MINISTRY OF REGIONAL DEVELOPMENT AND INFRASTRUCTURE OF GEORGIA

ROADS DEPARTMENT

Road Corridor Investment Program

Kobuleti Bypass Road, Kobuleti-Batumi Section and Batumi Bypass Road Design Project

ENVIRONMENTAL IMPACT ASSESSMENT

Section 2 : Kobuleti Bypass Road (km 12+400 ~ km 31+259)

FEBRUARY 2012

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List of Abbreviations and Acronyms

AADT	Annual Average Daily Traffic		IUCN	International Union of Conservation of Nature
ACCOBAMS	Agreement on Conservation of Cetaceans of the Mediterranean Sea, Black Sea and Contiguous Atlantic Area		Kg	Kilogram
ADB	Asian Development Bank		KIMS	Institute of Raw Materials of Caucasus
ADB	Asian Development Bank		Km/km	Kilometer
AEWA	African-Eurasian Migratory Waterbirds		Km^2	Square kilometer
AHs	Affected Households		KNP	Kolkheti National Park
AIDS	Acquired Immune Deficiency Syndrome		KNR	Kobuleti Nature Reserve
APs	Affected Persons		LARP	Land Acquisition and Resettlement Plan
BOD	Biological Oxygen Demand		m	Meter
Ca	Calcium		m^2	Square meter
CEAP	Construction Environmental Action Plan		m^3	Cubic meter
CH_4	Methane		MAC	Maximum Allowable Concentrations
CH_4	Methane		MFF	Multittranche Financing Facility
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora		MFF	Multi Tranche Financing Facility
Cl	Chloride		mg/l	Milligram per Liter
cm	Centimeter		MIS	Management Information System
CMS	Conservation of Migratory Species		MM	Man Month
CO	Carbon Monoxide		MOESD	Ministry of Economic Sustainable Development
CO	Carbon Monoxide		MOEP	Ministry of Environment Protection
CO_2	Carbon Dioxide		MRDI	Ministry of Regional Development and Infrastructure
COD	Chemical Oxygen Demand		mS/cm	Milli Siemens per centimeter
CR	Critical Endangered		N_2O	Nitrous Oxide
CSC	Construction Supervision Consultant		Na	Sodium
CSC	Construction Supervision Consultant		NGO	Non-governmental Agency
CSCES	Construction Supervision Environmental Specialist		NGOs	Non-governmental Organisations
cumec	Cubic meter per second		NMVOC	Non-methane Volatile Organic compounds
dBA	A' decibel		NO_2	Nitrogen Dioxide

DC	Design Consultant		NOAA	National Oceanic and Atmosphere Administration, USA
DDC	Detailed Design Consultant		NO_x	Nitrogen Oxides
DHs	Displaced Households		NO_X	Nitrogen Oxide
DO	Dissolved Oxygen		O&M	Operation and Management
DO	Dissolved Oxygen		OC	Organic Carbon
DPs	displaced persons		OH	Occupation and Health
EA	Environmental Assessment		OM	Operations Manual
EE	Ecological Examination		Pb	Lead
EE	Ecological Expertise		PM	Particulate Matter
EEC	Ecological Expertise Conclusion		PMU	Project Management Unit
EHSM	Environment, Health, and Safety Manager		PPE	Personal Protection Equipment
EI	Environmental Inspection		ppm	parts per million
EIA	Environmental Impact Assessment		RAMSAR	Ramsar Convention on Wetlands
EIA	Environmental Impact Assessment		RD	Roads Department
EIP	Environmental Impact Permits		RDMRDI	Roads Department
EIP	Environmental Impact Permit		REA	Rapid Environmental Assessment
EIRR	Economical Internal Rate of Return		RMS	root mean square
EMP	Environmental Management Plan		ROW	Right of Way
EMS	Environmental Management System		SEIA	Summary Environmental Impact Assessment
EN	Endangered		SEL	Sound Exposure Level
EUROBATS	Agreement on Conservation of Population of European Bats		SO_2	Sulfur Dioxide
FHWA	Federal Highway Administrators Traffic Noise Model		STD	Sexually Transmitted Disease
FS	Feasibility Study		STI	Sexually Transmitted Infections
GHG	Greenhouse Gases		TA	Technical Assistance
GIS	Geographical Information System		TDS	Total Dissolved Solids
GOG	Government of Georgia		TN	Total Nitrate
GRC	Grievance Redress Committee		TN	Total Nitrogen
ha	Hectares		TP	Polyphosphate
HC	Hydrocarbon		TPH	total petroleum hydrocarbon
HCO3	Bicarbonate		TSP	Total Suspended Particles
hr	Hour		TSS	Total suspended Sediments
ICZM	Integrated Coastal Zone Management		USEPA	United States Environmental Protection Agency
IEE	initial environmental examination		VU	Vulnerable
IES	Illuminating Engineering Society		$\mu g/m^3$	Microgram per cubic meter
IMCG	International Mire Conservation Group		^0C	Degree Celsius
IPCC	Intergovernmental Panel on Climate Change			

1. EXECUTIVE SUMMARY

1.1 Introduction

The 121 km existing Senaki-Poti–Sarpi road (S-2) along the western coast of Georgia is a key highway and international transit route in Georgia. It is connected to the major Black Sea ports of Georgia, viz. Batumi and Poti, and a number of holiday resorts, particularly, Kobuleti and Batumi. The road runs through heavily built up tourist and residential areas and provides poor road and travel conditions, especially for international transit traffic which has to mix with the dense urban traffic passing through narrow streets. At present a significant volume of international transportation is carried on the Batumi-Poti section of the road amounting to 1.0 million tons annually (2005), with 0.5 million tons on the Batumi-Sarpi section. This mix of heavy traffic on the existing road combined with poor road conditions leads to traffic congestion, dangerous driving situations and frequent traffic accidents, particularly in Batumi and Kobuleti and especially during the tourist season in summer. Hence the government is planning to construct bypass roads to Kobuleti and Batumi (the Project) with finance of Asian Development Bank (ADB). Ministry of Regional Development and Infrastructure (MORDI) is the executing agency of the Project and Roads Department (RD) under the ministry is the implementing agency. A pre-feasibility and feasibility study were carried out for the Project in 2005 and 2009. The proposed bypass roads will reduce the traffic congestion and accidents, increase the generated traffic in the existing road, and reduce travel time and vehicle operating costs.

Georgia enjoys a strategic location it has yet to fully capitalize on. It is on the shortest route between Europe and Azerbaijan, Armenia and the Central Asian Republics, through its Black Sea ports, Poti and Batumi. It also can link Russia and Turkey. The physical location ensures that it is a key transport link on the most direct route between the Black Sea and the Caspian Sea and Central Asia. Trade with neighboring countries, both transit and bilateral, is thus an important feature of the economy. Poor infrastructure and cumbersome processes inhibit the full exploitation of transit economy potential. Georgia's road network is crucial in facilitating sub-regional transport and trade. Thus the Project road has a significant potential for increase of sub-regional and regional trade, agriculture and tourism revenue and reducing poverty. The road is expected to (i) Increase in sub-regional trade through the Turkish border by 4% for 5 years

Map-1: Project Location

after completion, (ii) 30% increase in cross-border freight traffic by 2015 from 1.0 million ton in 2008 to 1.3 million ton, and (ii) Increase in registered visitors to Adjara region by 10% per annum for 5 years after completion from 285,000 in 2008.

Location. The Project road is located along the Black Sea in Adjara region. The entire project road, bypassing the resort town of Kobuleti from the East, is located within the administrative boundaries of Kobuleti region. The Project starts at Ispani village and ends at North portal of the existing tunnel.

Full Adjara by pass Project is packaged into 4 contracts as follows for preparation of detailed designs and implementation.

- Contract 1 – Km 0 to Km 12.4 bypassing Kobuleti Town – a new alignment
- Contract 2 – Km 12.4 to Km 31.3 bypassing Kobuleti Town – a new alignment
- Contract 3 – Km 31.3 to Km 32.3 along the existing road near Makhinjauri tunnel to make the full use of existing and recently constructed 4 lane road tunnel
- Contract 4 – Km 32.3 to Km 48.470 bypassing Batumi Town – a new alignment

The scope of the present document is to prepare Environmental Impact Assessment for 18.9 km Kobuleti bypass road section 2, Contract 2 under tranche 1.

Environmental Impact Assessment. The environmental impacts of the project will be considerable given that the Project area is located in a complex geological terrain and has significant ecological value. The impact assessment addresses the impacts and mitigation measures on the physical, the biological and the human environment. The EIA has been prepared to ensure that the Project is environmentally sound and sustainable as well as in compliance with the safeguard requirements of the ADB (Safeguard Policy Statement, 2009) and Government of Georgia (The Laws on Licenses and Permits, 2005; Environmental Impact Permits and Ecological Examination, 2008) and will be submitted to the Ministry of Environment Protection (MOEP) to obtain Environmental Impact Permit.

1.2 Project Description

The present project is financed by the loan ADB 2560-GEO, Road Corridor Investment Program (Tranche 1) for Preparation of Detailed Design and Preparation of Bidding Documents for Kobuleti Bypass Road, Kobuleti-Batumi Section and Kobuleti Bypass Road.

The project road, bypassing the Kobuleti from East, is entirely located in Kobuleti District and the most part of the road follows the new alignment and will cross mostly the agricultural and household plots.

The object of the present project, Kobuleti bypass, starts from the end of the section designed by the former consultants' consortium, at km 12+400, at village Ispani.

The length of the design road is 18.858 m.

Generally, the aim of the project was to lay the road along the route recommended by the Feasibility Study Report; however, rerouting of some sections turned out to be necessary, in particular:

- At the 17-th km of the design route, due to the construction of a new landfill, the Client (the Road Department) decided to bypass the latter. Accordingly, the design route recommended by the feasibility report in the adjacent areas before and after the given section was changed.

The design route starts with an up to 300-meter-long straight section across the plain terrain covered with old tea plantations and joins the two-level overpass junction (No. 1) at the liquid gas filling station, crosses the river Achkva and in the river floodplain. By running through the forest, Brushes and agricultural plots in the floodplains, the design road, through the bridge crossings, crosses the rivers Kintrishi and Kinkisha. By crossing the road of a local designation to village Bobokvati with a design bridge, the design road follows it and right bank of the river Dekhva upstream. Prior to entering the gorge of the river Shuagele, the design road crosses the river Dekhva with a highway bridge crossing. Approximately 3.5-km-long section of the design road follows up the gorge of the river Shuagele and crosses its bed at several points. At the watershed of the river Shuagele, the road enters a 295-meter-long design tunnel, which is planned to arrange by closed drilling. The next section runs across an old landslide section, where, aiming at avoiding the sections, a roadbed is planned to arrange on high embankments. By bypassing Chakvi the design road crosses the road connecting to village Khala, river Chakvistskali and road connecting to village Chaisubani.

The road reenters the section in the settled area, where several residential houses are to be demolished and a road of a local designation is to be laid over the design road. The existing Batumi-Tbilisi road and some roads of a local designation and gullies are crossed by the design road with a 230-meter-long design overpass. Then the design road penetrates the section where several existing high-voltage transmission towers are to be relocated. The design road ends with a complete overpass junction (No. 4) allowing the two-lane design road to merge with the four-lane design section and allow the passage of traffic flows to the city of Batumi, settlement Chakvi and Batumi Botanical Garden.

This section is in mountainous terrain. It includes two tunnels, fourteen bridges and two overpass bridges including four interchanges.

Traffic Volume. The traffic volume of existing Poti-Sarpi road is 6,667 in 2009 and expected to increase to 20,478 by 2033. 50% of the future traffic is estimated to use the project bypass roads.

Implementation Schedule. Tentative commencement date of the contract is August 2012 and the expected time to complete the construction works is 2015.

1.3 Baseline Environment

Climate. The climate of the region is moderately warm and humid. The region is characterized by hot summer with high amount of precipitation throughout the year. The average annual temperatures for Kobuleti and Chakvi are 13.4^0C and 14.1^0C, respectively. January is the coldest month with the average temperature 4.8^0C in Kobuleti. August is the hottest month with the average temperature 22.6^0C in Kobuleti and Chakvi. The average annual precipitation for Kobuleti and Chakvi is 2514 mm and 2788 mm, respectively. The project area is generally humid throughout the year with an average monthly humidity levels ranges from 73-84%. The average annual humidity level for Kobuleti and Chakvi are 78% - 81%, respectively.

Geology. Main part of the design corridor is located in complex geomorphologic conditions represented with hilly terrain of intensive erosive disintegration. The design alignment goes through the two tectonically distinguished areas: western termination of the Adjara-Trialeti mountain system and dive zone of the Kolkheti valley. Quarter age layers here show existence of heavy and strong volcanogenic rocks of middle Eocene age (tuff, sandstones, tuff-brachia's and tuff conglomerates);

Study area is built with different composition, structure and texture formations of Mid-Eocene volcanogenic-sedimentary rocks which are overlapped with the stream and marine, terrace and shelf quaternary sediments.

Soils. As the entire design corridor is located in the zone of warm and humid subtropical climate, the above rock soils undergo intensive chemical weathering and disintegrations (lateralization) represented utmost in higher cuts of the layers (10-30 meters in power) in hilly terrain. Due to the above processes the area has acquired high rate of geodynamic sensitivity.

Mostly at river terraces of the project area are presented mountain and forest podzolized and loamy soils.

Topography. The starting, 8.5-km-long section of the design route is located on a quite flat plain relief, on the terraces of the rivers Achkva, Kintrishi, Kinkisha and Dekhva. The next section of km 8+500 – km 12+300 follows the trough-like gorge of the river Shuagele at the river level, with the width of 50-80 m. The relief of the gorge is strongly dissectioned with numerous shallow and dry gullies. In the section at km 12+300-km14+100, the tunnel and overpass are to be constructed, the section at km 14+100-15+000, crosses the right nameless tributary of the river Chakvistskali. The section at km15+430-km16+350 is the crossing point with the river Chakvistskali. At this point, the river has developed an open gorge. Along the section of km16+350-km18+858, the design road crosses the left slope of the river Chakvistskali and then a hilly relief where there are mostly clay lateritic spreads,

Hydrology. The project area has significant surface water resources. Kobuleti bypass is crossed by 34 rivers and nameless brooks. Of them, the river Shuagele is crossed at several points, as the modernization road is planned to lie through the bed of this river. Three main rivers will be crossed by the project alignment Achkva, Kintrishi and Chakvistskali. All bridges in the Project area are designed for the design discharge of 100 years return period. The characteristics of the Rivers are stipulated by rather difficult geological constitution and features of relief and climate. All the rivers

belong to mountain river types and do not have big basins and hence river lengths are short. None of these rivers take their head from the glaciers or permanent snow mountains. Mainly they are fed from rain water, snow melt water and groundwater and hence they are characterized by spring and autumn floods. Most of the rivers are characterized by big fall, fast flow, in some sections rivers flow in narrow and deep gorges and create canyon shapes and waterfalls. In some sections the rivers causes the bank erosion causing damage to roads, bridges, crops, and residential houses.

Water Quality The quality of the water in all the rivers is generally very good. The rivers all have potable water with total dissolved solids ranging from 74 to 159 milligrams per liter. All the rivers are excellent sources of water for drinking and construction. No petroleum hydrocarbon or agriculture pollution was identified in the river water.

Noise Quality. Baseline noise level has been measured by device -."Шум – 1". 4 test points were selected near villages Makhinjauri (p.1), Salibauri (p.2), Makhvilauri (p.4) and in Khelvachauri Background noise levels ranges from 50-64dBA.

Baseline and predicted noise level in the area alongside the highway is not significant. In fact without applying any abatement measures, the noise level is in compliance with the standard requirements for the apartment houses at the distance of – 40-50m from the highway.

Air Quality. Air quality is within the national standards except near Khelvachauri. Concentrations of dust (PM) ranges from 0.025 to 0.89 mg/m^3, CO ranges from 0.11 to 2.04 mg/m^3, NO_2 ranges from 0.03 to 0.042 mg/m^3.

Ecosystems. Main types of the ecosystems along the Project can be classified as follows:

- Pasturelands with maize (corn) fields and pasturelands on drained lands on Colchic Lowland (from Natanebi River to Ochkhamuri village from 0 till 12 km) are important as the feeding place of the migrating birds, especially, of soaring raptor birds during spring and autumn migration.

- Rolling lands of foothills occupied by old, tea-bush gardens, covered with ferns, and by the renovate tea-bush plantations, as well as used as citrus and filbert-tree gardens, mainly on homestead lands. Small sites of semi-natural biotopes – wetlands, forests and meadows are embedded within the anthropogenic and residential area.

- Wetlands are important for many species as shelters, feeding places, stopover sites during migration and wintering. The most important site of wetland ecosystem is the peat bog Ispani II, only wild area near the Project alignment. This area supports specific complex of terrestrial vertebrate and invertebrate animals and serves as a feeding area and stop-over-site during passage for many birds' species. Especially it is important for breeding colony of Grey heron (*Ardea cinerea*).

Mammals. 55 species of mammals can be found in the Project area. However, there are no key-habitats of the endangered mammals within the Project area. Bats are most important and vulnerable terrestrial mammals of the Project area. 16 species of bats are recorded in the project area and two of them are red listed. Commonly distributed species in the project area are mole, wolf, jackal, fox, badger and wild cat.

Birds. The south-eastern coast of the Black Sea is one of the most important sites of Western Palaearctic birds' migration. Area includes the south-western part of the Colchic Lowland, seacoast, coastal lowland from Paliastomi Lake and left bank of Rioni River, in north, to Chorokhi River Valley, in south, foothills and pre-mountain area of the western slopes of the Meskheti Ridge. This

route will cross the Project Road. This area is of importance for a variety species as a stop-over site on passage and wintering habitat, but especially – for birds-of-prey. Hundreds of thousands of individual migratory raptors is concentrating here in autumn. This area including "Arkhavi-Borchka" in north-eastern Turkey is well-known "International Bird Area" for raptors.

None of important areas from the point of view of bird protection is located along the proposed alignment. RoW is crossing highly populated areas.

Reptiles. About 13-16 reptiles occur along the Project alignment. Commonly noted species are rock lizards and two of these species are endemic and found exclusively in the Caucasus. These lizards are very much depended on specific places of dwelling - rocks rich with insects. Dice snakes and marsh turtles are other types of reptiles noticed in the Project area. .

Amphibians. There are 12 species of amphibians found in Georgia and 10 of them are distributed in the Project area. Commonly noticed species and endemic to the region are marsh frog, toad, salamanders, and newts.

Fish. 47 freshwater and anadromous fish species occur in rivers, channels and mires. 16 fish species are known from the river Korolistskali, only two of them are redlisted. The least amount of species – 11 (with one redlisted) is known from river Bartskhana. The most number of fish species occurs in the river Chorokhi – 43, and seven of them are included in the Red Data List of Georgia.

The Black Sea salmon (*Salmo fario labrax*) is an endemic and anadromus species (fish that live in ocean and breed in fresh water) that migrates in to rivers Kintrishi, Chakvistskali, and in its inflow for spawning. Spawning areas are situated upstream the Construction Corridor. The salmon migration in the river lasts from March till July, with peak during April-June.

Land Use. The project area includes swamps, badlands, temporal dwellings, perennial plantations (e.g., tea, citrus), an industrial area, agricultural lands, arable lands, and forest. The road mostly passes through arable land comprising pastures, agricultural lands, and tea and citrus plantations. Corn, the major agricultural product, is widely grown on all agricultural land. Vegetables are the second major product.

Population. Adjara has a population of 382, 000 (2009 estimates). Its ethnic groups include Georgian, Russians, Armenians, Greeks, Abkhaz, etc. The Project Road is located in Kobuleti. It passes 8 villages/towns in Kobuleti district.

Economic Resources. Tourism is the major industry in the project area; extensive resort infrastructure is located along the existing road to Batumi. Other industrial activities are manly of light industries. In addition, several stone-crushing factories and an asphalt plant are located near Kobuleti. Industries and municipal infrastructure along the project road include electrical substations. Agriculture, including tea and citrus plantations, is the major economic activity in the project area.

1.4 Anticipated Environmental Impacts and Mitigation Measures

Anticipated environmental impacts of the Project, on the basis of the EIA study, are broadly classified into three categories: preconstruction, construction, and operation.

(i) **Preconstruction.** Anticipated impacts include:

a. pedestrian and high-speed traffic
b. land acquisition issues for new right of way areas, and
c. compensation issues for other fixed assets from acquired right of way

(ii) **Construction.** Environmental impacts could include

a. increased soil erosion, landslides, and/or siltation, including increased risks to downstream rivers and coastal resources as a result of cut and fill operations;
b. impacts of clearing right-of-way, removing vegetation (trees and shrubs), and disposing of spoil;
c. impacts of extracting and transporting construction material from existing quarry sites;
d. impacts of temporary use of land immediately adjacent to the road for sitting of contractor's yard, asphalt plant, and construction camps;
e. reduced air quality and visibility (air quality impacts and/or noise pollution from construction activities, quarry sites, material storage sites, temporary diversion roads, excavations, vehicle and equipment use, and asphalt mixing plant);
f. water and soil pollution at bridge end sites from improper handling and disposal of wastes and materials;
g. drainage from construction camps, material stockpiles, excavations, and quarry activities;
h. interruption to smooth traffic flow, increased traffic congestion, and public safety problems; and
i. social conflicts due to project activities

(iii) **Operation.** Possible environmental impacts include

a. increased traffic volume and related air, noise and public safety concerns; and
b. possible spills from the transport of hazardous cargo

Perceived from the project include

1. reduction of traffic congestion on Kobuleti and Chakvi and hence improved air and noise quality, and road safety;
2. reduced soil erosion and landslides due to slope stabilization measures;
3. improved access in the project area and resulting economic development;
4. faster route for international traffic between Poti and Sarpi; and
5. Improved access to tourist facilities.

Usually implementation of civil works does not have major or long-term impacts, but localized, short-term impacts can be addressed in detailed designs and through application of site-specific environmental management plans (EMPs). These construction-related impacts can be mitigated by (i) the contractors' work practices, especially those related to the storage of construction materials and cleanliness of work sites; (ii) cooperation of local authorities with the contractor for traffic management and use of public space and utilities; (iii) project management's strict enforcement of adequate construction practices and standards; and (iv) the incorporation of mitigation measures identified in the EIA. An environmental management and monitoring plan (including cost estimates) was prepared to mitigate the negative environmental impacts of the Project (Chapter 9)

1.5 Alternatives

Alternative analysis has been carried out for the alignment proposed in the feasibility study alignment considering environmental, social and technical issues.

Without Project Alternative. The present pattern of trade and the available transport links in the central Caucasus region, the bypass Project has a clear role, that of reducing the costs of trade with Georgia's major trading partners. It has other important benefits: it will reduce congestion and

accidents in Batumi and Kobuleti, and facilitate further development of these cities. High standard road access to Kobuleti will also encourage further investment in and around Kobuleti. Hence 'do nothing' or 'without Project' will deprive benefits of the Project and continue to increase the negative impacts generated by increased traffic loads on insufficient capacity of the existing road (traffic congestion, noise, low speed, higher emissions, accidents, etc).

Alternative Analysis during detail design:

In general the design aimed to follow the alignment recommended by the feasibility study report. The followings have been reviewed in detailed design stage

- The minimum curve of R=700 was applied in order to improve drivability where the comparatively small radius of curve was applied on the project alignment with design speed of 100km/hr
- In the Feasibility Study, two interchanges were planned. In detail design, 2 interchanges (N2 and N3) are added in order to secure the accessibility to local area.
- The final alignment is determined for detouring main obstacles such as a gas station, landfill area of Adjara Solid Waste and etc.

The Bypass road alignment starts with 200 m long transition section from 4 lane highway (designed earlier) towards 2 lane design road by the mean of grade separation.

The proposed Bypass road is in mountainous terrain. It includes two tunnels, fourteen bridges and two overpass bridges including four interchanges.

1.6 Public Consultation and Information Disclosure

1.6.1 Consultations to Date

Consultations with local communities and other stakeholders took place largely in conjunction with LARP preparation. Consultations are being conducted by the EIA team with the various stakeholders of the project. During Consultation, a wide range of questions were asked to prompt discussion on concerns or wishes relating to the project, expected effects on road safety, presence of sites of cultural or religious significance, presence or absence of wildlife, concerns about construction phase impacts, suggestions for the project.

From the discussions it was found that Participants were keen for road construction. They welcome the project itself and see construction work as a possible source of earning opportunity. Participants have some concerns over safety and property and wish to see safety issues addressed by sound engineering design, the use of signage and inclusion of pedestrian crossings at sites where pedestrians are most vulnerable. A detailed summary of attendance and discussions is included with the EIA.

During the stakeholder consultation at the Detailed Design stage, Expert consultations were also conducted both at Tbilisi and Kobuleti. This involved professionals who have specialized knowledge in wildlife, River ecology, morphology etc. and NGOs, who are reputed individuals and are responsible for reviewing the EIA report. The consultations offered the opportunity to collect available secondary data and information on environmental parameters. Also these consultations facilitated in identifying the parameters for baseline environmental monitoring survey.

Focus group discussions were held with community groups, local Government officials, community leaders and teachers. They were made aware of the proposed project and its intended scope. Construction impacts in this road section would be generation of noise and dust from civil works which are temporary and of short duration. Qualitatively, the beneficial impacts from the project will

outweigh the temporary disturbance during construction. Nonetheless, these impacts were considered in the Traffic Management Plan during construction including the mitigation measures such as in construction work schedule, spraying of water to minimize dust, etc.

1.6.2 Disclosure of Documents

The electronic versions of the draft EIA will be placed on the RD and Adjara Government web-sites. The hard copies of Georgian version of draft EIA report will be placed in:

- the RD office
- MoEP Department of Licenses and Permits
- Environment and Natural Resources Directorate of Adjara
- Municipalities of Batumi
- Gamgeoba of all Project villages

Public consultation meetings will be conducted following 50 days after the disclosure of EIA documentation in Kobuleti.

Information about the public consultation process will be made available for public through:

- publication in central mass media
- publication in regional newspapers
- distribution of information via the Aarhus Center internet resources
- placing information on the RD web-site

1.7 Environmental Management Plan

An EMP was prepared to address all the anticipated impacts of the Project. Locations of the impacts, mitigation measures, costs, institute responsible and monitoring measures are listed (Chapter 9). The following institutes are responsible for implementing and monitoring the mitigation measures:

- MRDI is responsible for planning, constructing, operating and maintaining regional, national and provincial infrastructures in Georgia and RD is responsible for overall management of roads.
- Environmental Division of the RD will undertake routine and random monitoring of the specific environmental management plans (EMP) addressed in this EIA.
- The supervision consultants under RD are responsible for environmental monitoring and management of project implementation and to help ensure the implementation of environmental management practices at each stage of the construction.
- MOEP will be consulted if complicated issues arise during construction and operation stages.
- External Monitor will be responsible for independent monitoring and implementation of EMP, and external monitoring and evaluation

Contractor is responsible for implementation of EMP during construction works and Construction Supervision Consultant (CSC) is primarily responsible for supervision of monitoring of the implementation of the EMMP. RD will hire ‘external monitoring consultant’ to monitor implementation and supervision of EMMP.

The EMP will be included in all the bid documents of the Project and will become a part of the civil works contract. The strict implementation of the EMP and project management’s strict enforcement of the adequate construction practices and standards will greatly reduce the negative impacts of the

Project. The estimated cost of implementation of EMP is US$ 2.1 million. The EMP is divided into following sections for ease of implementation.

- Waste Management
- Fuels and Hazardous Goods Management
- Water Resource Management
- Drainage Management
- Soil Quality Management
- Erosion and Sediment Control
- Top Soil Management
- Topography and Landscaping
- Borrow Areas Development and Operation
- Air Quality Management
- Noise and Vibration Management
- Protection of Flora
- Protection of Fauna
- Protection of Fisheries
- Road Transport and Road Traffic Management
- Construction Camp Management
- Cultural and Religious Issues
- Workers Health and Safety

Monitoring Plan. The environmental parameters that may be qualitatively and quantitatively measured and compared are selected as 'performance indicators' and recommended for monitoring during project implementation and operation and maintenance (O&M) stages. These monitoring indicators will be continuously monitored to ensure compliance with the national or other applicable standards and comparison with the baseline conditions established during design stage. The monitoring also continues during post construction to assess the actual environmental impacts of the project over the years following completion of the Project. The monitoring during construction stage will be implemented by the contractor and supervised by the Construction Supervision Consultant (CSC). The monitoring during O&M will be carried out by local organizations/consultants with sufficient experience in geological and ecological monitoring. Monitoring will be continued for a period of 3 years. Results of monitoring of impacts will have to be reviewed and evaluated from time to time by the External Monitoring consultants for any recommendations.

Institutional Strengthening and Capacity Building: Environmental Division in RD is responsible for overall implementation of EMP of all projects carried out by RD. It is recommended that RD should hire all the positions before starting the Project. To further strengthen the monitoring and compliance to environmental issues recommended in the EMMP, the following specialists are recommended for Contractors and CSC to be hired under the Project.

- Construction Supervision Consultant:
    - Environmental Specialist – International
    - Occupational Health and Safety Engineer - International
    - Environmental Specialist – National
    - Occupational Health and Safety Engineer - national
    - Social and Resettlement Specialist – International
    - Social and Resettlement Specialist – National

- Contractor:
    - Environmental Specialist
    - Occupational Health and Safety Specialist

- External Monitoring Consultants:
    - Environmental Specialist
    - Social and Resettlement Specialist

It is also recommended that the Each Contractor procured under this Project will be a compliant of ISO 14001, 2004 Environmental Management System (EMS) certification.

A series of capacity building programs are proposed for both the social and environmental division through continuous and oriented trainings.

1.8 Conclusions and Recommendations

The general conclusion prevails that the benefits and gains justify the project implementation. This project will result in a number of expected benefits and beneficial impacts which will far outweigh the few anticipated negative environmental impacts. This investment program will generate (i) faster and more reliable transport conditions, (ii) improved regional and supra-regional connectivity, and (iii) sustainable economic development as a result of the expected outcome of an efficient and safe transport system in Kobuleti as well as Adjara autonomous republic.

It is presumed that the provisions made in the draft EIA sufficiently address, minimize or offset or compensate identified adverse impacts and that they will make the overall environmental performance of this project acceptable. The project is therefore unlikely to result in significant additional negative impacts on the natural environment.

It is further concluded that the RD's assurance that the mitigation and monitoring measures as defined in the EMP will be implemented and duly incorporated in the Technical Specifications of the Contracts, and that the contractors will be held liable to implement the environmental safeguard actions, the project maintains a good chance to remain environmentally benign and will not cause major issues and conflicts.

2. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

2.1 The Necessity and Purpose of Environmental Impact Assessment

According to the Law of Georgia on Environmental Impact Permits, activities to be financed under the proposed project are subject to the State ecological expertise and environmental permitting (Chapter II, Article 4). For this purpose RD is obligated to carry out an Environmental Impact Assessment (EIA).

The EIA report must include environmental monitoring and management plans. The purpose of the EIA process is to identify and analyze all project related adverse impacts on natural and social environment at each phase of the project (design, construction and operating) and develop/provide mitigation and compensation measures to avoid or minimize the likely impacts to acceptable levels. Prior to commencement of activity, the contractor is required to prepare a site plan with a detailed information on the location of work camps; arrangements for water supply, sanitation, vehicle and machinery servicing, storage of construction materials and waste, final disposal of waste; location of quarries and arrangements for mitigating impacts from gravel/sand extraction. During the whole process of implementing the works the contractor will be responsible for ensuring the compliance of works with environmental management and monitoring plans through application of internal environmental supervision and quality control systems.

According to the Georgian legislation, the Ministry of Environment Protection of Georgia (MEP) is responsible for monitoring project implementation and compliance with the standards and commitments provided in the EIA, as well as with the conditions stated in the conclusion of the Ecological Examination (basis for issuing the Environmental Permit by the MEP).

2.2 Government Environmental Policy and Legal Framework

2.2.1 The Constitution of Georgia 1995 (amended in 1999, 2000-2006, 2008) 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. The articles related to environmental protection:

- According to article 37, chapter 4, the state should provide protection of environment and rational use of the nature with keeping interest of a society, present and new generation to provide safe environment.
- According to article 37, chapter 5 "all have the rights to receive the full, impartial and suitable information on the work and a living place.
- Article 41, chapter 1 of the lawful states: "according to the rules of law, all Georgian inhabitants - the plenipotentiary to receive the information and to acquaint the official documents existing in state structures, in case of this document does not cover (include) the state essential confidential information, or professional and commercial notes.

2.2.2 The Law on Environmental Protection 1996 (amended in 2000, 2003, 2007) is the main legal document of the Georgian environmental legislation. This law regulates relations between the state institutions, between physical and legal entities and delegates responsibilities between different administrative bodies in relation to environment and natural resource protection. A number of principles and notions are declared in the law including "sustainable development", "integrated pollution prevention and control", "best available technology", "cleaner production", "polluter pays principle", and alike.

2.2.3 Current Legislations Related to Environmental Permitting

Below is the list of laws relevant to environmental protection:

Adopted	Law of Georgia on
1994	Soil Protection
1996	System of Protected Ares
1996	Minerals
1996	Environmental Protection
1997	Wildlife
1997	Tourism and Resorts
1997	Water Protection
1997	Transit and Import of Hazardous Waste within and into the Territory of Georgia
1998	Resorts and Sanitary Protection of the Resort Zones
1998	Dangerous Chemical Substances
1998	Pesticides and Agrochemicals
1999	Atmospheric Air Protection
1999	Forest Code
2003	Red List and Red Data Book of Georgia
2005	Licensing and Permitting
2007	Environmental Impact Permit
2007	Ecological Expertise
2007	Cultural Heritage

Now, the procedure to issue environmental impact permits are presented as 3 laws: a) law on licenses and permits of Georgia (2005) b) law on environmental impact permits of Georgia c) the law on ecological expertise of Georgia 2008.

2.2.3.1 Law on Licenses and Permits, 2005. Licenses and Permits cover various types of licenses and permits, including environmental. Under this Law, licenses and permits have to be issued within 20 days after receiving application. The law sets up the standards of the application package that has to be submitted to relevant authority for obtaining of the permit.

2.2.3.2 Laws on Environmental Impact Permits (EIP) and Ecological Expertise (EE)

The **Environmental Impact Permits** are issued by the MOEP (competent authority) under a procedure including a) EA, b) ecological expertise and c) public participation. The detailed procedures are mainly determined by the **Law on Ecological Expertise** (dated December 13 2007, in force since January 1st, 2008, replaces/abolishes the old Law on State Ecological Expertise of 1996), the **Law on Licenses and Permits** (dated June 25, 2005) and the new **Law on Environmental Impact Permit** (dated December 13, 2007, in force since January 1st, 2008, replaces/abolishes the old Law on Environmental Permit -1996, the Decree No 154 "On the Procedure and Terms for Issuance of an Environmental Permit" Sept 2005 amended February 3, 2006.

According to the **Law on Ecological Expertise (2008)** 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 MOEP, 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 Law on **Environmental Impact Permit** contains the list of activities subject to EA and the related procedures and regulates the issuance of environmental impact permits. According to the Law, a developer seeking a permit prepares the EA, organizes its public discussion and takes other measures as appropriate. Investor/proponent also invites the MoE to take part in the process and afterwards applies to the MoE for a permit. With regard to public consultation of EA the Law on Environmental Impact Permit establishes the details on the succession of procedures, i.e. EA

coordination, timeframes for information disclosure and public discussion. Moreover, the Law determines how the outcomes of public discussions shall be documented. It also specifies documents to be submitted for obtaining permits, and provides the details on the procedure of permit issuance and the role of the MoE and the developer in this process.

"On the permission to influence to environment" the law of Georgia defines a package of the actions obliged at ecological examination within territory of Georgia (article 4, chapter 1) and the problem of the permission to influence on environment for their realization to execute make ecological examination during the edition of the permission, participation of a society in the course of decision-making on an influence estimation on environment and in the edition of the permission and a basis equal in rights about informing by it".

If the actions submitted (article 4, the head one) the law, requires permissions to construction, the administrative body responsible for the edition of the building permission, provide, involving (MOE) in administrative manufacture in the purpose has begun to let out the building permission, as other administrative body, with the established rule according to the law of Georgia "on the license and the permission."

2.2.3.2.1 Regulation on EIA "on environmental impact assessment " the problem consists in studying direct and indirect influence on health of people and safety; make the optimum design decision as to protection of environment and rational, steady use of natural resources; provide society participation; to expect interests of the state and a society to process of acceptance of the important decision connected, to understand the planned activity; this regulation establishes a rule to spend an influence estimation on environment, process, and these are stages; the problems presented to an estimation; the maintenance (EIA) considers, and these are problems (business) to present them.

2.2.3.2.2 Legislation on Public Consultation

The **Law on Environmental Impact Permit** establishes detailed procedures including EA coordination and establishment of the timeframes for information disclosure and discussion. The procedures identified by the Law are as follows:

1. Developer conducts public disclosure of the EA before submitting of the documentation to the administrative body for issuance of the Environmental Impact Permit.
2. Developer has to publish information relevant to its activities in central and regional newspapers (the latter in the regional newspaper where the activity is conducted);
3. The advertisement shall contain the following information related to the title, location, place, deadline of the activities.

2.2.3.2.3 Legislation on Submission of EIA to MOE

After publishing of the information in the newspaper within one week developer has to submit EA (in hard copy and electronic copy) to administrative structures. Within 45 days since the publishing of the information developer should review comments from public. After publishing of the information the developer should organize public consultation on a planned activity not earlier than 50 and not later than 60 days from the publication of information. Developer should provide written invitation on public consultation meeting to local governments; MoE and MoESD and other relevant authorities; the meeting shall be conducted within the administrative centre of the municipality (formerly rayon/district) where the activity is planned. The developer is authorized to provide minutes of the public consultations within the 5 days. Minutes have to be signed by relevant authorities present at the consultation meetings. If any objections are reflected in the meeting developer should consider them and develop relevant justifications.

2.2.3.2.4 Issuance of Environmental Impact Permit

The MoE carries out the ecological expertise of the project (for which the EA hearing has already been conducted) and issues a permit within a timeframe of 20 days. In this context, the approval of the other Ministries / Departments relevant to the Project is a prerequisite for issuing the environmental permit (see below). It should be considered that the Conclusions of the ecological expertise are the

prerequisites to the Environmental Impact Permit and the Construction Permit. If an activity requires a Construction Permit the administrative body issuing a permit (the Ministry of Economic and Sustainable Development) ensures the involvement of the other Ministries including MoE. The ecological expertise is an essential element of the Construction Permit and is thus mandatory for developer. Therefore Construction Permit shall incorporate elements of environmental impact permit and/or ecological expertise conclusions. In the event when activity does not require a Construction Permit, an Environmental Impact Permit shall be issued by MoE based on conclusion of ecological expertise and procedures determined by legislation.

2.2.4 Other National Environmental Regulations Relevant to the Project

2.2.4.1 Waste Management

Currently Georgia has no law on waste management it is still pending to adoption. The legislation pertaining to the waste issues are listed below: law that could be pertaining to the project is listed below: The **Law on Compensation for Damage Arisen from the Use of Hazardous Materials** (1999) specifies how charges for the use of and/or harmful impact on the environment are to be calculated and levied by the Ministry of Environment. The **Law on Hazardous Chemical Substances** (1998) - Regulated the problems connected with 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

2.2.4.2 Georgian Law on Ambient Air Protection (1999). The scope of the Law is protection of atmospheric air from harmful human impact on the whole territory of Georgia (Part I, Chapter I, and Article 1.1). Harmful human impact is an impact on atmospheric air caused by human activity, which may adversely affect on human health and natural environment (Part II, Chapter IV, and Article 11.1). The power of state structures on protection of atmospheric air first of all covers: a) to solve ecological system of monitoring. b) To manage and execute a policy and strategy in this case. c) To solve the incorporated (full) monitoring system atmospheric air pollution

2.2.4.3 The Law on Minerals of 1996 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.

2.2.4.4 The Wildlife Law of 1996 mandates the MoE to regulate wildlife use and protection overall territory of the country, including existing protected areas. For now, the Ministry of Energy and Natural Resources is responsible for this function also. This law also determines activities on protected areas by the corresponding structural units. At present, this is (MOE)

2.2.4.5 The Law on the System of Protected Areas of 1996 provides definitions of protected areas and outlines the limits for activities in these areas. Permitted activities are defined according to the area designation; territorial regulations, individual charters and area management plans; as well as the requirements of international agreements and conventions to which Georgia is a signatory.

The following activities are generally restricted within protected territories:

- damaging or changing in any way natural ecosystems;
- destroying natural resources for exploitation or any other purpose;
- catching, disturbing, damaging natural ecosystems and species;
- environmental pollution;
- introducing new and exotic species of living organisms;
- bringing explosive materials or poisoning substances; and
- Any other activities specifically prohibited by the management plan for a protected area.

2.2.4.6 The Law on Red List and Red Book of Georgia (adopted in May 8, 2003) 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 **Georgian Red List** (GRL) has been approved in May 2006 and is as such legally enforceable. The new GRL has been 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.

2.2.4.7 Law of Georgia on Cultural Heritage, 2007 (in force since June 2007, replaces/abolishes the old Law on Cultural Heritage dated June 25, 1999). In its article 14 the Law specifies the requirements for 'large-scale' construction works. According to these provisions, any extraction of natural resources (e.g. at a quarry or borrow pit), as well as construction of certain facilities determined by the Law, require clearance through the Ministry of Culture prior to commencement of works. The same article specifies the direction of the required research and the issues to be considered in the frame of desktop studies and fieldwork. Also, according to article 10.1 of this law, "if physical or legal person discovers any cultural heritage, during works, continuing this work may cause damage of this heritage or some kind of danger, physical or legal person is obliged to stop immediately these works and inform the ministry on cessation of work and the found out cultural heritage, within 7 days.

2.2.4.8. The Forest Code (June 22, 1999) establishes legal grounds for protection, restoration, and for the 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. Currently, the process of reviewing is underway.

