DOCUMENT NUMBER	GD-EIA-3000-GE-GR-0020-1

PREPARATION OF DETAILED DESIGN FOR NEW CONSTRUCTION OF BORITI-SHOROPANI SECTION (E60 HIGHWAY ROUTE), BIDDING DOCUMENTS, ENVIRONMENTAL IMPACT ASSESSMENT AND DETAILED LAND ACQUISITION AND RESETTLEMENT PLAN

SECTION F3
Non Technical Summary

01	**May 2018**	**FINAL SUBMISSION**	**Consultan**	**Team Leader**	**Project Director**
			Cons	**TL**	**PD**
00	**March 2018**	**ISSUED FOR APPROVAL**	**Consultan**	**Team Leader**	**Project Director**
			Cons	**TL**	**PD**
Rev.	Date	Issues description	Prepared	Checked	Approved

1. Introduction

This Environmental Impact Assessment (EIA) is part of the process of compliance with the Asian Development Bank (ADB) Safeguard Policy Statement (2009) and European Investment Bank (EIB) Statement of Environmental and Social Principles and Standards (2009) in relation to the construction of Section F3 of the new Khevi-Ubisa-Shorapani-Argveta section of the E60 Highway, or more simply, the "Project".

The EIA provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental effects associated with the project. More specifically, the EIA:

- Describes the existing socio-environmental conditions within the Project area;
- Describes the project design, construction activities and operational parameters;
- Describes the extent, duration and severity of potential impacts;
- Analyzes all significant impacts; and
- Formulates the mitigation actions and presents it all in the form of an Environmental Management Plan (EMP).

Based on the existing ADB Environmental Safeguards Policy (2009), this Project falls under ADB's project Category A. EIB require the EU EIA Directive to be followed. This Project falls within Annex 1 of the Directive which requires an Environmental Impact Assessment.

2. Project Background

The Government of Georgia is endeavoring to make Georgia a regional and logistics hub and more attractive for businesses. The East West Highway (EWH), stretching 410 km from Sarpi on the Black Sea, at the border with Turkey, through the center of the country to the capital Tbilisi and on to the border with Azerbaijan, is the main inter-regional and international route between western and eastern Georgia, as well as its neighboring countries. Representing about 2% of Georgia's road network and one fourth of its international roads, the EWH serves 8,000 to 10,000 vehicles per day and carries over 60% of the country's international trade. The EWH will be an integral part of one of the six key CAREC corridors providing the shortest transit link to connect Central Asia with Europe and East Asia.

In light of the traffic growth on EWH, the high percentage of truck traffic, and the difficult terrain and resulting geometric profiles, capacity expansion of the current 2-lane mountainous section between Chumateleti and Argveta is crucial to realizing full potential of the EWH with improvements to the highway either completed or underway on each side of this section.

Therefore, the Government has requested the Asian Development Bank (ADB) and several other development partners to finance the remaining bottleneck sections (Chumateleti - Argveta) on the EWH. A feasibility study financed under a World Bank project for the Chumateleti Argveta section (comprising four sections F1 through F4) of the EWH was completed in 2015. The detailed design of Section F1 and F4 has been completed and selection of the construction Contractor is on-going. Detailed design of sections F2 and F3 is now on-going and this report forms the EIA for detailed design phase of section F3 which will be followed by section F2.

3. Project Description

The Project involves construction of a new road section of the E-60 highway located in Imereti Region of central Georgia (see Figure 1). Section F3 forms the Boriti - Shoropani

portion of the Khevi-Ubisa-Shorapani-Argveta section of the E-60. The length of the Project road is 13.0 kilometers.

Figure 1: Road Location Map

The Projects geometric design standards have been selected based on traffic flow, road category and relief to ensure safe and unimpeded traffic flow. The road design is based on Georgian National Standard SST 72: 2009 “Standard on Geometrical and Structural Requirements for the Public Motor Roads of Georgia” and TEM (Trans-European North-South Motorway) Standards.

The main technical parameters adopted in the detailed design are as follows:

- Design speed - 100 km/h;
- Number of traffic lanes – 4;
- Width of traffic lane - 3.75 m;
- Width of each carriageway - 7.5 m;
- Width of paved shoulder (emergency lane) - 2.5 m;
- Width of verge – 1.0 m;
- Width of central reserve- 5.0 m;
- Width of paved shoulder at the central reserve - 1.0 m;
- Total width of each paved platform – 11.0 m
- Width of road bed - 27.0 m;
- Carriageway cross-fall on straight sections - 2.5%;
- Minimum radius of horizontal curve - 400 m;
- Maximum longitudinal gradient - 4%;
- Minimum convex curve - 15 000 m;
- Minimum concaved curve - 15 000 m.

Thirty five bridges will be constructed during the project works. The total length of the bridges is 6,295 meters, the longest of which is 1,182 meters. The bridges are grouped into the following main typologies:

- Steel-concrete bridges – 14 bridges: maximum span length up to 60 m.
- Precast concrete bridges – 13 bridges: maximum span up to 33 m

Nine tunnels will be constructed with double tubes with total length of 13,860 meters lengths from 251 m to 1,625 m.

To construct the roadbed in the project section concrete retaining walls and reinforced concrete support structures will be required on several sections due to the difficult relief conditions of the project section.

There are two interchanges planned in F3 Section.

The following types of culverts will be constructed:

- Underpasses for rural roads, which are construction of cast in situ reinforced concrete structures of closed contours cross sections 6.0x4.5 m - for passing rural roads is envisaged in the design.
- Cattle passes, which ensure cattle cross the project road. Construction of cast in situ reinforced concrete structures of closed contours cross sections 4.0x2.5 m - is envisaged in the design.
- Culverts, for which cast in situ reinforced concrete culverts cross section 2.0x2.5 m -, 4.0x2.5m - is envisaged in the design to provide water discharge from ravines and canals.

Underpasses and overpasses will be constructed using reinforced concrete culverts.

Two different pavement structures will be used:

- Concrete pavement structure for the motorway and interchanges; and
- Asphalt pavement structure for all Slip Roads and all Minor Roads and bridges.

4. Alternatives

The “No Action” Alternative in this instance is defined as a decision not to undertake the proposed construction of the Project Road. The “No Action” Alternative would result in the continued deterioration of the road, bridges and drainage structures along the RoW, thereby impeding the economic development of the Project Area and the Imereti region. All positive benefits would be foregone. The relatively minor, less than significant environmental impacts (such as noise and short-term air quality impacts due to maintenance activities) and inconveniences (such as traffic diversions) would be avoided in the short-run. In the long run, however, the steadily declining state of the roadway would severely hamper economic development in the area. In light of these considerations, the “No Action” Alternative is deemed to be neither prudent nor in the best interest of Georgia or those with an interest in, and attempting to assist restoration of, Georgia’s well being.

