Environmental Impact Assessment

January 2017

Georgia: Batumi Bypass Road Project (Part 1)

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ADB Asian Development Bank

Environmental Impact Assessment

Batumi Bypass Construction Project

Final Report

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Acronyms

AADT	Annual Average Daily Traffic
ADB	Asian Development Bank
AIIB	Asian Infrastructure Investment Bank
AIS	Alien Invasive Species
AM	Accountability Mechanism
APs	Affected Person
BID	Background Information Document
BRC	Batumi Raptor Count
CH_4	Methane
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on Migratory Species
CO	Carbon monoxide
CO_2	Carbon dioxide
CSC	Construction Supervision Consultant
EC	European Commission
EE	Ecological Examination
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIP	Environmental Impact Permits
EMP	Environmental Management Plan
EMS	Environmental Management System
GHG	Greenhouse Gas
GRCE	Grievance Redress Committee
GRCN	Grievance Redress Commission
GRL	Georgian Red List
GRM	Grievance Redress Mechanism
GSHAP	Global Seismic Hazard Map Project
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IUCN	International Union for the Conservation of Nature
LARP	Land Acquisition and Resettlement Plan
MAC	Maximum Allowable Concentrations
MACI	Main Architecture and Construction Inspection
MOVES	Motor Vehicle Emission Simulator
N_2O	Nitrous oxide
NGOs	Non-government Organization
NO_2	Nitrogen dioxide
NO_x	Oxides of Nitrogen
NSIDC	National Snow and Ice Data Centre
OHS	Occupational Health and Safety
OWS	Oil Water Separators
PGA	Peak Ground Acceleration

PPV	Peak Particle Velocity
RAM	Rapid Air Monitors
RC	Reinforced Concrete
RD	Roads Department
SC	Supervision Consultant
SPS	Safeguard Policy Statement
SSEMP	Site Specific Environmental Management Plan
UNEP	United Nations Environment Programme
WHO	World Health Organization

Units

µg	Microgram
µg/m^3	Microgram per Cubic Meter
dBA	A-weighted decibels
g/mi	gram per mile
GWP	Global Warming Potential
km	kilometer
kph	kilometer per hour
Leq	Equivalent Sound Level
Lmax	Maximum Sound Level
m	Meter
mph	mile per hour
squrare km	square kilometer

1. Executive Summary

1. The 81-km Poti–Batumi–Sarpi Road ("S2" under Georgian Highway Designation) along the western coast of Georgia, located in the Adjara Autonomous Republic, is a key international highway and international transit route in Georgia. It is connected to the important towns Batumi, Poti and Kobuleti. Batumi is a major Black Sea port and a holiday resort; Poti is the largest port of Georgia; and Kobuleti is a holiday resort. Due to heavy traffic on S2, there has been significant increase in congestion and accidents particularly during the tourist season in Batumi and Kobuleti. The Government of Georgia plans to construct two roads around Batumi and Kobuleti to bypass the highway traffic from these towns. This EIA has been prepared for the Batumi Bypass.

2. This EIA is a continuation of the previous study however wherever necessary new baseline data collection (including air, water and soil quality sampling and measurements of noise levels), stakeholder consultation, and assessment has been done, especially with regards to the new technology and scope of operation.

3. The Project is being co-financed by the Asian Development Bank (ADB) and the Asian Infrastructure Investment Bank (AIIB).

1.1 The Proposed Project

4. Adjara Autonomous Region, located in the southwest part of Georgia, is bordered by the Black Sea to the west and Turkey to the south. The two major towns Batumi and Kobuleti are major tourist centers, especially in the summer months. Batumi is also the second largest port in Georgia. Whilst the two towns cater for extensive tourist traffic, the existing S2 Highway also carries heavy goods and passenger traffic. Turkey is Georgia's most important trading partner and substantially all trade with Turkey passes along this road. The high incidence of traffic accidents, and the associated death and injury place a heavy burden on the health and welfare systems of the area. The proposed Project will support (i) construction of bypass roads around the Batumi; (ii) improve the international road transit network; (iii) improve road safety; (iv) strengthen institutions and (v) promote activities to involve the private sector.[1]

5. The Project road, bypassing the city of Batumi from East, is entirely located in Khelvachauri District (see **Figure 1-1** for the alignment and location of tunnels and bridges). The design alignment goes through the villages of Makhinjauri, Gantiadi, Kapreshumi, Salibauri, Peria, and Makhvilauri. Passing through the above villages, the design alignment crosses complex landscape of multiple ravines, streams, rivers, hills and hillsides. Thirteen kilometer of road (**Figure 1-2)**, five tunnels (**Figure 1-3)**, 15 bridges (**Figure 1-4)** and four interchanges are planned along the Project alignment.

6. Tentative commencement date of the contract is 2017 and the expected time to complete the construction works is 2020.

[1] Feasibility Study, 2009

Figure 1-1: Project Road Alignment

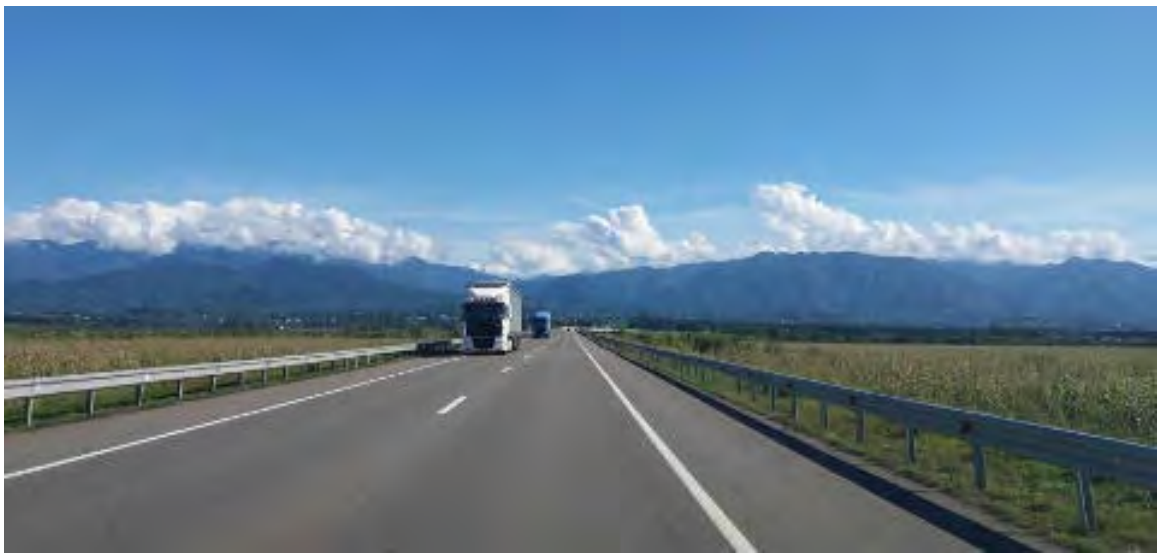

Figure 1-2: Kobuleti Bypass Road

Figure 1-3: A Tunnel with Similar Design

Figure 1-4: A Bridge over Kobuleti Road with Similar Design

1.2 Description of the Environment

7. The potential impacts of the Project on its surrounding physical and biological environments include air and water quality impacts, noise generation, land transformation and changes to soil. These are expected to reduce with the increased distance from the Project facilities, affecting more the areas located closer, up to one kilometer, to the Project alignment. For this, a study area of one kilometer around the site was delineated, to assess the baseline conditions in the areas likely to be affected by the Project due to its proximity to the Project site. This is referred to as the Study Area in this report. A detailed baseline of the physical, social, and ecological environment is provided.

8. The Project passes through a rolling and hilly terrain with elevations ranging from 20 to 197 m on the alignment. Nearly two-third of the Study Area is covered with vegetation whereas the remaining is anthropogenic in nature.

9. Air quality sampling was carried out at five different locations in the Study Area between September and October 2016 to characterize the current air quality within the Study Area. Particulate matter was sampled using Airmetrics MiniVol Portable Air Samplers, whereas the remaining pollutants measured using Gradko diffusion tubes. The results of the ambient air quality sampling are presented below.

- NO_2 levels are within limits at all locations other than A2. It is very slightly above the limit here likely due to the presence of the busy main road and industries near A2.
- SO_2 levels were lower than the detectable level at all locations.
- Ozone levels were below limits at all locations.
- Particulate matter results were high near A1, A2 and A5. The concentration is within the 24 hour IFC interim target 1 but above the guideline values.
- It must be noted that the tourist season is over. During the tourist season there are more cars and traffic jams within Batumi which could give higher readings at A1. However, the current reading is so low that the additional pollutant concentrations are also likely within limits.

10. To determine the baseline noise in the area, measurements were taken at seven locations, each for 24-hr. The survey was conducted with Cirrus Research plc.'s sound level meter, which was calibrated before and after measurements using a field calibrator.

11. The sources of noise were identified using the following sources:

- Identification of noise sources in the vicinity during set up and dismantling of sampling equipment
- The noise sampling equipment was set to record audio when noise levels exceed 80 dB A. These recordings were reviewed.

12. Based on the above the following conclusions are drawn regarding noise sources in the area:

- Traffic: for sampling locations along sealed roads traffic noise was very significant. Vehicles were observed to drive fairly fast (up to 50 kmph) on small roads adjacent to the noise sampling location (such as N4, and N5) with rapid acceleration and deceleration. There were more vehicles during the day than the night which explains the higher noise levels during the day.

- Natural sources: The major natural source of noise is the many streams that crisscross the mountainous landscape. Other sources include rain and wind. At night a drop in temperature results in an increase in the density and pressure of the air which may facilitate the propagation of noise from natural sources. This may result in conditions that have a higher noise level at night than during the day[2]. There are also fewer fluctuations during the night which further indicates that this is from steady natural sources.

13. Based on these results the following conclusions can be drawn

- Mountainous low density areas with low traffic
  - These areas such as N2, N3 and N7 have low noise.
  - L_{90} which is the background sound level is between 34 – 38 dB A. L_{10}, which corresponds to noise disturbances are lower than 51 dB A.
  - Daytime noise levels are lower (between 42 and 45.5 dB A) than night time noise levels (between 45 and 49 dB A. This is because these areas are dominated by natural noise sources discussed earlier.
- Medium density settlements along major roads
  - These areas such as N1, N4, N5 and N6 have a moderate amount of noise.
  - L_{90} ranges between 38 and 56 dB A. L_{10}, levels are as high as 62.8 dB A.
  - Daytime noise levels (between 55 and 63 dB A) are higher than nighttime noise levels (between 50 and 55 dB A) as these areas are dominated by human noise influences which reduce at night.

1.3 Information Disclosure, Consultation, and Participation

14. As part of the Environmental Impact Assessment process, consultations are undertaken with communities and institutions that may have interest in the proposed project or may be affected by it. The objective of conducting stakeholder consultations during the ESIA process is to inform all the stakeholders about the Project, record and take into account their opinions, suggestions and concerns and establish confidence amongst the Project stakeholders that the Project is developed in a responsible way. This section documents the consultation process for the EIA of the proposed Project.

1.4 Anticipated Environmental Impacts and Mitigation Measures

15. During the scoping stage of the EIA process, several potential environmental and social impacts of the project were identified. The baseline surveys were conducted keeping in consideration the potential impacts. In this chapter, the potential environmental and social impacts are evaluated. The impacts have been identified based on consideration of the information presented in previous chapters. To avoid unnecessary repetition of supporting information, cross referencing to previous sections is given where necessary. Following the impact assessment, the mitigation measures related to each impact category is presented.

1.4.1 Ecology and Habitat

16. The main concerns for impacts on ecological receptors are disturbances caused by site clearance, contamination of feeding, breeding and resting habitats, poaching of

[2] Davis M. L. and Cornwall, D. A. 1991. Introduction to Environmental Engineering. McGraw-Hill, Inc.

wildlife and introduction of invasive species, due to a lack of regulation, by staff involved in Project-related activities.

1.4.2 Construction Noise

17. Noise is defined as a loud, undesired sound that interferes with normal human activities. If it affects the well-being of the surrounding community (environmental noise), it is considered a nuisance and normally has no direct health impacts. Exposure to very high noise levels (exceeding 85 dBA), particularly for prolonged period can cause hearing loss. This level of noise is usually encountered in the workplace around construction sites and is considered an occupational hazard.

18. The potential noise related issue during construction of the project is disturbance to surrounding communities of the Project. The noise during the construction phase greatly depends on the stage of construction work and equipment used at the site. The construction activities can be divided into the following phases:

- Site clearing and preparation,
- delivery of equipment and materials to the site,
- excavation and tunnel construction,
- piling and concrete placement,
- erection of bridges, and
- finishing.

19. The main sources of noise and vibration during construction of the project are as follows:

- Construction machinery
- Drilling activities
- Haulage activities
- Concrete mixing and aggregate production systems,
- Vehicular movement; and
- Construction Camps

20. The proposed mitigation measures include:

- No construction work will be undertaken within 250 m of a house during the night.
- Prior of start of work on activities that may result in excessive noise, such as jack-hammer, tractor, dozer, grader and bored piling the community will be informed about the activity is imminent and the likely duration of the activity.
- Equipment emitting excessive noise in comparison with other similar equipment will not be allowed to operate.
- Equipment under use will be regularly maintained, tuned, and provided with mufflers to minimize noise levels.

- Equipment in poor state of maintenance, particularly without effective noise control will be checked to determine if it can be improved, and replaced with less noisy equipment as soon as practicable.
- Blowing of horn will be prohibited within the construction zones except under emergency conditions.
- Close liaison with the community and regular monitoring of the noise levels in the community are key to successfully implementation of the above mitigation measures. Specifically, the communities will be informed of all major construction activities at least three days in advance. Noise control measures will be discussed with the community through informal and formal meetings.
- A complaint registering, tracking and redressal mechanism will be implemented.
- Noise levels will be monitored regularly in the community in order to take timely corrective measures, if needed.

1.4.3 Vibration

21. Ground-borne vibration is the oscillatory motion of the ground about some equilibrium position, and can be described in terms either of displacement, velocity or acceleration. Because human sensitivity to vibration typically corresponds best to the amplitude of vibration velocity within the low frequency range of most concern (roughly 5-100 Hertz), vibration velocity is the preferred measure for evaluating ground-borne vibration from transit projects.

22. Vibration from the construction activities is a cause of 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.

23. The effects of vibration includes annoyance, sleep disturbance, and potential damage to structures. Sources of vibration includes construction equipment movement, pile driving, compaction, hammering (hydraulic or pneumatic), operation of batching plant and generators. Another source of vibration will be the blasting to be undertaken for tunneling. The propagation of vibration from construction activities are different in nature from the vibration from blasting. The construction activities are undertaken essentially on ground surface and spreads basically as two-dimensional waves. In contrast, the tunneling is undertaken below the surface and spreads in three-dimension. For this reason, the impact of the two is assessed separately.

24. It is shown the anticipated levels of vibration are well below the threshold of any possibility of damage to structures due to vibrations from typical construction activities related to roller, compactors, and movement of construction equipment. The piling for the bridge piers are likely to generate relatively more vibrations which depends on soil condition. However, even under extreme conditions, the vibration is unlikely to exceed 10 mm/s beyond 25 m.

25. Tunnel excavation will be carried out by two methods. “Drilling and Blasting” is the preferred method for Category V rocks whereas “Excavator and Jackhammer” is the preferred method for Category II and II rocks. Blasting results in release of energy in four

forms: a) ground vibration; b) airborne shockwaves; c) flying debris and rocks; and d) sound waves.

26. The airborne shockwaves are generated mainly if the blast is carried out on the surface or near the surface. The impact of airborne shockwaves is calculated and is shown that it is not of concern if the explosives are confined. The efficiency of blasting requires that the energy in airborne shockwaves remains low so that maximum energy is used for breaking rocks.

27. A second source of concern is flying rocks from the blast. Depending in the rock type and explosive strength, these rocks can go up to 50 m and can potentially damage structures. For the above reason, surface blasting or blasting near the mouth of the tunnel is not recommended. To prevent damage to the structures from flying rock and, to some extent minimize effect of airborne shockwaves and sound, no blasting will be carried out within 100 m of the mouth of the tunnel.

28. Underground blasting results in ground vibrations that cannot be confined to the site. 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 based on the safety standards) and evacuating it.

29. Prediction of vibration levels at a location away from the blasting site is a complex function of blasting parameters and rocks through which the waves propagate. A number of site specific experimental formulae have been developed to predict and control blasting effects. A recently developed model for blasting induced vibration was used.

30. In the case of ground vibrations, the level of vibration is measured by the Peak Particle Velocity (PPV) with units of millimeters of movement per second (mm/s). The PPV is directly related to the size of the blast and the distance from the blast—the closer to the blast the greater the vibration. Using the rock parameters and instantaneous charge weight, the PPV at intervals of 10 m from the blasting site was calculated.

31. The results indicate that for the given configuration, the applicable criteria of no damage (5 m/s) will be met at a distance of 130 from the blasting site. Further the PPV will exceed the threshold for structural damage at a distance of 60 m from the blasting site. The above results are based on certain key assumptions and understanding. These are:

- The accuracy and representativeness of information in the Feasibility Study. This includes the rock type, rock type distribution, and RQD;
- The tunnel composition of rock type is representative of the entire area to allow developing property of composite rock;
- The assumptions about borehole depth (5 m), total rock blasted in one cycle (460 m^3), powder factor (0.75) and maximum instantaneous charge (50 kg) are reasonable.

32. It is emphasized that these are assumptions and shall not be considered as binding. They are based on available information and have been selected as indicative of typical conditions that are likely to be encountered in the actual tunneling. In selection of the numbers, a reasonable level of conservative approach has been taken.

33. It is, therefore, believed that during the blasting for tunnels it shall be possible to meet the evaluation criteria which shall be considered binding on Construction Contractor.

34. A sensitivity analysis was also undertaken to ascertain the variation in distance at which the threshold values are exceeded. To investigate the impact of simultaneous variation in the three parameters, random variation about the mean values of the three parameters was generated. The calculated distance to structural damage risk was calculated to be 59 ± 13 m, and to the cosmetic damage risk was calculated to be 126 ± 28 m.

35. Blasting induced vibration risk zone maps were developed for each tunnel. The number of houses around the five tunnels that are in the structural damage and cosmetic damage risk zones are 64 and 80, respectively.

36. The PPV is predicted using a semi-empirical model which is the best alternate in the absence of measured field data. Although, there is reasonable confidence in the predicted value, but the norm is to measure field data to assess vibration levels. It is therefore proposed that the tunneling shall start from a tunnel with sparse population in the surrounding (for example, Tunnel 3). In the initial stages, the blasting induced vibration shall be measured as a function of maximum instantaneous charge and distance from the blasting site. This data shall be then used to refine the damage risk zones on the basis of the adopted criteria.

37. Early during the construction phase, the construction contractor shall develop a detailed tunnel blasting plan as part of the overall construction schedule. The plan shall specify, to a reasonable level of accuracy, the schedule for boring of each tunnel.

38. Using, the refined damage risk map and the tunnel boring schedule, the Supervision Consultant in consultation with the Roads Department and the Construction Contractor, shall identify the houses that will be affected and the impact duration and schedule.

39. For the houses that will fall in the Structural Damage Risk Zone, a temporary relocation plan will be developed. An amendment to the Land Acquisition and Resettlement Plan (LARP) will be commissioned for this purpose. Before start of blasting, all residents of houses in the Structural Damage Risk Zone will be relocated as per the LARP.

40. A survey will be undertaken in both zones, to determine the pre-blasting conditions of the buildings. The survey will be commissioned by the Supervision Consultant and will identify and record any existing damage to the structures. The survey will cover the following aspects:

a. Overall condition of the structures, both exterior and interior.
b. Documentation of defects observed in the structure using digital imagery along with notes, measurements and sketches.
c. Documentation of pre-existing cracks using digital imagery along with notes, measurements and sketches.

41. The survey will be accompanied with consultations with the affected household to explain the extent and reason for the survey, and the process for reporting any grievances regarding vibration impacts. The households should be provided with materials that summarize the grievance redress process.

42. Following completion of the blasting, the survey will be repeated in the Structural Damage Risk Zone to determine the condition of the buildings and verify that they are safe for re-occupation. If the buildings are safe, the residents will be allowed to return to their houses following any necessary damage repairs. If the buildings are damaged beyond repair, compensation will be paid to the owners as per the LARP.

43. If there are any claims or reports of damage in the Cosmetic Damage Risk Zone, the affected house will be surveyed against the pre-Project survey and repairs will be undertaken as appropriate.

44. Following are key mitigation measures for the management of blasting:

- Blasting will be scheduled during the day only.
- Local communities will be informed of blasting timetable in advance and will be provided adequate notice of when blasts are required outside of the planned schedule.
- A Blasting Management Plan will be developed by the Construction Contractor. The Plan will be reviewed and approved by the Supervision Contractor before the initiation of the blasting work.
- Throughout the blasting activity, vibration sensors will be installed at strategic location to monitor the impact of blasting and to ensure that the vibration levels are within the adopted criteria. The monitoring plan will be part of the Blasting Management Plan.

45. Unlike other construction activities, it is recognized that the impact of blasting on the community can be significant or can be perceived as significant by the community. It is therefore vital that regular and meaningful contact with the community shall be maintained and their grievance shall be attended to in a timely manner. In this regard:

- A meaningful community engagement plan will be developed. The plan will cover identify the affected community; the key contact persons; frequency of engagement; the information to be shared; the responsibilities to manage the plan; and the notice period to be giving to the community for various blasting related generating activities.
- The Grievance Redress Mechanism will be used to record, investigate, and respond to any complaints. Investigation of the complaints will be undertaken by the Supervision Consultant.

46. Vibration Monitoring Plan will include monitoring of vibration levels and frequency around the blasting sites. The objectives of the monitoring will be to:

- Ensure that vibration levels in the communities are within the adopted criteria levels;
- Maintain record of vibration to settle any potential conflicts; and
- Monitor changes in the vibration levels due to possible changes in the rock formation and take appropriate corrective actions.

47. Vibration data will be documented, reviewed, and preserved. It will be regularly shared with the RD, ADB, ministry of Environment and the community as part of the monthly progress report.

Operation Phase Impacts

48. Highway traffic is not likely to have any measurable impact on the structures or on comfort. The Federal Highway Administration of the USA has determined that "All studies the highway agencies have done to assess the impact of operational traffic induced vibrations have shown that both measured and predicted vibration levels are less than any known criteria for structural damage to buildings. In fact, normal living activities (e.g., closing doors, walking across floors, operating appliances) within a building have been shown to create greater levels of vibration than highway traffic."[3]

1.4.4 Air Quality

49. The ambient air quality may be affected by the Project activities during the construction phase. In this section, the impacts of construction activities on ambient air quality are discussed.

50. The sources of emission will include point sources (a single, stationary and identified source of pollution from where pollutants can be emitted into the atmosphere instantaneously and continuously). The stacks of all the generators are an example of point source. Other point sources include the batching plant.

51. The proposed mitigation measures include:

- Minimize disturbance to, or movement of, soil and vegetation.
- Prevent soil damage and erosion to reduce dust emission.
- Retain as much natural vegetation as possible.
- Install and maintain all vehicles and machinery with appropriate emission control equipment.
- Smoke from internal combustion engines should not be visible for more than ten seconds.
- Sprinkle water on all exposed surfaces, particularly those close and up-wind of the settlements.
- Dust suppression with covers on loads, water sprays, covers on long-term piles of materials when there are visible dust emissions.

Operation Phase Impacts

52. The air quality of the Study Area was modeled to assess the impacts of traffic on the new road. The results of the dispersion model shows marginal increase in air pollutant concentration in the surrounding areas.

1.4.5 Land Stability

53. The top cover of soil on the slopes around the Project facilities is mainly sand and fine clay. Any excavation work during the construction activities, whether permanent or temporary, would lead to loss of soil. Excavated material collected during excavation of the tunnels may be used during construction of the road. Erosion of soil can occur from removal of vegetation cover, runoff from unprotected excavated areas, muck disposal

[3] http://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/analysis_and_abatement_guidance/polguide09.cfm

sites and quarry sites. Excavations on slopes would also decrease its stability. Given the topography of the area, unprotected excavations on sloping grounds may lead to landslides, especially during the rainy season. Major landslides will disturb the slopes of the area and may also alter the bed of streams and rivers.

54. The proposed mitigation measures include:

- Vegetation loss will be limited to demarcated construction area.
- Areas such as muck disposal area, batching plant, labor camp and quarry sites after the closure shall be covered with grass and shrubs.
- Slope stabilization measures will be adopted such as adequate vertical and horizontal drains, drainage along roadsides, cross drainage and retaining walls.
- Slope movements will be monitored around excavation work areas.

1.4.6 Operation Noise

55. Noise is undesirable or unwanted sound. It can be subjective but its impacts may include annoyance, disturbance, stress, and physical and psychological damage. Sources of noise from highway traffic includes:

- Engine noise mainly from exhaust, during acceleration and stopping
- Friction between road surface and vehicle tire
- Horns and loud music
- Aerodynamic friction

56. To assess the impact of the proposed traffic on the surrounding communities, noise modeling was undertaken with the following objectives:

- Predict the noise level due to traffic on the proposed Batumi Bypass Road on the surrounding areas, particularly on the residences located within 100 m of the proposed road.
- Identify generic specifications of noise barriers to reduce the noise levels to acceptable criteria.
- Identify the areas, where the noise levels are unlikely to be mitigated to acceptable noise levels using the standard mitigations methods

57. The noise model, SoundPLAN Essential Version 3.0 by Braunstein + Berndt GmbH / SoundPLAN International LLC was used. The model is capable of modeling noise levels in three-dimensions. The following are the key inputs and assumptions: For the convenience of modeling the entire road was divided in to 9 segments. Each segment was modelled separately. In the 1-km zone on each side of the road, a total of 490 houses were identified. These are the potential receptors.

58. In addition to these 490 houses, 25 houses fell within 25 m of the edge of the road. These were not modeled as the Road Departments intends to remove all houses within 25 m of the edge of the road. These houses will be thus included in the LARP.

59. Following the modeling of “without mitigation” emission, noise walls were introduced to reduce the impacts on the receptors. The length and surface area of the walls in each segment is provided in the table. An estimated 14.5 km of noise wall of

2-4 m height will be required. The total surface area of the walls is estimated to be 58,000 m^2. The estimated cost of this noise wall is USD 275 per m^2 for a total cost of USD 15.95 million.

60. A key mitigation measure to achieve compliance with the noise standard is to ensure that the vehicle speed on the highway does not exceed 90 kph.

61. Even after the introduction the noise wall, the noise levels for some receivers could not be mitigated due to their location with respect to the road for the relative positions of selected receiver. The number of such receivers is 52. The strategy for these receivers will be as follows:

- Refined mitigation options will be considered. These may include higher walls (up to 6 m); wall and berm on the hill to provide better shielding; and plantation of 200 m wide avenue of trees to shield the houses.
- If by any of these measures noise levels for the houses cannot be mitigated, the owners of the houses will be given the option to relocate after selling their houses. Their names will be included in the LARP.
- An alternate, is that they despite the high noise want to stay in their houses. In that case, a legally binding agreement will be executed between the Roads Department and the receiver.

1.4.7 Socioeconomic Impact

62. The proposed Project is located in an area which is close to the urban area of Batumi, however, has a semi-urban and rural setting. The residents of the village depend on the city for their essential economic needs. Agricultural farming is the local economic activities. The key socioeconomic impacts on the community relates to resettlement. Other impacts such as noise, dust, and traffic impacts are covered elsewhere in the report.

- The Adjara is rich with archeological findings, though no known archeological sites are located within the construction corridor of the Project alignment, there is a potential that these works may damage the unidentified underground archaeological remnants. According to the Law of Georgia on Cultural Heritage, a separate study will be carried out to ascertain whether there is any archeological site present in the area. As part of the study Chance find procedure will also be developed.
- A cemetery is within the RoW of the alignment and will be displaced. The community is in agreement to relocate the cemetery. The Roads department will execute an agreement with the community and facilitate the relocation of the cemetery.
- The Project will have impacts on both urban economics and rural poverty in the project area. The road construction will create lot of job opportunities to the local community. It is expected that about 70,000 man months of employment during construction. The construction of the new bypass road constitutes the long-term improvement of economic conditions in the project area due to better traffic access. The greatest beneficiaries from a monetary standpoint will be the current road users, who will experience greater efficiency, higher safety, time and operational cost reduction, and less wear and damage to their vehicles.

- The most significant socioeconomic impact relates to the land acquisition and resettlement. A Land Acquisition and Resettlement Plan has been prepared separately to manage the resettlement process in accordance with the ADB safeguard policies.
- Consideration is made in the engineering design to provide paved full-width shoulder for pedestrians and roadside lay-bys for marketing local produce. Where space permits, either a part of the roadway or a separate surface from the edge of the roadbed is considered, especially in the region where road is passing through settlements, schools, and markets. Special provisions are made in bridge and tunnel designs for pedestrian traffic. Crash guardrails and barriers will be constructed along the roads and bridges designed to German standards. These barriers protect both the vehicles and surrounding communities from collisions. Bridges also contain pedestrian guardrails, after the sidewalk.

1.5 Environmental Management Plan

63. The main objective of the Environmental Management Plan (EMP) is to identify mechanisms to implement the environmental mitigation measures discussed in **Chapter 9**. It is the fundamental tool that ensures that all mitigation measures are consolidated, their implementation responsibilities identified and the resources required to implement the measures are provided. Further, the EMP includes monitoring measures as a feedback mechanism on implementation and effectiveness of the mitigation measures.

64. Environmental Management Plan (EMP) is prepared for all the identified environmental impacts during design, construction, and operation and management (O&M) stages due to implementation of various Project activities.

1.6 Conclusions

65. The proposed Project, the Batumi Bypass Road Construction, was evaluated in this report. The proposed design and construction activities were assessed against the laws of Georgia, and ADB's safeguard policies. Mitigation and management measures were recommended and made part of the project design.

66. Environmentally, the most important aspect of the project is the noise to be generated during project operation. Noise modeling was undertaken to predict the impact, and identify mitigation measures. Socially, the most important aspect is resettlement. A resettlement action plan has been prepared separately to undertake the resettlement in a fair and open manner and to minimize social or economic impacts.

2. Introduction

67. The 81-km Poti–Batumi–Sarpi Road ("S2" under Georgian Highway Designation) along the western coast of Georgia, located in the Adjara Autonomous Republic, is a key international highway and international transit route in Georgia. It is connected to the important towns Batumi, Poti and Kobuleti. Batumi is a major Black Sea port and a holiday resort. Poti is the largest port of Georgia. Kobuleti is a holiday resort. Due to heavy traffic on S2, there has been significant increase in congestion and accidents particularly during the tourist season in Batumi and Kobuleti. The Government of Georgia plans to construct two roads around Batumi and Kobuleti to bypass the highway traffic from these towns. This EIA has been prepared for the Batumi Bypass (the 'Project').

68. The Project is being co-financed by the Asian Development Bank (ADB) and the Asian Infrastructure Investment Bank (AIIB).

2.1 Introduction to the EIA

69. This EIA is a continuation of the previous study however wherever necessary new baseline data collection (including air, water and soil quality sampling and measurements of noise levels), stakeholder consultation, and assessment has been done, especially with regards to the new technology and scope of operation. The Terms of Reference (TOR) is included as **Appendix 1**.

2.2 Project Category

70. ADB uses a classification system to reflect the significance of a project's potential environmental impacts. A proposed project is classified as category A, B, C or FI. A 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. Whereas a proposed project is classified as Category B if its potential adverse environmental impacts are less adverse than those of Category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for Category A projects.

71. The proposed Project is classified as Category A mainly because a) it will have a permanent footprint that will be irreversible, and b) it involves resettlement of a relatively large number of people.

2.3 Organization of the Report

72. The EIA contains 12 chapters as follows: After the **Executive Summary** (**Chapter 1**) and **Introduction** (this chapter), the **Legal and Institutional Framework** (**Chapter 3**) discusses the environmental laws of the country and the ADB SPS 2009. The proposed project is described in **The Proposed Project** (**Chapter 4**). The physical, ecological and socioeconomic baseline is presented in **Description of the Environment** (**Chapter 5**). **Information Disclosure, Consultation, and Participation** (**Chapter 6**) and **Analysis of Alternatives** (**Chapter 7**) follow. The core of the EIA is the **Environmental Impacts and Mitigation Measures** (**Chapter 8**) which identifies the potential environmental and social impacts of the proposed Project, predicts their magnitude, evaluates the significance of impacts, and proposes mitigation measures, where required. The cumulative impacts are discussed in **Chapter 9**. This chapter is followed by the

Environmental Management Plan (**Chapter 10**) which identifies various implementing mechanisms, institutional arrangements, monitoring mechanisms, and other plans to ensure effective implementation of the proposed mitigation measures. The **Grievance Redress Mechanism** (**Chapter 11**) proposes the mechanism to affectively address any grievances of the community and other stakeholders against the project.

73. Finally, **Conclusions** (**Chapter 12**) concludes the report. The background information and detailed data is provided in the appendices.

3. Policy, Legal and Administrative Framework

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

Note: All legal instruments in Georgia are in the Georgian Language. English translations that have been used and quoted in this chapter are from various online sources and shall not be construed as official translation.

3.1 Environmental Policies and Laws of Georgia

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

76. The Ministry of Environmental and Natural Resources Protection (MoENRP) of the Government of Georgia is responsible for regulating the activities that affect the natural environment.

3.1.1 Constitution of Georgia 1995 (Last Amended 2013)

77. The Constitution of Georgia[4] defines both the rights and duties of the citizens of Georgia and the responsibilities of the State in the context of environment and sustainable development. Specifically it states that:

Rights of the Citizen

- Everyone shall have the right to live in a healthy environment and to use the natural and cultural environment [Article 37, Part 3].
- Everyone shall have the right to complete, objective, and timely information about environmental conditions [Article 37, Part 5].
- Every citizen of Georgia shall have the right of access to information as determined by law, as well as to official documents about him/her stored in state institutions, unless they contain state, professional, or commercial secrets [Article 41, Part 1].

Duties of the Citizen

- Everyone shall be obliged to protect the natural and cultural environment [Article 37, Part 3].

Responsibilities of the State

- Taking into account the interests of current and future generations, the State shall guarantee environmental protection and rational use of nature in order to ensure a safe environment for human health and maintain sustainable

[4] Georgia's Constitution of 1995 with Amendments through 2013, https://www.constituteproject.org/constitution/Georgia_2013?lang=en. Accessed October 15, 2016.

development of the country in line with the ecological and economic interests of society [Article 37, Part 4].

3.1.2 Law of Georgia on Environmental Protection 1996 (Last Amended 2016)

78. Law of Georgia on Environmental Protection 1996[5] is the earliest environmental law that "regulates legal relations in the field of environmental protection and the use of natural resources ('environmental protection') between state bodies and natural and legal persons…"

79. The main goals of this law, relevant to the proposed Project are:

- "protect fundamental human rights established by the Constitution of Georgia in the field of environmental protection, in particular the right to live in a healthy environment and the right to enjoy the natural and the cultural environment;
- ensure the protection of the environment and the rational use of natural resources by the State, and ensure a healthy environment in accordance with the environmental and economic interests of society and taking into account the interests of present and future generations;
- support the preservation of biological diversity and of rare, endemic and endangered species of flora and fauna typical of the country, and support the protection of, and ensure ecological balance within, the marine environment;
- preserve and protect natural landscapes and ecosystems; and
- ensure appropriate conditions for the sustainable development of the country.

