Environmental Impact Assessment

Project Number: 53178-001
May 2019

GEO: East–West Highway (Shorapani–Argveta Section) Improvement Project

Part 1 (Executive Summary and Section A)

Prepared by the Roads Department of the Ministry of Regional Development and Infrastructure of Georgia for the Asian Development Bank.

Environmental Impact Assessment

Updated Final – May 2019

Environmental Impact Assessment of Section F4 of the Khevi-Ubisa-Shoropani-Argveta Road (E60 Highway)
Republic of Georgia.

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Abbreviations and Acronyms

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
AM	Accountability Mechanism
ADB	Asian Development Bank
AST	Above Ground Storage Tank
AT	Argveta - Tbilisi
AQP	Air Quality Plan
BAT	Best Available Technology
BGL	Below ground level
BoQ	Bill of Quantities
BOD	Biological Oxygen Demand
BRI	Bridge
CAREC	Central Asia Regional Economic Cooperation
CAP	Corrective action plan
ccTV	Closed Circuit TV
CFC	Chlorofluorocarbon
CIS	Commonwealth of Independent States
CO	Carbon monoxide
COD	Chemical Oxygen Demand
CO_2	Carbon Dioxide
Cr	Chromium
dBA	decibel
DD	Detailed Design
EA	Executing Agency
EAC	Environmental Assessment Code
EC	Electrical conductivity
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EHS	Environmental Health and Safety
EMP	Environmental Management Plan
EM	Environment Manager
ERP	Emergency Response Plan
ES	Executive Summary
ESIA	Environmental and Social Impact Assessment
EU	European Union
EWH	East West Highway
EWHIPs	East West Highway Improvement Projects
FE	Iron
FS	Feasibility Study
GAA	Georgian American Alloys
GDP	Gross Domestic Product
GEOSTAT	National Statistics Office of Georgia
GEL	Georgian Lari
GHG	Greenhouse Gases
GoG	Government of Georgia
GOST	Technical Standard
GRM	Grievance Redress Mechanism
GRCE	Grievance Redress Committee
ha	Hectare
H&S	Health and Safety
HC	Hydrocarbon

HP	Horse Power
HZ	Hertz
IBA	Important Bird Area
IBC	Intermediate bulk storage containers
IFC	International Finance Corporation
IFI	International Finance Institutions
IEE	Initial Environmental Examination
IES	International Environmental Specialist
in/sec	Inch per second (25.4mm/sec)
IUCN	International Union for Conservation of Nature
km	Kilometer
km/h	Kilometers per Hour
Km^2	Square kilometer
LARP	Land Acquisition and Resettlement Plan
LC	Least Concern
LCF	Local Consulting Firm
L_{eaq}	Equivalent Continuous Level
MELT	Modified Eccentric Loader Terminal
mg/l	Milligram per liter
mg/m^3	Milligram per cubic meter
mg/kg	Milligram per kilogram
m^3/s	Cubic meters per second
m^3/h	Cubic meters per hour
m^3/d	Cubic meter per day
m	Meter
m^2	Square meter
m^3	Cubic Meter
m^3/s	Cubic meter per second
MAC	Maximum Allowable Concentrations
MCA	Multi-criteria analysis
MoEPA	Ministry of Environment Protection and Agriculture
MoESD	Ministry of Economy and Sustainable Development
MPE	Maximum Permissible Emission
MPC	Maximum permissible concentrations
MPD	Maximum Permissible Discharges
MSDS	Material Safety Data Sheet
$MtCO_2e$	Million tons of CO_2 equivalent
NES	National Environmental Specialist
NGO	Non-Governmental Organization
NH_4+	Ammonium
Nm^3	Normal cubic meter
NO_X	Nitrogen oxides
NO_2	Nitrogen Dioxide
NO_3	Nitrate
Ni	Nickel
NT	Near Threatened
OHS	Occupational Health and Safety
PA	Per Annum
PAP	Project Affected Person
PAH	Polycyclic aromatic hydrocarbons
PCR	Physical and cultural resources
PPV	Peak Particle Velocity
Pb	Lead
PM	Particulate matter

POPs	Persistent organic pollutants
PO_4	Phosphate
PMU	Project Managing Unit
PPE	Personal Protective Clothing
PPTA	Project Preparatory Technical Assistance
PPM	Parts per million
PSC	Pre-stressed concrete
SPM	Suspended Particulate Matter
RD	Road Department
RoW	Right of Way
SFF	State Forest Fund
SniP	Construction Standards
STD	Sexually transmitted diseases (such as HIV/AIDS)
SEMP	Specific Management Plan
SO_2	Sulfur Dioxide
SPS	Safeguard Policy Statement
TA	Tbilisi - Argveta
TBP	Tunnel Blasting Plan
TEM	Trans-European North-South Motorway
TMP	Traffic Management Plan
TOR	Terms of Reference
TSP	Total Suspended Particulates
TSS	Total suspended solids
TUN	Tunnel
UNEP	United Nations Environment Program
USAID	United States Agency for International Development
USD	United States Dollar
UST	Underground Ground Storage Tank
VU	Vulnerable
WB	World Bank
WHO	World Health Organization
WMP	Waste Management Plan
°C	Degrees Celsius
$\mu g/m^3$	Micrograms per cubic meter

Currency Exchange Rates as of 22nd May, 2019:
1 US$ = 2.77 (GEL)
($ refers in this report to US-Dollars)

Executive Summary

1. Introduction

1. This Environmental Impact Assessment (EIA) is part of the process of compliance with the ADB Safeguard Policy Statement (2009) in relation to the construction of Section F2 of the new Khevi-Ubisa-Shorapani-Argveta section of the E60 Highway, or more simply, the "Project".

