improvement of transport infrastructure	Improvement of the technical state of the international, state and regional roads, high probability of distress of transport intensity.	Improvement of the technical state of the roads in some or high-mountainous village and easy transportation.	Simplified rehabilitation of rural roads and transportation
Other social-economic benefit	At a country, regional or municipal level, or for several high-mountainous villages: • Improved waste management conditions. • Improved water-supply and water-drainage conditions. • Improved power supply and gas supply conditions. • Improved accessibility to other kinds of resources.	For several or high-mountainous villages: • Improved waste management conditions. • Improved water-supply and water-drainage conditions. • Improved power supply and gas supply conditions. • Improved accessibility to other kinds of resources.	Only some families (homesteads) receive various social-economic benefits.

Negative impact			
Resettlement, need to use private property	One of several cases of physical resettlement, or over 10 cases of economic resettlement, or one or several cases of economic resettlement in a high-mountainous village	Up to 10 cases of economic resettlement. Provided the compensation measures are taken, no population's dissatisfaction is expected	No physical or economic resettlement is expected. Temporal use of the privately owned land plots and units may be needed, with the relevant compensation measures planned.
Deterioration of transport infrastructure	Deterioration of the technical condition of the international, state and regional roads, significant increase of transport intensity.	Deterioration of the technical condition of the roads in some or high-mountainous villages or significant increase in vehicle movement; however, the impact is temporal.	No deterioration of local roads or significant increase of transport intensity is not expected.
Other negative social-economic effects	At a country, regional or municipal level, or for several high-mountainous villages: • Deteriorated waste management conditions and landfill overload. • Deteriorated water-supply and water-drainage conditions or overloaded relevant systems • Limited accessibility to other resources.	For several or high-mountainous villages: • Deteriorated waste management conditions and landfill overload. • Deteriorated water-supply and water-drainage conditions or overloaded relevant systems • Limited accessibility to other resources.	For several families • Deteriorated waste management conditions and landfill overload. • Deteriorated water-supply and water-drainage conditions or overloaded relevant systems • Limited accessibility to other resources. However, the problem can be solved by searching alternative routes.

Table 5.9: Assessment criteria of the expected impact on the historical-cultural monuments

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Damage to the historical-cultural monuments	Due to the small distance and following the methods used in the building and exploitation phases, there is a probability of damaging the monuments of the international or local historical-cultural heritage.	Due to the small distance and following the methods used in the building and exploitation phases, there is a probability of damaging the monuments of the local historical-cultural heritage.	Due to the great distance, the probability of damaging the monuments of historical-cultural heritage is less likely.
Unforeseen damage to the archeological monuments	Following the historical designation of the project area, there is a probability of the late identification of the archeological monuments.		The area is quite anthropogenic. Therefore, identification of the recent archeological monuments is less likely.

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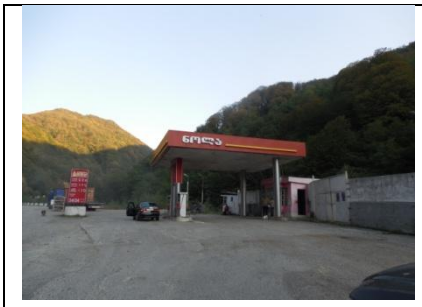
ANNEX 5: Business Structures and Premises Adjacent to the EWH Section between Chumateleti and Khevi

	Company, Contact Information	Type of Business	Employers			Coordinates
			Female	male	sum	
	"Shubitidze and Company"Ltd. 599 18 22 44 – Malkhaz Shubitidze	1. Restaurant "Nazuqebi"; 2. Rest Room; 3. Market	12	4	16	$42^{0}03^{II}57.85^{II}$ N; $43^{0}28^{II}47.61^{II}$ E;
	Individual Enterprise "Kukuri Kurtanidze" 558 39 93 39 – Kukuri Kurtanidze	Restaurant "Kheoba"	3	9	12	$42^{0}04^{II}02.54^{II}$ N; $43^{0}28^{II}47.96^{II}$ E;
	Abandoned restaurant. Owner is not known					$42^{0}05^{II}14.16^{II}$ N; $43^{0}27^{II}56.88^{II}$ E;
	Individual Enterprise „Tengiz Mumladze" 557 36 78 98 Tengiz Mumladze	Restaurant "Gedebi"	5	5	10	$42^{0}05^{II}14.74^{II}$ N; $43^{0}27^{II}56.55^{II}$ E;
	"Edemi"Ltd. 514 01 11 10 - Murman	Restaurant "Edemi"	7	23	30	$42^{0}04^{II}39.96^{II}$ N; $43^{0}28^{II}31.37^{II}$ E;