80. Article 5 states that "when planning and carrying out activities[6], state bodies and natural and legal persons (regardless of their ownership and organizational and legal form) shall be guided by the main environmental principles." For the applicability of this article, the law lists 12 environmental principles, which are:

- the risk reduction principle —an operator7 shall, when planning and carrying out his/her/its activities, take relevant measures to prevent or reduce the risk of an adverse impact on the environment and human health;
- the sustainability principle—the use of the environment and natural resources in a manner where no danger is posed to the development of society and where the protection of the environment and natural resources from irreversible quantitative and qualitative changes is ensured;
- the priority principle—an action that may have an adverse impact on the environment and human health may be replaced by another, less risky, though more expensive, action. Priority shall be given to the latter if its value does not exceed the costs of compensation of ecological damage caused by a less expensive action;
- the user pays principle—an operator pays for the use of natural resources of soil, water, forest, flora and fauna, subsoil and fossils;

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5 https://www.matsne.gov.ge/ka/document/download/33340/19/en/pdf, Accessed October 15, 2016.

6 The term "activity" is defined in Article of the Law of Georgia on Environmental Impact Permits.

7 "Operator is defined in the law as "a natural or a legal person carrying out an activity"

- the polluter pays principle—the obligation of an operator or other natural or legal person to compensate damage caused to the environment;
- the biological diversity preservation principle—activities shall not cause the irreversible degradation of biodiversity;
- the waste minimization principle—in the course of activities, preference is given to such technology as ensures the minimization of waste;
- the recycling principle—in the course of activities, preference is given to substances, materials and chemical compounds which can be reused or reprocessed, or biologically degraded, or decomposed safely for the environment;
- the restitution principle—the environment degraded as a result of activities shall be brought as close as possible to its original state;
- the environmental impact assessment principle—an operator shall, in the process of designing or planning his/her/its activities, take into consideration and assess the possible impact of those activities on the environment in accordance with the procedure established by law;
- the public participation principle—the participation of the public in the process of making important decisions related to the carrying out of an activity;
- the information accessibility principle—information on the environmental condition shall be open and available to the public.

81. Article 37 of the Law of Georgia on Environmental Protection 1996 covers the EIA and requires that:

- An environmental impact assessment shall be carried out before the issuance of environmental impact permits for the implementation of activities in order to prevent or reduce adverse environmental impacts.
- An environmental impact assessment shall determine the potential impacts of activity on the environment, and shall evaluate the ecological, social and economic consequences caused by such impacts.
- An operator shall include the results of environmental impact assessment in an environmental impact assessment report.

82. Articles of Chapter XII of the Act discusses the protection of the natural ecosystem. These include among others coastline, forests, and wildlife. Similarly, Chapter XIII of the Act covers the protected areas. Chapter XIV covers the global issues such as the climate change, biodiversity, and ozone layers. However, the implementation of these articles requires separate legislation under the Act. Where any law has been enacted in this context and is relevant is discussed later in this chapter.

83. In the context of this EIA, the specific requirements under this law are:

- Wherever relevant, the EIA process shall take into account the environmental principles. This is particularly important for those aspects of the environment for which specific laws, regulations and standards have not been enacted.
- An EIA shall be carried out for the proposed project for the issuance of environmental impact permits for the implementation of the Project.

3.1.3 Law of Georgia on Environmental Permit 2007 (Last Amended 2016)

84. The Law of Georgia on Environmental Permit 2007[8] is a legal instrument that regulates the environmental assessment procedures in Georgia. The Law defines the term "Environmental Impact Assessment", lists the activities that are subject to EIA, lays down the procedure for mandatory public hearing, EIA preparation and review process. And identifies the minimum contents of the EIA. Activities subject to environmental assessment include "Engineering of international and national highways, railways and the bridges and viaducts of the tunnel, as well as road, railway, and construction protection facilities of their areas" (Article 4, Clause 1(J)).

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

3.1.4 Other Relevant Laws

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

86. The Law regulates activities which may result in increased hazard to human life or health, involves interests of importance to the State or public, or connected to consumption of State resources. The Law defines the full list of activities which require licenses and permits, and sets out the rules for granting, amending and abolishing licenses and permits.

Law of Georgia on Ecological Expertise 2007 (Last Amended 2013)

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

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

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

Law of Georgia on Public Health 2007

89. The purpose of this law is the promotion of the healthy lifestyle and protection of the population's health; provision of the environment that is safe to human health; protection of the reproductive health of the family; prevention of the contagious and non-contagious diseases.

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

90. The Law aims at ensuring preservation of integrity and improvement of soil fertility. It defines the obligations and responsibility of land users and the State regarding the provision of soil protection conditions and ecologically safe production. The Law sets the

[8] https://tenders.procurement.gov.ge/public/lib/files.php?mode=app&file=356952&code=1344627268

maximum permissible concentrations of hazardous matter in soil and restricts the use of fertile soil for non-agricultural purposes, the execution of any activity without prior striping and preservation of top soil, open quarry processing without subsequent re-cultivation of the site, terracing without preliminary survey of the area and approved design, agricultural activities that could lead to overgrazing, wood cutting, damage of soil protection facilities, and any activity that could potential deteriorate soil quality (e.g. unauthorized chemicals/fertilizers, etc).

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

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

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

Waste Management Code 2015 (Last Amended in 2016)

93. The purpose of this Code is to establish a legal framework in the field of waste management to implement measures that will facilitate waste prevention and its increased re-use as well as environmentally safe treatment of waste. The objective of this Code is to protect the environment and human health through: a) the prevention or reduction of waste and its adverse impact; b) the establishment of effective mechanisms for waste management; c) the reduction of damage caused by the consumption of resources and the more efficient use of resources.

The Law on Minerals 1996 (Last Amended in 2015)

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

The Wildlife Law 1996 (Last Amended in 2015)

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

The Law on the System of Protected Areas 1996 (Last Amended in 2016)

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

97. The following activities are generally restricted within protected territories: damaging or changing in any way natural ecosystems; destroying natural resources for

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

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

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

Forestry Code of Georgia 1999 (Last Amended in 2013)

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

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

100. The Law defines terms, rules and procedures for the expropriation of assets necessary in the public interest. Expropriation requires the Presidential decree and a court decision. The decision of the court gives a detailed description of the expropriable property and due compensation to the owner. The Law states the public interests which allow expropriation of assets. These are the construction/installation of: a) Roads and highways; b) Railways; c) oil, gas and oil product pipelines; d) Power transmission and distribution lines; e) Water supply, sewage and storm water drainage systems; f)Telephone lines; g) Premises and objects of public needs; h) Works required for national defense; i) Mining and reserve development.

101. After issuance of the Presidential decree a person seeking for expropriator's right announces in the central and local printed media about the project, its scope, area coverage and brief description of the potentially expropriable property. All affected landowners also shall be informed about the dates of application to the court and action proceeding.

102. An expropriator should endeavor to obtain property in agreement with the owner. Prior to negotiation the expropriator evaluates the property and determines an estimated compensation sum or other property compensation according to fair market price. Agricultural lands are to be evaluated together with price of crops that could be yielded by the owner throughout the current agricultural year.

Georgian Labor Legislation

103. Applicable Georgian Labor Laws are as follows:

- Labor Code of Georgia (2006) governs the rights of the employees in all enterprises, institutions and organizations. This law establishes the requirements regarding human rights and creation of safe and healthy working

environment including health and safety conditions, social security and insurance; and

- Law of Georgia on Employment (2001) regulates the employment policy of Georgia, including protection of the unemployed in terms of economic, social and legal issues. For the protection of the unemployed, this law promotes employment programs.

3.2 Requirements for Environmental Assessment in Georgia

3.2.1 Requirements for EIA

104. The Environmental Impact Assessment is defined under the Georgian Law as:[9] - studying and examination procedure of the planned activities is designed to protect separate components of the environment, human, as well as landscape and cultural heritage. EIA study, identify and describe the direct and indirect impacts on human health and safety, herbage and animals, soil, air, water, climate, landscape, ecosystems and historical monuments, or all the above factors unity, among the factors that influence the cultural values (cultural heritage) and the social - economic factors.

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

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

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

3.2.2 The EIA Process

107. The EIA process will follow the relevant national and international requirements. The Law of Georgia on Environmental Impact Permit sets the legal basis for issuance of an environmental permit, including implementation of an ecological examination, public consultations and community involvement in the processes. Granting of permission or refusal to issue a permit is based on ecological examination of environmental documents presented to the Ministry of Environment and natural Resource Protection (MoENRP) by the project proponent.

108. Article 6 of the Environmental Impact Permit Law requires the project proponent to organize a public hearing of the EIA prior to submission of the final version documentation to the MoENRP. The permit application/issuance procedure for the Project, including EIA

[9] Law of Georgia on Environmental Impact Permit. Article 2 (D).

coordination, establishment of the timeframes for information disclosure and public review and discussion in accordance with Georgian Law will include the following steps:

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

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

110. Environmental impact permit is also required for running asphalt and concrete batching plant. License for use of natural resources, if own quarries are to be used, is also required. The authority responsible for issuing the license is MoENRP. All other issues such as temporary disposal of inert construction waste and unusable asphalt are regulated with the local municipal authorities and requires a formal agreement with them.

3.3 ADB Safeguard Policies

111. As per Asian Development Bank's SPS 2009, depending on the significance of project impacts and risks, the assessment may comprise a full-scale environmental impact assessment (EIA) for category A projects, an initial environmental examination or equivalent process for category B projects, or a desk review. ADB uses a classification system to reflect the significance of a project's potential environmental impacts. A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Projects are assigned to one of the four categories shown in **Table 3-1.**

112. The policy principles under the SPS 2009 for environmental assessment are:

- Apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety (EHS) Guidelines.
- Adopt cleaner production processes, and good practices of energy efficiency.
- Avoid or, when avoidance is not feasible, minimize or control the intensity or load of pollutants emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous material from their production, transportation, handling and storage.

113. The ADB SPS 2009 in its Policy Principles require conducting "an environmental assessment for each proposed project to identify potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project's area of influence. Assess potential trans-boundary and global impacts, including climate change."

114. Section D of the ADB SPS 2009, in its Subsection 6 requires analysis of impacts in the context of project's area of influence, encompassing "areas and communities potentially affected by cumulative impacts from further planned development of the project, other sources of similar impacts in the geographical area, any existing project or condition, and other project-related developments that are realistically defined at the time the assessment is undertaken."

Table 3-1: ADB Project Categories

Category	Project Description and Requirements
Category A	A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
Category B	A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
Category C	A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
Category FI	A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI

3.4 AIIB Safeguard Policies

115. The environmental and social policies are described in the document *Environmental and Social Framework* of the AIIB.[10] The overarching Policy of the AIIB is states that "The Bank recognizes that environmental and social sustainability is a

[10] http://www.aiib.org/uploadfile/2016/0226/20160226043633542.pdf. Accessed October 30, 2016.

fundamental aspect of achieving outcomes consistent with its mandate to support infrastructure development and enhance interconnectivity in Asia. The objective of this overarching policy is to facilitate achievement of these development outcomes, through a system that integrates sound environmental and social management into Projects."

116. As ADB is the lead lender for the proposed Project, AIIB has determined that the Project's compliance with the ADB social safeguards policies will be sufficient to meet AIIB requirements.

3.5 Harmonization of ADB and Government Safeguard Requirements

The environmental assessment of the Project will need to satisfy the requirement of both the government and ADB. A harmonized safeguard framework is developed for conducting EIA study of the Project. The framework is given in **Table 3-2**.

Table 3-2: Comparison of Georgian Legislation and ADB Requirements

Aspect	Asian Development Bank	Government of Georgia	Harmonized Framework
Environmental Policy and Regulations	ADB's SPS (2009) sets out the policy objectives, scope and triggers, and principles for three key safeguard areas: i. Environmental safeguards, ii. Involuntary resettlement safeguards, and iii. Indigenous peoples safeguards	Environmental assessment and permitting procedure in Georgia is set out in three laws: i. The Law on Licenses and Permits (2005); ii. The Law on Environmental Impact Permits (EIP), and iii. The Law on Ecological Examination (EE) 2008	
Screening	ADB carry out project screening and categorization at the earliest stage of project preparation when sufficient information is available for this purpose using REA checklist. Categorization into Category A, B, C, FI	Project Proponent in consultation with MOENRP	The Project is Categorized in to 'Category A'
Scoping	Avoid, minimize, mitigate and/or offset for adverse impacts and enhancement of positive impacts through environmental planning and management EA takes into account potential impacts (direct, indirect and cumulative) and risks on physical, biological, resettlement, socio-economic (including health and safety), and physical cultural resources	The impact assessment shall include components such as Air, Noise, Land, Water, Biological and health and safety. Involuntary resettlement is not a component of Assessment. Scoping is however not a requirement under the law	Conduct a process of Environmental Assessment that will consider in an integrated manner the potential environmental (including labor, health, and safety) risks and impacts of the project. The Environmental Assessment will take into account natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources
Alternatives	Examination of financially and technically feasible alternatives to the project location, design, technology and components, their potential environmental and social impacts Consider no project alternative.	Alternative assessments are to be carried out for the project location and design	Assessment of alternatives will include the location and design, and also no project alternative

Aspect	Asian Development Bank	Government of Georgia	Harmonized Framework
EIA Report	Guidelines and Table of Contents are provided for EIA report in SPS (2009). EMP will include proposed mitigation measures, monitoring and reporting requirements, institutional arrangements, schedules, cost estimates and performance indicators	No guideline or Table of Contents are available for EMP reports. Only guidelines (Regulation) on EIA is available, which includes required content of the EIA.	The EIA and EMP reports will follow the table of contents proposed in ADB's SPS (2009).
Public Consultations	Carry out meaningful consultation with affected people and facilitate their informed participation Ensuring women's participation in consultation. Involving stakeholders, project- affected people and concerned NGOs early in the project preparation and ensure that their views and concerns are made known and understood by decision makers and taken into account Continue consultations with stakeholders throughout project implementation as necessary to address environmental assessment- related issues.	Publication of information in national and regional mass-media. Arrange consultation not later than 60 days from the date of publication. All stakeholders are to be invited for the meetings.	Consultations will be carried out with the stakeholders, affected people, NGOs throughout the project cycle and consider their views in project design and safeguard plan. Questions and concerns raised during public consultations held in Feasibility stage will be considered. Village level consultations will be held with the affected people. Conduct a public consultation meeting in accordance with Georgian Guidelines in Batumi.
Public Disclosure	Draft EIA will be published in ADB website for 120 days before Project approval by the Board	The draft EIA should be available for public review for 45 days before public consultations.	Draft EIA report (English and Georgian) will be published in ADB and Roads Department Websites. The copies of the draft EIA report will be made available with the municipal offices.

3.6 Institutional Framework

3.6.1 Ministry of Environment and Natural Resources Protection (MoENRP)

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

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

3.6.2 Ministry of Economy and Sustainable Development (MoESD)

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

120. State supervision of construction and compliance monitoring is provided by the Main Architecture and Construction Inspection (MACI), which is operating under the Ministry of Economy and Sustainable Development of Georgia.

3.6.3 The Roads Department (RD or RDMRDI)

121. The Roads Department of the Ministry of Regional Development and Infrastructure (RD or RDMRDI) is responsible for elaboration of policy and strategic plans related to developing motor roads, management of road and traffic related issues and construction, rehabilitation, reconstruction and maintenance of the roads of public use of international and national significance, utilizing funds from the state budget, lawns, grants and other financial sources.

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

123. Within the RD there is Environmental Division dealing with the environmental issues. This division is supposed to review the EIAs and EMPs related to the Roads Department projects and perform monitoring of compliance of the contractor's performance with the approved EMPs, EIAs, environmental standards and other environmental commitments of the contractor.

3.6.4 Environment and Natural Resources Directorate of Adjara Autonomous Region

124. The Directorate of Environment and Natural Resources of the of Autonomous Republic of Adjara is responsible on establishing policy of sustainable development of the

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

3.6.5 Other Responsible Governmental Institutions

125. The Ministry of Culture, Monument Protection and Sports is responsible on supervision of the construction activities in order to protect archaeological heritage. In case if construction is to be carried out in a historic sites or zones of cultural heritage, consent of the Ministry of Culture, Monument Protection and Sport is also required for issuing construction permit.

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

3.7 International Treaties

127. Important international environmental treaties that have been signed by Georgia and may have relevance to the Project are listed in **Table 3-3**. They concern: climate change, depletion of the ozone layer, biological diversity and trade in wild flora and fauna, desertification; waste and pollution; cultural heritage, and preservation of the ecology of the Black Sea.

Table 3-3: International Environmental Treaties Ratified by Georgia

Agreement Date	Agreement Name	Ratification	Entry into Force
6/4/1999	Agreement on cooperation in the area of preservation and use of genetic resources of cultured plants of member states of the CIS		6/4/1999
6/16/1995	Agreement on The Conservation Of African-Eurasian Migratory Waterbirds		8/1/2001
11/24/1996	Agreement on The Conservation of Cetaceans Of The Black Sea, Mediterranean Sea And Contiguous Atlantic Area	5/31/2001	
12/4/1991	Agreement on The Conservation of Populations of European Bats	7/25/2002	8/24/2002
4/12/1996	Agreement on The Control of Transboundary Shipments of Hazardous and other Wastes Between States Members of The Commonwealth of Independent States	4/12/1996	
6/14/2002	Black Sea Biodiversity and Landscape Conservation Protocol to the Convention on the Protection of the Black Sea Against Pollution	9/22/2009	6/20/2011

Agreement Date	Agreement Name	Ratification	Entry into Force
1/29/2000	Cartagena Protocol on Biosafety to the Convention On Biological Diversity	2/2/2009	2/2/2009
3/22/1985	Convention for The Protection of The Ozone Layer	3/21/1996	6/19/1996
11/23/1972	Convention For The Protection Of The World Cultural And Natural Heritage		11/4/1992
6/25/1998	Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters	4/11/2000	10/30/2001
6/5/1992	Convention on Biological Diversity	6/2/1994	8/31/1994
3/3/1973	Convention on International Trade in Endangered Species of Wild Fauna and Flora	9/13/1996	12/12/1996
11/13/1979	Convention on Long-Range Transboundary Air Pollution	2/11/1999	5/12/1999
5/22/2001	Convention on Persistent Organic Pollutants	10/4/2006	1/2/2007
9/19/1979	Convention on The Conservation of European Wildlife And Natural Habitats	11/19/2009	3/1/2010
6/23/1979	Convention on The Conservation Of Migratory Species Of Wild Animals		6/1/2000
3/22/1989	Convention on The Control of Transboundary Movements of Hazardous Wastes And Their Disposal	5/20/1999	8/18/1999
4/21/1992	Convention on The Protection of The Black Sea Against Pollution	9/1/1993	1/15/1994
2/2/1971	Convention on Wetlands Of International Importance Especially as Waterfowl Habitat	2/7/1997	6/7/1997
6/17/1994	Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly In Africa	7/23/1999	10/21/1999
12/2/1961	International Convention for The Protection of New Varieties of Plants		11/29/2008
11/17/1997	International Plant Protection Convention (1997 Revised Text)	3/8/2007	3/8/2007
9/16/1987	Montreal Protocol On Substances that Deplete The Ozone Layer	3/21/1996	6/21/1996
4/21/1992	Protocol on Cooperation in Combating Pollution of The Black Sea Marine Environment By oil and other Harmful Substances in Emergency Situations	9/1/1993	1/15/1994
4/21/1992	Protocol on The Protection of The Black Sea Marine Environment Against Pollution by Dumping	9/1/1993	1/15/1994
4/21/1992	Protocol on The Protection of The Black Sea Marine Environment Against Pollution From Land-Based Sources	9/1/1993	1/15/1994

Agreement Date	Agreement Name	Ratification	Entry into Force
4/17/2009	Protocol on the Protection of the Marine Environment of the Black Sea from Land-Based Sources and Activities	9/24/2009	
12/11/1997	Protocol to The United Nations Framework Convention on Climate Change	6/16/1999	2/16/2005
12/10/1982	United Nations Convention on The Law of The Sea	3/21/1996	4/21/1996
5/9/1992	United Nations Framework Convention on Climate Change	7/29/1994	10/27/1994

3.8 Applicable Environmental Protection and Pollution Prevention Criteria

128. The proposed project is legally required to comply with the Georgian standards and norms. In addition, the ADB financing requires that World Bank Group's environmental guidelines should also be followed.

129. The Environmental, Health, and Safety (EHS) Guidelines of the World Bank Group (includes International Finance Corporation (IFC)) are technical reference documents with general and industry-specific examples of Good International Industry Practice. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

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

3.8.1 Ambient Air Quality Standards

131. Georgian and IFC guidelines for ambient air quality are presented in **Table 3-4** and **Table 3-5**. IFC provides several interim targets and guideline value for each parameter. This project will see the compliance with national as well as IFC guideline value (not interim targets) as these values are more stringent than the national standards.

Table 3-4: Georgian Standards for Ambient Air Quality

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

Table 3-5: IFC Ambient Air Quality Guidelines

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

World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile.

Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

3.8.2 Noise Level Standards

132. Admissible noise standards of IFC and Georgian national standards for the residential area are similar. The standards about the noise are allowed according to the Decree # 297/N of Georgian Ministry of Health, Labor and Social Affairs about "affirmation the norms over the qualitative norms of the environment" issued on August 16, 2001. There are defined as the admissible norms of noise as the maximum of the admissible norms for several zones of the territories. For the residential areas the standard requirements for noise are given in **Table 3-6**.

133. For IFC noise impacts should not exceed the levels presented in **Table 3-7** or result in a maximum increase in background levels of 3 dB at the nearest receptor location off site. This project will comply with both IFC Guidelines and Georgian Standards.

Table 3-6: Georgian Standards for Noise Levels

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

Table 3-7: IFC Noise Level Guidelines

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

3.8.3 Water Quality Standards

134. The values of Maximum Admissible Concentrations of the harmful substances in surface are provided in the Environmental Quality Norms approved by the Order #297N (16.08.2001) of the Ministry of Labour, Health and Social Protection (as amended by the Order No 38/n of the same Ministry of 24.02.2003). The admissible level of pollutants in surface and groundwater is given in **Table 3-8**. All effluents shall comply with the Georgian National Standards. However certain parameters are not specified in the national standards for these IFC Guidelines are being used as shown in the Table.

Table 3-8: Applicable Standards for Surface Water Quality

No	Description	Maximum Permissible Concentration	Source
Surface Water			
1.	pH	6.5-8.5	National
2.	Diluted oxygen, mg/l	4 – 6	National
3.	BOD5, mg/l	30	IFC
4.	COD, mg/l	125	IFC
5.	Total nitrogen, N, mg/l	10	IFC
6.	Total phosphate, mg/l	2	IFC
7.	Chlorides, mg/l	350	National
8.	Oil products, mg/l	0.3	National
9.	Zinc (Zn^{2+})	1g/kg	National
10.	Lead (Pb total)	23.0	National
11.	Chrome (Cr^{6+})	32.0	National
12.	Cadmium (Cd, total)	6.0	National
13.	Total Suspended Solids (mg/l)	50	IFC

3.8.4 Vibration Standards

The Georgian Standards for vibration are designed for human comfort. These are shown in Table 3-9. Note that no standards for building damage exist.

Table 3-9: Georgian General Admissible Vibration Values in Residential Houses, Hospitals and Rest Houses, Sanitary Norms 2001

Average Geometric Frequencies of Octave Zones (Hz)	Allowable Values X0,Y0, Z0			
	Vibro-acceleration		Vibro-speed	
	m/sec^2	dB	$m/sec\ 10^{-4}$	dB
2	4.0	72	3.2	76
4	4.5	73	1.8	71
8	5.6	75	1.1	67
16	11.0	81	1.1	67
31.5	22.0	87	1.1	67
63	45.0	93	1.1	67
Corrected and equivalent corrected values and their levels	4.0	72	1.1	67

Note:
It is allowable to exceed vibration normative values during daytime by 5 dB during daytime
In this table of inconstant vibrations, a correction for the allowable level values is 10dB, while the absolute values are multiplied by 0.32.
The allowable levels of vibration for hospitals and rest houses have to be reduced by 3dB

4. The Proposed Project

4.1 The Adjara Bypass Project

135. The 81-km Poti–Batumi–Sarpi Road ("S2" under Georgian Highway Designation) along the western coast of Georgia, located in the Adjara Autonomous Republic, is a key international highway and international transit route in Georgia. It is connected to the important towns Batumi, Poti and Kobuleti. Batumi is a major Black Sea port and a holiday resort. Poti is the largest port of Georgia. Kobuleti is a holiday resort. Due to heavy traffic on S2, there has been significant increase in congestion and accidents particularly during the tourist season in Batumi and Kobuleti. The Government of Georgia plans to construct two roads around Batumi and Kobuleti to bypass the highway traffic from these towns.

136. The Adjara bypass project is packaged into 4 contracts for preparation of detailed designs and implementation. These are:

- Contracts 1 and 2—new alignments of 12.4 km and 15.6 km, respectively to bypass Kobuleti Town
- Contract 3—incorporating the 3-km existing road near recently constructed 4-lane Makhinjauri tunnel, and
- Contract 4—new alignments of 17 to bypass Batumi Town

137. Contracts 1, 2 and 3 are either complete or under construction. Contract 4 is the focus of this report. There is a proposal to further extend the Adjara bypass project towards the south to avoid the towns of Gonio and Kvariati. This would require realignment of the southern 4-km section of the Contract 4. For this reason the last section has been excluded from this Project and the total length of the road which is subject of this EIA is 13.2 km. The complete bypass alignment is shown in **Figure 4-1**.

Figure 4-1: Adjara Bypass Project

4.2 Need of the Project

138. Adjara Autonomous Region, located in the southwest part of Georgia, is bordered by the Black Sea to the west and Turkey to the south. The two major towns Batumi and Kobuleti are major tourist centers, especially in the summer months. Batumi is also the second largest port in Georgia. Whilst the two towns cater for extensive tourist traffic, the existing S2 Highway also carries heavy goods and passenger traffic. Turkey is Georgia's most important trading partner and substantially all trade with Turkey passes along this road. Traffic growth was strong in 2007-8 (averaging around 20 percent a year) but has fallen by 18 percent in 2009 north of Batumi. Travel speeds are low and traffic accidents are higher than the national rate, which itself compares badly with nearby countries. The high incidence of traffic accidents, and the associated death and injury place a heavy burden on the health and welfare systems of the area. The proposed Project will support (i) construction of bypass roads around the Batumi; (ii) improve the international road transit network; (iii) improve road safety; (iv) strengthen institutions and (v) promote activities to involve the private sector.[11]

139. The direct beneficiaries of the project includes the autonomous region of Adjara, particularly the municipality of Batumi where 32% of the population of Adjara resides. The benefits includes reduced congestion and safer passage on the existing road, and faster travel for highway traffic using the bypass. The Project will also generate employment during its construction phase and, in the long-term, by increasing tourism opportunities in Batumi.

4.3 Project Design

4.3.1 Road Alignment and Right of Way

140. The Project road, bypassing the city of Batumi from East, is entirely located in Khelvachauri District (see **Figure 4-2** for the alignment and location of tunnels and bridges). The design alignment goes through the villages of Makhinjauri, Gantiadi, Kapreshumi, Salibauri, Peria, and Makhvilauri. Passing through the above villages, the design alignment crosses complex landscape of multiple ravines, streams, rivers, hills and hillsides.

141. The Project road alignment starts north of Makhinjauri. It swings of to the left from the existing highway by means of an interchange at the end of the newly constructed Chakvi Tunnel. This point is taken as 0 km of the chainage[12]. The total length of the Project road is approximately 13.2 km.

142. The road starts with a 200-m long transition section from the existing highway. An interchange will be constructed here. Within the limits of Makhinjauri, the road overpasses number of secondary roads and streams by 3 bridges and underpasses the populated hills via 2 tunnels. In Gantiadi also, the road overpasses local roads and streams by a bridge and follows slopes of hillside in cuts along the ravines.

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[11] Feasibility Study, 2009

[12] For linear infrastructure such as a road, chainage refers to linear measured from one end of the road along the center line of the road. It is a useful way to indicate the location of features on and in the vicinity of the road.

Figure 4-2: Project Road Alignment

143. In Kapreshumi, the road overpasses the existing oil terminal and river Korolistskali and enters the valley of Kveda Salibaruri, where the second interchange is located to provide access to local traffic.

144. In Kveda Salibauri the road crosses the local road and Skurdubi River. The Project road follows hillside cuts along the valley and enters the third tunnel under the Salibauri hill. After this tunnel, the road overpass the local roads and near the existing military camp, the road links to the third interchange to be constructed to provide access to the Batumi city. Following the interchange, the road approaches the village Peria through the fourth tunnel, where it overpasses the local road and valley by the viaduct.

145. Following the hillside in the valley, the road enters the fifth tunnel under the Peria hill. After the tunnel a long bridge, about one km long, overpasses number of steams and secondary roads in village Makhvilauri. Near the end of the alignment the proposed road follows flat terrain in the terraces of rivers Makhvilauris Tskali and Mejinistskali. At the intersection with the existing Batumi–Khelvachauri Road another full interchange is planned. However, this interchange will only be partly constructed under this project. The construction work to the south of the Batumi–Khelvachauri Road will be undertaken as part of the bypass extension project (see Section 4.1).

4.3.2 Road Dimensions

146. The Project road is a single carriageway i.e. a road with only one lane in each direction, other than in locations where a merging lane is required. Typical Project road dimensions are provided in **Table 4-1** and the corresponding layout shown in **Figure 4-3.** A photograph of the Kobuleti bypass is shown in **Figure 4-4** which has design similar to the Proposed Project.

Table 4-1: Typical Road Dimensions

Width of traffic lanes	3.5 m × 2
Width of paved shoulder	2.5 m × 2
Width of unpaved shoulders	1.0 m × 2
Total width of road	14.0 m

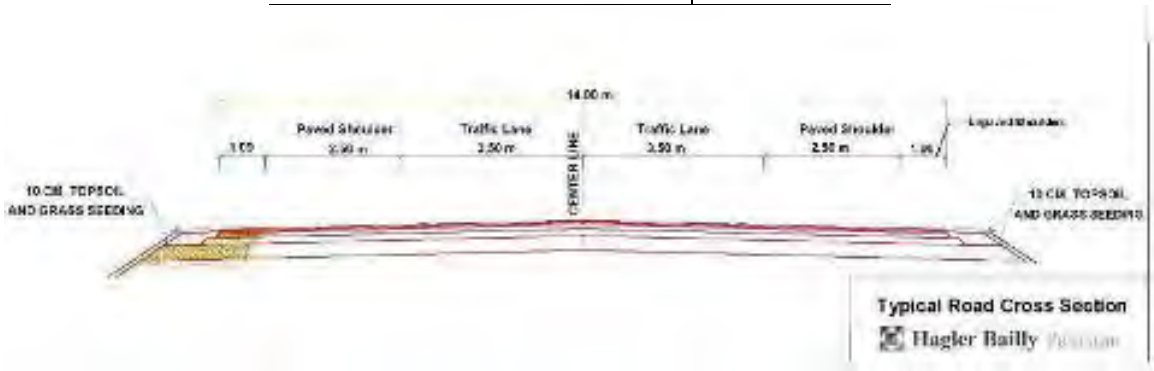


Figure 4-3: Typical Road Cross Section

Figure 4-4: Kobuleti Bypass Road

4.3.3 Road Design

147. The road is designed as a freeway by overpassing or underpassing all the existing roads. The design speed of the Project road is 100 kilometers per hour (kph). The width of the road is 14.0 m but the Right-of-Way (RoW) extends to at least 7 m outside the toe of the embankment to accommodate space for drainage ditch and a 3 m reserve zone outside of the ditch. The embankments consist of rocky soil.

148. Pavement design is based on the projected traffic volume discussed in **Section 4.8**. Asphalt concrete will be used for roads pavement, whereas cement concrete will be used in tunnels. Asphalt pavement structure is shown in **Figure 4-5**. The ramps have a different pavement structure due to lower expected traffic volumes on them. The pavement structure conforms to Georgian National Standards and to German and AASHTO standards.

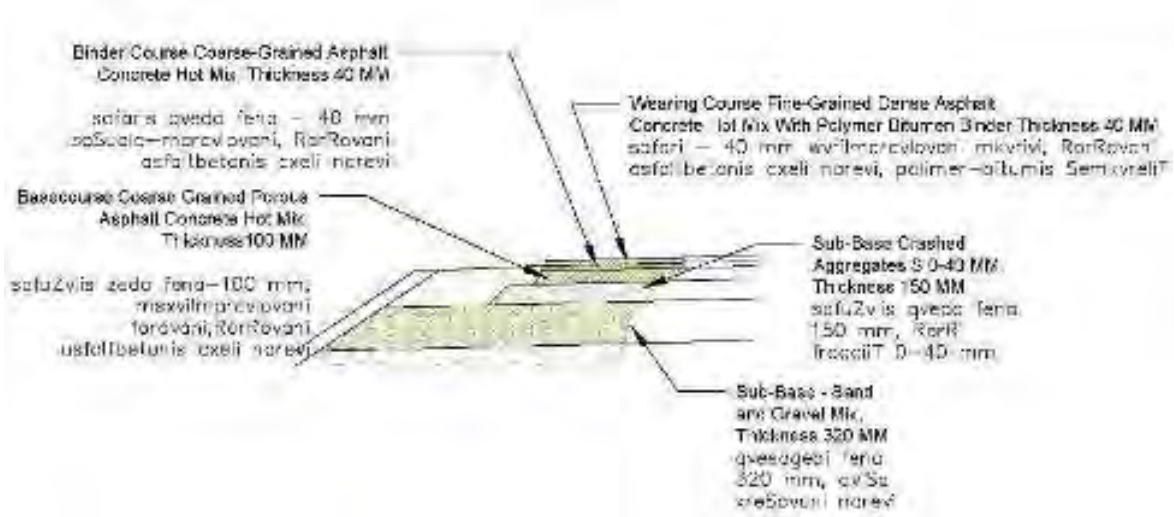


Figure 4-5: Asphalt Pavement Structure

4.3.4 Tunnels

149. Five tunnels are planned along the Project alignment as listed in **Table 4-2** and shown in **Figure 4-2**. The total length of tunnels along the alignment is 3,808 m. Emergency shafts will be installed in Tunnels 2, 3 and 4. Due to short lengths, no shaft will be required in the Tunnels 1 and 5. A diagram of the typical layout is presented in **Figure 4-6. Figure 4-7** displays an image of an already constructed nearby tunnel and illustrates the expected lighting, signage, pavement and footpath of the proposed tunnels

150. Tunnel design is based on the principles of New Austrian Tunneling Method. Tunnels are to be excavated through very weak weathered soil layer which consists of lean, brown-reddish clay, crushed stone and eluvial tuff-breccia.