2. 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:
   (i) Describes the existing socio-environmental conditions within the Project area;
   (ii) Describes the project design, construction activities and operational parameters;
   (iii) Describes the extent, duration and severity of potential impacts;
   (iv) Analyzes all significant impacts; and
   (v) Formulates the mitigation actions and presents it all in the form of an Environmental Management Plan (EMP).

3. Based on the existing ADB Environmental Safeguards Policy (2009), this Project falls under ADB's project Category A as the project is considered to have significant diverse impacts over a wide area, such as noise impacts, significant quantities of spoil disposal, road safety impacts, and vibration.

2. Project Background

4. 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.

5. 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.

6. 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 has been completed and selection of the construction Contractor is on-going. Detailed design of sections F2, F3 and F4 is now on-going and this report forms the EIA for detailed design phase of section F4 which will be followed by sections F3 and F2.

3. Project Description

7. 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 F4 forms the Shoropani – Argveta portion of the Khevi-Ubisa-Shorapani-Argveta section of the E-60. The length of the Project road is as follows:
   - Right lane **(TA** – meaning Tbilisi – Argveta direction**)** - 14.778 km;
   - Left lane **(AT** – meaning Argveta – Tbilisi direction**)** - 14.726 km.

Figure 1: Road Location Map

8. 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.

9. 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.

10. Five long span bridges and one short span bridge will be constructed during the project works. The total length of the five bridges is 4,912 meters, the longest of which is 941 meters. The bridges are grouped into the following main typologies:
    - Steel-concrete bridges - bridges 1,2,4: maximum span length up to 60 m for bridges 1 and 2 and up to 72 meters for bridges 4-AT and 4-TA.
    - Precast concrete bridges – bridges 3 and 5: maximum span up to 34m.

11. Six tunnels will be constructed with double tubes with length from 399 m to 1166 m.

12. 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. Reinforced concrete retaining walls are required at the beginning of the project section from:
    - KM 0.00 to KM 0.25
    - KM 8.63 to KM 8.71
    - KM 8.84 to KM 8.94

13. There are four interchanges planned in F4 Section.

14. 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 - 6 units 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 - 4 units is envisaged in the design.
    - Culverts, for which cast in situ reinforced concrete culverts cross section 2.0x2.5 m - 17 units, 4.0x2.5m - 2 units is envisaged in the design to provide water discharge from ravines and canals.

15. Eight underpasses will be constructed using reinforced concrete culverts. One overpass will be constructed at km 11+854 with a length of 40 meters.

16. 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

17. 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.

18. 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.

19. As noted above, the Project forms part of a program upgrading the E-60. The Khevi – Argveta section of the E-60 (including section F4) if 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.

20. 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.

21. 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.

5. Description of the Environment

22. Within the Project area the main sources of air emissions are from transport, including vehicles on the existing Project road, and large scale industrial facilities including the Georgian American Alloys (GAA) manganese processing plant which is located almost adjacent to the southern boundary of the Project road between KM 11 and KM 12. Air quality monitoring was carried out at nine different locations during August 2017 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.

23. Annual precipitation in Zestaphoni 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 Zestaphoni 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.

24. No site-specific data has been found relating to climate change. However, given the general overview for Georgia it can be assumed that there will be an increase in average annual temperatures of between 1 and 1.5 °C over the next 30 years and that precipitation will decrease. The number of hot days may increase, and as such, consideration of suitable pavement types shall be given.

25. 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, rolling hills and valley plain. The existing road is located within the bottom of the river valley and as such elevation only varies between 200 and 170 meters above sea level.

26. Within the Project area a few areas prone to landslides have been identified. Generally, the landslides do not affect the project alignment, except for the mass movements identified above around KM 0.6 affecting TUN 4.0.01-TA/AT and its eastern and western portals. 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).

27. Two main rivers can be found within the Project area, the Kvirila and the Dzirula. The confluence of the two rivers is in Shorapani adjacent to the Project road at Km 5.0. Other small tributaries within the area include the Borimela River (which the Project road crosses at KM 3.5), and the Ajamura and Samanishvilisghele rivers, both of which located on the south bank of the Kvirila river more than 1.3 km from the Project road. To assess the status of water quality in the Project area, including the Kvirila and Dzirula rivers, monitoring of surface water was undertaken in September 2017. The results of the monitoring exercise show that both the Dzirula and Kvirila rivers meet the national Maximum Allowable Concentrations (MACs) for surface water quality, although the levels of manganese in the Kvirila sample was above the recommended standards for drinking water, this is due to the presence upstream of manganese mining operations.

28. The soils in the Project area are very productive and range of crops are grown in the region which is well known for its wine production. However, hazardous wastes generated by the GAA, Chiatura manganese enrichment plant, and many small-size smelters operating in various settlements of Imereti are sources of soil pollution in the region. To assess the status of soil quality in the Project area, specifically around the Georgian American Alloys Plant (GAA) plant, soil samples were taken and analyzed. The results of the sampling show that all parameters are within the current Georgian limits with the exception of Arsenic and Lead. However, these limits are considered outdated, stemming from old regulations developed during Soviet times. Assessing the results against EU limits (Italy and the UK), the results of all parameters sampled are well within the limits for residential areas. In addition, the results are also well within the proposed Georgian maximum allowable concentrations recently developed by the MoEPA which should come into force in 2018. Most importantly, all parameters are also below the proposed Georgian preventive limits of risk elements in agricultural soil, which is an important factor considering that much of the spoil material may be disposed of at the Kutaisi bypass which borders on an area of agricultural land. Additional analysis of PAHs shows that both samples meet the Dutch target levels meaning that the soil is considered a sustainable soil quality and will have negligible risk to the ecosystem.