Given the complex topography of the region and Georgia in general, there are no other feasible alternative corridors that would be able to compete with the existing corridor in terms of travel times. In addition the Project forms part of the overarching program to upgrade the E-60 motorway which includes many sections that have recently been upgraded, or are in the process of upgrading (or detailed design), including the sections of road joining the start and end points of the Project road.

As noted above, the Project forms part of a program upgrading the E-60. The Khevi – Argveta section of the E-60 (including section F3) is one of the last remaining sections of the road requiring upgrading. Accordingly, the Project is focusing on the upgrading of the E-60 and will not consider any other transport mode as an alternative.

During the Projects Feasibility Phase a number of alignments were considered that broadly follow the existing E-60 corridor. The result of the Feasibility Report was a draft final corridor which the detailed design would use as a basis for the final road alignment (horizontal and vertical). During the detailed design phase a number of factors were taken into account to determine the final alignment, they included the consideration of potential resettlement issues and social aspects such as access and noise.

Only one pavement type was considered for the main pavement; rigid concrete mainly due to the fact that concrete pavements are already constructed on preceding sections of the E60 Highway. Asphalt pavement structure will however be used for all Slip Roads, bridges and all Minor Roads and bridges.

Several locations were identified for the disposal of spoil material from cuts and tunnels. Four locations have been considered as potential location for of spoil material. The location originally proposed, Kutaisi bypass, has been eliminated due to a lack of space for all of the material and the costs of transporting the waste to the site as well as environmental considerations of a huge amount of truck journeys through Zestaphoni. Three other potential locations closer to section F3 were screened to determine the potential environmental impacts of these areas. Two of these areas have been eliminated based on the fact a large number of trees would need to be felled in these areas. The remaining site, close to Boriti, is considered a possible option for the disposal material given the large volumes of spoil to be generated by the Project. **Section C.6 – Alterative Spoil Disposal Locations** discusses this issue further.

5. Description of the Environment

The Project area is located to the west of the Likhi Range which connects the Greater and Lesser Caucus Mountains. The Project corridor is set within a landscape of mountains and rolling hills. The existing road is located within the bottom of the river valley, elevation varies between 200 and 300 meters above sea level.

Generally, the landslides do not affect the project alignment except for two mass movements that have been identified at around KM1.4 to KM1.6 and at KM6.4. The first one affects TUN 3.0.01-TA/AT and caused the realignment of the tunnel in order to have its western portals outside the landslide area. The second smaller one affects the western abutments of BRI 3.1.06-TA/AT and the eastern portals of TUN 3.0.05-TA/AT. According to the Seismic Hazard Map of Building Norms and Rules effective in Georgia the study area is located in the 8-point earthquake zone (MSK 64 scale).

Annual precipitation in Zestafoni (nearest weather station) is around 1,200 mm. Rainfall is highest in the Winter, Autumn and Spring, although rainfall can still be observed during the hotter summer months. The monthly temperature for Zestafoni which ranges on average, from 5 °C in the winter months to around 25 °C in the summer. The dominant wind direction is from the east. However, strong winds from the west are also experienced quite frequently.

A climate risk and vulnerability assessment was prepared by ADB as part of the overall Project. The assessment concluded that the number of hot days (above 25ºC) is anticipated to increase and mean precipitation will decrease by 4.5% by 2050. The number of days with

heavy rainfall will also increase while annual river run-off is anticipated to decrease by 13%. The assessment also indicated that the Project area is in a high-risk range for landslides.

Within the Project area the main sources of air emissions are from transport, including vehicles on the existing Project road. Air quality monitoring was carried out at six different locations during early 2018 to characterize the current air quality within the Study Area. The results of the ambient air quality monitoring show that in all instances the parameters monitored were below national, and where applicable, IFC standards. The most noticeable factor was the higher levels of PM recorded at the first four monitoring stations which are adjacent to the existing road. This suggests that these levels PM_{10} and $PM_{2.5}$ are attributable to vehicle movements on the existing road.

The main river in the Project area is the Dzirula. The river heads at 1,252 m above sea level where several brooks merge on the western slopes of Likhi Range and flow into the river Kvirila from its left bank. The length of the river is 89 km, its total fall is 1,052 m and the area of its catch basin is 1,270 km^2. The river comprises 1,386 tributaries with the total length of 1,677 km. Within the Project area the main tributaries are; 1) Chkherimela River; 2) Macharula River; 3) Gezrula River; and 4) Khelmosmula River.

To assess the status of water quality in the Project area, including the Kvirila and Dzirula rivers, monitoring of surface water was undertaken in March 2018. The results of the monitoring exercise show that the Dzirula river meets the national Maximum Allowable Concentrations (MACs) for surface water quality.

The project road crosses the natural forest areas, agricultural land plots, hilly forest slopes, residential areas and riparian ecosystems. Due to anthropogenic impact in the main part of the area natural vegetation is lost to agricultural and other development. In these areas arable lands and pastures have developed. Some of the animal species typical for the area moved to other areas in search of a safe shelter. Over the time the fauna of the region has changed significantly. Animals currently found in the area of interest are mainly presented by those species that live in forested areas and/or can tolerate presence of humans.

According to available information there are three species considered as vulnerable in Georgia (Georgian Red List) that may be found within the Project area, the Otter (Lutra lutra) and the Caucasian squirrel (Sciurus anomalus) and the Mediterranean turtle (*Testudo graeca* Linnaeus). Site surveys did not reveal the presence of squirrels or turtles in the Project area. In addition, the review of the habitat along the alignment indicates that it is not optimum for existence of the Caucasian squirrel. Site surveys undertaken by local ecologists did not reveal evidence of otters in the Project area, such as otter holts or spraints. However, anecdotal and photographic evidence provided by the ADB for the F2 section EIA did show that otters are present within the F2 Project area, notably at the confluence of the Rikotula and Dzirula rivers. This suggests that otters may also be present within the F3 Project area.

The nearest protected area in the region is the Borjomi Nature Reserve which is located more than 15 kilometers south of the Project road. The nearest Important Bird Area (IBA) to the Project road is the Adjara-Imereti Ridge more than twenty kilometers south of the Project road.

The Project road is located within Zestaphoni and Kharagauli Municipalities within the Imereti Region. The main urban areas within the Project area include Boriti, Ubisa, Shrosha, Dzirula and Achara.