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

Table 4-2: List of Tunnels

Tunnel	Length	Chainage	
		Start	End
Tunnel 1	542 m	938 m	1480 m
Tunnel 2	807 m	2215 m	3022 m
Tunnel 3	805 m	5994 m	6799 m
Tunnel 4	1067 m	7663 m	8730 m
Tunnel 5	587 m	9520 m	10107 m

Table 4-3: Typical Tunnel Dimensions

Parameters	Value
Width of traffic lanes (2 lanes)	3.75 m each
Width of sidewalk (2 sidewalks)	0.75 m each
Total width of tunnel	10.76 m
Height clearance of tunnel	5.0 m
Pavement type	Cement concrete

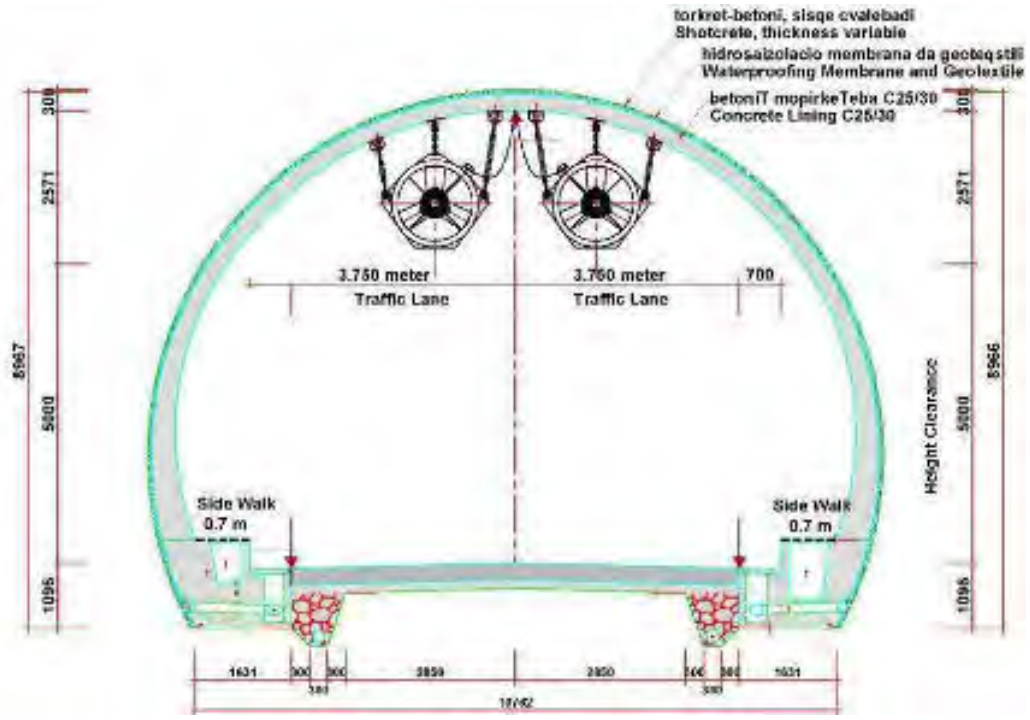


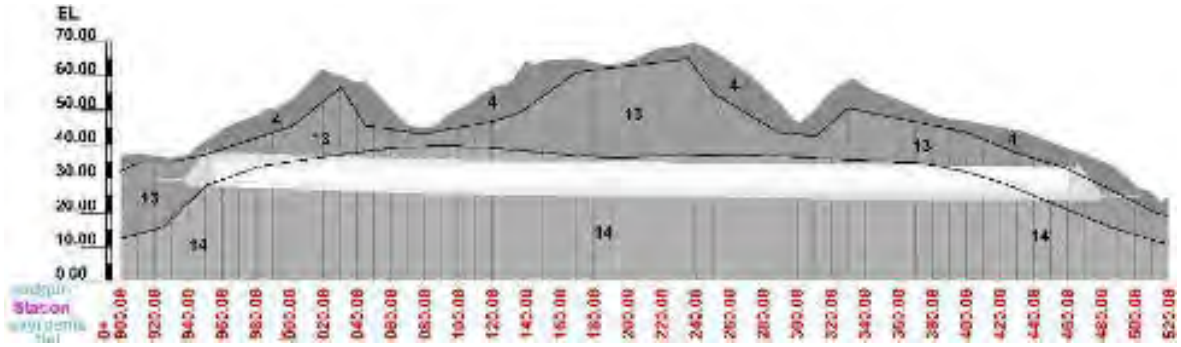
Figure 4-6: Typical Tunnel Cross Section

Figure 4-7: A Tunnel with Similar Design

152. As shown in **Table 4-4**, there are five types of soil in the Study Area. The linear cross-sections of the tunnels and the type of soils is shown in **Figure 4-8** to **Figure 4-12**.

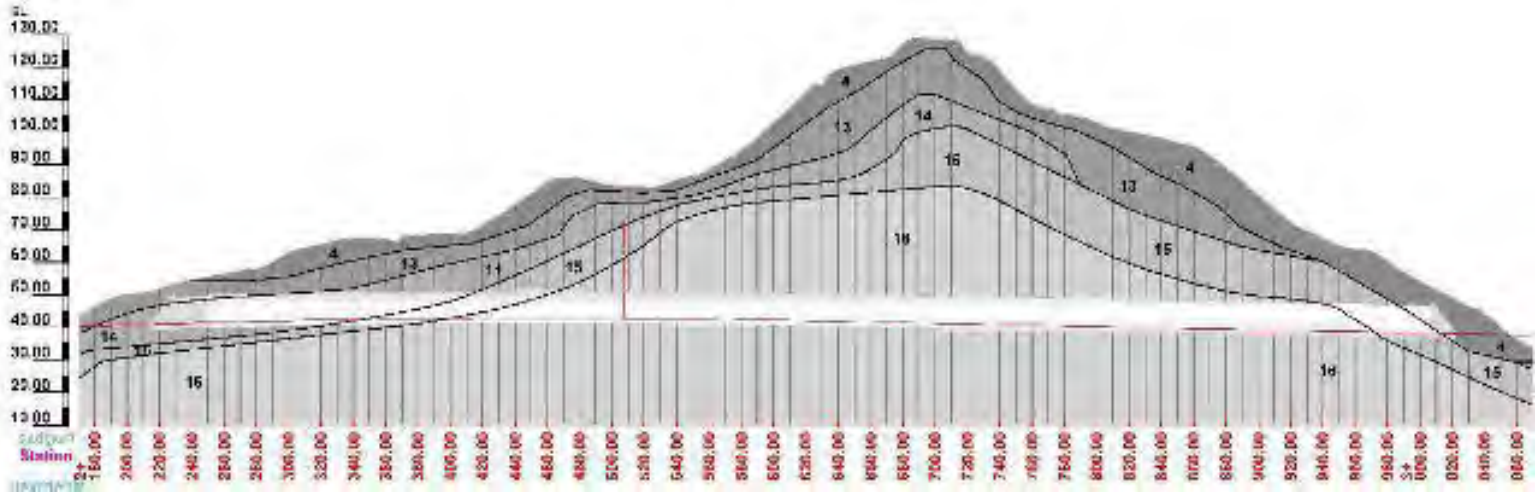
Table 4-4: Soil Types in the Study Area

Category	Description
4	Lean Clay, brownish-reddish, firm, with crushed stone inclusions
13	Lean clay, brownish-reddish, with inclusions, eluvial tuffbreccia
14	Highly weathered tuffbreccia
15	Tuffbreccia of medium weathered and fractured andesite-basalt content
16	Tuffbreccia of slightly weathered andesite-basalt content



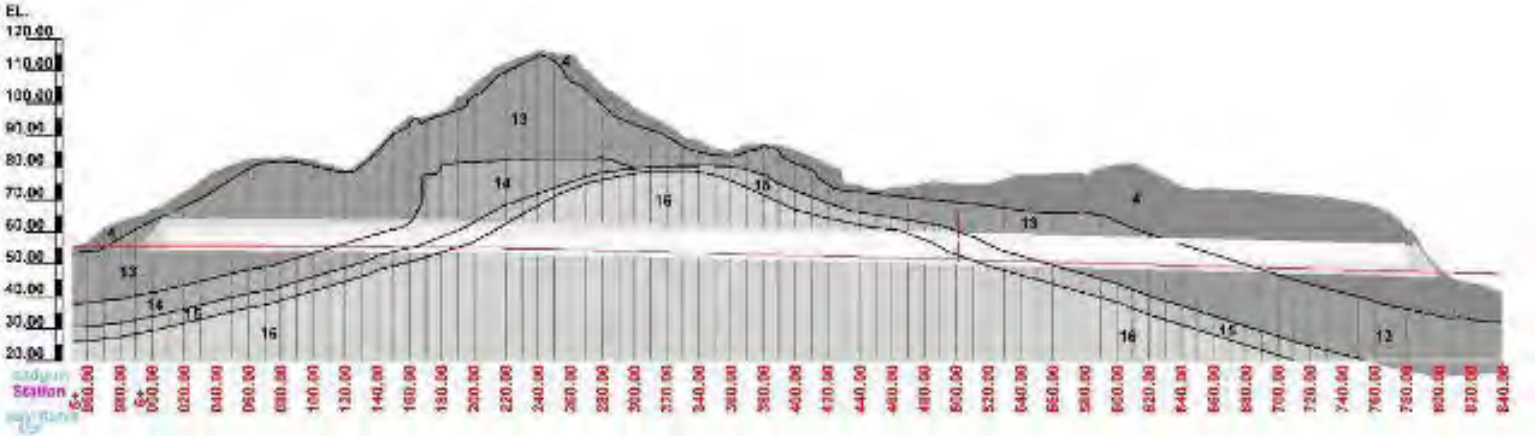
For soil categorization see **Table 4-4**

Figure 4-8: Depth of Tunnel 1



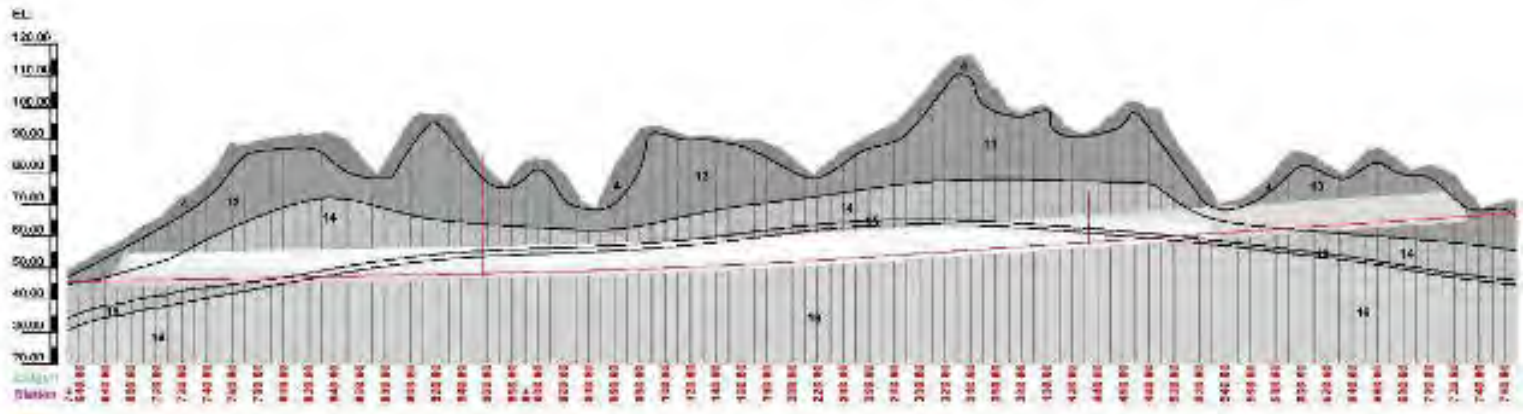
For soil categorization see **Table 4-4**

Figure 4-9: Depth of Tunnel 2



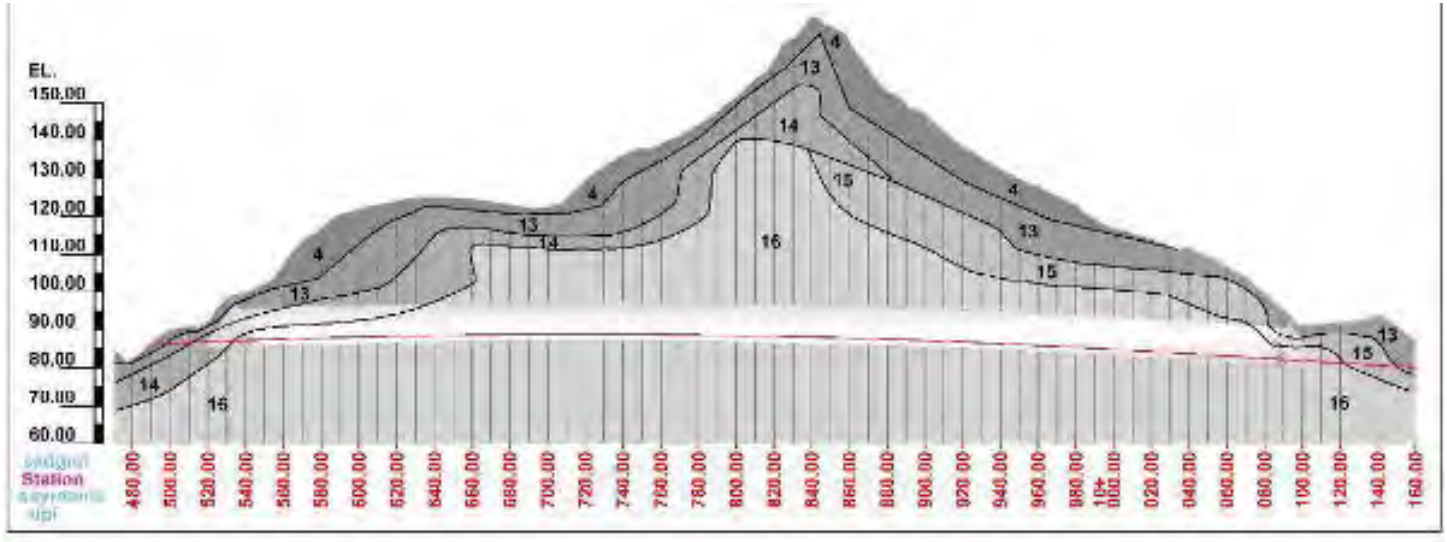
For soil categorization see **Table 4-4**

Figure 4-10: Depth of Tunnel 3



For soil categorization see **Table 4-4**

Figure 4-11: Depth of Tunnel 4



For soil categorization see **Table 4-4**

Figure 4-12: Depth of Tunnel 5

4.3.5 Bridges

153. There are 15 bridges planned along the main alignment as listed in **Table 4-5.** Additionally 3 bridges are designed on interchange ramps and 1 bridge is planned to connect to the existing roads. The bridges will be either 15 meters or 19 meters (where an acceleration or deceleration lane is required) wide, having dimensions listed in **Table 4-6**. A typical cross section layout for a 15 meter wide bridge is given in **Figure 4-13.** Photographs of bridges in the area are given in **Figure 4-14** to illustrate what the final bridge may be expected to look like.

Table 4-5: List of Bridges

Tunnel	Length (m)	Width (m)	Chainage (m)	
			Start	End
Bridge 1	190	15	417	607
Bridge 2	127	15	729	855
Bridge 3	475	15	1,631	2,105
Bridge 4	317	15	3,490	3,807
Bridge 5	570	15	4,219	4,789
Bridge 6a	32	15	4,975	5,007
Bridge 6b	32	19	5,112	5,143
Bridge 7	222	19	5,204	5,426
Bridge 8	203	19	6,926	7,129
Bridge 9	127	19	7,406	7,533
Bridge 10	430	15	8,796	9,224
Bridge 11	1,060	15	10,357	11,417
Bridge 12	158	15	11,601	11,759
Bridge 13	127	15	11,841	11,967
Bridge 14	32	19	12,932	12,963
Bridge 15	32	15	13,712	13,743

Table 4-6: Typical Bridge Dimensions

Parameters	Value
15 m wide bridges	
Width of traffic lane	3.5 m
Width of shoulder	2.5 m
Width of sidewalk	0.75 m
Width of barriers	0.75 m
Total width of bridge	15.0 m
19 m wide bridges	

Parameters	Value
15 m wide bridges	
Width of traffic lane	2 x 3.5 m
Width of shoulder	1.0 m
Width of sidewalk	0.75 m
Width of barriers	0.75 m
Total width of bridge	19.0 m

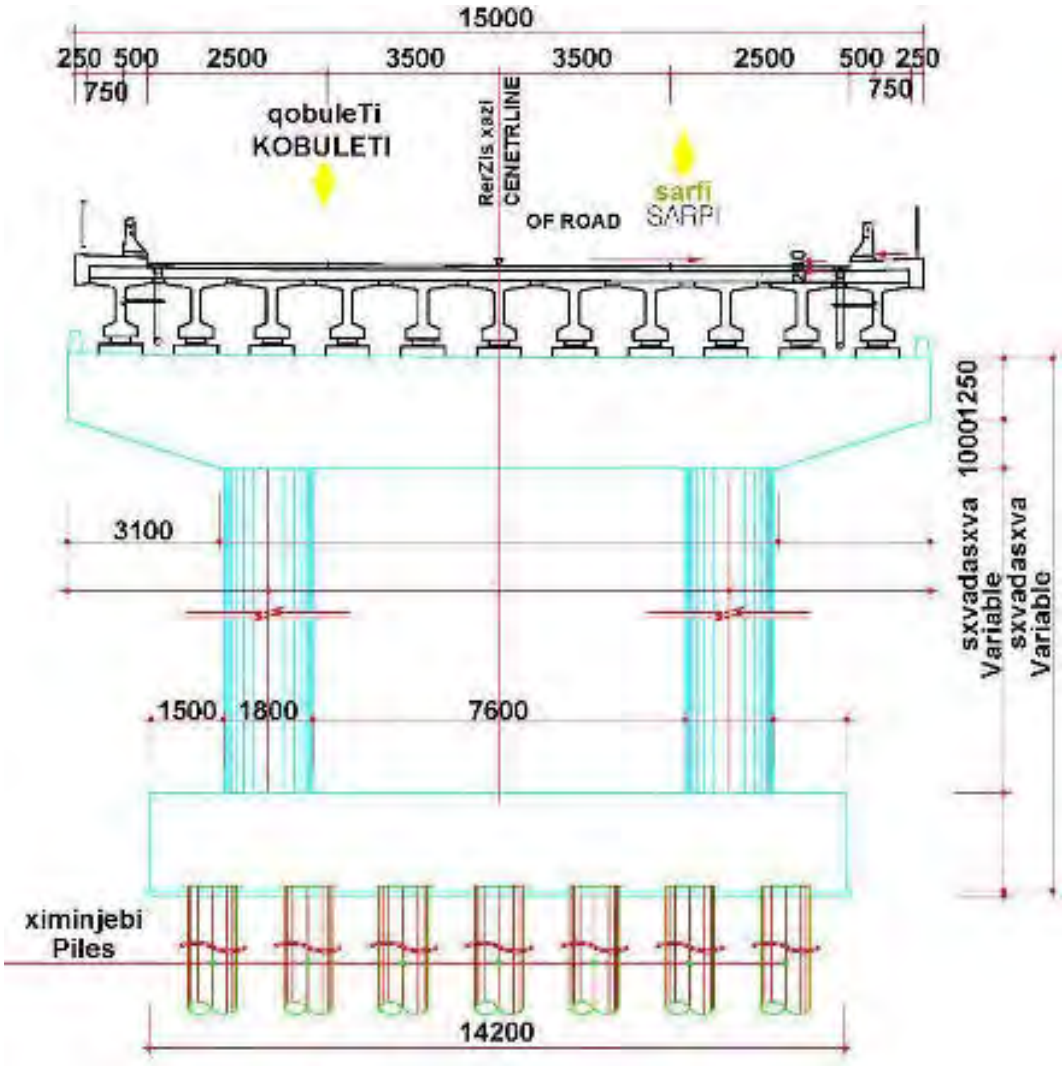


Figure 4-13: Typical Bridge Cross Section

Figure 4-14: A Bridge over Kobuleti Road with Similar Design

4.3.6 Interchanges

154. There are 4 interchanges planned on the alignment. The list of the interchanges with their purposes are provided in **Table 4-7** whereas the layouts are shown in **Figure 4-15**.

Table 4-7: List of Interchanges

Interchange	Chainage	Type	Purpose
Interchange 1	200	Direct	Allows traffic coming from Kobuleti to split into bypass traffic and Batumi city traffic. The interchange does not allow for connection of the local traffic onto the Bypass or the Bypass traffic to exit or turn around.
Interchange 2	5000	Partial Diamond	Compensates for the short coming of Interchange N1 by allowing local traffic connect onto the Bypass going towards Sarpi and bypass traffic from Sarpi to exit.
Interchange 3	7200	Semi direct	Constructed in the eastern suburb of Batumi, as it is a convenient connection to the city. Traffic from both directions on the Bypass can exit, and incoming traffic can enter and go in both directions.
Interchange 4	13000	Cloverleaf	The full cloverleaf design is constructed at the crossing with highway connecting city of Batumi to the districts of Ajara Autonomous Republic (Khelvachauri, Keda, Sheakhevi, Khulo), Southern Georgia (Akhaltsikhe, Akhalkalaki) and the border crossing with Armenia.

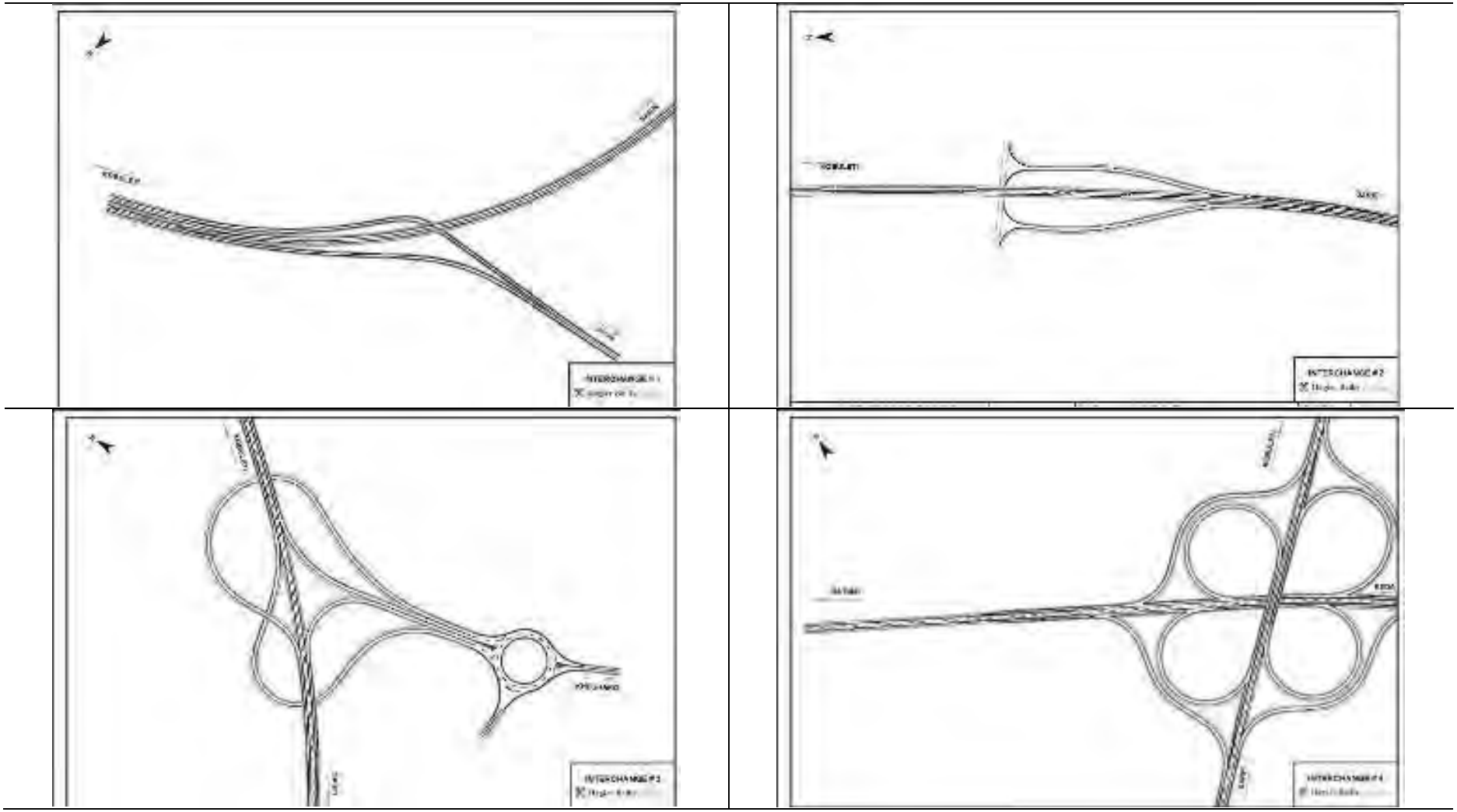


Figure 4-15: Layouts of Interchange

4.3.7 Culverts

155. In total 67 culverts are located along the project roads. For design life of rectangular and circular culverts AASHTO and SNiP-84 design standards are used. The application of the SNIP Standard considers the utilization of locally produced prefabricated culvert elements.

Table 4-8: Culvert Requirements

	Width (m)	Number
Circular Culverts	Diameter (meters)	
	0.5	4
	1	7
	1.5	38
Box Culverts	Dimensions (meters)	
	1.5 x 1.5	1
	1.3 x 1.8	1
	2.5 x 2.5	3
	1.0 x 4.0	1
	5.0 x 6.0	12

4.3.8 Service Buildings

156. One operation control center (site area 1777 m^2 and floor area 363 m^2) and five service buildings (site area 1028 m^2 and floor area 365 m^2 each) are planned along the route, which are placed near the tunnel entrances to ensure safe driving environments in the tunnel. The locations of these buildings are shown in **Figure 4-16**.

157. The operation control center will contain a control room, toilet, night duty room, utility room, hall, machinery room and electrical room. Service buildings will contain a control room, machinery room, electrical room and power generator room. All buildings are single story.

Figure 4-16: Service Building Locations

4.4 Construction Process

158. The construction process consists of preparation, construction and completion works. Each phase is described briefly below.

- Preparation works include the following activities:
  - Site preparation: after relocating power lines, water supply pipes, fiber optic cables, the site will be handed over to the Contractor
  - Site clearance: removal of existing building, structure, trees in construction site;
  - Manpower and equipment preparation: mobilizing manpower, mustering construction equipment, getting construction licenses
  - Auxiliary works: material transfer sites, temporary road, temporary drain, site leveling. Construct camp, site office. Connect power line, install water supply system for domestic and construction, set up concrete mixing plant and asphalt plant
- Construction works include the following activities:
  - Road base construction
  - Soft soil improvement and road sub base works will be conducted immediately after completing the road base construction;
  - Building of bridges and viaducts will be carried out in parallel with the soft soil improvement and road base construction
  - Install road pavement and slope protection
  - Install lighting system and security/safety signal systems
- Completion works include the following activities:
  - Repair of small defects
  - Return the drainage system affected temporarily during construction phase to its original status
  - Repair any local roads affected during construction
  - Clean up of the whole structure
  - Clean up of the construction site, warehouses
  - Collection of waste and superfluous materials
  - Transport of construction waste to licensed disposal site

4.4.1 Temporary Right of Way

159. The temporary right of way required for construction is variable largely dependent on the cut and fill requirements for the road. The bridge sections are more uniform and approximately 25 m wide. An example of the temporary right of way required for construction of the Project from Chainage 8700 m to 9540 m is shown in **Figure 4-17** with the widths of the construction corridor delineated in certain portions. It must be noted that this is an example and not an exhaustive representation of the width of the temporary RoW.

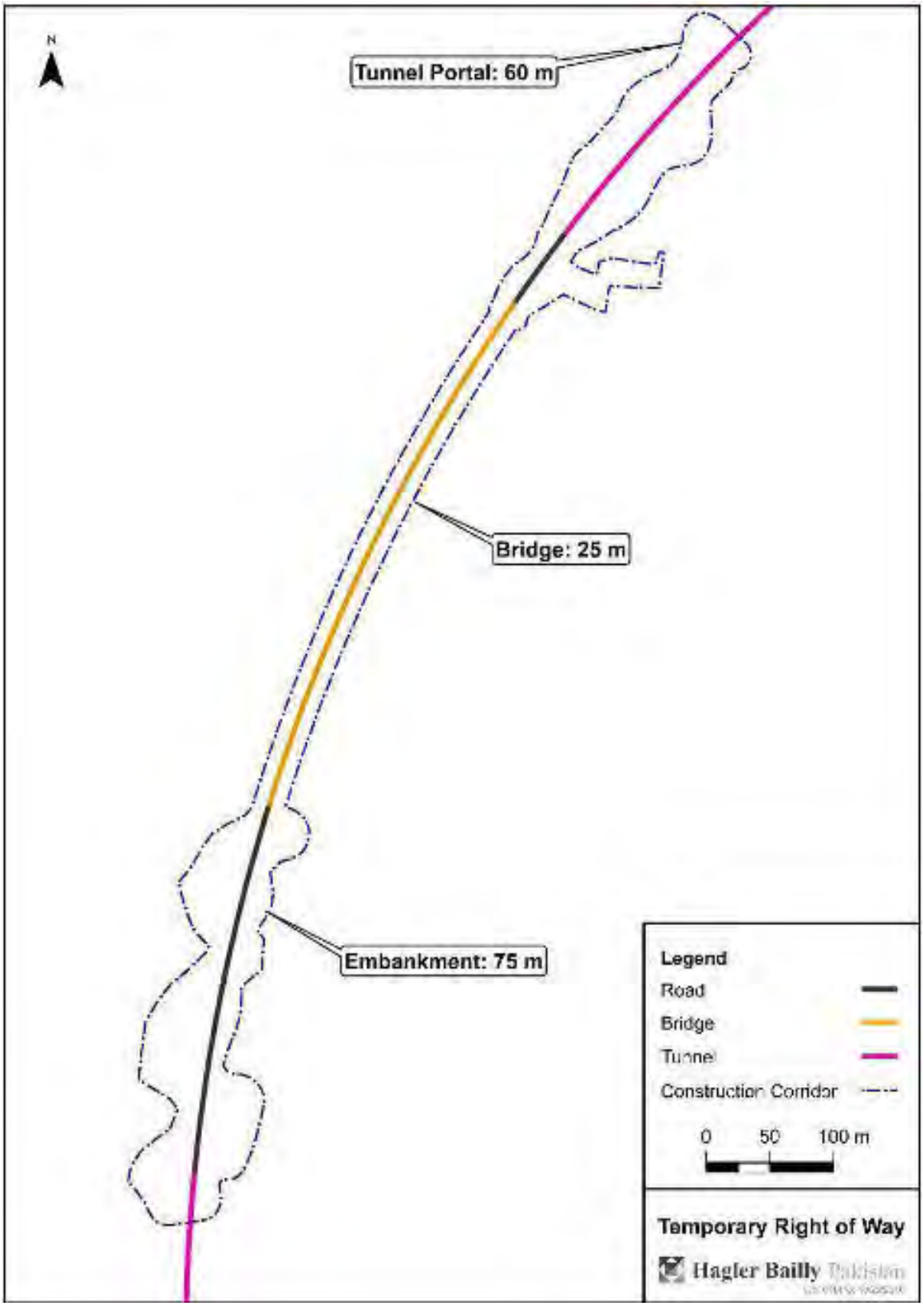


Figure 4-17: Temporary Right of Way Example

4.4.2 Construction Camps

160. Construction camp sites will be selected keeping in view the availability of an adequate area for establishing camp sites, including parking areas for machinery, stores and workshops, access to communication and local markets. They will be at an appropriate distance from sensitive areas, such as natural waterways, in the vicinity. The location of construction camps are not yet selected and final locations will be selected by the contractor after the approval from RD.

161. The area requirement for construction camps will depend upon the workforce deployed and the type and quantity of machinery mobilized. In view of the area required, it will not be possible to locate camp sites within the ROW and the contractors will have to acquire land on lease from private landowners. The construction camp will have facilities for site offices, workshop and storage yard, and other related facilities including fuel storage.

162. Detailed criteria for siting of construction camps and establishment of facilities are given in the Environmental Management Plan in **Chapter 10**.

- The contractor will provide the following basic facilities in the construction camps:
  - Adequate ventilation facilities
  - Safe and reliable water supply. Hygienic sanitary facilities and sewerage system. Treatment facilities for sewerage of toilet and domestic wastes
  - Storm water drainage facilities.
  - Sick bay and first aid facilities

4.4.3 Land Clearing

163. 76.6 ha of general site clearance and removal of obstructions, including bush and undergrowth and trees less than 0.1 m in girth is required. Felling and removal of 1,908 trees[13] greater than 0.1 m in girth is required. The number of existing structures that have to be dismantled is not finalized, however an estimated 93,000 m^3 of demolition is expected.

4.4.4 Leveling and Earthwork

164. A summary of required earthwork is provided in **Table 4-9**. Soils for fill can be obtained from cut areas or from borrow areas. Road way excavation will also yield material suitable for the construction of the capping layer. The topsoil is usually thin and weathered rock is found at a depth of 80 mm to 100 mm. The thickness of the topsoil including parts of the overburden interspersed by organic matter is 150 to 300 mm in average.

165. Where widening is required and in areas of new cuttings, the disturbance might initiate local slope slips. The slopes have to be protected against erosion due to water running of the road or from areas above the cut. Road side drains will prevent surface water from the road running down the embankment slope.

[13] The corresponding LARP identifies an impact on 41,730 trees. However, this includes trees that are on land plots that will be purchased but not necessarily felled and removed.

Table 4-9: Required Volume of Earthwork for Construction

Item	Amount (m^3)
Clearing and Grubbing	92,944
Earth Excavation- Common Soil	351,566
Embankment Filling – Common Soil	1,456,066
Removal of Unsuitable Materials	150,143

4.4.5 Bridge Construction

166. Most bridges will be constructed using pre-stressed precast concrete girders. In this method a crane moves the precast concrete girder up to the top of substructure. The weakness of this method is the requirement of installation of temporary plant for prefabrication of precast girder and difficulty of span arrangement over 40 m in a span length, but the strength is short construction period due to using crane method and economic efficiency. In this project, even though subsoil is in good condition of mountainous area, the typical span length of 31.6m was applied in consideration to convenience of fabrication and transportation.

167. Bridges number 5, 10 and 11 will be constructed using staging construction method using temporary steel bent to place the cast-in place concrete of superstructure. The weakness is relatively difficult in construction due to long period of construction to place cast-in-situ concrete of superstructure and requirement of temporary steel bent to support the formwork of concrete.

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

169. For foundation of substructures, installation of piles will be done through boring using cast-in-place bored pile with reinforced concrete was adopted due to local field condition, environment effect, and supply of materials. This construction method has minor noise and vibration impacts compared to pre cast driving methods.

4.4.6 Tunnel Excavation

170. Tunnels will be excavated using two methods: a) excavators of 0.5 m^3 capacity, Liebherr excavators and jackhammers and b) drilling and blasting. The first method will be used for Category II-III[14] soils and for Category V soils near the tunnel mouth. The second method will be used for Category V rock away from the tunnel mouth. With reference to Soils Types (**Table 4-4**), Soil Type 4, 14 and 14 fall in Categories II and III whereas Soil Type 15 and 16 fall in Category V. A breakdown of excavation volume by tunnel and method is provided in **Table 4-10.** In addition to the main tunnel, about 118 m^3 of soil and rock will be removed near mouth of the tunnel.

[14] Here rock categories are defined with respect to the volume that they will take after removal. Category II is defined as *fragmented rock but the muck pile is "frozen"*; Category III as *fragmented rock pile with mucking difficulties*; Category V is Fragmented rock. https://books.google.com.pk/books?id=8NHKBQAAQBAJ&pg=PA13&lpg=PA13&dq=Blasting+Category+V+Rocks&source=bl&ots=_APKZS89cx&sig=DkeqfS2s5OHHnrSaMy6WcoQutHU&hl=en&sa=X&ved=0ahUKEwiE9uOTqfDQAhXJPBoKHTuuDlUQ6AEIHTAB#v=onepage&q=Blasting%20Category%20V%20Rocks&f=false

Table 4-10: Main Tunnel Excavation Quantities (100 m^3)

	Tunnel					Total Excavation by method
	1	2	3	4	5	
Excavation of soil layer of category II-III by 0.5 m^3 capacity, Liebherr excavators and jackhammers	632	226	568	365	363	2,154
Excavation of soil layer of Category V by drilling and blasting		555	301	543	176	1,574
Total excavation of main tunnel	**632**	**781**	**869**	**908**	**539**	**3,728**

4.5 Resource Requirement

4.5.1 Construction Material

171. A large quantity of steel is required for the Project. The steel requirement for major heads as listed in **Table 4-11** comes to approximately 11,700 tons. Materials required for the pavement are listed in **Table 4-12**. Required culverts are listed in **Table 4-8**. Estimates are obtained from the Bill of Quantities for the Project.

Table 4-11: Major Steel Requirements

Item	Tons of Steel
Tunnels	
Installation of permanent steel frames	3,852
Wire mesh (100x100xΦ4.8)	806
Bridges[15]	
Deep Foundation	2,572
Substructure	3,366
Superstructure	1,099
Total	**11,695**

Table 4-12: Pavement Material Requirements

Item		
Preparation of Subgrade	m^2	228,539
Sub Base	m^2	197,920
Upper Base	m^2	185,725
Asphalt Concrete surface course	m^3	14,720

4.5.2 Water

172. Water is required during construction mainly for the following purposes

- Water for mixing or curing cement concrete, mortar, or grout.
- Water for planting or care of vegetation.