29. The project corridor crosses forest areas, agricultural land plots, hilly forest slopes, residential areas and riparian ecosystems. 17.3 hectares (ha) of the municipality of Zestaphoni is covered by forest and shrubbery. Due to human pressures natural vegetation has been taken over by agricultural crops and other human development. In these areas arable lands and pastures have developed. Some of the animal species typical for the area have moved to other areas in away from human activity. 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.

30. A study of flora within the Project area showed that the corridor could be split broadly into six sections, most of which were classified as a mix of 'high' and 'low' status. The low status areas were mainly classified in this was due to the absence of any unique flora in these areas and the generally degraded nature of the landscape due to human interference. The 'high' status areas were classified as such primarily due to the presence of a number of tree species fund on the Georgian Red List.

31. According to available information there are two species (Caucasian squirrel and Eurasian otter) considered as vulnerable in Georgia (Georgian Red List) that may be found within the Project area. As part of a fauna survey the bridge locations were checked with particular care and no otters were noted. During the survey trees within the RoW of the new alignment (with exclusion of the areas where tunnels are planned) have been checked. Neither burrows, nor squirrels have been registered in the survey area. The review of the habitat along the alignment indicates that it is not optimum for existence of the Caucasian squirrel.

32. The nearest protected area to the Project road is the Ajameti Managed Reserve, which is located approximately 5 kilometers south west of the end point of the road (km14.7). The nearest Important Bird Area (IBA) to the Project road is the Adjara-Imereti Ridge more than twenty kilometers south of the Project road.

33. 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. GAA is the largest company in Zestaphoni. GAA produced over 187,000 metric tons of silico-manganese in 2012, however the mining and production of the manganese is not without its environmental problems, including impacts to air quality and impacts to the water quality of the Kvirila River. The Project road passes almost adjacent to the north of the plant for around 2 kilometers between KM 9.7 and KM 11.8.

34. 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. Other than grapes, melon and maize are predominant crops grown in the region and have been noted within the Project corridor, specifically from KM 7.0 onwards.

35. 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 Zestaphoni for recreation or vacation.

36. 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 Zestaphoni, and these roads vary in condition from good to very poor. The main railway line from Tbilisi to Batumi runs broadly parallel with the Project road until it reaches Zestaphoni. In fact, in the first section of the road, between KM 0.0 and KM 6.0 the railway line and the road are only separated by a couple of hundred meters, with the road running south of the railway line. At one location, the new road alignment passes within 20 meters of the railway line (KM 2.5) and eventually passes over the railway line at KM 6.3 as the road heads northwest to start its bypass around Zestaphoni.

37. The Project road is located within Zestaphoni Municipality, which covers a total area of 423 square kilometers and includes the towns of Zestaphoni and Shorapani as well as numerous small villages. The following settlements have been identified within the Project area.
    - Kveda Tseva (KM 0)
    - Shorapani (KM 4.0 – 6.0)

- Zestaphoni (KM 6.0 – 11.0)
- Kveda Sakara (KM 11.0 – 12.0)
- Argveta (KM 13.0 – 15.0)

38. 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.

39. Data provided by the Road Department of the Ministry of Regional Development and Infrastructure (RD), shows that during the period 2012 – 2016 there were 2,713 collisions, 471 persons killed and 4,913 persons injured spread over the E-60 corridor. Focusing the analysis on the Khevi – Argveta section, 351 collisions occurred, 78 persons were killed and 648 persons were injured. Finally, along the F4 section 130 collisions occurred, with 30 persons killed and 218 persons injured.

40. The social survey undertaken as part of this Project found that the average wage of the population in the target villages is 650 GEL. The majority (70%) of those surveyed state that the main source of income is wage, 20% of the surveyed families said that main source is pension / allowance, only 5 % said that it is self-employment.

41. Previously there was a landfill site in Zestaphoni 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. No other landfill has been observed in Zestaphoni.

42. Within the Project area a number of physical cultural resources (PCR) have been identified including the Shoropani Fortress. None of the identified PCR, including the Shoropani Fortress is within close proximity of the Project road itself, with the exception of a cemetery and a small natural spring located to the north of the GAA.

43. Noise and vibration within the Project corridor can be discussed in two parts, firstly the parts of the corridor that broadly follow the existing alignment, and secondly the part of the corridor that bypass to the north of Zestaphoni more than 500 meters north of the existing road. Noise levels within the first part are predominantly a result of vehicle traffic on the existing road. Very little commercial, residential or industrial activities can be observed in these areas that would give rise to significant noise levels. In the second part of the corridor the alignment traverses a predominantly rural / residential landscape with the exception being the portion of the alignment that passes just to the north of the GAA facility. Noise and vibration monitoring has been undertake in both parts of the road for this EIA. Vibration values in the monitoring locations 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. Noise monitoring results show that noise levels close to the existing road are elevated above IFC daytime and nightime standards. However, as the Project corridor enters the rural bypass around the north of Zestaphoni noise levels get lower and are within IFC guideline limits for daytime and nightime noise.