	“Evrazia”Ltd. 593 36 34 24 Zviadi	Gas station	1	4	5	$42^{0}03^{II}39.46^{II}$ N; $43^{0}27^{II}25.60^{II}$ E;
	Abandoned service centre. Owner is not known					$42^{0}05^{II}42.81^{II}$ N; $43^{0}25^{II}54.42^{II}$ E;
	Abandoned restaurant. Owner is not known					$42^{0}05^{II}42.51^{II}$ N; $43^{0}25^{II}52.91^{II}$ E;
	“Sameba”Ltd. Avtandil Kurtanidze – 593 888883	Restorat “Jargvali”	13	27	40	$42^{0}05^{II}36.57^{II}$ N; $43^{0}25^{II}21.62^{II}$ E;
	Individual Enterprise “Ucha Kakiashvili” Ucha Kakiashvili – 598 132858	Resoranr “Khevi”	20	2	22	$42^{0}05^{II}41.50^{II}$ N; $43^{0}25^{II}34.71^{II}$ E;

	"Khepinura" Ltd. Owner: Adri Tabatadze Rented by Mariam Jananashvili – 551 130605	Fast food	16	2	18	$42^{0}05^{II}43.23^{II}$ N; $43^{0}24^{II}54.95^{II}$ E;

ANNEX 6: Guidelines for Waste Management

General Provisions

The below plan comprises all kinds of activities, which result in waste production, among these:

- Activities in normal exploitation conditions;
- Activities in abnormal exploitation conditions (i.e. during repair-construction works);
- Activities in case of emergency.

Goals and Objectives of Guidelines

Waste Management Guidelines set the rules of collection, transporting, allocation, treatment and disposal of different waste in accordance with the provisions of the environmental norms and rules.

Systemic method is used in the process of waste management, namely, it comprises the following key principles:

- Timely measures to avoid waste;
- If possible, facilitation of waste treatment;
- The destruction of waste is the last option.
- The waste management is conducted according to the below principles:
- Hierarchy principle in waste management;
- Proximity principle;
- Care commitment;
- Use of BATNEEC principles (the best known technique so far, which is not connected with excessive expenses);
- "The polluter pays" principle.

All of the above principles are discussed below.

Hierarchy Principle in Waste Management

Hierarchy principle in waste management illustrated in the below scheme implies the prioritization of various activities during waste management in terms of optimization.

Generally the best option is the prevention of waste, followed by the minimization of the amount and threat. In addition, it is accepted that re-use, restoration and recycling of waste is better and destruction is the last option.

Each waste flow should be processed according to the hierarchy. The selected technique should be the best in terms of threat and practicality.

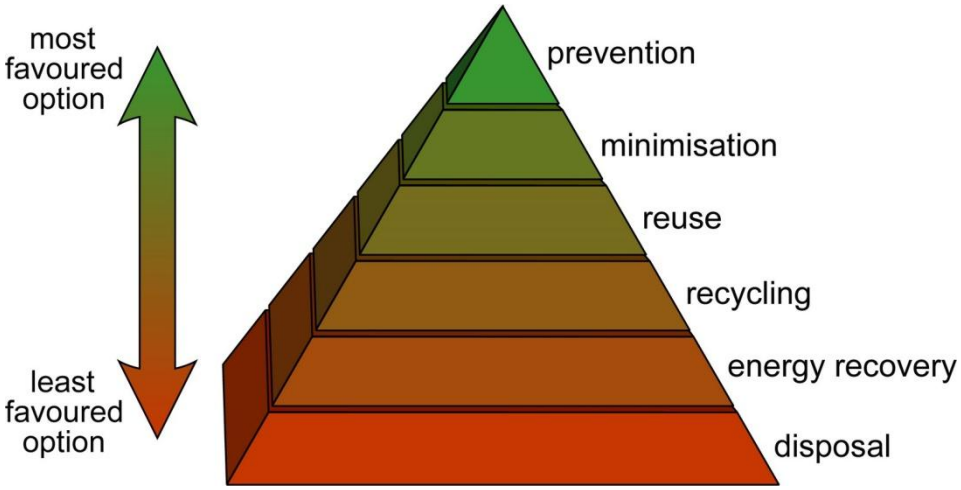


Fig.1. Hierarchy in Waste Management

Proximity Principle:

Proximity principle implies waste management be undertaken as near to the source of production as possible.