2.2.4.9. The Law of Georgia on Water (1997). The Law regulates the use of water resources, determines the rights and responsibilities of water users, and regulates water abstraction and discharges.

2.2.4.10. The Law on Soil Protection (1994). 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.

2.2.4.11 To 2007 "the sanitary code of Georgia"regulates legal relations for the sake of maintenance of healthy environment, also management rules a carrying out sanitary code. Now it is cancelled by the law of Georgia "on public health services" which aspires to provide health of the population and introduction a healthy way of life, to provide safe environment for health of the person.

2.2.4.12 Environmental Standards and Norms

Qualitative norms of the atmosphere air: According to the Chapter VI, paragraph 22 of Social Health Security Rule of Georgia (27.06.2007) According to the aim of social health protection The Georgian Ministry of Health, Labor and Social Defense creates and establishes the safe environment qualitative norms for the mankind that includes the admissible concentrations and unhealthy influence norms. According to the mentioned rule, the rules of air pollution protections and the norms of unhealthy influence concentrations are given in the decree about "Affirmation of the environment qualitative condition norms and their affirmations" issued on August 16, 2001 Decree # 297/N by the Minister of Georgian Ministry of Health, Labor and Social Protection. (Georgian Law Herald # 90 24.08.2001) with some changes and additions that have been placed in the decree of the same ministry #38/N (24.02.2003). The norms of the atmosphere pollution are given also in the decree # 89 (October 23, 2001). This is a decree about calculation of the air pollution index.

Maximum permissible cocentration of the Pollutants over the Above-Ground Layer of the Atmosphere

Substance	Maximum permissible cocentration (MAC) mg/m^3/average time
Azote 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

Noise standards: The standards about the noise are allowed according to the Decree # 297/N of Georgian Ministry of Health, Labor and Social Defense about "affirmation the norms over 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

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

2.3 Administrative Framework

2.3.1 Ministry of Environmental Protection (MOE)

The Ministry of Environment Protection is responsible for all environmental protection issues in Georgia except natural resources which under the recent changes in 2011 are subject of regulation by Ministry of Energy and Natural Resources of Georgia (MoEP). The responsibilities of the Ministry as the competent authority are:

To intermit, limit, or stop any activity having or likely to have adverse impact on the environment.

To issue a series of licenses and permits (including for environmental impact).

To control the execution of mitigation measures by the developer.

To receive free and unrestricted information from the developer monitoring systems, waste management etc.

Connected with projects of the actions presented to ecological examination, department of the mentioned ministry of ecological examination and, examine, organizes discussion of an estimation of influence on environment and prepares the documentation (the project of the order of the minister) to let out the permission to influence to environment. This department is obliged to control realization also.

Agency of Protected Areas. This Agency is responsible for state reserves, national parks, natural monuments, managed reserves, protected landscapes, biosphere reserves, world heritage districts and wetlands of international importance. The main tasks of the agency are to control territories of multilateral usage, to implement activities of looking after protected areas, to supervise, preserve, rehabilitate and protect them.

National Environmental Agency (established 29 August 2008) is responsible for preparing informational documents, forecasts and warnings regarding to existing and expected hydro-meteorological and geodynamic processes, also environment pollution conditions in order to provide state security, existing and expected hydro meteorological forecasting of rivers, water reserves and the Black Sea territorial waters, to provide civil aviation with meteorological inform

2.3.2 Ministry of Economy and Sustainable Development (MoESD)

MoESD is responsible for carrying out the review of technical documentation (including conclusion of independent experts) and issuing Permits on Construction for 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 (MACI), which is operating under the Ministry of Economy and Sustainable Development of Georgia.

2.3.3 The Roads Department (RD or RDMRDI)

The Roads Department of Ministry of Regional Development and Infrastructure (RD or RDMRDI) 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.

Thus, the RDMRDI is responsible for the procurement of design and EIA studies, as well as works on construction and rehabilitation of roads and is responsible for ensuring compliance with the Georgian legislation and environmental and social requirements of the relevant donor organizations. Control of implementation of the Environmental Management Plan (EMP) is direct responsibility of the Roads Department.

Within the RD there is special unit dealing with the environmental issues. The name of the unit is Environmental Division. This division 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.

2.3.4 Environment and Natural Resources Directorate of Adjara

The Directorate of Environment and Natural Resources of the of Autonomous Republic of Adjara is responsible on establishing policy of sustainable development of the autonomous republic of Adjara and monitoring in a field of natural resource management and environmental protection. Compliance of developing industrial projects with the environmental requirements set forth in legal documents, standards and norms is conducted by the department at all stages of the project development: preparation of development plans and programs, preparation of EIAs, design of particular projects, construction and rehabilitation activities and operation of facilities.

2.3.5 Other Responsible Governmental Institutions

The Ministry of Culture, Monument Protection and Sports 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.

The "National Service for the Foodstuffs Safety, Veterinary and Plant Protection" of the Ministry of the Agriculture is responsible for implementation of complex sanitary protection measures in case of identification burial sites during earthworks. Information about suspicious burial sites should be delivered to the "National Service for the Foodstuffs Safety, Veterinary and Plant Protection" of the Ministry of the Agriculture by the Construction Contactor (field environmental officer) and RDMRDI field officer.

2.4 International Treaties and Conventions

2.4.1 The Convention on Biological Diversity, 1994

International cooperation is a dominant feature and driving force for environmental reforms in Georgia. Setting the goal to preserve its biological diversity and realising the importance of

international cooperation, Georgia signed the Convention on Biological Diversity in 1994. Thus, accepting responsibility to safeguard the nation's rich diversity of plant, animal, and microbial life to begin using biological resources in a sustainable way and to ensure equitable sharing of benefits from biodiversity.

The Convention on Biological Diversity is the first global agreement, which, along with biodiversity conservation, necessitates the sustainable use of biological resources. Georgia has been recognised as holding an important reservoir of biodiversity, which is very important in the global context – according to the surveys and assessments conducted at an international level, Georgia as a part of the Caucasus, is recognized as:

One out of 34 biologically richest and endangered land ecosystems (Conservation International);
One out of 200 vulnerable ecoregions (WWF);
One out of 221 endemic bird habitats (Bird Life International);
One of the World Agrobiodiversity Centres.

2.4.2 The Convention on the Conservation of Migratory Species of Wild Animals

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention) aims to conserve terrestrial, marine and avian migratory species throughout their range. It was signed in 1979 in Bonn (Germany.) Georgia ratified the treaty in 2000 together with its three agreements:

- Agreement on "Protection of Populations of European Bats" (EUROBATS);
- Agreement on "Conservation of Cetaceans of the Mediterranean Sea, Black Sea and Contiguous Atlantic Area " (ACCOBAMS);
- Agreement on "Conservation of African-Eurasian Migratory Waterbirds" (AEWA).

Taking into account, that the Agreements have been initially designed as an instrument for facilitating the implementation of the CMS, the compliance with and enforcement of CMS in Georgia is mostly reflected in implementation of the Agreements.

2.4.3 Convention on Wetlands of International Importance

The Convention on Wetlands of International Importance, also called the Ramsar Convention aims to provide the framework for national action and international cooperation for the conservation and sustainable use of wetlands and their resources, especially as waterfowl. The convention was developed and adopted by participating nations at a meeting in Ramsar on February 2, 1971, and came into force on December 21, 1975. It entered into force on July 06, 1997 in Georgia.

2.4.4 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES is one of the largest conservation agreements in existence, it is an international agreement between governments. The conventions aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival and it accords varying degrees of protection to more than 33,000 different species of animals and plants. The text of the convention was agreed upon in 1973, and CITES entered into force on 1 July 1975. The date of accession for Georgia was September 13th, 1996 and the agreement entered into force on December 12, 1996 in Georgia.

2.5 Environmental Safeguards of ADB

According to ADB Safeguard Policy Statement (2009) and Operational Manual F1 (2010), the Project is classified as category "A" and therefore an EIA is required for the Project. The process of determining a project's environment category is to prepare a Rapid Environmental Assessment (REA). REA requires the completion of the environmental categorization form prior to the project initiation. REA uses sector-specific screening checklist, taking into account the type, size, and location of the proposed project; sensitivity and vulnerability of environmental resources in project area; and the potential for the project to cause significant adverse environmental impacts. A project is

classified as one of the four environmental categories (A, B, C, or FI) based on the most environmentally sensitive component. Categories are as follows:

Category A: A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA), including an environmental management plan (EMP), is required.

Category B: A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of 'category A' projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE), including an EMP, is required.

Category C: A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications need to be reviewed.

Category F: A proposed project is classified as category FI if it involves the investment of ADB funds to, or through, a financial intermediary.

For Category 'A' projects, the EIA (including EMP), is reviewed by ADB's Operations Department and the executing agency. Depending on the scope of public consultation activities, additional comments would be sought from the project affected people and other stakeholders. When the borrower/client submits the EIA and/or IEE, the operations department reviews them to confirm that (i) relevant information on potential project impacts and mitigation measures, including information from the EIA and/or IEE, has been made available, in a timely manner and before project appraisal, in an accessible place, and in a form and language(s) understandable to project-affected people and other stakeholders; and (ii) information disclosure requirements during project implementation are appropriately specified.

The operations department ensures that the following safeguard documents are posted on ADB's website: (i) draft EIA report at least 120 days before Board consideration for an environment category A project; (ii) the final or updated EIA or IEE, upon receipt.

2.5.1 Harmonization of ADB and Government Safeguard Requirements

The environmental assessment of the Project will need to satisfy the requirement of both the government and ADB. A harmonized safeguard framework is developed for conducting EIA study of the Project. The framework is given in Table 2-1.

Table 2-1: Comparison of Georgian Legislation and ADB Requirements

Aspect	Asian Development Bank	Government of Georgia	Harmonized Framework
Environmental Policy and Regulations	ADB's SPS (2009) sets out the policy objectives, scope and triggers, and principles for three key safeguard areas: (i)Environmental safeguards, (ii)Involuntary resettlement safeguards, and (iii) Indigenous peoples safeguards	Environmental assessment and permitting procedure in Georgia is set out in three laws: (i) The Law on Licenses and Permits (2005); (ii) The Law on Environmental Impact Permits (EIP), and (iii) The Law on Ecological Examination (EE) 2008	
Screening	ADB carry out project screening and categorization at the earliest stage of project preparation when sufficient	Project Proponent in consultation with MOEP	The Project is Categorized in to 'Category A'

Aspect	Asian Development Bank	Government of Georgia	Harmonized Framework
	information is available for this purpose using REA checklist. Categorization into Category A, B, C, FI		
Scoping	Avoid, minimize, mitigate and/or offset for adverse impacts and enhancement of positive impacts through environmental planning and management EA takes into account potential impacts (direct, indirect and cumulative) and risks on physical, biological, resettlement, socio-economic (including health and safety), and physical cultural resources	The impact assessment shall include components such as Air, Noise, Land, Water, Biological and health and safety. Involuntary resettlement is not a component of assessment Scoping is however not a requirement under the law.	Conduct a process of Environmental Assessment that will consider in an integrated manner the potential environmental (including labor, health, and safety) risks and impacts of the project. The Environmental Assessment will take into account natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources
Alternatives	• Examination of financially and technically feasible alternatives to the project location, design, technology and components, their potential environmental and social impacts • Consider no project alternative.	Alternative assessments are to be carried out for the project location and design	Assessment of alternatives will include the location and design, and also no project alternative
EIA Report	Guidelines and Table of Contents are provided for EIA report in SPS (2009). EMP will include proposed mitigation measures, monitoring and reporting requirements, institutional arrangements, schedules, cost estimates and performance indicators	No guideline or Table of Contents are available for EMP reports. Only guidelines (Regulation) on EIA is available, which includes required content of the EIA.	The EIA and EMP reports will follow the table of contents proposed n ADB's SPS (2009).
Public Consultations	• Carry out meaningful consultation with affected people and facilitate their informed participation • Ensuring women's	Publication of information in national and regional mass-media. Arrange consultation not later than 60 days from the date of	Consultations will be carried out with the stakeholders, affected people, NGOs throughout the project cycle and

Aspect	Asian Development Bank	Government of Georgia	Harmonized Framework
	participation in consultation. Involving stakeholders, project-affected people and concerned NGOs early in the project preparation and ensure that their views and concerns are made known and understood by decision makers and taken into account • Continue consultations with stakeholders throughout project implementation as necessary to address environmental assessment-related issues.	publication. All stakeholders are to be invited for the meetings.	consider their views in project design and safeguard plan. Questions and concerns raised during public consultations held in Feasibility stage will be considered. Village level consultations will be held with the affected people. Conduct a public consultation meeting in accordance with Georgian Guidelines at Kobuleti and Batumi.
Public Disclosure	Draft EIA will be published in ADB website for 120 days before Project approval by the Board	The draft EIA should be available for public review for 45 days before public consultations.	Draft EIA report (English and Georgian) will be published in ADB and Roads Department Websites. The copies of the draft EIA report will be made available with the municipal offices.

3. DESCRIPTION OF THE PROJECT

3.1 Overview

The 121 km existing Senaki-Poti–Sarpi road (S-2) along the western coast of Georgia is a key highway and international transit route in Georgia. It is connected to the major Black Sea ports of Georgia, viz. Batumi and Poti, and a number of holiday resorts, particularly, Kobuleti and Batumi. The road runs through heavily built up tourist and residential areas and provides poor road and travel conditions, especially for international transit traffic which has to mix with the dense urban traffic passing through narrow streets. At present a significant volume of international transportation is carried on the Batumi-Poti section of the road amounting to 1.0 million tons annually (2005), with 0.5 million tons on the Batumi-Sarpi section. This mix of heavy traffic on the existing road combined with poor road conditions leads to traffic congestion, dangerous driving situations and frequent traffic accidents, particularly in Batumi and Kobuleti and especially during the tourist season in summer. Hence the government is planning to construct bypass roads to Kobuleti and Batumi (the Project) with finance of Asian Development Bank (ADB). Ministry of Regional Development and Infrastructure (MORDI) is the executing agency of the Project and Roads Department (RD) under the ministry is the implementing agency. A pre-feasibility and feasibility study were carried out for the Project in 2005 and 2009. The study, (TA-7059-GEO), has identified a 48.4 km alignment between Choloki River north of Kobuleti to Chorokhi River south of Batumi, to bypass Kobuleti, Makhinjauri and Batumi The proposed bypass roads will reduce the traffic congestion and accidents, increase the generated traffic in the existing road, and reduce travel time and vehicle operating costs.

Georgia enjoys a strategic location it has yet to fully capitalize on. It is on the shortest route between Europe and Azerbaijan, Armenia and the Central Asian Republics, through its Black Sea ports, Poti and Batumi. It also can link Russia and Turkey. The physical location ensures that it is a key transport link on the most direct route between the Black Sea and the Caspian Sea and Central Asia. Trade with neighboring countries, both transit and bilateral, is thus an important feature of the economy. Poor infrastructure and cumbersome processes inhibit the full exploitation of transit economy potential. Georgia's road network is crucial in facilitating sub regional transport and trade. Thus the Project road has a significant potential for increase of sub regional and regional trade, agriculture and tourism revenue and reducing poverty. The Project is immediately expected to (i) Increase in sub regional trade through the Turkish border by 4% for 5 years after completion, (ii) 30% increase in cross-border freight traffic by 2015 from 1.0 million ton in 2008 to 1.3 million ton, and (iii) Increase in registered visitors to Adjara region by 10% per annum for 5 years after completion from 285,000 in 2008.

3.2 Purpose of the Study

The Project road is located along the Black Sea in Adjara region. Full Adjara by pass Project is packaged into 4 contracts as follows for preparation of detailed designs and implementation.

- Contract 1 – Km 0 to Km 12.4 bypassing Kobuleti Town – a new alignment
- Contract 2 – Km 12.4 to Km 28 bypassing Kobuleti Town – a new alignment
- Contract 3 – Km 28 to Km 31 along the existing road near Makhinjauri tunnel to make the full use of existing and recently constructed 4 lane road tunnel
- Contract 4 – Km 31 to Km 48 bypassing Batumi Town – a new alignment

The present project is financed by the loan ADB 2560-GEO, Road Corridor Investment Program (Tranche 1) for Preparation of Detailed Design and Preparation of Bidding Documents for Kobuleti Bypass Road, Kobuleti-Batumi Section and Kobuleti Bypass Road.

The Project will be designed as two contract packages and will be implemented in two tranches. The first tranche comprises 16.2km of new road (Kobuleti Bypass-Section 1); the second tranche comprises 18km of new road (Kobuleti Bypass- Section 2).

An Environmental Impact Assessment (EIA) was prepared in August 2009 as part of the feasibility study (TA 7059- GEO) to fulfill the Georgian Government Regulations and ADB criteria for environmental safeguard. EIA report was also prepared in July 2010 by GC-EAL-SAMBO consortium for the entire alignment of the road and it was approved by the MOEP.

Environmental Impact Assessment (EIA)

The environmental impacts of the project will be considerable given that the Project area is located in mountainous terrain and has significant ecological value.

The purpose of the updated EIA report is to define possible direct and indirect impacts of the proposed Kobuleti Bypass Road project on the physical, the biological and the human environment and to develop corrective measures to minimize, mitigate and/or compensate for the potential adverse effects. Mitigation measures and monitoring requirements are included in the Environmental Management Plan (EMP) to be attached to the bidding documents and in the Technical Specifications of the Work Contracts.

The EIA for Kobuleti Bypass Road has been prepared to ensure that the Project is environmentally sound and sustainable as well as in compliance with the safeguard requirements of the ADB (Safeguard Policy Statement, 2009) and Government of Georgia (The Laws on Licenses and Permits, 2005; Environmental Impact Permits and Ecological Examination, 2008) and will be submitted to the Ministry of Environment Protection (MOEP) to obtain Environmental Impact Permit.

Extent of the EIA

Pursuant to the recommendations of SPS (2009), the description of the potentially affected environment is divided into four sub-sections as follows:

i. **Physical Resources -** including a description of existing conditions in regard to climate, air quality, noise, topography, geomorphology and soil types, geology and seismology and water resources.

ii. **Ecological Resources** - including flora and fauna, aquatic resources and fisheries, wildlife, rare or endangered species, sensitive habitats and protected areas

iii. **Economic Development** - including natural resources and industries, infrastructure facilities, transportation, power supply prevailing land-uses and production, mineral development quarries, borrow pits) and tourism facilities

iv. **Social and Cultural Conditions** - including demography, administration, ethnic groups and indigenous people, and professional status and employment conditions. It also provides data in regard to local health facilities and public health, local education facilities and amenities, cultural heritage and religion, social well-being and public safety, gender Issues, human settlement in the RoW, and archaeological and historical resources

SPS, 2009 defines Project Area of Influence (PAI) (commonly referred to as the Project Area) as "The primary project site(s) and related facilities that the borrower/client (including its contractors) develops or controls such as access roads, borrow pits and disposal areas, and construction camps; associated facilities such as quarries and asphalt plants; areas and communities potentially affected by cumulative impacts...and; areas and communities potentially impacted by impacts from unplanned but predictable developments".

This updated EIA describes relevant physical, biological and socioeconomic condition of the environment within the PAI.

The Consultant prepared this EIA as part of detailed design stage of the project on the basis of detailed review of proposed engineering works, field investigations, stakeholder consultation, primary and secondary data collection, screening of all baseline environmental parameters, environmental quality baseline monitoring, and review of other road project reports in Georgia.

3.3 Location

The Project road is located along the Black Sea in Adjara region. The entire project road, bypassing the resort town of Kobuleti from the East, is located within the administrative boundaries of Kobuleti region. The Project starts at Ispani village and ends at North portal of the existing tunnel. The Project road is located in Kobuleti districts of the Adjara Autonomous Region. This road will pass Kobuleti city and 10 villages/towns in the district. Location of the Project road shown in Figure 3.1.

3.4 Key Project Components

The Project involves construction of new road (18,858 km). In addition, the project will construct bridges (16 nos.), culverts (64 nos.) and other drainage structures, retaining walls, tunnels (2 nos.), interchanges (4 nos.), land acquisition and resettlement; protection of landslide, geohazard and rockfall areas; excavation and operation of borrow pits; operation of boulder quarry; earth works; and operation of asphalt and concrete plants. The main components of Project are provided in Table 3-1 to Table 3-3.

Table 3-1: Details of Bridges

Bridge ID #	Station		Bridge Name	Superstructure Type	Overall Geometry			
	Beginning	End			Length	Span Arrangement	Width	Skew
Br 01	0+520.00	0+637.50	Kobuleti Interchange Bridge	Precast composite I-girder, 12 nos	117.50	27+31.6+27+ 31.6	17.00	
Br 02	1+682.00	1+808.70	Achkva river Bridge	Precast composite I-girder, 11 nos	126.70	4@31.6	15.00	20°

Bridge ID #	Station		Bridge Name	Superstructure Type	Overall Geometry			
	Beginning	End			Length	Span Arrangement	Width	Skew
Br 03	4+373.66	4+405.26	Khutsubani Underpass	Precast composite I-girder, 12 nos	31.60	1@31.6	17.00	30°
Br 04	4+484.00	4+610.70	Kintrishi river Bridge	Precast composite I-girder, 11 nos	126.70	4@31.6	15.00	30°
Br 05	5+421.00	5+579.40	Kinkisha river Bridge	Precast composite I-girder, 11 nos	158.40	5@31.6	15.00	20°
Br 06	5+903.50	5+962.20	Kvirike Underpass	Precast composite I-girder, 12 nos	58.70	31.6+27	17.00	
Br 07	6+860.00	7+340.00	Dekhva I Bridge	Post-tensioned Double-T girder	480.00	40+8@50+40	15.00	
Br 08	8+173.00	8+643.00	Dekhva II Bridge	Post-tensioned Double-T girder	470.00	2@40+7@50+40	15.00	
Br 8a	10+834.00	10+865.60	Shuagele Underpass	Precast composite I-girder, 11 nos	31.60	1@31.6	15.00	30°
Br 9	12+800.00	13+980.00	Sachino Viaduct	Post-tensioned Double-T girder	1180.00	40+22@50+40	15.00	
Br 10	14+755.00	15+235.00	Qveda Achkva Viaduct	Post-tensioned Double-T girder	480.00	40+8@50+40	15.00	
Br 10.1	15+317.236		Chakvi I overpass	Precast composite I-girder, 6 nos	31.60	1@31.6	9.00	30°
Br 11	15+430.00	16+350.00	Chaqvistskali river Viaduct	Post-tensioned Double-T girder	920.00	40+16@50+2@40	15.00	
Br 11.1	17+044.042		Chakvi II overpass	Precast composite I-girder, 6 nos	31.60	1@31.6	9.00	
Br 12	17+429.00	17+659.00	Chakvi Viaduct	Post-tensioned Double-T girder	230.00	40+3@50+40	15.00	
Br 13	18+275.00	18+338.30	Chakvi Interchange Bridge	Precast composite I-girder, 14 nos	63.30	2@31.6	19.00	30°
※ The total number of bridges is 16					4537.70			
Source: Engineering Consultant, detail design stage, May 2011								

Figure 3-1: Location Map of the Project

Table 3-2: Details of Tunnels

Tunnel		T-1(NATM)	T-2(Cut and Cover)
Chainage	Start	12km370.0	16km403.0
	End	12km665.0	16km572.0
Length (m)		295.0	169.0
Overburden (m)	Min.	5.6	1.0
	Max.	31.7	14.5

Source: Engineering Consultant, detail design stage, May 2011

Table 3-3: Summary of Interchanges

No. of IC	Chainage	Type of IC	Cross Road		
			Name	Width	Speed
1	0+500		Kobuleti		
2	4+300		Khutsubani		
3	5+800		Kvirike		
4	13+000		Chakvi		

Source: Engineering Consultant, detail design stage, May 2011

3.5 Description of Road Alignment

The starting, 8,5-km-long section of the design route is located on a quite flat plain relief, on the terraces of the rivers Achkva, Kintrishi, Kinkisha and Dekhva, which in a geological respect, is mostly presented by alluvial shingle, with boulder admixtures at some places, and the grounds along these sections beyond the river terraces are presented by brownish Middle Quaternary soft-plastic high-humid clays and there are high-compressive weak clays with organic admixtures spread in the individual bogged areas (km 0+280-0+540, km 1+900-2+160, km 3+760-4+040, km 5+600-5+880). Shore-type landslide and erosive processes of a minor scale are fixed along the given section, which do not pose a major geo-hazard to the construction of the road.

The next section of km 8+500 – km 12+300 follows the trough-like gorge of the river Shuagele at the river level, with the width of 50-80 m. The relief of the gorge is strongly dissectioned with numerous shallow and dry gullies. The river meanders intensely and there are over-floodplain terraces developed on its two sides. At some places, the river washes its banks, and at some places, the existing alluvial terraces on the both banks of the river form plain surfaces. The terrace steps are built with alluvial shingle with boulder admixtures and sandy-loam and clay-loamy fillers, and the geology of the slope is participated by Paleogenic deposits, in particular, those of 'Chidila stratum' (lava breccias, tufa-breccias), which outcrop at some places, but are mostly covered with a laterite stratum of a great thickness. It should be noted that the hayfields are irrigated resulting in bogged areas at some places and in artificially deteriorated physical-mechanical properties of the grounds. No increased geological hazards are identified along the given section.

The section at km 12+300-km14+100, where the tunnel and overpass are to be constructed, is presented by landslide-like creeps developed in a lateritized layer here and there, which are worth attention in the construction process to reduce the risk of origination and activation of landslide processes due to cutting the slopes.

Along the section at km 14+100-15+000, which crosses the right nameless tributary of the river Chakvistskali, the right slope of the tributary, in a geological respect, is presented by a lateritized layer of quite a great thickness formed over the greatly inclined slopes and poses the hazard of activation of the landslide processes during the building, particularly in case of using large sections. The left slope of the given tributary is less prone to landslide.

The section at km15+430-km16+350 is the crossing point with the river Chakvistskali. At this point, the river has developed an open gorge. It is structured with alluvial shingle with boulder admixtures and gravely and clay filler. The depth of the river local washout is worth attention. No other geological hazards are fixed along the given section.

Along the section of km16+350-km18+858, the design road crosses the left slope of the river Chakvistskali and then a hilly relief where there are mostly clay laterites spread, which are formed as a result of intense weathering of volcanogenic deposits of Chidila stratum. The grounds have weak physical-mechanical properties evidenced by gravitational talus of different strengths at the artificially made sections; however, the given surroundings do not pose any significant problem to the road construction.

The detail layout of the road alignment is shown in Annex 3-5

3.6 Project Designs

Before 2009, the geometric road design standards in Georgia were those which were used throughout the former Soviet Union. Since the last edition of the SNIP for road design was introduced in 1984, modern developments and practices were not considered. Therefore, a new design standard, "Geometric and Structural requirement for highways in Georgia", was developed and adopted under a World Bank financed project.

The present design has applied guidelines of the above standard. In case of need for covering any of shortcomings in the national standard, along with the SNIP standards, references has been made to relevant clauses of AASHTO standard for design specifications of highways and highway bridges

3.6.1 Traffic Volume

The pavement has been design using the following forecasted traffic data. Future traffic has to be expressed in Equivalent Standard Axles (ESA)/year and over the design life. The design life is 20 years and construction has been assumed to be completed in 2014.These estimates are based on the manual traffic counts carried out in the detailed design study on the existing road during January, 2011

Table 3-4: Forecasted daily traffic (Annual Average Daily Traffic/AADT) data

Year	Car	Bus			Truck				Total
		Mini	Medium	Large	Light	Medium	Heavy	Trailer	
2014	2999	1244	34	29	216	62	38	183	4805
2015	3138	1302	36	30	226	65	40	191	5028
2016	3282	1362	37	32	237	68	42	200	5260
2017	3435	1425	39	33	248	71	44	209	5504
2018	3593	1491	41	35	259	75	46	219	5759
2019	3761	1560	43	36	271	78	48	229	6026
2020	3934	1632	45	38	284	82	50	240	6305
2021	4117	1708	47	39	297	86	53	250	6597
2022	4307	1787	49	41	311	90	55	262	6902
2023	4507	1870	51	43	325	94	58	274	7222
2024	4665	1935	53	45	336	97	60	284	7475
2025	4828	2003	54	46	348	101	62	294	7736
2026	4998	2073	56	48	360	104	64	304	8007
2027	5172	2146	58	49	373	108	66	315	8287
2028	5353	2221	60	51	386	111	69	326	8577
2029	5542	2299	62	53	399	115	71	337	8878

2030	5736	2379	64	55	413	119	73	349	9188
2031	5936	2463	66	57	428	123	76	361	9510
2032	6143	2549	69	59	443	128	78	374	9843
2033	6359	2638	71	61	458	132	81	387	10187

Source: Consultant's survey, January 2011

The pavement has been design using the following forecasted traffic data. Future traffic has For the purpose of estimating the Equivalent Single Axle Loads ("ESALs"), Table 3-5 provided annual traffic volumes by vehicle categories for 20-year long period, which are calculated from the data given in Table 3-4.

Table 3-5: Traffic Volumes by years

Year	Car	Bus			Truck				Total
		Mini	Medium	Large	Light	Medium	Heavy	Trailer	
2014	1094635	454060	12410	10585	78840	22630	13870	66795	1753825
2015	1145370	475230	13140	10950	82490	23725	14600	69715	1835220
2016	1197930	497130	13505	11680	86505	24820	15330	73000	1919900
2017	1253775	520125	14235	12045	90520	25915	16060	76285	2008960
2018	1311445	544215	14965	12775	94535	27375	16790	79935	2102035
2019	1372765	569400	15695	13140	98915	28470	17520	83585	2199490
2020	1435910	595680	16425	13870	103660	29930	18250	87600	2301325
2021	1502705	623420	17155	14235	108405	31390	19345	91250	2407905
2022	1572055	652255	17885	14965	113515	32850	20075	95630	2519230
2023	1645055	682550	18615	15695	118625	34310	21170	100010	2636030
2024	1702725	706275	19345	16425	122640	35405	21900	103660	2728375
2025	1762220	731095	19710	16790	127020	36865	22630	107310	2823640
2026	1824270	756645	20440	17520	131400	37960	23360	110960	2922555
2027	1887780	783290	21170	17885	136145	39420	24090	114975	3024755
2028	1953845	810665	21900	18615	140890	40515	25185	118990	3130605
2029	2022830	839135	22630	19345	145635	41975	25915	123005	3240470
2030	2093640	868335	23360	20075	150745	43435	26645	127385	3353620
2031	2166640	898995	24090	20805	156220	44895	27740	131765	3471150
2032	2242195	930385	25185	21535	161695	46720	28470	136510	3592695
2033	2321035	962870	25915	22265	167170	48180	29565	141255	3718255

Source: Consultant's survey, January 2011

3.6.2 Road Design

The road will be designed as a freeway by over passing or under passing all the existing roads. The design speed of the Project road is 100 km/hr for main road and 60 km/hr for ramps. The width of the road is 14.0m.The right of way (RoW) extends 7m outside the toe of the embankment to accommodate space for 2 m wide drainage ditch and 1 m space from the toe of the ditch and 3 m reserve zone outside of the ditch. The embankments consist of rocky soil. Asphalt concrete pavement is designed for all sections of the road including bridges and tunnels.

The road standards adopted for the Project design are shown below:

Road Class	International Highway
Design Speed	100 km/hr
Width of roadbed	14.0 m
Width of Carriage way	7.0 m
Width of traffic lane	3.5m
Width of paved shoulders	2.5 m
Width of unpaved shoulders	1.0 m
Pavement type	asphalt concrete

Typical cross section of a 2-lane road is shown in Figure 3-3 and in Figure 3-4.

Figure 3-3: Cross Section of Road Pavement (Type I) for General Section

Figure 3-4: Cross Section of Road Pavement (Type II) for Acceleration –Deceleration Section

Pavement

According to Georgian standards with 11 ton axle loads based on traffic load and sub-grade strength. Typical asphalt concrete and cement concrete pavements are shown in Figure 3-5 and Figure 3-6 (these are indicative only).

Figure 3-5: Section of Asphalt Pavement Structure

Figure 3-6: Section of Cement Concrete Pavement Structure

3.6.3 Bridges and Overpasses

The project involves 16 bridges with total length of 4538 m, which is about 25 % of the total alignment. There are seven long bridges that are 200 meters or more in length

Total bridges consist of 14 main bridges and 2 overpass bridges. Especially there are 6 long bridges that are 200 meters or more in length. Listed in the table below are general features of bridges in the 2nd section.

As the following table shows, apart from bridge # 5, 10 and 11, all the bridges are furnished with a superstructure of precast girder type.

Being different to the detail design of 1st stage, the typical width and superstructure type of bridge were changed due to several reasons as described below.

First, the typical width of bridge was changed from 14 m to 15 m in accordance with the minimum width of sidewalk and wayside for maintenance specified in Georgian standards.

Second, the superstructure type of bridge was changed from the type used in the 1st stage based on Road Department's opinion that the cast-in-situ concrete between top flanges of girders frequently cracked. Thus cross section without the cast-in-situ concrete between top flanges was applied. In this type, although the number of girders increases from 8 to 11, the lower construction cost and higher construction speed are its strength.

Typical cross section of bridges are shown in Figure 3-7.

The superstructure of bridges was designed in accordance with HL-93 loading and the others were designed based on AASHTO Standards Specification for highway bridges (2002) and AASHTO LRFD Bridge Design Specifications (2007)

Cross Section applied to 1st Stage	Proposed Cross Section

Figure 3-7: Typical cross section of Bridges

Table 3-6: Lists of bridges of Section 1 (Kobuleti Bypass)

Bridge ID #	Station		Bridge Name	Superstructure Type	Overall Geometry			
	Beginning	End			Length	Span Arrangement	Width	Skew
Br 01	0+520.00	0+637.50	Kobuleti Interchange Bridge	Precast composite I-girder, 12 nos	117.50	27+31.6+27+ 31.6	17.00	
Br 02	1+682.00	1+808.70	Achkva river Bridge	Precast composite I-girder, 11 nos	126.70	4@31.6	15.00	20°
Br 03	4+373.66	4+405.26	Khutsubani Underpass	Precast composite I-girder, 12 nos	31.60	1@31.6	17.00	30°
Br 04	4+484.00	4+610.70	Kintrishi river Bridge	Precast composite I-girder, 11 nos	126.70	4@31.6	15.00	30°
Br 05	5+421.00	5+579.40	Kinkisha river Bridge	Precast composite I-girder, 11 nos	158.40	5@31.6	15.00	20°
Br 06	5+903.50	5+962.20	Kvirike Underpass	Precast composite I-girder, 12 nos	58.70	31.6+27	17.00	
Br 07	6+860.00	7+340.00	Dekhva I Bridge	Post-tensioned Double-T girder	480.00	40+8@50+40	15.00	
Br 08	8+173.00	8+643.00	Dekhva II Bridge	Post-tensioned Double-T girder	470.00	2@40+7@50+ 40	15.00	
Br 8a	10+834.00	10+865.60	Shuagele Underpass	Precast composite I-girder, 11 nos	31.60	1@31.6	15.00	30°
Br 9	12+800.00	13+980.00	Sachino Viaduct	Post-tensioned Double-T girder	1180.00	40+22@50+4 0	15.00	
Br 10	14+755.00	15+235.00	Qveda Achkva Viaduct	Post-tensioned Double-T girder	480.00	40+8@50+40	15.00	
Br 10.1	15+317.236		Chakvi I overpass	Precast composite I-girder, 6 nos	31.60	1@31.6	9.00	30°
Br 11	15+430.00	16+350.00	Chaqvistskali river Viaduct	Post-tensioned Double-T girder	920.00	40+16@50+ 2@40	15.00	
Br 11.1	17+044.042		Chakvi II overpass	Precast composite I-girder, 6 nos	31.60	1@31.6	9.00	
Br 12	17+429.00	17+659.00	Chakvi Viaduct	Post-tensioned Double-T girder	230.00	40+3@50+40	15.00	
Br 13	18+275.00	18+338.30	Chakvi Interchange Bridge	Precast composite I-girder, 14 nos	63.30	2@31.6	19.00	30°
※ The total number of bridges is 16					4537.70			

Source: Engineering Consultant, detail design stage, May 2011

3.6.4 Tunnels

The design of the Kobuleti-Batumi Section (Km 12+400~31+259) tunnel #1 is based on the principles of NATM (New Austrian Tunneling Method). Tunnel #1 is to be excavated through very weak weathered soil layer which consists of lean, reddish-brown clay, gravel and crushed stone and tuff breccias of extremely weathered and highly fractured andesite-basalt. Consequently the support selection criteria based on ground condition and stability of tunnel during construction and operation period are the key design factors.

The tunnel status of Kobuleti-Batumi section (Km 12+400~31+259) is given on the Table 3-7. Total 2 tunnels are planned to be constructed. The length of tunnel No.1 is 295.0m and that of tunnel No. 2 is 169.0m so total length of 2 tunnels is 464.0m including portal and cut & cover area. Overburdens of two tunnels are ranged from 5.6m to 31.7m, which means two tunnels exist in relatively lower depth. Since overburden of tunnel No. 2 is too shallow, cut and cover method with maximum 7m backfill is used.

The anticipated subsurface conditions and the strength of soil layers create difficult conditions for the design and construction of tunnels. The soft and weak deposits at the project site with lower shear strength will be able to induce large deformation during tunneling. Therefore application of various pre-support techniques ahead of advancing tunnel face is recommended to limit the ground deformation.

The type of ground in which most of the tunnels will be mined is classified as weak lean clay with eluvial tuff-breccia and weathered breccia with low strength. Effective ground improvement and various pre-support methods are to be considered in this phase of design such as pipe roof umbrella, horizontal / vertical jet grout arch and invert micro pile with grouting.

Table 3-7: Lists of Tunnels

Tunnel		T-1(NATM)	T-2(Cut and Cover)
Chainage	Start	12km370.0	16km403.0
	End	12km665.0	16km572.0
Length (m)		295.0	169.0
Overburden (m)	Min.	5.6	1.0
	Max.	31.7	14.5

Source: Engineering Consultant, detail design stage, May 2011

Figure 3-8: Typical Tunnel Cross Section (Straight Section)

3.6.5 Interchanges

There are 4 interchanges designed along the road. These junctions are designed as of deferent type in accordance with standard requirements.

Functional assignment each of the interchanges is provided bellow:

- Interchange N1, km 0+500

Construction of grade separated full interchange N1 shall be carried out at the existing gas station in order to allow the traffic from the town of Kobuleti, and vice versa, interchange into the traffic of the bypass highway.

- Interchange N2, km 4+300; Interchange N3, km 5+800

Grage separated junctions are constructed at the intersections of the local roat to villages of Khutsubani and Kvirike respatively in aim of allowing the traffic from the surrounding villages connect to the bypass highway.

- Interchange N4, km 18+300

Full interchange N4 will be constructed at the end of the design road in order to connect the traffic from the town Chaqvi, and vice versa, to the design bypass. The intechange will accommodate the traffic from the adjuscent sections to turn arround and also, connect to the Botanic Graden of Batumi city.

Figure: 3.9: Typical cross section of Interchanges

3.6.6 Culverts

In total 64 culverts are located along the project roads. For design life of rectangular and circular culverts AASHTO and SNiP-84 design standards are used. The application of the SNIP Standard considers the utilization of locally produced prefabricated culvert elements.

New pipe culverts under the main road should have a minimum diameter of 1.50 m for ease of maintenance. However, at some places the desired minimum diameter for pipe culverts could not be implemented, because existing ditches are not deep enough, the adjacent ground is flat, and the existing road embankment could not be raised. Therefore lesser diameter, 1.0 m, for certain pipe culverts were accepted for the ramps and existing roads.

In aim of accommodating the local connectivity 5 box culverts with cross section size of 5.0X6.0 m, are provided to underpass the secondary roads.

3.7 Volume of Civil Works

Total volume of civil works in the Project based on the estimates of the detailed design is given in Table 3-8.

Table 3-8. Total volume of civil works

No.	Details	Unit	Quantity
	A. Subgrade Works		
1	General site clearance	Ha	82.5
2	Tree felling and removal	No	1844
3	Clearing and Grubbing	m3	92944
4	Earth Excavation- Common Soil	m3	351566
	-Soft Rock	m3	NA
	- Hard Rock	m3	NA
5	Embankment Filling – Common Soil	m3	1456066
6	Removal of Unsuitable Materials	m3	150143
7	Dismantle Existing Structures	No	N/A
8	Roadside Drain – Masonry Lined	M	405
9	Concrete Lined	M	7316
10	Unlined	M	N/A
11	Catch Drains	M	880
12	Sub-Surface Drains	M	NA
	Chute and Scour Protection	m2	NA
13	River Training Works	M	680
14	B. Pavement		
15	Preparation of Subgrade	m2	228539
16	Sub Base	m2	197920
17	Upper Base	m2	185725
18	Asphalt Concrete surface course	m3	14720
	C. Structures		
	Circular Culverts, 500 mm	No	4
	Circular Culverts, 1000 mm	No	7
19	Circular Culverts, 1500 mm	No	38
	Box Culverts, 1,5X1,5 m	No	1
20	Box Culverts, 1,3X1,8 m	No	1
	Box Culverts, 2,5X2,5 m	No	3
	Box Culverts, 1,0X4,0 m	No	1
21	Box Culverts, 5,0X6,0 m	No	12
22	Small Bridges RC < 50m	M	574
23	Large Bridges RC Box Girder	M	2058
24	Large Bridges RC Prestressed	M	1947
25	Interchanges	No	5
26	Separated Intersections	No	1
27	Over/Under passes	No	5
28	Pedestrian crossings (Over/under)	No	NA
29	Retaining Walls	M	290
	D. Tunnel Works		
30	Civil Works Type DI	M	NA
31	Type DII	M	NA
32	Type DIII	M	NA
33	Extra Support	M	NA
34	Long Span Pipe Roof	M	NA
35	Tunnel Portals	No	NA
36	Tunnel Illumination	M	NA
37	Emergency Generator	LS	NA
38	Provision of Power Supply	LS	NA

No.	Details	Unit	Quantity
	E. Slope Stabilization		
39	Dry Stone Masonry Walls	M/m3	2479/27596
40	Landscaping	M2	4576
	F. Roadside Facilities		
41	Service/weighbridge Area	No	NO
42	Signing and Road Marking	KM	27027
43	Steel Guardrails	M	17320
44	New Jersey Barriers	M	10381
45	Boundary Fencing	M	NA

3.8 Quarries and Borrow Sites

During construction of the road, locations of quarry and borrow sites, access roads, spoils disposal sites for wastes and other facilities will be determined by contractors. Project will not implement any exploration activities from illegal sources.