6. Impact Identification

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

Design / **Preconstruction Phase**

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

46. 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. Soil samples taken to the north of the GAA plant have indicated that this area does not comprise levels of soil contamination above Dutch Intervention Levels or Italian standards for residential areas. Arsenic and Lead were identified in the samples above the current national limits, but within proposed new national limits and other international limits (UK and Italy). However, only two soil samples were taken in this location and it is possible that soil contamination could still exist in the area north of the GAA. The Project road runs parallel to the GAA plant for approximately 1.3 kilometers, but the potential for any additional pollution is considered to be confined to a smaller area, around 500 meters in length, and is focused around large two piles of waste material sited on the northern boundary of the GAA. In this portion of the Project road the road level will be raised on an embankment. An average of 50 cm of topsoil will be stripped from an area more than 40 meters wide over this 500 meter section, that equates to around 10,000 m^3 of top soil to be removed. Although the two soil samples taken as part of this EIA did not show significant levels of contamination it is considered prudent to undertake additional sampling of these soils to determine if any additional actions for soil monitoring and disposal would be needed during the construction phase.

47. Natural Hazards - Generally, landslides in the Project area do not affect the project alignment, except for the mass movements identified above around KM 0.6 affecting TUN 4.0.01-TA/AT and its eastern and western portals. The impacts from the landslides are not expected to be significant enough to warrant major mitigation measures as part of the detailed design. However, minor mitigation measures e.g. safety nets have been included in the design. The project is located in a seismically active area. 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 the GoG.

48. 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 to the north of Zestaphoni and the fact that large portions of the road run beneath ground reduces the level of resettlement and compensation that would otherwise be expected if the existing alignment was being upgraded.

49. 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.

50. 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

51. 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.

52. 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.

53. 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 and Kvirila rivers. The required amounts, potentially 200 m^3 per day (0.002 m^3/s) are insignificant given the flow rates of these major rivers.

54. 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).

55. 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.

56. 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 7,232 trees have been identified in State Forest Fund areas. Of these, 204 are Georgian Red-listed species greater than 8cm in diameter and 411 are Georgian Red-listed species less than 8cm in diameter. 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.

57. Fauna - Impacts during the construction phase may occur, including; a) As a result of vegetation cover removal and earthworks habitats (nests, holes) may be lost. Tree and vegetation cutting will also affect the food base, b) Small-sized animals may fall in trenches and pits and may be injured, c) During the movement of construction vehicles and construction equipment, collision with animals may be expected, d) Emission of noise, dust and combustion products, as well as human intensive activities will cause animal disturbance and migration to other places, e) Unsystematic spread of waste, improper management of waste (change in environmental quality indicators) will cause a further deterioration of the living conditions of terrestrial and aquatic animals, f) Night lighting systems at construction camps may cause disturbance of animals and disorientation of birds, g) There may be the cases of poaching by staff, h) Temporary impacts on fish may occur due to sedimentation and water turbidity in the immediate vicinity of the construction work area, and the potential for minor introduction of pollutants from construction operations; and i) Bridge works could impact upon the habitat of otters.

58. Protected Areas - The nearest protected area to the Project road is the Ajameti Managed Reserve, which is located approximately 5 kilometers south west of the end point of the road and is unlikely to be impacted by Project works.

59. 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 number of locations. The bridge works above the railway line at KM 13.1 may cause specific issues due to its close proximity to railway.

60. 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.

61. 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.

62. Tunnel & Embankment Spoil Material - A large volume of spoil material will be generated from the tunneling works. Estimates provided by the Projects Tunnel experts indicate that as around 1,027,200 m^3 of spoil material will be generated from the tunneling. Another 1,184,100 m^3 of cut will be generated from excavation works on slopes, etc. Where practical the spoil will be re-used as embankment material at the Project site (for example on the embankments behind Zestaphoni). Estimates indicate that approximately 1,519,800 m^3 can be re-used as embankment material, which would leave approximately 691,500 m^3 as static balance. Assuming that most of the embankments associated with the Project are located in the bypass area to the north of Zestaphoni, the average journey distance to transport the spoil material from tunnels to the embankment areas may be around 8 kilometers. To transport material to the embankment areas approximately 250,000 truck journeys will be required, or an average of 277 a day over the 30 month construction period. Disposal of the static balance would require an area of 82,980 m^2 with a height of 10 meters if they were to be disposed of in one spoil disposal location. Preliminary investigations with the RD indicate that the spoil material could be re-used as embankment material at the Kutaisi Bypass where material is required to construct a further two lanes of the bypass. A field visit to the Kutaisi area did not indicate any sensitive land uses in this area which has already been acquired by the RD for the future construction works in this area. Disposal of spoil material in this location will require close coordination between the contractors of both projects and the RD. To transport this volume of material to Kutaisi Bypass over 115,250 truck journeys will be required, or an average of 128 per day over the 30 month construction period. The distance to the Kutaisi site is around 35.5 kilometers.

63. 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.

64. 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.

65. 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.

66. 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.

67. 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 embankments around Zestaphoni may also have an aesthetic impact.

68. 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 one cemetery identified approximately 50 meters south of tunnel TUN 4.0.06-AT/TA and a small natural spring located to the north of the GAA.

69. 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.

70. 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 likely that construction works will impact upon structures within the Project area, potentially causing cosmetic damage and in extreme cases possibly structural damage.

71. Cumulative Impacts – Cumulative impacts during the construction phase include:
    (i) Construction Traffic – Most construction vehicles will be operating within their specific section (and even the Contractors individual 'Lot'), however, there will also be numerous daily vehicle movements across all three sections for the delivery of materials and the movement of spoil material to Kutaisi bypass. These combined vehicle movements will have impacts to noise and air quality along the road, in addition to the potential safety aspects that come with the movement of as many as 1,000 construction vehicles per day along the combined F2, F3 and F4 section.

(ii) Construction Camps – There are, potentially six construction 'Lots' for the all three sections. This means that there could be six different contractors as well as at least three supervision engineers. Each one will need their own construction camps and offices. As noted above, the valley is rather constrained in terms of land availability and six construction camps could place a strain on the local population and the ecology of the area.