[15] Not including the bridges number 5, 10 and 11 will be constructed using staging construction method

- Water for earthwork, pavement courses, dust control, and incidental construction.

4.6 Borrow Areas and Quarries

173. This section describes quarries that were selected during detail design. The final locations of quarries and borrow areas will be determined at the final design stage. The exploitation of the borrow pits and quarries will be conducted by licensed companies or the Constructing Contractor will obtain its own licenses. The Project will not implement any exploration activities from illegal sources.

174. Construction materials, such as boulders, stones, gravel and sand are locally available at a reasonable distance. Possible borrow areas and quarries are listed in **Table 4-13** and shown in **Figure 4-14**.

Table 4-13: List of Potential Quarries

Name of Deposit	Resources	Region	Proximity
Kheghru	Diorite- Porphyry	Khelvachauri	9 km southeast of Batumi
Abanostskali	Andesite and Tuff-breccia	Kobuleti	Adjacent to village of Khala
Achi	Porphyry	Ozurgeti	8-9 km south of district centre Ozurgeti
Akhalsheni	Tuff-Breccia	Khelvachauri	4 km south of Batumi
Bezonisthkali	Andesite and Lava Breccia	Kobuleti	The confluence of Bezonistskali and Chaqvistavi Rivers
Dagvi	Andesite-Basalt	Kobuleti	1.5 km north-east of village of Zeda-Dagvi
Dologani	Andesite-Porphyry	Keda	0.5-1 km from village of Dologani
Kinkishi	Basaltic Andesite	Kobuleti	0.5 km southeast of village of Zeda Sameba
Simoneti	RubbleAndesite	Khelvachauri	5-6 km from district centre of Khelvachauri

Table 4-14: List of Existing Sand-Gravel Quarries

License No	Region	Company
00117, 100279, 100282, 100280, 100278, 100284, 100285, 100286, 100128, 100127, 100125	Khelvachauri	Temi Ltd., Holder, Zimo-7, Construction Company, Gza Energy 2006 Ltd., Loseb Khalvashi Contact Ltd., Zimo-7, Nurol Georgia, Deko
00122, 100291, 100123	Kobuleti	Evrika Zka Ltd., Jakmar Moistsrapashvili, New Construction Technologies Ltd.

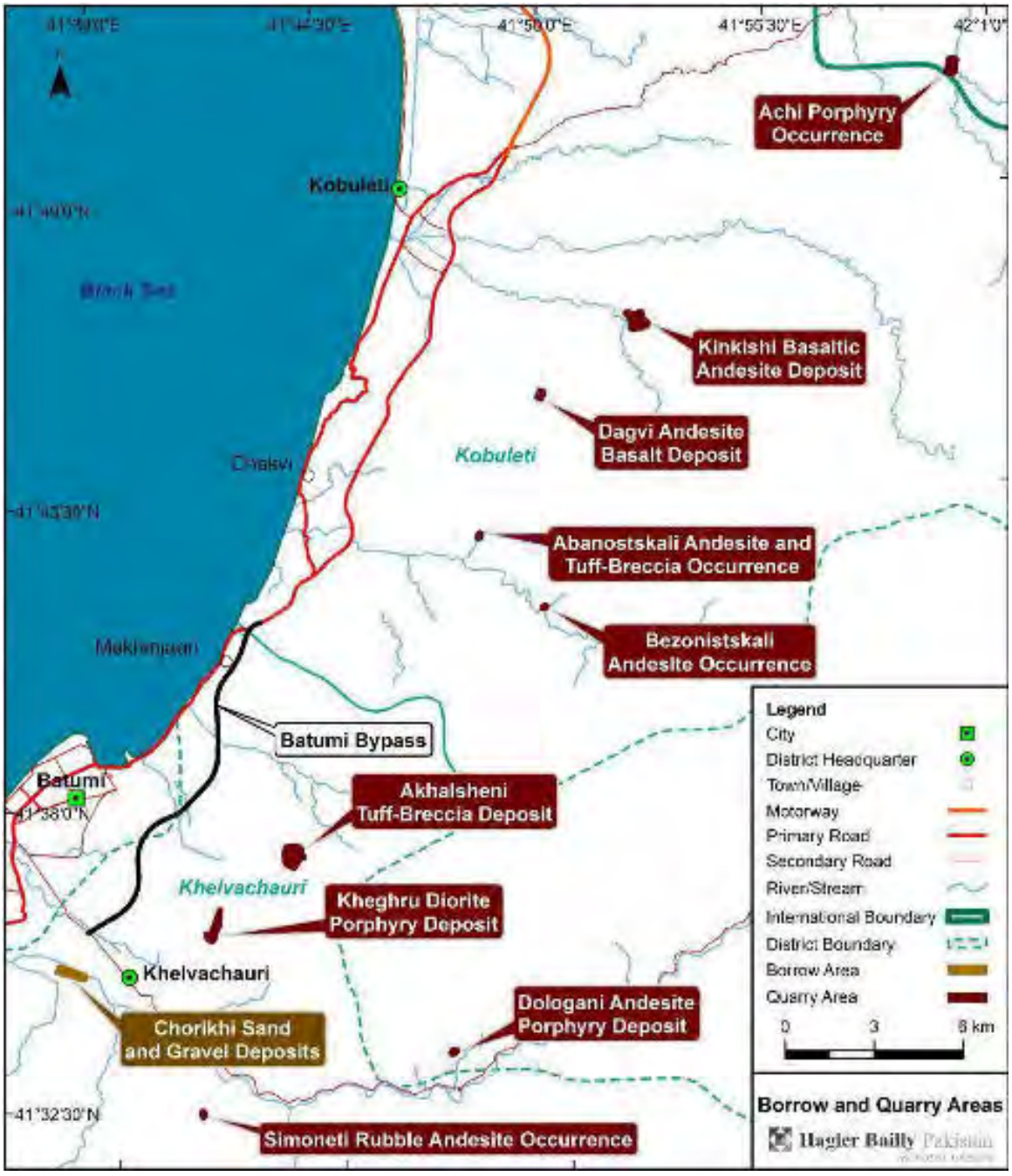


Figure 4-18: Locations of Potential Quarries

4.7 Current and Projected Traffic

175. The detailed design study provides traffic projections based on traffic surveys that were conducted in 2011 at multiple locations on the proposed alignment and expected GDP growth rate. These projections are shown in **Table 4-15.**

176. The Road Department conducts traffic counts at key locations on the road network. Two of these counts are on the S02, one between Kobuleti and Batumi and the second between Batumi and Sarpi. These counts are presented in **Table 4-16**. It must be noted

that these counts are for both directions and that these are total volumes. The detailed design estimates that 55% of traffic on the existing road is expected to divert to the bypass road.

Table 4-15: Forecasted Annual Average Daily Traffic (AADT) Volume

Year	Car	Bus			Truck				Total
		Mini	Medium	Large	Light	Medium	Heavy	Trailer	
2014	2999	1244	34	29	216	62	38	183	**4805**
2015	3138	1302	36	30	226	65	40	191	**5028**
2016	3282	1362	37	32	237	68	42	200	**5260**
2017	3435	1425	39	33	248	71	44	209	**5504**
2018	3593	1491	41	35	259	75	46	219	**5759**
2019	3761	1560	43	36	271	78	48	229	**6026**
2020	3934	1632	45	38	284	82	50	240	**6305**
2021	4117	1708	47	39	297	86	53	250	**6597**
2022	4307	1787	49	41	311	90	55	262	**6902**
2023	4507	1870	51	43	325	94	58	274	**7222**
2024	4665	1935	53	45	336	97	60	284	**7475**
2025	4828	2003	54	46	348	101	62	294	**7736**
2026	4998	2073	56	48	360	104	64	304	**8007**
2027	5172	2146	58	49	373	108	66	315	**8287**
2028	5353	2221	60	51	386	111	69	326	**8577**
2029	5542	2299	62	53	399	115	71	337	**8878**
2030	5736	2379	64	55	413	119	73	349	**9188**
2031	5936	2463	66	57	428	123	76	361	**9510**
2032	6143	2549	69	59	443	128	78	374	**9843**
2033	6359	2638	71	61	458	132	81	387	**10187**

Table 4-16: AADT Volume on S2 from 2011 to 2014

Year	Cars	Mini Buses and Pickups	Buses, Trucks and Trailers	Total
Kobuleti-Batumi km 95				
2011	6,865	3,364	1,084	**11,313**
2012	7,038	3,284	1,179	**11,502**
2013	11,341	1,360	1,619	**14,320**
2014	12,393	1,381	1,627	**15,401**
Batumi-Sarpi km 110				
2011	3,788	1,672	915	**6,375**
2012	5,973	2,229	1,030	**9,231**
2013	8,468	1,304	1,328	**11,100**
2014	10,447	1,322	1,356	**13,125**

4.8 Project Implementation Schedule

177. Tentative commencement date of the contract is 2017 and the expected time to complete the construction works is 2020.

5. Description of the Environment

178. This section describes the Study Area's existing environment including the physical, ecological and socioeconomic baseline conditions. The physical baseline includes geomorphology, water resources, climate, air quality, and noise levels. The ecological baseline includes nearby protected areas, habitat types and ecological resources. The description of the socioeconomic environment includes the area's population, infrastructure, education, health, and occupations and income.

5.1 Area of Influence

179. The potential impacts of the Project on its surrounding physical and biological environments include air and water quality impacts, noise generation, land transformation and changes to soil. These are expected to reduce with the increased distance from the Project facilities, affecting more the areas located closer, up to one kilometer, to the Project alignment. For this, a study area of one kilometer around the site was delineated, to assess the baseline conditions in the areas likely to be affected by the Project due to its proximity to the Project site (**Figure 5-1**). This is referred to as the Study Area in this report. The Study Area selected for the EIA includes sensitive receptors[16] that are most likely to be impacted by the Project's development activities. The spatial boundaries of the Study Area includes part of the Black Sea. Although no direct impact of the proposed Project is anticipated on the Black Sea, wherever relevant discussion of the marine environment has been provided.

[16] Sensitive receptors include, but are not limited to, residential areas, schools, places of worship, wetlands, and habitats. These are areas which are more susceptible to the adverse effects of an anthropogenic activity such as noise, air emissions, traffic influx, and privacy issues.

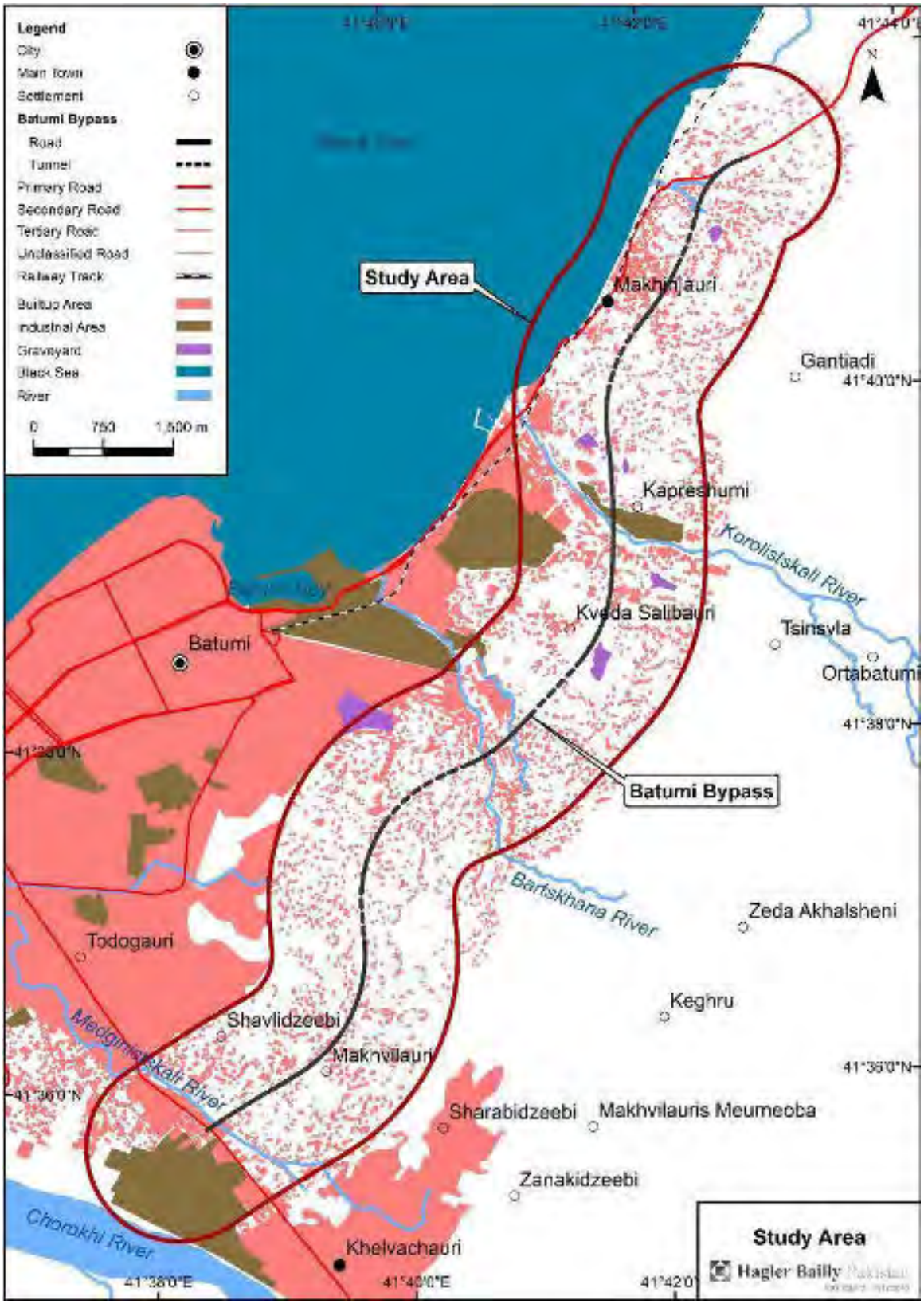


Figure 5-1: Study Area

5.2 Physical Environment

5.2.1 Topography

180. The Project passes through a rolling and hilly terrain with elevations ranging from 20 to 197 m on the alignment. The elevation profile of the current ground elevations along the proposed alignment given in **Figure 5-2.** The Project road passes through 3 hill ranges, namely Makhinjauri Hill Range, Salibauri Ridge and Peria Hill Range. These ranges and the topography of the Study Area are shown in **Figure 5-3**.

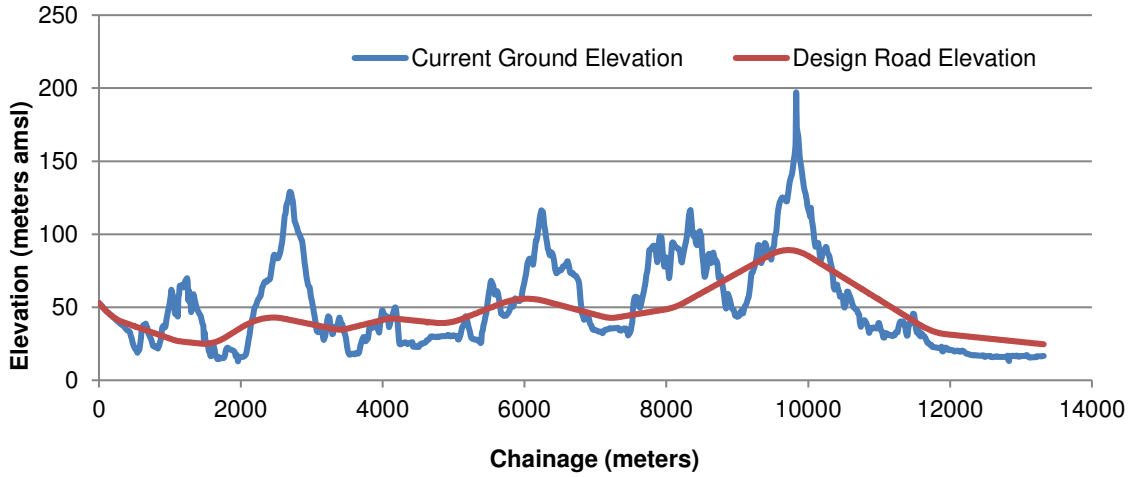


Figure 5-2: Current Ground Elevations of Project Alignment[17]

[17] From detailed design study

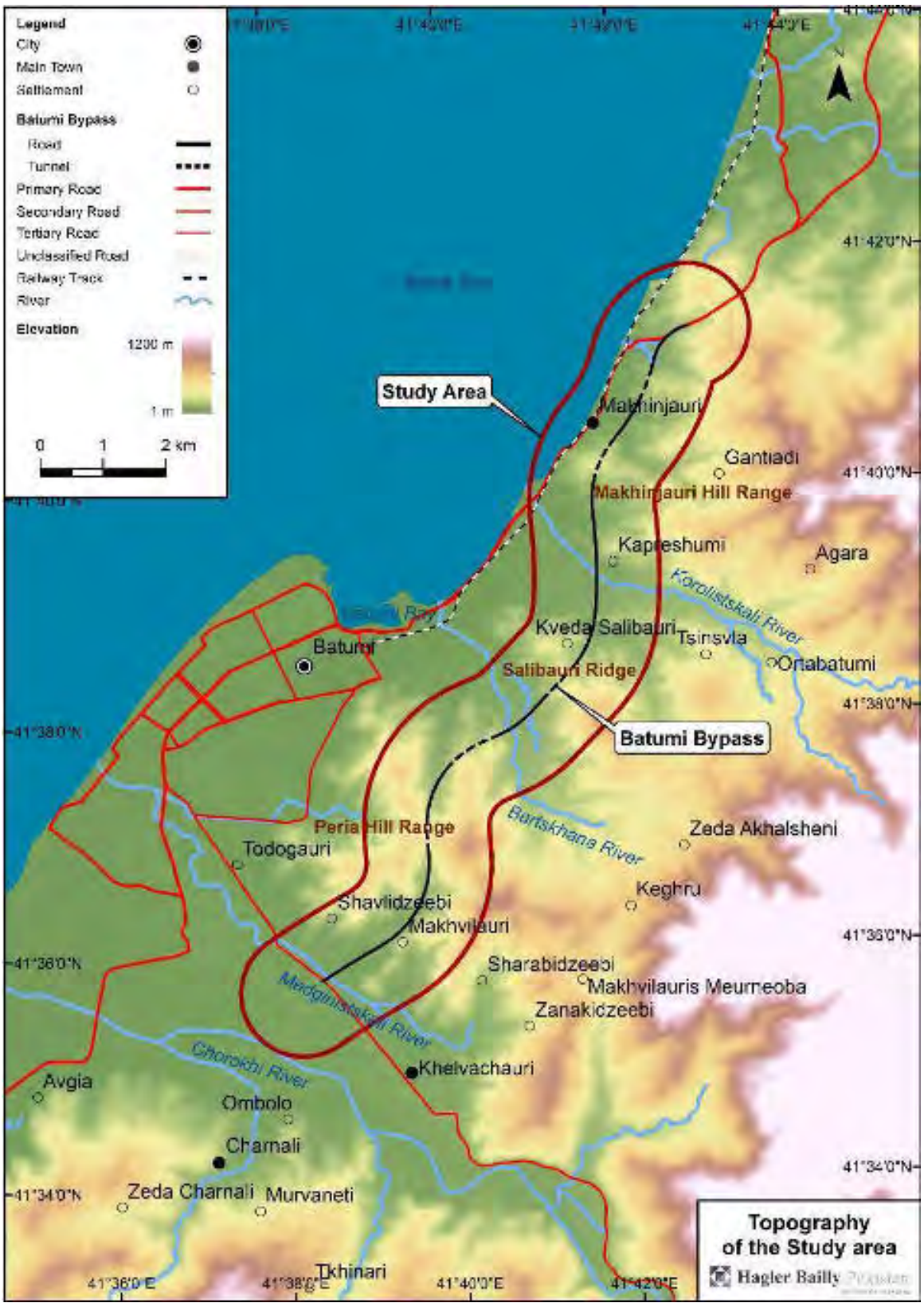


Figure 5-3: Topography of the Study Area

5.2.2 Land Use

181. Land use within the Study Area was digitized using Google Earth imagery dated May 9, 2016. The land use distribution is presented in **Table 5-1** and shown in **Figure 5-4**. Land use shown outside the Study Area was obtained from various online resources.

182. Towards the north the town of Makhinjauri lies within the Study Area and has densely packed homes. Towards the south a large number of houses are clustered around the Batumi – Khelvachauri road. Most of the remaining built-up area along the alignment consists of distributed homes along the mountain roads.

183. The main industrial zone in the Study Area is to the south of Batumi along the Chorokhi River and includes crushing plants, batching plants, warehouses. A large oil terminal is present towards the north.

184. There are agricultural fields near the Chorokhi and Korolistsskali Rivers as the topography is flatter here. The remaining terrain in the Study Area is mountainous and some areas are terraced to make space for agriculture.

185. There are a few rivers and many small streams that crisscross the Study Area. There are approximately 227 km of road and 5 km of railway that cross the Study Area. There are also several graveyards with the Study Area. Unclassified area is categorized as vegetation. This includes dense natural vegetation, planted orchards of citrus, and distributed nut and other fruit trees and some grassy areas.

Table 5-1: Land Use Distribution in the Study Area

Land Use	Square km	Percentage
Vegetation	19.48	65.40%
Built-up Area	2.91	9.80%
Agricultural Field	2.49	8.30%
Industrial Area	1.64	5.50%
Black Sea	1.46	4.90%
Road	1.21	4.10%
Rivers	0.34	1.10%
Graveyard	0.22	0.70%
Railway	0.03	0.20%
Total	**29.78**	**100%**

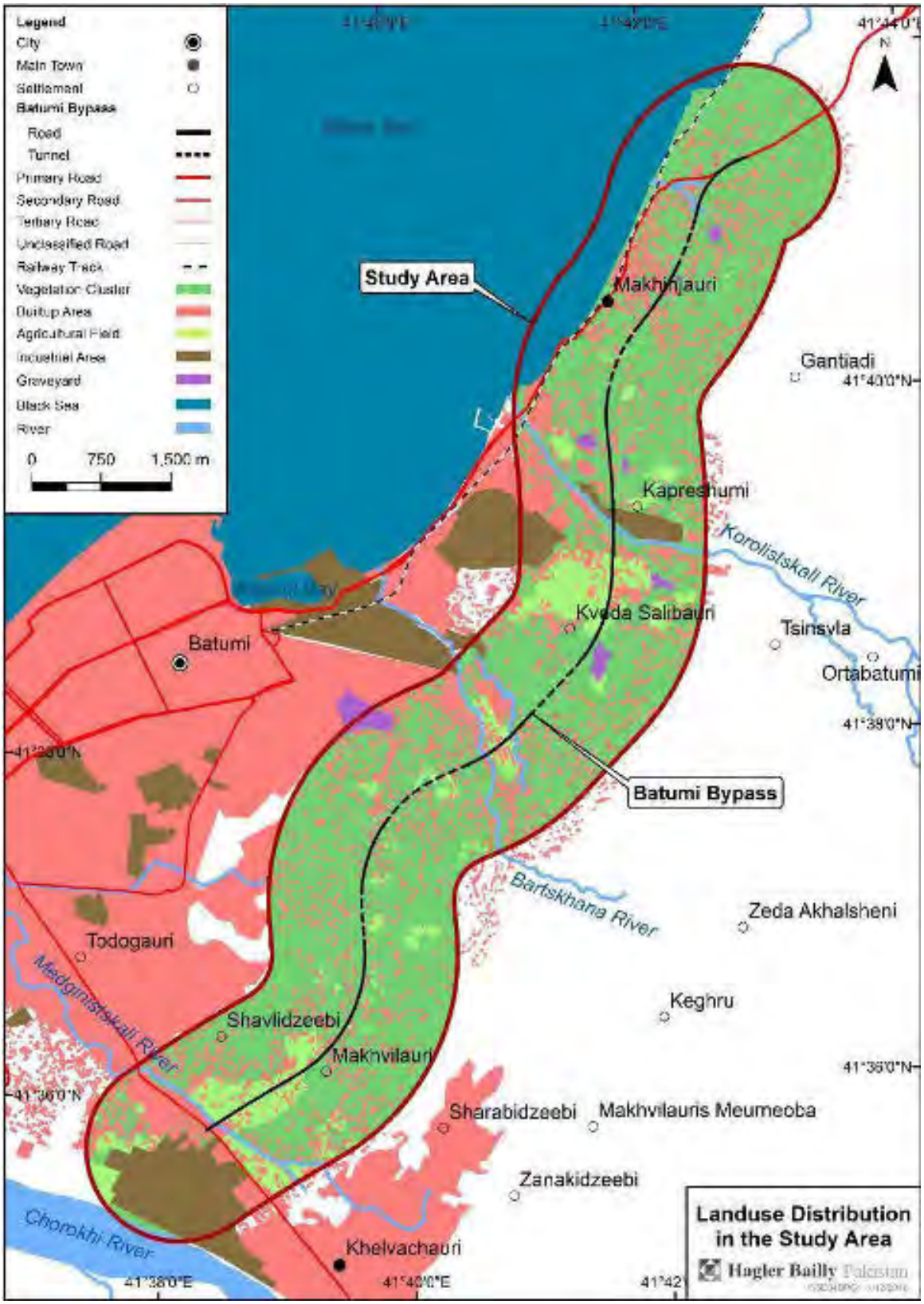


Figure 5-4: Land Use in the Study Area

5.2.3 Climate

186. The climate baseline is established based on the information provided in the detailed design of the bypass. Data from multiyear observations of the weather stations at Batumi, Makhinjauri and Chakvi, as given in the detailed design study are presented in this section.

187. The Project is located in the southern extension of the Kolkheti Valley. Therefore, the climatic conditions typical to the Kolkheti Valley prevail in the given area. The little altitude of the area, its near location to the warm Black Sea and the frequency of humid air masses penetrating from the west in all seasons of the year contribute to a humid subtropical climate.

188. The Study Area is highly influenced by the Black Sea, and therefore, winter is warm and summer is relatively cool here. In addition, no direct penetration of the cold northern air masses is possible, as the Caucasian Mountains serve as a natural obstacle for them.

189. The duration of the sunshine per annum on Kolkheti Valley is long with its annual average value exceeds 2000 hrs. The total radiation varies between 110 and 130 Kcal/cm^2 and the annual factor of the radiation balance is close to 60 Kcal/cm^2.

190. Average monthly temperatures are provided in in **Table 5-2** and graphed in **Figure 5-5**.

Table 5-2: Average Monthly Air Temperature (°C)

Weather Station	Temperature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Chakvi	Average	6.2	6.5	8.3	11.5	15.7	19.6	22.2	22.6	19.7	16.1	12	8.4	**14.1**
	Max	25	28	33	37	37	40	40	40	36	36	29	27	**40**
	Min	-9	-9	-7	-3	1	7	11	10	6	1	-3	-7	**-9**
Makhinjauri	Average	5.7	6	7.9	11.2	15.5	19.5	22.2	22.6	19.7	15.9	11.3	7.6	**13.8**
	Max	25	27	31	37	38	39	41	42	37	35	29	27	**42**
	Min	-11	-10	-8	-3	1	8	11	12	6	1	-6	-8	**-11**
Batumi	Average	7.1	7.2	8.4	11.5	15.8	20	22.8	23.2	20.3	16.6	12	8.6	**14.5**
	Max	25	28	33	38	38	39	41	41	37	33	29	28	**41**
	Min	-9	-9	-7	-1	3	10	13	14	7	3	-6	-6	**-9**

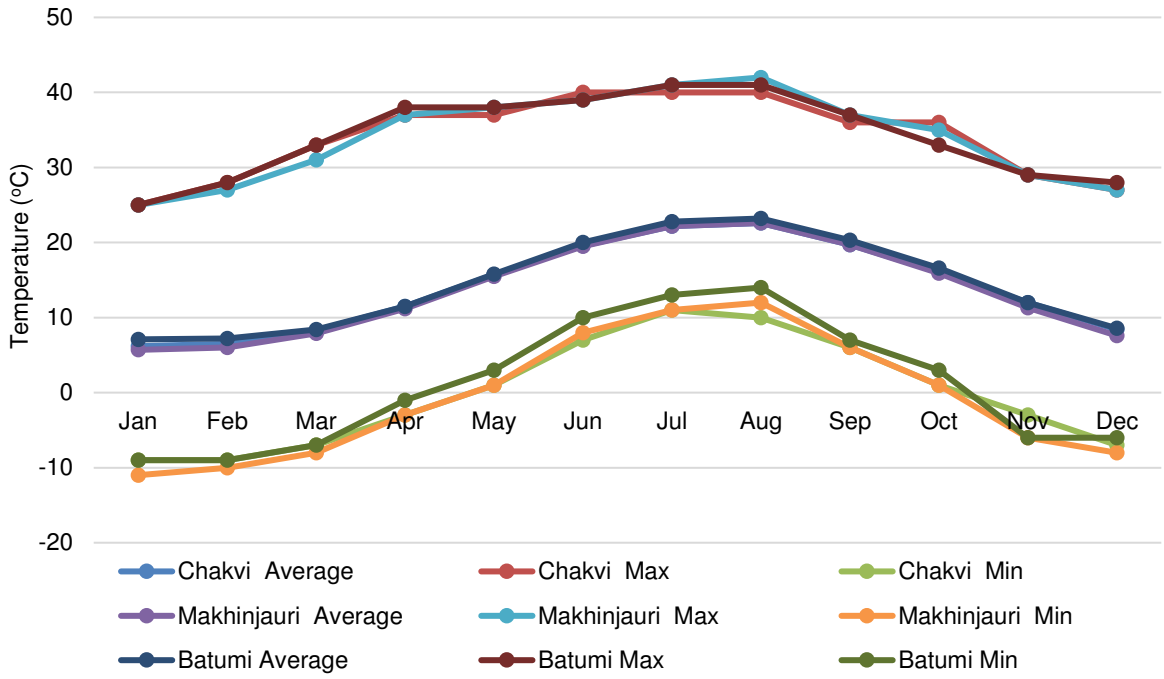


Figure 5-5: Average Monthly Air Temperature (°C)

191. Precipitation is regular and abundant in the study area. In particular, the annual sum of the atmospheric precipitation falling over mountain Mtirala over the watershed on the river Korolistskali exceeds 4500 mm. There is a small dip in precipitation in April – May to below 150 mm per month. Precipitation peaks in September at over 300 mm per month. Furthermore, annual precipitation exceeds 2700 mm. The trend in precipitation is presented in **Table 5-3** and shown in **Figure 5-6.**

Table 5-3: Average Monthly and Total Annual Precipitation (mm)

Weather Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Chakvi	281	240	207	120	111	170	192	251	333	321	297	265	**2,788**
Makhinjauri	258	263	201	126	104	158	178	266	335	314	286	265	**2,754**
Batumi	281	228	174	122	92	163	182	255	335	306	304	276	**2,718**

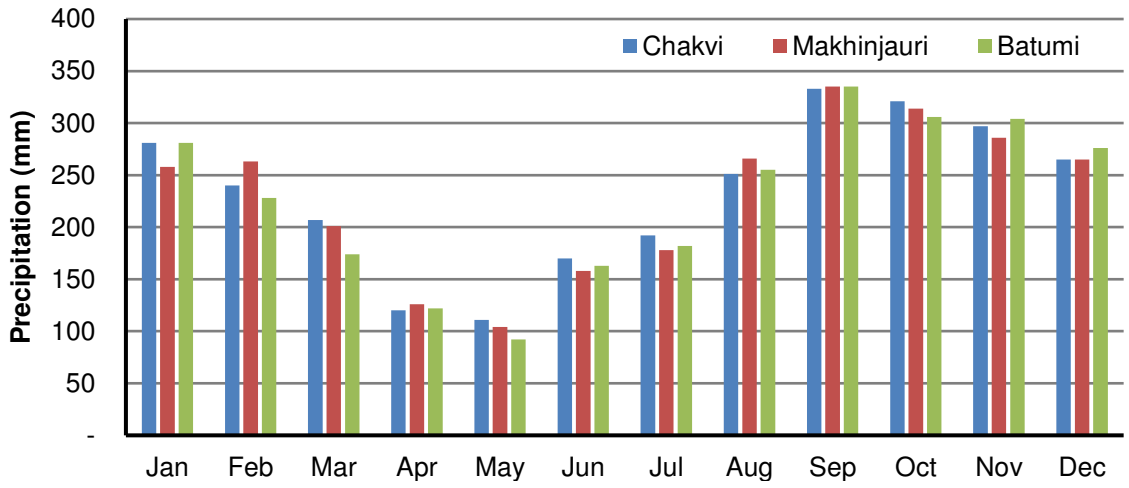


Figure 5-6: Average Monthly Precipitation

192. Air humidity is high as shown in **Table 5-4** and **Figure 5-7**.

Table 5-4: Average Monthly Humidity

Relative, %	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chakvi	74	76	78	78	81	79	80	81	81	80	78	73
Makhinjauri	78	78	80	80	82	80	81	82	84	84	81	76
Batumi	76	78	80	81	82	80	81	83	85	86	83	77

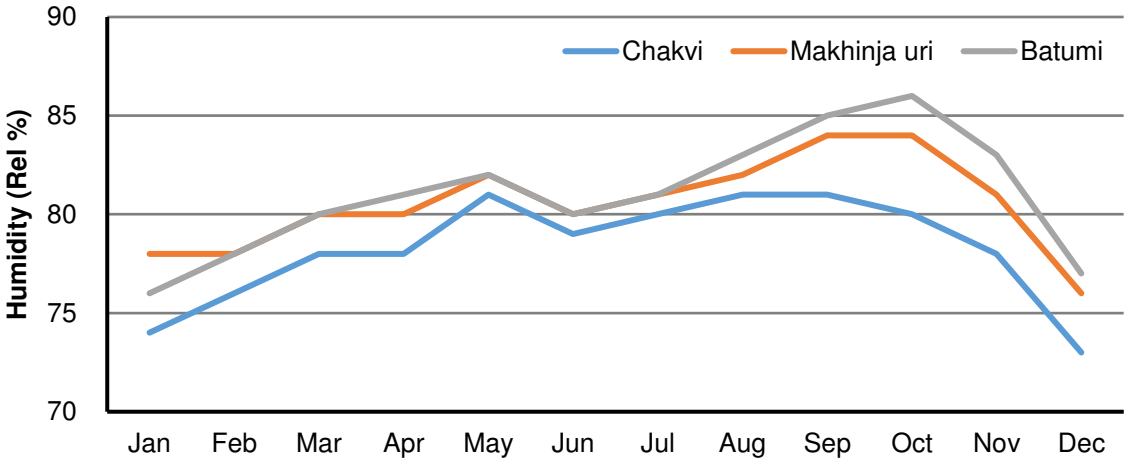


Figure 5-7: Average Monthly Relative Humidity

193. The southern-eastern and southern western winds prevail in the area for 40-50% of the time. 30-40% of the time the air is still. The remaining time is spread between the other directions. This is illustrated in **Table 5-5**.

Table 5-5: Wind Direction (% of annual values)

Weather Station	N	NE	E	SE	S	SW	W	NW	Still
Chakvi	3	4	13	33	7	18	15	7	32
Makhinjauri	9	4	9	32	16	13	10	7	32
Batumi	9	7	8	11	14	31	12	8	43

5.2.4 Geomorphology

194. Geotechnical investigation team of BT Design and Consulting Company conducted assessment and geological surface survey of the design road corridor from February 22 to March 20, 2011.

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

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

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

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

198. The morphological zone of Kobuleti and Kakhaberi plain-accumulative seaside zone of Kolkheti Lowland is developed by a joint action of river and marine processes and

is structured with thick deposits of delta facies with the thickness of 140 m in Kobuleti zone and up to 300 mm in Kakhaberi area.