Borrow pits location will be proposed by the engineering team at the final design stage. The exploitation of the borrow pits and quarries will be conducted by the licensed companies or the Constructing Contractor will obtain its own licenses. There will be potential impact of quarrying activities at various locations including river bed and floodplain locations. So, necessary environmental permits of suppliers from relevant authority will be obtained by the contractors if used any illegal source.

The following quarries are selected for the supply of aggregate used in road construction during detail design.

Table 3-9: Potential Sites for Borrow Materials

Name of Deposit	**Resources**	**Region**	**Proximity**	**Reserves**
Kheghru	Diorite-Porphyry	Khelvachauri	9km south-east of Batumi	Category A – 213000 m^3, Category B – 258000 m^3 Category C1 – 626000 m^3 A+B+C1 – 1097000 m^3
Abanostskali	Andesite and Tuff-breccia	Kobuleti	Adjacent to village of Khala	Category C2 – 470,300 m^3
Achi	Porphyry	Ozurgeti	8-9 km south of district centre Ozurgeti	P – 8.0 million m^3
Akhalsheni	Tuff-Breccia	Khelvachauri	4 km south of city of Batumi	Category B – 2.2million m^3, Categories A+B+C – 10994 thousand m^3 Category C1 – 8720.3 thousand m3, Category C2 – 9895 thousand m3
Bezonisthkali	Andesite and Lava Breccia	Kobuleti	the confluence of Bezonistskali and Chaqvistavi Rivers	Category C1 – 89.3 thousandm3
Dagvi	Andesite-Basalt	Kobuleti	1.5 km north-east of village of Zeda-Dagvi	Category B – 226,000 m^3 Category C1 – 875,000 m^3 Total: B+C1 – 1,101,000 m^3

Dologani	Andesite-Porphyry	Keda	0.5-1 km apart from village of Dologani	Category C2 – 375000 m^3 Category C2 – 295000 m^3
Kinkishi	Basaltic Andesite	Kobuleti	0.5 km south-east of village of Zeda Sameba	Category B–1.6 million m^3 Category C1 – 7095 m^3
Simoneti	Rubble Andesite	Khelvachauri	5-6 km from district centre Khelvachauri	Category C2 – 108000 m^3
License No		**Resources**	**Region**	**Company**
No 00117		Sand-Gravel	Khelvachauri	Temi Ltd.
No. 100279, No. 100282, No. 100280, No. 100278		Sand-Gravel	Khelvachauri	Holder, Zimo-7, Construction Company, Gza
No. 100284		Sand-Gravel	Khelvachauri	Energy 2006 Ltd.
No. 100285		Sand-Gravel	Khelvachauri	Loseb Khalvashi
No. 100286		Sand-Gravel	Khelvachauri	Contact Ltd.
No. 00128, No. 00127, No. 00125		Sand-Gravel	Khelvachauri	Zimo-7, Nurol Georgia, Deko
No. 00122		Sand-Gravel	Kobuleti	Evrika Zka Ltd.
No. 100291		Sand-Gravel	Kobuleti	Jakmar Moistsrapashvili
No.100123		Sand-Gravel	Kobuleti	New Construction Technologies Ltd.

3.9 Construction Camps

Camp sites will be selected keeping in view the availability of an adequate area for establishing camp sites, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity. Final locations will be selected by the contractor after the approval from RD.

The area requirement for construction camps will depend upon the workforce deployed and the type and quantity of machinery mobilized. In view of the area required, it will not be possible to locate camp sites within the ROW and the contractors will have to acquire land on lease from private landowners.

The construction camp will have facilities for site offices, workshop and storage yard, and other related facilities including fuel storage. The site selection for the construction camp is not yet finalized.

The contractor will provide the following basic facilities in the construction camps. Detailed criteria for siting of construction camps and establishment of facilities are given in the Environmental Management Plan of Chapter 9 under 'Construction Camp Management'

- Adequate ventilation facilities
- Safe and reliable water supply. Hygienic sanitary facilities and sewerage system. Treatment facilities for sewerage of toilet and domestic wastes
- Storm water drainage facilities.
- Sick bay and first aid facilities

Since there have not been yet chosen the location for the construction camp or the routes of the temporary access roads, the evaluation of the removed soil storage shall be carried out by the local authorities and The Directorate of Environment and Natural Resources of the of Autonomous Republic of Adjara.

3.10 Construction Process

I. Preparation Works

Preparation works include the following activities

- Site Preparation: relocating power line, water supply pipe, fiber optic cable, the site will be handed over to Contractor
- Site Clearance: Removing existing building, structure, trees in construction site;
- Manpower, equipment preparation: mobilizing manpower, mustering construction equipment, getting construction licenses
- Set up auxiliary works: material transfer sites, temporary road, temporary drain, site leveling. Construct camp, site office. Connect power line, install water supply system for domestic and construction, set up concrete mixing plant and asphalt plant

II. Construction Works

Construction works include the activities below

- Soft soil improvement and road sub base works: to be conducted immediately after completing the road base construction;

- Building bridges and viaducts: it will be carried out in parallel with the soft soil improvement and road base construction
- Execute road pavement, slope protection
- Install lighting system and security/safety signal system for land and waterway transportation

III. Completion Works

Completion works include the following activities. After completing the above construction works, the road should be carried out the completed works for going to operate. Complete work will be implemented at the end of construction time. The work includes

- Repair of small defects
- Clean up the construction site, warehouses
- Collecting waste and superfluous materials
- Construction waste will be transported to licensed disposal site
- Return of the status of drainage system affected temporarily during construction phase
- Cleaning the whole structure
- Repair to return of status of local roads effected during construction phase.

3.11 Project Costs

The estimated total construction cost including VAT is confidential and will be provided from Road Department of Georgia.

3.12 Implementation Schedule

Tentative commencement date of the contract is spring 2012 and the expected time to complete the construction works is 30 month from the beginning.

4 DESCRIPTION OF THE ENVIRONMENT

The primary objective of the study of existing environmental parameters is to provide an environmental baseline against which potential impacts from the construction and operation phases of the proposed 18.859 km Kobuleti Bypass road can be compared. Baseline data includes an inventory of physical, ecological and socio-economic parameters. Covering these aspects, data has been compiled for:

- Land Environment (topography, geology, seismology and soils);
- Water Environment (water resources, water quality);
- Air Environment (meteorology, air quality);
- Noise Environment (noise levels);
- Ecological Environment
- Socio-economic Environment

Baseline data for the study area were collected using the following methods:

- Gathered data from previous EIA report prepared by GC-EAL-SAMBO (July 2010) for the whole alignment
- Field Visits
- Geological and Hydrological study Report of kobuleti Bypass section
- Primary data collection on water quality, soil quality, noise quality
- Desk Top Research
- Public Consultation
- Preparation of maps

The influence area (impact zone) for the EIA covers ½ km on either side of the road alignment in order to include sufficient coverage of the receiving environment of the impacts of the present.

Annex 4-1 represents Environmental Study Area showing the general alignment of the road (**within ½ km on either side of the alignment)** including major land use, settlements, water ways, roads and other major infrastructures in the area considered to be possibly affected by the proposed road project. A summary Table of the project area is given in Table 4-1.

Table 4-1: Summary of Important Features of the Project Road

Si No.	Parameter	Description
1	**Climate**	Seaside damp subtropical climatic zone
2	**Ecologically Sensitive Area**	**Chorokhi River**
	Wild Life Sanctuaries	**N/A**
	National Parks	**N/A**
	Reserve/Protected Forests	**N/A**
3	**Geomorphology**	Its geomorphological nature was totally formed on the general background of the alternating-sign tectonic movements of the Late Apline orogenetic cycle and active course of erosive-denudation processes.
4	**Major Soil Type**	well-developed red-soils, loamy soil
5	**Principal Crops**	Corn, beans, vegetable, citrus

6	**Predominant Geological Formations**	The geology of the region is presented by tufogenes, clay-slates and young andesite-basalt lavas. The bedrocks are covered with strong layers of loamy soil.
7	**Hydrogeology**	The main drainage channels and their distribution network were deemed inappropriate to consider, as their parameters, the values of maximum annual discharge, corresponding levels and safe velocity were calculated at the design stage and no hazardous hydrogeological events are expected.
8	**Major Water Bodies**	3 River
9	**Environmental Hotspots**	River crossings
10	**Major Industries/Business Entrepreneurs**	Hotels in Kobuleti

4.1 Physical Resources

4.1.1 Climate

The project area is classified as a seaside damp subtropical climatic zone. A climate zone of this type is formed under the influence of subtropical and moderate latitudes, circulation processes in the atmosphere and orographic patterns. Due to the influence of mountain ridges bordering from three sides, damp unstable air masses coming from the west (from the Black Sea), undergo convergence and form ascending flow up the west slopes of mountains. This causes the formation of a damp climate, with a large amount of precipitation almost any time of the year, against the background of a high thermal regime. A generalized climate map of Adjara is shown in Figure 4-1.

The project area, located on west coast of the Adjara, has an average rainfall of 2000 to 2800mm; average monthly temperature ranging from 5 ^{0}C in winter to 22.5^{0}C in summer, and dominant wind direction towards north east. A detailed note on the hydrometerological data of the 4 weather stations (Kobuleti, Chakvi, Makhinjauri and Batumi) located close to the project road is given in summary presented below.

Figure 4-1: Climate Map of Adjara

Average monthly temperatures of the 4 weather monitoring stations located close to the Project is shown in Figure 4-2. The average annual temperatures for Batumi, Makhinjauri, Chakvi and Kobuleti are 14.4 ^{0}C, 13.8 ^{0}C, 14.1 ^{0}C and 13.4 ^{0}C, respectively. January is the coldest month with the average temperature ranging from 4.8 ^{0}C in Kobuleti to 6.7 ^{0}C in Batumi. August is the hottest month with the average temperature ranging from 23.1^{0}C in Batumi to 22.6^{0}C in all three of the other areas.

Average monthly rainfall in Batumi, Makhinjauri, Chakvi and Kobuleti are shown in Figure 4-3. The average annual precipitation for Batumi, Makhinjauri and Kobuleti is 2531 mm, 2610 mm and 2320 mm, respectively. For all four areas, September is generally the wettest month with an average precipitation of 321 mm and May the driest month with an average precipitation of 93.8 mm.

Source: Government of Adjara

Figure 4-2: Average Monthly Temperature in the Project Area

Source: Government of Adjara

Figure 4-3: Average Monthly Precipitation in the Project Area

Source: Government of Adjara

Figure 4-4: Average Monthly Humidity in Project Area

The project area is generally humid throughout the year with an average monthly humidity levels ranges from 73-84% (Figure 4-4). The average annual humidity level for Batumi, Makhinjauri, Chakvi and Kobuleti are 79%, 80%, 78% and 81%, respectively.

The annual average and monthly wind speeds are shown in Table 4-2 and a breakdown of the wind direction is given in Table 4-3 for 2 weather stations. The average annual wind speed in Chakvi is 6.1 Km/hr with February being the windiest month with a wind speed of 9.7 km/hr and the most prevalent wind direction being from the south-west (24%). For Chakvi, the most prevalent wind direction is from the south-east (33%). Kobuleti has the highest average annual wind speed at 9.4 Km/hr, with winds reaching 11.2 Km/hr in February. For Kobuleti, wind direction is mostly from the south-west (30%) and north-east (23%).

Table 4-2: Average Monthly Wind Speed (Km/hr)

Meteorological Station	Months												Average Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Chakvi	6.8	7.6	6.8	5.8	5.4	5.8	6.1	5.8	6.5	6.5	6.1	6.1	6.1
Kobuleti	9.7	11.2	10.8	10.1	9.4	9.0	9.4	8.6	8.3	8.6	9.0	9.0	9.4

Table 4-3: Average Wind Direction (%)

Meteorological Station	Direction							
	N	NE	E.	SE	S	SW	W.	NW
Chakvi	3	4	13	33	7	18	15	7
Kobuleti	2	23	13	8	7	30	11	6

4.1.2 Topography and Landscape

The terrain map of the project area is shown in Figure 4-5. The last 4 km of the proposed project road pass through a flat terrain of coastal plain with elevations ranging from 0 to 30 m. The rest of the project road passes through a rolling and hilly terrain with elevations ranging from 20 to 192m.

The elevation profile of the project road is also shown in Figure 4-5.

Figure 4-5 : Elevation Map of the Project Area

4.1.3 Geomorphology

Geotechnical investigation team of BT Design and Consulting Company conducted assessment and geological surface survey of the design road corridor during the summer 2011. The design corridor starts from the village Ispani and ends at the 4th interchange at the end of village Chakvi. As a result of the study and analysis, the team has identified the following:

Landscape and Geographical Condition

The area in question with its landscape-geographical peculiarities, is included in the region of Ajara piedmont of the southern-western part of Kolkheti region characterized by the clearly expressed subtropical landscape with typical climatic, soil and geo-botanic conditions. There is one-story hilly and lowland landscape with typical wet subtropical climate, well-developed red-soils here and if not considering Batumi Botanical Garden, all the territory is intensely anthropogenized and cultivated. This is the area, which, of other regions of Georgia, is most densely populated with the population density of over 500 men on 1 sq.m. and the population mostly occupies the slopes of a hilly relief with significant gradients (Photo 4.1).

Photo 4.1

Geomorphological Peculiarity of the study area

In a geomorphological respect, the study area is included in the region of Ajara-Trialeti mountain system of the Lesser Caucasioni occupying hilly and seaside zones of so called Ajara-Guria piedmont in the south-western area of the region. Its geomorphological nature was totally formed on the general background of the alternating-sign tectonic movements of the Late Apline orogenetic cycle and active course of erosive-denudation processes. The morphometric ridges of different hypsomeric heights and directions with numerous branches, deep narrow gorges, basins, hills, denudation and marine-accumulative plains developed here form a multispectral mosaic landscape. It should be noted that the alternating-sign tectonic movements of the Late orogenetic stage continue to present. This is clearly evidenced by the morphological structures with flattened denudation surfaces located at different hypsometric levels, terrace steps and thick accumulative plains (Kobuleti, Kakhaberi Plains, etc.). This is also proved by the alluvial deposits with the thickness of over 40-60 m deposited in the beds of the rivers Ajaristskali and Chorokhi. The rate of elevation for the piedmont zone in Ajara-Trialeti western part measured with instruments on average amounts to 2 mm a year and increases gradually as the hypsometric altitude increases. At the same time, it is worth mentioning that the process of elevation and subsidence takes place on its own in the morphological-structural blocks isolated with tectonic faults, such as Supsa-Natanebi structural and Tsikhisdziri-Makhinjauri blocks where the rate of elevation is 2 mm annually on average; Kobuleti structural block, which is located between the river Natanebi and Tsikhisdziri mountain ridge, subsides by 1 mm a year, and the elevation process in Sarpi-Kalgandeti structural block takes place at the speed of 2 mm a year and so on.

So, the formation of the primary morphological structures in the region is caused by active differentiated processes at the Neotectonic stage and different erosion and denudation properties of the bedrocks, with a clear layering of the relief on their general background, with the relief-forming exogenic factors typical to them.

In this connection, there are three sharply different morphological levels identified within the limits of the study area:

1) a plain-accumulative relief of Kolkheti Lowland presented by Kobuleti seaside area and Kakhaberi Plain; 2) a hilly piedmont zone of Ajara-Trialeti western segment, and 3) a zone of a low-mountainous erosive relief.

1. The morphological zone of Kobuleti and Kakhaberi plain-accumulative seaside zone of Kolkheti Lowland is developed by a joint action of river and marine processes and is structured with thick deposits of delta facies with the thickness of 140 m in Kobuleti zone and up to 300 mm in Kakhaberi area.

The plain lowland of Kobuleti is bordered by Tsikhisdziri mountain ridge built with volcanogenic rocks from the south and by the river Natanebi from the north and is the block bent in the modern epoch, which is subject to subsidence at present of up to 2 mm a year. On its hand, in a morphological respect, there are lagoon-boggy zone, a narrow shelf and old seaside bund identified in the area of Kolkheti Lowland, which represent a relict of a Phanagoria (Egrisi phase) regress and runs along the edge for 10 km.

Kakhaberi accumulative plain belongs to Chorokhi-Batumi structural block, which during the whole Quaternary period was subject to subsidence, with the present rate of 0,8-1,3 mm a year. Kakhaberi Lowland is divided by the river Chorokhi in two unequal parts, with its wide right plain occupied by the city of Batumi with more than one relict lakes. A left narrow strip of Kakhaberi Lowland is presented by the low floodplain and above-floodplain terraces of the river Chorokhi.

Kakhaberi Lowland, which in a mopho-genetic respect is a delta-like formation of the river Chorokhi, has a form of a triangle in the plan with its vertex resting against the city of Batumi and villages Gonio and Makho. In the west, in the seaside zone, the absolute altitudes of the plain vary between 1.7 and 3.5 m; in the east (in the environs of villages Makho and Khelvachauri) its indicators increase to 28.3-34.7 m. In the extreme part of the flat surface of Kakhaberi plain there are bogged areas. The direction of the general inclination of the accumulative plain is from east to west. Within Kakhaberi plain-accumulative unit, there are the following elements identified in a morphological respect: 1) a floodplain accumulative plain with an unfinished cycle of development, which is stretched as a narrow strip along the river Chorokhi to village Erge and is totally covered with water during the floods; 2) a slightly inclined alluvial-marine delta-like plain with the finished cycle of development. Its maximum width is fixed in the western part and it gradually gets narrow eastwards decreasing to 0.5 km in the environs of village Erge (Photo 4.2).

Photo 4.2. Kakhaberi plain relief

2. The low-mountainous hilly morphological zone of the piedmont of Ajara-Trialeti ridge penetrating the study area with the western end of Meskheti ridge and its secondary branches - western ends of Kobuleti and Chakvi ridges. There are also short meridian branches running from the main watershed of Meskheti ridge in the south, which abruptly descend to the gorge of the river Ajaristskali.

Chakvi ridge and its small branches, which occupy the northern-western part of the area, are a watershed. The main watershed crest of the rivers Ajaristskali and Chakvistskali is directed sublaterally south-west with the absolute altitudes of 1553 m (mountain Chakvistskali), 1450 m (mountain Agaristavi), 1436 m (mountain Tsoniarisistavi), 1389 m (mountain Makhuntseti) and 896 m (mountain Erge).

The morphological peculiarity of the relief of the given zone is the result of the geology of the given area, tectonic faults of the rocks and deep weathering crust. In the zone of the seaside hilly relief, there are marine terrace steps from Chaudi through the Black Sea age survived as fragments, and there are denudation surfaces survived in the zone of the crests of the watersheds as fragments (Photo 4.3).

Photo 4.3: Typical Morphological Features of the Project Area

4.1.4 Geodynamic process along the Project Road

The most complex part of this road section is the section from the left bank of the river Dekhva till the village Sachino. Morphologically the road section is situated within the margins of hilly zone of Ajara-Trialeti mountain range foothills. The section is heavily disrupted by deep erosive processes and typical hilly-waved relief with steep slopes. In the geological composition of the study section Mid Eocene volcanic-sedimentary rocks prevail which are represented by black mica tuffs, tuff sandstones, tuff breccias, andesites and porphyrites. The upper part of these deposits is severely modified and disintegrated due to processes translated into the Upper Quaternary age laterites, outcome of which is powerful (more than 20 m thick) clay-gravel layers. On slopes the lateritic layers there are dealluvial clay beddings.

Floodplains of the rivers and gorges are mainly structured with variable weathered layers. It is worth to mention that the Mid Eocene deposits belong to high strength rocky deposits while their modification – the lateritic horizon belongs to deposits having low bearing properties and no resistance to erosion and landslide processes.

The most part of the Project road section passes the narrow gorge of the river Shua Gele being the left tributary of the river Dekhva. The gorge is characterized with tectonic disruptions and complex engineering-geology conditions. First of all the existing situation is conditioned by geo-morphologic and hydrologic conditions and by the low bearing characteristics of gorge constituent deposits, naturally resulted in development of erosive and landslide-gravity processes.

Morphology of the river Shua Gele (gorge fall depth, narrowness, river course meandering etc.) gives no possibility to use the wide area for road construction. Complex engineering measures (river training, bank strengthening, overpasses, high fills) would be necessary. Cut of slopes definitely will be followed with activation of landslides and gravity loads, so it should be ruled out. In extremis, where slope cutting is difficult to realize, measures against landslide activities are needed.

Photo 4.4: Landslide in lateritic slope at km 0+500.

4.1.5 Geological Hazards of the Project Area

Due to complex morphological relief, unstable geological formations and for climatic process, the mountainous region of Adjara contains sensitive geological environmental and exhibits active geological processes. Landslides are the major outcome of this geological process and are a major geological hazard in the Project area (Annex 4.2 Geological hazards Map).

According to the data of the state Department of Geology of Georgia, by 2000, there were 374 newly formed and active landslide bodies, 18 mudflow-transformable erosive water flows and over 57-km-long river bank erosion areas were identified. Nearly about populated areas are at the risk of these process. The degree of activation of these processes was comparatively higher in last 15 years and is evident almost every year. Only in 2004-2009, there were about 200 landslide sites were activated and approximately 1600 residential houses were destroyed to different degrees. In 2008, about 40 populated areas were found in the high risk area of landslide events. The landslides took the lives of 10 people.

Large-scale formation of landslides and other hazardous geological processes in the region has been the result of the following factors:

(1) Changes in the hydrometeorological patterns as a result of global climatic changes (mainly changes atmospheric precipitations and humidity).

Total annual precipitation is a key factor for provoking landslides. Changes in annual rainfall patterns thus have a direct influence on the formation and activation of landslides. Water infusion rate to the aeration zone of slope deposits is directly related to the mechanism of dynamics of landslides since it reduces the shear resistance of the strata. Therefore, the degree of activation and dynamic mode of the climatogenic landslides depends on the deviation of the normal rainfall pattern. It has been already noted that when the total annual precipitation exceeds the average long-term val Kobuleti ut 300 mm, the activation of landslide processes is greater than the background activation Chakvi occurs so called stressed state. When the deviation is more than 300-500 mm, the landsl Batumi ses start to activate extremely.

Note: A graph of years versus deviation of precipitation for Kobuleti and Chakvi.

Figure 4-6: Standard deviation analysis of historical precipitation

(2) The dynamics of the slopes prone to landslides is greatly provoked by seismic effect – the earthquakes formed in the local morphological structure and those of a transitive nature.

For instance, in 1986, the 4-5 point earthquakes occurring in Adjara sea water area destructed the slopes of the hilly relief in Kobuleti and Khelvachauri municipalities, which were in the state of homeostasis and the landslides activated by the earthquakes caused the deformation of different degrees and ruined about 400 residential houses, and in 1998, the transit effect of the earthquakes in Spitak caused a grand rockfall in Skhvalta gorge, burying of a great area of village Tsablani and human loss.

(3) Anthrogenic factor through intense development and urbanization of the area through construction of heavy buildings, local roads, cutting the slopes in geologically hazardous areas without evaluating their stability, irregular cutting of forest massifs, digging out tea plantations, etc – caused the extreme pressure on the slopes. This is well evidenced by the extreme activation of the landslide processes in autumn of 2008 near that affected nearly 45 populated areas resulting in to the destruction of 382 residential houses and death of 11 people in the villages of Ortabatumi and Akhalsopeli.

Generally, the landslides formed over the slopes covered with laterites of hilly relief and risky areas occupy large areas, but their majority not associated with the zones with tectonical faults are characterized by not deep deformations (mostly 3-5 m deep) and small areas (from tens of square meters to 1.0-1.5 ha). The given type of landslides is mostly block-and-flow and plastic landslides with their sliding surfaces in the laterite grounds usually coinciding with the lower border of the active weathering zone of bedrocks or the aeration zone of ground water levels. In addition, the slopes of the relief covered with laterite deposits, notwithstanding the significant inclination, mostly tend to preserve stability with the limit balance in natural conditions. However, if anthropogenic factor is activated (cutting the slopes, first of all) or the impact of seismic effect takes place, the slopes rapidly loose the state of homeostasis and landslides start to form and activate. As for the delluvial-clay rocks, the situation is slightly different here. The landslides developed in them are directly linked with the factor caused by the humidity effect and totally cover the zone of full humidification, whose thicknesses are much greater (up to 5-10 m, on average) than those of the slopes covered with laterites.

A geological hazard map of the Project road is prepared and shown in Figure 4.7. The map is prepared according to the engineering-geological conditions (degree of geological hazards), with three categories, I (simple), II (average) and III (complex) categories. The areas are categorized by considering different factors, in particular, by geomorphologic conditions; geological and hydrogeological , and geological processes.

Figure 4-7: Geological Hazard of the Project Road

Category 1 (Low): The category 1 has low geological hazard and located in a single geomorphological zone, with its surface being horizontal and not dissectioned. In a geological respect, the zone is presented by no more than two lithological layers with their location being horizontal (or slightly inclined), or by rocky rocks, which may be covered with non-rocky rocks of a little strength, outcropping onto the surface. Groundwater in this zone generally occurs in unconfined conditions. No hazardous geological processes or specific grounds (settling, swelling, etc.) are found here.

Category 2 (Medium Hazard): The category 2 (medium) category includes the areas, which are spread within the limits of several geomorphologic elements of a similar genesis, with their surfaces slightly inclined and dissectioned. In a geological respect, they are presented by no more than four lithological layers. The rocky rocks have uneven surfaces and are covered with non-rocky deposits. The groundwater occurs in two or more formed aquifers and has different chemical composition. Hazardous geological processes are limited.

Category 3(Complex): The category 3 (complex) category includes the areas, which are spread within the limits of several geomorphologic elements of different genesis, with their surfaces strongly dissectioned. In a geological respect, the areas are presented by more than four lithological layers with their strengths sharply varying. The rocky rocks are very much weathered and fissured. They are covered with non-rocky rocks. The groundwater aquifers are not sharply distinct. Some areas are structured with alternating water-bearing and water-resistant rocks. Hazardous geological processes are widely spread, or the territory is potentially dangerous in respect of origination and activation of hazardous geological processes. Project design and construction in this zone should consider the complex geological processes.

4.1.6 Hydrology

The construction of Kobuleti bypass road is to be conducted under very fierce physical-geographic conditions. This design road is being crossed by 34 water drains. All bridges in the Project area are designed for design discharge of 100 years return period. Culverts in the Project area are designed for a design discharge of 50 years to allow the flood water to freely flow.

The characteristics of the Project Rivers are stipulated by rather difficult geological constitution and features of relief and climate. All the rivers belong to mountain river types and do not have big basins and hence river lengths are short. None of these rivers take their head from the glaciers or permanent snow mountains. Mainly they are fed from rain water, snow melt water and groundwater and hence they are characterized by spring and autumn floods. Most of the rivers are characterized by big fall, fast flow, in some sections rivers flow in narrow and deep gorges and create canyon shapes and waterfalls. In some sections the rivers causes the bank erosion causing damage to roads, bridges, crops, and residential houses. River training structures will be designed for the rivers that exhibit bank erosion near the project road crossings to protect the project infrastructure.

Photo 4.5: Bank erosion of Korolistskali River at the Project site

Among those Achkva, Kintrishi and Chakvistskali are relatively large rivers. The short hydrological characterization of these rivers is given below.

The river Achkva heads at 1000 m altitude where several springs join on the north-western slope of mountain Ilia Tsikhe and flows into the Black Sea at Kobuleti. The length of the river is 19 km, its

total fall is 999 m, its mean slope is 52.6‰; the area of the catch basin is 37 km^2 and the average altitude of the basin is 156 m. The river is flown by 79 rivers of different ranges with the total length of 80 km.

The upper part of the basin, which is located on the north-western slope of Ajara-Imeretei Ridge, is dissectioned with the gorges of tributaries and dry gullies. The middle part of the basin is hilly and its lower part is located on the seaside lowland. The geology of the basin is mostly presented by the Tertiary and Quaternary deposits. There are mostly mountain and forest podzolized soils spread over the bedrocks. The vegetation cover of the basin is presented by a Kolkhetian type forest.

The riverbed is moderately winding. The width of the current varies between 2 and 12 m, its depth is 0.2-1.5 m and its velocity is 1.1-0.2 m/sec.

The water regime of the river is characterized by flashfloods during the year. There is relatively non-stable low-water period of the river observed in summer. There are no icy events taking place on the river.

At the crossing point with the design motorway, the width of the river current is 10-12 m and its maximum depth is 0,6-0,8 m. The banks of the river are slightly eroded.

The river Kintrishi heads at the altitude of 2320 m near mountain Khino (2598.9 m), on the south-western slopes of Ajara-Imereti Ridge and flows into the Black Sea 1 km south of Kobuleti. The length of the river is 45 km, its mean slope is 52‰; the area of the catch basin is 254 km^2 and the average altitude of the basin is 835 m. The principal tributaries of the river are the Magalahevisghele (with the length of 12 km) and Kinkisha (15 km).

The river basin presents a mountainous relief with its geology participated by tufogenes, andesites, basalts and alluvial, delluvial and elluvial deposits. The bedrocks are covered with loamy soils. 70% of the basin is covered with dense mixed forest.

The riverbed is winding and is branched past village Khutsubani. The branching forms low islands with the length of 50-1000 m and width of 50-200 m. The width of the river current varies between 1 and 50 m, its depth varies from 0.2 m to 2 m and its velocity is 1.8-0.7 m/sec.
The water regime of the river is characterized by spring floods and flashfloods during the year. At the same time, the levels of the flashfloods caused by rains much exceed those of flashfloods caused by snow-melting in spring. There is relatively non-stable low-water period of the river observed in summer. The within-year distribution of the river in different months varies in a great range from year to year. There are no icy events taking place on the river.

At the crossing point with the design road, the width of the river varies between 20 and 25 m, its maximum depth is 0,6-0,8 m. The banks of the river, with their height of 3,5-4,0 m are covered with vegetation.

The river Chakvistskali heads at the altitude of 1300 m on the southern slope of mountain Tirati (1379,4 m) on Kobuleti ridge and flows into the Black Sea south of village Chakvi.

The length of the river is 23 km, its total fall is 1300 m, its mean slope is 56,5‰; the area of the catch basin is 176 km^2. The river is flown by 496 tributaries of different ranges with the total length of 337 km.

The mountainous relief of the river basin past village Khala changes for the hilly relief. The river current is moderately winding and is not branched up to village Giorgadzeebi. Past village Giorgadzeebi, the river forms several islands, which, during the floods and flashfloods, are covered with an approximately 1-meter-high water layer.

The water regime of the river is characterized by spring floods and flashfloods during the year caused by rains. At the same time, the levels of the flashfloods caused by rains much exceed those of the flashfloods caused by snow-melting in spring. There is relatively non-stable low-water period of the river observed in summer. The within-year distribution of the river in different months varies in a great range from year to year. There are no icy events taking place in the lower reaches of the river.

At the crossing point with the design road, the river has a wide plain. The width of the current is 20-25 m and its maximum depth is 0,8-1,0 m. The river banks with their height of 1,5-3,0 m are collapsed. At the crossing point with the design road, the river is crossed by a gas pipeline, and a 1000-mm-diameter Batumi water pipe follows its left bank. On the crossing site, the river Chaisubani flows into the river from its left side.

Most of other small rivers and nameless brooks are the tributaries of large rivers and are characterized by the same water regime as the large rivers are.

The main drainage channels and their distribution network were deemed inappropriate to review, as their parameters, the values of maximum annual discharge, corresponding levels and safe velocity were calculated at the design stage and no hazardous hydrological events are expected for them.

The morphometric elements of the rivers and brooks crossing the design road in the design sections are given below, in the chapter of water peak discharges.

Maximum River Expenses

The rivers and gorges crossing Makhinjauri-Batumi design road are not hydrologically researched. Therefore their maximum water expense amounts are defined with the method presented in "Technical instruction for calculating maximum river expenses of Caucasian rivers".
According to the method the amounts of maximum river expenses for the rivers, the water catchment area of which does not exceed 400m^2, is calculated by the following equation:

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

Where *R* is rayon parameter. Its value is estimated as 1.35 according to the conditions of Western Georgia.

F is the volume of water catchment are in the design zone in km^2;
K is climate coefficient of the rayon the value of which is taken from a special map and in our case equals 9.
τ _ the repetitiveness in waters.
$\bar{i}$ _ is the balanced slope of the river current in units from the start to the design cross;
L – is river length from the start to the design cross;
Π - is coefficient of soil cover in the river basin. Its value is taken from the special map and relevant table and in our case is estimated 1.50.
λ - is forest coefficient of the basin, and is calculated by the following equation

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

here F_t is the volume of forest covered basin in %

δ - is the coefficient of the. It is calculated by the equation

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

where B_{max} is maximum width of the basin in km;

B_{sas} – is average width of the basin in km. It's value is calculated from the equation $B_{sas} = \frac{F}{L}$

During calculation of maximum water expenses of rivers and gorges, the water catchment volume is less than 5km^2, are also included in the above equation with the relevant and special coefficients presented 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 morphological elements necessary for calculating maximum water catchment expenses for rivers and gorges crossing the design road estimated from the 1:2500 scale map and also values of maximum water expenses of the 100, 50 and 10 year repetitiveness calculated from the above equation are given in the table below, Table 4-4.

Morphological elements and maximum water expenses of rivers and brooks crossing design road in m^3/sec

Table 4-4

Brook # and River name	CH	F km^2	L km	i Cal.	δ	λ	Π	Peak discharges		
								$\tau = 100$ years	$\tau = 50$ years	$\tau = 10$ years
Brook #1	0+435*	0.28	0.85	0.015	1.09	0.85	1.50	12.5	9.60	5.20
Brook #2	1+160	0.32	1.28	0.012	1.15	0.87	1.50	14.5	11.1	6.05
#3 Achkva	1+730	30.0	13.5	0.058	1.20	0.86	1.19	305	235	130
Brook #4	2+055	1.50	2.60	0.021	1.16	0.90	1.50	50.0	38.5	21.0
Brook #5	3+460	This is the channel heading from Brook #6								
Brook #6	3+700	1.32	2.35	0.017	1.11	0.92	1.50	43.5	33.5	18.1
Brook #7	4+300	0.08	0.27	0.022	1.00	0.89	1.50	5.60	4.30	2.35
#8 Kintrishi	4+600	208	42.8	0.054	1.02	0.87	1.19	670	515	280
Brook #9	5+010	0.39	0.80	0.029	1.03	0.92	1.50	17.5	13.5	7.25
#10 Kinkisha	5+560	36.0	14.0	0.089	1.00	0.88	1.50	390	300	165
Brook #11	6+000	0.13	0.55	0.100	1.04	0.84	1.50	9.05	7.00	3.80
Brook #12	6+210	0.10	0.50	0.126	1.06	0.86	1.50	8.20	6.30	3.40
Brook #13	7+020	0.30	0.65	0.097	1.09	0.87	1.50	17.0	13.0	7.15
#14 Dekhva	____	40.0	15.0	0.076	1.00	0.88	1.50	405	315	170
Brook #15	7+420	0.66	1.70	0.068	1.07	0.85	1.50	25.5	20.0	11.0
#16 Dekhva	8+460	39.0	13.7	0.083	1.00	0.88	1.50	405	315	170
#17 Shuagele	8+500	11.2	5.50	0.028	1.06	0.89	1.50	200	155	83.0
#18 Shuagele	9+230	10.4	4.40	0.033	1.01	0.89	1.50	190	145	79.5
#19 Kazarisgele	9+460	4.40	5.75	0.102	1.24	0.88	1.50	140	105	58.0
#20 Shuagele	9+635	5.61	3.78	0.036	1.00	0.90	1.50	130	100	54.5
#21 Shuagele	11+150	3.97	2.75	0.047	1.01	0.90	1.50	105	79.5	43.5
#22 Shuagele	11+900	0.79	1.10	0.091	1.00	0.90	1.50	30.5	23.5	12.5
Brook #23	12+960	0.21	0.75	0.087	1.12	0.89	1.50	14.0	11.0	5.80
Brook #24	13+280	0.24	1.00	0.092	1.09	0.84	1.50	14.0	11.0	5.80

Brook #25	13+525	4.45	4.30	0.135	1.11	0.85	1.50	130	100	54.5
Brook #26	13+720	0.21	1.00	0.120	1.05	0.84	1.50	13.0	9.75	5.30
Brook #27	14+000	0.08	0.47	0.211	1.08	0.85	1.50	7.60	5.80	3.15
Brook #28	15+050	0.75	1.05	0.122	1.01	0.89	1.50	30.5	23.5	13.0
Brook #29	15+550	1.95	2.15	0.144	1.16	0.85	1.50	73.0	56.0	30.5
#30 Chakvistskali	____	165	18.2	0.071	1.02	0.87	1.19	775	595	325
#31 Chakvistskali	16+000	144	18.0	0.071	1.02	0.87	1.19	710	545	300
#32 Mechkheristksali	16+320	21.1	10.6	0.120	1.18	0.88	1.50	355	275	150
Brook #33	16+850	0.33	0.75	0.076	1.04	0.85	1.50	16.5	12.5	6.85
Brook #34	17+500	0.54	0.98	0.060	1.00	0.92	1.50	23.0	17.5	9.55
Brook #35	17+550	2.24	3.05	0.098	1.17	0.87	1.50	77.5	59.5	32.5
Brook #36	18+400	1.2	2.10	0.134	1.06	0.84	1.50	47.5	36.5	20.0

* - pickets are taken from the topological map of 1:10000 scale

Special attention should be paid to the fact that during the bridge structure construction on the rivers the increase in solid deposits and suspended solids in water current is expected, which will have negative effect on ichtyo-fauna and its migration. Therefore it is necessary that bridge construction be planned taking into account the fish spawning period.

The territory for machinery disposal near the rivers must be covered with asphalt and fenced with concrete low fences, in order to avoid entering of spilled fuel and lubricants in the water.

The domestic waste disposal areas of the construction camps must be selected in the territories distanced from rivers no less than 50 meters, in order to avoid their entering the water.

4.1.7 Hydrogeology

According to the hydrogeological zoning of Georgia (Buachidze I. (1970), the Project area is located in the region of the water-pressure fissure waters of Adjara-Imereti of the water-pressure system of Adjara-Imereti folded zone. The hydrogeological conditions of the project are grouped in five principal hydrogeological complexes:

1. Aquifers of volcanogenic stratum of the Middle Eocene.
2. Aquifers of the Flysch rocks of the Upper Eocene.
3. Aquifers of the continental-volcanogenic rocks of the Upper Miocene- ower Pliocene.
4. Aquifers in the slope deposits of the Quaternary Period.
5. Aquifers in the alluvial deposits of the Quaternary Period.

Aquifers of the volcanogenic stratum of the Middle Eocene are in full associated with the crust of weathering, and the atmospheric precipitations and their depths of location vary between 10 and 50 m. These waters discharge on the surface as springs with their flow varying between 0.1 and 10.0 l/sec. The latter is associated with the tectonic faults. By their chemical composition, the waters are of hydrocarbon-calcium-sodium and sodium-calcium types, with their general mineralization of 0.2-0,.5 gm/l. They belong to fresh drinking waters, with general hardness of 0.5-2.4 mg/equivalent; PH=5.5-7.4.

In the Flysch rocks of the Upper Eocene, its weathered-fissured zone is sporadically water - encroached. As usual, their flows are not great and constitute 0.05-0.3 l/sec. By their chemical composition, the waters are mainly hydrocarbon-sulphate-calcium-sodium, or sulphate-hydrocarbon-calcium-sodium, with their general mineralization of 0.1-0.3 g/l. Sulphate-hydrocarbon waters are of the greatest mineralization. The waters of deep circulation in the hydrothermally changed rocks have great flows. For instance, at 100-150 m depth in the boreholes bored in Meris complex ore, a strong water stream with the flow of 10-12 l/sec was gained. The mineralization of these waters was 1.1 g/l, and according to their chemical composition, they are sulphate-calcium or sulphate-hydrocarbon-calcium-sodium. The complex is mainly fed with atmospheric precipitations and river waters.

The water-bearing horizon of the Upper Miocene-Lower Pliocene continental-volcanogenic deposits is quite abundantly water-encroached, as its majority is located in Alpine zone, where the surface streams are mostly formed. The waters of a non-deep circulation are mainly associated with fissure zones and their penetration depths in rocks are up to 50-60 m. The flows of the springs vary between 0.1 and 0.6 l/sec, sometimes more. According to their chemical composition, the waters are mostly hydrocarbon-calcium-sodium. The ground waters are fed with atmospheric precipitations and condensate waters.

Aquifers in the slope deposits of the Quaternary Period are mainly associated with clay loams. The flow of the springs is 0.01-0.4 l/sec. The temperatures of the waters vary between 7^0 and 15^0C. The waters are mostly fresh (with dry residue of 0,038-0,520 g/l). According to their chemical composition, they are of carbonate-calcium and sulphate-sodium types. The waters are mostly fed with atmospheric precipitations.

Aquifers in the alluvial deposits of the Quaternary Period are of no-deep and deep circulations and are distinguished for quite great flows. In the wells of Kakhaberi Valley located on the low terraces of the floodplain of the river Chorokhi, the water flow is 10-15 l/sec. The waters are fresh; they are of a good quality and of weak mineralization of 0.2-0.4 g/l. According to their chemical composition, they are mostly hydrocarbon-calcium or hydrocarbon-calcium-magnesium.

Groundwater supplies in the hilly areas (tuffs and volcanic formations) are mostly from fractured and weathered aquifers. In the zone of weathering, in particular in the pivotal parts of anticlines, volcanogenic layers are characterized by intensive fracture and erosion, due to which this zone is rich in ground water resources. Deeply penetrating fracture is observed in the zones of tectonic break-ups and fault zones and groundwater in these zones is in artesian condition. Due to these artesian conditions, the water level in the bore wells is generally located about 5 m depth.