Care Commitment

The implementation of the "care commitment" program is facilitated for all types of waste.

The principle of "care commitment" implies that the person who produced or owns the waste is obliged to facilitate due management of the waste even after the waste is passed to the third party.

Care commitment system categorizes and sets the amount and character of the waste from "cradle to the grave" (i.e. from the production till the processing and final destruction including transportation).

The focus of the principle is on the fact that waste producer should select third party to whom the waste shall be passed with due diligence, evaluate the party's capacity and control the party's activities in terms of waste management.

Care commitment requirements are as follows:

- Waste, which is passed to the contractor or carrier for destruction, should have detailed written information on how the waste should be safely transported, processed and destroyed;
- The waste should be passed only to the permitted persons, i.e. registered waste carriers, licensed contractors, waste collectors of the local authorities or persons freed from the licensing obligation;
- Waste should be packaged as necessary, so that it will not spill or leak in the environment;
- All appropriate measures should be introduced, so that all persons who transport or destroy waste follow the requirements of law.
- BATNEEC (the best known technique so far, which is not connected with excessive expenses) principle implies waste management be implemented using the best known technique, which is not connected with excessive expenses.

"The Polluter Pays" Principle

The principle implies that the person who causes the contamination of the environment should indemnify the expenses necessary to eliminate the results of the pollution.

Waste management infrastructure in the project zone and licensed companies

The project zone is located on the territory of Khashuri and Zestaponi municipalities. The landfills of Zestaponi, Kharagauli and Khashuri municipalities are found closest to the project area. As they failed to meet the legal requirements, "Solid Waste Management Company of Georgia" Ltd. closed Kharagauli and Zestaponi landfills in 2016. Consequently, the nearest landfill to serve the project is Khashuri landfill. This landfill will be located on the territory of village Tagveta in Khashuri municipality. This landfill has been owned by "Solid Waste Management Company of Georgia" Ltd. since 2013. In recent years, the company accomplished construction and assembly works on the polygon. Within the scope of the project, the landfill was totally improved. The territory of the landfill was insulated and the waste was covered with an insulation layer. At present, the object is thoroughly electrified. The distance of the landfill to the project zone is 20-30 km.

At present, the above-said landfill is the most acceptable alternative for the disposal of the municipal and non-hazardous waste originated in the construction phase of Chumateleti-Khevi highway.

As for the hazardous waste, which is not expected to originate in great amounts in the construction phase, the licensed companies may be charged with managing it. Below, we give a list of companies (though incomplete) managing hazardous waste on the territory of Georgia:

1. "Mersi" Ltd. (Environmental Impact Permit No. 00054, date of issue: 7.11.2006). The company receives hydrocarbons by pyrolyzing the used tires and other rubber waste.
2. "Frontera East Georgia" Ltd. (Environmental Impact Permit No. 00040, date of issue: 5.9.2006). The company cleans the soils polluted with oil or oil slug and disposes the inert material waste and various chemicals in safe conditions.
3. "Nasadgomari" Ltd. (Environmental Impact Permit No. 00059, date of issue: 1.24.2007). The company owns the bio-remediation grounds, where the soils polluted with oil hydrocarbons are delivered and processed with special technology. The process envisages processing the polluted ground with mineral fertilizers and (artificial) introduction of microorganisms in the soils.
4. "Sanitary" Ltd. (Environmental Impact Permit No. 00136, date of issue: 11.17.2008). The company has a permit for temporal storage of hazardous waste. The types of waste for temporal storage are: used technical oils, oil paraffin, solid waste polluted with oil (plastic, uniforms, rugs), used adsorbents, used batteries, used luminescence/fluorescent bulbs, used antifreeze and paint waste/boxes. It is planned to export hazardous waste to the European countries (Germany, Holland) for final disposal or destruction with certain intervals (once a year presumably). If it is possible (provided there are proper technologies) the waste can be handed down to the contractor with the relevant permit to treat or make it harmless.
5. "Big Been" Ltd. (Environmental Impact Permit No. 00134, date of issue: 2.13.2015). The company makes packaging materials by secondary processing of polyethylene and polypropylene waste. The plant receives the waste from different industrial objects under the relevant agreement.
6. "Sarini" Ltd. (Environmental Impact Permit No. 00102, date of issue: 08.1.2014). The company undertakes management/incineration of toxic and hazardous waste.
7. "Georgian International Energy Company" Ltd. (Environmental Impact Permit Number – Conclusion, date of issue: 9.13.2010). The company has a landfill cell for asbestos and glass-fiber construction materials.