Operational Phase

72. Climate Change - The transport sector is vulnerable to changes in climate variables, expected changes in the frequency and intensity of extreme weather events, and increased sea level. The following are a few examples of the potential effects; a) Changes in temperature—both a gradual increase in temperature and an increase in extreme temperatures—are likely to impact road pavements (for example, heat-induced heaving and buckling of joints), b) Changes in temperature will also impact the behaviour of permafrost and thus the infrastructure lying on permafrost, c) Changes in precipitation and water levels will impact road foundations, d) Extreme weather events such as stronger and/or more frequent storms will affect the capacity of drainage and overflow systems to deal with stronger or faster velocity of water flows, e) Stronger or faster velocity of water flows will also impact bridge foundations, f) Increased wind loads and storm strengths will impact long span bridges, especially suspension and cable-stayed bridges, g) High levels of precipitation may threaten embankment stability and h) Increase in scouring of roads, bridges, and support structures.

73. 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.

74. Noise – A noise model developed for the EIA shows that there are many receptors, 115, where IFC guideline limits for daytime and nightime noise would be exceeded in 2033 given the predicted increase in traffic over this period. The model also shows that noise abatement, in the form of a 4-meter-high solid noise barriers would reduce the number of affected receptors to just 24.

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

76. 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 suggests that there are no negative impacts on the environment. In addition to the fact that the maximum allowable limits are not surpassed, it must be taken into account that the road provides benefits in term of vehicular emission due to the smoother drive and optimized alignment. If a similar traffic flow should transit via the existing road, the emissions would be almost 20% higher. The new road will have a positive impact on the air quality in term of reduced emissions compared to a similar flow of traffic along the existing one.

77. 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.

78. Employment and Business - 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. 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.

79. 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 some way 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.

80. 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 Actions

81. The summary mitigation measures for the potential impacts identified above for the Project Road include:

Design / Preconstruction Phase

82. 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 shall include the following plans:
    (i) 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 Action Plan.

(ii) Site Specific Plans:

- Construction Camp Plan.
- Asphalt Plant Plan.
- Rock Crushing Plant Plan.
- Concrete Batching Plant Plan.
- Bridge Construction Plan (for each bridge construction site)

83. The SEMP will be submitted to the Engineer and RD for approval at least 10 days before taking possession of any work site. No access to the site will be allowed until the SEMPs are approved by the Engineer and RD. New topic specific or site specific EMPs may also need to be developed by the Contractor during the construction phase. These new plans will also need to be approved by the Engineer and the RD.

84. 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.

85. 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).

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

87. Climate Change - Most climate change impacts are projected to occur slowly over a long period of time and as such providing mitigation measure for topics such climate change impacts on pavement design need to be taken over time and cannot be determined in a study like this. Notwithstanding the above a number of simple measures can be taken to ensure that in the short term that extreme precipitation events do not result in significant impacts to the Project, they include; a) Increase ditch and culvert capacity, b) Maintain positive cross slope to facilitate flow of water from surface, c) Increase resistance to rutting, d) Reduce splashing/spray through porous surface mixtures, e) More frequent use of elevated pavement section, f) Improve visibility and pavement marking demarcation, and g) Ensure that all embankments are seeded to help increase stability.

88. Contaminated Soils – An additional four samples will be taken prior to the start of construction by the Engineer. If the results show that the monitored parameters are within the proposed national limits and the Dutch target values no further soil sampling will be considered necessary. Should the results of the monitoring indicate any elevated levels of contamination further testing of the excavated soils in this area will be required during the construction phase by the Contractor. The procedure for any construction phase testing is as follows:
    a) The Contractor shall identify a temporary storage area for excavated material.
    b) The Contractor shall strip the topsoil in batches of 2,500 m^2 and store the mixed material in the temporary storage area (the stockpile).

c) The Contractor shall then divide the stockpile into quadrants of 250m^3.
d) The Engineer will hire a certified laboratory to take a soil sample from each of the quadrants for further chemical analysis.
e) If the results show the all of the samples are within the proposed national limits and the Dutch target values the material can be removed from the stockpile area and disposed of as non-hazardous material.
f) If any of the ten samples show elevated levels of contamination the material from the respective contaminated quadrants will be disposed of as hazardous waste. Any other non-contaminated quadrants may be disposed of as non-hazardous waste.

89. Alternatively, the Contractor may wish to explore alternative methods to treat the contaminated waste so that it can be disposed of as non-hazardous waste. If the Contractor chooses this option, he will be responsible for the preparation of a Contaminated Spoil Treatment Plan that will outline the procedures and methods for treating the waste spoil.

90. 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.

91. 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 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.

92. 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.

93. Cutting of Trees – Cutting of trees can be addressed under two headings:
    (i) Private Land – Compensation shall be paid to all affected tree owners as per the Project LARP.
    (ii) State Forest Fund – An inventory of the species to be de-listed is being prepared as part of this EIA and updates to this document will be made when the final information is received. 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 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 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.

94. 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.

95. 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 SEMP.

96. 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.

97. Spoil Disposal – The responsibility for identifying the final disposal areas for tunnel and embankment spoil material lies with the Contractor. Initial consultations with the RD indicate that the remaining static balance of 691,500 m^3 could be re-used at the Kutaisi Bypass. However, Spoil material from F4 will be generated at different times and in different volumes throughout the construction phase. At this stage of the Project the construction schedule for F4 is not known and as such it is not possible to draw up plans for the disposal of spoil material at the Kutaisi bypass. If the Contractors for F4 and Kutaisi bypass can, in coordination with RD, agree to re-use the materials F4 Contractor will be responsible for preparing a Spoil Disposal and Re-use Plan specifically for the Kutaisi bypass site.