Springs are also located in the hilly areas and are especially located in tuffo-breccias, gravel and bedding andesine. Some of these springs are also ejects water above ground level due to high artesian conditions. Average discharge from spring varies from 0.2 to1.5 l/sec. Springs are characterized with bicarbonate and, rarely with bicarbonate-sulfate chemical content and low mineralization (100 mg/l).

4.2 Ecological Resources

Ecological surveys covering flora and fauna were carried out along the project road by local ecological experts and a comprehensive report on the surveys is given in Annex 4-4 to Annex 4-5. A summary of these reports are presented in the following sections. Locations of the ecological survey sites are given in Figure 4-8 and summary observations in these locations are given in Table 4-5.

Figure 4-8: Locations of Ecological Survey Sites

Table 4-5: Flora and Fauna of the Project Area

Site Number	Description	Flora	Birds	Other Animals
043	Crossing with Construction Corridor. New road after the exit out of the existing tunnel on distance about 1 -1.2 km. Terrain needs to be reclaimed.	Territories severely modified by anthropogenic factors.	5 common bird species	No other animals.
044	Crossing with Construction Corridor. Rural residential area - Chaisubani village.	Residential areas.	Nine bird species were recorded during visit at site – all common	No other animals.

Site Number	Description	Flora	Birds	Other Animals
	Slope covered by ferns and weed bushes; common anthropogenic landscape, typical for the area.		garden species.	
045	The left bank of the river Chakvistskali on opposite side of Village Gorgadzeebi, upstream from the river-crossing site.	Riverine alder fragments and residential territories.	12 bird species were recorded, nothing extraordinary – association of forest birds	Marsh frogs not numerous
046	Crossing with Construction Corridor. Residential area – Chakvi; common anthropogenic landscape, typical for the area. The right bank of the river Chakvistskali, exactly on river-crossing site. The projected highway runs along the floodplain on this site. Shrubs, sparse trees, low grass.	Pastures (secondary meadows) and bamboo plantations.	Three bird species were identified by typical voices - Blackcap (Sylvia atricapilla), Common Nightingale (Luscinia megarhynchos) and Eurasian Blackbird (Turdus merula).	Marsh frogs not numerous; more than 10 species of fish – locals say.
050	Zeda Ulianovka village, Bamboo grove on the border of Construction Corridor.	Residential and agro landscapes occur.	At least 15 birds were observed. Noteworthy – migration of the European Honey-buzzard (Pernis apivorus) – 12 migrating at height 100-120 m in NW directions were observed	No other animals.
051	Rural residential area - Kveda Ulianovka village. Out of Construction Corridor. Citrus gardens, orchards, tea plantations, etc.	Residential and agro landscapes occur.	6 common synanthropic bird species were watched.	No other animals
052	Crossing with Construction Corridor. Rural residential area - Kveda Ulianovka village. Citrus and fruits gardens, orchards, tea plantation, partly abandoned; bamboo grove on private land.	Agro landscapes with citrus, tea, technical crop plantations and orchards	At least 29 bird species were presented in site - a good developed forest birds association.	No other animals
053, 054	Crossing with Construction Corridor. Area between Shuagele village and Tsikhisdziri village. Shua-Gele stream valley. Pastures and haymaking area, kitchen gardens; in the villages – citrus gardens and orchards.	Agricultural land.	During survey by foot from site No 53 to site No 54 at least 19 bird species were recorded, mostly common species widely distributed in the area.	No tracks of wild mammals. Marsh frog and small fish seen in the stream.
055, 056	Crossing with Construction Corridor. Shua-Gele stream at the village Tsikhisdziri, conjunction of streams Shua-Gele and Deki. Wet haymaking sites and grazing sites along the valley. Evidence of overgrazing. Banks of streams covered with litter.	Agricultural land.	At least 18 bird species were observed in site – mostly common species widely distributed in the area.	No tracks of wild mammals. Marsh frog. Local fisher man caught a few small fry and riffle minnow (*Alburnoides bipunctatus fasciatus).* They say that in the stream occurs cry-fish – that should be Colchis crayfish (Astacus colchicus) listed in the Red Data List of Georgia.

Site Number	Description	Flora	Birds	Other Animals
057	Rural residential area - environs of Bobokvati village, grazing site in the floodplain with evidences of overgrazing, bridge. View on Construction Corridor and on the river crossing area from left bank of the river Dekhva (or Degva);	Agricultural land	8 bird species were recorded in site	No other animals recorded
059	Road Kobuleti-Kvirike crossing with Construction Corridor; Old abandoned tea-bush plantations; old trees of Eucalyptus along the road, small stream and riparian vegetation along them.	Eucalyptus plantation.	Seven bird species were observed in site – mainly common synanthropic species; nest of bird-of-prey but could be suspected in the site.	No other animals recorded.
067	Road Kobuleti-Khutsubani crossing with Construction Corridor and River Kintrishi crossing. Residential area - easternmost edge of the Kobuleti town. On the river banks - shrubs, sparse trees, low grass.	Cut alder seedling with the occurrence of braken fern in the grass cover (Alnus barbata, Pteridium tauricum).		Frogs

4.2.1 Flora

A detailed report on Flora of the Project area is presented in Annex 4-4. Communities and species (included in Georgian Red List, Red Book, endemic, rare) of various conservation value are abundant in the Adjara as well as plants of economic value (medicinal, odorous, wild fruit, fiber, tubers, decorative, drinking, raw material and firewood forests, forage, hay meadow-pasture, wild relative of crops, etc).

Adjara vegetation is fairly diverse, which is determined by the different natural conditions of the area as well as quite complex history of flora and vegetation development. Adjara, as many researchers have indicated, is the richest province of Kolkheti relict flora. The majority of the elements typical for Kolkheti flora are found in the region. Moreover, there are such relict species, which grow only within Adjara, i.e. – Medvedev's birch, ground laurel – *Epigaea gaulterioides*, etc. The elements of European forest flora are abundantly mixed with Kolkheti vegetation.

The list of the species of Georgian Red List of Red Book that are observed in the project corridor is given in Table 4-6.

Table 4-6: Red List Flora Species in Project Area

№	Latin Name	Common Name	Protection Status
1	*Buxus colchica* Pojark.	Colchic boxwood	Vulnerable
2	*Castanea sativa* Mill.	Common chestnut	Vulnerable
3	*Juglans regia* L.	Nut tree	Vulnerable
4	*Pterocarya pterocarpa* (Michx.) Kunth.	Caucasian wingnut	Vulnerable
5	*Quercus hartwissiana* Stev.	Colchic oak	Vulnerable
6	*Quercus imeretina* Stev. Ex Malleev	Imeretian oak	Vulnerable
7	*Staphylea colchica* Stev.	Colchic bladder nut	Vulnerable

4.2.2 Fauna

Biogeographically, the Project area falls into the Colchic region of the Caucasus district. A note on the zoogeographical aspects of the study area is presented in Annex 4.4 and a detailed report on fish observations are given in Annexes 4.5.

Ecosystems of the Project Area

Main types of the ecosystems along the Project can be classified as follows:

Industrial and Urban Areas: Sometimes, nests of birds or significant associations of bats can be found in old industrial buildings - mainly abandoned storehouses, cellars, attics etc. Two of the bat species are included in the Red Data List. During short field survey such associations or nesting places of protected species were not found in buildings close to the ROW of future highway.

Rural Landscapes: Rural landscapes cover largest part of the Project area crossed by the Project alignment. Cultivated lands are feeding place for many animals, especially for birds - nesting in a forest and the visitors on flyway. But their composition is not diverse and numerous. Wild animal complexes once established on pastures and meadows, now have reduced population and limited to forests.

- From the Ochkhamuri till the Kobuleti the Project alignment runs through old, tea-bush gardens, covered with ferns. These plantations are partly abandoned, partly in process of renovation. The process of the renovation starts as a plantation burning-off, which is followed by deep cultivation of soil. Therefore, animal populations on such sites are scarce. No significant populations of the protected by law species are known on this grounds.
- from Kobuleti to Zeda Ulianovka, the alignment passes through homestead lands covered with orchards, filbert-tree plantations and citrus gardens. Dense human population and regular works in yards and gardens reduced number of rare and endangered species in this area. No protected by law species observed during the field trip.

River bank ecosystems: River bank ecosystems, usually differs from surrounding landscapes by the higher humidity, less developed soil layer, more developed bushes and less covered with agricultural landscapes. These ecosystems usually form narrow belts along rivers up to several hundred meters wide. Generally, they are quite diverse in regard of species composition of plants and animals. They are important for many species as shelter and feeding place.

Foothill deciduous forests: Generally, the mountain forest is richest ecosystem with high diversity, large number of endemic, game and endangered species. At the same time, animal communities of these ecosystems are very sensitive for human impact. The Project Corridor is situated within such kind of landscape from Bobokvati village till Makhvilauri. Actually, along the whole route the natural vegetation is changed. Only small plots with semi-natural coverage are scattered there. Most part of alignment was covered by homestead area and different plantations (citrus, tea-bush etc). No protected by law species were found during survey. It is possible, that some of protected species can find shelter within the construction corridor, but number of individual animals will be not high.

In summary, all the above ecosystems in the Project can be united as the following categories:

- Rolling lands of foothills occupied by old, tea-bush gardens, covered with ferns, and by the renovate tea-bush plantations, as well as used as citrus and filbert-tree gardens, mainly on homestead lands. Small sites of semi-natural biotopes – wetlands, forests and meadows are embedded within the anthropogenic and residential area. The complex of common garden

(synanthropic) species of birds, mammals, reptiles, and invertebrates is spread from environs of Ochkhamuri village to southern outskirts of Batumi.

General Characteristics of Animal Species` Composition

Mammals

108 species of mammals occur in Georgia of which 55 species can be found in the Project corridor. However, these areas are not any key-habitats of the endangered mammals. Bats (Chiroptera) are most important and vulnerable terrestrial mammals of the Project area. Bats are extremely restricted in finding shelters for breeding colonies. They frequently form large colonies in manmade structures and/or tree holes along the roads. 16 species of bats are recorded in the project area, of which two species are included in the Georgian Red Data list and in the IUCN Red List under the category vulnerable (The Atlas of European Mammals, 1999; The Red List of Threatened Animals IUCN, 1994, 2003).

Birds

There are approximately 390 bird species recorded in Georgian avifauna and more than 220 of these species breed regularly or incidentally in Georgia, while others appear in the country during migrations or in winter time. Based on all available data and taking into account the viewpoint of bird conservation, it can be concluded that breeding avifauna of the project area can be classified as a poor by breeding species and is presented in general by common, widely distributed and numerous bird species. The dominate group of breeding birds are small passerines.

The south-eastern coast of the Black Sea is one of the most important sites of Western Palaearctic birds' migration. Area includes the south-western part of the Colchic Lowland, seacoast, coastal lowland from Paliastomi Lake and left bank of Rioni River, in north, to Chorokhi River Valley, in south, foothills and pre-mountain area of the western slopes of the Meskheti Ridge. This route will cross the Project Road. This area is of importance for a variety species as a stop-over site on passage and wintering habitat, but especially – for birds-of-prey. Hundreds of thousands of individual migratory raptors is concentrate here in autumn. This area including "Arkhavi-Borchka" in north-eastern Turkey is well-known "International Bird Area" for raptors.

None of important areas from the point of view of bird protection is located along the proposed alignment. RoW is crossing highly populated areas.

Reptiles

54 species of reptiles were ever recorded for Georgia and about 13-16 reptiles occur along the Project alignment. Commonly noted species are rock lizards and two of these species are endemic and found exclusively in the Caucasus (*Darevskia derjugini, Darevskia Darevskia parvula*). These lizards are very much depended on specific places of dwelling - rocks rich with insects.

Amphibians

There are 12 species of amphibians found in Georgia and 10 of them are distributed in the Project area. Commonly noticed species and endemic to the region are marsh frog (*Rana macrocnemis, Pelodytes caucasicus*), toad (*Bufo verrucosissimus),* salamanders (*Mertensiella caucasica*), and newts (*Triturus vittatus*)

Fish

The present ichthyofauna of Georgia comprises 167 species, 109 genera, 57 families, 25 orders and 3 classes. Among them 61 are freshwater inhabitants, 76 species occurs in marine water and 30 species are anadromous. Ichthyofauna of Adjara is not rich. 47 freshwater and anadromous fish species occur in rivers, channels and mires. In Kintrishi River are recorded 25 species and five of them are in the Red Data List. There are 23 fish species in Dhekva river, two of them are red listed. 21 species are known from the river Chakvistskali, with four included in the Red Data List.

Fish are sensitive towards impacts caused by the construction and exploitation of Kobuleti bypass. The fish might fall under impact during civil works, as a result of fuel drainage and during construction works in the river grove, also as a result of trucks crossing the river, especially in the spawning and migration period. Besides during civil works access to spawning and wintering places will be limited for fish in certain areas of the river and the marsh.

Invertebrates

Invertebrates, and in particular insects, a new group included in the Red Data Books in last decades. Thousands of invertebrates species occurs in Georgia and most of them are very poorly studied. There is only fragmentary bibliography on most of them. Even taxons like a class or orders are entirely not investigated in Georgia. Among poorly studied taxons we have to enumerate free-living flat-worms (*Plathelminthes)*, other aquatic free-living worms, Miriapoda *(Myriapoda)*, aquatic snails. Conservation status of the most of species can be characterized as DD (Data deficient).

Red List of Georgia

41 red listed terrestrial species can be noticed within the Project area (Table 4-7). According to Criteria of Georgian Red List four mammals are Vulnerable (VU), among 24 birds two are Critical Endangered (CR), eight - Endangered (EN) and 15 - Vulnerable (VU), one reptile is Endangered and one amphibian – Vulnerable. The amphibian - Caucasian Salamander, very narrow-ranged endemic of Georgia, is recorded at Mtsvane Kontskh. Ten invertebrates, among which are four Endangered and six - Vulnerable species. 11 fish are among redlisted animals. Important mammals in the Black Sea are two dolphin species, an endangered Common bottlenose dolphin (*Tursiops truncatus*) and one vulnerable Harbour Porpoise (*Phocoena phocoena)* - EN and one VU).

Table 4-7: Red Listed Animals that can be found within the Project area

#	***Latin name***	**English name**	qarTuli dasaxeleba **Georgian name**	**National status**
		Mammals	**ZuZumwovrebi**	
1	*Rhinolophus mehelyi*	Mehely's Horseshoe Bat	mehelis cxvirnala	VU
2	*Rhinolophus Euryale*	Mediterranean Horseshoe Bat	samxreTuli cxvirnala	VU
3	*Sciurus anomalus*	Persian Squirrel	kavkasiuri ciyvi	VU
4	*Lutra lutra*	Otter	Wavi	VU
		Birds	**Frinvelebi**	
1	*Podiceps grisegaena*	Red-necked Grebe	ruxloyela murtala	VU
2	*Pelecanus onocrotalus*	Great White Pelican	vardisferi varxvi	VU
3	*Pelecanus crispus*	Dalmatian Pelican	qoCora	EN
4	*Ciconia ciconia*	White Stork	laklaki	VU
5	*Ciconia nigra*	Black Stork	yaryati	VU
6	*Tadorna ferruginea*	Rudy Duck	Witeli ixvi	VU
7	*Melanitta fusca*	White-winged Scoter	garieli	EN
8	*Haliaeetus albicilla*	White-tailed Eagle	Tetrkuda fsovi	EN

#	***Latin name***	**English name**	qarTuli dasaxeleba **Georgian name**	**National status**
9	*Accipiter brevipes*	Levant Sparrowhawk	qorcqviTa	VU
10	*Buteo rufinus*	Long-legged Buzzard	velis kakaCa	VU
11	*Aquila heliaca*	Imperial Eagle	begobis arwivi	VU
12	*Aquila clanga*	Greater Spotted Eagle	didi myivani arwivi	VU
13	*Aquila chrysaetos*	Golden Eagle	mTis arwivi	VU
14	*Neophron percnopterus*	Egyptian Vulture	faskunji	VU
15	*Aegypius monachus*	Black Vulture	svavi	EN
16	*Gyps fulvus*	Griffon Vulture	orbi	VU
17	*Falco cherrug*	Saker Falcon	gavazi	CR
18	*Falco vespertinus*	Red-footed Falcon	TvalSava	EN
19	*Falco biarmicus*	Lanner Falcon	wiTelTava Sevardeni	VU
20	*Falco naumanni*	Lesser Kestrel	mcire kirkita	CR
21	*Tyto alba*	Barn Owl	buxrinWa	EN
22	*Grus grus*	Common Crane	Ruxi wero	EN
23	*Burhinus oedicnemus*	Eurasian Thick-knee	TvalWketia	VU
24	*Panurus biarmicus*	Bearded Parrotbill	ulvaSa wivwiva	VU
		Reptiles	**qvewarmavlebi**	
1	*Vipera kaznakovi*	Caucasian viper	kavkasiuri gvelgesla	EN
		Amphibians	**amfibiebi**	
1	*Mertensiella caucasica*	Caucasian Salamander	kavkasiuri salamandra	VU
		Fish	**Zvliani Tevzebi**	
1	*Huso huso*	Beluga/ Giant Sturgeon	svia	EN
2	*Acipenser sturio*	Atlantic Sturgeon	atlanTiuri zuTxi	CR
3	*Acipenser nudiventris*	Fringebarbel sturgeon	jarRala/foreji	EN
4	*Acipenser stellatus*	Starred Sturgeon	taraRana	EN
5	*Acipenser gueldenstaedti*	Colchic Sturgeon	rusuli zuTxi	EN
6	*Acipenser persicus*	Persian Sturgeon	sparsuli zuTxi	EN
7	*Salmo fario*	Brook Trout	mdinaris kalmis	VU
8	*Salmo fario labrax*	Black Sea Salmon	SavizRvis oraguli	EN
9	*Capoeta (Varicorhinus) sieboldii*	Colchic Khramulya	kolxuri xramuli	VU
10	*Rutilus frisii*	Black Sea Roach	SavizRvis nafota	VU
11	*Neogobius fluviatilis*	Monkey Goby	meqviSia Rorjo	VU
		Invertebrates	**uxerxemloebi**	
1	*Phassus shamil*	Schamyl's Ghost Moth	kavkasiuri wmindadgaxviara	EN
2	*Eudia pavonia*	Small Night Peacock Butterfly	Ramis mcire farSevangTvala	VU
3	*Manduca atropos*	Death's Head Sphinx	sfinqsi mkvdarTava	EN
4	*Deilephila nerii*	Oleander Sphinx	oleandris sfinqsi	EN
5	*Callimorpha dominula*	Tiger Moth	daTunela hera	VU
6	*Axiopoena Maura*	Cave Transcaspian Tiger Moth	mRvis amierkavkasiuri daTunela	EN
7	*Allancastria caucasica*	Caucasian Festoon	kavkasiuri zarinTia	VU
8	*Xylocopa violaceae*	Violet Carpenter bee	iisferi qsilokopa	VU

#	***Latin name***	**English name**	qarTuli dasaxeleba **Georgian name**	**National status**
9	*Calopteryx mingrelica*	Banded Agrion	samegrelos turfa	VU
10	*Astacus colchicus*	Colchis crayfish	kolxuri farTofexa kibo	VU

11	*Dolomedes plantarius*	Fen raft spider	tivis oboba	VU
12	*Helix buchi*	Beech Snail	buxis lokokina	VU

National status according to the Criteria of Red Data List of Georgia: CR - Critical Endangered, EN - Endangered and VU - Vulnerable

4.2.3 Bird migration routes across project area

Bird migration and nomadic movements take place in Georgia during the whole year. However, there are sharply seen two migratory periods – spring and autumn passage. The important Euro-African and Euro-Asian migratory fly-ways of many bird species cross the territory of Georgia, from their nesting sites to the wintering areas and back. Not less than 215 species, or more than half of bird species of Georgia, are migratory birds, which are absent in the winter. Not less than 230 species are regularly noted at the period of seasonal migrations in the spring and autumn. Also, about 40 species are irregular migrants. The fly-ways of migratory birds' on the territory of Georgia are linked with natural "guiding" lines – with the outlines of the Black Sea coast line, valleys of the large rivers (Rioni, Mtkvari and with their tributaries), mountain ranges, mainly with the Greater Caucasus Chain and its spurs, and less with the Surami ridge and with ranges of the Lesser Caucasus. There are known primary, secondary and additional flyways, as well as concentration places of migratory flocks, so-called "migratory bottle-necks" and stop-over sites (places of their stay for the resting). The "bottle-necks" are situated on the passes in mountains (especially passes of the Great Caucasus) and in valleys of large rivers – Mtkvari, Rioni, Tergi (Terek), Alazani, and in valleys of some tributaries of them. The most important bottle-neck is located in south-western part of Kolkheti Lowland on the coastal lowlands of Adjara.

The general flyway within the project area lies along the whole of the Project Road. It follows the Black Sea coastline.

Spring Migration (March – first half of May).

General direction of the migration is from the South to the North. They use all suitable valleys of the rivers and the coast of the Black Sea. Part of the flock fly above the sea surface few kilometers away from the coastline. Transit migrants are dominating. Their species composition and numbers vary to a great extent, sometimes in a very short time.

There are four waves of the birds' migration in the spring - (i) beginning of March till the middle of March, (ii) during second half of March, (iii) from the first week of April till the third week of April, and (iv) from the end of April till the second week of May.

In the first (1-20 March) and second (second part of March) waves of migration, many cranes, birds-of-prey, waterfowls and crovids (*Corvidae*) are migrating. Third wave – (7-10 April till 1 May) is the most intensive migration wave. More than half of the spring migrants migrate in this time. The last fourth wave (May) includes small birds (cuckoo, oriole, swift and some species of small passerines).

Arrivals of the migrant birds, which are nesting in Georgia, continue from 5-10 May to 20-25 May, with peak between 10 and 20 May.

The most important factors of intensification of spring migration are the meteorological conditions on the plains of the North Caucasus and the existence in Transcaucasia. The soaring birds (e.g. large birds of prey) are in need of the good warmed grounds and places with the ascending flows of air. The migration of some species of ducks, geese, waders, and cranes occur at night.

Main flight altitude for most of the migrants is around 20-50 m.; some of the small bird species (*Passeriformes*) prefer the 5-20 m. The large bird species (waterfowl, birds of prey, cranes, gulls, etc) on the contrary usually fly higher (100-250 m).

Autumn Migration (September – end of October).

General direction of the migration is from the South to the North. The birds' flock cross the Main Caucasus Ridge through the passes in the gorges of the main rivers and go down to the intermountain plains. They do not follow to the bends of these riverbeds. The main part of the birds flies along the coastline of the Black Sea and above the sea. Birds gather in large flocks in the Kolkhida/Colkhic Lowlands.

Transit migrants are dominating, their species composition and numbers vary to a great extent, sometimes in a very short time.

Autumn passage is longer and more active than the spring passage. The first autumn migrants appear even at the beginning of August. The autumn passage ends at the beginning of November. There are shown three waves of the autumn migration - at the beginning of September, from the second week of September till the first week of October, at the end of October. The most common migrants are passerines (*Passeriformes*), waders (*Charadriformes*), birds-of-prey (*Falconiformes*), geese (*Anseriformes*), pigeons (*Columbiformes*).

The cold snaps on Russia territory, as well as also weather conditions (direction and force of winds, intensity and character of precipitation, height and density of the cloudiness) in some regions of Georgia and in adjacent regions of Russia and Turkey influence the intensity of the autumn passage.

The migration occurs both during day and night - dusk migration includes some species of the waterfowls and birds-of-prey, and night migration includes some species of ducks, geese, and cranes. Main flight altitude for most of the migrants is around 20-50 m.

Winter Migration (December - February)

This period is characterized by poor species structure with limited territorial distribution of large aggregations of birds, by high numbers of some wintering species. At the later period of the winter (the last weeks of February) it is noted increasing of the diurnal activity of all species and some revival of activity in the movements of both flocks of wintering species and resident breeders. The territory of Georgia is of important significance for wintering birds. More than 130 species are wintering there and more than 40 of them are gathered in numerous flocks. Birds are distributed irregularly in the places of wintering. Mostly, they prefer the open and semi-open areas on the plains in the regions with generally warm and snowless winters. The most important wintering area is Colchic Lowland, at coastal lowlands, in flood-plains of large rivers of Black Sea basin and of their inflows.

Number of birds changes during the wintering season, reaching maximum usually in the middle of 1st – the beginning of 2nd half of February. The greatest aggregation of wintering birds occurs on Colchic Lowland, where up to 60 % of birds from the total of those wintering in Georgia are recorded during the some years. Seaside lowlands also play the important role as wintering habitat, here are recorded up to 10-25% of the birds wintering in Georgia in different years. Up to 15-20 % of birds, wintering in Georgia, are recorded in open landscape of Eastern Georgia.

Number of the migrants varies noticeably from year to year. Unfortunately, the available data, does not allow defining an exact number of the birds, which are flying during the seasonal migrations through the territory of Georgia. General estimations of the number of the migratory and wintering

birds: about 250 bird species - from 25 up to 40 millions of individuals, (depends of the weather conditions) migrate along the Black Sea coast.

4.2.4 Protected Areas

Ispani Mire (Kobuleti Protected Areas)

The Ispani mire, a protected area and RAMSAR wetland site (number 894), is located 350 meters away from the project road between Km 6 to 12 section one. The location of the mire and the project alignment near the mire is shown in Figure9. The mire consists of 770 ha and contains two parts – Kobuleti State Nature Reserve (Ispani II, the northern area – 331.25 ha) and Kobuleti Managed Reserve (Ispani I, the south west area- 438.75 ha). Between mire and the project road there is main railway and agricultural lands. The road will not pose any serious risk to this site since there are no drains to the direction of the mire. In addition there is also artificial barrier as a railway embankment before the mire. The aerial photograph of the mire and Project road is shown in Figure 4-9.

Figure 4-9: Distance to the Ispani Mire

Photo 4.6: Photograph of the Ispani Mire from the Observation Tower

The mire is a part of the Kolkheti low land system of wetlands. The rationale for including the mire in the RAMSAR list is: (i) Ispani II mire is one of the two percolation bogs which are discovered worldwide (another one is Imnati, which also occurs in the Kolkheti lowland, located about 20km from north of the Ispani mire) and (ii) Vegetative cover of the Ispani I and Ispani II peatland complex contains plant communities of relict (e.g. *Carex lasiocarpa, Molinia litoralis*), northern Palaearctic species (e.g. *Drosera rotundifolia, Sphagnum imbricatum, S. palustre, S. papillosum, S. rubellum, S. auriculatum*), Kolkheti elements (e.g. *Rhododendron luteum, Rhododendron ponticum, Rhynchospora caucasica Vaccinium arctostaphyllus*) as well as species like *Frangula alnus, Rubus spec.* or *Alnus barbata* at the margin of the peatlands. The Ispani I and Ispani II peatland complex has many ancient relic species of vegetation that are found nowhere else in the world. A photograph of the Ispani mire from the observation tower in the mire is shown in Photo 4.6.

Percolation bogs have no acrotelm with horizontal water flow like other raised bogs, but a predominantly vertical water flow through the entire peat body. The Ispani 2 bog is an extraordinary bog (Krebs et al 2009) and is the type locality of percolation bogs (Kaffke et al. 2000), i.e. it was the first mire in the world identified as a 'percolation bog' (Couwenberg & Joosten 1999, 2005, Kaffke et al. 2000, Haberl et al. 2006). Only two well-developed bogs of this type are known to exist worldwide, both in the Kolkheti Lowlands, the other one is Imnati. Ispani 2 It shares many characteristics with 'normal' raised bogs, including its dome shape, its ombrotrophic (solely rain-fed) water and nutrient supply, and its acid and nutrient poor site conditions (Kaffke 2008, De Klerk et al. 2009). In contrast to all other bogs, however, Ispani 2 does not show surficial water flow and – as a consequence - no explicit microtope patterning (Couwenberg & Joosten 2005).

The project road is close to Ispani Mire also it does not cross the territory. Other sensitive areas can be considered river crossing such as river Achkva, Kintrishi, Dexva and Chakvis Tskhali.

4.3 Environmental Quality

Environmental investigations were carried out during feasibility study to establish baseline conditions for air, surface water and noise quality. Further environmental investigations were carried out during detailed design stage to establish baseline indicators for water, soil and noise quality. Locations of these investigations are given in Table 4.8 and shown in Figure 4-10.

Table 4-8: Locations of Baseline Environmental Quality Monitoring

		Location	Northing	Easting
Surface Water	1	Otschakumri river (downstream of railway and road)	41°52.294	41°49.765
	2	Tagoni (downstream of railway track)	41°50.912	41°49.392
Groundwater	1	Well in Otshkmuri village	41°51.279	41°50.152
	2	Well in downstream of Chakiv Landfill site	41°42.262	41°44.173
Air Quality	1	Kobuleti town near Ispani mire	41°51.790	41°46.784
	2	Otschakmuri	41°51.319	41°50.145
	3	Near Chakvi Landfill site	41°42.262	41°44.173
Soil Quality	1	Near Otschakumuri River	41°52.169	41°50.067
	2	Otschakmuri	41°51.319	41°50.145
	3	Near Chakvi Landfill site	41°42.262	41°44.173

Figure 4-10: Location of Environmental Quality Investigation Sites

4.3.1 Surface Water Quality

Water quality investigations have been carried out during feasibility study stage in April 2009, to assess the background water quality. The analysis of water samples also includes estimation of total nitrate (TN), polyphosphate (TP), and total petroleum hydrocarbon (TPH) to assess the pollutions levels from agriculture and industrial flows. Physical properties, such as temperature, pH, turbidity and electricity conductivity, of three river waters are given in Table 4-9, while major cations and anions of these waters are given in Table 4-10. Water quality of all the rivers in general is very good except Waters of the all rivers are potable and contain total dissolved solids ranging from 74 to 159 mg/l. All the rivers are excellent sources of drinking and can be used for construction purposes. The pH level of the rivers ranges from 7.66 to 7.81.

Table 4-9: Physical Properties of River Waters

No	River	Temp, °C	pH	Turbidity, FTU	EC mS/cm
1	Achva		7.9		0.268
2	Kintrishi	20.5	7.9	0.29	0.085
3	Chaqvistskali	20.4	7.89	0.43	0.079

Source: Institute of Mineral Raw Materials of Caucasus

Table 4-10: Chemical Properties (Major Ions) of River Waters

No	River	mg/l								
		Cl	HCO_3	SO_4	Ca	Mg	Na	K	DO	TDS
1	Achva	8.34	112.8	47.0	38.0	7.3	8.7	1.5	-	237.1
2	Kintrishi	5.0	37.8	14.4	9.0	4.1	7.9	0.4	9.8	79
3	Chaqvistskali	5.0	41.5	14.4	8.8	3.8	5.6	0.4	10.0	79

Source: Institute of Mineral Raw Materials of Caucasus

4.3.2 Groundwater Quality

Groundwater samples in the Project area are collected from wells and springs and the results of analysis are given in Table 4-11. The total dissolved solids (TDS) of the groundwater are below 300 mg/l. All the elements are within the standards. Presence of coliforms is noticed in all groundwater samples.

Table 4-11: Groundwater Quality of Project Area

#	Name	Standard	Well at vil. Ochkhamuri	Well below proposed Chakvi landfill site
1	pH		6.04	8.24
2	TDS, mg/l		88.5	94.0
3	Sulphate, mg/l	250	0.372	0.614
4	Chlorides, mg/l	250	6.224	0.138
5	Bicarbonate, mg/l		36.6	39.0
6	Sodium, mg/l	200	6.5	5.5
7	Calcium, mg/l	140	5.25	12.7
8	Magnesium, mg/l	85	1.7	6.9
9	Total Coliforms, in 250 ml		1 500	1 200

Source: Consultant's Water Quality Baseline Monitoring

4.3.3 Noise Quality

Baseline Noise Measurement Data

Sampling Session 1

Baseline noise level has been measured by device -."Шум – 1". 4 test points were selected near villages Makhinjauri (p.1), Salibauri (p.2), Makhvilauri (p.4) and in Khelavachauri. One device have been located at 5m distance from the edge of the existing road. Each minute one measurement has been carried out. The average of 30 measurements during 30 min is provided in the table below.

Results are provided in the Table 4-12

Table 4-12 Measured Levels of Baseline Noise

#	Time of Noise Measurement	Average Noise Level dBA 5m from the Road	
	Kobuleti (East of Kobuleti)		
		Average	Maximum
1	12.10 – 12.40	57	78
2	14.50 – 15. 20	65	83
3	17.30 – 18.00	52	65
	Chakvi		
		Average	Maximum
4	10.30 – 11.00	63	74
5	15.30 – 16.00	59	65
6	17.30 – 18.00	56	67

Sampling Session 2

1. Noise

The baseline noise was measured using device produced in UK "PCE-EM882". Measurements were undertaken in all identified points using the following methodology: data was taken from the device at each point in every 5 minutes during half an hour (total of 6 data) and average calculated for each point of noise (Table 4-13).

Table 4-13 Measured Levels of Baseline Noise

Location of measurement	After 5 minutes	After 10 minutes	After 15 minutes	After 20 minutes	After 25 minutes	After 30 minutes	Average
I point	**46.7**	**45.8**	**45.2**	**48.3**	**48.5**	**46.8**	**46.8**

II point	**50.2**	**47.6**	**48.0**	**48.3**	**48.7**	**47.9**	**48.45**
III point	**47.3**	**46.9**	**46.8**	**49.4**	**45.8**	**48.6**	**47.46**
IV point	**48.4**	**47.3**	**47.8**	**48.4**	**48.3**	**49.1**	**48.2**
V point	**57.4**	**59.4**	**61.3**	**45.2**	**64.8**	**63.3**	**58.56**
VI point	**46.4**	**48.5**	**45.5**	**47.5**	**47.7**	**47.7**	**47.22**

As the obtained data shows the baseline noise level is fairly low. Only at №5 point, in the vicinity of an automobile road, the noise level is relatively high in comparison with other locations, although it does not exceed the standard (see Photo 4.7 – 4.10).

Photo 4.7 Sampling point I **Photo 4.8 Sampling point II**

Photo 4.9 Sampling point IV **Photo 4.10 Sampling V point**

Modeling of Traffic Related Noise

Point-source propagation can be defined as follows: Sound $level_1$ – Sound $level_2$ = 20 log r_2/r_1. This means that for every doubling of distance, the sound level decreases by 6dBA ("inverse square law"). Line-source propagation occurs when there is a continuous stream of noise sources. The reinforcement by the line of point sources makes the propagation field either cylinder shaped or a half-cylinder shaped area. The line source propagation prediction model is as follows: Sound level1 – Sound level2 = 10 log r_2/r_1; The decrease in sound level for each doubling of distance from a line source is 3 dBA. When noise levels from a busy highway are considered, it is appropriate to utilize the highway as an infinite line source and consider a 3-dBA doubling of the distance-propagation rate.

In order to carry out semi-quantitative estimation of noise impacts related to existing and projected traffic, we used measured noise data – average and maximum values provided in the Table 4-12. Based on comparison of the maximum and average levels of noise and existing traffic volume data, we can consider that current traffic is not high enough to apply linear source propogation (3-dBA law) but the attenuation figures are between the point source and linear source (between 3-dBA and 6-dBA values). Increase of the traffic volume will lead to reduction of intervals between the vehicles crossing the given crossection of the highway. Therefore, we assumed that according to the traffic volumes projected for the 2030, the traffic will be "dense enough" to apply 3-dBA law for the noise attenuation and maximum of currently observed average figures (68 dBA) could be taken as indicative figure for noise at a 5m distance from the road side. Table 4-14 provides noise levels at different distances from the edge of the road as predicted by "3dBA-law".

Table 4-14 Predicted level of Baseline Noise

Distance from the Edge of the Road m	Predicted Noise Level Average Value - dBa	Predicted Noise Level Maximum Value - dBa
5	68	85
10	65	82
20	62	79
40	59	76
80	56	73
160	53	70
320	50	67

Modeling of Noise Related to Construction Activities

Evaluation of construction related noise relies upon known information on the noise produced by various equipment and activities at individual stages of construction. For example noise levels produced at 50 ft (15.24m) as provided by the U.S. Department of Transportation, FHWA, CADOT, and SBAG 1993; and Country Sanitation Districts of Los Angeles County 1994 are about:

Table 4-15

Source of Noise	Equivalent noise level, dBA
1. Construction machinery and mechanisms	
Backhoes	84 – 85
Bulldozers	84 – 85
Graders	91 – 92
Compressors	80 – 88
Jackhammers	85 – 98
pile drivers	96 – 107

According to other sources (U.S. Environmental Protection Agency, 1972,):

Table 4-16

Source of Noise	Equivalent noise level, dBA
Construction machinery and mechanisms	
Compacters (rollers)	72 – 75
Front loaders	72 – 83
Backhoes	72 – 92
Tractors	78 – 95
Scrapers, graders	80 – 95
Pavers	85 – 88
Trucks	83 – 93
Compressors	75 – 88
crane, movable	75 – 85
Jackhammers and rock drills	82 – 98
Vibrator	70 – 82
Saws	72 – 82

Noise generated by mobile sources naturally attenuates at a certain distance. Attenuation follows logarithmic pattern. In case of construction related noise, point source propagation model should be applied. Point-source propagation can be defined as follows: Sound $level_1$ – Sound $level_2$ = 20 log r_2/r_1. This means that for every doubling of distance, the sound level decreases by 6dBA ("inverse square law").

Table 4-17

Distance from the Edge of the Road m	Predicted Noise Level Average Value - dBa	Predicted Noise Level Maximum Value - dBa
5	80	90
10	74	84
20	68	78
40	62	72
80	56	66
160	50	60

320	44	54

Resume
Baseline Conditions

Baseline and predicted noise level in the area alongside the highway is not significant. In fact without applying any abatement measures, the noise level is in compliance with the standard requirements for the apartment houses at the distance of – 40-50m from the highway.

Project Impact and Mitigation (Construction Phase).

As a result of rough estimation of construction related noise, we can assume that the noise impact will not exceed radius of 320m. This means that settlements will not be affected. Neither ecologically sensitive areas will be disturbed by the noise nuisance. Temporary and slight increase of the noise level near the construction ground within the 300m radius is acceptable impact. However, mitigation of this impact is possible by engine maintenance practice and avoidance of engine work in non-operational mode. The only limitation that could be recommended is to minimize the night-time works near villages. The night-works at other sites could be carried out without limitation.

Project Impact and Mitigation (Operation Phase).

Traffic related noise will not affect area out of 40-50m from the highway. The impact is not expected to be high even in 2030, when the traffic intensity is expected to increase significantly as compared with the current situation. The abatement measures (installation of noise barriers and speed restriction) applied for the specific sections of the highway, enable to reduce the noise level up to 12dBA.

4.3.4 Air Quality

Until 1991, air quality monitoring was carried out regularly and systematically in Georgia in 11 cities, including Batumi. Dust, CO, NO_2 and SO_2 were measured continuously for 3 times in a day. The available latest air quality monitoring data for Batumi is from 1995 to 2004 and is shown in Figure 4.11. The average yearly concentrations of dust, sulfur dioxide and nitrogen dioxide in Batumi slightly exceeded norms. The maximal dust concentration exceeded MPL 1.2 times. In the later years of the data, the concentration of nitrogen dioxide increased substantially, while the level of hydrogen sulfide pollution decreased. Air quality monitoring in the Project area was carried out at 5 locations and the results are given in Table 4.18 and all concentrations are within the national standards. The equipment used for air quality monitoring are *Microdust Pro Particulate Monito r*(Casella, USA) for PM, *Gas Alert Micro 5 Multigas Detector* (BW Technologies, Canada) for SO2, and *Elan* (Russia) for CO and NO2. The average yearly concentrations of dust, sulfur dioxide and nitrogen dioxide in Batumi slightly exceeded norms. The maximal dust concentration exceeded MPL 1.2 times. In the later years of the data, the concentration of nitrogen dioxide increased substantially, while the level of hydrogen sulfide pollution decreased.

Source: Environmental Pollution Monitoring Centre, MOEP, 2005

Figure 4.11: Air Quality Monitoring Data of Batumi

Table 4-18: Air Quality Data in the Project Area

No	Parameter	Unit	Standard	Near Proposed Chakvi Landfill site	Kobuleti, near Ispani mire	Ochkhamuri
1	PM	mg/m^3	0.5	0.354	0.046	0.04
2	CO	mg/m^3	3.0	0.48	1.75	0.65
3	NO_2	mg/m^3	0.04	0.042	0.03	0.003

No	Parameter	Unit	Standard	Near Proposed Chakvi Landfill site	Kobuleti, near Ispani mire	Ochkhamuri
4	SO_2,	mg/m^3	0.5	0	0	0

Source: Consultant's air quality monitoring, 2010

4.3.5 Soil Quality

Soil quality analysis was carried out with 'Atomic Absorption Spectrophotometer (Analist-200) and the results are shown in Table 4-19. Dutch and other international standards for the heavy metal concentrations in soils are shown in Table 4-20. The concentrations of heavy metals in soils are generally less than international standards except for copper and the reasons for these high concentrations can be attributed to natural background concentrations.

Table 4-19: Soil Quality of the Project Areas

#	Name	Ochkhamuri	planned disposal area near Chaqvi
1	Lead Pb, mg/kg	15.33	19.25
2	Zinc Zn, mg/kg	58.28	67.11
3	Cobalt Co, mg/kg	10.77	21.48
4	Copper Cu,mg/kg	42.64	13.97
5	Nickel Ni, mg/kg	17.82	53.80

Table 4-20: Standards Heavy Metal Concentrations in Soils (mg/kg)

Element	Dutch Standards, 1985	International Standards, 1985
Cu	36	2-50
Zn	140	10-300
Pb	85	0.1-20
Ni	35	1-100
Co	20	1-50

Source: Environmental Assessment and Management Report of E60 Highway, 2007 Road Department, Georgia

4.4 Social, Economic and Cultural Resources

4.4.1 Population and Communities

Population of Adjara as of 2009 statistics is 382 thousands (Table 4-21). Approximately, 43.6% of the population lives in urban areas and 56.4% lives in rural areas. The Autonomous Republic of Adjara consists of seven administrative-territorial units: 2 cities and 5 rayons. From 2003 to 2005, the population growth rate has remanded stable, at around 0.5%. Batumi is the most populated city, with a population of 122 thousands. Ethnic groups of Adjara include Georgian, Russians, Armenians, Greeks, Abkhaz, etc. In the Project affected households, about 97% are of Georgian ethnicity. Armenians comprises only 2.0% and Russians, 0.25% (Table 4-22).