<u>The Main Goals of Waste management Process:</u>

- Facilitation of the waste identification according to its categories and threats;
- Facilitation of the segregated collection of waste, compliance with the conditions of the temporary disposal to exclude the impact of the waste on the environment and human health;

- Facilitation of the transportation conditions of waste, which should exclude the emission or loss of waste as well as probability of accidents, damage to the environment and human health;
- The use of methods safe to the environment and human health during the treatment, processing or disposal of waste;
- Minimization of the amount of waste;
- Re-use of waste;
- Identification of personal responsibility for waste management;
- Facilitation of the records on industrial and household waste.
- The implementation of the instructions given in the plan is compulsory to all employees.

General Requirements of Safe Waste Handling:

- The staff involved in waste management (collection, storage, transportation, delivery/receipt) should be trained in occupational health care and safety issues;
- The staff should be facilitated with special clothes, shoes and individual protection equipment. If required the staff clothes should be specially processed – especially after operations related to the hazardous waste;
- The staff should be able to provide first aid in case of poisoning or trauma during waste related activities;
- The people who have not undergone appropriate training, have no special clothes or have signs of sickness should not be allowed to work;
- Allocation of waste exceeding the set norm in the area of waste collection is not allowed. Allocation of waste near spark or warmth sources is not allowed;
- In case of allocation of different types of waste their compatibility should be considered;
- Storage of external items, personal clothes, special clothes, individual protection equipment is not allowed in the areas of industrial waste collection. Eating in such areas is strictly prohibited;
- Rules of personal hygiene should be strictly followed when working with industrial waste. Before eating and after completion of work hands should be washed with soap and warm water;
- In case of poisoning signs the work should be terminated and the affected person should address the nearest medical point and inform the management of the structural unit;
- The areas of collection of flammable waste should be facilitated with firefighting equipment. Smoking and use of open fire is strictly banned in the areas of allocation of such waste;
- The staff should know the waste characteristics and firefighting rules. The fire extinguishing of burning flammable or fuel liquids is possible with fire extinguishers, sand or asbestos clothes;
- Fire extinguishing of burning solvents with water is not allowed.

Responsibility for the Implementation of Measures Determined by the Plan

Management is responsible for the following:

- Approval of waste inventory charter;
- Facilitation with the equipment, resources and inventory required for waste management;
- Protection of the environmental legislation of Georgia in the process of the management of waste produced as a result of the plant activities.

Staff, who is involved in the waste management field, is responsible for the following:

- Non-fulfillment of waste collection, storage, transportation and other conditions as stipulated by the waste management plan;

- Allocation of waste in non-sanctioned places;
- Violation of norms, rules and records on waste production, processing, use and disposal;
- Delivery of incomplete incorrect documentation (information) on waste management or refusal to deliver such information;
- Delivery of waste without duly formalized documentation;
- Non-fulfillment of the requirements of the waste management plan by the subordinate staff.

Procedures and Rules of Waste Management

This section describes the measures and rules, which should be met (prior to processing and/or destruction) for waste management purposes. Management measures are reviewed according to the below priorities.

Waste Classification

Further management of waste significantly depends on the classification of waste at the place of production. Segregation of waste by waste types, meeting the storage requirements and processing/destruction – all of the above requires appropriate classification of waste.

Waste categories should be identified, samples taken, checked, tested or analyzed in laboratory with the aim to facilitate the classification of waste according to EU standards and determine the below issues:

- Which category the waste belongs to – hazardous, non- hazardous or inert;
- How waste management should be implemented.
- Person responsible for waste management should facilitate the below for waste classification:
- Use temporary inventory of waste, which should describe wide array of expected types of waste;
- If the specific type of waste is not included in the inventory, use other additional methodology to classify waste;

If the general methodology of waste classification is not complete, waste samples should be taken and checked in laboratory to facilitate the classification of waste by the below table.