According to the most recent census data (2014), Imereti has a population of 533,906 which is a significant decrease from the 2002 census when the population was recorded as 699,666. The population of Zestafoni was 58,401 in 2014 of which the majority was

classified as rural population. The population of Kharagauli was much smaller (19,473) the majority of which is also classified as rural and only 1,965 as 'urban'.

According to data provided by the RD, during the period 2012 – 2016 there were 2,713 collisions, 471 persons killed and 4,913 persons injured spread over the E-60 corridor, from km 18 to km 302 (284 km in total, from Tbilisi to Khobi) with some notable cluster locations. In other words, it means 1 collision every 16 hours, 1 person killed every 4 days and 1 person injured every 9 hours. Focusing the analysis on the Khevi – Argveta section, 351 collisions, 78 persons killed and 648 persons injured. Finally, along the F3 section 115 collisions occurred, with 23 persons killed and 226 persons injured.

The social survey undertaken as part of this Project found that 11.4% of those interviewed had a very low income such as 300 GEL per month. 21% declared an income between 305 and 600 GEL, while only 3.2% reported an income between 605 and 100 GEL. The confirmation about the results can be matched with the fact that almost 20% of those interviewed declared an income derived from a pension, only 21% from a regular salary and 9.5% from an owned business.

Two educational facilities are located within the Project area. Boriti school is located adjacent to the existing road and new alignment at KM0.0. Shrosha school is located adjacent to the existing road, but more than 450 meters from the new alignment.

Viticulture is the main economic activity in the municipality of Zestaphoni providing 80% of agricultural output. Its development is supported by favorable soil-climatic conditions. Agricultural land plots cover 7,027 ha of the municipality or 46% of the whole territory. 5,159 ha out of the above-mentioned area are arable lands. 1.5% of the total area of Kharagauli municipality is used for agricultural purposes. 70.9% of this territory is occupied by pastures and 29.1% is used for ploughing and sowing, annual crops grow over 22.5% of the area, permanent plantings grow over 11,5% and perennial plants grow over 6,6% of the area. Kharagauli municipality is the leading municipality of bee-keeping in Georgia. No significant industrial activities are present within the Project area. A popular pottery / ceramics market is located adjacent to the existing road close to Shrosha.

Tourism plays an important role in the economics of the Kharagauli, with Borjomi-Kharagauli National Park and Nunisi resort being popular destinations. Zestaphoni is not considered an important or significant area for tourism and recreation. A recent study of foreign visitors to Imereti region indicated that less than 2% of the visitors visited Zestafoni for recreation or vacation.

The road network in the Project area is dominated by the existing E-60 which links Tbilisi with Batumi. Numerous local roads feed onto the E-60 in Zestafoni, and these roads vary in condition from good to very poor. The main line from Tbilisi to Batumi runs close to the Project road (within 200 m) from around KM 11.4 until the end of the road. The Project road crosses the rail line once at KM 12.0. Georgian Railways own and operate the rail services in Georgia. There are two live lines on the route within the Project area, one on a higher elevation and one on a lower elevation. The line on the higher elevation operates 4 trips per day, the lower line accommodates approximately 40 journeys per day.

Previously there was a landfill site in Zestafoni adjacent to Kvaliti village. The area of the site was 2.2 hectares and received 15,000 m^3/year of waste. However, the Solid Waste Management Company of Georgia closed the Zestaphoni municipal landfill in 2016 due to the fact that it was overloaded. Kharagauli Municipality previously used Boriti landfill located in Boriti Village. The landfill was put into operation in 2005 but is currently closed. As such there appears to be no landfill within the Project area for hazardous and non-hazardous waste.

Within the Project area a number of physical cultural resources (PCR) have been identified including St Georges Monastery in Ubisa. None of the identified PCR, including the monastery is within close proximity of the Project road itself, with the exception a religious monument located at KM0.5 within 20 meters of the new alignment, close to Bridge BRI 3.1.02-TA.

Vibration values in the Project area are currently too low to cause any structural or cosmetic damage and/or cause nuisance of the residents. According to the national standard the values are ranked as weak and non-perceptible. The results of the ambient noise monitoring show that the noise levels next to the existing road are currently elevated above IFC and national standards in all but one out of the thirteen samples. In addition, a noise model of the baseline noise levels was also prepared. The model shows that ambient noise levels are generally above IFC standards, with only nine of the fifty modeled receptors being below the standards.

6. Impact Identification

The following provides a summary of the potential impacts associated with the roads:

Design / Preconstruction Phase

Air Quality – lack of foresight in the siting of construction camps, rock crushing plants and concrete batching plants in the pre-construction phase could lead to significant air quality impacts in the construction phase, especially to sensitive receptors.

Soils – Productive soils can also be impacted without due consideration of their value when locating access roads, camps, plant, etc. Soil erosion can also occur on embankments and around structures if adequate consideration of this issue is not taken into account in the design phase.

Three petrol stations were noted within the Project corridor. All of these petrol stations will need to be demolished to make way for the new alignment. Two of the petrol stations are located beneath the new alignment below bridges and as such structural demolition will be limited to above ground structures thereby eliminating the requirement for any significant excavation of soils and the removal of any underground storage tanks (UST). Any above ground storage tanks (AST) will need to be removed as hazardous waste. Partial excavation of soils from the area around the petrol stations will be required to construct bridge piers. The remaining petrol station will need to be demolished in its entirely and it is likely that any AST/UST at this site will need to be removed. Contaminated soils and water may be encountered around fuel dispensers, piping, and tanks during excavation. Depending on the type and concentration of contaminants present, small quantities of soils or liquids may need to be managed as a hazardous waste.

Landslides - Generally, the landslides do not affect continuously the project alignment, except for two mass movements that have been identified at around KM1.4 to KM1.6 and at KM6.4. The first identified landslide area at TUN 3.0.01-TA/AT resulted in the realignment of the tunnel in order to have its western portals outside the landslide area. The second smaller landslide affects the western abutments of BRI 3.1.06-TA/AT and the eastern portals of TUN 3.0.05-TA/AT. The Bridge piers will be constructed on piles that will eliminate impacts to the bridge, while the tunnel portal will be strengthened for a distance of 6 meters to ensure the landslide does not affect the tunnel.

Seismicity - The Detailed Design Consultants have experience of designing roads in seismically active areas and have ensured that all designs are compliant with the relevant seismic standards of Georgia.

Land Use - As the road involves construction of an almost entirely new alignment land acquisition and resettlement could be anticipated to be extensive. However, the approach to design the road bypassing most residential areas and the construction of numerous tunnels reduces the level of resettlement and compensation that would otherwise be expected if the existing alignment was being upgraded.