Table 4-21: Population of Adjara Region (thousands)

	2002	2009
Adjara Autonomous Republic	376.016	382.4
Batumi	121.806	122.5
Kobuleti Municipality	88.063	89.9
Khelvachauri Municipality	90.843	92.8
Keda Municipality	20.024	20.0
Shuakhevi Municipality	21.850	22.3
Khulo Municipality	33.430	35.0

Source: National Statistics Service of Georgia

Table 4-22: Ethnicity of Households

No.	Ethnicity	AH	%
1	Georgian	101	99
2	Other	1	1
	Total	102	100
Source:DMS/AP Census (Detail Design Consultant)			

Source: Socioeconomic survey, Feasibility Study (2009)

The Project Road measuring 18.9 km in length and located east of Kobuleti. It passes 8 villages/towns in Khelvachauri district. The names of the villages along the Project road are given in Table 4-23.

Table 4-23: List of Villages in the Project Impact Zone

Name of Village	Legal Status	District/Rayon
Khutsubani	Village	Kobuleti
Bobokvati	Village	Kobuleti
Sachino	Village	Kobuleti
Gvara	Village	Kobuleti
Ochkhamuri	Village	Kobuleti
Mukhaestate	Village	Kobuleti
Kobuleti	Urban Village	Kobuleti
Kvirike	Village	Kobuleti
Chakvi	Village	Kobuleti
Tsikhisjvari	Village	Kobuleti

4.4.2 Industries and Infrastructure

In 2004, the Gross Domestic Product of the Autonomous Republic of Adjara was GEL 490 million, which is 5% of the GDP of Georgia. The main industries in Adjara are manufacturing, agriculture and tourism. The manufacturing sector is dominated by food, tobacco, and woodworking industries and accounted for 5.9% of Adjara's GDP. As of 2005 there were 515 industrial enterprises in Adjara, 34 state enterprises and 117 non-governmental enterprises. Some of the major industrial enterprises in Adjara are listed in Table 4-24. The agricultural sector is dominated by tobacco, citrus plants, potatoes, tea, and livestock farming. The share of agriculture in the GDP of Adjara is 18.7% (GEL 91.52 million). Private farms occupy 63.8% of the agricultural lands. State and non-governmental agricultural farms occupy the rest, 46.2%.

Table 4-24: Major Industrial Enterprises in Adjara

	Industrial Enterprise
1	Batumi Sea Port
2	Batumi Oil Terminal LTD
3	Batumi Oil Refinery Plant LTD
4	Adjara Energo Company LTD
5	Adjarautotrans LTD
6	Batumi Mechanical Plant LTD
7	Transformer and Electric Equipment (JSC)
8	Batumi Locomotive Depot of Georgian Railway LTD
9	Batumi Carriage Depot of Georgian Railway LTD

10	Adjargas JSC
11	Batumi Ship Building Plant LTD
12	Transport Administration
13	Beer and non-akcoholic drinks enterprise LTD
14	Batumi Wood Refinery Furniture Enterprise JSC
15	Zenauri and Geladze LTD
16	Khelvachauri Bread Enterprise LTD

Source: Adjara Solid Waste management Feasibility Study and Project Preparation report, 2009

Figure 4-12: Locations of the villages and their population

Tourism is one of the major industry in the Project area and extensive resort infrastructure is located all along the existing road in Batumi and Kobuleti. In 2004, the total cost of services rendered in the sphere of tourism was GEL 16.7 million, which is 3.4% if the Adjara GDP. The tourist season lasts about 3 months, from late June till the end of September. On average, according to 2004 estimates, about 65-70 thousand people visited Adjara during the tourist season.

Citrus and Vegetables are the major crops being cultivated in the project area. Details of major cropping pattern in the project area obtained from the affected households are given in Table 4-25.
Corn, Vegetables and citrus are the major crops being cultivated in the project area. About 22% of the households cultivate citrus in average area 0.19 Ha each. Other crops like vegetables by 20% in average area of 0.08 Ha, corn by 21% in average area of 0.08 Ha

Table 4-25: Major Cropping Pattern

No.	Type of Crops	HH	%of HH	Average cultivated Area (Ha)
1	Corn	35	20.1	0.09
2	Bean	22	15.1	0.07
3	Vegetables	33	19.1	0.01
4	Grape	20	11.3	0.01
5	Fruit	3	0.9	0.01
6	Citrus	36	24.5	0.23
7	Others	17	9.3	0.01
Source:DMS/AP Census (Detail Design Consultant).				

Details of health care facilities in Adjara are given in Table 4-26, which includes 19 hospitals and 248 first aid network facilities. 1252 medical professionals are working in these facilities. Among them 78 are physicians, 42 are surgeons, 122 are gynecologists, 115 are village doctors, and 93 are paramedics.

Table 4-26: Health Care Facilities in Adjara

No		In 2008	In 2009
1	Number of Hospitals	18	19
2	Neurological Centre (with Hospital)	1	1
3	Blood transfusion station	1	1
4	Ambulance Service	6	6
5	First Aid Network in Total	245	248
	Among them		

	Centre for Family Medicine	2	2
	Independent poly clinics	11	11
	Medical Centre for Polyclinic Profile	5	5
	Private Polyclinic Institutions	3	4
	Health entre	3	3
	Centre for Primary Health Care	46	45
	Community Medical Centre	175	177

4.4.3 Transportation

The road network in the Project areas is poor with several rural areas which are not connected to the road network. Only national and regional highways are asphalted and all other rural roads are graveled, and these graveled rural roads are difficult to drive on, during the rainy season. Transport network in the Project area is shown in Figure 4-13.

Figure 4-13: Transport Network in the Project Area

Georgia has two main ports and both lie on this section of the Black Sea coast, Poti, 30 km to the north of the project area, and Batumi. Although some of the goods and materials leave the ports by rail, much of it also transported by road. In addition heavy commercial road traffic from Turkey enters Georgia through the Sarpi border post and up to Kobuleti, some destined for other areas of Georgia and some transiting through Georgia along the existing road and then along the main E-W highway to Azerbaijan, Armenia and beyond. Except for oil, transit trade mostly comprises agricultural products, building materials, and machinery.

This mix of international and local traffic combined with poor road conditions leads to dangerous driving situations and frequent traffic accidents. At present a significant volume of international transportation is carried on the Batumi-Poti section of road amounting to 1.0 million tons annually (2005), with 0.5 million tons on the Batumi-Sarpi section.

4.4.4 Cultural Resources and Archaeological Sites

Though the Project area has rich historical and archaeological heritage, no historical and archaeological sites and monuments are located along the Project road.

Figure 4-14: Location of Archaeological Sites

4.4.5 Land Use

Land use of the Project area is classified into swamps, badlands, temporal dwellings, perennial plantations (tea, citrus, etc), industrial area, agricultural lands, arable lands and forest. Project area mostly passes through arable land consisting of pastures, agriculture lands, tea and citrus plantations. Corn is the major agriculture product in the project area and is widely grown in all agriculture lands, and vegetables are the second major product.

4.4.6 Socioeconomic Conditions

This impacts assessment details loss of land, structures and other assets for the Kobuleti Bypass 18.9 km Section-2 road. Compensation and rehabilitation measures have been worked out based on these impacts. A detailed inventory of all the impacts has been done following the final alignment as per detailed engineering design for the Kobuleti Bypass 18.9 km Section-2 road under Contract-4 Tranche 1.

Digitized cadastral maps were collected from Registration Offices of NAPR. The final road alignment was superimposed on the digitized cadastral maps and land survey using DGPS was conducted on site to identify the affected land parcels, demarcation of land parcels including correction in geometric details and quantification of land parcels including affected part. With the cadastral details from land survey, detail measurement survey (DMS) and census was started 25 March 2011 and terminated on 11 April 2011 for correction in geometric details of road alignment. Detail measurement survey (DMS) and census was concluded on 31 May 2011 and 31 **May 2011** is considered as the **cut-off date** for compensation eligibility of this project. Additionally, a socioeconomic survey (SES) of more then 20% sample from the affected households was carried out in the project affected areas in order to understand the socio-economic condition of the affected population.

In all land impacts amount to some 1,173,922 sq.m of land from 700 plots (see table 2.1 for details). Figures on Land impacts are provided in accordance to the land classification and legal categories that are relevant to determine compensation modalities and compensation amounts due to their owners/users. Land has been classified in three main types:

- **Type 1**: Private land that is compensable because it is titled or legalizable according to the law. Legalizable land is land occupied by a house or close to a house that is currently untitled but is occupied by users who were legitimate land leasers under the old Soviet land administration system. This land includes **158** plots measuring in all **216,628** sqm.
- **Type 2**: Public land that is compensable because used continuously by users who were legitimate land leasers under the old Soviet land administration system but is not legalizable because it is not occupied by houses or bordering houses. No Type 2 plots are affected.
- **Type 3**: Land that is not compensable because not regularly used or used extemporaneously by users who were not legitimate leasers under the old Soviet land administration system. This land is also non-legalizable as it is not occupied by houses or close to houses. This land type includes **542** public land plots measuring in all **957,294** sqm.

A census of 100% of the AHs available on site was conducted to enumerate the APs. A sample socio-economic survey was included in the project area covering 102 households which more than 20% of the total AHs covered in census. The objective of the socioeconomic survey was to gather general information on socioeconomic condition of the affected people. The socioeconomic information of the affected population as per census and socioeconomic survey is presented hereunder

The Census identifies that about 53% of the APs (APs) are female. The average family size is 5.1. members per household.

The project road is mostly located in rural areas except Kobuleti. Survey shows that 99% of the AHs reside in rural areas.

20% of the population have university level education, 74% have primary and secondary level education, 6% have pre-school level education

Education of Households

About 20% of the population have university level education, 74% have primary and secondary level education, 6% have pre-school level education (Table 4-27).

Table 4-27: Education of Households

No.	Category	Male		Female		Total	
		AP	%	AP	%	AP	%
1	Pre-School	22	9	12	4	34	6

2	Primary & Secondary	165	68	218	79	383	74
3	University	57	23	46	17	103	20
4	Illiterate	0	0	0	0	0	0
	Total	244	100	276	100	520	100
Source:DMS/AP Census (Detail Design Consultant).							

Source: DMS/AP Census 25 March–11 April 2011 (Detail Design Consultant)

Major Economic Activities

Agriculture as the primary economic activity reported 65% households.. The details are given in Table 4-28 below.

Table 4-28 Economic Activity of the Households

No.	Type of Activities	Primary		Secondary	
		HH	%	HH	%
1	Agriculture	66	65	27	27
2	Agricultural Labourer	6	6	13	13
3	Small enterprise	5	5	11	11
4	Government Service	19	18	7	7
5	Business and trading	19	19	10	10
6	Daily Wage	8	8	19	19
7	Others	8	8	8	8
Source:DMS/AP (Detail Design Consultant).					

Source: DMS/AP Census 25 March–11 April 2011 (Detail Design Consultant)

Employment Status

About 15% working age APs are wage employed, 24% are self-employed and about 15% are economically inactive (Table 4-29). About 46% of the APs reported that are unemployed including 44% among males and 47% among the females. Details are given in Table 4-29.

Table 4-29: Economic Activity of the Households Members

No.	Gender	Economically inactive		Wage employed		Selfemployed		Unemployed		Total	
		AP	%	AP	%	AP	%	AP	%	AP	%
1	Male	19	10	29	15	55	29	88	46	191	100
2	Female	42	18	28	12	47	20	118	50	235	100
	Total	61	14	57	13	102	25	206	45	426	100
Source: DMS/AP (Detail Design Consultant).											

Source: DMS/AP Census 25 March–11 April 2011 (Detail Design Consultant)

Annual Income of AHs

Agriculture, service and wage employment are major contributors to income of the AHs. The survey found that 14% of the AHs get income from one single sources, 38% from double sources and 48% from three or more sources.

Table 4-30: Average Monthly Household Income against Number of Sources

Number of sources of Income	AH	% of AHs	Average annual income (GEL)
Single source	14	14	9567

Double Source	39	38	13568
Three + sources	49	48	16920
Total	102	100	
Source:DMS/AP Census (Detail Design Consultant).			

Source: DMS/AP Census 25 March–11 April 2011 (Detail Design Consultant)

Table 4-31: Annual Household Income distribution by Sources

Sources		%	Average annual income from the source (GEL per HH)
Wage employment	40	39	6423
Agriculture	31	30	4905
Business/Service	13	13	2153
Property	2	2	378
Pension	4	4	706
Remittance	6	6	1034
Other	5	5	795
Total	102	100	16394
Source:DMS/AP Census (Detail Design Consultant).			

Source: DMS/AP Census 25 March–11 April 2011 (Detail Design Consultant)

Source of Drinking Water

The major source of drinking water is dug-well and piped water supply - 29% of households use water from dug-well and 63% of households use water from piped supply, 8% of households reported other sources Details are given in Table 4-32.

Table 4-32 Source of Drinking Water

No.	Sources	HH	%
1	Piped water supply	66	65
2	Well	32	31
3	Others	4	4
	Total	102	100
Source:DMS/AP Census (Detail Design Consultant).			

Source: DMS/AP Census 25 March–11 April 2011 (Detail Design Consultant)

Sanitation Facilities

54% of surveyed households use flush toilet and 46% use latrine Details are given below.

Table 4-33: Types of Toilet

No.	Toilet	HH	%
1	Flush toilet	63	62
2	Latrine	39	38
	Total	102	100
Source:DMS/AP Census (Detail Design Consultant).			

Source: DMS/AP Census 25 March–11 April 2011 (Detail Design Consultant)

Usage Pattern of Fuel for Heating

Wood is the major source of fuel being used by the households (89%) for heating. Details are given in Table 4-34

Table 4-34: Type of Fuel Used for Heating

No.	Types of Fuel	HH	%
1	Electricity	2	2
2	Wood	87	85
3	Gas	8	8
4	Other	5	5
	Total	102	100
Source:DMS/AP Census (Detail Design Consultant).			

Source: DMS/AP Census 25 March–11 April 2011 (Detail Design Consultant)

5 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 Approach to Screening of Environmental Impacts

The approach to screening of environmental impacts for the Project follows the guidance contained in a range of documents relevant to environmental assessment of road projects including the following key documents

(i) ADB's Safeguard Policy Statement (SPS), 2009
(ii) IFC Environmental, Health and Safety Guidelines, Toll Roads, April, 2007
(ii) Environmental Guidelines for Selected Infrastructure Projects (Highways and Roads, ADB, 1993)
(iii) Environmental Impact Assessment of Road Corridor Investment Program (ADB Loan No. 2560-GEO), June 2010
(i) World Bank (WB) Environmental Assessment Sourcebook, Vol.2, Guideline for Environmental Assessment for Roads and Highways Projects,1991

Potential impacts on various environmental components due to different project activities during pre-construction, construction and O/M stages have been identified. The following detailed investigations are being carried out to assess the impacts:

- Detailed review and analysis of available spatial databases for all environmental parameters in project areas such as terrain, soils, geology, rivers, forests, protected areas, land use, and population
- Geotechnical investigations through boreholes and soil analysis
- Environmental quality baseline monitoring of air, noise, surface water, and groundwater,
- Ecological surveys comprising vegetation, wildlife, and fisheries,
- Review of engineering designs
- Hydrological calculations.
- Census survey to assess the extent of land acquisition and resettlement, loss of vegetation, occupation, income and poverty levels of the affected households, etc.
- Review of archeological reports
- Stakeholder, focus group discussions and public consultations

Issues for inclusion in the environmental screening were identified through the EIA scoping process. Based on knowledge of the existing environment, the project characteristics and experience with the typical potential impacts of road and highway development, those issues for which environmental impacts were likely to occur were identified.

A range of technical investigations was carried out for each of the identified environmental issues to determine the effect that the project may have on a particular characteristics of the surrounding environment. Potential impacts were categorized according to the project phases, i.e. pre-construction, construction or operation, in which they occurred. Impacts with the potential to occur during decommissioning or as a result of accidents or unforeseen conditions were also identified. This process was carried out to ensure mitigation measures could be developed which were appropriate to each project phases.

For those identified impacts for which it was possible and/or necessary, mitigation measures were developed. The following hierarchy of mitigation strategies (from highest priority to lowest priority) was implemented:

- IMPACT AVOIDANCE: Changing project location, design and construction methods to avoid impacts;

- IMPACT MINIMIZATION: Where impacts cannot be avoided, implementing mitigation measures to reduce the impact to acceptable levels;

- COMPENSATION: Arranging compensation where impacts cannot be avoided or sufficiently mitigated;

- ENHANCEMENT: Measures, which, at insignificant cost to the project, give appreciable social or developmental benefits

Cumulative impacts of the project were considered separately. Cumulative impacts are complex impacts that arise from the Project acting in combination with other past, present and future activities and development. Cumulative impacts can be:

- Additive: impacts that result from the combined effect of a number of smaller impacts
- Compensatory: impacts that occur when the effects of one project or activity act to offset the effects of another
- Synergistic: impacts that result when smaller impacts combine to create different or more significant impacts – the overall impact is greater than the sum of the individual impacts
- Masking: impacts of multiple projects overlap in a way that there is no perceived additional impact, usually for an initial period of time after which impacts become one of the other types of cumulative impacts

Classification of Environmental Impacts of the Project

In this EIA report, (negative) environmental impacts of the Project are classified into 5 levels in accordance with international classifications with specific conditions of the project site taken into account.

- No impact: means unapparent and negligible influence on the natural and socio-economic environments at the project site and its surroundings.
- Minor impact (or small impact): means slight influence on a small portion of population (in this projects: some households at each commune) or a small area of natural ecosystems (for example, less than 1.0 ha at each site).
- Intermediate (or medium impact): means influence on a portion of population or a relatively large area of natural ecosystems (for example 1.0 – 10.0 ha of forest at each sites).
- Major impact: means significant influence on a large portion of population (various communes inside and around the project ROW) or a large area of natural ecosystems (more than 10.0 ha each site in this project).
- Unknown impact: means influence that is unpredictable as lacking information or data (for instance, impacts due to sea level rise, earthquake, heavy flood, etc in this project area).

Each impact is also determined as short-term or long-term, recoverable or irrecoverable, unmitigatable or mitigatable.

A detailed environmental management and monitoring plan has been prepared for all the identified impacts and is presented in Chapter 9.

5.2 Project Related Significant Impacts

5.2.1 Pre-construction Stage

In the Pre-Construction Stage the main activities of the project are:

(i) Study to select best alignment of the bypass.
(ii) Further investigation on geo-engineering to detailed design the road and bridge.
(iii) Design roads, bridges and other technical facilities.
(iv) Acquire land, relocate houses and infrastructural facilities; remove vegetation covers within the project ROW for construction of road, bridges and other technical facilities.
(v) Implement resettlement action plan (RAP).
(vi) Land clearing for preparation of « clean area » for road and bridge

5.2.1.1 Loss of Land

This road alignment will entail acquisition of 50 registered private plots measuring 104,813 sqm and 108 legalizeable plots measuring 111,815 sqm which in total 158 private plots with area of 216,628 sqm. Although 542 public plots measuring 957,294 sqm will be used by alignment from which 87 plots (282,393 sq m) are temporarily used by illegal users/squatters and 455 plots (674,901 sq m) will not require for any compensation or other assistance as it is totally free land. Land impacts by land type are detailed in Table 5-1 below.

Table 5-1: Impact on Land

		Area (sq. m.)	Number of plots
Type 1 Land (compensable)			
Agriculture land	Used as agriculture	191717	131
	Used as Residential	24911	27
Sub Total		216628	158
Type 3 Land (non compensable)			
Temporarily used		282393	87
Non used		674901	455
Sub Total		957294	542
Total		1173922	700

The current status of ownership of acquired land is provided in Table 5-2. The owners/users will be compensated for land according to the Government Decree of March 1, 2011.

Table 5-2: Land Impacts by Type of Land Ownership

No.	Legal Status		No. of Plots	Area (sq. m/)
	Type 1 Land (compensable)			
1	Private Land	Registered	50	104813
2		Legalizable	108	111815
	Total Private Land		158	216628
	Type 3 Land (non compensable)			
3	State owned Land	Temporary used	87	282393
4		Uncultivated	455	674901
	Total State Land		542	957294
	Total land		700	1173922

5.2.1.2 Loss of Households

In all land impacts amount to some 1,173,922 sq.m of land from 700 plots (see table 2.1 for details). Figures on Land impacts are provided in accordance to the land classification and legal categories that are relevant to determine compensation modalities and compensation amounts due to their owners/users. Land has been classified in three main types:

- Type 1: Private land that is compensable because it is titled or legalizable according to the law. Legalizable land is land occupied by a house or close to a house that is currently untitled but is occupied by users who were legitimate land leasers under the old Soviet land administration system. This land includes 158 plots measuring in all 216,628 sqm.
- Type 2: Public land that is compensable because used continuously by users who were legitimate land leasers under the old Soviet land administration system but is not legalizable because it is not occupied by houses or bordering houses. No Type 2 plots are affected.
- Type 3: Land that is not compensable because not regularly used or used extemporaneously by users who were not legitimate leasers under the old Soviet land administration system. This land is also non-legalizable as it is not occupied by houses or close to houses. This land type includes 542 public land plots measuring in all 957,294 sqm.

Table 5-3 below provides details about the impacts on Landowner/user's households

Table 5-3: Affected Households

Impact Category	No. of Ahs		Net No. Of APs	Remarks
	No. in Category	Absolute (without double counting)		
A. Land				
A1. Agricultural Private Land Used for Agriculture purpose	**131**	**131**	**668**	
A2. Agricultural Private Land Used for non-agriculture purpose (rersidential)	**27**	**27**	**137**	
A3. Agricultural State Land Temporary used	**87**	**87**	**443**	
Total (A)	**245**	**245**	**1248**	
B. Crops /Trees				
B1. Only Cops Losses	**0**	**0**	**0**	
B2. Crops and Tree Losses	**114**	**114**	**579**	
B3. Only Tree Losses	**1**	**1**	**4**	
Total (B)	**115**	**115**	**583**	
C. Permanent Structure				
C1. Only Residential Structure	**13**	**13**	**65**	
C2. Residential and Auxiliary Structure	**6**	**6**	**31**	
C3. Only Auxiliary Structure	**6**	**2**	**9**	
Total (C)	**25**	**25**	**105**	
D. Relocated AH				
D1. Relocated AH	**19**	**19**	**96**	
Total (D)	**19**	**19**	**96**	

5.2.1.3 Loss of trees

The right of way will affect 8728 fruit trees and 37138 sq. m tee plant under private ownership. Also all timber trees are state owned and do not require payment of compensation.

Table 5-4: Affected Trees

	Age group	Number of Trees
Mandarin	**5-**	10
	5-9	55
	10-14	107
	15-19	568
	20+	2446
Sub-total		**3186**
Orange	**15-19**	4
	20+	92
Sub-total		**96**
Lemon	**5-9**	8
	10-14	30
	15-19	3
	20+	23
Sub-total		**64**
Fig	**5-**	4
	5-9	7
	10-14	9
	15-19	15
	20+	6
Sub-total		**41**
Persimmon	**5-**	6
	5-9	19
	10-14	16
	15-19	21
	20+	93
Sub-total		**155**
Medlar	**5-**	4
	5-9	18
	10-14	7
	15-19	10
	20+	23
Sub-total		**62**
Apple	**5-**	7
	5-9	23
	10-14	29
	15-19	18
	20+	42

Sub-total		**119**
Pear	**5-**	4
	5-9	19
	10-14	34
	15-19	25
	20+	64
Sub-total		**146**
Plum	**5-**	5
	5-9	37
	10-14	46
	15-19	29
	20+	14
Sub-total		**131**
Walnut	**5-**	7
	5-9	43
	10-14	160
	15-19	146
	20+	350
Sub-total		**706**
Hazelnut	**5-**	173
	5-9	853
	10-14	485
	15-19	609
	20+	1120
Sub-total		**3240**
Grape	**5-**	2
	5-9	26
	10-14	58
	15-19	16
	20+	42
Sub-total		**144**
Kiwi	**5-**	10
	5-9	5
	10-14	13
	15-19	2
	20+	10
Sub-total		**40**
Faioja	**5-**	3
	5-9	2
	10-14	20
	15-19	18
	20+	22
Sub-total		**65**

Other Fruit Trees	**5-**	0
	5-9	15
	10-14	137
	15-19	296
	20+	85
Sub-total		**533**
Sub-total Trees		**8728**
Sub-Total Tee (sq m)	**20+**	**37138**

Tree felling should be performed upon preliminary notification to the relevant authority (MOEP and Forestry Department of MOENR). New plantation is proposed within 3 m reserve space is available within ROW on both sides of the road.

5.2.1.4 Loss of Crops

The total crop area 256770 sqm from 161 plots which are totally private plots (see Table 5-5).

Table 5-5: Impact on Crops

Type	Area (sq. m)	Number of Parcel
Corn	97911	42
Beans	242	10
Vegetables	28349	26
Hay/Grass	128068	83
Total	256770	161

5.2.1.5 Loss of Building/Structures

Table 5-6 and Table 5-7 below provides details about the impacts on Buildings/Structures and Wall / Fences respectively

Table 5-6: Impacts on Buildings/Structures

Type	Characteristic			No of Buildings/structure	Number of Stories	Area in Plan (sq m)	Total Area of Building/structure (sq m)
	Materials	Grade	Sub Grade				
Residential	Block (B)	A	B	7	1.8	1111	1985
		B	B	4	2.0	595	1192
			C	3	1.7	382	664
		C	C	2	1.6	326	524
	Block-Wood (BW)	B	B	1	2.0	106	212
			C	1	2.0	100	200
	Wood (W)	C	C	1	1.0	85	85
Sub Total				**19**	**1.8**	**2705**	**4862**

Supplementary Facility	Storege	Block (B)	C	3	1.0	118	118
		Wood (W)	B	6	1.0	102	102
	Cattle Hous	Block (B)	C	2	1.0	130	130
	Garage	Block (B)	C	1	1.0	24	24
Sub total				**12**	**1.0**	**374**	**374**
Grant Total				**31**	**1.7**	**3079**	**5236**

Table 5-7: Impacts on Wall / Fences

		Grade	Affected	Number of Parcel
Fence/Wall	Concrete-Steel (m)	A	110	3
		B	585	7
		C	4200	36
	Block-Cement (m^3)	B	118	2
Total				48

5.2.1.6 Loss of Business and Employment

The right of way has affected only agricultural land and with crops and trees. There is no any impact on business and employees.

5.2.1.7 Compensation and Resettlement Framework

The following Table summarizes impact of Land Acquisition and Resettlement.

Table 5-9: Summary Impact on Land Acquisition and Resettlement

No.	Impacts	Unit	Quantity (sqm)			
			Type 1	Type 2	Type 3	Total
Land Tenure Patterns						
1	Total Land parcels affected	No.	158		542	700
2	Total Land area affected	Sqm	216628		957294	1173922
3	Total Land parcels to be acquired	No.	158		87	245
4	Total land Area to be acquired	Sqm	216628		282393	499021
5	Private legal Plots	No.	50			50
		sq.m	104813			104813
6	Private Legalizable plots	No.	108			108
		sq.m	111815			111815
7	Non cultivated state plots	No.			455	455
		sq.m			674901	674901
8	Private agricultural land used for agriculture purposes	No.	131			131
		sq.m	191717			191717
9	Private agricultural land used as residential	No.	27			27
		sq.m	24911			24911
Agricultural Patterns						
10	Area under Corn Cultivation	Sqm				97911
11	Area under Beans	Sqm				2442
12	Area under Vegetables	Sqm				28349
13	Area under Hay/Grass	Sqm.				128068
14	Affected Trees	No.				8728

Affected Structures						
15	Residential Structures /Houses	No.				19
16	Supplementary facility	No.				12
17	Indusial & Commercial structures	No.				0
18	Wall/Fenc	No.				48
Affected Households						
19	Severely affected Households	No.				190
20	Vulnerable Households	No.				5
21	AH with legal plots	No.	50			50
22	AH with legalizable plots	No.	108			108
24	Total AH	No.	158		87	245
25	Total Affected Persons	No.	805		443	1248

A resettlement framework for the Project was prepared in compliance with the national laws and legislation related to land Acquisition and resettlement and ADB's Safeguard Policy Statement, 2009. Land Acquisition and Resettlement Plan (LARP) are prepared for Kobuleti Bypass Road Section 2, Contract 2) and presented in separate reports.

The legal and policy framework of the project on land acquisition and resettlement has been adopted to assist the APs and/or households for their lost land and assets, income and livelihood resources. Expropriation of land through eminent domain will not be applied unless approach for acquisition through negotiated settlement fails. Compensation eligibility is limited by a cut-off date as set for this project on the day of concluding of the AP Census which is **31 May 2011**. APs will be entitled for compensation or at least rehabilitation assistance under the Project are (i) all persons losing land irrespective of their title, (ii) tenants and sharecroppers irrespective of formal registration, (iii) owners of buildings, crops, plants, or other objects attached to the land; and (iv) persons losing business, income, and salaries. A summary entitlements matrix is included in Table 5-10.

Table 5-10: Compensation of Entitlement Matrix

Type of Loss	Application	Definition of AH/APs	Compensation Entitlements
Land			
Permanent loss of agricultural land	AP losing productive land regardless of impact severity	Owner with full registration	Cash compensation at full replacement cost. If the residual plot becomes unviable for cultivation, the project will acquire it if the owner so desire.
		Legalizable Owner (APs with title formalization pending and APs who are not registered but have residential land or agricultural plots adjacent to the residential land)	The ownership rights of these APs will be recognized, the land registered in NAPR and the APs provided with cash compensation at full replacement cost.
		APs who are not registered but legitimately use agricultural land not adjacent to residential plots	These will not be registered in NAPR. However the APs will be provided with cash compensation at full replacement cost, according to the Decree of the Government of 01.03.2011.
		APs that are not legitimate land users or squatters (these are APs who were not land leasers under the old system or occupy a plot illegally)	One time self-relocation allowance in cash equal to 12 months at minimum salary (@311 GEL per month x 12 months=3732 GEL / AH).
		Agricultural Tenant	A one time self-relocation allowance in cash equal to 1 year at minimum salary (@311 GEL per month x 12 months=3721 GEL / AH)

Non-Agricultural Land	AP losing their commercial/ residential land	Owner with full registration	Cash compensation at replacement rate or through replacement land equal in value to plot lost and at location acceptable to APs. The cash option has been selected for this project.
		Legalizable Owner (The owners legalizable according to active legislation)	The ownership rights of these APs will be recognized, the land registered in NAPR and the APs provided with cash compensation at full replacement cost.
		Non-legalizable land users (without registration/valid documents using land permanently.	A one time self-relocation allowance in cash equal to 1 year at minimum salary (@311GEL per month x 12 months=3721 GEL / AH)
Buildings and Structures			
Residential and non residential structures/assets		All AHs regardless of their legal ownership/ registration status (including legalizable and Informal Settlers)	Full impact: Cash compensation for building/structures losses at full replacement costs free of depreciation and transaction costs Partial impact: repairs compensation .
Loss Of Community Infrastructure/Common Property Resources			
Loss of common property resources	Community/Public Assets	Community/Government	Reconstruction of the lost structure in consultation with community and restoration of their functions
Loss of Income and Livelihood			
Crops	Standing crops affected or affected agricultural land, used permanently for crop cultivation.	All APs regardless of legal status (including legalizable and Informal Settlers)	Crop compensation in cash at market rate by default at to gross crop value of expected harvest.
Trees	Trees affected	All APs regardless of legal status (including legalizable and Informal Settlers)	Cash compensation at market rate on the basis of type, age and productive value of the trees.
Business/Employment	Business/employment loss	All APs regardless of legal status (including legalizable and Informal Settlers)	Owner: (i). (permanent impact) cash indemnity of 1 year net income; (ii) (temporary impact) cash indemnity of net income for months of business stoppage. Assessment to be based on tax declaration or, in its absence, minimum salary. Permanent worker/employees: indemnity for lost wages equal to 3 months of minimum salary. (@311 GEL per month x 3 months=933 GEL / AH)
Allowances			
Severe Impacts	>10% income loss	All severely affected AHs including informal settlers	Agricultural income: 1 additional crop compensation for 1 year's yield of affected land or an allowance covering 3 months of minimum salary for cases when crop compensation is not applicable (@311 GEL per month x 3 months=933 GEL / AH)
Relocation/Shifting	Transport/transition costs	All AHs to be relocated	An allowance covering transport and livelihood expenses for the transitional period. (@ 200 GEL as vehicle hire charge + 311 GEL per month x 3 months =1133GEL/AH)

Vulnerable People Allowances		AHs below poverty line, headed by Women	Allowance equivalent to 3 months of minimum salary and employment priority in project-related jobs (@311 GEL per month x 3 months=933GEL / AH)
Temporary impacts during construction		All APs	Due compensation to be assessed and paid when the impacts are identified based on the above provisions.

5.2.2 Construction Stage

Generally, construction impacts are expected to last for a relatively short time period and are expected to cease soon after the completion of construction. Construction impacts are considered to be minimal as all the construction works will be carried out within the site boundary on the acquired land and will be controlled via the mitigation measures defined in this EIA. If Contractor does not comply with the environmental specifications, serious long term environmental problems could emerge.

5.2.2.1 Geo-hazards

Project road passes through sensitive geological formation and construction activities may trigger landslides, rock falls, and soil erosion. A geological hazard map of the Project road is prepared with three categories of and shown in Figure 5-1. The areas are categorized by considering various factors such as geological, hydrological and geomorphologic conditions. Category 1 is low hazardous zone with no active geological process, Category 2 is medium hazard zone with limited geological process, and Category 3 with complex hazardous zone with active geological process and the construction activities in these sections may trigger landslides, rock falls and soil erosion.

Km 6+500 – 14 is Category 3 zone, which runs across the gorge complicated by narrow tectonic faults of so called "Shua Ghele", the left tributary of the river Dekhva, whose tectonic-geological peculiarity and nature of the relief result in the active development of landslide and erosive processes. Cutting the slopes for earth works in this narrow gorge will activate landslide-gravitational processes.

Km 14 to 16 runs through a landslide body in a stable state, but construction activities in this section may activate this stable landslide body.

Km 16- 18, a section is located in hazardous geological terrain, especially near area adjacent to the northern entrance of the tunnel (Photo 5-1.1).

Figure 5-1.1: Existing road cut slopes (Km 16-18) that will be widened towards these slopes.

Source: Environmental Impact Assessment of Road Corridor Investment Program (ADB Loan No. 2560-GEO), June 2010

Figure 5-1: Geological Hazard of the Project Road

Therefore, to avoid the above impacts, necessary mitigation measures, such as retaining walls, realignments or overpasses, are to be provided in the designs. During the design and construction of the road, particular attention should be paid to cutting the slopes only in the last resort by taking proper protection measures.

For proper planning preventive and mitigation measures, the nature and leading mechanisms of geohazard development in the area should be clearly understood. According to the review provided in the chapter 4, the problem is mainly associated not with the active landslides in particular locations

but with existence of unstable landscape ("weak soil") and landslide prone areas expended along the 40% of the road alignment. The leading mechanism of landslide formation is related to the water infusion degree of the slope deposits and correlation with the intensity of precipitations is clearly defined. Accordingly, following conclusions could be made in this regard:

- Surface water management is considered as a major mitigation factor for prevention of landslides during construction activities, as well as during operation phase. Temporary drainage systems should be installed to prevent landsliding during construction (cutting slopes, deep trenches etc.). Permanent drainage systems for the surface water management and slope stabilization should be installed and adequate monitoring and maintenance should be ensured. This may require also installation of drainage pipes at a deeper level than for temporary drainage system. Seasonal aspects should be considered during planning the monitoring activities: snow-melting and flooding periods are of great importance.
- Slope stabilization techniques to prevent erosion, and further triggering of landslides is extremely important. Mechanical means, like berms, geogrids, biomats, as well as anti-erosion and re-vegetation of slopes should be applied.
- At very particular locations, revetment structures or reshapement of relief may be required
- Near tunnel areas to ensure stability of the tunnel entrance areas, prior to starting any works on concrete entrances, preliminary protective measures are necessary to undertake
- The design for landslide prevention structures should be based on the borehole data and slope stability analysis.
- As a long term mitigation measure, it is crucial that land degradation is stopped. Maintaining a vegetative cover in the cut and mountainous areas will reduce erosion through run-offs, land and mud slides.

Geo-hazards associated with project shall be O&M by the Road Department Environmental Division and in case of the necessity National Environmental Agency of the Ministry of Environment more details about RD Environmental Division is referenced in section 9.13 of this document.

5.2.2.2 Soils and Materials

The main impacts on the soil during construction are from (i) loss of topsoil from the construction sites; (ii) conversion of the existing land uses such as agriculture and plantations to stockpiles of materials, and damage to the temporarily acquired land; (iii) cut and fill operations, (iv) extraction of fill materials from cut section, and/or borrow pits, (v) soil erosion in mountainous slope, side slope, borrow pits and uncompacted embankments and siltation, and (vi) contamination of the land from hazardous and toxic chemicals and construction material spillage. In addition site preparation activities generate spoils consisting of crop residue, grasses, trees and earth.

Top Soils

Topsoil of cultivated land used for temporary work areas will be stripped off and stockpiled, to be replaced when the construction is completed and the cultivated land rehabilitated. The top soil along the Project road will also be stripped, preserved for reuse. There may potentially be some topsoil washout due to improper storage and reinstatement. Contractors will be encouraged to minimize usage of productive agricultural land and convert them to their original state after completion of civil works. Embankments should be monitored during construction for signs of erosion; long-term material stockpiles will be covered to prevent wind erosion.

The storage of topsoil in stockpiles, no more than 2m high with side slopes at a maximum angle of 45^0, will take into consideration the following:

- Segregation of the topsoil from the subsoil stockpiles

- Dedicated storage locations that prevent the stockpiles being compacted by vehicle movements or contaminated by other materials;
- Segregation from subsoil stockpiles;
- No storage where there is a potential for flooding;
- No storage at less than 100 m from river/streams, subject to site specific topography.

Contractor will protect the stockpiles from flooding and run-off by placing berms or equivalent around the outside where necessary. Topsoil stockpiles will be monitored and should any adverse conditions be identified corrective actions will include: (i) anaerobic conditions - turning the stockpile or creating ventilation holes through the stockpile; and (ii) erosion - temporary protective silt fencing will be erected;

Topsoil removed from the construction sites will be used for reinstatement of the topsoil on the embankments or in the adjacent construction corridor affected by the project activities. Topsoil will be reinstated separately from subsoil, with care taken to avoid mixing of the materials. The topsoil reinstatement will be sufficient to restore the fertile depth to the initial conditions as judged by the topsoil strip during visual observation and comparison of the reinstated site and adjacent land. When replacing the topsoil Contractor will program the works such that the areas farthest away from the stockpiles are reinstated first with reinstatement getting progressively closer to the stockpiles, thus reducing the number of vehicle movements over the reinstated topsoil. The reinstated topsoil will then be harrowed, where practical, to protect the stability and promote vegetative growth

Borrow Material

During construction, the volume of cut and fill are estimated to be approximately 2.16 million m^3 respectively. Table 5-11 provides the estimated quantity of materials to be used/ generated during construction for the Project road. However, the Project will source more than 2 million m^3 of borrow material to fill deep section and prepare road embankment.

Table 5-11: Cut and fill volumes

		Unit	Quantity
	General site clearance and removal of obstructions, including bush and undergrowth and trees less than 0.08 m in girth	Ha	82.5
	Tree felling and removal	No	1844
	Clearing and Grubbing	m^3	92944
	Earth Excavation- Common Soil	m^3	351576
	-Soft Rock	m^3	N/A
	- Hard Rock	m^3	N/A
	Embankment Filling – Common Soil	m^3	1456066
	Removal of Unsuitable Materials	m^3	150153

Quarry and Borrow Sites

During detail design, location of potential borrow and quarry area was selected which is presented in Table 3-9 of Chapter 3. However, the Contractor is responsible for selection of suitable borrow pits.

The exploration of the borrow pits should be conducted by the licensed companies. In case if the constructing company intend to perform quarrying activities, the company has to obtain related license. Validity of licenses for the abovementioned companies is a main mechanism to guarantee that most of impacts related to quarrying will be mitigated. License is provided by the MOEP only on a basis of preliminary assessment (including limits and conditions for reinstatement). The Environmental Department of Adjara AR and Environmental Inspectorate of MOEP are in charge to

control compliance of the quarrying company's performance. The role of the RD within this plan should be to ensure timely and permanent involvement of the MOEP in construction supervision.

Generally quarry sites are the major sources of environmental impact due to dust and noise pollution, loss of biodiversity, and generation of spills. Operation of the quarries above the approved limits may cause change of floodplain hydrology and trigger erosion and landscape degradation. The operating procedure for borrow pits shall consider following principles: (i) maximize the amount of fill that can be effectively used from the pit, (ii) minimize erosion and sedimentation, (iii) preserve the water quality of the rivers, (iv) protect air quality during excavation, (v) prevent wildlife from falling into the pit, and (vi) reinstatement of the site after construction. Only approved borrow and quarry sites will be used by the contractors and produce copy of necessary government licenses to the client before procurement.