Provisions for Waste Classification

Waste Classification	Provisions
Inert	According to provisions of article 2 of EU directive 1999/31/EEC, inert waste is the waste which is not subject to significant physical, chemical or biological changes. Inert waste is not resolved, burn or show any other physical or chemical reaction; it does not decompose and negatively impact other matter, with which it interacts; it does not cause the pollution of the environment and damage human health. The contamination effect and eco-toxicity of such waste should be insignificant and will not pose threat to the surface and/or ground water quality.
Hazardous	Hazardous waste is the waste determined by article 1(4) of 91/689 directive and has the following potential characteristics: explosiveness, acidity, high degree of flammability or flammability, irritation causing, toxicity, carcinogenicity, corrosiveness, infectiousness, teratogenesis, mutagenicity; emits very toxic or toxic gases as a result of contact with air, water or acid; substances which could create other substances and eco-toxic substances as a result of destruction.

Non-hazardous	Waste which does not meet the above described provisions.
Waste water	Fresh water which was polluted as a result of project activities.

Inventory

After the classification of waste, which should determine the potential threat of the waste, the person responsible for waste management shall develop the inventory list comprising the below information:

- Waste flows and sources;
- Description and classification of waste flows, i.e. if the specific waste is hazardous or not;
- Storage rules, if applicable;
- Destruction methods and contractors;
- Quantitative characteristics of waste – annual, quarterly or monthly, whichever necessary.

Inventory records during annual or other changes are handled by the persons responsible for waste management. The copies of the waste inventory lists are delivered to the plant management. The records are updated only but those persons who have undergone special training in the issue of the use of waste inventory list.

Correct inventory of waste is necessary for the identification of the below issues:

- How the waste should be processed (if applicable);
- How the waste should be handled (i.e. need for personal protection equipment and like);
- How the waste should be stored (if applicable);
- Rule of final processing/destruction.

The aim of the inventory and further measures, among them – labeling, is to provide for the sufficient information and consequently safe final destruction of waste.

Waste Segregation and Collection

Special containers should be placed in the proximity of the waste producing unit.

Waste should be segregated and allocated in the appropriate container at the waste producing unit.

As a result of the activities at different units waste, which is the subject to registration, collection, temporary storage, carriage, treatment, processing or disposal, is produced and collected.

The method of separated collection of industrial and household waste according to waste categories and threat should be organized and introduced at the object.

The below is the subject to segregated collection and storage:

- Household waste;
- Industrial waste, the carriage of which is not banned on the household grounds (i.e. rubberized asbestos, rubber, plastic household items, wooden and paper waste, wood and sawdust waste, polyethylene pipes, sandpaper waste, etc.);
- Quicksilver containing substances and material;
- Lead containing waste;
- Chemical waste;
- Oily clothes, used respirator filters;
- Oil waste, among these – precipitator waste;
- Used industrial oils, lubricants;
- Material used during the liquidation of oil spills;

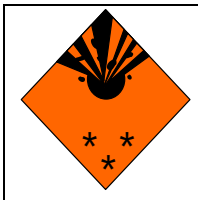
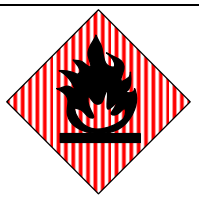
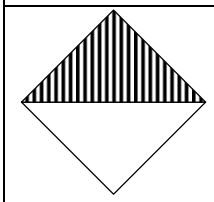
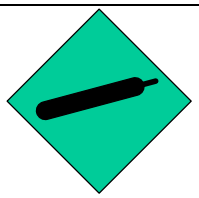
- Contaminated soil and sand;
- Metal scraps, welding electrode waste;
- Used rubber hoses, used tires;
- Used lead accumulator waste;
- Paint and paint barrel waste;
- Medical waste.

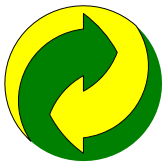
Labeling

Persons responsible for waste management are obliged to provide for marking of the waste containers in a way that the contents should be identified and described in detail. The above is necessary for the external staff to follow the safety rules of waste handling. Waste the type of which is not indicated shall be deemed hazardous and become the subject to the above described classification.

Appropriate labels should be applied to all containers (mugs, wheel boxes, barrels, etc.) so that it is clear which type of waste could be placed in the container. To avoid misunderstanding old labels should be removed.