Hydrology - During design, all drainage works have been 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. Accordingly, failure of structures is not anticipated.

Health safety – Failure to incorporate a full range of safety measures into the road design may result in accidents and even deaths on the road, especially close to schools.

Construction Phase

Air Quality - During construction of the road, air quality may be degraded by a range of operational activities including; exhaust emissions from construction machinery; open burning of waste materials; and dust generated from haul roads, unpaved roads, exposed soils, material stock-piles, etc. This can lead to health impacts to locals and impacts to ecology and crops.

Soils - Potential soil contamination is a possibility in the construction phase resulting from poorly managed fuels, oils and other hazardous liquids used during the project works. It is also possible, that without adequate protection measures soil erosion could occur on road and bridge embankments.

Surface Water – Impacts to surface water and groundwater could occur through improper operation of construction camps, asphalt plants, etc. Poor construction management around bridges and close to surface watercourses could also lead to pollution incidents. Without due care temporary drainage structures may also fail, or get obstructed with construction debris, leading to flooding of property and access roads. Technical water may be sourced from the Dzirula river. The required amount, potentially 200 m^3 per day (0.002 m^3/s) is insignificant given the flow rates of this major river.

Groundwater – Impacts to groundwater include spills and leaks of hazardous liquids used at construction sites and camps and potential impacts to groundwater resources during tunnel construction (discussed in more detail below).

Bridge Construction - Bridge construction activities may increase silt load in the river during construction at bridge sites and may result in accidental spillage of concrete and liquid waste into the river. This may impact upon the ecology of rivers and aquatic wildlife.

Flora & State Forest Fund – A number of trees will need to be cut within the Project area, both on private land and within State Forest Fund areas. In addition, other trees (potentially including Georgian red-listed species) are located adjacent to the boundary of the site and may be damaged accidentally by construction works. A total of 9,709 trees greater than 8cm in diameter have been identified in State Forest Fund areas. Of these, 657 are Georgian Red-listed species. The trees cut in these areas will need to follow the procedures for de-listing, cutting and removal as described below. Trees that will be cut located on private land will require compensation to be paid to the landowners. The compensation will be made according to the Project LARP.

51. Biodiversity – A range of Project related activities may have negative impacts upon fauna in the Project area, including site clearance, pollution and waste generation, light pollution and a lack of regulation. These activities may degrade habitat and impact significantly upon wildlife in the Project area. Site clearance carried out for the Project will result in loss of habitat that is presently being used by wildlife. Impacts to habitat were unavoidable given the constraints of the Project corridor and the need to design a safe road to a modern standard. It is estimated that approximately 33 hectares can be classified as natural habitat within the Project buffer – all of the land in this area will be cleared for construction works. Almost all of these areas comprise the State Forest Fund areas that will be de-listed as per the national requirements outlined in this report. Approximately 19 hectares of SFF will be de-listed, including 9,709 trees over 8cm in diameter.

Protected Areas - The nearest protected area, Borjomi Nature Reserve, is located more than 15 kilometers south of the road and will not be impacted by Project works.

Infrastructure - The main impacts resulting from Project works will be road diversions and some temporary blocking of access routes. However, the road has been designed in a way so that it has relatively little impact upon the existing road, or other local roads due to the fact that it is a new alignment often passing through tunnels and over bridges. In some locations road closure will be needed and may occur for periods between one and two hours and as such is not a significant issue as long as the local population are given notice of the delays and suitable detours are provided. The new alignment also crosses above and adjacent to the existing railway line at a couple of locations. The bridge works above the railway line at KM12.0 may cause specific issues due to its close proximity to railway.

Utilities - Medium and low voltage power lines, water supply and gas pipes are located within the Project corridor. It is possible that these utilities will need to be temporarily removed during construction.

Waste - Road construction will inevitably generate solid and liquid waste products including inert waste (e.g. concrete, wood, plastics, etc.) and hazardous waste (e.g. waste oils, batteries, etc.). In addition, uncontrolled discharges of sewage and 'grey water' (e.g. from washrooms and canteens) from construction sites and worker's camps may also cause odors and pollute local water resources.

Tunnel & Embankment Spoil Material - A large volume of spoil material will be generated from the tunneling works. Estimates provided by the Detailed Design Consultant indicate that as around 1,510,000 m^3 of spoil material will be generated from the tunnels, 278,000 m^3 from tunnel portals, 400,000 m^3 from local roads / interchanges / bridges and 1,247,000 m^3 from cut in side slopes. Where practical the spoil will be re-used as embankment material at the Project site. Estimates indicate that approximately 516,000 m^3 can be re-used as embankment material, which would leave approximately 2,919,000 m^3 as static balance.

The average journey distance to transport the spoil material from tunnels to the embankment areas may be around 5 kilometers. To transport material to the embankment areas approximately 28,000 return truck journeys will be required (based on 12m^3 of material in each truck), or an average of 31 a day over the 30 month construction period.

Construction Camps - Construction camps constitute a temporary land use change and raise issues related to activities such as impacts to air quality; poor sanitation arrangement and improper methods used for disposal of solid wastes and effluent; and transmission of communicable diseases to the local people by the construction workers due to inappropriate health monitoring facilities.

Tunnel Construction - The main typical environmental problems linked to the construction of underground works are; a) Triggering of surface settlements, structures collapses and slope instabilities, b) Drying up of springs and groundwater alterations, c) Storage and use of excavated materials, d) Noise, e) Vibrations, f) Pollution of groundwater, mainly after the realization of stabilization works by injections.

Community Health and Safety – Construction activities may result in an increase in road traffic accidents between vehicles, pedestrians and vehicles and livestock and vehicles. There will also be short term impacts to noise and air quality, which may impact upon health. Migrant workers may also increase community health and safety risks, for example, through the spread of sexually transmitted diseases.

Occupational Health and Safety - Workers' rights including occupational health and safety need to be considered to avoid accidents and injuries, loss of man-hours, labor abuses and to ensure fair treatment, remuneration and working and living conditions.

Landscape - The Project Area largely consists of valleys with large trees and bushes of heights greater than 2 m. The hilly landscape greatly restricts visibility to a less than one km at receptor locations. The construction phase visual impact will be local and temporary. The activities during construction that will affect the aesthetics of the area include excavation, and storing of material in stockpiles and dumping at the waste disposal areas. The elevated interchanges and retaining walls in some sections may also have an aesthetic impact.

Physical and Cultural Resources - No physical cultural resources have been identified within the Project corridor that are likely to be significantly impacted by Project works with the exception of the religious monument located at KM0.2.