98. If there is no agreement between the Contractors of F4 and the Kutaisi Bypass regarding the re-use of the materials the Contractor will be responsible for the preparation of a separate Spoil Disposal Plan for Arrangement of Spoil Disposal Area and a Re-cultivation Plan for a separate site which will be indicated and provided by the RD. The Plan 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. The 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.

99. 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 Engineer within the vicinity of each tunnel he is excavating.

100. 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.

101. Loss of Land and Property - Under the terms of the Loan of the ADB, before the commencement of the construction works at any part of the site, the *Employer* must prepare the Land Acquisition and Resettlement Plan (the LARP), obtain the approval of ADB and then implement the plan and acquire the land.

102. 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.

103. 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

104. 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.

105. 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.

106. 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.

107. 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.

108. Flora – it is recommended that re-planting of the 615 red-list species is undertaken as an additional compensation measure. The Contractor should coordinate with the National Forest Agency to identify a site, or sites, within the Project area where these trees can be re-planted. Plant maintenance will be carried out for at least two years. The Contractor will be responsible for the maintenance. 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.

109. Fauna - Prior to the start of construction in river beds, or close to river embankments (within 10 meters), the Contractor shall undertake a site survey (using a local ecologist) to ensure that there are no otter burrows in these areas. If burrows are found in these areas the Contractor will prepare a method statement for the management of these areas which will be sent to the Engineer for review and approval. Poaching of wildlife shall be strictly prohibited.

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

111. 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 KM 6.3 and at Bridge BR 4.0.1.AT/TA, the Contractor will be responsible for the preparation of an Environmental, Health and Safety Method Statement for working in these areas.

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

113. 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.

114. 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.

115. Bridge Construction – A range of measures are provided in the EIA to prevent impacts occurring at bridge construction sites, 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 establish 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.

116. Tunnels - Routine monitoring of the groundwater levels in well in the Project area will be undertaken on a weekly basis by the Contractor within the vicinity of each tunnel he is excavating. The monitoring shall continue for a two-month period after the tunnel is sealed. 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 will be constructed for the affected persons.

117. 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.

118. 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.

119. 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.

120. 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 cemetery be fenced off to ensure that there is no encroachment into this area by construction workers or equipment. A short section of noise barrier is recommended around KM 10.1 if it is not to be included as part of general noise mitigation measures. During the construction works the spring shall be fenced on the northern side to prevent construction works impacting upon the spring. In the event of any chance finds during the construction works procedures shall apply that are governed by GoG legislation and guidelines.

121. 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, choice of tunneling techniques and defining damage risk zones.

Operational Phase

122. Noise – The noise models prepared indicate that noise barriers, in certain locations and of certain heights, will reduce noise levels to comply with IFC standards. These noise barriers should be constructed as part of the Project. However, 24 receptors have been identified that will still be subjected to noise levels above IFC standards during the operational phase. A range of potential mitigation measures were assessed for these remaining 24 receptors, they included speed limits, noise proof windows and low noise asphalt. However, none of these options are viable for the Project. However, two other options have been determined as viable for the Project, expropriation of the affected property, or signing of a waiver. The RD will be responsible for consulting with the remaining 24 receptors to determine what option is preferable to the individual receptors. This activity shall be completed before construction commences and the results of the consultations shall be presented to the ADB for final review and approval.

123. Induced Impacts – Although the EMP contains provisions controlling direct impacts of land takings for both the road and ancillary functions (asphalt plants, construction camps, etc.), control of the induced impacts is largely beyond the scope of the Project.

124. 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.

125. 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

126. 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:

127. Instrumental Monitoring – This shall be completed by independent specialists and will include; a) Routine air quality, water quality soil sampling and noise monitoring during the construction phase; and b) Annual noise monitoring throughout the Project operational lifecycle at the receptors identified as part of the noise model.

128. 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.

129. 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

130. Two rounds of stakeholder consultations were undertaken in Zestaphoni. 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.

131. 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.

10. Conclusions

132. This EIA has established that in general there are no significant environmental issues that cannot be either totally prevented or adequately mitigated to levels acceptable GoG and international standards for Project activities.

133. However, several residual impacts have been identified in botht the construction and operational phases of the Project, including:

Construction Phase

134. The identified residual impacts during the Construction Phase include:

- **Terrestrial Fauna** - Site clearance will impact upon fauna in the Project corridor, including, for instance Otters. Further surveys of fauna prior to the start of construction to identify potentially affected species and action plans to manage these issues will help reduce the residual impacts. Residual Impacts will be **MINOR** / **MODERATE.**

- **Aquatic Flora and Fauna** - A number of bridge piers will be constructed within the Dzirula rivers. In addition, bridge abutments will also encroach into the river in some locations. Even though mitigation measures outlined above will help reduce the significance of the impact, residual impacts will still remain as aquatic flora and fauna are disturbed by the Project works. Residual Impacts will be **MODERATE.**

- **Land Use -** No residual impacts are anticipated if the LARP is implemented correctly. However, there will still be disruption to the local community during the LARP implementation process. A GRM has been prepared to manage complaints received during this process. Residual Impacts will be **MINOR** / **MODERATE.**

- **Waste Management and Spoil Disposal** - In general, if the mitigation measures suggested are implemented residual impacts will be minor. However, restoration of any spoil disposal area will take a number of years and as such the residual impacts for the spoil disposal areas are considered minor/medium. Residual Impacts will be **MINOR** / **MODERATE.**