Fig.2. Information and Warning Signs

 Explosive substances or material	 Toxic gas or substance	 Easily flammable gas and liquid	 Easily flammable solid substance
 Other hazardous substances and material	 Spontaneously igniting substance	 Non-toxic gas	 Hazardous if affected by water
 Infection threat	 Oxidant	 Corrosive substance	 Radioactive substance

 Smoking is banned	 Subject to processing	 For household waste	 Flammable

Waste Storage

The waste should remain on place for minimal period of time and removed as soon as possible for further treatment and destruction.

Waste storage places should be put on the corresponding plan of the object. The waste should be stored in such conditions to avoid the below:

Accidental leak or spill, surface or ground water contamination, breaking of container due to accidental crash, contact with the air due to utilization of secondary packaging and/or covers;

Corrosion or depreciation of containers both due to the environment (through provision of shelter) and the waste itself; to provide the above mentioned containers should be proof to the specific waste which should be placed in it, i.e. automobile accumulators should be placed on plastic plates which are corrosion proof;

Theft due to un-protected allocation of waste within the protected perimeter of the object.

Waste containers should correspond to the waste to be stored, its form, structure and threat. Only containers in good state of repair should be used. Covers should close or other type of covers used. Containers which react to the contents or could result in the leak of the dangerous substance should not be used. All hazardous waste should be strictly segregated from the other types of waste. Only one type of hazardous waste could be placed in a container. Solid and liquid waste should not mix.

The long term collection and storage of waste within the plant is allowed as temporary measure only if:

- Waste is used in the further technological cycle with their full utilization purpose;
- The user does not exist; etc.
- Proceeding from the toxic and physical-chemical characteristics of waste and its components temporary storage is allowed in:
- Industrial or auxiliary storages (storage, store-room);
- Temporary non-stationary warehouse;
- Open areas.
- The areas of temporary waste storage within the object are identified during the waste inventory process and should comply with the below requirements:
- The ground cover should be solid (concrete, asphalt-concrete or concrete tiles);
- The ground should be fenced and facilitated with ricks to avoid the spill of the harmful substances in rain sewerage or soil;
- The ground should be facilitated with comfortable access for auto-transport;
- The waste should be effectively protected against the impact of precipitations and wind (stalls, packaging, allocation of waste in containers, etc.).

During the temporary storage of waste in non-stationary warehouses and grounds the following conditions should be met: the possibility of waste disposal into the waste water or soil should be eliminated.

Hazardous waste could be stored in stationary warehouse. For this purpose a special warehouse area should be facilitated within the object. The area should be arranged according to the environmental requirements, namely:

- The floor and walls should be covered with ceramic tiles;
- The ceiling should be painted with moisture proof paint;
- The area should be equipped with the below:
- Exhaust ventilation system;
- Sink and tap for watering-washing of the area;
- Water intake drain;
- Iron lattices should be installed on the doors and windows;
- Racks and shelves should be installed for waste allocation;
- Waste could be allocated only in hermetic packaging, which should have appropriate labels.

Removal of hazardous waste from the plant and further management should be undertaken by organization with appropriate permit on this type of activity.

Waste Passing Rule

Passing of waste should be formalized through filling in the waste pass form. In each case the below information should be entered:

- Date and time of delivery;
- Description of waste with reference to amount;
- Information on waste producer;
- Information on waste carrier;
- Information on waste recipient;
- Signatures of the representatives of the producer, carrier and recipient.

The filled in form of waste pass should be present along with the carriage overheads from the waste production area or object to the designated place of destruction, that is treatment device of waste waters, landfill, etc.

Each form of waste pass should comprise the full description of waste, structure, production process, packaging, total amount of the passed waste and other relevant information.

Waste pass form should be filled in three copies. The formal procedure of waste pass is as follows:

- Waste pass form is signed by incumbent persons and sub-contractor, who conducts waste removal and carriage;
- The upper copy (first copy) stays at the object and is stored in the archive;
- The below two copies follow the waste till the place of processing, treatment or disposal;
- The carrier is obliged to make the responsible person sign the form at the waste recipient object. It should be indicated that the waste was received in the place of designation;
- After the above procedure the second copy is left at the recipient object;
- The carrier keeps the third copy in the office. Upon the next removal date the carrier should deliver the mentioned third copy to the area of waste production;
- The third copy stays at the waste production area and is stored along with the first copy;

The photo copy of the third copy is made at the area of waste production. The photo copy is sent to the environmental division within the fulfillment of reporting obligations.