Noise - The potential noise related issue during construction of the project is disturbance to sensitive receptors in the Project area. The main sources of noise and vibration during construction of the project included; a) Construction machinery, b) Drilling activities, c) Haulage and general vehicle movements, d) Concrete mixing and aggregate production systems; and e) Construction Camps / Ancillary Facilities.

Vibration - Vibration from the construction activities is a cause for concern to the community. The effects of vibration varies and depends on the magnitude of the vibration source, the particular ground conditions between the source and receiver, presence of rocks or other large structures in the area. The intensity, duration, frequency and number of occurrences of a vibration all play an important role in both the annoyance levels caused and the strains induced in structures. It is possible that construction works will impact upon structures within the Project area, potentially causing cosmetic damage.

Operational Phase

Air Quality – The main source of air pollution during the operational phase will be vehicles moving on the highway. The main pollutants are: CO; NO_X; hydrocarbons (HC); SO_2; carbon dioxide (CO_2); and particulate matter (PM). An air dispersion model was prepared for this EIA to assess the potential operational impacts of the road on air quality in the future. The analysis of the impact on operational phase air quality determined by the traffic on the new road suggests that there are no negative impacts on the environment.

Climate Change - The climate risk and vulnerability assessment classified portions of the Project according to the risk of them being affected by climate change. Bridges, tunnels, cut sections and drainage structures were deemed to be at high and moderate risk from climate change. Road surface, road embankments, road base and interchanges were deemed to be at low risk from climate change. All of the items identified have been assessed by the

Detailed Design Consultant and none of the issues identified are considered to represent a significant risk given the design measures already included as part of the Project.

Hydrology – In rare circumstances there could be a major spill of oil / fuel from tanker trucks. Such spills could impact significantly on the Dzirula and Rikotula rivers given the proximity of the road to these surface water courses in many locations along the alignment. Drainage of run-off from bridge decks could flow directly to the rivers if correct drainage is not installed on the bridges. This could be a problem if the bridges have accumulated oils and grease during dry periods and they are suddenly washed out during heavy rainfall.

Employment and Businesses - Although the existing road will remain open for almost its entire extent and interchanges will be constructed to access the existing road from the new alignment, it is likely that a number of roadside market traders will be impacted by the reduced traffic levels on the existing road, including the pottery and ceramics traders around Shrosha.

After the Project construction phase many local workers may be without employment. However, the Project will have provided them, in many instances, with additional skills and experience to work on similar projects in other locations.

Health and safety – Rehabilitation of the road will result in numerous beneficial health and safety impacts, including; reduced dust levels, faster emergency response times; improved pedestrian crossing facilities and improved road geometry. However, higher speeds on the road could give rise to more traffic accidents, especially as speeds increase along with vehicle numbers.

Visual Impact - Cut slopes, embankments, concrete bridges and tunnels will have an impact on the landscape within the valley throughout the Project lifecycle. The mitigation measures outlined above may go someway to enhancing the aesthetic value of the Project especially as vegetation grows back around construction zones, and in all likelihood any negative opinion of the new road in terms of visual impact will decrease over time as people get used to the altered landscape.

Noise – A noise model developed for the EIA shows that there are many locations where IFC guideline limits for daytime and nighttime noise would be exceeded in 2037 given the predicted increase in traffic over this period. There are also many locations where the predicted noise is more than 3 decibels above the modeled ambient. The model also shows that noise abatement, in the form of a 4 meter high solid noise barrier can reduce noise levels, but in some instances, even with the noise barrier the road noise still exceeds IFC guideline limits.

Vibration - Highway traffic is not likely to have any measurable impact on the structures or on comfort.

Induced Impacts – It is possible that construction of the new road could induce development along the corridor to some extent, but in general the purpose of the Project is to improve the existing E-60 corridor to provide safer and quicker journey times which will help facilitate the movement of people and goods locally and regionally. It is considered unlikely that significant new commercial, industrial or residential developments would arise along this portion of the corridor as a result of the Project that in turn may lead to; a) conversion of agricultural land, b) Increased population living within the corridor which may lead to stress on social services, such as schools, hospitals, etc, b) Required upgrading or expansion of utilities, such as electricity supply, and c) Stresses on water availability, specifically groundwater. It is also noted that the Project does not increase accessibility to forests.

7. Mitigation and Management Actions

The summary mitigation measures for the potential impacts identified above for the Roads include:

Design / Preconstruction Phase

Site Specific Environmental Management Plan – To ensure that all of the potential mitigation measures are applied during the construction phase, the Contractor shall be responsible in the pre-construction phase for the preparation of his Specific Environmental Management Plans (SEMP). The SEMP will also include the following plans:

- Topic Specific Plans:
    - Waste Management Plan.
    - Spoil Disposal Plan for Arrangement of Spoil Disposal Area.
    - Re-cultivation Plan.
    - Traffic Management Plan.
    - Occupational Health and Safety Plan.
    - Emergency Response Plan.
    - Air Quality Plan.
    - Spill Response Plan.
    - Vibration Monitoring Plan.
    - Clearance, Re-vegetation and Restoration Management Plan.
    - Groundwater Management Plan.
    - Tunnel Blasting Plan.
    - Noise Management Plan.
    - Biodiversity Management Plan.
- Site Specific Plans:
    - Construction Camp Plan.
    - Asphalt Plant Plan.
    - Rock Crushing Plant Plan.
    - Concrete Batching Plant Plan.

The Construction Supervision Consultant (forthwith known as the 'Engineer') shall be responsible for reviewing and approving the SEMP and its associated plans.

Permits – The Contractor shall be responsible for obtaining all of the required environmental permits prior to the start of construction. All permits will be reviewed by the Engineer before construction work commences.

Siting of Facilities – Locations for rock crushing facilities, concrete batching yards and asphalt plants will require approval from the Engineer, MoEPA and the RD during the Pre-construction phase. Efforts will be made to ensure that these facilities are as near to the Project road as practical to avoid unnecessary journeys and potential dust issues from vehicle movements during construction works on unpaved roads in urban areas. Haul routes will be prepared and submitted to the Engineer as part of his Traffic Management Plan (TMP). To prevent impacts arising from asphalt plants, construction camps, batching plants and rock crushing plants, they will be prohibited within 500 meters of any urban area or sensitive receptor (school, hospital, etc).

Air Quality - To adequately manage air quality impacts the Contractor will be responsible for the preparation of an Air Quality Plan.

Soils – Removal operations of any USTs, ASTs, and connected piping should include the procedures recommended in this EIA by the World Bank Group including removal of any hazardous waste for disposal at a licensed facility.