Coastal Geomorphology

199. The Eastern Black Sea Region, located in the north east of Turkey, has been exposed to severe coastal erosion and shoreline recession for the last 30 years. One of the most important reasons for this problem is the response of the coast on manmade activities. As a result of sand mining by people and municipalities, the coastal balance was broken.[18]

5.2.5 Geological Hazards

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

201. According to the state Department of Geology of Georgia, by 2000, there were 374 newly formed and active landslide bodies, 18 mudflow-transformable erosive water flows and over 57-km-long river bank erosion areas were identified. The degree of activation of these processes was comparatively higher in last 15 years and is evident almost every year. Only in 2004-2009, 200 landslide sites were activated and approximately 1600 residential houses were destroyed to different degrees. In 2008, about 40 populated areas were found in the high risk area of landslide events. The landslides took the lives of 10 people. Within the alignment examples of geological activity is shown in **Figure 5-8**.

202. Based on the Global Seismic Hazard Map Project (GSHAP), the peak ground acceleration (PGA) of 10% in 50 years is between 2.4 and 3.2 m/s^2 (see **Figure 5-9**).

Cracked walls due to shifting soils.
(41°40'45.91"N, 41°42'18.57"E).

Landslide in lateritic slope at km 0+500.

Figure 5-8: Geological Activity within the Study Area

[18] Coastal erosion in Eastern Black Sea Region, Turkey: Reply, Coastal Engineering December 1995

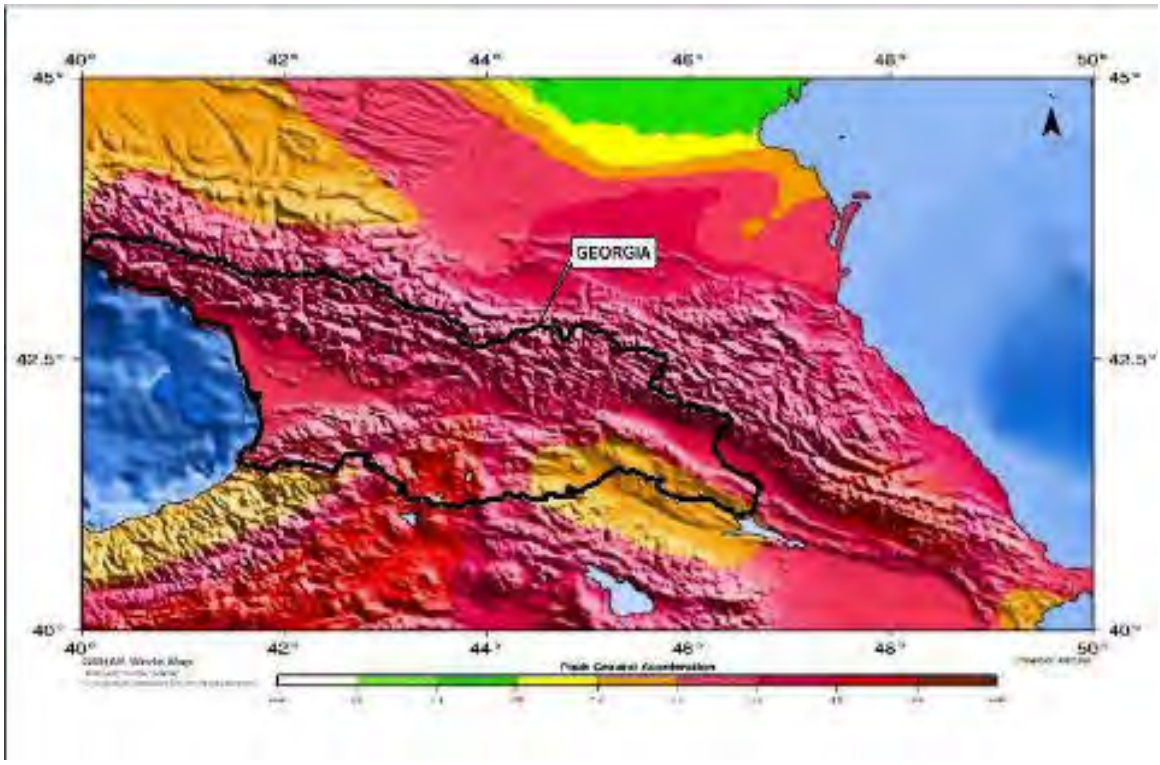


Figure 5-9: Global Seismic Hazard Map of Georgia

Source: Giardini, D., Grünthal, G., Shedlock, K. M. and Zhang, P.: The GSHAP Global Seismic Hazard Map. In: Lee, W., Kanamori, H., Jennings, P. and Kisslinger, C. (eds.): International Handbook of Earthquake & Engineering Seismology, International Geophysics Series 81 B, Academic Press, Amsterdam, 1233-1239, 2003.

5.2.6 Air Quality

203. This section describes the current ambient air quality in the area where Project activities are proposed. The results discussed in this section are based on measurements undertaken for the EIA in October 2016. The pollutants selected for evaluation, based on the expected emissions from the Project activities and the level of risk to human health posed by these pollutants, are as follows:

- Sulfur dioxide (SO_2)
- Oxides of Nitrogen (NO_X)
- Ozone (O_3)
- Coarse (PM_{10}) and fine ($PM_{2.5}$) respirable particulate matter

Methodology and Sampling Locations

204. Air quality sampling was carried out at five different locations in the Study Area between September and October 2016 to characterize the current air quality within the Study Area. Weather data was collected using a portable weather meter during the duration of particulate matter sampling. A description of sampling locations and the rationale of selection is given in **Table 5-6**. The ambient air quality data was compared against applicable IFC and Georgian Standards.

Table 5-6: Air Quality Sampling Locations

Sample ID	Coordinates	Location	Rationale for Site Selection
A1	41°38'13.40"N 41°38'20.30"E	Bagrationi Street, Batumi	Along the truck transport route in the city that may benefit from traffic diversion.
A2	41°35'36.31"N 41°38'33.95"E	Khelvachuri	Near proposed interchange on main road to Khelvachauri.
A3	41°39'03.77"N 41°41'46.40"E	Kapreshumi	Main road near Interchange 2 which will see increased traffic
A4	41° 36' 21.5" N 41° 39' 34.2" E	Makhvilauri	Typical air quality of low density valleys where bypass will pass.
A5	41°35'29.60"N 41°40'51.20"E	Zanakidzeebi	Reference location far from any development.

Note: O_3 was only sampled at A1, A2 and A4
Particulate matter was only sampled at A1, A2, A4, and A5

205. O_3, NO_X, NO_2 and SO_2 were measured using Gradko diffusion tubes. These tubes passively uptake pollutants via diffusion and hence require longer sampling of durations of between 2-4 weeks. The collected pollutants are quantified using ion chromatography. Repeat measurements were made for NO_2 and SO_2 using Gradko rapid air monitors (RAM) at A2 and A3.

206. Particulate matter was sampled using Airmetrics MiniVol Portable Air Samplers. This equipment draws an air sample through an inlet by a vacuum pump at a fixed flow rate. The particulates are filtered using an impactor and collected on a filter paper which was dried and weighed after the sampling to obtain the weight of particulates in the sampled volume of air. The equipment was factory calibrated on March 11, 2015. The MiniVol calibration is performed with an NIST -traceable standard. Each unit has a unique pair of calibration constants derived from the calibration which are used to calculate the sampler's actual flow rate at all ambient conditions

207. The method, duration of sampling and laboratory for analysis is summarized in **Table 5-7**. Photographs of the diffusion tube and particulate matter sampling sites are shown in **Figure 5-10** and **Figure 5-11** respectively**.** The sampling locations, along with nearby settlements and roads are shown in **Figure 5-12.**

Table 5-7: Methodology and Duration of Sampling

Parameter	Equipment	Date and Duration of Sampling	Lab for Analysis
O_3, NO, NO_2 and SO_2	Passive diffusion tubes	Sept 30 to Oct 14, 2016 2 weeks[1]	Gradko Lab, UK
NO_2 and SO_2	Rapid air monitor	Oct 14, 2016 17-19 hours	Gradko Lab, UK
PM_{10} and $PM_{2.5}$	Low volume sampler	October 6 to 16, 2016 24 Hours at each location for each parameter	HBP Lab, Islamabad
Weather data[2]	Kestrel 5500 weather meter	During PM sampling 24 Hours at each location	Field data

Note:

1. Recommended sampling duration is between 2-4 weeks.
2. Weather data includes wind speed and direction, temperature, humidity and barometric pressure.

Diffusion Tubes at A1

Diffusion Tubes at A2

Diffusion Tubes at A3

Diffusion Tubes at A4

Diffusion Tubes at A5

Rapid Air Monitors at A3

Figure 5-10: Diffusion Tubes and RAM Site Photographs

Low Volume Sampler at A2

Low Volume Sampler at A3

Low Volume Sampler at A5

Figure 5-11: Particulate Matter Sampling Site Photographs

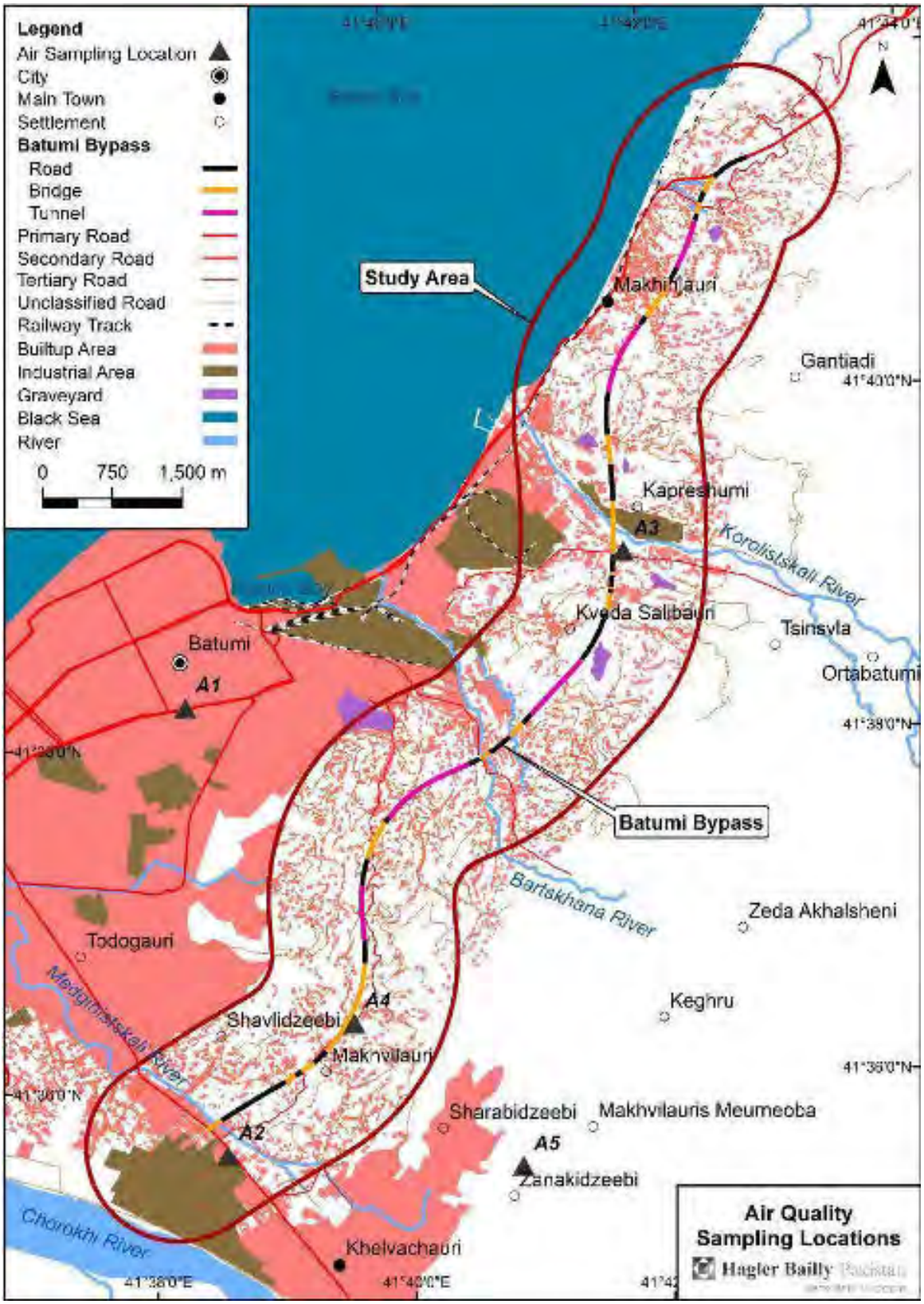


Figure 5-12: Air Quality Sampling Locations

Results and Analysis

208. The results of the ambient air quality sampling are presented in **Table 5-8**, the complete laboratory reports found in **Appendix 2**, and discussed below:

- NO_2 levels are within limits at all locations other than A2. It is very slightly above the limit here likely due to the presence of the busy main road and industries near A2.
- SO_2 levels were lower than the detectable level at all locations.
- Ozone levels were below limits at all locations.
- Particulate matter results were high near A1, A2 and A5. The concentration is within the 24 hour IFC interim target 1 but above the guideline values.
- It must be noted that the tourist season is over. During the tourist season there are more cars and traffic jams within Batumi which could give higher readings at A1. However, the current reading is so low that the additional pollutant concentrations are also likely within limits.

Table 5-8: Ambient Air Quality Sampling Results (µg/m^3)

Sample ID	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$
A1 – 14 day	10.51	<1.37	43. 21		
A1 – 24 hour	14.92	<4.45		81.24	49.86
A2 – 14 day	40.32	<1.38	40.13		
A2 – 24 hour	23.01	<4.83		72.54	44.45
A3 – 14 day	12.85	<1.39	27.74		
A4 – 14 day	11.58	<1.39			
A4 – 24 hour				40.97	28.17
A5 – 14 day	36.12	<1.39			
A5 – 24 hour				89.38	63.59
Georgian Standard – 24 hour	40	50	–	150	
IFC (8 hour daily max - guideline)	–		100	–	–
IFC (annual – interim target 1)	–	–	–	70	35
IFC (annual – guideline)	40	–	–	20	10
IFC (24-hour – interim target 1)	–	125	–	150	75
IFC (24-hour – guideline)	–	20	–	50	25

Note:

1. Blank cells indicate no measurement was undertaken
2. An en dash '–' indicates that no standards specified
3. Georgian Standards for PM are for all particle sizes.

5.2.7 Water Resources

209. Water resources in the Study Area include surface drainage and mountain springs. Photographs of major rivers and selected springs are shown in **Figure 5-13**.

210. The rivers in the Study Area are mountainous rivers and do not have large basins and hence river lengths are short. None of the rivers are fed by glaciers or permanent snow mountains, and rather are fed by rain, snow melt and groundwater and hence they are characterized by spring and autumn floods. Most of the rivers are characterized by a large fall and fast flow. In some sections rivers flow in narrow and deep gorges and create canyons and waterfalls. In some sections the rivers causes the bank erosion causing damage to roads, bridges, crops, and residential houses. Among these the Korolistskali, Bartskhana, Mejini and the Chorokhi are main rivers. Other than these rivers there are a large number of small streams that are present in the Study Area.

211. Some homes rely solely on mountain spring water collection structures are constructed around springs to store water from where it is transported to homes using PVC or steel pipes. Most communities have water supply connections.

River Korolistskali

River Chorokhi

Small stream near Makhvilauri

Spring water collection structure

Water supply pipes from collection structure

Spring without collection structure.

Spring water collection structure

Spring water collection structure

Figure 5-13: Water Resources in the Study Area

5.2.8 Water Quality

212. Water quality samples from rivers, streams and community springs were collected and analyzed for establishing baseline conditions for surface and groundwater.

Methodology and Sampling Locations

213. A total of 5 samples were collected and analyzed. Of these, 3 were surface water samples and 2 were spring water samples. **Table 5-9** describes the sample locations and rationale for their selection. The sampling locations are mapped in **Figure 5-14**.

214. Water samples were tested at the National Environmental Agency. Photographs of the sampling are shown in **Figure 5-15**. Strict sampling protocol was followed during sampling including

- Powder-free disposable gloves were worn at all times.
- Sample bottles were filled to the top to eliminate air space.
- Sample bottles were capped as soon as they were filled, placed in plastic bags, and placed into coolers.
- One duplicate sample was collected as part of QC check
- Samples were transported to the lab within 24 hours of sampling

Table 5-9: Water Quality Sampling Locations

ID	Coordinates	Description	Notes and Justification
W1	41° 40' 47.0" N 41° 42' 21.0" E	Mountain spring, near Makhinjauri	To establish baseline for spring water quality. Spring water is used extensively by surrounding communities.
W2	41° 39' 33.8" N 41° 41' 17.9" E	Korilistskali River, downstream of oil terminal	River water may be contaminated due to the oil terminal
W3	41° 39' 03.1" N 41° 42' 23.3" E	Korilistskali River, upstream of oil terminal	Reference sample to compare with W3
W4	41° 36' 30.2" N 41° 39' 37.4" E	Stream near Makhvilauri	To establish baseline for streams in area. Secondly the construction corridor follows this stream for a large part increasing chances of contamination
W5	41° 36' 25.8" N 41° 39' 35.1" E	Mountain spring near Makhvilauri	To establish baseline for spring water quality. Spring water is used extensively by surrounding communities.
W6	41° 36' 30.2" N 41° 39' 37.4" E	Duplicate of W4	Quality control check for lab

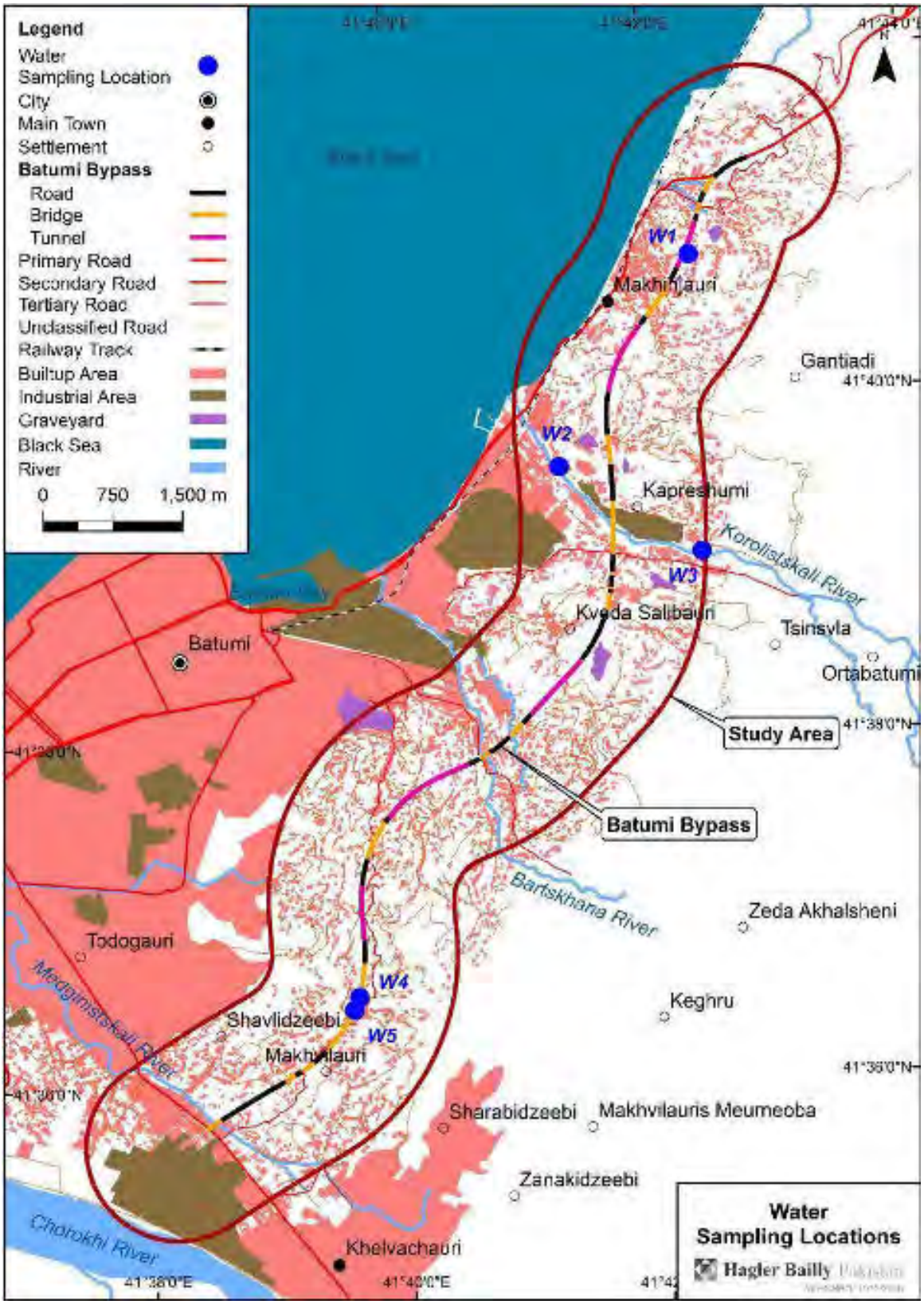


Figure 5-14: Water Quality Sampling Locations

Collection of water sample W01

Collection of water sample W02

Collection of water sample W03

Collection of water sample W04

Sample labeling and packing in zip lock bags

Sample storage in chilled containers

Figure 5-15: Photographs of Water Sampling

Results and Analysis

215. The results are tabulated in **Table 5-10** and the complete laboratory report can be found in **Appendix 3**. An analysis of the results is provided below:

- Both spring water samples (W1 and W5) tested negative for E.coli and total coliforms and therefore are fit for drinking in this regard. All other samples were

in excess of Georgian standards likely due to seepage of household sewage into streams.

- Other than microbiology all samples comply with Georgian maximum permissible concentrations.
- Very low concentrations of metals were detected. This is likely due to the short flow distance of these rivers.
- W02 and W03 are show almost identical results. These samples were taken from downstream and upstream of the oil terminal. The large fast flowing river resulted in a well-mixed water samples. No contamination due to the oil terminal was observed in this sampling.

Quality Assurance

216. One duplicate sample (W06) was analyzed as quality control (QC) sample. The real identity was unknown to the testing laboratory. Upon receipt of results, relative percentage difference (RPD) was checked with the corresponding sample (**Table 5-11**). Key findings on QC results are as follows:

- Of nine parameters analyzed for general ions RPD of QC sample results with corresponding sample results for seven (07) parameters fall below and four above 20%.
- RPD of QC sample results with corresponding sample results for all analyzed major ions fall below 10%.
- RPD of QC sample results with corresponding sample results for analyzed 15 metals, eight fall below and seven above 20%.
- Based on above discussions generally for most of the parameters RPD fall below 20% and the results are deemed acceptable.

Table 5-10: Water Quality Sampling Results

Parameter	Unit	Method	Georgian MPC	W01	W02	W03	W04	W05	W06
General Parameters									
pH		ISO 10523:2010	6.5-8.5	7.68	7.52	7.69	7.61	7.41	7.64
Turbidity	NTU	Photometric		0.31	0.14	0.14	0.59	0.09	0.68
Total suspended solid	mg/l	ISO 11923:2007		4.8	4.4	3.8	3	6.2	5.4
Total dissolved Solids	mg/l	Weight	1000	50	31	31	96	199	143
Hardness	mgeqv./l	ISO 6059-84		0.74	0.72	0.64	1.48	2.2	1.3
BOD_5	mg/l	ISO 5815-1:2010	6	0.79	0.64	0.93	1.23	0.79	0.68
COD	mg/l	ISO 6060:2010	30	2.74	1.96	1.76	2.35	3.92	2.94
Chloride	mg/l	ISO 10304-1:2007	350	4.449	1.983	1.514	3.42	5.428	3.286
Alkalinity	mg/l	Titrimetric		42	48	46	104	132	88
Major Ions									
Sodium	mg/l	ISO 9964-3:2010	200	8	2.5	2	7.5	9.5	7
Calcium	mg/l	ISO 6058:2008	180	8.73	9.83	8.49	15.93	26.08	16.31
Potassium	mg/l	ISO 11885:2007		1.499	0.547	0.5034	0.8808	0.8646	0.8598
Sulphate	mg/l	ISO 10304-1:2007	500	1.496	2.098	1.521	3.75	7.081	4.125
Microbiology									
Total coliforms	in 1 dm^3	membrane filtration		N/D	10 000	12 000	9 000	N/D	13 000
E-coli	in 1 dm^3	membrane filtration	5000	N/D	8 000	8 000	7 000	N/D	10 000
Fecal streptococci	in 1 dm^3	membrane filtration		N/D	N/D	N/D	N/D	N/D	N/D
Metals (Total)									
Iron - Fe	mg/l	ISO 11885:2007	0.3	0.0881	0.0269	0.0323	0.0974	0.0137	0.1054

Parameter	Unit	Method	Georgian MPC	W01	W02	W03	W04	W05	W06
Zinc - Zn	mg/l	ISO 11885:2007	1	0.0082	0.0066	0.0115	0.0062	0.01	0.009
Cadmium - Cd	mg/l	ISO 11885:2007	0.001	0.0002	0.0002	0.0003	0.0001	0.0003	0.0002
Cupper - Cu	mg/l	ISO 11885:2007	1	0.0006	0.0011	0.0011	0.0024	0.0017	0.0025
Nickel-Ni	mg/l	ISO 11885:2007	0.1	0.0002	0.0016	0.0014	0.0001	0.0015	0.0005
Arsenic - As	mg/l	ISO 11885:2007	0.05	0.0018	0.0033	0.0008	0.0037	0.0023	0.0039
Lead - Pb	mg/l	ISO 11885:2007	0.03	0.005	0.0024	0.003	0.0016	0.0046	0.0032
Chrome - Cr	mg/l	ISO 11885:2007	0.5	0.0055	0.0041	0.0044	0.0031	0.0095	0.0047
Manganese-Mn	mg/l	ISO 11885:2007	0.1	0.0047	0.0068	0.0024	0.0026	0.0016	0.0031
Mercury	mg/l	ISO 11885:2007	0.0005	<0.0003	<0.0002	<0.0002	<0.0001	<0.0003	<0.0002
Aluminum - Al	mg/l	ISO 11885:2007	0.5	0.0477	0.0189	0.0226	0.0694	0.0057	0.0758
Antimony - Sb	mg/l	ISO 11885:2007	0.05	0.0004	0.013	0.0075	0.0005	0.0041	0.0073
Barium - Ba	mg/l	ISO 11885:2007	0.1	0.0201	0.0058	0.0055	0.0041	0.0009	0.0044
Boron - B	mg/l	ISO 11885:2007	0.5	0.0064	0.0483	0.0109	0.0028	0.0004	0.0035
Selenium - Se	mg/l	ISO 11885:2007	0.01	<0.0006	<0.00006	<0.0006	0.0009	<0.0003	0.0069

Table 5-11: Water Quality Assurance Sample Analysis Result

Parameter	Unit	Sample ID: WR16- FB	Sample ID: WR16A-3b (D)	RPD(%)
General Parameters				
pH		7.64	7.61	0.4%
Turbidity	NTU	0.68	0.59	14.2%
Total suspended solid	mg/l	5.4	3	57.1%
Total dissolved Solids	mg/l	143	96	39.3%
Hardness	mgeqv./l	1.3	1.48	12.9%
BOD_5	mg/l	0.68	1.23	57.6%
COD	mg/l	2.94	2.35	22.3%
Chloride	mg/l	3.286	3.42	4.0%
Alkalinity	mg/l	88	104	16.7%
Major Ions				
Sodium	mg/l	7	7.5	6.9%
Calcium	mg/l	16.31	15.93	2.4%
Potassium	mg/l	0.8598	0.8808	2.4%
Sulphate	mg/l	4.125	3.75	9.5%
Metals (Total)				
Iron - Fe	mg/l	0.1054	0.0974	7.9%
Zinc - Zn	mg/l	0.009	0.0062	36.8%
Cadmium - Cd	mg/l	0.0002	0.0001	66.7%
Cupper - Cu	mg/l	0.0025	0.0024	4.1%
Nickel-Ni	mg/l	0.0005	0.0001	133.3%
Arsenic - As	mg/l	0.0039	0.0037	5.3%
Lead - Pb	mg/l	0.0032	0.0016	66.7%
Chrome - Cr	mg/l	0.0047	0.0031	41.0%
Manganese-Mn	mg/l	0.0031	0.0026	17.5%
Mercury	mg/l	<0.0002	<0.0001	0.0%
Aluminum - Al	mg/l	0.0758	0.0694	8.8%
Antimony - Sb	mg/l	0.0073	0.0005	174.4%
Barium - Ba	mg/l	0.0044	0.0041	7.1%
Boron - B	mg/l	0.0035	0.0028	22.2%
Selenium - Se	mg/l	0.0069	0.0009	153.8%

5.2.9 Soil Quality

217. There is one-story hilly and lowland landscape with typical wet subtropical climate, well-developed red-soils in the area and if not considering Batumi Botanical Garden, all the territory is intensely anthropogenized and cultivated.

218. The Geotechnical Engineering Report in the design documents contains detailed information on the soils. 234 disturbed and undisturbed soil samples were studied in total. A summary of the physical properties of the soils in the road and bridge sections, as obtained by that study, are summarized in **Table 5-12**.

Table 5-12: Physical Properties of Common Soils in the Project Area

	Moisture content %	Bulk Density	Porosity
Earth fill	-	1.80	-
Clay, yellowish firm	40.3	1.59	58.4
Clay, brownish black	50.9	1.57	61.4
lean clay, reddish brown	43.6	1.6	58.6
Lean clay, brownish-reddish	29.8	1.6	54.1
Silty sand, dark grey	-	-	-
Sand silty, dark grey	-	-	-
Gravel, crushed stones, with lean clay inclusion	23.4*	1.63*	50.7*
Cobbles, yellowish brown with clay inclusion	29.1*	1.61*	54.1*
Cobbles, with boulder inclusions, with lean clay filling	24.9*	1.62*	51.5*
Cobbles, with boulder inclusions, with silty sand filling	21.3*	1.61*	49.5*
Cobbles, with boulder inclusions, with sand filling	20.1*	1.64*	58.3*
Lean clay, reddish brown with gravel inclusion, eluvial tuff breccia	29.6	1.75	49.8
Tuff breccia, extremely weathered	25.8	2.00	41.3
Tuff breccia, weathered and fractured andesite-basalt content	8.7	2.35	20.1
Tuff breccia, slightly weathered and andesite-basalt content	4.9	2.50	11.9

* Parameters are given for soil filling

219. Surface samples were also collected to elucidate the Study Areas' soil quality with regard to agriculture, and existing toxic metals.

Methodology and Sampling Locations

220. Surface soil samples were collected after removing of 15 cm upper surface layer with a plastic spoon. Samples were taken in a manner that minimized loss of volatile compounds, and samples were sealed immediately in double zip lock bags with minimal headspace. Sampling locations are provided in **Table 5-13** and shown in **Figure 5-16**. Photographs of sampling are shown in **Figure 5-17**.

Table 5-13: Soil Quality Sampling Locations

ID	Coordinates	Description	Notes and Justification
S1	41° 40' 47.0" N 41° 42' 21.0" E	Forested area near Makhinajauri	To establish baseline for soil quality.
S2	41° 39' 30.1" N 41° 41' 21.5" E	Downstream of oil terminal	Soil may be contaminated due to the oil terminal
S3	41° 39' 01.5" N 41° 42' 23.6" E	Upstream of oil terminal	Reference sample to compare with W3
S4	41° 36' 28.3" N 41° 39' 34.5" E	Near Makhvilauri	Agricultural land along right of way
S5	41° 36' 28.3" N 41° 39' 34.5" E	Duplicate of S4	Quality control check
S6	41° 35' 48.3" N 41° 38' 52.3" E	Near Makhvilauri	Agricultural land along right of way

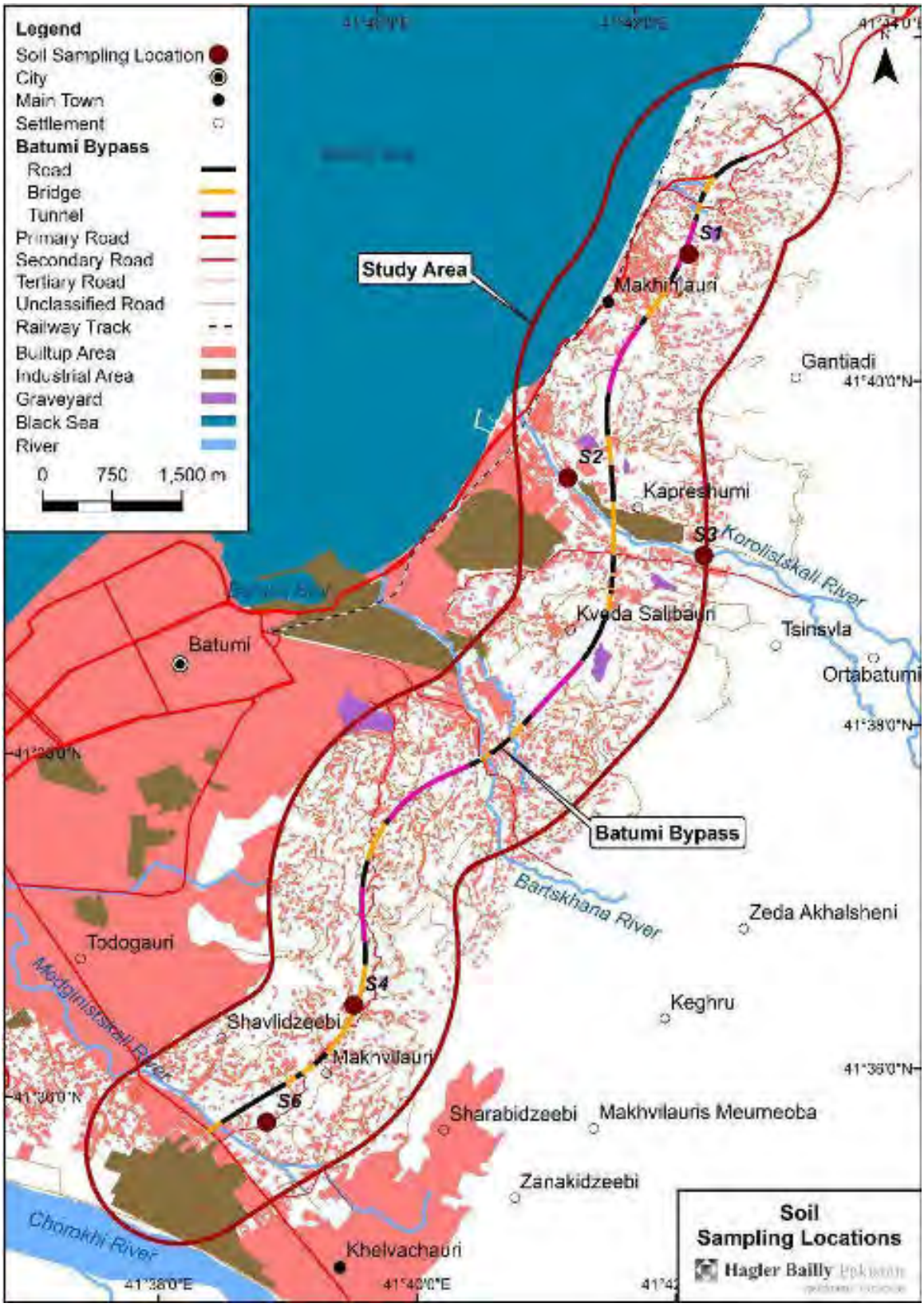


Figure 5-16: Soil Quality Sampling Locations

Soil sampling at S1

Soil sampling at S2

Soil sample and duplicate at S4

Soil sample site S6

Figure 5-17: Soil Quality Sampling Photographs

Results and Analysis

221. The results are presented in **Table 5-14.** Key observations are as follows:

- pH of soil sample S01 and S04 were found to be acidic as per available criteria[19].
- Nitrates were found adequate for agricultural activity in soil sample S01, and marginal in S02 and S04 but low in S03 and S06 as per available criteria[20].
- Phosphates levels were found low for agricultural activity in all soil samples[21].
- Cobalt (Co) was detected higher than target value (i.e. three times its average crustal abundance) in sample S02.