The mitigation plan to be followed by the Contractor at the borrow sites is: (i) only borrow areas approved by the environmental authority will be used for the project; (ii) pits management, (including restoration if it will follow the completion of certain works) shall be in full compliance with all applicable environmental standards and specifications; (iii) the excavation and restoration of borrow areas and their surroundings, in an environmentally sound manner to the satisfaction of the MOEP and RD; (iv) borrow pit areas will be graded to ensure drainage and visual uniformity or to create permanent tanks/dams. Additional borrow pits, if necessary, will not be opened without the restoration of those areas no longer in use, and without the approval of MOEP. Topsoil from the opening of borrow pits will be saved and reused to revegetate the pits to the satisfaction of the MOEP.

Crushing plants are to be installed with scrubbers and filters to cleanse the dust in crushing plant. Local roads will be damaged during transportation of borrow materials and by the construction equipment. In order to reduce impact on all borrow sites and local roads, contractors will water the local roads close to the settlements used by the borrow trucks and rehabilitate the local roads to their original conditions.

5.2.2.3 Spoils and Wastes

Spoils

The Project will generate about 2.16 million m^3 of spoils due to excess cuts or unsuitable cuts for fill. Environment Department of Adjara AR proposed the following sites for disposal of spoils

- unused landfill site in Kobuleti for reclamation purposes
- Landfill site in Batumi for temporary storage and use for further reclamation purposes (after closure of the landfill, which is planned for the year 2011)
- coastal protection works if rock contains rock material

Contractors in consultation with the Environment Department of Adjara AR will submit a spoil plan to RD and MOE for approval. The spoil plan should show the location of proposed sites (landfill or borrow pits) to be used and the measures to be taken to rehabilitate these pits upon finalization of the Project. Costs of the spoil disposal will be included into cost break-down provided by contractor within bidding proposal and should be reflected in the contract It is also recommended to allow local communities to utilize any excess rock, which may be left following reuse. Suitable access to the materials will be agreed with the local authorities in consultation with the community.

Wastes

Construction works are expected to generate wastes from including garbage, recyclable waste, food waste, and construction debris. In addition small quantities of hazardous waste will also be generated mainly from the vehicle maintenance activities (liquid fuels; lubricants, hydraulic oils; chemicals,

such as anti-freeze; contaminated soil; spillage control materials used to absorb oil and chemical spillages; machine/engine filter cartridges; oily rags, spent filters, contaminated soil, etc).

The contractor in consultation with RD and MOE will identify suitable sites for both hazardous and non hazardous waste disposal sites. Further the contractor, (i) provide refuse containers at each worksite, (ii) maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal, (iii) train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process, and (iv) Collect and transport hazardous and non-hazardous wastes separately to all the approved disposal sites. Vehicles transporting solid waste shall be covered with tarps or nets to prevent spilling waste along the route. The sites for waste disposal shall be agreed with the local municipal authorities. The specialized company (like Sandasuptaveba") will be contracted to ensure collection of domestic and general waste from camps and temporary storage areas and transportation to the landfills.

The hazardous waste is expected to constitute in average about 0.1% of total amount of the wastes. Taking into account lack of specific hazardous waste treatment facilities in Georgia, the common construction practice accepted by the authorities is to dispose certain types of wastes at the municipal landfills. According to local legislation (Order #36/N of the Minister of Labour, Health and Social Protection of 24.02.2003) small amounts of listed types of hazardous wastes could be disposed on municipal landfills. Disposal of the most part of hazardous wastes should be agreed with the MOEP and local authorities. Constructing Contractor shall collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at the temporary storage sites and further at the locations approved by MOEP or pass it to the licensed operator (e.g. Sanitari Ltd), having environmental permit on operation of the hazardous wastes.

5.2.2.4 Fuel and Hazardous Material Storage Sites

Fuel and hazardous material storage sites and their handling are the potential sites for soil and water pollution. Improper sitting, storage and handling of fuels, lubricants, chemicals and hazardous materials, and potential spills from these will severely impact the soil, water and groundwater quality and cause safety and health hazards.

The following sites are restricted for siting of any fuel and hazardous material storage sites, including refuelling operations, asphalt plants and construction camps

- within 100m from the banks of any streams
- within 500m from any residential areas, cultural or archaeological sites
- in swampy soils, forests and protected areas

These sites are to be designed such way that any spills from these goods will not pollute the soils and water. As a minimum, these sites are to be bunded on all sides on top of an impermeable layer (e.g. concrete lined) by providing absorbent and containment material (e.g. absorbent matting) and without any drainage provision. The bunds are to be designed to hold at least 110% of the container capacity. If more than one container is stored within the bund, the bund must be capable of storing 110% of the biggest container's capacity or 25% of their total capacity, whichever is greater. Accumulated rainwater in bunds will be pumped out of the bund to either drains or the ground if uncontaminated. In case of fuel spillage the spilled fuel should be recollected and contaminated bund treated by the absorbents: sawdust, sand or straw.

All the personnel involved in the handling of these sites are to be properly trained. All fuel / hydrocarbon dispensing nozzles are to be of a drip control design and securely locked when not in use. Refueling will always be carried out with the correct equipment (i.e. nozzles of the appropriate

size), and only by suitably trained and experienced Refueling Operators. Fuel supply equipments will be regularly revised to prevent leakage due to inappropriate condition of refueling equipments.

Vehicles will not be left without supervision during refueling process. Ground water and surface water pollution risk will be reduced or eliminated in case of immediate removal of polluted ground. Soiled ground and absorbents will be removed, stored and treated as hazardous waste. In case of significant spill authorized and responsible person will be informed, works will be stopped till the elimination of pollution risk.

All the mobile construction equipment such as cranes, compressors, generators, bulldozers, excavators etc. will be maintained and operated such that all leaks and spills of materials will be minimized. Daily plant checks (Vehicle Maintenance Procedure) will be undertaken to ensure no leaks or other problems are apparent. Vehicle maintenance, cleaning, degreasing etc will be undertaken only in designated areas of hard-standing.

5.2.2.5 Water

Project road crosses 3 major rivers and streams and could affect the surface runoff flow pattern. During design, all drainage works are designed based on the historical flood data and flood forecasting. A design discharge of 50 years return period is considered for culverts, and 100 years of bridges. Embankments of the Project road will obstruct surface runoff and culverts are proposed for all small drains including agricultural drains.

The potential sources of impact on the water quality are the: (i) bridge construction which will increase silt load in the river during construction at bridge sites and accidental spillage of concrete into the river, (ii) embankments and construction materials (fill, sand, and gravel) are subject to wash out with rainwater, (iii) hydrocarbon leakage and spills from storage, mixing plants and washing of vehicles and equipment. It is therefore vital that prompt action is taken in the event of any potential water pollution incident, and (iv) discharge of sewerage from work sites and construction camps to the water resources; or percolation through seepage and contamination of the local water table.

The key mitigation measures are, (i) divert the water flow near the bridge piers. In sections streams earths and stones will be stored properly so that they do not block rivers and streams. Coffer dams, silt fences, sediment barriers or other devices will be provided to prevent migration of silt during construction within streams. Dewatering and cleaning of cofferdams will be performed to prevent siltation by pumping from cofferdams to a settling basin or a containment unit; (ii) open surface will be covered by grasses and creepers to reduce wash-away material; (iii) hydrocarbons will be stored minimum 100 m away from rivers and dry gorges within the bunded areas; (iv) construction and work sites will be equipped with sanitary latrines that do not pollute surface waters and contractors will submit a simple sewage management plan; (v) discharge of sediment-laden construction water directly into surface watercourses will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge; and (vii) drainage system will be periodically cleared so as to ensure adequate storm water flow.

Water quality monitoring will be taken up during construction works at all major bridge site quarterly to assess the impact of bridge construction on water quality and implementation of necessary mitigation measures. Stream crossings that are dry during the work period will be kept unobstructed at all times and the channels will not be altered. Bridge construction will be scheduled in dry season to avoid adverse impact on fishery and river water quality.

5.2.2.6 Air Quality

During construction, air quality is likely to be degraded by exhaust emissions from the operation of construction machinery; fugitive emissions from asphalt plants; and dust generated from haul roads,

unpaved roads, exposed soils and material stock piles. The dust will settle on trees and crops, and may cause some degree of respiratory stress for nearby residents.

The key mitigation measures include: (i) Construction equipment will be maintained to a high standard to ensure emissions are minimized, for example by cleaning fuel injectors. Machinery causing excessive pollution (e.g., visible smoke) will be banned from construction sites. Vehicle refueling will be undertaken through the use of fuel nozzles and pumps so as to avoid fugitive emissions of volatile organic compounds. (ii) The contractor will submit a dust suppression program prior to construction. The plan will detail action to be taken to minimize dust generation (e.g., spraying of roads with water, vegetation cover in borrow sites), and will identify equipment to be used. (iii) Construction materials will be stored away from the residential areas and will be properly covered. Use of defined haulage routes and reductions in vehicle speed where required. Materials will be transported to site in off peak hours and will be covered/wetted down to reduce dust. (iv) In case if the Contractor will use own asphalt plants, the asphalt plants will be located at a distance far away from the settlements to avoid direct impact of emissions on local settlements. it is also recommend that the concrete production plants are to be located more than 300m and borrow sites are to be located more than 100 m from settlements. The construction and road machinery used during the construction process shall comply with national environmental requirements with respect to emission and noise pollution.

If contractor wish to establish asphalt plant, he shall prepare related plant-specific EIA and obtain a valid operating permit (Environmental Impact Permit) for the asphalt plant. He shall submit a layout plan of the site of the mixing plant and a method statement on handling of bitumen spills prior to the commencement of works.

5.2.2.7 Noise and Vibration

During construction, the potential sources of noise are due to operation of construction related vehicular traffic, earth moving equipment, heavy machinery, and pile driving activities can generate high noise and vibration levels. Noise and vibration will have impact on people, fauna, live stock and natural environment.

Acoustic enclosures around the pile drivers will reduce the noise levels by 60 decibels and are strongly recommended. Regular maintenance of construction equipment and vehicles in accordance with manufacturers' maintenance procedures will greatly reduce the noise levels. Contractors are recommended to monitor the noise levels regularly at the construction sites and take necessary measures to comply with the national standards. High efficiency mufflers are to be fitted to the noise generating equipment. The construction related activities will be restricted between 0600 to 2100 hours within 150m of settlements and 500m from sensitive receptors (hospitals and schools).

5.2.2.8 Impacts associated with Tunnel construction

The main effect of any tunnel should be expected to be positive, since it allows the roadway to avoid encroachment upon mountain scenery areas or other environmentally sensitive areas.

There is a possibility of soil erosion and adverse aesthetic impact if spoils from tunnel excavation are not properly placed and rehabilitated. An estimate of soil and rock to be excavated, and thus disposed of properly, should be completed.

5.2.2.9 Construction Camps

The Contractor shall take his best effort to employ local people including women and disadvantaged. A special clause in this regard was included in the contract document. Gamgeoba of all Project villages are requested to prepare a list of skilled and unskilled people willing to work in the

construction works. RD will provide the list to the contractor and ensure its compliance. However, some of the workforce (especially the skilled) is expected to be recruited from outstation areas and hence temporary accommodation shall be provided at adjacent areas. Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructures of nearby communities.

The potential implications associated with housing of immigrant workforce include generation of solid waste, adverse water quality impacts arising from discharge of partially treated sewage and refuse, public health impacts through the possible introduction of diseases not prevalent in the surrounding areas and promotion of disease vector habitats within the temporary housing areas, social-cultural conflicts arising from religious, cultural and behavioral discords between immigrants and local residents, and promotion of un-aesthetic practices. Such impacts, if they materialize, will generally be short term and tolerable. However, long-term adverse impacts on individuals and communities as a whole cannot be discounted. Hence, specific safeguards are required to be taken to quell potential adverse environmental, public health and socio-cultural impacts.

It is strongly recommended that the contractor should hire local workers as many as available. Contractor has to prepare a detailed layout plan of the construction camp with the design of sewerage facilities and locations of relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, and submit RD for approval prior to the development of the construction camps. Local authorities responsible for health, religious and security shall be duly informed on the set up of temporary accommodation facilities so as to maintain effective surveillance over public health, social and security matters.

The camps should have adequate housing for all workers, safe and reliable water supply, fuel supply, waste disposal facilities, hygienic sanitary facilities and sewerage system, treatment facilities for sewerage of toilet and domestic wastes, storm water drainage facilities, adequate health care facilities, and in-house community/common entertainment facilities.

The Contractor shall conduct ongoing training programs to all construction workers on basic sanitation and health care issues and safety matters, and on the specific hazards of their work and HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education and communication. Complement educational interventions with easy access to condoms at campsites as well as voluntary counseling and testing.

The contractor shall restore all the construction camps to original condition after completion of civil works.

5.2.2.10 Community Impacts

Construction worksites may place stresses on resources and infrastructure of nearby communities. This may lead to antagonism between residents and workers. To prevent such problems, the contractor will provide temporary worksite facilities such as health care, eating space. In addition, a grievance redress mechanism will be established that allows local people to raise grievances arising from the construction process. Labor intensive construction and the use of local labor during the construction will increase benefits to the local community and resolve such conflicts. Contractors will communicate to the public through community consultation and public announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restrictions.

The Project will have significant impacts on both urban economics and rural poverty in the project area. The road construction will create lot of job opportunities to the local community. It is expected that about 70,000 man months of employment during construction. The construction of the new

bypass road constitutes the long-term improvement of economic conditions in the project area due to better traffic access. The greatest beneficiaries from a monetary standpoint will be the current road users, who will experience greater efficiency, higher safety, time and operational cost reduction, and less wear and damage to their vehicles. From a numerical standpoint, the largest group of beneficiaries will be all kind of people around Batumi city and the periphery by getting rid of traffic congestion and huge traffic flow. Second group will the local people, who will have improved access to markets and cheaper transport costs for their commercial produce.

Local residents will also be benefitted from expanded opportunities for seasonal employment elsewhere to earn supplemental incomes. Rural villages will also have improved delivery of health, education, and other social services by virtue of all weather feeder and rural road connections to the bypass interchanges. With the year-round access to new markets provided by the Project, the village level enterprises will also prosper, promoting local economic growth.

5.2.2.11 Health, Safety and Hygiene

Construction sites are likely to have health and safety impacts. There will be a potential for diseases to be transmitted, exacerbated by inadequate health and safety practices. There will be an increased risk of work crews spreading socially transmitted diseases such as HIV/AIDS. Mitigation measures include: (i) provision of adequate health care facilities within construction sites; (ii) an health and safety manager, appointed by the contractor for each site, and first aid facilities will be made readily available; (iii) training of all construction workers in basic sanitation and health care issues (e.g., how to avoid transmission of sexually transmitted diseases such as HIV/AIDS), general health and safety matters, and on the specific hazards of their work; (iv) personal protection equipment for workers, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection; (v) clean drinking water and safe sanitation for all workers; (vi) adequate protection to the general public, including safety barriers and marking of hazardous areas; (vii) safe access across the construction site to people whose settlements and access are temporarily severed by road construction; (viii) adequate drainage throughout the work sites to ensure that disease vectors such as stagnant water bodies and puddles do not form; and (ix) Septic tank and garbage box will be set up in construction site, which will be periodically cleared by the contractors to prevent outbreak of diseases. Where feasible the contractor will arrange the temporary integration of waste collection from work sites into existing waste collection systems and disposal facilities of nearby communities.

Intensive movement of heavy trucks is required to deliver required amount of materials to the needed sites within the construction corridor. The impacts anticipated in this regards are noise and vibration, traffic congestion, air pollution, dust and risks associated with refueling and vehicle cleaning. The construction sites impose certain safety risks for the population and, therefore, compliance with safety rules is important. The contractor is responsible for ensuring that all construction vehicles observe speed limits on the construction sites and on public roads and to provide adequate signage, barriers, and flag persons for traffic control. All vehicles should be fitted with audible warning devices when reversing.

Recontamination by infectious biological materials (e.g. Anthrax) is a potential threat during earth works near the pest holes (i.e. not registered Anthrax sites). The risks are related to the fact that a large amount of the spontaneous burial sites is not registered by the relevant authorities.

The Consultant proposed a road safety campaign to upgrade skills and knowledge of drivers and school students by introducing safety courses in drivers' training and school curriculum.

5.2.2.12 Cultural and Archaeological Sites

The Adjara is rich with archeological findings and the list of the identified archeological sites located near the Project road is given in Chapter 4. Though no known archeological sites are located within the construction corridor of the Project alignment, there is a potential that these works may damage the unidentified underground archaeological remnants.

Preliminary detailed studies including field survey, required according to the law of Georgia on Cultural Heritage, should be carried out for obtaining Construction Permit.

5.2.2.13 Utilities

Some overhead telephone and power cables will need to be moved and will be vulnerable to accidental damage by construction plant and will need to be moved. Where necessary, utilities will be relocated. Effects of severance during relocation can be mitigated by providing information to the affected public stating when services will be disrupted, and minimizing to the extent practicable, the duration of severance of services in each case. Risks of accidental disruption can be reduced by ensuring that plant such as excavators are operated by trained personnel, and that operations are adequately supervised.

The contractor has to take special care during demolition of the installments in aim of keeping the existing materials sound for further reinstallation. Prior to any realignment works the contractor is in charge of providing detail design in strict adherence to the national standard specification and instructions of the owner.

5.2.2.14 Ecological Environment

Flora and Fauna

The road does not pass through any forests, grassland or significant wildlife habitats. All land either side of the road is residential or used for agriculture or orchards. However, roadside trees, grasses and shrubs and the habitats formed by them are potentially vulnerable to toxins that may be released during construction operations.

In addition vegetation clearance is required is required at the ancillary sites such as stock piling areas and borrow sites. Vegetative cover stripped from the locations described above will be kept for landslide and slope protection. Contractors will be responsible for putting new vegetation in removal sites. Compaction around trees will be performed carefully to avoid the damage of tree “drip-line”.

In order to minimize disturbance to plants and animals, any toxic and hazardous materials required for construction, including asphalt will be properly stored and secured, and sited in approved locations. Vehicles and equipment shall be maintained in good operable condition, ensuring no leakage of oil or fuel and the fitting of proper exhaust baffles.

Ecology and Wildlife

The roads do not pass through any protected areas or ecologically sensitive areas. During field survey it confirms that there are no known populations of threatened species in the immediate vicinity of the road. Impacts on ecology and wildlife due to road construction will not be significant

Fish, Fisheries and Aquatic Biology

The main potential impact to fish and other aquatic species in the watercourses is the noise and water pollution from construction activities. The sources of such impacts are pile driving activities; construction activities in water such as construction of pier and river training works; erosion from earth works; discharges from construction sites and camps; and hydrocarbon spills. The increased turbidity will affect all groups of hydrobiontes, especially fish iires (freshwater and anadromous), during spawning time, and endemics protected by law - Colchis crayfish, larva of dragonflies.

A number of important fish species annually swim back up the rivers from the Black Sea for spawning. However, the Project road does not cross the spawning areas of any species of any conservation importance. The Black Sea Salmon migrates from the Sea up the rivers for spawning and spawns in the upper course of the rivers. The Black Sea Salmon migrates into the rivers Kintrishi, Chakvistskali, Chorokhi and its tributaries. The proposed Kobuleti Bypass road (Section 1) crosses such type of rivers. So, the project road construction may have a significant impact on the Black Sea Salmon if all proposed mitigation measures will not be met.

Generally mitigation measures proposed in other management plans such as water resources management plan, drainage management plan and waste management plan will protect the water quality and thereby fisheries and aquatic biology. Contractor is recommended to schedule the bridge construction activities during low flow season to avoid any impacts on fisheries, and always allow some channel flows in the river without completely obstructing the river flow.

Piling is recommended for all bridges for Kobuleti Bypass road. Pile driving activities generate very high under water noise levels. These noise levels are expressed in (i) peak sound pressure level (peak), which is maximum pressure level generated by a single strike, (ii) accumulated sound exposure level (SEL), which is a sum of cumulative squared over the time of entire single pile driving event, and (iii) root mean square level (RMS), which is the square root of the mean square of the single pile driving event. Units of the sound levels are expressed in decibels (dB) over a range of frequencies which the level is measured (1 µP a^2 /Hz).

The noise criteria of pile driving on the impact of fish as given by NOAA (National Oceanic and Atmosphere Administration, USA) are given in Table 5-12.

Table 5-12: NOAA Criteria for Pile Driving and its Impact on Fish

Effect	Metric	Fish Mass	Threshold
Onset of physical injury	Peak Pressure	N/A	206 dB (re: 1 µPa)
	Accumulated Sound Exposure Level (SEL)	> 2 g	187 dB (re: 1µPa2*sec)
		< 2 g	183 dB (re: 1µPa2•sec)
Adverse behavioural effects	Root Mean Square Pressure (RMS)	N/A	150 dB (re: 1 µPa)

Source: NOAA (National Oceanic and Atmosphere Administration), USA

Pile driving produces intense, sharp spikes of sound which can easily reach levels that injure fish. Typical noise levels from 48 inch pile drivers that will be used in the Project are given in Table 5-13. Generally two types of hammers impact hammers and vibratory hammers are in use. The impact hammers may be more harmful than vibratory hammers for two reasons: first they produce more intense pressure waves, and second, the sounds produced do not elicit an avoidance response in fishes, which will expose them for longer periods to those harmful pressures.

Table 5-13: Typical Noise Levels for 48-inch Pile Drivers

Distance, m	Peak	RMS	SEL
10	205	195	185
20	202	190	180

45	195	185	175
65	185	175	

Source: California Department of Transportation, 2007

The Contractor is recommended to follow the following mitigation measures[1] to reduce the impact on fish during pile driving activities:

1. Use a vibratory hammer. Under those conditions where impact hammers are required for reasons of seismic stability or substrate type, it is recommended that the pile be driven as deep as possible with a vibratory hammer prior to the use of the impact hammer.
2. Monitor sound levels during pile driving to ensure that they do not exceed the NOAA or any other international recognized criteria.
3. Implement measures to attenuate the sound should sound pressure levels exceed the NOAA or any other international recognized criteria. If sound pressure levels exceed acceptable limits, implement measures to reduce sound pressure levels. Methods to reduce the sound pressure levels include, but are not limited to:

    a. Installation of underwater enclosures to minimize sound
    b. Surround the pile with an air bubble curtain system or air-filled coffer dam.
    c. Use a smaller hammer to reduce the sound pressure. The sound produced in pile driving has a direct relationship to the force used to drive the pile. A smaller hammer will have less force on the pile therefore, producing less sound.
    d. Use a hydraulic hammer if impact driving cannot be avoided. The force of the hammer blow can be controlled with hydraulic hammers, and reducing the impact force will reduce the intensity of the resulting sound.

5.2.3 Operation Stage

5.2.3.1 Water

During operation of the Project, the water quality could be affected by accidents near streams involving vehicles carrying mineral or hazardous substances and clogging of drainage system by grass, shrubs, and earth block due to storm water flow.

5.2.3.2 Air Quality

During the operational phase, emission of particulate matter (PM) as well as Hydrocarbon (HC), Carbon Monoxide (CO), Nitrogen Oxides (NO_x), Sulfur Dioxide (SO_2) from the diesel and gasoline engines on the highway will increase. The air quality in tunnel sections will also be deteriorated. However, all tunnels will be of limited access and will prevent pedestrians to walk through. Therefore, pollutant concentration will be localized in nature and does not pose any threat to the population.

The annual emissions along the project roads are estimated for future traffic data using USEPA guidelines[2] and presented in Table 5-14. Table 5-14 shows annual emission estimates for the years 2010, 2014, 2025 and 2033 for both 'with' and 'without' project scenario. Pollutant concentration in the bypass roads will be localized in nature and will not pose any threat to the population and by implementing the Project, emission on the existing Poti-Sarpi road will be reduced considerably.

Table 5-14: Estimated Air Emissions

Year	Estimated Annual Emission (ton)				
	TSP	NOx	PM	CO	HC

[1] The National Marine Fisheries Service, NOAA - Summary of Potential Impacts To Fish From Pile Driving - http://www.fakr.noaa.gov/habitat/letters/2003/dec/valdezharbordredge.pdf

[2] USEPA, 1995. Compilation of Air Pollutant Emission Factors, AP-42, Vol. 1, Fifth Edition

Year	Estimated Annual Emission (ton)				
	TSP	NOx	PM	CO	HC
Without Project (existing road) = 45 km					
2014	48.70	208.46	209.67	1,670.44	226.01
2025	82.50	353.11	355.15	2,829.53	382.83
2033	114.30	489.24	492.08	3,920.43	530.43
With Project					
Existing road = 45km					
2014	28.44	122.32	123.71	1,002.18	134.03
2025	44.13	189.80	191.96	1,555.11	207.97
2033	60.80	261.50	261.50	2,142.60	286.54
By-pass road = 48 km					
2014	21.59	91.71	91.67	713.44	98.06
2025	39.94	169.67	169.58	1,319.86	181.40
2033	57.21	243.03	242.92	1,890.61	259.85

Source: EIA Report, Subregional Road Corridors Development Program, August 2009

Emission of greenhouse gases (GHG) such as Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O) and NMVOCs generated by the future traffic is also estimated and using IPCC guidelines[3] and presented in Table 5-15. GHG on the existing road will also be considerably reduced after construction of the Project road.

Table 5-15: Estimated Annual Greenhouse Gas Emissions

Year	Estimated Annual Greenhouse Gas Emission (ton)			
	CO_2	CH_4	N_2O	NMVOCs
Without Project (existing road) = 45km				
2010	7,.52	2.87	0.17	183.51
2014	8,459.69	3.43	0.20	219.31
2025	14,329.69	5.82	0.34	371.49
2033	19,854.38	8.06	0.47	514.71
With Project (Existing road)= 45km				
2014	5,004.33	2.05	0.12	131.78
2025	7,765.34	3.18	0.18	204.48
2033	10,698.91	4.39	0.25	281.73
With Project (Bypass road) = 48km				
2014	2,741.02	1.08	0.22	67.86
2025	5,070.90	2.00	0.41	125.54
2033	7,263.72	2.86	0.18	179.82

Source: EIA Report, Subregional Road Corridors Development Program, August 2009

Increased traffic emissions during O&M could be reduced by taking strict national regulatory/policy measures on fuel quality and engine maintenances.

5.2.3.3 Noise and Vibration

Due to increase in traffic volume, noise is expected to increase. This impact is permanent and negative, particularly when new settlements will develop in close vicinity to the existing road.

Adequate mitigation solutions are twofold, and include: (i) establishment of noise reducing barriers made of hedges and indigenous tree species; (ii) further improvement of the traffic-related noise climate can be achieved by enforcing traffic laws and regulations to curb speeding, particularly in the vicinity of human settlement areas; and (iii) enforcing a compulsory vehicle testing on standard

[3] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.

permissible noise emission, followed by a technical clearance certificate that needs to be clearly visible at each vehicle's window shield.

5.2.3.4 Impacts on Ecological Environment

No impact on floral resources is anticipated during operational stage of the project. During operation of the project, the water quality could be affected by accidents near streams involving vehicles carrying mineral or hazardous substances and clogging of drainage system by grass, shrubs, and earth block due to storm water flow. A spill contingency plan will be prepared by the RD.

5.2.3.5 Tunnel Facilities

Tunnel Ventilation

The purpose of ventilation is to reduce the concentration of harmful gasses and particles such as CO, HC, NOx etc. When ventilation to reduce CO concentration is carried out to the designed target level, other harmful gases and particles also decrease to a safe level. On the other hand, soot generated by heavy vehicles creates visibility problems and ventilation design should also satisfy visibility requirements.

A transverse or semi-transverse system for ventilation is normally recommended when the length of bi-directional traffic tunnel exceeds 500m. However longitudinal ventilation system is more economical and safer according to the risk analysis of tunnel. Therefore, the longitudinal ventilation system is decided to be used for the tunnel ventilation.

The list below should be considered in design, construction and operation of the ventilation system:

- To control pollutants emitted by vehicles on the road under normal and peak traffic flow
- To control pollutants emitted by vehicles on the road where traffic is stopped due to any incidents such as to an accident
- To control heat and smoke in the event of fire

Tunnel ventilation shall be designed in accordance with TEM, PIARC, Directive 2004/54/EC. The detail has been discussed in the Engineering Report.

According to the result of calculation for fresh air requirement, the fresh air requirements of T-1 has less capacity with 110 m^3/sec of minimum air, where. T-2,T-3,T-4 and T-5 have slightly higher capacity.

However, those capacities rates are much less than smoke control capacities. Therefore, smoke control capacities are mainly considered to choose a Jet fan.
Longitudinal ventilation system with jet fans is installed on the top two in parallel in the tunnel.

Standby jet-fans are installed to consider fire loss of jet-fan in longitudinal ventilation. The capacity for tunnels ventilation is calculated in accordance to PIARC solutions.

In addition smoke pressurization equipment will be installed in evacuation passage to prevent the intrusion of fire smoke. The small diameter jet-fans are installed at upper exiting tunnels to prevent smoke.

Tunnel Illumination

The lighting requirements of a tunnel are very different every day and every night. At night, the problem is relatively simple. It is simply solved by providing luminance levels to light the routes inside the tunnel as equal to outside the tunnel. The design of the lighting during daytime is particularly critical because of the human visual system. The driver outside the tunnel cannot simultaneously perceive details on the road under a highly illuminated lighting outside of the tunnel and the relatively dark one inside. Therefore, an illumination system in tunnel is required to reduce differences in luminance between inside and outside

For the safety of the traffic, tunnel illumination (lighting) is designed and installed along the tunnel side walls at about 10 m interval. Transitional illuminations at both tunnel portals are designed too. Illumination is generally required for the tunnels longer than 50 m. Tunnel illumination shall be designed in accordance with CIE 88 ; 2004, 2nd edition. The detail are described in the Engineering report.

Emergency Exits

In accordance with the Directive 2004/54/EC, the emergency exit to outside shall be installed at the interval of 500 m, if the length of tunnel exceeds 500 m.

In accordance with the result of Quantitative Risk Analysis (QRA), it shall be determined whether emergency exit will be installed or not. If it is determined to be installed, the space of emergency exit is also decided based on the result of Quantitative Risk Analysis (QRA).

5.2.3.6 Impacts on Community

The Bypass road may create a physical barrier isolating villages, fields and residential sites along the road into two sides. This may obstruct local residents to get their fields, to visit their neighbours, to go to local administrative offices, and markets etc. This impact is expected as medium if the project does not implement suitable measures for mitigation. The obstruction by the bypass road to the normal daily pattern of local residents will create strong complaints from communes' authorities and residents. This physical barrier may also obstruct animal crossing.

To avoid the division of community by the bypass road, the project has planned and will design and construct interchanges, underpass and overpasses. These facilities were planned at the high populated areas and at the suitable sites for local residents to pass across the bypass road.

5.3 Spill Contingency Plan

Oils and lubricants stored near the Project site for construction activities are sensitive sites and any spills from these materials will damage the environment. Further, the Project road will be used for transport of Hazardous and Toxic materials from Poti and Batumi ports and there might be potential chances for spills from these vehicles during accidents. Hence, to address both the issues, before operation of the Project, RD will prepare a spill contingency plan or emergency plan with a set of measures to be followed to minimize the potential adverse effects of a spill of harmful substances that pollute the environmental resources such as soil and water.

In order to rapidly and successfully respond to such spill, personnel responsible for containing and cleaning up the spill must know the steps that need to be followed during and after such event. Contingency plans or emergency response plans describe information and processes for containing and cleaning up of any spill of harmful substances that occur in a defined geographic area. Well-designed contingency plans assist response personnel in their efforts to contain and clean up spills by outlining the steps that should be taken before, during, and after an emergency. When used properly by trained personnel, a well-designed contingency plan enables spill response efforts to proceed

smoothly and effectively, minimizes danger to cleanup personnel, reduces the overall costs of cleanup by avoiding unnecessary effort, and ensures that sensitive habitats are protected.

5.4 Road Safety Measures

Road safety under the Project will be improved by proper traffic engineering design (appropriate vertical and horizontal alignment) and traffic control facilities, including roadside concrete barriers, sidewalks, road signs, and street lights within settlements. Provision of safe pedestrian facilities e.g. shoulders, foot paths and bus bays. During construction, the contractor is responsible for ensuring that all construction vehicles observe speed limits on the construction sites and on public roads and to provide adequate signage, barriers, and flag persons for traffic control. All vehicles should be fitted with audible warning devices when reversing. The Consultant proposed a road safety campaign to upgrade skills and knowledge of drivers and school students by introducing safety courses in drivers' training and school curriculum.

5.5 Preliminary assessment of Impact of Climate Change

The Black Sea coastal zone has a humid subtropical climate. The average annual temperature there is 14-15^{0}C, with extremes ranging from -15^{0}C to +45^{0}C, and annual amounts of precipitation vary between 1,500 mm and 2,500 mm. The Black Sea influences the climate of West Georgia, resulting in mild winters, hot summers and abundant precipitation. Here in the mountainous and high mountainous areas, the annual air temperature ranges from 2-4^{0}C to 6-10^{0}C with an absolute minimum between -30^{0}C and -35^{0}C, and annual amounts of precipitation range between 1,200 mm and 2,000 mm.

Despite the fact that Georgia's sea coastal zone is recognised as the calmest region of the Black Sea, nevertheless about once every 20 years a hurricane here accrues with a wind speed exceeding 47 m/s (Supsa meteorological station). Such gale-force winds predominantly (in 70% of cases) blow in from the sea and initiate powerful storm surges and rough seas.

One of the climatic parameters important for the development of tourism here is the relative air humidity assessed for this region as well. Evaluations have shown that conditions tend to be better in Adjara, though according to Poti weather station data, the relative humidity is increasing even more.

Calculations carried out using the PRECIS regional climate model have shown that up to 2050 in the Black Sea coastal zone (Poti area), an increase in air temperature by 1.20C is anticipated to have a background precipitation decrease of 8-10%.

Table 5-16 Numerical and relative change on heavy storms

Years	Force of storms							
	4 Force		5 Force		6 Force		7 Force	
	Number	%	Number	%	Number	%	Number	%
1961-1971	326	79,7	77	18,8	6	1,5	–	
1987-1988	713	86,2	112	13,5	2	0,2	–	
1997-2007	254	51,8	210	42,9	23	4,7	3	0,6

These projected changes in climatic elements would affect the development of different branches of the economy of the Black Sea coastal zone, of which one of the most important is the tourist and recreational sector. At the same time, on the same sections of the coastal zone, e.g., at the Kobuleti, Batumi, and Sokhumi portions, an important role is given to agriculture, which is driven by the possibility of growing profitable crops.

From this standpoint, the Kobuleti region is the most desired area of the coastal zone, where citrus plants are successfully grown (60% of Adjara's overall harvest), in addition to tea, tungtrees, bamboo, etc. Among the annual crops, maize and vegetables are grown here. In the last several years, hazelnut has been intensively developed in the region.

Given the predicted climate changes for this region due to global warming, the creation of better conditions for the production of oranges and lemons is anticipated, in view of their preference for warmer climates than the present environment. It should be expected that these plants will gradually supplant the less profitable tangerine tree. This substitution of plants would provide a doubling of income from citrus growing. The increase of the vegetation period for vegetables from the current average of 224 days to 290 days could make it possible to supply the coastal resorts with fresh vegetables all year round.

At the same time, accounting for the anticipated decrease in precipitation, the application of modern irrigation systems would be required in April–May and partially even in the summer months as well.

***Oceanographic conditions*.** During western gale-force winds a rise in sea level of 0.8 m is possible along Georgia's Black Sea coastal zone, causing an increase in the level of water in the river mouths by 1.5-2.5 m, due to the blocking up of river run-off. During spring floods, the sea level is higher by 0.20-0.25 m compared to autumn, and in the case of storm surge super positioning, its increment exceeds 1.0-1.2 m. One of the most powerful and unpredictable events in the coastal zone is the seiche – causing a rapid variation of sea level generated by changes in atmospheric pressure, during which the sea level alters by 0.5-0.7 m in only one or a few hours.

Assessment of the Black Sea coastal zone's vulnerability to climate change. Georgia's Black Sea coastal zone has a special importance for the country's economy: it is the main foreign cargo turnover locale along this route. Special loading comes to the ports (Batumi, and especially Poti).

Along the whole length (330 km) this zone is characterised by a dense population, a great number of industrial enterprises, and accordingly, by a developed infrastructure. Any variation of the marine ecosystem parameters caused by climate change seriously affects the infrastructure as well. Taking into account these circumstances, the Black Sea coastal zone's vulnerability to climate change has been assessed, not only considering ecological, but social and economic factors as well, on the level of the whole infrastructure of the region.

The Chorokhi River Delta includes the coastal territory from the state border of Georgia, with the Republic of Turkey, to the mouth of the Korolistskali River. Its area occupies 85 km2, of which 40% is land. Its marine border passes over the limit of the Chorokhi River sediment spread, at a distance of 5.5-6.0 km from the coast. About 70% of the Delta land is occupied by the city of Batumi with its suburbs and the Adlia Airport, 15% by cropland and beaches, and the remaining part is covered by the bushes and marshes of the Kakhaberi Plain. The territory of the Delta is built from the alluvium of the Chorokhi River.

The eustasy of the Chorokhi River Delta has been measured since 1924-1925. Here, its relative value reaches 0.15-0.20 m/century, seriously accelerating the process of coastal erosion. In 1970- 2006, or in the period of acute activation of anthropogenic components of climate warming, the degradation process intensified markedly, causing the growth of the sea intrusion rate onto the land, from 2-3 m to 8-10 m annually. In 2005-2007, the sea washed away the internal motorway in Adlia, and directly threatened the Batumi Airport runway. In the near future, a further intensification of this process is anticipated. Despite the eustasy and anthropogenic mistakes (erroneous orientation of a concrete wall protecting the right bank of the Chorokhi River), such a forecast is based upon the construction of a cascade of reservoirs on the Chorokhi River, as a result of which the coast will not be able to get the Chorokhi alluvium for 450-500 years. In spite of the above-mentioned circumstances, the vulnerability caused by eustasy is much smaller here than in the Rioni River Delta, and hence the value of this indicator for the examined segment has been evaluated as 3 marks.

The increase in the power and frequency of storm surges is the direct result of an intensification of atmospheric circulation processes that were forcefully expressed during the 1960s-1970s. According to recent records, the frequency of storms in the cold period of the year, on this section of the Adlia-Batumi coast, has almost doubled. Due to the fact that the wave impact line has been progressing onto the land due to eustasy, the destructive action of storms has been increasing, proportionally to the rate of this line invasion. According to observations going on in this segment, during 2003-2006, or after the cessation of the Chorokhi River alluvium transit to the coast, the width of the land washed away by storms increased from 6-7 m, to 8-10 m annually. This second indicator has been observed here against a background of eustasy, as well as being significantly reinforced by it. Therefore, taking into account intensified storms and the washing off of this coastline; this indicator has been estimated as 5 marks.

Sedimentation in the glacier-fed rivers in this segment has not been expressed, as there are no glaciers or centennial stocks of snow in the Chorokhi River basin. Hence its action has been assessed as a zero mark.

Alterations of aquatic environment thermal indices are urgent and numerous in the Chorokhi Delta. In line with the changes in sea surface temperatures, the recreational features of the segment have also changed. In 1924-1990, the sea temperature here decreased by 1.00C, and in 1924-2006 by 0.80C. As for the Rioni River Delta, this fact is explained by an extraordinary warming of the climate throughout 1995-2006, exceeding by 0.6-0.90C temperature variations in other time periods. In this period, the air temperature in the area of breeze circulation rose, causing a prolongation of the recreational season and the vegetation period by 7 and 4 days respectively. This means an increase in positive temperature sums took place, which determined the quality of crop yields and dates of harvesting. At the same time, as a part of the shelf near Adlia is narrower and steeper, the impact of these thermal indices alterations were more pronounced there than on the Batumi coast, which has a relatively wider shelf. According to these alterations of the aquatic environment thermal indices, the habitat of living organisms is changing here as well. The value of this indicator and its anticipated impact in this segment are sufficiently high, resulting in an evaluation of 5 marks.

5.6 Induced and Cumulative Impacts

Georgia is located south of the Caucasus mountain range, with Russia to the north, Armenia and Turkey to the south, Azerbaijan to the east, and the Black Sea to the west. It has a population of 4.5 million. Georgia, due to its geographic location, provides the shortest transit link between Central Asia and Europe. Hence, transport plays a pivotal role in supporting the national economy, and development of the transport sector is vital to increasing economy of the region through reduced transport costs and increased transit revenues.

Kobuleti Bypass road will create favorable conditions for the fast development of cities, industrial parks, seaports, airports, commercial sectors and tourism in the western coast of the country and Adjara Autonomus Republic. As discussed above, those are major positive impacts of the project with the socio-economic points of view.

The Project road will improve the tourism industry in the area and provide easier access to the various tourist attraction sites in the Project area such as nature reserves, cultural and
historical heritage sites, and picturesque beaches. The Project will improve the tourism industry in the area and provide easier access to these tourist sites.

Increased tourism may also be beneficial by encouraging local officials to preserve the aesthetic value of the entire region (e.g. to promote the collection of rubbish and debris and to construct wastewater collection and treatment systems). However, increased tourism has the potential to over

commercialize and negatively impact natural tourist locations. This should be carefully monitored by local officials.

Closure of the Batumi noncompliant landfills have synergic effects with the project, which may be considered as positive cumulative impacts. One of the significant problems of the project is the need for disposing significant amount of generated spoil. Coverage of the closed landfills requires also significant amount of filling materials. Therefore, major part of the spoil generated during the road construction could be used for the coverage of the closed landfills and landscaping.

Development of the modern highway and increase of cargo traffic through the highway will have some impact on the Batumi sea port operations. This impact is considered not to be significant, so far as most part of freight shipped from the Batumi port is delivered by railway transport and the share of highway transport is minor. Increase of highway traffic will not increase significantly cargo flow through the sea port, but mainly will increase overland transportation flows from/to turkey.

However, construction of the Kobuleti bypass may have tangible indirect impact on the sea port development. Currently, the space of sea port is limited and further expansion is constrained by the existing highway. The section of the highway adjacent to the sea port will lose its role after construction of the Kobuleti bypass. This will create a prerequisite for expansion of the sea port to the territories currently occupied by the highway. Preliminary negotiation of the Sea Port administration with the Batumi City Hall has been initiated.