Bridge Design - The bridge designs considered where possible, to avoid placing bridge piers in rivers. However, it is important to point out that the Project road is located in a complicated orography (a narrow valley with a central river) and that the geometric standards of the route have imposed strong constraints that oblige to pass over the river, to have no greater environmental impact on forests or populated areas. Bridge designs will ensure that drainage from bridge decks over 50 meters do not discharge directly to the watercourses beneath the bridges. Discharge waters will lead to an oil/grease interceptor tank or filter pond adjacent to the bridge in order to trap oil and grease run-off. In addition, the bridge design and layout must be aesthetically pleasing and in harmony with the existing environment.

Drainage Design - Consideration in the design phase has to be given to the issue of drainage and culverts to ensure that drainage patterns are improved from the existing conditions and that increased run-off does not occur or result in flooding of areas previously undisturbed or in those areas identified as flood prone by the Project FS. During design, all drainage works have been 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.

It is also strongly recommended that the Road Department (RD) considers including the use of oil separators within the road drainage system to capture any spills of oil / fuel and also to filter hydrocarbon run-off from the road in general.

General Tree Protection - Prior to the commencement of works the Contractor shall stake the boundary of the entire work site, including intersections and areas under bridges (this excludes within rivers and tunnels, but not tunnel portals). The Contractor shall then identify through a site survey if any Georgian Red-listed tree species are located within 5 meters of the site boundary. This survey will form part of the Contractors Clearance, Re-vegetation and Restoration Management Plan. If any of these trees are identified the contractor will be required to place wood fencing around the tree in order to protect the tree during construction works, including its root zones. The Engineer will inspect all of the tree protection measures on a regular basis.

Cutting of Trees – Cutting of trees can be addressed under two headings:

- Private Land - Compensation shall be paid to all affected tree owners as per the Project LARP.
- State Forest Fund (SFF) – An inventory of the species to be de-listed has been prepared as part of this EIA. The RD is responsible for supplying this information to the National Forest Agency in writing in order to complete the de-listing process. The RD shall also apply to the Ministry of Environmental Protection and Agriculture (MoEPA) in writing regarding the identified Red-List species in the project area so that they may also be de-listed from the SFF. Compensation payments for the tree cutting in SFF areas will paid to the Government by the RD according to Government of Georgia (GoG) regulations prior to any tree cutting. No compensation in the form of re-planting is required under this resolution unless specified by the MoEPA in the Conclusion of Ecological Expertise.

Biodiversity – Prior to any land clearing activities, bridge works, or works in tunnels, site surveys shall be undertaken by national specialists to determine the presence of any species that may be impacted in these areas including bats, birds, otters, squirrels, herpetofauna and turtles. Management plans for identified species noted in the area will be

prepared by the Contractors specialists and implemented prior to the start of any land clearing / construction works.

As noted above, 9,709 trees over 8cm in diameter will be de-listed and felled in SFF areas. Tree replanting on a basis of 1:3 should be undertaken, meaning that 30,000 seedlings will be replanted as part of the Project. The Contractor will coordinate with MoEPA and the National Forest Agency to identify a site, or sites, within the Project area where the trees can be re-planted (including the spoil disposal site in Boriti). Where practical trees should be replanted as close to their original location as possible as a 'restoration' measure. The Contractor shall also coordinate with MoEPA and the National Forest Agency to determine the composition of species to be replanted and to ensure they include the Georgian Red-list species identified in the SFF inventory. The Contractor shall include this information as part of his Clearance, Re-vegetation and Restoration Management Plan. The plan shall clearly identify the approved locations for tree-replanting and restoration, the species and numbers to re-plant and the schedule for re-planting and maintenance. The plan will be submitted to MoEPA and the National Forest Agency for comment before submission to the Engineer for approval.

Infrastructure - A road condition survey will also be conducted by the Engineer prior to construction in order to gauge the damage to the road as a result of the intensive heavy traffic. Before completion of the Project the Engineer shall repeat the survey to determine which, if any roads need to be repaired by the Contractor. The Contractor will also submit a Traffic Management Plan to local traffic authorities prior to mobilization and include the plan as part of his Specific Environmental Management Plan (SEMP).

Waste Management – The Contractor shall prepare and submit a waste management plan outlining measures to manage and disposal of all waste streams, including hazardous waste and methods for recycling waste. The plan will clearly identify how and where hazardous wastes will be disposed of.

Spoil Disposal – The responsibility for identifying the final disposal areas for tunnel and embankment spoil material lies with the Contractor. However, initial assessment of this issue has been undertaken for this EIA and environmental screening of several potential spoil disposal sites have been undertaken. Two sites, one close to Boriti, and one close to the new market area have fewer significant environmental and social impacts and it is possible that the spoil material could be placed in these locations. If the Contractor chooses to use this location, or another, he will be responsible for the preparation of a Spoil Disposal Plan for Arrangement of Spoil Disposal Area and a Re-cultivation Plan. This plan shall be prepared in accordance with regulation N 424 on Approval the Rules for Removal, Storage and Use of Topsoil and Re-cultivation. The Contractor will also complete an EIA for this location to satisfy the national EIA regulations. All relevant permits will be needed before any spoil can be placed in the identified area. The Plans will also be provided to the RD and the Engineer as part of his SEMP. No spoil storage will be allowed until the RD and the Engineer have approved the plan.

Tunnels – The Contractor will develop a ground water management plan for each tunnel under which shall be submitted for approval by the Engineer at least four weeks prior to the start of tunnelling works. The plan shall include routine monitoring of the groundwater levels in wells against baseline water levels (measured by the Contractor before the start of tunnel works) in the Project area which will be undertaken on a weekly basis by the Contractor within the vicinity of each tunnel he is excavating.

Emergency Response - The Contractor will be responsible for preparation of an Emergency Response Plan (ERP) which will include sections relating to; a) Containment of hazardous materials, b) Oil and fuel spills, c) Fire, gas leaks and explosions, d) Work-site accidents;

and e) Earthquake and other natural hazards.

Loss of Land, Property and Livelihoods - The Employer must prepare the LARP. Then, the Employer will implement the plan and acquire the land before the commencement of the construction works at any part of the site. As part of the Project a new road side market area will be constructed. The new market area, located between bridges BRI-3.0.07 AT/TA and BRI-3.0.08 AT/TA, has been created for market stall holders along the existing alignment to relocate to this area, including the pottery and ceramics traders at Shrosha.

Noise - Correct siting of construction camps and ancillary facilities will reduce the potential for elevated noise levels to affect sensitive receptors. Locating these facilities more than 500 meters downwind of sensitive receptors will limit potential noise impacts. In addition to the above, prior to the start of construction, and as part of his SEMP, the Contractor will develop a noise management plan.