- **Vibration** - Despite the fact that comprehensive mitigation measures have been set to manage construction vibration there may still be instances where construction works may result in unanticipated vibration. However, these will only be temporary and localized. Good oversight from the Contractors HSE team and the Engineers environmental manager should limit the impact of these types of incidents. Residual Impacts will be **MINOR** / **MODERATE.**

- **Noise** - Despite the fact that comprehensive mitigation measures have been set to manage construction noise there may still be instances where construction works may result in unanticipated elevated noise levels. However, these will only be temporary and localized. Good oversight from the Contractors HSE team and the Engineers environmental manager should limit the impact of these types of incidents. Residual Impacts will be **MINOR** / **MODERATE.**

Operational Phase

- **Climate Change** - 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. Residual Impacts will be **LOW/MEDIUM.**

- **Soils** - The erosion protection measures outlined above will prevent impacts occurring into the operational phase of the Project. However, although the measures outlined above will mitigate short term impacts, in the long term a solution for the disposal of contaminated soils must be found otherwise residual impacts will be medium. Residual Impacts will be **MEDIUM.**

- **Hydrology** - It is noted that the Project requires interceptor tanks for bridge run-off and this could also be applied to 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. Residual Impacts will be **LOW/MEDIUM.**

- **Aquatic Flora and Fauna** - The actual area in the river to be lost from bridge piers or retaining walls will be minimal compared to the wider aquatic habitat available in the Dzirula River, well below 1% of the habitat available. While habitat loss will cause local impacts to aquatic flora /fauna as rivers are dynamic systems it is expected that the river will make a full recovery following construction. Residual Impacts will be **LOW/MEDIUM.**

- **Employment and Local Businesses -** 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. Residual Impacts will be **LOW/MEDIUM.**

- **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. Residual Impacts will be **LOW/MEDIUM.**

- **Noise** - According to the noise model residual impacts to a number of receptors will remain even after the construction of the noise barriers listed above. Further assessment of the impacts to these receptors will be on-going during the operational stage of the Project to confirm the findings of the model and if additional noise abatement measures are required, including for example; Fencing around individual properties, construction of earth embankments around groups of properties, installation of sound proof windows in properties and expropriation. Residual Impacts will be **MEDIUM.**

11. Implementation

135. 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.

136. 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 camp site.

137. 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.

138. 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.

A. Introduction

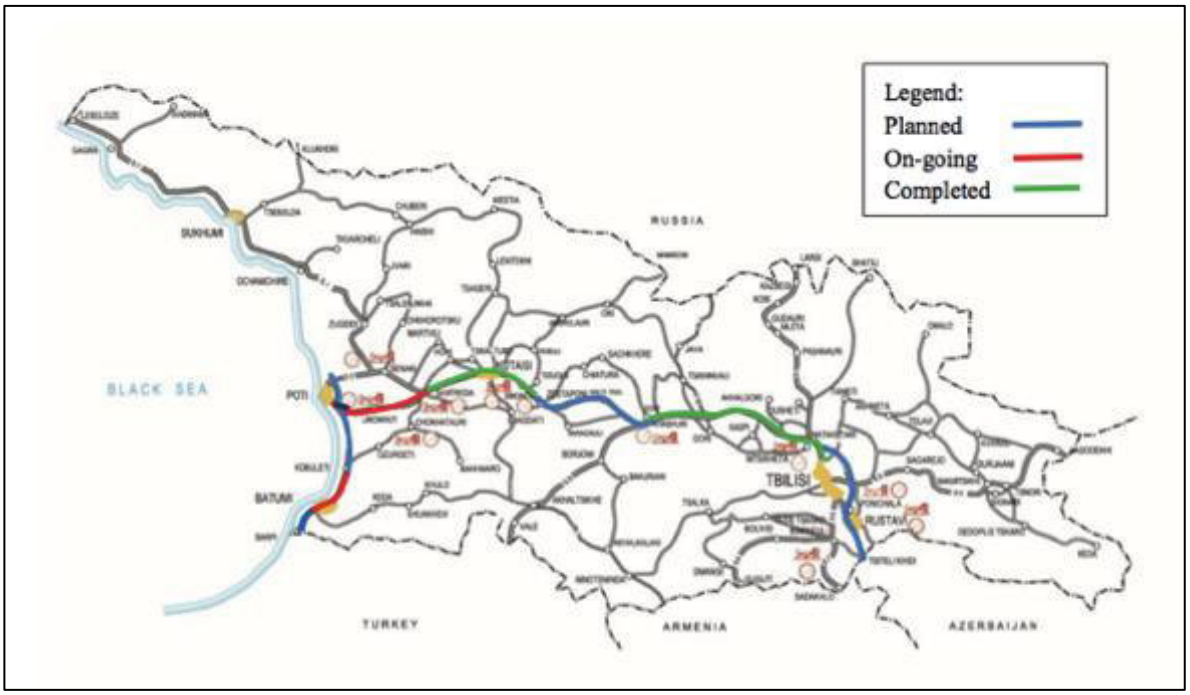
A.1 General

139. This section of the report; a) outlines the purpose of the EIA; b) provides a summary of the project, and c) identifies the project proponent.

A.2 Overview

140. 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. In anticipation of admission of Georgia to the Central Asia Regional Economic Cooperation (CAREC) program in 2016, 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. **Figure 2** illustrates the current status of road construction and rehabilitation projects in Georgia.

Figure 2: Status of Road Construction / Rehabilitation Projects in Georgia



141. 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.

142. 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.