[19] The United States Department of Agriculture Natural Resources Conservation Service classifies soil pH in the ranges acidic (5.1–6.0), normal (6.1 – 7.8), alkaline (7.9 – 9.0). Soil pH is in the range 6.0 to 7.0 for most plants but some prefer acid or alkaline conditions

[20] Land Resources Research Institute National Agricultural Research Center Islamabad- Pakistan classifies soil Nitrate in the ranges Low (< 11 mg/kg), marginal (11 – 20 mg/kg) and adequate (>20 g/kg). For soil Phosphate the ranges Low (<4 mg/kg), marginal (4 – 7 mg/kg) and adequate (>7 mg/kg)

[21] ibid

- Arsenic (As) was detected higher than target value in sample S06
- Molybdenum (Mo) was detected higher than target value in sample S01, S02, S03 and S06.
- Boron (B) was detected higher than target value in sample S01, S02 and S03.
- Cadmium (Cd) was detected higher than target value in sample S01 and S04.
- The higher values of above metals may be due to natural conditions.

Table 5-14: Soil Quality Sampling Results

Parameter	Unit	Method Reference	Georgian MPC	3 x Crustal Abundance	S01	S02	S03	S04	S06
General and Major Ions									
pH		ISO 10523:2010	–	–	5.78	6.81	6.01	4.4	7.03
TPH	mg/kg	Weight method	–	–	ND	ND	ND	ND	ND
NO_3	mg/kg	ISO 10304-1:2007	–	–	184.55	13.28	6.39	14.99	0.35
PO_4	mg/kg	ISO 10304-1:2007	–	–	0.764	0.122	0.302	0.19	0.782
Metals									
Cu	mg/kg	ISO 11885:2007	3	204	72.59	63.63	55.56	40.51	82.62
Ni	mg/kg	ISO 11885:2007	4	270	17.02	34.07	32.53	11.5	13.02
Zn	mg/kg	ISO 11885:2007	23	237	395.98	279.56	439.44	118.02	410.12
Co	mg/kg	ISO 11885:2007	5	60	60.57	42.59	36.54	29.01	13.52
Cr	mg/kg	ISO 11885:2007	6	420	33.04	32.06	27.53	64.51	32.05
Pb	mg/kg	ISO 11885:2007	6	30	20.02	<2.51	15.02	1.5	3
As	mg/kg	ISO 11885:2007	2	6.3	5.01	<1.50	5.01	5	12.02
Ca	mg/kg	ISO 6058:2008	–	123,000	45.82	18.22	18.48	16.8	44.24
Mg	mg/kg	ISO 6058:2008	–	62,700	15.6	6.62	4.36	3.66	11.26
Na	mg/kg	ISO 9964-3:2010	–	69,000	13	9	5	4	11
Mo	mg/kg	ISO 11885:2007	–	4.5	22.53	18.04	13.01	8	5.01
Mn	mg/kg	ISO 11885:2007	700	3,300	515.12	591.68	599.1	456.09	481.22
K	mg/kg	ISO 11885:2007	–	45,000	559.67	388.28	222.72	384.08	386.58
Al	g/kg	ISO 11885:2007	–	240,000	14.71	15.75	11.96	15.15	9.61

Parameter	Unit	Method Reference	Georgian MPC	3 x Crustal Abundance	S01	S02	S03	S04	S06
B	mg/kg	ISO 11885:2007	–	26.1	129.15	64.13	33.03	21.5	2
Ba	mg/kg	ISO 11885:2007	–	1,020	65.58	96.19	80.08	36.51	118.68
Cd	mg/kg	ISO 11885:2007	–	0.45	2	1.5	0.5	1.5	0.5
Se	mg/kg	ISO 11885:2007	–	0.15	8.51	25.05	25.53	16.5	5.51
Hg	ug/kg	ISO 11885:2007	–	0.201	<0,9	<0,9	<0,9	<0,9	<0,9
Fe	%	ISO 11885:2007	3	123,000	2.61	2.81	2.06	2.5	2.25

5.2.10 Noise Levels

222. This section defines the baseline ambient sound levels in the Study Area in a manner that can be used for the assessment of the noise impact of the proposed Project. Sound levels were measured at selected locations considered representative of the nearby receptors of possible noise pollution from the Project.

Methodology and Sampling Locations

223. To determine the baseline noise in the area, measurements were taken at seven locations. These locations are given in **Table 5-15**. The survey was conducted from October 1 to October 14, 2016. At each location approximately 24-hour readings were taken.

224. The survey was conducted with Cirrus Research plc.'s sound level meter, Model CR:1720. The instrument meets the International standards IEC 61672-1:2002, IEC 660651:1979, IEC 60804:2001, IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986, and ANSI S1.43-1997 where applicable. The instruments have a resolution of 0.1 dB.

225. The meter was calibrated at the start and end of measurement at each site, using Cirrus Research plc.'s acoustic calibrator, Model: CR:514. The sound meter and calibrator were factory calibrated on September 28, 2015. The instrument was mounted on a tripod, to avoid interference from reflecting surfaces within the immediate neighborhood, and a wind shield was used in all measurements. Photographs of the sampling equipment setup are provided in **Figure 5-18**. The sound sampling locations are mapped in **Figure 5-19**.

Table 5-15: Noise Level Sampling Locations

ID	Location	Coordinates	Dates of Survey	Description
N1	Makhinjauri	41° 40' 31.6" N 41° 41' 59.5" E	Start: Oct 1 , 10:51 am End: Oct 2, 10"51 am	At house opposite a school and along a sealed road
N2	Makhinjauri	41° 39' 30.3 " N 41° 41' 43.5 " E	Start: Oct 2, 11:13 am End: Oct 3, 12:35 pm	Remote houses along low density section of right of way
N3	Makhinjauri	41°39'28.66"N 41°41'44.19"E	Start: Oct 13, 3:27pm End: Oct 13, 4:07am	Remote houses along low density section of right of way
N4	Kapreshumi	41° 39' 08.1" N 41° 41' 36.5" E	Start: Oct 3, 1:51 pm End: Oct 4, 1:31 pm	Along sealed road in medium sized settlement, near proposed interchange
N5	Kapreshumi	41° 39' 03.0" N 41° 41' 47.3" E	Start: Oct 7, 10:46 pm End: Oct 8, 11:19 pm	Near N4 but closer to existing intersection. QC for N4.
N6	Makhlivauri	41° 36' 21.5" N 41° 39' 34.2" E	Start: Oct 4, 4:03 pm End: Oct 5, 3:30 pm	Houses along sealed road, in low density section of right of way
N7	Makhvilauri	41° 36' 21.5" N 41° 39' 34.2" E	Start: Oct 22, 5:55 pm End: Oct 23, 11:20 AM	Low density section of right of way at a distance from the road.

Sound meter at N1

Sound meter at N2

Sound meter at N4

Sound meter at N5

Sound meter at N6

Sound meter at N7

Figure 5-18: Noise Level Sampling Photographs

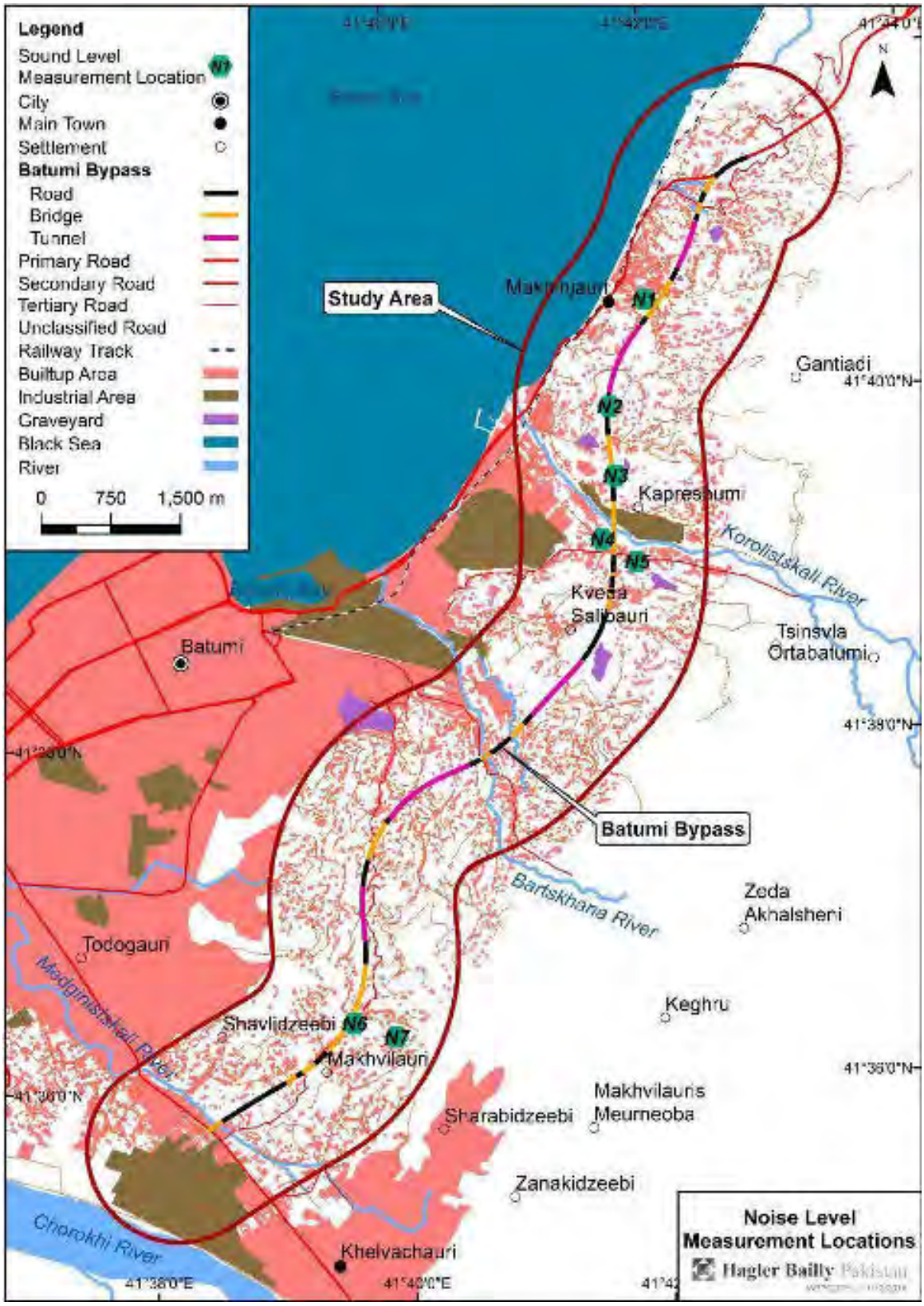


Figure 5-19: Noise Level Measurement Locations

Results and Analysis

226. The sources of noise were identified using the following sources:

- Identification of noise sources in the vicinity during set up and dismantling of sampling equipment
- The noise sampling equipment was set to record audio when noise levels exceed 80 dB A. These recordings were reviewed.

227. Based on the above the following conclusions are drawn regarding noise sources in the area:

- Traffic: for sampling locations along sealed roads traffic noise was very significant. Vehicles were observed to drive fairly fast (up to 50 kmph) on small roads adjacent to the noise sampling location (such as N4, and N5) with rapid acceleration and deceleration. There were more vehicles during the day than the night which explains the higher noise levels during the day.
- Dogs: almost every home that was visited along the alignment owned a dog. During the night if a vehicle passed by the home these dogs would bark even after the vehicle had left.
- Natural sources: The major natural source of noise is the many streams that crisscross the mountainous landscape. Other sources include rain and wind. At night a drop in temperature results in an increase in the density and pressure of the air which may facilitate the propagation of noise from natural sources. This may result in conditions that have a higher noise level at night than during the day[22]. **Figure 5-20** illustrates the rise in base noise levels as the night progresses and a decline after sunrise. There are also fewer fluctuations during the night which further indicates that this is from steady natural sources.

Figure 5-20: Time Series for Noise Levels at N2

[22] Davis M. L. and Cornwall, D. A. 1991. Introduction to Environmental Engineering. McGraw-Hill, Inc.

228. A summary of the results are provided in **Table 5-16**. Georgian and IFC EHS noise standards indicate a 55 dB A limit for daytime and 45 dB A limit for nighttime noise levels (see **Chapter 3** for details). However, IFC EHS limits further require that the sound levels comply with limits for each hour. Therefore, hourly Leq (db A) is presented in **Table 5-17**.

229. Leq, is the average sound level. L_{10} and L_{90} refer to percentile noise levels that are exceeded 10% and 90% of the time, respectively with L_{50} being the median sound level. Daytime averages are calculated for 7 am to 10pm and nighttime for 10 pm to 7 am according to IFC EHS guidelines. Reported sound levels are on the A scale, which covers the full audio range and is relatable to human hearing.

Table 5-16: Summary Statistics of Noise Levels during the Survey

Location	Makhinjauri	Makhinjauri	Makhinjauri	Kapreshumi	Kapreshumi	Makhlivauri	Makhlivauri
ID	N1	N2	N3	N4	N5	N6	N7
	Urban	Rural	Rural	Urban	Urban	Rural	Rural
24 hour	53.7	46.6	54.5	56.7	60.9	55.3	44.1
Day	55.6	44.1	45.4	58.1	62.6	56.7	42.7
Night	50.2	49.3	**	52.5	56.6	**	45.2
L10	52.1	49.8	50.8	59.5	62.8	53.7	45.2
L50	44.6	41.6	42.7	45.8	56.1	42.7	36.8
L90	38.9	36.8	37.8	39.9	45.3	38.6	34

** Results are being analyzed further for quality assurance

Table 5-17: Hourly Leq Results (dB A)

Location	Makhinjauri	Makhinjauri	Makhinjauri	Kapreshumi	Kapreshumi	Makhlivauri	Makhlivauri
ID	N1	N2	N3	N4	N5	N6	N7
	Urban	Rural	Rural	Urban	Urban	Rural	Rural
Daytime IFC limits: 55 dbA							
7:00 AM	46.6	46.6		54.4	56.7	62.4	45.5
8:00 AM	49.3	44.6		59.5	58.8	52.4	45.5
9:00 AM	53	40.5		59.8	60.3	54.6	44.7
10:00 AM	52.6	41.4		58.6	64.7	56.2	44.4
11:00 AM	53.1	40.9		58.3	60.2	58.1	46.8
12:00 PM	62.1	40.2		57.3	61.7	49.2	
1:00 PM	54.8	39.5		57.1	62.1	54.8	
2:00 PM	51.4	38.9		59.4	59	54.8	
3:00 PM	55.2	41.8	46.3	58.7	61.5	50.9	
4:00 PM	50.3	38.9	44.5	57.8	60.1	52	
5:00 PM	54.7	41.4	46.1	57.2	63.7	51.5	46.7
6:00 PM	51.3	46.6	44.1	58.3	65.7	52.6	45.9
7:00 PM	57.9	49.2		57.2	63.4	55	47.6

Location	Makhinjauri	Makhinjauri	Makhinjauri	Kapreshumi	Kapreshumi	Makhlivauri	Makhlivauri
ID	**N1**	**N2**	**N3**	**N4**	**N5**	**N6**	**N7**
	Urban	**Rural**	**Rural**	**Urban**	**Urban**	**Rural**	**Rural**
8:00 PM	52.9	45.1	48.3	56.8	64.5	50.9	44.2
9:00 PM	49.2	43	43.1	57	62.2	51.9	40.9
Nighttime IFC limits: 45 dbA							
10:00 PM	51.4	51.5	43.3	55.9	62	57.5	39.9
11:00 PM	55.6	45.2	52.6	56.1	57.7	54.6	47.2
12:00 AM	49.7	47.6	64.8	52.3	54.8	52	43.9
1:00 AM	51.8	46.2	47.6	53.1	54.5	59.6	40.3
2:00 AM	48	48.6	46.2	49.8	51.7	45.1	36.9
3:00 AM	46.5	50.4	46.9	48.3	57	48.9	35.8
4:00 AM	44.8	51.4	44.5	43.7	53.8	49.2	40.6
5:00 AM	44.1	50.1		47.8	54.5	54.5	45.4
6:00 AM	45.8	48.1		52.5	52.5	56.5	41.7

230. Based on these results the following conclusions can be drawn

- Mountainous low density areas with low traffic
  - These areas such as N2, N3 and N7 have low noise.
  - L_{90} which is the background sound level is between 34 – 38 dB A. L_{10}, which corresponds to noise disturbances are lower than 51 dB A.
  - Daytime noise levels are lower (between 42 and 45.5 dB A) than night time noise levels (between 45 and 49 dB A. This is because these areas are dominated by natural noise sources discussed earlier.
- Medium density settlements along major roads
  - These areas such as N1, N4, N5 and N6 have a moderate amount of noise.
  - L_{90} ranges between 38 and 56 dB A. L_{10}, levels are as high as 62.8 dB A.
  - Daytime noise levels (between 55 and 63 dB A) are higher than nighttime noise levels (between 50 and 55 dB A) as these areas are dominated by human noise influences which reduce at night.

5.3 Ecological Baseline

231. The ecological baseline has been prepared to describe the ecological resources within the Study Area.

5.3.1 Introduction

Scope

232. The scope of the ecological baseline includes the following:

- A review of the literature to determine areas of conservation importance around the Project

- Habitat classification to describe the Study Area and to assess the presence of potential habitats for species of conservation importance
- A review of the ecological survey results presented in the Environmental Impact Assessment (EIA)[23]
- A review of the species of conservation importance, based on Georgia's National List, reported in the EIA, to be present in the Project area
- Identification of species of conservation importance based on the IUCN Red List
- Review of the ranges of the species of conservation importance, based on the IUCN Red List
- Review of the species reported from Georgia whose distributions overlap with that of the Study Area
- Review of the threats faced by the species of conservation importance based on the IUCN Red List (Critically Endangered, Endangered, Vulnerable, Near Threatened), to assess Project-related threats

233. The list of species to take into consideration was developed based on a review of the distributions of species that overlap with the Study Area as well as those reported to be present in the Project area. For all species of conservation importance, information on habitat and threats is presented. For all species of conservation importance reported to be present in the Project area, detailed discussions are presented.

Sources of Information

- Sambo Engineering, March 10, 2016, Environmental Impact Assessment for Construction of Batumi Bypass Road Section for the Ministry of Regional Development and Infrastructure of Georgia Road Department
- The IUCN Red List of Threatened Species. Version 2016-2
- BirdLife International
- Georgia Biodiversity Database
- The Integrated Biodiversity Assessment Tool (IBAT)
- Other Literature

Areas of Conservation Importance

234. Areas of conservation importance located closest to the Project are shown in **Figure 5-21**. These include protected areas and Important Bird Areas (IBAs). They have been marked from various sources, shown below.

[23] Sambo Engineering, March 10, 2016, Environmental Impact Assessment for Construction of Batumi Bypass Road Section for the Ministry of Regional Development and Infrastructure of Georgia Road Department

Figure 5-21: Areas of Conservation Importance

Sources: Agency of Protected Areas, Georgia <http://apa.gov.ge/ge/>, accessed October 10, 2016
BirdLife International, < http://www.birdlife.org/>, accessed October 10, 2016
Google Earth™ Places

235. It can be seen from **Figure 5-21** that the IBA labelled Batumi, overlaps with the Project and that of the Chorokhi Delta is located less than 3.75 km from it. The other Areas of Conservation Importance closest to the Project are listed below along with their distances from it:

- Mtirala National Park, 4 km
- Machakhela Planned National Park, 11 km
- Kintrishi Nature Reserve and IBA of Kintrishi, 15 km

Habitat Classification and Description of Study Area

236. The Study Area comprises a variety of habitat types. Habitat classification of the Study Area was carried out using ***Google Earth™*** satellite imagery. The different habitat types identfied include the following:

- Vegetation Cluster
- Builtup Area
- Agricultural Field
- Industrial Area

237. The distribution of these habitat types is shown in **Figure 5-22**. The percentage of each habitat type in the Study Area is provided in **Table 5-17**. The Study Area is dominated by Vegetation Cluster habitat. The second highest habitat type is Builtup Area. It can be seen in **Figure 5-22** that Builtup Area habitat is distributed throughout the Study Area with no large stretches of Vegetation Cluster habitat. This is indicative of a very disturbed environment with widespread human activity.

238. The habitat is classified as a Modified Habitat based on ADB standards.[24] It is altered natural habitat formed by removeal of native species during resource harvesting and land use conversion.

[24] https://www.adb.org/sites/default/files/institutional-document/33739/files/environment-safeguards-good-practices-sourcebook-draft.pdf

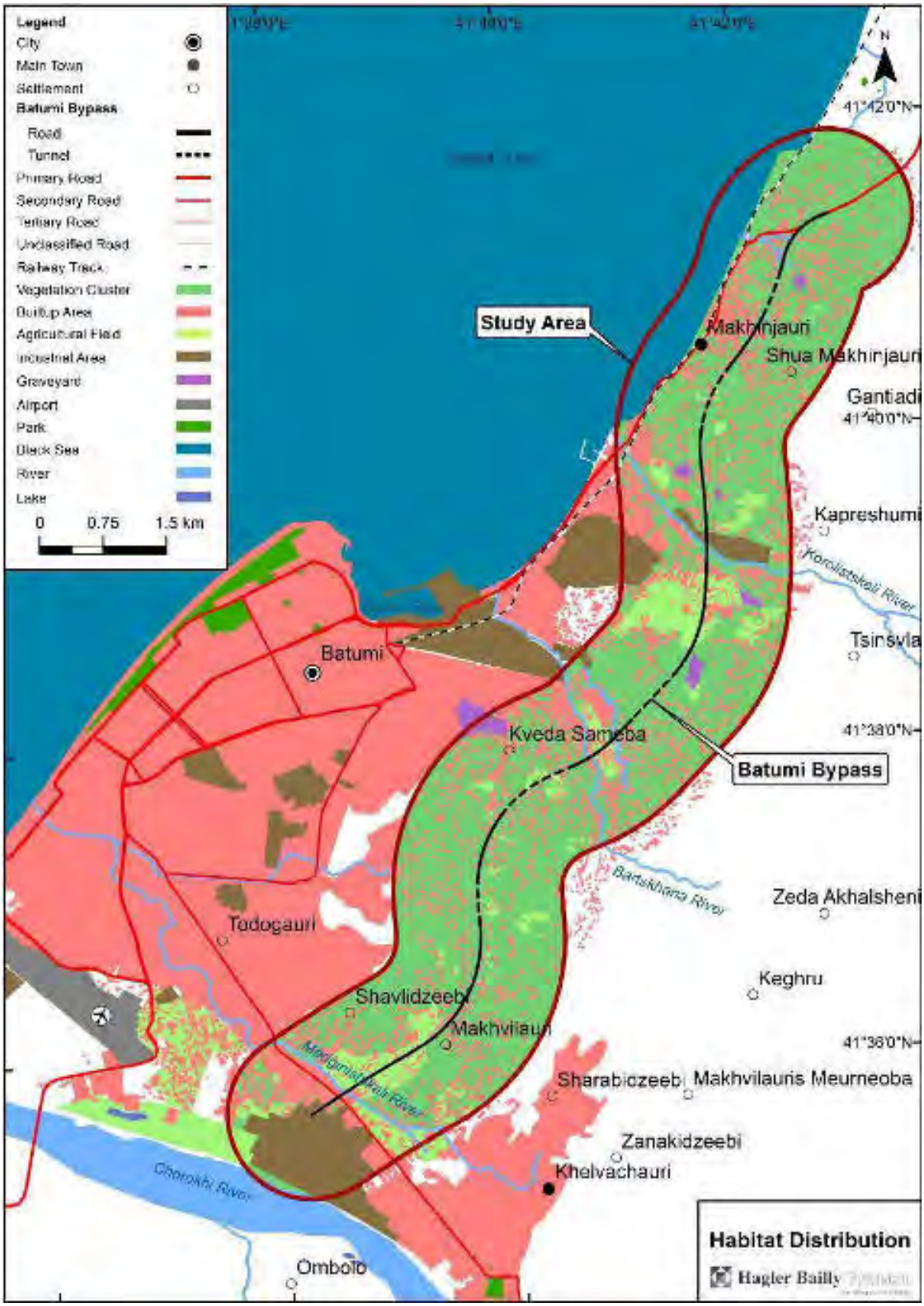


Figure 5-22: Habitat Distribution in Study Area

Table 5-18: Percentage Distribution of Habitat Types in the Study Area

Habitat Type	Percentage Distribution in Study Area
Vegetation Cluster	65.4
Built-up Area and Infrastructure	20.2
Agricultural Field	8.3
Marine	4.9
River	1.1
Total	***100***

Surveys

239. Surveys were carried out as part of the EIA conducted by Sambo Engineering.[25] The sampling locations for the surveys within the Study Area are shown in **Figure 5-23**. They were carried out in an area that is larger than the Study Area. Therefore, only sampling locations within the Study Area are shown.

240. The results of the surveys are provided in **Table 5-19**. It provides a description of each sampling location along with observations of fauna.[26]

[25] Sambo Engineering, March 10, 2016, Environmental Impact Assessment for Construction of Batumi Bypass Road Section for the Ministry of Regional Development and Infrastructure of Georgia Road Department

[26] Sambo Engineering, March 10, 2016, Environmental Impact Assessment for Construction of Batumi Bypass Road Section for the Ministry of Regional Development and Infrastructure of Georgia Road Department

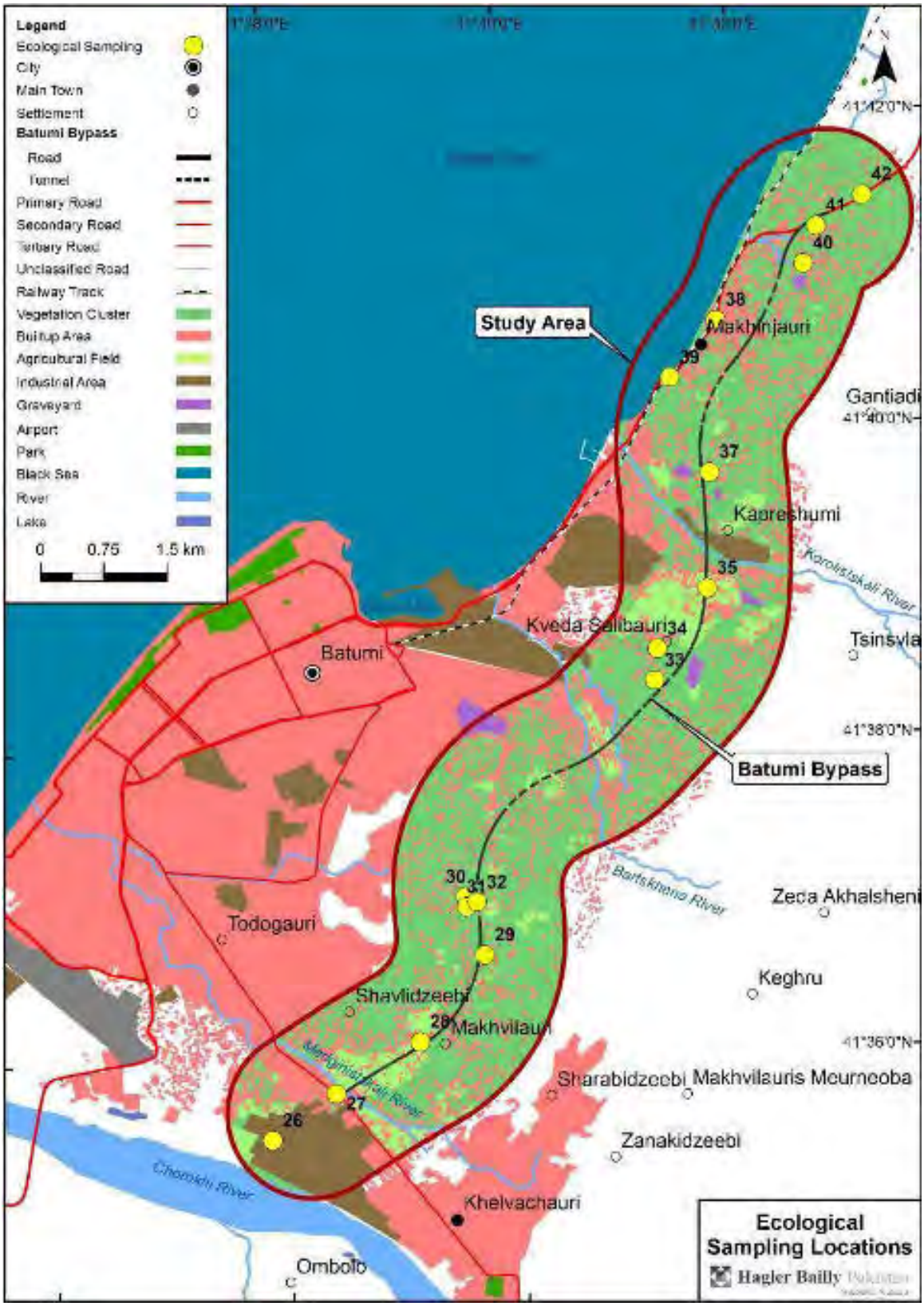


Figure 5-23: Ecological Sampling Locations

Table 5-19: Survey Observations

Sampling Location ID	Coordinates	Site Description	Fauna
1.	41° 37' 50.9628" E 41° 35' 29.4324" N	• Stone-crushing plant and kitchen-garden	• Five synanthropic[27] bird species were observed.
2.	41° 38' 24.2592" E 41° 35' 46.6800" N	• Typical urban landscape. • Old trees plantation on the eastern side.	• Two synanthropic bird species - House Sparrow *Passer domesticus*, Carrion (Hooded) Crow *Corvus corone cornix*
3.	41° 39' 08.0424" E 41° 36' 05.7132" N	• Common anthropogenic landscape. • A few large, old trees of Eucalyptus along road, bushes, fences.	• 11 common synanthropic species bird species were observed
4.	41° 39' 42.4584" E 41° 36' 38.4408" N	• Common anthropogenic landscape, typical of the area • Small outcrops of wild plants; citrus gardens, shrubs. • Remnants of secondary forest.	• No tracks of mammals • 19 bird species were observed • The noteworthy breeding site of the Common Buzzard *Buteo buteo* – observed one pair • Probably breeding site of the Common Kestrel *Falco tinnunculus* – single specimen • Common forest passerines observed • Lizards observed – Spint-Tailed Lizard *Darevskia rudis.*
5.	41° 39' 33.4152" E 41° 37' 01.1460" N	• Common anthropogenic landscape, typical for area • Small outcrops of wild vegetation. • A lot of introduced exotic plants. • Citrus gardens, orchards, brushwood • Secondary forest; a few large trees, but it seems that all old trees were cut down and, therefore, there are low chances to find bat colony.	• 26 bird species were observed • Noteworthy observation of migration of raptor –- European Honey-buzzard *Pernis apivorus* – six migrating individuals were observed flying in North-West direction; • Lizards observed. Species not identified

[27] Living in close association with humans

Sampling Location ID	Coordinates	Site Description	Fauna
6.	41° 39' 33.7428" E 41° 36' 57.1896" N	• Common anthropogenic landscape, • typical for area with small outcrops of wild vegetation, • A lot of introduced exotic plants. • Citrus gardens, orchards, brushwood, • Secondary forest; a few large trees, but it seems that all old trees were cut down and, therefore, there are low chances to find bat colony.	• 26 bird species were observed • Noteworthy observation of migration of raptor birds - European Honey-buzzard *Pernis apivorus* – six migrating individuals were observed flying in North West direction; • Lizards observed. Species not identified
7.	41° 39' 39.2796" E 41° 36' 58.8708" N	• Common anthropogenic landscape, • typical for area with small outcrops of wild vegetation, • A lot of introduced exotic plants. • Citrus gardens, orchids, brushwood, • secondary forest; • A few large trees, but it seems that all old trees were cut down and, therefore, there are low chances to find bat colony.	• 26 bird species were observed • Noteworthy observation of migration of raptor birds - European Honey-buzzard *Pernis apivorus* – six migrating individuals were observed flying in North West direction; • Lizards observed. Species not identified
8.	41° 41' 13.6140" E 41° 38' 22.2612" N	• Common anthropogenic landscape, typical for area. • Tea plantation, small citrus gardens, orchards; • Small wet meadow (about 20x50 m); • A few large trees.	• 15 bird species (common forest species) observed • No other animals observed
9.	41° 41' 15.4968" E 41° 38' 34.3248" N	• Common anthropogenic landscape, typical for area. • Tea plantation, small citrus gardens, orchards; • Small wet meadow (about 20x50 m); • A few large trees.	• 15 bird species (common forest species) observed • No other animals observed
10.	41° 41' 42.1332" E 41° 38' 57.1560" N	• Small gardens • Degraded pasture • Small stream	• 11 common garden bird species observed • No other animals

Sampling Location ID	Coordinates	Site Description	Fauna
11.	41° 41' 45.1500" E 41° 39' 41.6592" N	• Settlement • Ruins of school • grazing area within the village • Gardens • Old Eucalyptus along road	• 6 common synanthropic bird species observed • No other animals
12.	41° 41' 50.6400" E 41° 40' 40.2528" N	• The alignment is going along the existing highway Batumi - Kobuleti within the Makhinjauri settlement.	• eight common synanthropic bird species observed • No other animals observed
13.	41° 41' 26.1996" E 41° 40' 18.6636" N	• The alignment is going along the existing highway Batumi - Kobuleti within the Makhinjauri settlement.	• eight common synanthropic bird species observed • No other animals observed
14.	41° 42' 36.3420" E 41° 41' 01.0320" N	• Orchards • Kitchen-gardens • Rich vegetation • Gentle slopes • Roads	• 6 common synanthropic bird species observed • No other animals observed
15.	41° 42' 43.5852" E 41° 41' 15.4068" N	• Orchards, • Kitchen-gardens, • Rich vegetation, • Gentle slopes, • Roads.	• 6 common synanthropic bird species observed • No other animals observed
16.	41° 43' 07.5432" E 41° 41' 26.8296" N	• Orchards • Kitchen-gardens • Road.	• Nine bird species were observed – all common garden species, • No other animals observed

Source: Sambo Engineering, March 10, 2016, Environmental Impact Assessment for Construction of Batumi Bypass Road Section for the Ministry of Regional Development and Infrastructure of Georgia Road Department

5.3.2 Terrestrial Ecology

241. Terrestrial ecology consists of the following:

- Terrestrial Flora
- Mammals
- Birds
- Herpetofauna
- Invertebrates

242. Each of these have been described in detail below.

Terrestrial Flora

243. The plant ecological diversity in Georgia is complex and wide-ranging, as habitat in the country ranges from high mountain ridges of north Georgia to flatwoods and swamps of south Georgia. Among the geographic regions numerous ecosystems or environments exist where unique plants species have adapted. In some cases, plant species have adapted to very specific and restricted environmental conditions. Others occur over much wider and more general environments.[28] The flora of Georgia contains between 4,200 and 4,500 species of vascular plants. Of these, nine percent are endemic to Georgia and 14 percent are endemic to the Caucasus. Ten species of vascular plants are known to have become extinct in Georgia. In addition, 50 are Critically Endangered, 300 are classified as rare, and 140 have undergone significant decline. Relic and endemic species are widely distributed in Georgian forests. In total, 1,000 plant species are considered endemic. Of more than 400 species of trees, 60 naturally occur only in Georgia and another 43 only in the Caucasus region. Among the endemics the most common species are *Taxus baccata, Pinus pithycesa*, *Pterocaria fraxinifolia, Corylus iberica*, *Quercus imeretina, Zelkova carpinifolia, Pistacea mutica,* and *Acer iberica*.[29]

244. Plant cover in Batumi is dominated by *Prunus laurocerasus*.[30] Other planted vegetation includes Magnolia grandiflora, *Quercus acuta*, *Eucalyptus viminalis*, *Camelia japonica*, *Acer japonicum*, *Cedrus deodara*, *Lagerstroemia indica*, *Ternstroemia japonica*, *Cupressus sempervirens*, *Juglans regia*, *Olea europaea*, *Podocarpus* species, *Eriobotrya japonica*, *Prunus cerasifera*, *Magnolia soulengeana*, *Liriodendron tulipifera*, *Paeonia arborea*, *Pyracantha* species, *Michelia* species, *Juniperis sabina*, *Cinnamomum camphora*, *Washingtonia filifera*, *Trachycarpus fortunei*, *Chamaerops* humilis, *Phoenix canariensis*, *Butia capitata* and *Thuja* species. Bushes include *Abelia* species, *Ilex* species, *Euonymus* species, *Chaenomeles japonica*, *Photinia* species, *Spirea* species, *Kalistimoni* species, *Leptospermum* species, *Gardenia* species, *Forsythia* species, *Hibiscus* species, *Mutabilis* species, *Nandina domestica* and *Rhododendron*

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[28] UGA Extension Bulletin 987. Native Plants for Georgia Part 1: Trees, Shrubs and Woody Vines, <http://extension.uga.edu/index.cfm>, accessed October 15, 2016

[29] Chemonics International Inc, 2000, Biodiversity Assessment for Georgia: Task Order under the Biodiversity & Sustainable Forestry IQC (BIOFOR) for USAID Washington E&E Bureau, Environment & Natural Resources Division

[30] Beruchashvili, N. L., Z. V. Davitashvili, and N. K. Elizbarashvili, 2002. Geography of the Georgia "Kilo" and "Meridian", Tbilisi, p 91

catawbiense.[31] Photographs of the terrestrial vegetation observed in the Study Area are provided in **Figure 5-24**.