Vibration - The Contractor will develop a detailed Tunnel Blasting Plan (TBP) as part of the overall construction schedule. The TBP shall specify, to a reasonable level of accuracy, the schedule for boring of each tunnel and will include the results of all of the surveys undertaken. The TBP will also include a vibration monitoring plan to monitoring vibration levels and frequency around the blasting sites.

Construction Phase

Air Quality - Proper control, siting and maintenance of equipment, including concrete batching plants, shall mitigate emissions impacts. Spraying of roads with water during dry periods and covering of friable materials will also help prevent dust impacts.

Soils – Standard measures are outlined within the EMP to reduce the impacts of potential spills and leaks. They include storing hazardous liquids in special storage areas within concrete bunds and the provision on spill kits in these areas. Erosion control measures and measures to preserve topsoil are also recommended within the EMP.

Surface water – Proper design, siting and management of facilities (including construction camps and concrete batching plants) will help reduce impacts to water quality. Accidental spills could occur and provisions are recommended in the EMP to manage such accidents. Temporary drainage in villages will be kept clear of construction debris to prevent flooding at work sites.

Drainage and Flooding - During the construction phase the Contractor will be required to construct, maintain, remove and reinstate as necessary temporary drainage works and take all other precautions necessary for the avoidance of damage to properties and land by flooding and silt washed down from the works. Should any operation being performed by the Contractor interrupt existing irrigation systems, the Contractors will restore the irrigation appurtenances to their original working conditions within 24 hours of being notified of the interruption. The Contractor will also be responsible for ensuring that no construction materials or construction waste block existing drainage channels within the Project corridor. The Engineer will be responsible for routine monitoring of drainage channels to ensure they remain free of waste and debris.

Biodiversity – Specific mitigation measures have been prepared for International Union for Conservation of Nature (IUCN) and Georgian Re-list species identified as part of this report. In addition, a range of general mitigation measures have been prepared to limit impacts to fauna, including for example, prohibiting hunting and poaching.

Regarding tree re-planting, plant maintenance will be carried out for at least two years in the plantation areas. The Contractor will be responsible for the maintenance of these areas. If the maintenance period extends after the completion of the Contractors contract period the RD will be responsible for contracting an operator to maintain the trees for the remaining period. During the Construction phase the Engineer will undertake monthly monitoring of the re-planted areas and report on the success rate of the re-planted trees, which should be above 80%. If the success rate falls below 80% the Contractor will re-plant on a 1:1 basis to compensate for losses. The Contractor will be responsible for paying for any compensational re-planting.

Protected Areas - No construction activities, including camps, haul routes, etc. will be allowed within, or through protected areas, or reserves.

Landscape – The following mitigation measures are proposed to reduce the visual impact of the Project; a) minimize disturbance to, or movement of, soil and vegetation; b) undertake landscaping after the completion of the activities to match in with surrounding landscape; and c) Reinstate vegetation.

Infrastructure - To mitigate the potential impacts the Contractor will submit a Traffic Management Plan to local traffic authorities prior to mobilization and include the plan as part of his SEMP. The Contractor will also provide information to the public about the scope and schedule of construction activities and expected disruptions and access restrictions and allow for adequate traffic flow around construction areas via diversions or temporary access roads. To prevent potential environmental, health and safety issues arising whilst working in the area above the railway line at KM12.0, the Contractor will be responsible for the preparation of an Environmental, Health and Safety Method Statement for working in these areas.

Utilities - During construction all utilities in the Project area shall be kept operational, particularly during the winter months.

Waste Management - The Contractor will be responsible for the safe collection and removal of all waste materials from his site. Accordingly, he shall prepare contracts with a suitably licensed waste management contractor for the removal of inert and hazardous wastes from his sites. The Contractor as proof of the shipment of these wastes shall also keep waste manifests.

Asphalt Plants, Concrete Batching Plants and Construction Camps – The EMP provides a range of detailed mitigation and management measures for these facilities. All of these measures are based on international best practice.

Bridge Construction – A range of measures are provided in the EIA to prevent impacts occurring at bridge construction site including for example; ensuring no waste materials are dumped in the river, including re-enforced concrete debris, ensuring that no hazardous liquids are placed within ten meters of the river, providing portable toilets at bridge construction sites to prevent defecation by workers into the river and provision of areas where concrete mixers can wash out leftover concrete in the form of a lined settling pond at each bridge site. In addition, the Contractor, through his Environmental Manager, will be responsible for consulting with MoEPA to confirm the fish spawning period in relation to the bridge construction works to ensure that all works are undertaken in periods least likely to affect the fish spawning period.

Tunnels - Routine monitoring of the groundwater levels in wells in the Project area will be undertaken on a weekly basis by the Contractor within the vicinity of each tunnel under excavation. If drawdown levels in wells are significant the Contractor will provide a

temporary source of potable water to the affected persons until the groundwater levels are recharged. The Contractor will pass all drainage water from the tunnel through a settlement tank. Weekly monitoring of the water quality from the tank will be undertaken by the Contractor to assess for any pollution. If the drainage water meets drinking water standards it can be considered for re-use in any potentially depleted wells during the construction phase. The Contractor shall continue to monitor the water levels in the affected wells for a period of two months after construction is completed. If the wells begin to recharge to their pre-construction levels no further actions will be necessary. However, if the water fails to re-charge to pre-construction levels new boreholes, or alternative sources of water supply will be provided for the affected persons.

Blasting - The Project will conduct construction blasting consistent with Georgian and international safety standards. Blasting will be conducted using standard mining industry practices and procedures to ensure safety of personnel and equipment. This includes establishing a safety zone around the blast area, say to a distance of 500 m (actual distance will be established by the Contractor and approved by the Engineer based on the safety standards) and evacuating it. In addition, no blasting will be carried out within 100 m of the portal of the tunnel, blasting will be scheduled during the day only and local communities will be informed of blasting timetable in advance.

Community Health and Safety – The Contractor will be responsible for holding monthly community meetings within the Project area throughout the construction period. The monthly meetings will be held in the villages along the alignment and will provide a forum for locals to discuss specific issues, such as noise and dust, with the Contractor before making complaints formal through the Grievance Redress Mechanism.

Occupational Health and Safety - Health and safety plans, training and HIV/AIDS and vector borne disease awareness programs will be provided by the Contractor. The Contractor shall also be responsible for providing adequate Personal Protective Equipment for all workers, including sub-contractors and site visitors. If groundwater is to be used as potable water it will be tested weekly to ensure that the water quality meets the GoG drinking water standards.