Table 1: Chumateleti – Argveta Road Sections

Road Section	Location	Length (km)	Funding Agency
F1	Chumateleti-Khevi	11.10	World Bank
F2	Khevi-Ubisa	15.40	ADB
F3	Ubisa - Shoropani	10.50	EIB
F4	Shoropani - Argveta	15.80	ADB

143. The detailed design of Section F1 has been completed and selection of the construction Contractor is on-going. Detailed design of sections F2, F3 and F4 is currently on-going. This EIA focuses on Section F4.

A.3 Purpose of the EIA report

144. This Environmental Impact Assessment (EIA) is part of the process of compliance with the ADB Safeguard Policy Statement (2009) in relation to the construction of Section F4 of the new Khevi-Ubisa-Shorapani-Argveta section of the E60 Highway, or more simply, the "Project".

145. The EIA provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental effects associated with the Project. The EIA provides a detailed description of the direct and indirect environmental effects associated with the proposed Project during key periods of work.

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

A.4 Category of Project

147. Based on the existing ADB Environmental Safeguards Policy (2009), this Project falls under ADB's project Category A as the project is considered to have significant diverse impacts over a wide area, such as noise impacts, significant quantities of spoil disposal, road safety impacts, and vibration.[1]

A.5 Scope of the EIA

148. Scoping is the process of determining which are the most critical issues to study in the EIA and involve community participation. The scope of the EIA in hand is based upon

[1] According to ADB "*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 is required.*"

four factors; 1) the EIA requirements of the ADB and specifically the IRD/SPEA Terms of Reference (ToR) for the Project; 2) the findings of scoping consultations; 3) the defined Project Area; and 4) other best practice guidelines, e.g. IFC EHS Guidelines. The following section provides further details of each of these aspects.

A.5.1 Scoping Consultations

149. Scoping consultations were held in June 2017 in Zestaphoni. Participants in the consultations were given an overview of the proposed project and then asked what they thought may be the significant issues that would require detailed study as part of an EIA. The following summarizes the key comments received:

- In previous road projects in the region there were bad experiences with disposal of spoil material, especially from tunnels. Locations were selected, but there was too much spoil material and as such locals were paid to allow spoil material to be dumped on their land. This issue needs to be carefully managed.
- Landslides are a problem in this region, the project must carefully manage this issue.
- For every tree cut, at least three must be replanted as part of the project.
- Access to properties and land needs to be maintained during both phases.
- Will the Contractors repair access roads after construction works are completed?
- There are lots of cultural heritage sites along the corridor. They need to be protected.

150. **Section I** provides the full details of the scoping consultations. **Section F** discusses these potential impacts in more detail and provides mitigation measures where warranted.

A.5.2 ADB Requirements

151. According to the ADB Terms of Reference (ToR) for the Detailed Design (DD) Consultants (IRD/SPEA), the following actions are required:

i. Based on the findings of the feasibility study, the Consultant shall identify the nature and scale of the potential environmental and social impacts of the road construction and operation and confirm that the proposed works fall under Environmental Category A as defined. The output of the Consultant's work will be an EIA report, including Environmental Management Plan (EMP). The Consultant shall review relevant sources of information to identify presence of any known archaeological sites within the road corridor.

   The Consultant's assignment will comprise of the following tasks for preparation of EIA report:

   - Identify sensitive environmental, social, and cultural heritage receptors within the corridor of East-West highway Khevi-Ubisa – Shorapani - Argveta, point out risks to the natural and social environment and to the cultural assets associated with the anticipated construction works in this section, and describe their nature and scope;
   - Cooperate with the engineers in the process of defining exact alignment of the highway with the purpose of integrating environmental, social, and cultural heritage perspectives into the selection of the optimal route;
   - Provide a set of detailed mitigation measures aimed at avoiding or decreasing expected negative impacts of construction on the natural, social, and cultural environment, and develop an environmental management plan including mitigation and monitoring plans;
   - Produce an EIA report, including an environmental management plan, satisfactory to the RD and the ADB; and

- Assist the RD, as requested, during public consultations on the draft EIA report and through the process of obtaining an environmental permit from MoEPA.

ii. Key issues environmental and social issues may include:

- Describe Noise and Air emissions modeling using the traffic projections of the detailed design;
- Impacts of noise, vibration and air pollution near inhabited areas during construction and operation;
- Risks of uncovering archaeological material during excavation works;
- Risks related to temporary storage and final disposal of construction waste and excess material;
- Risks of soil degradation and erosion from cutting slopes and borrowing construction materials;
- Identify the territories for spoiled soil disposal temporary and constantly storage, according to the Georgian Legislation;
- Risks of Landslide;
- Risks of ground water flows; and
- Risk of water pollution from construction near rivers and streams.

A.5.3 Best Practice

152. The World Bank Group (WBG) have prepared Environmental, Health and Safety Guidelines for a range of topics including noise, water quality, air quality, occupational health and safety, community health and safety, etc. Where relevant, the Project will include the recommendations of the WBG guidelines to ensure that the Project meets international best practice.

A.5.4 Structure of the Report

153. Given the findings of the scoping consultations, the recommendations of the ToR, best practices guidelines and the defined Project area the following structure will be followed:

Section A: Introduction – The section in hand provides the introductory information.

Section B: Description of the Project – Section B describes the Project need and its environmental setting. A scope of works is also provided indicating the type of engineering works required.

Section C: Analysis of Alternatives – This portion of the report provides an analysis of alternatives, including the 'no project' option.

Section D: Legal, Policy and Administrative Framework - This section presents an overview of the policy/legislative framework as well as the environmental assessment guidelines of Georgia that apply to the proposed project. The overview is based on recent EIA reports prepared for the previous East West Highway Improvement Projects (EWHIPs).

Section E: Methodology – This portion of the report provides the methodology for completion of the EIA, including the procedures followed for monitoring, surveys, modeling, etc.