41°40'40.26"N, 41°42'10.62"E

Citrus species, 41°40'40.26"N, 41°42'10.62"E

41°40'25.24"N, 41°41'57.98"E

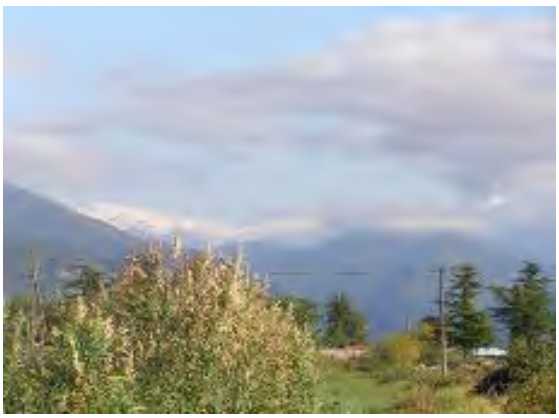
Diospyros kaki, 41°39'30.74"N, 41°41'44.44"E

41°39'30.74"N, 41°41'44.44"E

Hibiscus rosa-sinensis, 41°39'30.74"N, 41°41'44.44"E

[31] Batumi City Council (BCC). 2014. "Batumi Sustainable Energy Action Plan."

41°39'33.74"N, 41°41'18.18"E



Miscanthus sinensinsis, 41°35'54.64"N, 41°36'35.63"E

41°36'26.19"N, 41°39'43.40"E

Figure 5-24: Terrestrial Vegetation in the Study Area

245. The IBAT was used to find the species whose distribution overlaps with the Study Area as reported by the IUCN Red List Database. A list of these species is provided in **Table 5-20**, along with their IUCN status, information on habitat and threats.[32]

[32] IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-2*. <http://www.iucnredlist.org>. Downloaded on October 13, 2016.

Table 5-20: List of Plant Species with Ranges Overlapping with Study Area

Scientific Name	Common Name	IUCN Status	Habitat	Threats
Campanula pontica	Pontic Campanula	Vulnerable	Grows on limestone rocky areas in the montane forest zone.	Deforestation and road construction are the main threats in Georgia.
Chaerophyllum astrantiae	Astrantia-like Cow Parsley	Near Threatened	Recorded in alpine meadows and rhododendron shrubland in Georgia.	Habitat degradation on account of overgrazing is the major plausible threat in Georgia.
Dryopteris liliana	Buckler Fern	Vulnerable	Occurs in spruce-beech forests.	Logging is a plausible threat to the species habitat.
Kemulariella colchica	Colchic Kemulariella	Vulnerable	Grows in limestone rock crevices in the upper montane to subalpine zones.	Construction, land development and recreation are the main threats.
Laserpitium affine	Similar Laserwort	**Endangered**	Occurs in forest clearings, crook-stemmed forests and meadows in subalpine and alpine zones.	Deforestation, grazing, and global climate change are as the major threats.
Myosotis lazica	Lazetian Forget-me-not	Near Threatened	Occurs in moist meadows and forests.	Grazing and deforestation.
Symphytum ibericum	Georgian Comfrey	Data Deficient	Can be found in rhododendron scrub on shaded coastline areas as well as Colchic rainforest from the lower through middle montane zone.	Threats are unclear.
Trapa colchica	Colchis Water-Chestnut	**Critically Endangered**	Grows in freshwater ponds and artificial canals.	Major threats are coastal freshwater ponds degradation and habitat loss caused by land privatization, infrastructure development and very low environmental education.

246. Of the plant species of conservation importance based on Georgia's Red List reported to be found in the Project area[33], thereare two species classified as being of conservation importance based on the IUCN Red List. These include Colchic Boxwood *Buxus colchica* and Common Walnut *Juglans regia*, both Near Threatened (although *Buxus colchica* is Lower Risk/near threatened). Both species are described in detail below. There

Colchic Boxwood Buxus colchica

247. Colchic Boxwood is an evergreen tertiary-period relict plant species of genus Buxus growing in Europe. It is small-leaved and the most winter hardy of European boxwoods, found at elevations ranging from 1300-1800 meters (m) above sea level. It can tolerate winter temperatures up to -10°C and lives up to 600 years, growing very slowly. Under favorable conditions, it reaches heights of 15 m to 20 m.[34]

248. The main growing area of the species in Georgia is the Mtirala National Park (Kobuleti region, Adjara, Western Georgia)[35], located 4 km from the Project. The main threats that the species is facing in Georgia include climate change impacts, increasing temperatures, shrinking glaciers, rising sea levels, reduction, and redistribution of river flows, decreasing snowfall and an upward shift of the snowline.[36] In addition to these environmental changes pathogen attack is also an important factor in reducing its population.[37] Due to such threats the species has been listed as Near Threatened by the IUCN and Vulnerable in Georgia's Red List.

Common Walnut *Juglans regia*

249. The Common Walnut is the most widespread tree nut in the world. It is native to the old world.[38] Its range extends from Xinjiang province of western China, parts of Kazakhstan, Uzbekistan, and southern Kyrgyzstan, and from the mountains of Nepal, Tibet, northern India, and Pakistan west through Afghanistan, Turkmenistan, and Iran to portions of Azerbaijan, Armenia, Georgia, and eastern Turkey.[39] In Adjara it is rare and can be found near Zamleti and Shuakhevi Scheme.[40]

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[33] Sambo Engineering, March 10, 2016, Environmental Impact Assessment for Construction of Batumi Bypass Road Section for the Ministry of Regional Development and Infrastructure of Georgia Road Department

[34] Matsiakh I, 2016. Assessment of Forest Pests and Diseases in Native Boxwood Forests of Georgia. Forestry Department, Ukrainian National Forestry University (Lviv).

[35] Gorgiladze L, Meparishvili G, Sikharulidze Z, K.Natsarishvili, Davitadze R, 2011. First report of box blight caused by Cylindrocladium buxicola in Georgia. New Disease Reports 23, 24. [doi:10.5197/j.2044-0588.2011.023.024]

[36] Akhalkatsi M. 2015. Forest habitat restoration in Georgia, Caucasus ecoregion. Clean Up Georgia – Increasing Public Awareness and Involvement in Solid Waste Management Improvement (Phase II), 103 pp.

[37] Gorgiladze L, Meparishvili G, Sikharulidze Z, K.Natsarishvili, Davitadze R, 2011. First report of box blight caused by Cylindrocladium buxicola in Georgia. New Disease Reports 23, 24. [doi:10.5197/j.2044-0588.2011.023.024]

[38] Fernandez-Lopez J, Aleta N, Alıas R, 2000. Forest Genetic Resources Conservation of Juglans regia L. IPGRI Publishers, Rome

[39] McGranahan G and Leslie C, 2009. Breeding Walnuts (Juglans Regia)

[40] Adjaristsqali Hydropower Project, 2014. Environmental and Social Impact Assessment – Part 6

250. The Common Walnut is facing many threats across its range including fruit collection, livestock grazing and cutting.[41] Due to these threats its population is declining and as a result it has been listed as Near Threatened in the IUCN Red List and Vulnerable in Georgia Red List.

Invasive Plant Species

251. Alien invaders are plants that are of exotic origin and are invading previously pristine areas or ecological niches.[42] As exotic plant species have very limited natural "check" mechanisms within the natural environment, they are often the most opportunistic and aggressively-growing species within the ecosystem. Therefore, they are often the most dominant and noticeable within an area. Disturbances of the ground through trampling, excavations or landscaping often leads to the rapid dominance of exotic pioneer species. As a result Project-related activities which cause disturbance to vegetation can result in the growth and expansion of invasive plant species. Under natural conditions, these pioneer species are overtaken by sub-climax and climax species through natural veld succession. This process, however, takes many years to occur, with the natural vegetation never reaching the balanced, pristine species composition prior to the disturbance. There are many species of indigenous pioneer plants, but very few indigenous species can out-compete their more aggressively-growing exotic counterparts.[43]

252. Alien vegetation invasion results in degradation of the ecological integrity of an area, causing:[44]

- A decline in species diversity
- Local extinction of indigenous species
- Ecological imbalance
- Decreased productivity of grazing pastures
- Increased agricultural input costs

253. Some of the invasive species of Georgia include *Ailanthus altissima*, *Clerodendrum bungei*, *Miscanthus sinensinsis*, *Robinia pseudoacacia*, *Spiraea japonica* and *Vitex rotundifolia*. The species *Ailanthus altissima* and *Robinia pseudoacacia* have predicted potential distributions in Batumi.[45] Photographs of these species are shown in **Figure 5-25**.

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41 IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-4*. <http://www.iucnredlist.org>, Access on 21th October 2016.

42 Bromilow, C., 2001. *First Impression. Problem* Plants *of South Africa*. Briza Publications, Pretoria, RSA.

43 Zdanow, L., 2015. Vegetation Assessment as Part of the Environmental Assessment and Authorisation Process for Completion of the R45 Road Corridor Adjacent to Malmesbury, Western Cape Province. Scientific Aquatic Services. SAS, 1–52.

44 Ibid

45 Kikodze D, Memiadze N, Kharazishvili D, Manvelidze Z, Mu¨ller-Scha¨rer H, 2010. The alien flora of Georgia

Ailanthus altissima (Tree)

Robinia pseudoacacia (Tree)

Source: Kikodze D, Memiadze N, Kharazishvili D, Manvelidze Z, Mu¨ller-Scha¨rer H, 2010. The alien flora of Georgia.

Figure 5-25: Alien Invasive Species

Proximity of Mtirala National Park from Project

254. Mtirala National Park is located 4 km from the Project. It was established in 2006 with a total area of 15,806 hectares (ha). Situated high in the Caucasus Mountains, it was created with the purpose of preserving the Colchic forest ecosystems. Flora of the National Park is represented by Chestnut *Castanea* and Beech *Fagus* forests. At elevations ranging from 550 m to 1,000 m above sea level Chestnus trees are mixed with Beech, Caucasian Oak *Quercus macranthera*, Alder *Alnus barbata* and Lime trees *Tilia*. Mixed forest of Cholchic type spreads from 50 m to 600 m above sea level and consists of Beech, Hornbeam *Carpinus*, Chestnut and Alder. Sub-forest is covered with shrubbery of Pontic Rhododendron *Rhododendron ponticum*, Cherry Laurel *Laurocerasus officinalis,* Black Sea Holly *Ilex colchica,* Colchic Box Tree *Buxus colchica* and several kinds of Lianas. Endemic plant species of the park are *Alnus barbata*, *Epigaea gaultheroides*, *Primula megasaefolia*. Relict Species are *Buxus colchica*, *Betula medwedewii*, *Laurocerasus officinalis*, *Rhododendron ponticum*, *Ilex colchica*. Plant species ofn the Red List of Georgia present are *Epigaea gaultheroides*, *Primula megasaefolia*, *Betula medwedewii*.[46]

Mammals

255. Georgia has rich diversity of mammals with a total 95 reported species. Among these 68 are small mammals and 27 are large mammals. A total of 19 species of these are endemics and 15 have not had their conservation statuses evaluated. A total of seven species are Endangered and five are Vulnerable, based on the IUCN Red List, with 20 classified as being Least Concern. Large mammals were widely distributed up to the beginning of this century, for example the ranges of Asian leopard *Panthera pardus*, Lynx *Felis ly*nx, and Grey Wolf *Canis lupus* covered practically the whole country. The Striped Hyena *Hyaena hyaena* was common in all arid zones of the country.[47]

[46] Rec Caucasus, <http://www.rec-caucasus.org>, accessed October 21, 2016

[47] Chemonics International Inc, 2000, Biodiversity Assessment for Georgia: Task Order under the Biodiversity & Sustainable Forestry IQC (BIOFOR) for USAID Washington E&E Bureau, Environment & Natural Resources Division

256. The IBAT was used to find the species whose distribution overlaps with the Study Area as reported by the IUCN Red List Database. A list of these species is provided in **Table 5-21**, along with their IUCN status, information on habitat and threats.[48]

[48] IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-2*. <http://www.iucnredlist.org>. Downloaded on 13 October 2016.

Table 5-21: List of Mammal Species with Ranges Overlapping with the Study Area

Scientific Name	Common Name	IUCN Status	Habitat	Threats
Barbastella barbastellus	Western Barbastelle	Near Threatened	Forages in mature woodland and woodland edges In summer, roosting sites occur in mature woodlands and occasionally in older buildings. In winter the hibernation may start in trees, but later underground sites are preferred	Loss of old mature woodland and ancient trees with loose bark or wood crevices (reforested areas are not suitable for this species); disturbance and loss of underground habitats, disturbance and loss of roost sites in older buildings.
Lutra lutra	Eurasian Otter	Near Threatened	Lives in a wide variety of aquatic habitats, including highland and lowland lakes, rivers, streams, marshes, swamp forests and coastal areas independent of their size, origin or latitude	The aquatic habitats of otters are extremely vulnerable to man-made changes. Canalization of rivers, removal of bank side vegetation, dam construction, draining of wetlands, aquaculture activities and associated man-made impacts on aquatic systems are all unfavorable to otter populations
Miniopterus schreibersii	Schreiber's Bent-winged Bat	Near Threatened	Forages in a variety of open and semi-open natural and artificial habitats, including suburban areas It is a colonial species that roosts mostly in caves and mines (although it can also be found in man made tunnels, ruins and other buildings)	In the Caucasus, disturbance caused by tourism in caves is a problem
Myotis bechsteinii	Bechstein's Myotis	Near Threatened	Has specialized habitat requirements and is largely dependent on mature natural forests.	Threats include inappropriate management and development of woodland habitats, intensive agriculture (e.g., use of pesticides on farmland adjacent to woodland occupied by the species) and human disturbance of roost sites. The loss of old trees with hollows is a particular problem.

Scientific Name	Common Name	IUCN Status	Habitat	Threats
Nyctalus lasiopterus	Giant Noctule	Vulnerable	Forages over mixed and deciduous forest and wooded river valleys (the latter especially on migration). It is highly dependent on mature forest	Little is known about potential threats, but loss of mature woodland and loss of or disturbance to roost sites (old trees) have a negative impact on the species.
Rhinolophus euryale	Mediterranean Horseshoe Bat	Near Threatened	Forages in Mediterranean and sub-Mediterranean shrubland and woodland	Threats include loss of foraging habitat, and disturbance and loss of underground habitats. On a landscape scale, fragmentation
Rhinolophus mehelyi	Mehely's Horseshoe Bat	Vulnerable	Forages in Mediterranean shrubland and woodland, in dry steppes and particularly link to water bodies	Affected by disturbance and loss of underground habitats and adequate hunting grounds, changes in foraging habitats

257. A list of mammal species of conservation importance based on Georgia's Red List reported to be found in the Project area[49], three are of conservation importance based on the IUCN Red List include the Mehely's Horseshoe Bat *Rhinolophus mehely* listed as Vulnerable, Mediterranean Horseshoe Bat *Rhinolophus Euryale* listed as Near Threatened, and Common Otter *Lutra lutra*, also listed as Near Threatened. Details about these three mammal species are provided below.

Mehely's Horseshoe Bat *Rhinolophus mehelyi*

258. Mehely's Horseshoe Bat is an exclusive cave-dwelling bat species, preferring warm caves located below 700 m and in extensive karstic[50] areas. The species living in colonies, typically include up to 200 bats, but significantly larger colonies of over 5,000 bats have also been documented.[51,52] It is insectivorous, foraging in Mediterranean shrubland and woodland, in dry steppes and particularly linked to water bodies.[53]

259. A decline in the population of the Mehely's Horsehoe Bat has been recorded since the 1980s.[54] Fragmented distribution[55], loss of roosting sites, modification of feeding areas, as well as the high frequency and uncontrolled nature of cave tourism are the main causes for its decreasing population.[56] As a result the species has been has been listed as Vulnerable both in Georgia's Red List and the IUCN Red List. It is protected by national legislation in all European range states. There are also international legal obligations for its protection through the Bonn Convention (Eurobats) and Bern Convention where those apply. Its inclusion in the EU Habitats and Species Directive means this species is ear-marked for special conservation measures, and some of its roosts are already protected.[57]

Mediterranean Horseshoe Bat *Rhinolophus Euryale*

260. The Mediterranean Horseshoe Bat is social, gathering in colonies to roost.[58] Summer colonies are generally fairly small, usually containing up to a few hundred individuals, while winter colonies are often much larger, sometimes numbering over 2,000

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[49] Sambo Engineering, March 10, 2016, Environmental Impact Assessment for Construction of Batumi Bypass Road Section for the Ministry of Regional Development and Infrastructure of Georgia Road Department (EIA)

[50] Karstic is "an area of irregular limestone in which erosion has produced fissures, sinkholes, underground streams, and caverns."

[51] Dietz, C., von Helversen, O., Nill, D., 2009: Bats of Britain, Europe and Northwest Africa. AandC Black, London. 399 pp.

[52] Dumitrescu, M., Tanasachi J., Orghidan, T. 1963: Răspândirea chiropterelor în R.P. Română. Travaux d'Institut de Spéologie Émile Racovitza 34: 509-575.

[53] Salsamendi, E., Garin, I., Arostegui, I., Goiti, U., Aihartza J. 2012: What mechanism of niche segregation allows the coexistence of sympatric sibling rhinolophid bats? Frontiers in Zoology 9: 30

[54] Gazaryan S.V., Jamirzoev G.S. 2005. Results and Perspectives on the Study of Bats Fauna of Daghestan // In: Mammals of mountainous areas. Materials of International Conference (4-9 September, 2005). KMK, M.: 49-57. (in Russian)

[55] Dietz, C., von Helversen, O., Nill, D. 2009: Bats of Britain, Europe and Northwest Africa. AandC Black, London. 399 pp.

[56] IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-4*. <http://www.iucnredlist.org>, Access on 21th October 2016.

[57] Wildscreen Arkive < http://www.arkive.org/> accessed October 20, 2016

[58] Goiti U., Aihartza, J.R. and Garin, I. 2004. Diet and prey selection in the Mediterranean horseshoe bat*Rhinolophus euryale* (Chiroptera, *Rhinolophidae*) during the pre-breeding season. *Mammalia*: **68**(4): 397-402.

individuals. This species also forms large groups during the breeding season.[59] It is insectivorous, reported feeding close to vegetation.[60]

261. The threats faced by the Mediterranean Horseshoe Bat include loss of its foraging habitat and disturbance to its underground habitat.[61] Urbanization, tourism and intensive farming by humans further exacerbate the problem.[62] Due to this its population is decreasing in most of its range and as a result it has been declared by the IUCN as Near Threatened and Vulnerable in Georgia's Red List. The Mediterranean Horseshoe Bat and some of its roosts are protected in Europe by national legislation. It is included in the Bonn Convention and the Bern Convention, and it is also listed on Annex II and IV of the EU Habitats and Species Directive.[63]

Common Otter *Lutra lutra*

262. The Common Otter is adapted to life in aquatic conditions.[64] It lives in a wide variety of aquatic habitats, including highland and lowland lakes, rivers, streams, marshes, swamp forests and coastal areas independent of their size, origin or latitude.[65] The species is facing many threats throughout its range including man-made changes. Canalization of rivers, removal of bank side vegetation, dam construction, draining of wetlands, aquaculture activities and associated man-made impacts on aquatic systems are all unfavorable for otter populations.[66]

263. The Common Otter is rare in Adjara and in Georgia due to a low food supply and conflict with commercial fisheries. Due to such threats its population is decreasing throughout its range as well as in Georgia. It has been declared as Near Threatened by the IUCN and Vulnerable in Georgia Red List. It has been also included in the Appendix I of the CITES Species. The Eurasian Otter is strictly protected under international legislation and conventions.[67]

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59 IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-4*. <http://www.iucnredlist.org>, Access on 21th October 2016.

60 Goiti U., Aihartza, J.R. and Garin, I. 2004. Diet and prey selection in the Mediterranean horseshoe bat*Rhinolophus euryale* (Chiroptera, *Rhinolophidae*) during the pre-breeding season. *Mammalia*: **68**(4): 397-402.

61 IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-4*. <http://www.iucnredlist.org>, Access on 21th October 2016.

62 Russo, D., Jones, G. and Migliozzi, A. 2002. Habitat selection by the Mediterranean horseshoe bat,*Rhinolophus euryale* (Chiroptera: *Rhinolophidae*) in a rural area of southern Italy and implications for conservation. *Biological Conservation*, 107: 71-81.

63 Wildscreen Arkive < http://www.arkive.org/> accessed October 20, 2016

64 Roberts, T.J. 1997. The Mammals of Pakistan. Oxford University Press Karachi. 525 pp.

65 Mason, C.F. & Macdonald, S.M. 1986: Otters: Ecology and conservation. Cambridge. Cambridge University Press, 236p.

66 Ruiz-Olmo, J., Loy, A., Cianfrani, C., Yoxon, P., Yoxon, G., de Silva, P.K., Roos, A., Bisther, M., Hajkova, P. & Zemanova, B. 2008. *Lutra lutra*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>. Downloaded on October 15, 2016.

67 IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-2*. <http://www.iucnredlist.org>. Downloaded on 13 October 2016.

Birds

264. A total 360 bird species have been reported from Georgia.[68] There are a total of 31 Important Bird Areas (IBAs) in the country covering an area of 1,432,960 ha.[69] A map showing all IBAs is provided in **Figure 5-21**. There is lower level of endemism in birds as compared to other groups of wildlife due to their mobility in different seasons. Some 100 species are migratory and appear in the country on passage or during the winter. Many species are dependent on wetland habitats, which are under severe threat in Georgia.[70] Among birds of prey, the most threatened species is the Imperial eagle *Aquila heliaca*. Among vultures, the Black Vulture *Aegipius monachus* is the rarest. The Black Stork *Ciconia nigra* is noteworthy as a widespread but uncommon species.[71]

Important Bird Areas Closest to the Study Area

265. The IBA which overlaps with the Project includes that of Batumi. Located 3.75 km from the Project is the IBA of the Chorokhi Delta. The boundaries of both IBAs are shown in **Figure 5-26**.

[68] Chemonics International Inc, 2000, Biodiversity Assessment for Georgia: Task Order under the Biodiversity & Sustainable Forestry IQC (BIOFOR) for USAID Washington E&E Bureau, Environment & Natural Resources Division

[69] BirdLife International < http://www.birdlife.org/>, accessed October 15, 2016

[70] Chemonics International Inc, 2000, Biodiversity Assessment for Georgia: Task Order under the Biodiversity & Sustainable Forestry IQC (BIOFOR) for USAID Washington E&E Bureau, Environment & Natural Resources Division

[71] Shavgulidze, I. 2014. Stakeholder Participation in the NBSAP Revision Process: Georgia. <https://www.iucn.org/sites/dev/files/import/downloads/georgia.pdf>, accessed October 21, 2016

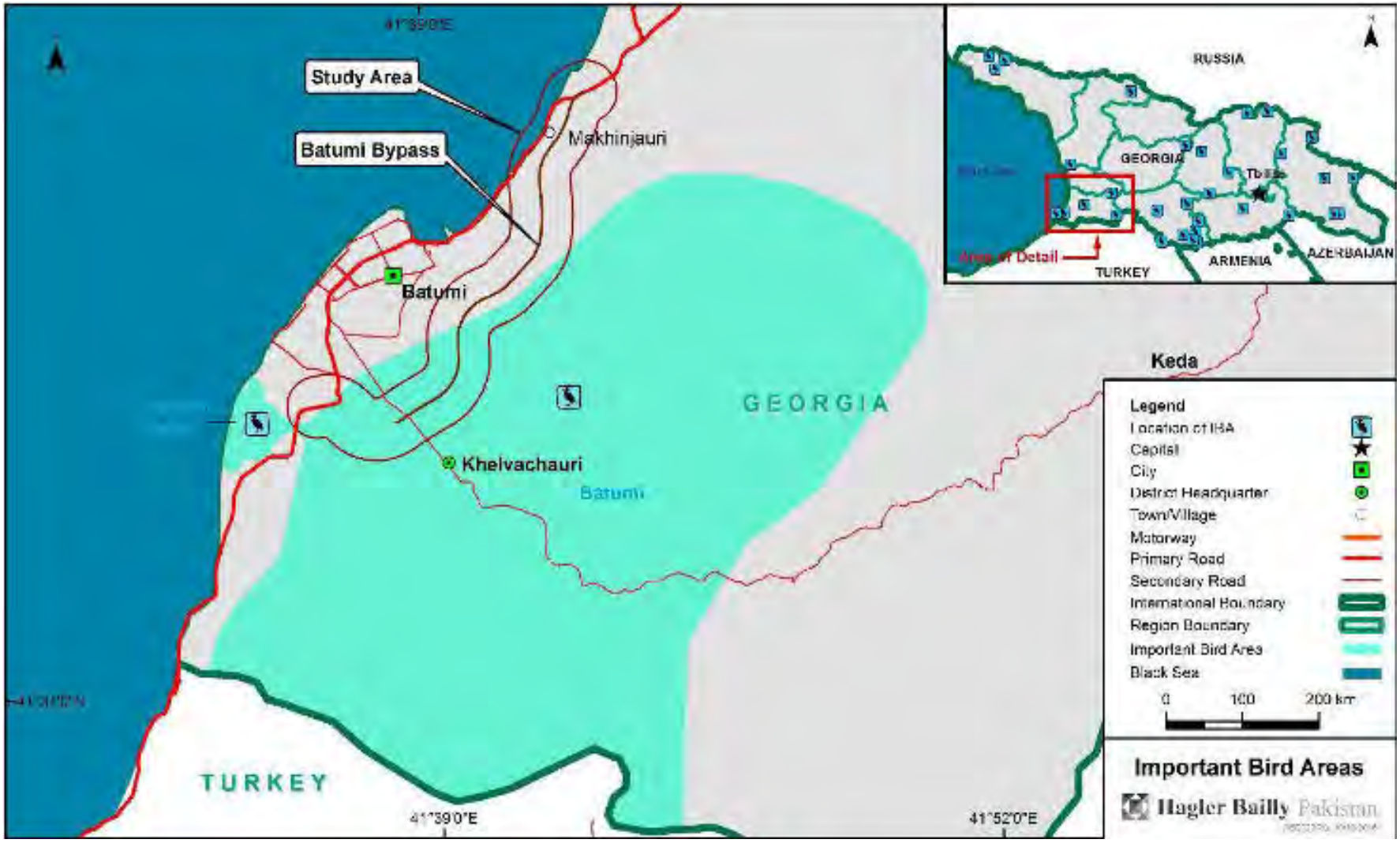

Figure 5-26: Important Bird Areas

266. The IBA of Batumi covers about 38% of the Study Area. It has a high abundance of soaring birds and cranes, especially in the passage season. In 2003 an estimated 74,625 individuals of these type of birds were observed in the IBA during this season.[72] The Eastern Black Sea Flyway is also located over Batumi[73] making this an important IBA for migratory bird species.

267. The IBA of Chorokhi Delta is important for certain species of conservation importance, based on the IUCN Red List, including Yelkouan Shearwater *Puffinus yelkouan* (Vulnerable), Sociable Lapwing *Vanellus gregarius* (Critically Endangered), and Black-winged Pratincole *Glareola nordmanni* (Near Threatened).

268. Wetlands International reported survey results[74] for wintering waterbirds and migratory waterbirds in the Chorokhi Delta. Three species of conservation importance were observed amongst the wintering water birds, the Yelkouan Shearwater, Dalmatian Pelican and the Common Pochard, all listed as Vulnerable.

Raptor Migration

269. Raptor migration takes place during the autumn season (Late August to November) every year. These birds of prey make their way from the Russian forests and plains to their warmer African wintering grounds. Part of the migration route is along the shores of the Black and Caspian Sea with Batumi being one of the most visually impressive areas where there is a 10 km wide corridor in which over a million raptors are recorded annually. A total of 36 species of raptors have been recorded with numbers regularly reaching 100,000. Late August is the time when almost the entire eastern population of Honey Buzzards and loose flocks of harriers pass through this corridor. In mid-September eagles start to migrate and towards the end of September Steppe Buzzards build up.[75]

270. Hunting is a serious concern during the passage season. On average 13,000 harriers, Honey Buzzards and eagles are killed annually. This is illegal in Georgia but law enforcement has been limited. The coastal wetlands near Batumi are frequented by hunters who often kill indiscriminately, targeting species of conservation importance including the Sociable Lapwing, Great Snipe, Baillon's Crake and Purple Swamphen.[76]

271. Batumi Raptor Count (BRC) is a nature conservation NGO that works to protect and monitor the migratory birds of prey that travel during the autumn season.[77] The highest number of raptor species of conservation importance were observed in 2015. The species listed as Endangered that were observed include the Steppe Eagle, Egyptian Vulture and Saker Falcon. During all three years at least two species listed as Endangered were observed. The results highlight the importance of the Eastern Black Sea Flyway passing over Batumi, as a very important route for migratory species of conservation importance.

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72 BirdLife International <http://www.birdlife.org>, accessed October 21, 2016

73 Maanen E, EcoNatura, Raptor migration and bird conservation challenge along the eastern Black Sea coast <http://www.econatura.nl>, accessed October 21, 2016

74 Wetlands International < https://www.wetlands.org/>, accessed October 21, 2016

75 Verhelst, B., April 2016, Preserving the Batumi bottleneck, BirdLife International, Europe and Central Asia

76 Ibid

77 Batumi Raptor Count, http://www.batumiraptorcount.org/, accessed October 27, 2016

272. The IBAT was used to find the species whose distribution overlaps with the Study Area as reported by the IUCN Red List Database. A list of these species is provided in **Table 5-22**, along with information on their IUCN status, habitat and threats.[78]

Table 5-22: List of Birds Species with Ranges Overlapping with Study Area

Scientific Name	Common Name	IUCN Status	Habitat	Threats
Aquila heliaca	Imperial Eagle	Vulnerable	In the Caucasus, it occurs in steppe, lowland and riverine forests and semi-deserts.	Breeding sites are threatened primarily by intensive forestry in the mountains, and by the shortage of large indigenous trees in the lowlands
Aythya nyroca	Ferruginous Duck	Near Threatened	Strong preference for fresh standing water and is very rarely found on flowing streams or rivers	Threatened by the degradation and destruction of well-vegetated shallow pools and other wetland habitats
Coracias garrulus	European Roller	Least Concern	Prefers lowland open countryside with patches of oak *Quercus* forest, mature pine *Pinus* woodland with heathery clearings, orchards, mixed farmland, river valleys, and plains with scattered thorny or leafy trees.	Persecution on migration in some Mediterranean countries and hundreds, perhaps thousands, are shot
Falco cherrug	Saker Falcon	**Endangered**	Open grassy landscapes such as desert edge, semi-desert, steppes and arid montane areas	Suffered mainly from the loss and degradation of steppes and dry grasslands through agricultural intensification, plantation establishment and declines in

[78] IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-2*. <http://www.iucnredlist.org>. Downloaded on 13 October 2016.

Scientific Name	Common Name	IUCN Status	Habitat	Threats
				sheep pastoralism, causing a decline in key prey species
Ficedula semitorquata	Semi-collared Flycatcher	Least Concern	Favors forest belts, mainly on mountain slopes up to about 2,000 m altitude, occupied by mature deciduous trees (notably oak *Quercus* and hornbeam *Carpinus*) as well as temperate riverine and swamp forests	Suffers from habitat destruction in some areas, which is likely to be responsible for recent declines.
Gypaetus barbatus	Bearded Vulture	Near Threatened	Nests are located on remote overhung cliff ledges or in caves and will be re-used over the years.	The main causes of on-going declines appear to be non-target poisoning, direct persecution, habitat degradation, disturbance of breeding birds, inadequate food availability
Lyrurus mlokosiewiczi	Caucasian Grouse	Near Threatened	Found in subalpine and alpine meadows, on north-facing slopes with *Rhododendron*and juniper *Juniperus*, and on the edge of birch forest in spring and winter, at elevations of 1,300-3,000 m	Ongoing road building for the construction of holiday homes in the mountains is currently the major threat and is likely to significantly increase the rate of decline by fragmenting habitat, causing disturbance and allowing increased access for hunters and herdsmen

Scientific Name	Common Name	IUCN Status	Habitat	Threats
Melanitta fusca	Velvet Scoter	Vulnerable	The species breeds on wooded coastlines, small freshwater lakes, pools and rivers especially where there are boulder-covered or small rocky islands available for nesting with extensive herbaceous vegetation, shrubs and low trees	Moulting and wintering concentrations of this species are very susceptible to oil spills and other marine pollutants
Neophron percnopterus	Egyptian Vulture	**Endangered**	Typically nests on ledges or in caves on cliffs, crags and rocky outcrops, but occasionally also in large trees, buildings (mainly in India), electricity pylons and exceptionally on the ground. Forages in lowland and montane regions over open, often arid country.	Disturbance, lead poisoning (from gun shot), direct poisoning, electrocution (by powerlines), collisions with wind turbines, reduced food availability and habitat change
Pelecanus crispus	Dalmatian Pelican	Vulnerable	Occurs mainly at inland, freshwater wetlands but also at coastal lagoons, river deltas and estuaries	Continuing threats include disturbance from tourists and fishers, wetland alteration and destruction, water pollution
Puffinus yelkouan	Yelkouan Shearwater	Vulnerable	Breeds on rocky coastal and offshore islets, and on the mainland.	The most serious threat to the species is mortality from incidental fishing bycatch, followed by predation by invasive predators (predominantly rats *Rattus rattus* and to a lesser extent, feral cats *Felis catus*).

273. Of the bird species of conservation importance based on Georgia's Red List reported to be found in the Project area[79], there are a total of eight species of conservation importance based on the IUCN Red List. In addition to this 19 species are migratory and congregatory. The species of conservation importance based on the IUCN Red List, reported to be present in the Project area, are described in detail below.