The filled forms of waste pass are stored throughout the entire validity term of the contract.

The responsible person is obliged not to issue and sign the waste pass form, if he/she has sound suspicion that the waste has not reached the designated area in accordance with the applicable rules.

Waste Pass Form

Table 2

#	Information on waste producer	Information on waste carrier	Information on waste recipient	Waste composition	Rule/place of production	Packaging

#	Type of waste	Amount of waste	The period of waste collection	The number and name of automobile used for waste transportation	Driver's signature	Time of waste removal from the area of production	The time of waste reception at the place of waste reception	The waste producer's signature	Waste recipient's signature

Waste Producer Organization

Waste Recipient Organization

(It is filled in three copies, one stays with the waste producer, the second belongs to the driver and the third – to the waste recipient. After transportation the driver returns his/her copy to the waste producer).

Waste Transportation

Waste transportation should be conducted in full compliance with the sanitary, environmental and hazardous cargo carriage safety norms. All operations connected with waste loading/unloading and transportation should be maximally mechanized and hermetic.

The loss and dissipation of waste should be avoided during waste transportation. During the transportation of hazardous waste to the temporary storage the accompanying person should have the appropriate document – the request of removal of hazardous waste, which should be verified by plant management. The waste carrier facilitates the transport, loading and transportation of the hazardous waste to the designated area in accordance with sanitary, environmental and safety rules. Upon the completion of the operation the vehicle should be cleaned, washed and treated. The vehicle used for waste transportation should have appropriate warning sign.

Waste which is the subject to secondary processing should be removed from the plant territory by appropriate contractor company on the basis of a contract signed in advance.

Household waste is collected within the plant in special containers, while removal is conducted by the municipal cleaning service on the basis of a contract and according to the determined schedule.

The workers employed in the transportation (drivers and workers) should undergo appropriate training.

The below main risks are connected with cargo transportation:

- Automobile accidents;
- Dissipation or spill of cargo;
- Inappropriate loading of a vehicle.
- To avoid the above mentioned the below should be facilitated:
- The vehicle should be systematically checked in terms of technical state of repair and the traffic speed rules should be met;
- The hermiticity of containers should be checked;
- The cargo capacity of the vehicle should be considered during the loading in order to avoid over-loading of the vehicle;

Liquid impermeable capacious geo-membrane should be placed on the body of the vehicle. It should facilitate the detention of waste on the body of the vehicle in case of emergency spill.

If an accident still occurs despite the consideration of the above safety measures and the environment is contaminated, then the driver urgently contacts with the object administration, who implements the measures as stipulated by the emergency response plan and with the help of the rescue team.

Monitoring of Waste Management

During industrial waste collection, storage, transportation, use, treatment and disposal applicable ecological, sanitary-epidemiologic and safety norms and rules should be complied.

The registration of waste production, allocation, treatment and removal is conducted in special journal. The volume of the removed or utilized waste should be confirmed documentarily.

The person responsible for waste management should systematically control the below:

- The adequacy of the waste packaging;
- Presence of labeling on the packaging;
- The state of temporary waste allocation grounds;
- The amount of the collected waste and compliance with the applicable norms (visual control);
- Compliance with the procedure of the waste removal from the territory;
- Fulfillment of the requirements of ecological safety and safety technique.

Indicators of Effective Waste Management

As it has been already mentioned, different types of waste could be produced at the object. The applicable waste management rules should be complied to provide for appropriate waste management. The waste removal/disposal should be conducted according to the determined rule and following the applicable norms/rules of Georgia.