Physical and Cultural Resources - The cemetery identified close to the Project road is unlikely to be impacted by construction works, however, it is required that during the construction phase the northern boundary of the religious monument be fenced off to ensure that there is no encroachment into this area by construction workers or equipment. In the event of any chance finds during the construction works procedures shall apply that are governed by GoG legislation and guidelines.

Noise & Vibration – The Contractor will be responsible for implementing the range of good practice measures outlined in this EIA and its EMP to limit construction noise impacts, including time and activity constraints. Specific measures have been proposed in this EIA to manage vibration issues during the construction phase, they include building surveys, consultations, real time monitoring, defining damage risk zones, and temporary relocation of affected people.

Operational Phase

Noise – The following mitigation measures are proposed for the Project:

- Noise Barriers – construction of four sections of 4 meter high noise barrier approximately 2400 meters long.
- Routine Noise Monitoring – Monitoring of identified Receptors should be undertaken on an annual basis to determine actual noise levels at these locations. If noise levels are above IFC limits, the RD shall consult with the effected owners to determine a suitable

mitigation measures including for example; installation of sound proof windows in properties.

Climate Change – Although no significant risks have been identified, the Detailed Design Consultant shall ensure the items outlined in this report are included in the "Recommendations for the management of the highway" document.

Hydrology - During the operational phase of the Project, the RD will be responsible for monitoring drainage along the road to ensure that it does result in increased run-off and flooding. The RD will be responsible for rectifying this issue if it occurs.

Groundwater - The Contractor shall continue to monitor the water levels in any affected ground water wells for a period of 12 months after construction is completed at the tunnel sites. If the wells begin to recharge to their pre-construction levels no further actions will be necessary. However, if the water fails to re-charge to pre-construction levels alternative water supply will be provided to the affected parties, this may include for example, increasing the depth of their wells, or piped water from another location, which, as noted above, appears to be a fairly effective option.

8. Monitoring Actions

To ensure that all of the above mitigation actions are completed according to the requirements of this EIA, monitoring shall be undertaken of Project works by the Engineer and by independent monitoring specialists. Specifically, both observational monitoring and instrumental monitoring shall be undertaken as follows:

Instrumental Monitoring – This shall be completed by independent specialists and will include:

- Routine air quality, water quality soil sampling and noise monitoring during the construction phase; and
- Annual noise monitoring throughout the Project operational lifecycle at the receptors identified as part of the noise model.

Schedules, parameters, locations are indicated by the EMP. The Engineer shall be responsible for contracting independent monitoring specialists during the construction phase. In addition, the Contractor will be responsible for real time monitoring of vibration during the Construction phase of the Project. The RD will be responsible for operational monitoring, e.g. hiring independent monitoring specialists.

Observational Monitoring – The Contractors actions shall be continually monitored by the Engineer throughout the Projects Construction phase. This will be achieved through weekly inspections of the Contractors environmental performance and his SEMP by national and international environmental specialists engaged by the Engineer throughout the construction period. The Engineer shall have the right to suspend works or payments if the Contractor is in violation of any of his obligations under the EMP and this EIA.

9. Consultations

Two rounds of stakeholder consultations were undertaken in the Project area. The first round of consultations helped define the scope of the EIA. The second round of consultations were then undertaken on the draft EIA. During the consultations a number of issues were raised, such as disposal of tunnel spoil material, tree cutting and replanting, access to properties during construction and identification of sites of cultural heritage.

All of the issues identified in the consultations have been included within the impact assessment portion of the EIA and where practical, measures have been proposed to reduce the significance of, or mitigate impacts. **Section I** of the Report provides details of the consultation procedures and the main comments received.

10 Conclusions

This EIA has established that in general most environmental issues can be either totally prevented or adequately mitigated to levels acceptable GoG and international standards for Project activities.

However, several residual impacts have been identified, including:

- Greenhouse Gasses - Residual impacts from the generation of GHGs will remain throughout the lifecycle of the Project. This is an unavoidable consequence of the Project, but as noted in other sections of this report, the growth of the electric car market and more fuel efficient cars may, in the future lead to a decrease in the emissions generated on the Project road.

- Surface Water Drainage - It is noted that the Project requires interceptor tanks for bridge run-off and this should also be considered for the road drainage network in general, if not residual impacts will occur during the operational phase as polluted road water run-off drains directly into surface water courses.

- Employment - After the Project construction phase many local workers may be without employment. However, the Project will have provided them, in many instances, with additional skills and experience to work on similar projects in other locations. Local businesses supplying the Contractors and their staff may also see a fall in trade, this is an unavoidable consequence of the Project.

- Visual Impacts - Cut slopes, embankments, concrete bridges and tunnels will have an impact on the landscape within the valley throughout the Project lifecycle. The mitigation measures outlined above may go someway to enhancing the aesthetic value of the Project especially as vegetation grows back around construction zones, and in all likelihood any negative opinion of the new road in terms of visual impact will decrease over time as people get used to the altered landscape.

- Noise - Implementation of the recommended mitigation and management measures will help to reduce noise levels at many locations. However, at some receptors noise levels may rise above IFC standards during the operational phase of the Project. Monitoring of these sites will be required on an annual basis to determine actual noise levels in these areas. Where they exceed IFC standards the RD will consult with the affected owners to determine the most acceptable noise mitigation measures, including for example noise proof windows. There may be some vibration and noise nuisance during the construction phase of the Project, due to unforeseen events, but in general the measures outlined should ensure that all issues are suitably management and mitigated to prevent any long term significant impacts.

The total estimate costs of the environmental mitigation and management to be funded by ADB has been calculated at approximately US$4,198,680, or approximately 1.5% of the total project cost of $330m.

11. Implementation

The EMP, its mitigation and monitoring programs, contained herewith will be included within the Project Bidding documents for project works. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs.

The Bid documents state that the Contractor will be responsible for the implementation of the requirements of the EMP through his own Specific Environmental Management Plan (SEMP) which will adopt all of the conditions of the EMP and add site specific elements that are not currently known, such as the Contractors construction camp locations.

The EMP and all its requirements will also be added to the Contractors Contract, thereby making implementation of the EMP a legal requirement according to the Contract. He will then prepare his SEMP which will be approved and monitored by the Engineer. Should the Engineer, through routine monitoring by his national and international environmental specialists, note any non-conformance with the SEMP the Contractor can be held liable for breach of the contractual obligations of the EMP. To ensure compliance with the SEMP the Contractor will employ a national environmental specialist to monitor and report Project activities throughout the Project Construction phase.

A grievance redress mechanism (GRM) has also been prepared as part of the Project. The GRM provides a structure for stakeholders to make complaints and a mechanism for the complaints to be resolved both locally and centrally.