6. ANALYSIS OF ALTERNATIVES

6.1 Overview

Alternative analysis for selection of project alignment has been carried out during both the prefeasibility study (2005-2006) and feasibility study (2009). The prefeasibility study has studied three different alignments between River Choloki and Sarpi to recommend a final alignment for Kobuleti and Kobuleti Bypass roads. The feasibility study reviewed all those alignments and made modifications to the prefeasibility recommended alignment. The present detailed design study carried out further alternative analysis for alignment and design aspects of the project considering environmental, engineering and social issues.

6.2 Without Project' Alternative

The project road has a significant potential for increase of subregional trade with Georgia's major trading partners and tourism revenue. Other important benefits of the project are reduction of congestion and accidents in Batumi and Kobuleti, and favorable atmosphere for further investment in Batumi and Kobuleti. A detailed study on the benefits of the Project has been carried out during feasibility.

The 'do nothing' or 'without Project' option is not really an alternative since the objective of the Project is to construct bypass roads to divert the traffic from already congested roads in Kobuleti and Batumi. There has been significant increase in congestion and accidents on the existing road especially during the tourist season in summer. The without project scenario will continue to increase the negative impacts generated by increased traffic loads on insufficient capacity of the existing road (traffic congestion, noise, low speed, higher emissions, accidents, etc). Continuous growth of tourist and residential infrastructure along the existing road will further deteriorate the movement of international and transit traffic, smooth access of the local population, and tourists.

6.3 Alternate Analysis in Feasibility Study

A summary of alternative analysis conducted in the feasibility study is presented in this section to understand the rationale for the selection of the project alignment during feasibility study stage. In the Feasibility study, the project was considered to construct a 2 lane new road (45km) except along 3 km (Km28-31) near Makhinjauri tunnel on the existing road. In addition, the Project will construct a number of bridges, culverts, retaining walls, and tunnels.

6.4 Alternative Analysis during Detailed Design

6.4.1 Improvement of Project Route of Feasibility Study Stage

In 2009, the total length of the project was determined as 48.4km in Feasibility Study Stage. As a result of reviewing the Feasibility Study, the problems such as the poor drivability and obstacles on the project alignment have been arisen

The followings have been reviewed in detailed design stage

- The minimum curve of R=720 was applied in order to improve drivability where the comparatively small radius of curve was applied on the project alignment with design speed of 100km/hr
- Main obstacles such as school and cemeteries on the project alignment
- Additional section of 3km has been designed in consideration of continuity of alignment since the 3km section of the beginning area has been excepted out of the previous works.

Furthermore, in case of planning with alignment in Feasibility Study, several problems would be arisen such as extreme difficulty of construction of the interchange which is nearby railway passing along the seashore, difficulty in traffic control under construction, especially in peak season for tourism as well as the function of the motor roads of international importance will be lost due to linking access road into the villages.

Therefore alternative alignment passing though the mountainous area that is about 500m away from costal road was selected in order to settle down these problems.

The following section presents the alternative alignment has been studies during detailed design of Kobuleti Bypass road.

6.4.2 Study of Alternative Alignment

Km 0+000 to 8+500

The section from km 0+000 to 8+500 exists in agricultural land and small village.

Km 8+500 to ending point

The section from km 8+500 to ending point in the Feasibility Study exists in hilly territory. The alignment in the Feasibility Study comprised 2 short reverse curves to pass the agricultural land as possible as it can.

Figure 6-1. Kobuleti bypass alignment

Conclusion

In general the design aimed to follow the alignment recommended by the feasibility study report;

The Bypass road alignment starts with 300 m long straight section across the plain terrain covered with old tea plantations and joins the two-level overpass junction (No. 1) at the liquid gas filling station. The overpass will serve the function of connecting the traffic flows from Kobuleti and adjacent villages to the design mains.

The proposed Bypass road is in mountainous terrain. It includes 2 tunnels, 16 bridges and 3 interchanges.

6.5 Selection of Design and Construction Standards

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

Major findings and recommendation with regard to selection of design and construction standards can be summarised as described below.

Before 2009, the geometric road design standards in Georgia were those which were used throughout the former Soviet Union. Since the last edition of the SNIP for road design was introduced in 1984, modern developments and practices were not considered. Therefore, a new design standard,

“Geometric and Structural requirement for highways in Georgia”, was developed and adopted under a World Bank financed project.

The present design has applied guidelines of the above standard. In case of need for covering any of shortcomings in the national standard, along with the SNIP standards, references has been made to relevant clauses of AASHTO standard for design specifications of highways and highway bridges.

7 INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

The EA process included public participation, consultation and focus group discussions to help RD achieve public acceptance of the Project. The consultation process followed the harmonized environmental safeguard requirements developed for the Project. The following are the principles for the consultations:

- Free, prior and informed consultation with affected people and informed participation as early as possible and throughout the project implementation.
- Consideration of the consultations carried out during feasibility study stage of the Project
- Disclosure of draft EIA in Georgian language (no earlier than 50 and no later than 60 days) prior to public consultation.
- Community engagement free of external manipulation, interference, or coercion, and intimidation, and conducted on the basis of timely, relevant, understandable and accessible information.
- A grievance mechanism to receive and facilitate resolution of the affected communities' concerns and grievances about the borrower's environmental performance.
- Expert consultation, focus group discussion and a formal public consultation.

7.1 Consultations during Feasibility Study

Two public consultations were conducted during feasibility study for the whole alignment[4], first public consultation was held in Batumi on April 28, 2009 and the second public consultation was held on June 25, 2009. The information of the Public Consultations was published in national and provincial newspapers before the Consultation. Results of both these consultation were positive; participants consider that the bypass roads would bring significant economic benefits to the region and advised to take cautious measures in preserving the protected nature reserve. Details of these consultations are presented in Table 7-1 and Table 7-2. Those comments were considered during updating environmental assessment, alternative analysis and detail engineering designs for Kobuleti Bypass road project.

Table 7-1: Details of the First Public Consultations

Issues	**Participants' Opinion, Comments and Suggestions**	**Response to Questions and Concerns**	***Action Points during Detail Design of Kobuleti Bypass Road***
General perception about the project and the awareness about the proposed project.	Most of the participants are in favor of the project and are aware about the proposed project.		
Support of local people for the proposed project?	Almost everybody said that they will support the project and advised the Consultant to take precautions in the environmental mitigation to avoid Kobuleti Nature Reserve and religiously sensitive locations.	The Consultant made realignments to avoid the buffer zone of the Kobuleti Nature Reserve and cemeteries along the road corridor. EMP covered specific measures to follow during construction in religiously sensitive locations	*The alignment were further revised to avoid any impacts.*

[4] Subregional Road Corridors Development Program, August 2009

Any critical issue or concern by the local people regarding the project? Any criteria you would like to see considered during project design, construction and operation stage?	Protection of Kobuleti nature reserve, dust suppression, landslide, rockfall and noise mitigation should be considered. Engineers should design the bridges and culverts in accordance with good engineering practices so as to improve water flow. Most people believed that Consultants and Contractors from the past use smaller culverts and that had resulted in the damage of structures.	Road has been realigned to avoid impacts on the nature reserve, dust suppression measures and noise barriers are considered in the EMP. Retaining walls has been considered to protect landslide and rock fence is also considered in the engineering design. Proper hydrological analysis has been done to design the drainage structures.	*Mitigation measures are followed to prevent or mitigate geohazards, noise.* *Hydrological design considered 50 year design discharge for culverts and 100 year design discharge for bridges.*
Are you aware of any information that is vital for the proposed project (economic development, savings in travel time, easy access to social infrastructure)?	The Project will enhance economic development of the Adjara region by constructing bypass roads.		
Are there other criteria you would like to see considered during project design, construction and operation stage (access road, bridge or culverts, village market etc)?	Soil erosion and geohazards should be considered while designing the roads in mountainous areas. Land acquisition should be minimized and proper compensation should be considered.	Slope protection by design retaining structures, vegetation in unstable batters, and rock fence are considered in the engineering design. A Land Acquisition and Resettlement Plan is prepared in compliance with ADB guidelines. Proper compensation is designed in the resettlement plan and land acquisition and resettlement framework.	*Slope protection measures such as 'soil nailing' and retaining structures are designed for geohazards,* *Alternatives are considered for Km 0+000 to 3+500 to reduce the land acquisition*
Do you support proposed road project?	Support the development of the project for tourism development.	By constructing the bypass roads, the traffic congestion and traffic safety of the existing road will be improved by diverting transit traffic to the bypass roads.	
Any Other Issues you may feel to share	All the participants agreed that the project should start as soon as possible. Local people and local contractor should be employed during construction. In order to comply with environmental requirements, the road should be constructed bypassing the Ochkhamuri railway.	EMP recommended in the employment of the local people during construction. The road has been realigned along the railway line close to Ochkamuri.	

Is this consultation useful? Comments	Everybody was of the opinion that the consultation is very useful and they expect the continued consultation in the future also.	Second consultation will be organized in June and further consultation has been recommended in the EIA during detailed design and construction phases.	

Source: EIA Report, Subregional Road Corridors Development Program, August 2009

Table 7-2: Details of the Second Public Consultations

Issues	**Participants' Opinion, Comments and Suggestions**	**Response to Questions and Concerns**	***Action Points during Design of Kobuleti Bypass Road***
any impact on the protected area (Ispani nature reserve, religiously sensitive sites, historical or archaeological sites)?	A protection wall is to be constructed to separate Ispani mire from the road. Cultural sites should not be disturbed due to construction activities	A fence wall around Ispani mire is proposed in the engineering design. EMP covered specific measures to follow during construction in religiously sensitive locations	*EMP is further updated with the cultural and archeological sites*
Does the proposed project create any problems with water courses (by blocking water ways) dust or noise?	The Project may increase noise pollution.	Noise levels along the Project during operation are assessed and noise barriers of length 341 m is proposed in the engineering design at places where noise levels exceed the standards.	*Noise barriers will be considered based on the results of the noise monitoring*
Have you any concern about the effect of construction on water courses, slope stability, air, dust, noise and vibration	55 percent of participants have expressed that the construction activities will generate air, noise and water pollution.	EMP covered specific mitigation measures to implemented for reduction of air, noise and air pollution during construction activities.	*EMP is further updated considering air, noise, and water pollution impacts*
Any critical issue or concern regarding the proposed road project (e.g., flooding, landslide, rockfall, drainage, critical side slope, damaged culvert etc.)?	22 percent of the participants have expressed that the construction activities may trigger landslide and rock fall in the hilly areas.	Landslide and rockfall protection measures are considered in the engineering design through retaining structures, vegetation in unstable batters, and rock fences.	*Landslide and rock fall protection measures such as 'soil nails' and retaining structures are designed.*
Are you aware of any information that is vital for the proposed project (economic development, savings in travel time, easy access to social infrastructure)? If yes, what are they?	The Project will improve traffic flow in Kobuleti and Batumi, decrease travel time and improve the economy of the region. In village Makhvilauri It would be nice to build shops along the road, so local people could have trade points	Two roadside service stations are recommended along the bypass roads to promote income-generating businesses for local settlers along the road project. These stations will provide vehicle and food services to tourists and travelers and thus, will increase the income opportunities especially for poor	

Issues	Participants' Opinion, Comments and Suggestions	Response to Questions and Concerns	*Action Points during Design of Kobuleti Bypass Road*
		families.	
Do you support proposed road project?	All participants supported the Project. However proper compensation for land and structures to be paid.	A Land Acquisition and Resettlement Plan is prepared in compliance with ADB guidelines. Proper compensation is designed in the resettlement plan and land acquisition and resettlement framework.	
Is this consultation useful? Comments	All participants have expressed that the consultations are very useful and recommended continued consultation in the future also.	Continued consultations are recommended during detailed design and construction phases.	*Village wise consultations with affected communities are planned during detailed design stage. Continued consultations are recommended during construction stage.*
Would you like to be involved in the implementation of the project (e.g., construction worker, local contractor, road maintenance etc.)?	45 percent of participants are interested to involve in the project as construction workers or local contractors.		*Contractor shall hire the local people during construction works. A special clause is included in the contract documents in this regard.*

Source: EIA Report, Subregional Road Corridors Development Program, August 2009

7.2 Consultations during Detailed Design Stage- Kobuleti Bypass Road

Consultations are being conducted by the EIA team with the various stakeholders of the project. The details are given in the Table 7-3. These consultations were very useful in conducting alternative assessment of the Project and environmental assessment of the Project.

Table 7-3: Details of Consultations carried out by the Environmental Team

Date	Place	Names of the Persons and Organisation	Points raised by the Participants
March 23, 2011	Tbilisi	Lika Bubashvili, Environmental Specialist, Roads Department	The Road Department urged the need of updating EIA instead of EMP
March 29, 2011	Batumi	Nodar Kontselidze, head of the Service Biodiversity and Integrated Control of the Environment	Locations of quarry and borrow sites will be decided by the government if the consultant provide section wise requirements of borrow and quarry material. Landfills proposed to be closed near Kobuleti and Batumi are the suitable places for spoil disposal.
March 29, 2011	Batumi	Mr. Elguja, Director, RD, Adjara	Discussions were held on construction materials, quarries and sources, transport of construction materials ; impact of noise, vibration, dust and road crossings, roadside tree plantations and road safety;

March, 30, 2011	Batumi	Mr. Teimuraz Dumbadze, the Governor of Khelvachauri Municipality	Land acquisition and compensation issues. Questions were raised on employment during construction and geometry of the road
April 16, 2011	Tbilisi	Irakli Litanishvili, Vice Chairman, RD	A proposal for realignment was discussed the alternatives in terms of environmental, social, technical and time lines

Expert Consultations

During the stakeholder consultation at the Detailed Design stage, Expert consultations were conducted both at Tbilisi and Batumi. This involved professionals who have specialized knowledge in wildlife, River ecology, morphology etc. and NGOs, who are reputed individuals and are responsible for reviewing the EIA report. The consultations offered the opportunity to collect available secondary data and information on environmental parameters. Also these consultations facilitated in identifying the parameters for baseline environmental monitoring survey.

During the consultations, guidance was obtained on various aspects of the EIA study, with particular emphasis on the need to carefully choose the project boundary for impact analysis, consider climate change in project design, conduct wildlife and ecological study, assess impact of future traffic on Batumi City's traffic management

The major issues raised were:

- Impacts (including from induced development) on coastal and mountain landscapes, habitats as well as protected areas and related mitigation, minimization, avoidance and compensation measures to be addressed comprehensively.
- The project should contribute into comprehensive improvement of the RD/MRDI organizational structure, mechanisms, systems, plans and capacity for managing environmental, social, health and safety issues, including enforcement mechanisms and monitoring systems. Related institutional strengthening should be provided with adequate budget and human resources.
- Adequate set of environmental and related management plans should be developed or clearly outlined, whenever impossible to elaborate details. All these plans should be clearly bound into construction and supervision contracts.
- Quarries and spoil disposal are the major environmental issues related to the highway construction projects. These aspects should be described in details and related detailed quantities and costs (including site-specific details) included in the project design and reflected in the EMP structure and implementation budget as well. Comprehensive mitigation and restoration measures to be specified.
- EIA should be comprehensive but also very site specific in assessing and mitigating impacts. Engineers should provide details of proposed alignments so that environmental baseline, impacts and mitigations can be analyzed in sufficient spatial detail. Environmentally sensitive locations, geo-hazards and crossings to be addressed in detail.
- Comprehensive environmental quality monitoring standards should be applied and modeling employed, including best international practices whenever Georgian legislation does not provide for adequate standards (noise and air pollution, for instance) and modeling tools.
- Strict avoidance of conflict of interest between those in charge of design engineering and those dealing with environmental assessment should be safeguarded at all staged and strictly in line with ADB consultants guidelines.

- Climate change/sea level rise impact on the project should be considered in the design;
- Other comments and suggestions provided earlier in relation to Adjara bypass road project in response to environmental analysis contained under FS remain valid and pertinent as well.

Consultants responded that updated EIA is being prepared at the design stage and will be disclosed later. The documents will address all the raised issues.

Community Consultations

Focus group discussions were held with community groups, local Government officials, community leaders and teachers. They were made aware of the proposed project and its intended scope. Construction impacts in this road section would be generation of noise and dust from civil works which are temporary and of short duration. Qualitatively, the beneficial impacts from the project will outweigh the temporary disturbance during construction. Nonetheless, these impacts were considered in the Traffic Management Plan during construction including the mitigation measures such as in construction work schedule, spraying of water to minimize dust, etc.

In each case, a wide range of questions were asked to prompt discussion on concerns or wishes relating to the project, expected effects on road safety, presence of sites of cultural or religious significance, presence or absence of wildlife, concerns about construction phase. impacts, suggestions for the project. Summary of discussions and suggestions are listed in **Table *7-4*.**

From the discussions it was found that Participants were keen for road improvements and they will support the project. Participants have some concerns over safety and property and wish to see safety issues addressed by sound engineering design, the use of signage and inclusion of pedestrian crossings at sites where pedestrians are most vulnerable. They also advised the Detailed Design Team to take precautions in the environmental mitigation to avoid impacts anticipated during the preconstruction, construction and operation stage (land loss, resettlement issue, noise pollution, traffic management, road safety etc.) of the project and to ensure protection of the sensitive locations of the areas.

In addition to the above consultation meetings, a total of 6 consultative meetings with the APs were conducted during LARP III preparation.

Table 7-5: Summary of Community Consultations

Issues Discussed	**Participant's Opinion , Comments and Suggestions**	**Significance**
General perception about the project and the awareness about the proposed project.	Most of the participants are in favor of the project and have been made aware of the proposed project through the various surveys that have taken place	Acceptance of the project
Support of local people for the proposed project?	The vast majority support the project. Some participants mentioned that they are ready to work on the project as unskilled laborers	Acceptance of the project Availability and willingness to work on the project

Any critical issue or concern by the local people regarding the project? Or Any criteria you would like to see considered during project design, construction and operation stage?	Preference to identify suitable alignment that avoids as many structures as possible is the major concern. Respondents requested that environmental hotspots (like school, hospital, cemeteries etc.) are avoided as much as possible	Wish to minimize effects on property and cemeteries
Do you have any problem with the existing road?	Long journey times for travel	Dissatisfaction with existing condition of the road
Is the proposed project going to reduce accidents and provide better traffic system?	All the participants felt that the proposed road development project will facilitate a better traffic system. However, it was felt that accidents might increase in number if a high standard of engineering design is not followed. Participants mentioned that safety measures are especially important for social institutions like schools, hospitals	Some concerns over safety, supporting design measures such as increased signage
Protected areas (national parks protected forest, religiously sensitive sites, historical or archaeological sites), if any	Mtirala National Park is about 3 km away from the alignment. From Chainage km 4to 9 km is heavily built up area and with several commercial, industrial and residential areas	No concerns over the park, the nearest sites with terms of cultural or religious significance are far from the road. Tunnels/bridges are designed to avoid most of those structures
Employment Status: Percentage of employment/unemployment/underemployment	Unemployment is common in the project area	Currently concerned about levels of earning opportunities
Perceived losses from the project	Land acquisition and resettlement will be the major issue. According to the participants, this can be mitigated through proper compensation and assistance to the affected persons	No major concerns provided adequate compensation is provided
Is this consultation useful? Comments	All respondents were of the opinion that the consultation is very useful and they expect continued consultation in the future.	Keen to continue to be consulted on road construction
Are there birds and animals of interest in the area?	Kobuleti Protected areas (Ispani) is far from the present road alignment. Animals of interest are therefore mostly concentrated in that area	No concerns over nature conservation, the nearest sites of interest are far from the road

If this road is improved, there may be large groups of workers living temporarily in the area, and construction operations that generate noise and dust. Are there any other issues about construction, including noise and dust that might worry you?	The respondents strongly welcome the road construction activities. Many observed that the measures are temporary and besides there will be more chances for local communities to be employed during construction, providing both skilled and unskilled labor. Participants did not mention any other problems which might bother them other then following basic safety rules.	Residents understand that construction impacts can be expected and do not have an issue with these, provided safety measures are taken.
Given that the new road will be wider and smoother, enabling higher driving speeds, what Road Safety Issues/measures would you propose?	Participants suggested signage (speed limits, warnings etc.), pedestrian crossings in front of social institutions and to ensure that there are footpaths along the road	Pedestrian crossings as well as signage

7.3 Proposed Consultation and Disclosure Plan

In accordance with the harmonization of Government legislation and ADB requirements presented in Table 2-3, the consultations requirement of the Project is

- Consultations will be carried out with the stakeholders, affected people, NGOs throughout the project cycle and consider their views in project design and safeguard plan. Questions and concerns raised during public consultations held in Feasibility stage will be considered.
- Village level (Community) consultations will be held with the affected people.
- Conduct a public consultation meeting in accordance with Georgian Guidelines at Batumi.

In order to comply with the above requirements, the following actions are planned

7.3.1 Disclosure of documents

The electronic versions of the draft EIA will be placed on the RD and Adjara Government web-sites. The hard copies of Georgian version of draft EIA report will be placed in:

- the RD office
- MoE Department of Licenses and Permits
- Environment and Natural Resources Directorate of Adjara
- Municipalities of Batumi

7.3.2 Public consultation meetings

Public consultation meetings will be conducted following 50 days after the disclosure of EIA documentation at Batumi.

7.3.3 Information about the planned meetings

Information about the public consultation process will be made available for public through:

- publication in central mass media
- publication in regional newspapers
- distribution of information via the Aarhus Center internet resources
- placing information on the RD web-site

The disseminated announcement will contain information on:

- where the interested parties can find the electronic versions and hard copies of the disclosed documents
- place and schedule of the planned public consultation meetings
- the deadlines for providing comments
- details of contact persons for submitting comments

In addition the following stakeholders to be invited for the Consultation meetings:

- Representative of Adjara Governments
- Mayors of Batumi and Khelvachauri
- Representative of the Ministry of Regional Development and Infrastructure
- Head, Department of Roads, Batumi
- Representative of the Ministry of Environment Protection, Tbilisi
- Representatives of Affected Communities
- representatives of NGOs familiar with social, economic and cultural conditions in the area affected

8 GRIEVANCE REDRESS MECHANISM

8.1 Objective

Current grievance redress mechanism pertains to the contact 2, tranche 1 of the project road. During implementation of the Project, there might be several issues related to environmental hazards and disputes on entitlement processes will occur due to the Project activities. For example, intensive schedule of construction activities; inappropriate timing of construction vehicle flow; waste; noise and air pollution from construction activities; ecological disturbances; cultural conflicts between migrant workers, are some of the environmental issues that are likely to arise from 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.

In order to provide an accessible mechanism to all the affected persons to raise their issues and grievances related to social and environmental issues, a Grievance Redress Committee (GRC) will be established. The GRC will be officially recognized 'non-judicial community based body that will seek to resolved non-judicial disputes arising out of various matters related to the implementation of EMP and LARP. The fundamental objective of GRC is to resolve any environmental and resettlement related grievances locally in consultation with the aggrieved party to facilitate smooth implementation of the EMP and LARP.

8.2 Grievance Mechanism for Environmental Issues

8.2.1 Type of Grievance

The following are some of the environmental issues could be subject for grievances from the affected people, concerned public and NGOs

- Dust, noise and air pollution from construction activities
- Nuisance
- Intensive schedule of construction activities
- Inappropriate timing of construction vehicle flow
- Traffic movement
- Water pollution
- Waste disposal
- Disturbances to flora and fauna
- Impacts on protected areas and cultural sites
- Health and safety
- Criminal activities
- Failure to comply with standards or legal obligations

8.2.2 Composition of GRC

The following members are recommended to form a GRC to look into the environmental matters.

Representative of RD, Adjara – Convener
Environmental Specialist of RD – Secretary
Environmental Specialist of Construction Supervision Consultant – Member
Environmental Specialist of the Contractor - Member
Head of the Environment and Natural Resources Directorate of Adjara - Convener
Representative of Concerned Rayon Municipalities – Member
Representative of APs – Member

The scope of work and the Terms of Reference for GRC are:

(i) The GRC shall review, consider and resolve grievances related to environmental issues during implementation received by the RD
(ii) Environmental Specialist of CSC is responsible for conducting investigations on these grievances
(iii) Any grievance presented to the GRC should ideally be resolved on the first day of hearing or within a period of three weeks, in case of complicated issues requiring additional investigations
(iv) GRC is empowered to take a decision which is binding on RD and considered final.
(v) A minimum three (3) members shall form the quorum for the meeting of the GRC

GRC meeting will be held in the RD's regional office or other locations agreed by the committee. If needed GRC members may undertake field visits to verify and review the issues at dispute.

8.2.3 Procedures for Filing GRC Cases

Any concerned person can raise a grievance with the GRC. There are several ways one can report a grievance:

- Send a completed Grievance Form (which is available in Gamgeoba of Project villages) to the Secretary of GRC to address in the form;
- Contact the Secretary of GRC over the phone. The contact details are also provided in the form;
- Send an email to the address provided in the form;

The grievance will be reviewed and will be decided whether it will be taken into further consideration. In case the grievance is not connected to the Project related activity or in case the Project authority finds that they are working within the applicable Georgian and international standards, the grievance will not be further processed. In these cases this will be explained in writing to the grievant.

In all other cases the GRC will investigate whether they have failed to work to the intended standard and, if they have, identify measures which might be taken to protect against the incident occurring again.

The grievance mechanism will be made public through the public consultations and information leaflets during implementation.

Table 8-1: Claims and Comments Submission Form

Reference #	
Name, Last name	
Contact Information Please indicate the preferable means of communication (Mail, Telephone, E-mail)	☐ Mail: Please indicate the postal address: _____ _____ _____ ☐ Telephone: _____ ☐ E-mail:_____
The language desirable for the communication	☐ Georgian ☐ English ☐ Russian
Describe the incident or the claim:	What happened? Where it happened? To whom it happened? What is the result of the problem?
Date of Incident or Claim:	
	☐ Single incident/claim (Date _____) ☐ Took place several times (how many times: _____) ☐ Current (the existing problem)
To your opinion how this problem should be solved?	
Signature: _____ Date: _____ Please return this form to Roads Department of Roads Department of MRDI: Head of the Environmental Division, 12 Alexandre Kazbegi str, Tbilisi, Phone: 822-370508 or email: info@georoad.ge Or Directorate for Environment and Natural Resources Autonomous Republic of Adjara Address: # 6 Rustaveli Str., Batumi Tel: 877 232227, or e-mail: koncelidze@rambler.ru	

8.2.4 Grievance Review Process

In some instances it may be possible to resolve a grievance straight away. Where this is not possible the GRC will work through the steps shown below:

Step 1: Receive Complaint

Once the GRC receives a completed form or get notification of a problem, it will assign someone to be responsible for resolving the grievance.

Step 2: Acknowledgement

Secretary of GRC will acknowledge receipt of a grievance by letter within 10 working days of having received the grievance. The acknowledgement will specify a contact person, their reference indicator and an anticipated target date for resolution.

Step 3: Investigation

GRC will work to understand the cause of every grievance. GRC may need to contact the claimant during this time.

Step 4: Resolution

Once GRC have investigated a grievance, GRC will write to the claimant the results of the investigation and of GRC proposed course of action, should GRC believe any to be necessary.

If the claimant considers the grievance to be satisfactorily resolved GRC would appreciate sharing that with him/her by signing a Statement of Satisfaction. If the grievance remains unresolved it will be reassessed and GRC will have further dialogue with the claimant to discuss if there are any further steps which may be taken.

Step 5: Follow Up

The GRC may contact the claimant at a later stage to ensure that our activities continue to pose no further problems.

All grievances shall be monitored by the GRC, who will be responsible for ensuring that a plan is developed and internally approved by the GRC (and if appropriate discussed with the claimant) for any unresolved grievances. The plan's objective will be to bring unresolved grievances to a swift and fair resolution.

Confidentiality and Anonymity

The claimant may wish to raise a concern in confidence under this procedure. If claimant asks the GRC to protect his/her identity, it will not be disclosed without his/her consent. Details of submissions and allegations will remain secure within the team responsible for investigating the concerns. However, the situation may arise where it will not be possible to resolve the matter without revealing claimant's identity (for instance where it is required to give evidence in court). The investigative team will discuss with the claimant whether and how best to proceed.

In case the claimant does not disclose his identity to the GRC it may make it more difficult to look into the matter, to protect claimant's position or to give feedback.

Accordingly, while GRC will consider anonymous reports, they are not encouraged. If the claimant does insist on raising a concern anonymously, he will need to provide sufficient facts and data to enable the investigative team to look into the matter without his assistance.

8.3 Grievance Mechanism for Social Issues

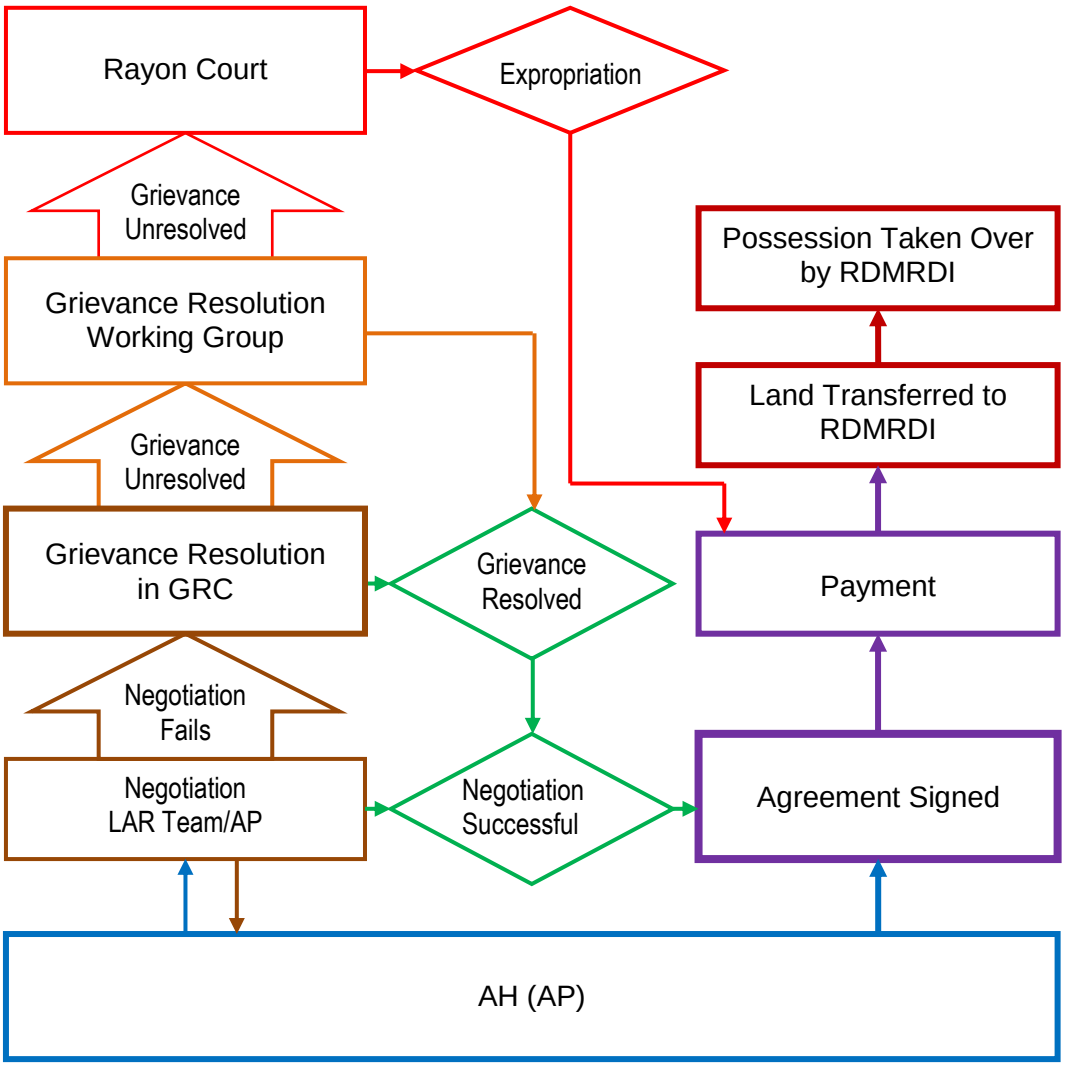
The member secretary of GRCs and Rayon level LAR Team will be regularly available and accessible for APs to address concerns and grievances. The LAR Team will assist the aggrieved APs in formally lodging their claims to the GRC and where applicable to the Working Group of RU at RDMRDI in Tbilisi. The complaints and grievances from the APs will be addressed through the process described

below in Table 8-2. The grievance resolution and acquisition processes are presented the flow diagram shown at Figure 8-1.

RU of RDMRDI headquarters will keep record of complaints received for its use as well as for review by ADB during regular supervisions.

Table 8-2: Grievance Resolution Process

Steps	Action level	Process
Step 1	Contract agreement	When during the contract discussion any grievances arise, solutions acceptable to both Rayon's LAR Team and the APs will be sought. If any aggrieved AP is not satisfied with the solutions, the next option will be to lodge grievances to the GRC.
Step 2	GRC Resolution	If the grievance is not solved at the previous level, the LAR Team will assist the aggrieved APs to formally lodge the grievances with the respective GRC.The aggrieved APs must lodge the complaint within 1 week of failure of negotiation at village level and produce documents supporting his/her claim. The GRC member secretary will review the complaint and prepare a Case File for GRC hearing and resolution. A formal hearing will be held with the GRC at a date fixed by the GRC member secretary in consultation with Convenor and the aggrieved APs. On the date of hearing, the aggrieved AP will appear before the GRC at the Gamgeoba office and produce proof in support of his/her claim. The member secretary will note down the statements of the complainant and document all proof. The decisions from majority of the members will be considered final from the GRC and will be issued by the Convenor and signed by other members of the GRC. The case record will be updated and the decision will be communicated to the complainant AP by the LAR Team at the village level.
Step 3	Decision from central RDMRDI	If any aggrieved AP is unsatisfied with the GRC decision, the next option will be to lodge grievances to the Working Group of RU at RDMRDI at the national level within 2 weeks after receiving the decision from GRC. The complainants, must produce documents supporting his/her claim. The Working Group will review the GRC hearing records and convey its decisions to the aggrieved APs within 2 weeks after receiving the complaint.
Step 4	Decision from court	If the grievance redress system fails to satisfy the aggrieved APs, they can pursue further action by submitting their case to the appropriate court of law (Rayon Court). In case, if the ruling by the court is below the market price assessed through the open market survey earlier, RDMRDI will provide additional funds to ensure that compensation provided reflects full replacement cost.



Source: LARP II, Kobuleti Bypass Road, June , 2011

Figure 8-1: Grievance Resolution and Acquisition Process

9 ENVIRONMENTAL MANAGEMENT PLAN

The ADB Safeguard Policy Statement (SPS, 2009) states that "This section [of the EIA Report, the Environmental Management Plan, EMP] deals with a set of migration and management measures to be taken during the project implementation to: Avoid, Reduce, Mitigate, or Compensate for adverse environmental impacts (in that order of priority).

Efforts have been made to avoid and reduce adverse environmental impacts in the Project Design and additional recommendations to further avoid or reduce impacts are provided in Chapter 5 and reflected in the proposed EMP. The SPS goes on to state that in regard to mitigation and compensation, the EMP should address "the following key components: Mitigation, Monitoring, Implementation, and Performance Indicators."

9.1 Guiding Principles of EMP

9.1.1 Methodology

Environmental Management and Monitoring Plan (EMMP) is prepared for all the identified environmental impacts during pre-construction, construction and O&M stages due to implementation of various Project activities. The methodology followed for preparing the EMMP is given in Figure 9-1 and consists of the following steps:

Figure 9-1: Framework for Preparation of EMMP during Construction and O&M

- Deriving mitigation/protection measures for identified impacts for each of the Project activity and environmental component;
- Recommend mitigation, compensation and enhancement measures for each identified impacts and risks;
- Developing a mechanism for monitoring the proposed mitigation measures,
- Estimating budget requirements for implementation mitigation and monitoring measures, and
- Identifying responsibilities of various agencies involved in the Project for implementation and monitoring of mitigation measures

The EMMP prepared in accordance with the above framework is given in Table 9-1 and Table 9-2 and each of the components in the framework is discussed in the following sections. The EMMP will be included in all the bid documents of the Project and will become a part of the civil works contract. The strict implementation of the EMMP and project management's strict enforcement of the adequate construction practices and standards will greatly reduce the negative impacts of the Project.

9.2 Mitigation Measures

This section includes the principles, procedures and mitigation measures that are necessary for ensuring the most appropriate environmental mitigation and enhancement plans applicable during different stages of project implementation. To avoid and minimize the impacts resulting from the activities of the project, measures/management plans are based on appropriate technological design, improvements or adjustments, good site operational practices etc.

The mitigation plan has been recommended to highlight the action to avoid/minimize/ control the impacts arising out of different project phases i.e. pre-construction, construction and operation, for each of the anticipated impact as described in EIA Report.

Mitigation measures have been identified to avoid or ameliorate potential negative impacts.

9.3 Monitoring Mechanism

Monitoring of environmental components and mitigation measures during construction and operation stages is a key component of the EMP to safeguard the protection of environment. The objectives of the monitoring are to (i) monitor changes in the environment during various stages of the project life cycle with respect to baseline conditions; and (ii) manage environmental issues arising from construction works through closely monitoring the environmental compliances. A monitoring mechanism is developed for each identified impact and it includes:

- Location of the monitoring (near the Project activity, sensitive receptors or within the Project influence area)
- Means of monitoring, i.e. parameters of monitoring and methods of monitoring (visual inspection, consultations, interviews, surveys, field measurements, or sampling and analysis)
- Frequency of monitoring (daily, weekly, monthly, seasonally, annually or during implementation of a particular activity)

The monitoring program will also include regular monitoring of construction activities for their compliance with the environmental requirements as per relevant standards, specifications and EMP; The purpose of such monitoring is to assess the performance of the undertaken mitigation measures and to immediately formulate additional mitigation measures and/or modify the existing ones aimed at meeting the environmental compliance as appropriate during construction.

The environmental parameters that may be qualitatively and quantitatively measured and compared are selected as 'performance indicators' and recommended for monitoring during project implementation and O&M stages. These monitoring indicators will be continuously monitored to ensure compliance with the national or other applicable standards and comparison with the baseline conditions established during design stage. The list of indicators and their applicable standards to ensure compliance are given below:

- Air quality (PM), SO2, NO2, and CO) – Georgian National Standards (Order #297N, dated 16.08.2001 of the Ministry of Labour, Health and Social Protection and as amended by the Order No 38/n, dated 24.02.2003)
- Noise levels – Georgian National Standards (Decree of the Minister for Health, Labour and Social Affairs, 297n of August 16, 2001, on the 'Approval of Environmental Quality Standards')
- Surface Water Quality (TN, TP & TPH - TDS, Cl^-, HCO_3, DO, Turbidity, pH) – Standards from the Environmental, Health, and Safety (EHS) Guidelines of the World Bank Group (April 2007) are used.
- Groundwater Quality (pH, TDS, Cl, HCO_3, SO_4, Ca, Mg, Na, Coliform) – Standards from the Environmental, Health, and Safety (EHS) Guidelines of the World Bank Group (April 2007) are used.
- Number of identified critical wildlife species and migratory birds – Comparison with Baseline Environment

During the preconstruction period, the monitoring activities will focus on (i) checking the contractor's bidding documents, particularly to ensure that all necessary environmental requirements have been included; and (ii) checking that the contract documents' references to environmental mitigation measures requirements have been incorporated as part of contractor's assignment and making sure that any advance works are carried out in good time.

Construction environmental monitoring is a function of supervision, and the essential purpose is to ensure adherence to the EMP. The monitoring is a day to day process, which ensures that departures from the EMP are avoided or quickly rectified, or that any unforeseen impacts are quickly discovered and remedied. Specific actions in the EMP that are to be monitored are included in the Monitoring Plan. During construction, environmental monitoring will ensure the protection of landslide, side slopes, and embankment from potential soil erosion, borrow pits restoration, quarry activities, siting of work sites and material storages, siting of batch, concrete and asphalt plants especially close to the nature reserve, preservation of religiously sensitive locations, community relations, and safety provisions.

Post monitoring evaluation will be carried to evaluate the impacts of the Project during first 3 years of operation of the Project. Regular monitoring of the condition of the road surface, bridges, culverts, drainage structures and slope protection structures is important from an environmental management point of view, but takes place as part of regular road maintenance. In addition to this activity, information on the locations, type and consequences of traffic or traffic related accidents is required, in co-operation with traffic police. Recommended air, noise and water quality monitoring, greening and landscaping and community feedback are also included in the Monitoring Plan

The monitoring plan and details of monitoring locations for environmental condition indicators of the project during the construction and operation stage are presented in ***Table 9.2***.

9.3.1 Monitoring Schedule and Performance Indicator

The monitoring schedule has been developed based on the possible occurrence of adverse impacts and required mitigation actions. However, this schedule is subject to change depending on the analysis results obtained. The performance indicators and protocol for changing the monitoring schedule is given below.

- Tree Plantation

The 75% survival rate of re-plantation shall be monitored on the first year of the operation phase. If the survival rate is found below 75%, necessary measures will be taken to increase the survival rate and monitoring shall be again taken up on the third year of operation. This cycle should continue until the 75% survival rate is achieved.

- Soil Erosion and Drainage Congestion

No significant soil erosion problem is anticipated due to the project either in the construction phase or in the operation phase. However, in the construction phase, some localised soil erosion may be noticed owing to construction activities. However, if soil erosion is noticed during construction and operation phase, the corrective action shall be initiated and frequency of check be increased to assess the tendency of occurrence.

The cross drainage structure shall be free from siltation. Visual check shall be made periodically to identify any drainage congestion or water logging along the road. Appropriate corrective action shall be taken to clear the congestion and prevent reoccurrence.

- Air and Noise Quality

Due to the variability of the construction activities, namely changes in batch composition, type of construction activity and other anthropogenic influences, the ambient air quality of the project area may change. If the air quality with respect to any parameter exceeds by more than 25% of its last monitored value, the monitoring frequency shall be doubled and cause of the increase investigated. If the construction activities are found to be the reason for this increase, suitable measures should be

adopted.