Potential Impact	Pollution of the territory due to inappropriate waste management
Sources	Packaging; Other construction waste;

	Waste collected during land works; Fuel use and storage; Repair of the equipment; Household waste
Goal	Facilitation of timely removal of waste according to the applicable rule; Prevention of damage to the environment caused by waste
Activity/Control	Facilitation of compliance with appropriate legislative and regulative requirements; Arrangement of special place for temporary waste storage; Throw of waste according to the applicable legislative requirements; Separation of hazardous and non-hazardous waste; Transportation of the household waste to the landfill; Re-use of waste (if applicable); The blocking of access and movement roads should be prevented
Effectiveness Indicator	Absence of grievances; Absence of waste collected during waste and technical servicing; Absence of hazardous waste and spill traces (i.e. oil, fuel, etc.)
Monitoring	Supervision over the allocation-removal procedures of waste; Regular monitoring of waste collection-removal; Due registration of records; Grievance records, if needed – response
Corrective Activities/Reporting	Corrective measures should be implemented as soon as a problem arises or a grievance is received; The work managers account for every incompliance/violation of applicable norms; If needed, the responsible person on the working place informs the management of the cases
Responsible Person	Executor of works
Responsibility for Monitoring/Execution	Plant management

Information on the Waste Produced during Object Exploitation

The following categories of waste are expected during object exploitation:

- Household waste;
- Office waste (paper, cartridges, bulbs, etc.);
- Packaging (wood, paper, etc.);
- Oil contaminated clothes, filters, absorption pillows;

- Oil contaminated soil;
- Polymer waste;
- Medical waste.

The amount of household waste produced during plant functioning is connected with the staff number. According to the preliminary data, up to 200 people shall be employed. Following the accepted norm, 0.70 m^3 of household waste is produced per employee annually. Proceeding from the above, the amount of household waste per year will be: 0.70 X 200 = 140 m^3. The installation of closed containers is planned for household waste at the object. The removal of this waste and disposal at the grounds will be conducted on the basis of the contract with the municipal cleaning service.

Oil contaminated mass as well as other hazardous waste shall be temporarily allocated within the plant in accordance with environmental and hygienic requirements and proceeding from the collection passed to the organization with appropriate environmental impact permit for further processing/disposal/treatment.

Wooden packaging material shall be passed to the local population for further re-use.

The management of waste produced at the object (classification, inventory, segregation, collection, storage, passing and transportation) and monitoring shall be conducted in accordance with the above principles, procedures and rule.

ANNEX 7: 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 river 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 river 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 to call the local fire squad.	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.
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	• Individual cases of accidents; • Severe fracture - a fracture of the joints of the middle;	• Several traumatic accidents; • Severe fracture - Articular fracture etc.; • III and IV degree burns (skin, hypodermic tissues

	damage); • Assistance to injured personnel and the liquidation of the incident is possible by local medical service.	• II degree burns (deep layer of the skin lesions); • There is the need to move injured personnel to the local medical facility.	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.

ANNES 8. Questionnaire for socio-economic study

Family member interviewed
Date --
Checklist #
Name of the respondent
Date - - -
Signature
Name of the Head of Household

1. Household Characteristics

Name, Surname	**Gender**	**Age**	**Ethnic Group**	**Religion**	**Education**				
					Incomplete Secondary)	Completed Secondary	Professional /Technical	High School	Illiterate
Head of Household (HoH)									
Other Members of Family (with notes on relationship with the HoH)									

2. Residence area

Residence area	
Urban	Rural

3. Social Status (Vulnerability)

Any Social Allowances from the Government	Lower than poverty line 57000 scores	Medical Policy Lower than 70000 scores	Other social allowances

4. Women headed household (without breadwinner male)

Yes	No

5. Income Sources

Major Income	Agriculture	Permanent salary in the public service	Permanent salary in the private company	income from Own business	Periodic wages (workings)	Pension
Additional Income						

6. Credit and its structure (Yes/No and bank or individual credit)

Bank	Private Person	No

7. Real estate of the affected households[4]

Property	Category	Characteristics
Land	**Agricultural/residential/commercial**	**area**
Land plot 1		
Land plot 2		

8. Movable Property (number)

Radio	TV	Refrigerator	Washing Machine	Car	Motorbike	Bicycle	Gas stove	Heating devices	Conditioner

9. Livestock (How many)

Cattle	Pig	Sheep	Horse/donkey	Poultry

[4]This table is related to all assets of AHs but not only affected assets

10. Current and basic expenses of the family (GEL per a year)

For food	Not food	Totally

11. Availability of infrastructure and communal services (Yes/No)

Centralized water supply	Well	Spring	Centralized sewage	Septic tank in the yard	Electric power supply	Natural gas	Gas balloons	Liquefied fuel	fire wood

12. Medical Services and Education (Yes/No)

Local Policlinics	Local Hospitals	Municipal Hospitals	Kindergarten	Secondary School	High School	Local Road	Central roads