Similarly, due to the variability in traffic movement, namely changes in traffic volume, traffic compositions and other anthropogenic influences, the noise quality in the project area is likely to change. If the noise quality exceeds by 20% of the applicable ambient noise quality standard or 5% of its last monitored value, the monitoring frequency shall be increased and the cause of the increase investigated. If the construction activities are found to be the reason for this increase, suitable measures should be adopted.

- Water Quality

No significant change in water quality is perceived due to the project in the operation phase. However, in the construction phase, the monitored values for pH, BOD, COD, TDS, DO and Oil & Grease might change owing to construction activities. Hence, it is suggested that if the monitored value for any water quality parameter exceeds by more than 20% of its last monitored status the monitoring frequency shall be increased

9.4 Budget Estimates

Cost estimates are prepared for all the mitigation and monitoring measures proposed in the EMMP. The details of the cost estimates and the budget during construction stage and first three years of operation stage for the mitigation measures are given in Table 9-3 and for monitoring measures are given in Table 9-4. The cost estimates for some of the mitigation measures that were already part of civil works contract or resettlement plans are not included in the EMMP. The cost estimates also includes the budget for environmental monitoring, consultants for EMMP implementation, institutional strengthening and capacity building of Environmental Division of RD and environmental enhancement/compensation measures. The total budget for EMMP implementation is estimated to be about US$ 2.1 million.

9.5 Institutional Framework for Implementation of EMMP

Institutions responsible for executing and monitoring the environmental aspects of this Project are:

- MRDI is responsible for planning, constructing, operating and maintaining regional, national and provincial infrastructures in Georgia and RD is responsible for overall management of roads.
- Environmental Division of the RD will undertake routine and random monitoring of the specific environmental management plans (EMP) addressed in this EIA.
- The supervision consultants under RD are responsible for environmental monitoring and management of project implementation and to help ensure the implementation of environmental management practices at each stage of the construction.
- MOEP will be consulted if complicated issues arise during construction and operation stages.
- External Monitor will be responsible for independent monitoring and implementation of EMP, and external monitoring and evaluation

Contractor is responsible for implementation of EMP during construction works and Construction Supervision Consultant (CSC) is primarily responsible for supervision of monitoring of the implementation of the EMMP. RD will hire ‘external monitoring consultant’ to monitor implementation and supervision of EMMP.

Each Contractor procured under this Project will be recommended to be a compliant of ISO 14001,

2004 Environmental Management System (EMS) certification. Further conditions of compliancy for OHSAS 18000 (2007) related Occupational Health and Safety (OHS) could also be imposed on the Contractors. Each contractor will be recommended to have one Environmental Specialist and one Occupational, Health and Safety (OH) Specialist, who will be working in close coordination with the environmental staff of CSC and RD.

CSC will be responsible to monitor all activities of all contractors procured under the Project. As several contractors will be working simultaneously for timely and speedy implementation of the project, it is important that CSC has an environmental unit to effectively supervise and monitor the environmental activities being implemented in the field. The CSC is also responsible to update or make necessary changes to the EMMP if required based on the revised designs and locations.

9.6 Management of Project related Impacts

An EMP has been prepared for each identified impact and presented in Table 9-1. This EMP is divided into three sections, pre-construction, construction, and O/M. Again each section is further divided into Project activity to address activitywise impacts. Each impact in the EMP is addressed by the following steps

- Activity
- Impact
- Mitigation measures
- Implementation agency
- Supervision agency

The contractor also has to refer to the corresponding ECPs proposed in the next section for additional and specific measures to be adopted while implementing the EMP.

9.7 Environmental Code of Practices (ECP)

A Standard Environmental Code of Practice (ECP) has been prepared to address all general construction related and environmental impacts of the project. The ECPs will provide guidelines for best operating practices and environmental management guidelines to be followed by the contractors for sustainable management of all environmental issues. This ECP could be annexed in the general conditions of all the contracts carried out under the project.

The list of ECPs prepared for the project is given below and the ECPs are given in Annex 9-1.

- ECP 1: Waste Management
- ECP 2: Fuels and Hazardous Goods Management
- ECP 3: Water Resource Management
- ECP 4: Drainage Management
- ECP 5: Soil Quality Management
- ECP 6: Erosion and Sediment Control
- ECP 7: Top Soil Management
- ECP 8: Topography and Landscaping
- ECP9: Borrow Areas Development and Operation
- ECP 10: Air Quality Management
- ECP 11: Noise and Vibration Management
- ECP 12: Protection of Flora
- ECP 13: Protection of Fauna
- ECP 14: Protection of Fisheries

- ECP 15: Road Transport and Road Traffic Management
- ECP 16: Construction Camp Management
- ECP 17: Cultural and Religious Issues
- ECP 18: Community and Worker's Health and Safety

It is recommended that all major contractors to be procured under the Project will be a compliant of ISO 14001. This will be done by RD imposing the requirements of ISO certification during prequalification of contractors. These Contractors can also prepare a 'Construction Environmental Action Plan' (CEAP) demonstrating the manner in which they will comply with the requirements of ECPs and the mitigation measures proposed in the EMMP of the EIA Report. The CEAP will form the part of the contract documents and will be used as monitoring tool for compliance. Violation of the compliance requirements will be treated as non-compliance leading to the corrections or otherwise imposing penalty on the contractors.

Table 9-1: Environmental Management Plan

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	Supervision
A. Design Phase/Preconstruction				
Land acquisition and Resettlement	Acquisition of 117.3 ha of land, 700 plots. (Ref: LARP –III, January 2012)	Alternatives are proposed to reduce the land acquisition. A land acquisition and resettlement plan is prepared, outlining who is entitled to compensation, what will be the compensation mechanisms, how much the compensation will be paid according to the type of damages Provide compensation in accordance with LARP	Design Consultant/RD	RD/External Monitor
Detailed Design	Potential impacts caused by drilling wells for geotechnical investigation	Properly cover and seal drilled wells after completion of investigation to avoid potential contamination of ground water	Design Consultant	RD
Preparation of CEMP	Contractual Requirements	Prior to commencement of any site works, each contractor shall prepare a site specific or construction EMP (CEMP) which specifies the responsibilities, location associated costs, schedule/time frame and other relevant information for implementing its provisions which will include the following: (i) selection of sites for material exploitation and storing, as well as sites for concrete, crushing and asphalt plants, (ii) plans for material transportation routes and timing, (iii) identification of specific disposal sites for unsuitable soils, (iv) soil erosion control measures including soil stabilization measures at disposal sites, (v) construction camp management, (vi) quarry/aggregate/borrow site management and restoration, (vii) traffic management, (viii) noise reduction measures including construction of temporary noise barriers, (ix) dust suppression measures, (x) handling and storage of hazardous substances such as fuel, etc. (xi) occupational	Contractor	CSC, RD

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	Supervision
		and community health and safety, (xii) emergency response plan in case of spills and other accidents involving workers and the community, (xiii) chance find procedures measures and other applicable mitigation measures indicated in the Project EMP included in the EIA approved by RD and ADB. The CEMP should be fully consistent with the Project EMP. Before civil works begin, the CEMP shall be reviewed by the CSC and endorsed to ADB.		

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	**Supervision**
Geohazards	Project road passes through sensitive geological formation and may trigger landslides, rock falls, and soil erosion. Km 6+500 - 14 the gorge "Shua Ghele", the left tributary of the riv. Dekhva, active development of landslide and erosive processes. Landslide prone area. High risks of triggering landslides. Zone Km –14-16 The road section adjacent to the settlement Chakvi (near the design landfill). Stabilized landslide body. Landslide activation can be easily triggered by construction activities. Km 16-18.9 The area of weak soil adjacent to the northern entrance of the tunnel, v. Sakhalvasho. Landslide activation can be easily triggered by construction activities.	The Project road is divided into three geohazards categories (simple, medium and complex categories) and engineering design structures for slope protections such as soil nails, retaining walls, drainages are designed. Following mitigation measures are planned: • Avoidance of expended landslide prone areas is not possible without major rerouting. • In most critical zones it is proposed to construct overpasses • Surface water management is considered as a major mitigation factor for prevention of landslides during construction activities, as well as during operation phase. Temporary drainage systems should be installed to prevent land sliding during construction (cutting slopes, deep trenches etc.). Permanent drainage systems for the surface water management and slope stabilization should be installed and adequate monitoring and maintenance should be ensured. Seasonal aspects should be considered during planning the monitoring activities: snow-melting and flooding periods are of great importance. • Slope stabilization techniques to prevent erosion and further triggering landslides are extremely important. In most cases, mechanical means, like berms, geogrids, biomats, as well as anti-erosion revegetation of slopes shall be applied. "Soil nailing" also could be	Design Consultant	RD

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	Supervision
		used for particular sites. • At very particular locations, revetment structures or reshaping of relief may be required Detailed Design for the landslide prone areas will provide site specific specifications for the soil stabilization works required for the complex zones. The design of potential landslide zones in Kobuleti Bypass section includes soil nails. The project design considered 7-8 point seismicity of the region (Decree No. 1-1/2284 of October 7, 2009 of the Minister of Economic Development of Georgia about approving the Building Norms and Rules 'Anti Seismic Construction)		
Hydrology	Project road crosses rivers and several streams, rivers and drains and will affect the natural hydrological and flood water flow.	Hydrological analysis was carried out for all the rivers and streams in the Project area. A design discharge of 100 year return flood is considered for design of bridges and 50 year for culverts.	Design Consultant	RD
Severance	Severance of communities and villages	The project road is designed as access restricted highway (freeway) and overpasses are recommended for all local roads with interchanges with all major regional roads. Hence the project road will not interference with	Design Consultant	RD

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	**Supervision**
		the local traffic		
Archaeology	The project area is rich with archaeological findings and potential risk of damaging some artifacts during the earthworks is significant.	Preliminary detailed studies including field survey, required according to the law of Georgia on Cultural Heritage, should be carried out for obtaining Construction Permit.	RD	Ministry of Culture, Monument Protection and Sport
B. Construction Phase				
Clearing of sites	Striping of top soils (20 cm depth) Excess soil, rock	• Collect/strip top soil before earth filling and store and reuse it for final surfacing of road embankment and tree plantation • Implement ECP 7 on Top Soil Management • Most part of cut spoil will be used for filling the embankments. However, the rest should be disposed together with the demolished engineering structures (concrete, etc.) Two major spoil disposal sites have been recommended by the Directorate of Environmental Protection and Natural Resources of Adjara Government. These are the existing landfills in Batumi and Kobuleti, which are planned to be closed and covered. Spoil from the road construction could be used for coverage needs. The other sites also may be recommended by the Directorate upon the request of the Contractor.	Contractor	CSC, RD
	Cutting of 20469 nos. trees	• Tree plantation along road side open spaces within ROW • Follow ECP 12 and 13 on Protection of Flora and Fauna while tree cutting	Contractor	RD,MOE
Establishment of camps	Lack of proper services in camps such as safe drinking water and sanitation	• Provision of necessary facilities in construction camps as given in ECP 16 on Construction Camp Management	Contractor	CSC, RD, External Monitor
Maintenance of camps	Contamination from solid waste	• Implement waste management activities as given in ECP 16 on Construction Camp Management • All construction materials will be reused,	Contractor	CSC, RD, External Monitor

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	**Supervision**
		recycled and properly disposed off, All worn out parts, equipment and empty containers must be removed from the site to a proper storage location designated by RD • There will be no site specific landfills established by the contractors. All solid waste will be collected and removed from the work camps and disposed in local waste disposal sites		
STI and HIV trainings		• Conduct for all construction workers induction training on STI and HIV issues as well as basic sanitation and health issues	Contractor	CSC, RD, External Monitor
Large quantities of material import	Exploration of illegal source	Environmental permits of suppliers from relevant authority	Contractor	RD
Mobilization of equipment and materials through road	Road safety and Traffic Management	• Implement ECP 15 on Road Transport and Road safety Management • Ensure that all construction vehicles observe speed limits on the construction sites and on public roads • Provide adequate signage, barriers and flag persons for traffic control	Contractor	CSC, RD, Local Government, Police
	Damage of local roads due to movement of heavy axle loads	• Maintain all existing roads in traffic worthy condition ensuring maintenance of uninterrupted movement of traffic. • Temporary bypasses to be constructed and maintained (including dust control) during the construction period at bridge/tunnel crossings. • Repair the damaged local roads to their original condition after project	Contractor	CSC, RD
Grievance redress		• Form a grievance redress committee in association with affected population before starting the civil work and advance notice must be given to the community about the construction schedule.	Contractor	CSC

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	**Supervision**
	Dust and emissions from construction vehicles and equipment may cause health problems or accidents and injuries to construction workers and nearby community	• Implement ECP 10 on 'Air Quality Management' • Each vehicle related to the construction has to have valid "Emission Permit for motor vehicle" during construction • Vehicular traffic through communities will be avoided as far as possible. Vehicle speeds will be kept low if they should pass through communities. • Cover haul vehicles carrying dusty materials • Watering of the un paved roads	Contractor	CSC, RD, Local Government
Operations at Construction Yards and Construction Sites	Air pollution from material storage sites and mixing sites	• Implement ECP 10 on Air Quality Management • Water to be sprayed during the construction phase in all mixing areas where dry materials are handled and / or crushed. Temporary access roads to aggregate sites must be included in the dust suppression program. A spraying schedule will be prepared by the contractor and will serve as the basis of a dust control program. The Project authorities will regularly monitor this schedule. • Materials to be covered in vehicles going to and from the construction sites to reduce spills.	Contractor	CSC, RD
	Noise pollution from operation of construction yard and construction activities	• Implement ECP 11 on Nose and Vibration Management • Use of vehicles, machineries and equipments that are of good quality and generates noise as per their specifications	Contractor	CSC,RD
	Pollution risk from fuel and other hazardous material storage sites	• Implement ECP 2 on 'Fuels and Hazardous Goods Management' • Contractor to develop and undertake construction waste management strategy for	Contractor	CSC, RD

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	**Supervision**
		both hazardous and non-hazardous wastes separately. • Contractor to confine the contaminants immediately after such accidental spillage • Contractor to collect contaminated soils, treat and dispose them in environment friendly manner • All areas intended for storage of hazardous materials to be quarantined and provided with adequate facilities to combat emergency situations complying all the applicable statutory stipulation • Train the personnel in-charge of these sites to control access to these areas and entry to be allowed only under authorization		
	Air and noise pollution from Operation of generators for electricity generation	• Routine maintenance and regular inspection of these generators. • Use of canopy for diesel/gas generators for noise control/reduction	Contractor	CSC, RD
	Surface water pollution	• Implement ECP 3 on 'Water Resources Management' • Discharge sediment laden construction water into settling lagoons or tanks prior to final discharge	Contractor	CSC, RD
	Solid Waste, excess materials	• Implement ECP 1 on 'Waste Management'. • Develop appropriate construction waste management strategy along with its strict adaptation • Develop waste handling training material and conduct monthly waste management induction trainings • Organize proper collection and transport of wastes	Contractor	CSC, RD
Occupational health and safety issues	Construction works may pose health and safety risks to the	Included in civil works Contract • Implement ECP 18 on Community and	Contractor	CSC, RD

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	**Supervision**
	surrounding communities, construction workers and site visitors leading to severe injuries and deaths.	Worker's Health and Safety • Ensure construction related safety measures as an integral part of the construction works • Provision of adequate on site First Aid Boxes and treatment facilities		
Construction of Bridge Substructure (pile driving and concreting)	Pollution of the river from pile driving and concrete works	• Use a smaller hammer to reduce the sound pressure. The sound produced in pile driving has a direct relationship to the force used to drive the pile. A smaller hammer will have less force on the pile therefore, producing less sound. • Reduce noise levels by 60 decibels • Regular maintenance procedures with manufacturer requirements • Comply with national standards • Activities will be restricted between 0600 and 2100 hours within the distance of 150, of settlements and 500m from sensitive receptors hospitals and schools • Use a hydraulic hammer if impact driving cannot be avoided. The force of the hammer blow can be controlled with hydraulic hammers, and reducing the impact force will reduce the intensity of the resulting sound.	Contractor	CSC, RD, External Monitor
	Risk of water contamination with concrete	• Unused concrete should not be disposed into the river water • Unused concrete should be collected properly and disposed in the designated waste dumping site	Contractor	CSC, RD
Construction of Superstructure	Occupational, health and safety	• Implement ECP 18 on Workers Health and Safety • Provision of adequate lighting along the bridge and tunnel alignment and in the area particularly where construction works will take place • Proper safety training for all participating in	Contractor	CSC, RD

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	**Supervision**
		the construction works and distribution of PPE (such as helmets, masks, safety shoes and goggles, rain coats, ear plugs etc.) to the construction labors, engineers		
	Air pollution from welding	• Proper safety training for all participating in the welding works and distribution of personal protective equipments (such as helmets, masks, safety shoes and goggles, rain coats, ear plugs etc.) to the construction labors, engineers	Contractor	CSC, RD
Operation of hot mix plants, etc Transportation of construction materials and carrying out construction activities	Air pollution and dust generation	• Undertake precautionary measures for reducing dust emissions from DG sets, hot mix plants, crushers and batching plants; • Provide adequate stack height and dust extraction systems for the hot mix plants • Ensure water spreading to suppress dusts particularly during dry and windy weather • Monitor ambient air quality and comply with the standards by reducing the emission levels of air pollutants	Contractor	CSC, RD
Asphalting	Spills from Bitumen plants may contaminate surface water quality during - Thinning of bitumen - Leaks in drums - Handling of bitumen	• Disposal of Bitumen will not be allowed to enter running or dry streambeds and nor will be disposed of in ditches or small waste disposal sites prepared by the contractor • Bitumen storage and mixing areas must be protected against spills • As a minimum, these areas must be contained, as to allow immediate collection and clean up • Careful management of any petroleum products used in the preparation of the bitumen mixture to avoid spills and contamination of the local water table	Contractor	CSC, RD
	Impact on Traffic safety	• Implement ECP 15 on Traffic Management and Road Safety • Control speed of construction vehicles	Contractor	CSC, RD

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	**Supervision**
		through road safety education and fines • Allow adequate traffic flow around construction areas • Provide adequate signage, barriers and flag persons for traffic control		
	Traffic jams and congestion	• Communicate to the public through community consultation and newspaper announcements regarding the scope of schedule of construction, as well as certain construction activities causing disruptions or access restrictions • Implement ECP 15 on Traffic Management and Road Safety	Contractor	CSC, RD
C. Operation and Maintenance Phase				
Vehicular movement	Increase noise level because of enhanced traffic volume	• Put signage for noise regulations at sensitive locations (school, hospitals, health care units) with clear instructions of not using horns and running vehicles with limited/allowable speeds • Monitoring of noise quality are recommended during O& M near the densely populated areas and based on the noise monitoring results, additional mitigation measures are to be designed • Maintain tree plantation on both sides of the roads	RD	MOE
	Drainage leading to water logging and impacting on surrounding lands	• Monitor drainage pattern after high down pouring and recession flood • Connect water pockets to the nearest drainage structures/canals by constructing roadside drainage canal	RD	MOE
	Soil and water contamination from accidental spillage of oils/fuels	• Emergency Response plan is prepared to address the accidental spillage of fuels and hazardous goods • Immediate collection of spilled oils/fuels/lubricants through collection of	Ministry of Interior, RD,	Ministry of Interior, RD

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	**Supervision**
		contaminated soils and sucking oils from surface water through appropriate technologies		
Landscape and Erosion Protection	Long term degradation of natural landscape at land strips and slopes; Visual impacts Change of drainage patterns, erosion, degradation of vegetation, fragmentation of habitats	• Restoration of the landscape to the natural shape (at the sites not occupied permanently by the carriageways and road facilities, and where reinstatement is possible). • Reinstatement of landscape. Restore topsoil and vegetation cover, bio-restoration, landscaping, mitigation of visual impacts; eco-compensation program.	RD in long term perspective through Contractors	RD MOEP
	Erosion from road cuts and fills and sedimentation of natural drainage ways. Erosion of lands below the road bed receiving concentrated outflow from covered or open drains.	Reinstatement of relief and landscape; • Installation of long-term drainage systems and anti-erosion structures. • reinstatement of relief, soil and vegetation cover	RD in long term perspective through Contractors	RD MOEP
	Construction of the road can trigger development of the landslides in the landslide prone areas	• Permanent monitoring using markers, where applicable • Maintenance of surface water drainage systems, revetments, berms and terrace structures installed for minimizing geohazard development risks	Constructing contractor RD in long-term perspective through contractors	RD Regional services of MOEP
Protection of Flora and Fauna	Mortality of animals during road crossing and collision due to street lighting	• Flora and fauna monitoring will be carried out during first 3 years of operation including monitoring of mortality of fauna due to project roads • Within 6 month of the project start develop monitoring plan with indicating possible impacts on the migratory species etc • Lower wattage flat lens fixtures are recommended for street lights • Animals deaths are expected due to road	RD in long term perspective through contractors Contractor	RD, MOEP, External Monitor RD, MOEP, External Monitor

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Institutional Responsibilities	
			Implementation	**Supervision**
		crossing to due to provision of several underpasses, bridges and culverts • Reflective signs are recommended for pavement		
Consequence of Climate Change	Increased rainfall and flood	• Design and construct road embankment and bridges that could withstands predicted flood levels • Design and construct culverts and drainage systems to ensure that storm water in drainage preventing inundation of areas along the road embankments	Design Consultants Contractor	RD, MOE, External monitor

Note; RD- Road Department, MOE- Ministry of Environment protection, CSC-Construction Supervision Consultants

Table 9-2: Environmental Monitoring Plan during Construction and Operation

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency	
				Implemented By	Supervised By
During Construction					
Material Supply	Work Sites	Possession of official approval or valid operating license of suppliers materials (asphalt, cement, quarry and borrow material)	Before an agreement for the supply of material is finalized.	Contractor	CSC, RD, External Monitor
Operation of borrow and quarry sites	Quarry Sites	Visual inspection of quarry sites	Monthly	Contractor	CSC, RD, External Monitor
Top Soil	Construction Corridor	Top soil of 0.15 m depth should be excavated and stored properly	Beginning of earth works	Contractor	CSC, RD
	-do-	The stored top soils should be used as cladding material over the filled lands	Immediately after filling and compaction of dredge materials	Contractor	CSC, RD
Erosion	Side slopes of the embankments and material storage sites	Visual inspection of erosion prevention measures and occurrence of erosion	At the end of filling activity	Contractor	CSC, RD
Landslide/Rock fall control	Active rock fall sections and steep mountainous slopes	Visual Inspection, monitoring the construction of rock fence	Monthly	Contractor	CSC, RD
Hydrocarbon and chemical storage	Construction camps	Visual Inspection of storage facilities	Monthly	Contractor	CSC
Local Roads	Approach Roads	Visual inspection to ensure local roads are not damaged	Monthly	Contractor	CSC
Traffic Safety	Haul Roads	Visual inspection to see whether proper traffic signs are placed and flagmen for traffic management are engaged	Monthly	Contractor	CSC
Air Quality (dust, smoke)	Construction sites	Visual inspection to ensure good standard equipment is in use and dust suppression measures (spraying of waters) are in	Daily	Contractor	CSC

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency	
				Implemented By	Supervised By
		place.			
	Asphalt Plant	Visual inspection to ensure asphalt plant is located >500 m from residential areas	Monthly	Contractor	CSC
	Material storage sites	Visual inspection to ensure dust suppression work plan is being implemented	Monthly	Contractor	CSC
Air Quality (PM, NO_2, SO_2, CO)	Near the sensitive sites and settlements (as directed by CSC)	Air quality monitoring	Quarterly	Contractor through a nationally recognized laboratory	CSC External Monitor
Noise	Construction sites	Visual inspection to ensure good standard equipment are in use	Weekly	Contractor	CSC
	Construction sites	Ensure work restriction between 21:00-06:00 close to the sensitive locations	Weekly	Contractor	CSC
	Near the sensitive sites and settlements (as directed by CSC)	Hourly, day and night time noise levels (dB) monitoring using noise meters	Quarterly	Contractor through a nationally recognized laboratory	CSC External Monitor
Surface water quality	At all streams near the bridge construction sites near down stream	Sampling and analysis of surface water quality (TN, TP & TPH - TDS, Cl, HCO_3, DO, Turbidity, pH)	Weekly	Contractor through a nationally recognized laboratory	CSC External Monitor
Groundwater quality	Drinking water quality of workers and at the baseline monitoring stations	Sampling and analysis of groundwater quality ((pH, TDS, Cl, HCO_3, SO_4, Ca, Mg, Na, Coliform)	During well establishment and quarterly	Contractor through a nationally recognized laboratory	CSC External Monitor
Waste Management	Construction camps and construction sites	Visual inspection that solid waste is disposed at designated site	Monthly	Contractor	CSC, RD, External Monitor
Drinking water and sanitation	In construction sites and construction camps	Ensure the construction workers are provided with safe water and sanitation facilities in the site	Weekly	Contractor	CSC, RD

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency	
				Implemented By	Supervised By
Floral and faunal Monitoring	Project area	Survey and comparison with baseline environment	Yearly	RD through nationally recognized institute	CSC, External Monitor
Cultural and archeological Sites	At al l work sties	Visual observation for chance finding	Daily	Contractor	CSC, External Monitor
Reinstatement of Work Sites	All Work Sites	Visual Inspection	After completion of all works	Contractor	CSC, RD, External Monitor
Safety of workers	At work sites	Usage of Personal Protective equipment Monitoring and reporting accidents	Monthly	Contractor	CSC, RD, External Monitor
During Operation and Maintenance					
Surface Water Quality	At all major river sites	Sampling and laboratory analysis	Yearly	RD through nationally recognized laboratory	External Monitor
Groundwater	At the Baseline Monitoring Sites	Sampling and Laboratory analysis	Yearly	RD through nationally recognized laboratory	External Monitor
Air quality	At the baseline monitoring sites	24 hours air quality monitoring of PM, SO2, NO2 and CO	Yearly	RD through nationally recognized laboratory	External Monitor
Noise Quality	At random selection along the approach roads	Hourly, day and night time noise levels (dB) monitoring using noise meters	Yearly	RD through nationally recognized laboratory	External Monitor
Floral and faunal Monitoring	In the Project area	Detailed monitoring plan developed on species assessment.	Yearly	Contractor and RD	External Monitor
Landscape	Along Project alignment	Visual inspection of long-term degradation of natural landscape at land strips and slopes adjacent to road. Development of landslides, rockfalls and other natural hazardous process. Visual Impacts. Change of drainage patterns, erosion and degradation of vegetation	Quarterly	RD	MOE

Table 9-3: Summary of Costs of EMP during Construction and Operation

	Item	Unit	Unit Cost, US$	Quantity	Total Cost, US$
	A) During Construction Stage (4 Years)				
	I. EMP Budget - Contractors Budget				
1	Dust Suppression Measures	LS			100,000
2	Seeding and Sodding of Embankments and Slopes	LS			100,000
3	Plantation development within ROW	LS			100,000
4	Environmental Specialists of the Contractor				Included in civil works
5	Protection of Slopes/Landslides/Rockfall				Included in civil works
	Subtotal of Contractor's Budget (I)				*300,000*
	II) EMP Budget - RD Budget				
1	Archaeological Studies	LS			200,000
2	Land Acquisition and Resettlement				included in LARP
3	Income and Livelihood Restoration Plan				included in LARP
4	Environmental Consultants of CSC (national & international)				included in CSC Budget
5	Training Programs to Environmental Division	LS			200,000
6	Training to Construction Workers, supervisors, contractors	Quarterly	2,000	16	32,000
7	Equipment for Environmental Division	LS			50,000
8	Flora and Fauna Monitoring	Yearly	25000	4	100,000
9	Buffer zoning near nature reserve/ plantation development	LS			1,000,000
	Subtotal of RD Budget (II)				1,582,000
	Subtotal (A) - Budget During Construction				1,910,000
	B) During Operation and Maintenance - 3 Years				
1	Maintenance of Vegetation	Yearly	35000	3	140,000
2	Road Safety Campaign	LS			50,000
	Subtotal (B) - Budget During O &M				190,000
	Grand Total (A+B)				**2,100,000**

Table 9-4: Summary of Costs for Monitoring during Construction and Operation

	Item	Unit	Unit Cost, US$	Quantity	Total Cost, US$
	A) During Construction Stage				
	1. Environmental Quality Monitoring - Contractors Budget				
1	Air Quality Monitoring (5 sites@ 3 times/yr over 4 years)	Site	500	60	30,000
2	Surface Water Quality Monitoring (8 bridges @ 3 times/yr over 4 years)	Site	500	51	25,500
3	Groundwater Quality Monitoring (5 sites@ 3times/yr over 4 years)	Site	500	60	30,000
4	Noise Monitoring (5 sites @ 3 times/yr over 4 years)	Site	100	60	6,000
5	Vibration Monitoring	LS			25,000
	Subtotal '1' - Contractors Budget				***115,000***
	B) Environmental Monitoring - RD Budget				
1	*Wildlife Monitoring Budget*	Yearly	10000	1	10000
	Subtotal '2' - RD Budget				***10,000***
	Sub Total (A) - Budget During Construction				***125,000***
	B) During Operation and Maintenance Stage (3 Years) - RD Budget				
1	Air Quality Monitoring (5 sites@ yearly over 3 years)	Site	500	15	7,500
2	Surface Water Quality Monitoring (5 sites@ yearly over 3 years)	Site	500	15	7,500
3	Groundwater Quality Monitoring((5 sites@ 3 yearly over 3 years)	Site	500	15	7,500
4	Noise Monitoring(5 sites@ 3 yearly over 3 years)	Site	100	15	1,500
5	Flora and Fauna Monitoring	Yearly	25000	3	75000
6	Monitoring for degradation of landscape	Quarterly	1000	12	12000
	Sub Total (B) -Budget during O&M				***111,000***
	Grand Total (A+B)				**237,500**

9.8 Resettlement Action Plan

The road alignment will entail acquisition of 50 registered private plots measuring 104,813 sqm and 108 legalizeable plots measuring 111,815 sqm which in total 158 private plots with area of 216,628 sqm. Although 542 public plots measuring 957,294 sqm will be used by alignment from which 87 plots (282,393 sq m) are temporarily used by illegal users/ squatters and 455 plots (674,901 sq m) will not require for any compensation or other assistance as it is totally free land. Out of the total 158 affected private plots with 216628 sqm land, 131 plots with 191717 sqm land is agriculture/arable; 27 plots with 24911 sqm is residential.

9.9 Landscaping and tree plantation

In the long-term greenery planting and the development of roadside zone will be the responsibility of RDMRDI for the whole length of the Highway.

a) Protection of existing greenery. Clearing the proposed road alignment does not result in extensive loss of trees. Certain sections will result in some tree lose as with the last western interchange where there are a number of oak trees in the alignment which must be removed.

No red data species are represented in the affected area and the trees are not from the State Forestry Fund. The felled trees will be registered and compensated in accordance with the relevant regulations (in particular – "The law Protection of the State Forest Deposits and Greenery Plantation"). Tree felling will be performed only upon preliminary notification to the relevant authority (Regional Services of MoE or Municipal Services).

b) Planting of Trees. Replacement planting of trees will be undertaken as well as being a measure to absorb traffic emissions. Planting will take place along proposed carriageways and interchange access roads.

Tree greenery planting along the road is proposed in three layers: a) The closest to the drainage trench layer consisting of undersized bushes, like dog-rose, barberry, juniper etc. b) The second row (1m from the first one) will include higher-sized bushes and undersized trees, e.g. pomegranate, mulberry, cherry-plum, almond-trees, Japonise sophora (Sophora japonica) etc. c) Third row will be planted at 1,5m distance from the second layer. The third row should be formed by tall trees, like horse-chestnut, platan, acacia, gleditschia, ash-tree, pine-tree, cedar and in some cases – cypress. The seedlings should be 5 years old and height of the tree-plants not less than 1.5 – 2m. Precise estimate of tall trees should be planted, as well as bushes will be done after the exact alignment will be defined. Implementation of the mentioned program will be a good compensation for felled trees and will carry additional protection function (against emissions).

Community health and safety issues should be considered during selection of the three species along the ROW. This should avoid species that will drop branches in storms, obstruct power lines, drains etc.

Tree greenery planting along the road is proposed in three layers: a) The closest to the Planting of greenery should take place after completion of construction activities – at the stage of site reinstatement. A Project for Planting Greenery should be elaborated and implemented by a special contractor. The aforementioned contractor will be subcontracted by Constructing Contractor or directly by RDMRDI. Accordingly the RDMRDI should reflect this requirement in the bidding documentation and the contracts and the cost should be set for this purpose.

9.10 Emergency Response Plan

RDMRDI in conjunction with the Ministry of Interior (Department for Managing Emergency Situations) should put in place emergency response plans and procedures to restrict and contain damages from accidental spills, heavy floods or other hazardous materials. It requires establishing and developing a communication and response system to minimize the impacts of these situations and also minimize the time required to respond to these situations in order to safeguard people, property and environmental resources. Contractor shall submit approved Accident Safety and Hazardous Chemical Spill Management Plan. The plan should also have details of detours in case of emergency.

9.11 Reporting and Feedback Mechanism

Contractor, through the environmental specialist on the team, shall prepare monthly status reports on the EMP implementation. Such reports must carry information on the main types of activities carried out within the reporting period, status of any clearances/permits/licenses which are required for carrying out such activities, mitigation measures applied, and any environmental issues emerged in relations with suppliers, local authorities, affected communities, etc. Contractor's monthly status reports shall be submitted to the CSC and RD.

CSC prepares monthly reports on the status of EMP implementation and environmental performance of the contractor. These reports shall be based on the contractor's reports and their supervision. CSC shall assess how accurate is the factual information provided in the contractor's reports, fill any gaps identified in them, and evaluate adequacy of mitigation measures applied by contractor. CSC must

highlight any cases of incompliance with EMPs, inform on any acute issues brought up by contractor or revealed by supervisor himself, and propose corrective actions.

RD must ensure that monthly reports from the contractor and from the CSC are made available for the Environmental Division of the RD promptly upon their receipt. The RD, through its environmental specialists, shall report annually to the ADB on the status of environmental compliance of construction works. Such reporting shall contain information on all violations identified and the actions taken for fixing of such cases. RD shall inform the ADB on any major environmental issues at any time, independently from the schedule of regular reporting.

After project completion, RD will be in charge of the operation and maintenance of the Project. Environmental Divison of RD is responsible for compliance with the monitoring plan during O&M (Table 9-2).

The RD shall submit the following environmental reporting documentation to the ADB:

- *EIA and EMP Reports.* The reports prepared by the design consultants are to be submitted to ADB for their review and approval.
- *Initial Report* shall be submitted within max 6 month after project start.
- *Annual Reports on EMP Implementation:* The annual reports will include environmental mitigation measures and monitoring activities undertaken, details of monitoring data collected, analysis of monitoring results, recommended mitigation measures, environmental training conducted, and environmental regulatory violations.
- *Project Completion Environmental Monitoring Report:* Three years after completion of construction, the RD shall submit a Project Completion Environmental Monitoring Report to ADB which will summarize the overall environmental impacts from the Project.

The effectiveness of mitigation measures and monitoring plans will be evaluated through a feedback reporting system. Measures required in the EMP will be adjusted, if necessary. The MOEP will play a critical role in this feedback and adjustment mechanism. In particular, the Environmental Inspection (EI) of the MOEP will be responsible for monitoring compliance of the construction activities with the Conditions of Environmental Impact Permit, existence of licenses on quarrying activities, permits on operation of asphalt plants, permits on tree felling etc. The EI may identify and estimate damages imposed by the activities and charge appropriate fines in accordance with the legislation (e.g. damage of topsoil; impact on ichtyofauna etc.).

Feedback and adjustment will be carried out in two tiers. Upon request for EMP modification by the Contractor and RD will review the proposals in detail and consider their acceptance or rejection. Only those modifications will be considered, which do not contradict to the Conditions of the Environmental Impact Permit. RD will consider comments and suggestions from CSC and ADB. Appropriate responses and revisions in the EMP will be implemented, if necessary. The contractor and RD will then implement the modifications.

RD will be responsible for enforcing compliance of contractor with the terms of the contract, including adherence to the EMP. For minor infringements, an incident which causes temporary but reversible damage, the contractor will be given 48 hours to remedy the problem and to restore the environment. If restoration is done satisfactorily during this period, no further actions will be taken. If it is not done during this period, RD will arrange for another contractor to do the restoration, and deduct the cost from the offending contractor's next payment. For major infringements, causing a long-term or irreversible damage, there will be a financial penalty up to 1% of the contract value in addition to the cost for restoration activities.

9.12 Adaptation of EMMP during Implementation

Though EMMP developed for the Project in this EIA report by providing key preventive, mitigatory measures and processes to ensure compliance with safeguards - for a complex Project of present nature, some adaptation/changes are possible during implementation. These changes may not be

known at this stage. In such instances, modifications in the EMMP will be carried out by the CSC or Environmental Division of RD.

9.13 Institutional Strengthening and Capacity Building

Environmental Division in RD is under the Management of Technical Policy of Road Department /Designing. The Resettlement Division is located under the Division of Road Development and Resettlement. The staff positions and name of the staff in the both these divisions are

- Environment
    - Head of the Division – to be recruited Zurab Lebanidze
    - Chief Specialist in Project Analysis field - Luiza Bubashvili
    - Chief Specialist- Maia Jagashvili
    - Chief Specialist/in monitoring field - Gia Sofadze
    - Specialist – to be recruited

It is recommended that RD should hire all the positions before starting the Project. To further strengthen the monitoring and compliance to environmental issues recommended in the EMMP, the following specialists are recommended for Contractors and CSC to be hired under the Project.

- Construction Supervision Consultant:
    - Environmental Specialist – International
    - Occupational Health and Safety Engineer - International
    - Environmental Specialist – National
    - Occupational Health and Safety Engineer - national
    - Social and Resettlement Specialist – International
    - Social and Resettlement Specialist – National

- Contractor:
    - Environmental Specialist
    - Occupational Health and Safety Specialist

- External Monitoring Consultants:
    - Environmental Specialist
    - Social and Resettlement Specialist

A series of capacity building programs are proposed for both the social and environmental division through continuous and oriented trainings on

- Social &Environmental issues of the Project
- Social &Environmental laws & regulations, norms, procedures and guidelines of Government and ADB
- Environmental &Social safeguards, their importance and benefits
- Preparation of EIA such as screening and/or scoping and adequacy of impact assessment, EMP provisions, Costing etc.
- Preparation of LARP.
- Preparation of ToR, and other documentation
- Preparation of Environmental and Social covenants in loan agreement
- GIS, MIS, database management Methods of sampling and testing various environmental parameters (all test procedures),
- Disciplines like Environmental Management, Sustainable development, Environment Economics, Environment Auditing etc.
- Behavioural Sciences

- Some of the senior representatives should receive environmental and social safeguard training under a recognized program (national and/or overseas).

Roles and responsibilities of various agencies for implementation of EMMP are given in Annex 9-2

10. CONCLUSIONS AND RECOMMENDATIONS

The updated EIA for Kobuleti Bypass Road has been prepared to ensure that the Project is environmentally sound and sustainable as well as in compliance with the safeguard requirements of the ADB (Safeguard Policy Statement, 2009) and Government of Georgia (The Laws on Licenses and Permits, 2005; Environmental Impact Permits and Ecological Examination, 2008) and will be submitted to the Ministry of Environment Protection (MOE) to obtain Environmental Impact Permit.

The present EIA reveals that there will be both negative and positive impacts due to the construction activities and normal operations of the bypass roads. Recommendations are made to mitigate expected negative environmental impacts with adequate funds provided to cover environmental monitoring and mitigation cost.

The major positive impact of the Project will be less air pollution and dust, less congestion, and improved traffic safety in the existing road, and better accessibility. Additional positive impacts are the increased growth in the economy of the region, substantial income and employment opportunities, improved living conditions, reduced poverty, and better access to village produce.

Potential negative impacts are 28.3 ha of land acquisition and relocation of 179 nos. households, affected of 3 nos. commercial structures/shops, loss of crops in 26.6 ha of agriculture land, loss of 12985 nos. productive and 256 non productive fruit trees, impacts on flora and fauna, changes in land use and resulting damage potential of geohazards, borrow pits and quarry sites. Construction related activities will have impact on the natural drainages, generation of excess materials, noise and air pollution and road safety.

Road safety will be improved by stabilizing unstable batters and installing road safety barriers including proper traffic engineering signs and display boards. Soil erosion and rock falls will be minimized after Project completion. Landslide, critical side slope and unstable batters will be protected by retaining structures. The contractor will prepare a spoil and waste disposal plan in consultation with MOE and submit to RD for approval. Quarries and borrow materials will be collected from the pre-approved sites and will be properly restored after the extraction of materials. A land acquisition and resettlement plan was developed to compensate the affected population.

Construction works will generate a number of short time negative impacts on the environment. The temporary construction works could create more impacts than the activities related to the permanent works. For this reason, environmental management and monitoring program is developed for both temporary and permanent works covering construction and operation stages and is estimated to cost US$ 2.1 million.

Proper and timely implementation of various provisions of the EMP in terms of mitigation measures, monitoring and capacity building will minimize adverse environmental impacts due project construction and operation. To ensure that adverse impacts due to project implementation will be adequately addressed, the tender and contract documents for civil works for the entire project (ADB and JICA sections) shall include the EMP. Regular monitoring and reporting on the status of EMP implementation shall be undertaken to ensure that mitigation measures are implemented as required and to allow for formulation and implementation of corrective actions, as necessary.

Environmental Consultants of Construction Supervision Consultants are responsible for monitoring of implementation of EMP and ensure compliance. Environmental Division of RD is also responsible for supervision of construction works and compliance to EMP in coordination with supervision consultants and hiring of external/independent monitoring consultants. Capacity building programs are proposed to strengthen the capacity of the Environmental Division.

The Project will have overall beneficial impact as well as some negative impacts that will be carefully monitored and adequately mitigated. Therefore, the completion of this EIA fully meets the MOE and ADB requirements and submitted to MOE to obtain EIP.