Dalmatian Pelican *Pelecanus crispus*

274. The Dalmatian Pelican *Pelecanus crispus* is a huge, whitish water bird, having silvery-white breeding plumage, yellow to purple bare skin around the eyes, orange-red gular pouch at onset of breeding becoming yellow later, pale grey under-wing becoming darker at wing-tips, and bushy crest on nape.[80]

275. The species mainly inhabits inland, freshwater wetlands but also coastal lagoons, river deltas and estuaries.[81] It breeds on small islands in freshwater lakes or in dense aquatic vegetation.[82] Nest sites are found in areas with plentiful fish and vegetation, and nests are constructed from reeds, grass, and sticks, fastened together with droppings.

276. Declines in the past have been due to wetland drainage, shooting, and persecution by fishermen who believe that the Dalmatian Pelican competes with them for food. Currently, habitat degradation from wetland alteration and water pollution are serious threats.[83]

277. The Dalmatian Pelican is classified as Vulnerable by the IUCN[84] and Endangered in the Georgia's Red List. The species has been listed in Appendix I of CITES.[85]. It is also listed on Appendices I and II of the Convention on Migratory Species (CMS or Bonn Convention)[86] and in Annex I of the European Commission (EC) Birds Directive.[87]

White-winged Scoter *Melanitta fusca*

278. The White-Winged Scoter *Melanitta fusca* is the largest scoter. It is distinguished from other scoters by the all-white patch (speculum) on the secondary feathers of its wings. Adult males are entirely blackish with a small white, teardrop-shaped patch around its eye. Its orange bill has a black hump at the base and is somewhat wedge-shaped. Females and juveniles of both sexes are dark brownish with paler bellies, having a dark

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79 Sambo Engineering, March 10, 2016, Environmental Impact Assessment for Construction of Batumi Bypass Road Section for the Ministry of Regional Development and Infrastructure of Georgia Road Department

80 Birdlife International, < http://www.birdlife.org/>, accessed October 18, 2016

81 BirdLife International, 2016. Species factsheet: *Pelecanus crispus*. Downloaded from http://www.birdlife.org on 24/10/2016.

82 del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. *Handbook of the Birds of the World, vol. 1: Ostrich to Ducks*. Lynx Edicions, Barcelona, Spain.

83 BirdLife International 2016. Species factsheet: *Pelecanus crispus*. Downloaded from http://www.birdlife.org on 24/10/2016.

84 IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-4*. <http://www.iucnredlist.org>, accessed October 20, 2016.

85 UNEP-WCMC. SPECIES+ CITES database. < http://www.speciesplus.net/species > accessed October 20, 2016

86 Global Register of Migratory Species (March, 2008). Summarizing Knowledge about Migratory Species for Conservation. <http://www.groms.de/>, accessed on October 21, 2016.

87 EC Birds Directive (April, 2005). Directive 2009/147/EC on the conservation of wild birds <http://www.jncc.gov.uk/page-1373>, accessed October 21, 2016

bill and variable amounts of white on their head that can appear as spots.[88] The species breeds in most European countries. An estimated 1,500 birds winter in the Black Sea and Caucasus, and there are thought to be breeding populations in Georgia as well.[89] In spring, scoters move from the saltwater habitats where they wintered (usually bays and inlets) to inland freshwater habitat, using estuaries and open coast habitats, then large lakes and rivers when moving inland to breeding areas.[90]

279. The main threats to the White-winged Scoter in the Europe are identified as loss of breeding and wintering habitat, drowning in fishing nets, pollution – especially oil spills, and human disturbance.[91] Due to these threats and decreasing populations the species has been listed as Vulnerable by IUCN and Endangered in Georgia's Red List. The species has also been listed in Annex II of the EC Birds Directive.[92]

Imperial Eagle *Aquila heliaca*

280. Imperial Eagles *Aquila heliaca* are stocky in shape with black-brown feathers and a pale golden crown and nape. The shoulders have prominent white patches and the tail is greyish-brown.[93] The Imperial Eagle is a large generalist predator.[94]

281. During the year 1996 there were 10-12 breeding pairs in East Georgia, while the western parts of the country were not inhabited by this species.[95] The current size of the Georgian population is estimated around 15 breeding pairs, most of them located in a relatively small area on the Iori River plain.[96]

282. Globally the population is decreasing primarily as a result of habitat loss and degradation, adult mortality through persecution and collision with power lines, nest robbing and prey depletion.[97] Due to such decreasing population the species has been listed as Vulnerable both in the IUCN Red List and Georgia's Red List.

283. The species has been listed in CITES Appendix I and II. It is also listed in Appendices I and II of the Convention on Migratory Species (CMS or Bonn Convention). It is legally protected in many countries including Georgia.[98]

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88 Sea Duck Information Series, 2003. White-winged Scoter (Melanitta fusca) <http://seaduckjv.org/>, accessed October 21, 2016

89 IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-4*. <http://www.iucnredlist.org>, Access on October 21, 2016.

90 Sea Duck Information Series, 2003. White-winged Scoter (Melanitta fusca) <http://seaduckjv.org/>, accessed October 21, 2016

91 Kirby J, Linsley M, Vessem J, Hagemeijer, W, 2009, Management Plan for Velvet Scoters (Melanitta fusca). Directive 79/409/EEC on the conservation of wild birds. 2007-2009

92 Ibid

93 Wild Screen Arkive <http://www.arkive.org/> accessed on October 21, 2016

94 Snow, D.W. & Perrins, C.M. 1998: The Birds of the Western Palearctic. Concise Edition. Vol. 1. – Oxford University Press, Oxford.

95 Abuladze, A. (1996): Ecology of the Imperial Eagle Aquila heliaca in Georgia. In: Meyburg, B. U. & Chancellor, R. D. (eds.) 1996: Eagle Studies. World Working Group on Birds of Prey (WWGBP), Berlin, London & Paris, p. 447–457.

96 Horváth, M., Haraszthy, L., Bagyura, J. & Kovács, A. 2002: Eastern Imperial Eagle (*Aquila heliaca*) populations in Europe. Aquila 107-108, p. 193- 204.

97 BirdLife International. 2010: Species factsheet: *Aquila heliaca*. – On-line database, accessed October 18, 2016

98 Birdlife International, < http://www.birdlife.org/>, accessed October 18, 2016

Greater Spotted Eagle Aquila clanga

284. The Greater Spotted Eagle *Aquila clanga* is a medium-sized dark eagle. Adults are dark brown with slightly paler flight feathers. Under-wing cover is generally darker than flight feathers. Bands of white spots across upper wing of juveniles are prominent.[99] During the breeding season, the greater spotted eagle is found in lowland forests near wetlands, where it nests in tall trees and hunts over swamps and wet meadows.[100] During the migration seasons and in winter, it visits deserts, shrub land, wetlands, and mangroves, congregating around shallow water and perching on low bushes and small trees.[101] The species habitat is destroyed as a result of wetland drainage, deforestation, urbanization and agricultural intensification as well as abandonment of traditional methods of floodplain management.[102]

285. The species has been listed as Vulnerable both by IUCN and in Georgia's Red List. The species is protected under various international agreements (EC Birds Directive Annex I, Annexes II of Bern, Bonn and Washington conventions).[103] However, it is not protected in Georgia.

Egyptian Vulture *Neophron percnopterus*

286. This is a small vulture with long, pointed wings, a small and pointed head, and a wedge shaped tail.[104] The Egyptian Vulture is rapidly declining in large parts of its range. The native breeding range extends over Georgia.[105] The European population is estimated to be 3,300-5,050 breeding pairs, equating to 9,900-15,150 individuals which makes up 25-49% of the global range.[106] This population has declined by more than 50% over the last three generations, consistent with a worldwide decline in the species population.[107]

287. The Egyptian Vulture typically nests on ledges or in caves on cliffs, crags and rocky outcrops, but occasionally also in large trees. It forages in lowland and montane regions over open, often arid, country. It also scavenges at human settlements.[108] Disturbance, lead poisoning (from gun-shot), direct poisoning, electrocution (by powerlines), collisions with wind turbines, reduced food availability and habitat change are currently impacting upon European populations.[109]

Black Vulture *Aegypius monachus*

288. The Black Vulture *Aegypius monachus* is a large, dark brown bird. It has broad wings which have a serrated appearance to their trailing edges, owing to the pointed tips

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[99] ibid

[100] BirdLife International, < http://www.birdlife.org/>, accessed October 21, 2016

[101] BirdLife International, 2001. *Threatened Birds of Asia: the BirdLife International Red Data Book*. BirdLife International, Cambridge, UK.

[102] Wild Screen Arkive <http://www.arkive.org/> accessed on October 21, 2016

[103] Ibid

[104] IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-4*. <http://www.iucnredlist.org>, Access on October 21, 2016.

[105] Birdlife International, < http://www.birdlife.org/>, accessed October 18, 2016

[106] Ibid

[107] Ibid

[108] Ibid

[109] Ibid

of the secondary feathers.[110] In flight, the tips of the wings show seven deeply splayed 'fingers'[111], and this species has a short, slightly wedge-shaped tail.[112] It occurs in scrub, arid and semi-arid alpine steppe and open grassland, as well as in forest. It can be found at elevations of around 300 m to 1,400 m in Europe, and up to 4,500 m in Asia.[113] The total number in Georgia is estimated to be 17-19 pairs.[114]

289. The Black Vulture is currently facing two main threats, direct human-caused mortality and reduced food availability. Habitat loss may also present a threat to this bird. The use of poisoned baits for predator extermination, as well as shooting and the destruction of nests, all contribute to human-associated deaths.[115]

290. The threats and decreasing population has resulted in this species being declared as Near Threatened by IUCN and Endangered by Georgia's Red List. It is also included in Annex I of the EU Wild Birds Directive and in Appendix II of the Bern, Bonn and CITES Conventions.[116]

Saker Falcon *Falco cherrug*

291. The Saker Falcon *Falco cherrug* is a large, powerful bird of prey with an exceptionally broad wingspan for its size.[117] Like other falcons this species is equipped with sharp, curved talons for grasping prey, while the strong, hooked beak is used to tear its victim's flesh.[118] The Saker Falcon prefers open terrain for hunting, such as forest steppe, desert steppe and arid montane areas.[119]

292. In Georgia it is widespread and a regular passage visitor across the country, but very rare (in Western Georgia, i.e. in the Black Sea basin) to rare (in Eastern Georgia, i.e. in the Caspian Sea basin), passage migrant and irregular (occasional) winter visitor to Georgia. The data on this species in Georgia is quite fragmentary and on biological features is absent totally.[120]

293. In Europe, this species has suffered mainly from the loss and degradation of steppes and dry grasslands through agricultural intensification, plantation establishment and declines in sheep pastoralism, causing a decline in key prey species; off take for

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[110] Clark, S. 1999. A Field Guide to the Raptors of Europe, The Middle East and North America. Oxford University Press, Oxford.

[111] World Association of Zoos and Aquariums - Cinereous vulture < http://www.waza.org/en/site/home>, accessed October 20, 2016

[112] del Hoyo, J., Elliott, A. and Sargatal, J. 1994. *Handbook of the Birds of the World. Volume 2: New World Vultures to Guineafowl*. Lynx Edicions, Barcelona.

[113] ibid

[114] Abuladze, A. 1994. Birds of prey in Georgia in the 20th century. In: Meyburg, B. -U. and Chancellor, R. D. (eds.) Raptor Conservation Today. WWGBP/Pica Press.

[115] Wild Screen Arkive <http://www.arkive.org/> accessed on October 21, 2016

[116] BirdLife International, 1996. Action plan for the Cinereous Vulture (*Aegypius monachus*) in Europe on behalf of the European Commission.

[117] Blue Planet Biomes, <http://www.blueplanetbiomes.org/> accessed October 21, 2016

[118] Animal Diversity Web. *Falco Cherrug* Saker Falcon, <http://animaldiversity.org/> accessed October 21, 2016

[119] BirdLife International (2016) Species factsheet: *Falco cherrug*. Downloaded from http://www.birdlife.orgon 24/10/2016.

[120] Abuladze, A. 2013. Birds of Prey of Georgia , Lasha Khvichia, ISBN 978-9941-0-5397-9

falconry is a serious problem, which has caused local extinctions.[121] Due to such threats and decreasing populations the species has been listed as Endangered by the IUCN and Critically Endangered in Georgia's Red List. The Saker Falcon is protected across much of its range, particularly in Eastern Europe, where controls of illegal trade were implemented in various countries in the 1990s. There have been concerted conservation efforts in Europe.[122] The species is listed on Appendix II of the CITES, and in 2002 CITES imposed a trade ban on the United Arab Emirates.[123]

Red-footed Falcon *Falco vespertinus*

294. The Red-footed Falcon *Falco vespertinus* is a small, slender bird of prey.[124] Males have mostly slate-grey plumage. Its legs are red, as are the eye-rings and a patch at the base of its bill. The larger females have blue-grey upper parts and tail patterned with black bands, with rusty orange or yellowish plumage on the under parts. The pale head bears a rust-colored crown, a blackish eye patch and slight moustache.[125]

295. The global population is estimated to number 300,000-800,000 individuals, with 26,000-39,000 pairs in Europe.[126] In Georgia 10-50 breeding pairs are present where the species is an occasional, irregular migratory breeder in small numbers (10-50) breeding pairs.

296. In the Eurasian breeding range, the Red-footed Falcon inhabits open habitats with some tree cover. This includes steppe, wooded steppe, cultivation and pastures, normally in lowland, although up to 1,500 m in Asia.[127]

297. The Red footed Falcon is facing a number of threats across it distribution range, including the destruction of suitable nest sites and the widespread use of pesticides which affects the falcon's food supply.[128]

298. Due to a decreasing population the species has been listed as Near Threatened by IUCN and Endangered in Georgia's Red List. The species has also been added to Annex I of EC Birds Directive and on Appendix II of CITES.

Herpetofauna (Reptiles and Amphibians)

299. The herpetofauna of Georgia is represented by 66 species, including 53 species of reptiles and 13 species of amphibians. Reptile species occur throughout Georgia, consisting of 3 species of tortoises, 27 lizards and 23 snakes. A total of six reptiles are included in the Georgia's Red List. Seven reptiles having the largest parts of their ranges in Georgia are Vulnerable. The ranges of *Vipera lebetina*, *Eumeces schneider* and *Eryx*

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[121] Baumgart, W. 1994. Saker Falco cherrug. In: Tucker, G.M.; Heath, M.F. (ed.), *Birds in Europe: their conservation status*, pp. 198-199. BirdLife International (Conservation Series 3), Cambridge, UK.

[122] BirdLife International <http://www.birdlife.org/>, accessed October 21, 2016

[123] UNEP-WCMC. SPECIES+ CITES database. < http://www.speciesplus.net/species > accessed October 20, 2016

[124] Clark, W.S. 1999. A Field Guide to the Raptors of Europe, the Middle East and North Africa. Oxford University Press, Oxford.

[125] del Hoyo, J., Elliott, A. and Sargatal, J. 1994. *Handbook of the Birds of the World. Vol. 2: New World Vultures to Guineafowl*. Lynx Edicions, Barcelona.

[126] Birdlife International, < http://www.birdlife.org/>, accessed October 18, 2016

[127] del Hoyo, J., Elliott, A. and Sargatal, J. 1994. *Handbook of the Birds of the World. Vol. 2: New World Vultures to Guineafowl*. Lynx Edicions, Barcelona.

[128] BirdLife International, <http://www.birdlife.org/> accessed on October 21, 2016

jaculus have been declining for the past 10 years.[129] Amphibians are represented by four species of newts and nine species of frogs and toads. One species, Caucasian Salamander *Mertensiella caucasica* is endemic to Georgia and Turkey.[130] Among the vertebrate groups, reptiles probably contain the highest proportion of endemic species to the Caucasus - out of 53 reptile species found in the Caucasus, 12 are considered endemic to the region.[131]

300. The IBAT was used to find the species whose distribution overlaps with the Study Area as reported by the IUCN Red List Database. A list of these species is provided in **Table 5-23**, along with information on their IUCN status, habitat and ecology.[132]

Table 5-23: List of Herpetofauna Species with Ranges Overlapping with Study Area

Amphibians	Common Name	IUCN Status	Habitat	Threats
Bufo verrucosissimus	Caucasian Toad	Near Threatened	Mountain coniferous, mixed and deciduous forests upwards to the sub alpine belt.	Destruction of forests and drainage of wetlands by people might result in population declines of this hygrophilous forest species.
Mertensiella caucasica	Caucasian Salamander	Vulnerable	It is a habitat specialist, found mainly in beech (*Fagus orientalis*), coniferous (*Abies nordmanniana* and *Pic ea orientalis*), box forest (Buxus sp.),	Habitat destruction is a major threat across the species range. In Georgia, the destruction of forests (tree felling), use of brooks as roads for the transportation of cut trees, and destruction of habitats by cattle
Ommatotriton ophryticus	Northern Banded Newt	Near Threatened	Found in coniferous, mixed and deciduous forests (composed of birch, oaks, eastern hornbeams, alders, chestnuts, beach and rhododendrons) up to subalpine meadows	This species is sensitive to habitat loss.

[129] Chemonics International Inc, 2000, Biodiversity Assessment for Georgia: Task Order under the Biodiversity & Sustainable Forestry IQC (BIOFOR) for USAID Washington E&E Bureau, Environment & Natural Resources Division

[130] Chemonics International Inc, 2000, Biodiversity Assessment for Georgia: Task Order under the Biodiversity & Sustainable Forestry IQC (BIOFOR) for USAID Washington E&E Bureau, Environment & Natural Resources Division

[131] Shavgulidze, I. (2014) Stakeholder Participation in the NBSAP Revision Process: Georgia, <https://www.iucn.org/>, accessed October 21, 2016

[132] IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-2*. <http://www.iucnredlist.org>. Downloaded on 13 October 2016.

Amphibians	Common Name	IUCN Status	Habitat	Threats
Pelodytes caucasicus	Caucasian Parsley Frog	Near Threatened	Associated with broad leaved, mixed coniferous deciduous and, rarely, coniferous mountain forests. It generally occurs in dense vegetation (bushes and grasses). Aquatic habitats of the species include the shores and banks of ponds and streams with clear and cold flowing water, and still waters.	A general loss and pollution of habitats (including through pesticides, mineral fertilizers, and cattle),
Pseudepidalea variabilis	Varying Toad	Data Deficient	Grassland, meadows and steppe habitats, forests and shrubland, and a range of wetland areas or waterbodies.	The loss (for instance through agricultural expansion) or degradation (pollution) of wetland breeding habitats.
Reptiles				
Darevskia derjugini	Derjugin's Lizard	Near Threatened	Typically associated with damp areas in forested montane habitats	Ongoing habitat loss through deforestation is considered to be a major threat
Natrix megalocephala	Large-headed Water Snake	Vulnerable	Associated with Colchis type forests with an evergreen underwood.	Predation from the introduced North American Raccoon Procyon lotor; competition with raccoons for prey (fishes); and habitat loss, most especially because of development along the Black Sea coastline (including tourism).
Vipera kaznakovi	Caucasian Viper	Endangered	Inhabits the forested slopes of mountains, the beds of wet ravines and post-forested clearings.	Threatened by illegal overcollection for the international pet trade (Baran and Atatur, 1998). Additional threats include habitat conversion for urban development, tourism and agriculture
Lymnaea bakowskyana	None	Data Deficient	The habitat preferences of this species are not known.	Unknown if this species is affected by any major threat processes.

Amphibians	Common Name	IUCN Status	Habitat	Threats
Paladilhiopsis schakuranica	None	Data Deficient	This species is known from caves	It is unknown whether this species is being impacted on by any major threat processes.

301. There are two herpetofauna species of conservation importance reported to be present in the Project area, based on Georgia's Red List.[133] Both species are of conservation importance based on the IUCN Red List as well; the Caucasian Viper *Vipera kaznakovi* is listed as Critically Endangered and the Caucasian Salamander *Mertensiella caucasica* is listed as Vulnerable. They are described in more detail below.

Caucasian Viper *Vipera kaznakovi*

302. The Caucasian Viper is endemic to the Caucasus (endemism status above refers to Georgia) and is listed as Endangered in the IUCN Red List due to its Area of Occupancy[134] being less than 500 km^2.[135] It inhabits the forested slopes of mountains, in the bottoms of humid canyons, in post-forested clearings and meadows.[136] The Study Area covers approximately 0.2% of its range.

303. The Caucasian Viper is terrestrial and found in a range of forest habitats, both in ravines and on mountain sides. These habitats include mixed subtropical forests with evergreen underwood, coniferous forest, chestnut and cherry groves, and beech and willow woods. It may also be found in disturbed habitats including areas of cleared forest and tea cultivation.[137] It is known to occur on or near the Black Sea Coast, including the western half of the Adjaristsqali basin Discrete Management Unit.[138] However, confirmed records are only from the coastal part of Adjara (near Poti, Batumi and Charnali Gorge), Kintrishi Nature Reserve and Mtirala National Park. The estimated number of Caucasus viper in Georgia is just above 3,000 individuals.[139]

304. The species is threatened by illegal international pet trade, habitat loss to urbanization, agriculture, dam construction especially in Georgia, and increased tourism-

[133] Sambo Engineering, March 10, 2016, Environmental Impact Assessment for Construction of Batumi Bypass Road Section for the Ministry of Regional Development and Infrastructure of Georgia Road Department

[134] Area of occupancy is defined as the area within its 'extent of occurrence' which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may, for example, contain unsuitable habitats. The area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon (e.g. colonial nesting sites, feeding sites for migratory taxa).

[135] Tuniyev B., G. Nilson, A. Agasyan, N. Orlov, S. Tuniyev. 2009. Vipera kaznakovi. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. . Accessed: 19 June 2013.

[136] Mallow D., D. Ludwig, G. Nilson. 2003. True Vipers: Natural History and Toxinology of Old World Vipers. Malabar, Florida, Krieger Publishing Company, 410 p.

[137] IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-4*. <http://www.iucnredlist.org>, Access on October 21, 2016.

[138] Tuniyev, B., Nilson, G., Agasyan, A., Orlov, N., Tuniyev, S. 2009. Vipera kaznakovi. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. . Downloaded on 01 June 2013.

[139] Tuniyev, B., Tuniyev, S. 2009. Conservation strategy for endemic species of Caucasin vipers (Pelias kaznakovi, Pelias dinniki). In: Zazanashvili, N. and Mallon, D. (Eds). Status and protection of globally threatened species in the Caucasus. CEPF, WWF, Tbilisi.

based development on the coast of the Black Sea.[140] Due to such threats it has been also listed as Endangered in Georgia's Red List. The Caucasian Viper is subject to state and regional level legal protection.[141]

Caucasian Salamander *Mertensiella caucasica*

305. The Caucasian Salamander *Mertensiella caucasica* is a habitat specialist, found mainly in beech (*Fagus orientalis*), coniferous (*Abies nordmanniana* and *Picea orientalis*), box forest (Buxus sp.), in Mediterranean shrub forest, mixed forests, the subalpine belt and in alpine meadows.[142]

306. The species distribution is severely fragmented and confined to small streams free of fish, and there is a continuing decline in the extent and quality of its habitat in Turkey and Georgia. The current distribution includes the north-east part of Anatolia in Turkey and south-west Georgia including Adjara.[143] In Adjara, the Caucasian Salamander has been recorded in 19 sites, including Mtirala National Park, Kintrishi Nature Reserve and Machakhela National Park.[144,145] The Study area covers approximately 0.1% of its range.

307. The Caucasian Salamander faces many threats across its distribution. In Georgia, the destruction of forests (tree felling), use of brooks as roads for the transportation of cut trees, and destruction of habitats by cattle are known causes of population declines.[146] Due to decreasing numbers the species has been listed as Vulnerable both in the IUCN Red List and Georgia's Red list.[147] Its range includes the town of Batumi where the specimens have light, earthworm-like coloration and their spots are reduced.[148]

Invertebrates

308. Georgia has rich diversity of invertebrate fauna. Over 11,100 invertebrate species have been recorded across the country but still information is somewhat patchy. Some groups have been very well studied, while other groups are almost totally lacking in information. The most diverse group is represented by arthropods having 9,150 species (over 8,230 insect species). Groups including many of the parasitic worms and flukes have been well studied, as have earthworms and some of the key insect groups such as

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[140] ibid

[141] Khanna, D.R. and Yadav, P.R. 2004. *Biology of Reptiles.* Discovery Publishing House, New Delhi. Ananjeva, N.B., Orlov, N.L., Khalikov, R.G., Darevsky, I.S., Ryabov, S.A. and Barabanov, A. 2006. *The Reptiles of Northern Eurasia: Taxonomic Diversity, Distribution, Conservation Status*. Pensoft Publishers, Sofia.

[142] IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-4*. <http://www.iucnredlist.org>, Access on October 21, 2016.

[143] Kaya, U., Tuniyev, B., Ananjeva, N., Orlov, N., Papenfuss, T., Kuzmin, S., Tarkhnishvili, D., Tuniyev, S., Sparreboom, M., Ugurtas, I. & Anderson, S. 2009. *Mertensiella caucasica*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2

[144] Tarkhnishvili, D. Kaya, U. 2009. Status and conservation of the Caucasian salamander (Mertensiella caucasica). In: Zazanashvili, N. and Mallon, D. (Eds). Status and protection of globally threatened species in the Caucasus. CEPF, WWF, Tbilisi

[145] Manvelidze, Z. 2012. Expansion and improved management effectiveness of Adjara's protected areas. Association for Nature Protection and Sustainable Development Use 'Mta Bari'. Batumi.

[146] IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-4*. <http://www.iucnredlist.org>, Access on October 21, 2016.

[147] ibid

[148] AmphibiaWeb, 2016. Mertensiella caucasica *Caucasian Salamander* <http://amphibiaweb.org/> accessed on October 21, 2016

Lepidoptera (butterflies) and Coleoptera (beetles). The Coleoptera (with almost 5,000 recorded species) along with Diptera (flies) and Hymenoptera (wasps and bees) show high species richness among the groups studied to date.[149]

309. Of the invertebrates species of conservation importance based on Georgia's Red List, reported to be found in the Project area[150], only one is of conservation importance based on the IUCN Red List, the Fen Raft Spider *Dolomedes Plantarius*. Information about this species is provided below.

Fen Raft Spider *Dolomedes Plantarius*

310. The Fen Raft Spider is predatory, however, it does not build a web to catch prey. It inhabits the margins of pools or ditches where it hunts over open water surfaces. Adults eat drowning terrestrial insects and many aquatic species, including pond skaters, other species of aquatic spiders, dragonfly larvae and even sticklebacks. Fen Raft Spiders are largely aquatic animals, dependent on the presence of standing or slow-moving water.[151] Clear water is essential for breeding. The eggs are laid into silk sacs that are immersed in water in hot weather.[152] Low availability of suitable aquatic habitat, drainage and polluted water are the main causes for the species decline.[153]

5.3.3 Aquatic Ecology

311. Aquatic Ecology consists of fish fauna, phytoplankton. These have been described in below.

Fish Fauna

312. A total of 48 species are reported to be living in Georgian waters of the Black Sea.[154] The most important groups of species are sturgeons (7 species), anchovies, sprats, whiting, spiny dogfish, scads, pickerel, red mullets and mullets. The most internationally and locally valued freshwater fish species are the sturgeons. Major fish populations are in the Chorokhi River, located adjacent to the Study Area (**Figure 5-1**), and in the Black Sea.

313. The IBAT was used to find the species whose distribution overlaps with the Study Area as reported by the IUCN Red List Database. A list of these species is in **Table 5-24**, along with information on their IUCN status, habitat and ecology.[155]

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[149] National Biodiversity Strategy and Action Plan-Georgia, 2005, Tbilisi, Page 106

[150] Sambo Engineering, March 10, 2016, Environmental Impact Assessment for Construction of Batumi Bypass Road Section for the Ministry of Regional Development and Infrastructure of Georgia Road Department

[151] Wild screen Archive 2016. <http://www.arkive.org> accessed on October 21, 2016

[152] Suffolk Wildlife Trust 2016. Fen raft spider, <http://www.suffolkwildlifetrust.org/>, accessed October 21, 2016

[153] ibid

[154] Froese, R. and D. Pauly. Editors. 2016. FishBase. World Wide Web electronic publication. www.fishbase.org, version (06/2016).

[155] IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-2*. <http://www.iucnredlist.org>. Downloaded on 13 October 2016.

Table 5-24: List of Fish Species with Ranges Overlapping with Study Area

Species Diversity	Common Name	IUCN Status	Habitat	Threats
Alopias vulpinus	Common Thresher Shark	Vulnerable	While found both in coastal and oceanic waters, it is most abundant in waters up to 40 or 50 miles offshore	Threatened from a combination of slow life history characteristics, hence low capacity to recover from moderate levels of exploitation, and high levels of largely unmanaged and unreported mortality in target (for fins and their valuable meat) and bycatch fisheries.
Anguilla anguilla	European Eel	**Critically Endangered**	Range of habitats from small streams to large rivers and lakes, and in estuaries, lagoons and coastal waters	The causes of the declining recruitment rates are still not fully understood
Arnoglossus kessleri	Scaldback	Data Deficient	Found on the upper part of the continental shelf, at depths ranging from 10 to 200 m. It lives on muddy and sandy substrata	A possible major threat could be bycatch in trawlers
Dasyatis pastinaca	Common Stingray	Data Deficient	A demersal brackish to marine water species, found over sandy and muddy bottoms from shallow waters to a depth of approximately 200 m, although it seems to be most abundant in inshore waters.	Taken as bycatch and is sometimes targeted in semi-industrial, small-scale and commercial bottom trawl, gillnet, beach seine, bottom longline and trammelnet fisheries.
Hippocampus guttulatus	Long-snouted Seahorse	Data Deficient	Mostly found inhabiting small home ranges in shallow coastal waters, lagoon systems and estuaries	Habitat degradation and disturbance through direct anthropogenic activities such as coastal developments and the effect of fishing gear
Syngnathus tenuirostris	Narrow-snouted Pipefish	Data Deficient	Inhabits estuaries with rocky, sandy and muddy substrates, and associated with Zostera seagrass beds and sparsely vegetated habitats	May be threatened by the degradation of shallow-water habitats. Habitat loss is caused by land reclamation and coastal development, and habitat quality has decreased as a result of sedimentation, pollution and eutrophication

314. Of the fish species of conservation importance based on Georgia's Red List, reported to be present in the Project area[156], five are listed as Critically Endangered on the IUCN Red List of Species. These are described in detail below.

315. The five species of conservation importance based on the IUCN Red List are sturgeons of the family Acipenseridae. All are anadromous, i.e. they spend most of their life at sea but migrate into river systems for reproduction.[157] These species are highly prized for their meat and unfertilized roe (caviar), traded both legally and illegally.[158] Overfishing is a major threat.[159]

316. In Georgia, the south east coast of the Black Sea is an important feeding and wintering area for sturgeons. They migrate upstream in a number of rivers for spawning, the main ones being the Supsa, Inguri, Chorokhi and Rioni.[160]

Giant Sturgeon Beluga Huso Huso

317. The species is native to Georgia but it is found in other countries as well.[161] It spawns in the main course of large and deep rivers with strong current and on stone or gravel bottoms.[162] Juveniles occur in shallow, riverine habitats during their first summer.

Atlantic Sturgeon Acipenser sturio

318. The species lives the major part of its life in the sea but enters rivers for reproduction. It is found on various substrates, from sand to rocks. At the sea, it occurs in coastal and estuarine zones. In freshwaters, it inhabits estuaries and large rivers.[163]

Fringebarbel Sturgeon Acipenser nudiventris

319. The adult specimens of this species mainly occur in the sea close to shores and estuaries and in deep stretches of large rivers over muddy substrate. They are usually solitary while juveniles live in shallow riverine habitats. Spawning takes place in strong-current habitats in the main course of large and deep rivers on stone or gravel bottoms, from end of April to June.[164] This species has the highest relative fecundity for any sturgeon species.

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[156] Sambo Engineering, March 10, 2016, Environmental Impact Assessment for Construction of Batumi Bypass Road Section for the Ministry of Regional Development and Infrastructure of Georgia Road Department

[157] Bemis, W. E. and Kynard, B. 1997. Sturgeon rivers: an introduction to Acipenseriformes biogeography and life history, in Birstein, V. J., Waldman, J. R., & Bemis, W. E., (eds.), Sturgeon Biodiversity and Conservation. Kluwer Academic Publishers, Dordrecht. 25-71.

[158] Engler, M. and Knapp, A. 2008. Briefing on the evolution of the caviar trade and range state implementation of Resolution Conf. 12.7 (Rev. Cop 14). A TRAFFIC Europe Report for the European Commission. Brussels, Belgium.

[159] The IUCN Red List of Threatened Species. Version 2016-2. <www.iucnredlist.org>. Downloaded on 23 October 2016.

[160] CITES Species Database <https://www.speciesplus.net/>, accessed October 21, 2016

[161] Gesner, J., Chebanov, M. & Freyhof, J. 2010. *Huso huso*. The IUCN Red List of Threatened Species 2010: e.T10269A3187455 <http://dx.doi.org/10.2305/IUCN.UK.2010-1.RLTS.T10269A3187455.en>, accessed October 21, 2016

[162] Kottelat, M. and J. Freyhof, 2007. Handbook of European freshwater fishes. Publications Kottelat, Cornol and Freyhof, Berlin. 646 pp.

[163] FishBase <http://www.fishbase.org>, accessed October 21, 2016

[164] Ibid

Starred Sturgeon Acipenser stellatus

320. The south east coast of the Black Sea is an important feeding and wintering area in Georgia. The main rivers used are the Supsa, Inguri, Chorokhi and Rioni.[165] The species is found at sea, in coastal and estuarine zones, where it forages on clayey sand bottoms, as well as intensively in middle and upper water layers. It spawns in strong-current habitats in the main course of large and deep rivers, on stone or gravel bottoms. It migrates upriver at higher temperatures and therefore later than other sturgeons, with two peaks, in spring and in autumn.

Persian Sturgeon Acipenser persicus

321. In Georgia, the south east coast of the Black Sea is an important feeding and wintering area. It migrates upriver for spawning. The main rivers used are the Chorokhi and the Rioni.[166] At sea, in coastal and estuarine zones, it spawns in strong-current habitats in the main course of large and deep rivers on stone or gravel bottoms. Juveniles are found in riverine habitats during their first summer. Juveniles migrate to the sea during their first summer and remain there until maturity. There is strict national and international regulation of fishing and trading of caviar and meat, but there is still illegal trade.[167]

Phytoplankton

322. Phytoplankton refers to the autotrophic component of the plankton that drifts in the water column. Its cumulative energy fixation in carbon compounds (primary production) is the basis for the vast majority of oceanic and some freshwater food chains.[168]

323. At the flowing places of rivers carrying large amounts of suspended solid material (sand and silt) and also some hazardous substances, considerable reduction of some species is observed.

324. The Georgian Black Sea coast is characterized by large variability of the hydrological regime and anthropogenic impact, resulting in considerable differences in systematic composition and quantitative development of phytoplankton by seasons and years, especially in areas of river discharge.[169]

Habitat Assessment

325. The Study Area does not meet the criteria for Critical Habitat because it does not have high biodiversity value. It is not located in a legally protected area or an area officially proposed for protection.

326. The criteria for Critical Habitat[170] include the following, along with their respective habitat assessments for the Study Area:

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[165] CITES Species Database <https://www.speciesplus.net/>,accessed October 21, 2016

[166] CITES Species Database <https://www.speciesplus.net/>, accessed October 21, 2016

[167] IUCN 2016. *The IUCN Red List of Threatened Species. Version 2016-2*. <http://www.iucnredlist.org>. Downloaded on 13 October 2016.

[168] Science Daily, < https://www.sciencedaily.com/>, accessed October 24, 2016

[169] Ibid

[170] ADB Environmental Safeguards A Good Practice Sourcebook Draft Working Document

Habitat required for the survival of critically endangered or endangered species

327. The Study Area does contain species listed as Critically Endangered and Endangered, however, it does not contain habitat that is required for their survival. These species are widespread outside the Study Area.

Areas with special significance for endemic or restricted-range species

328. The Study Area does contain species that are endemic and range restricted. However, it does not have areas with special significance for them. These species are widely distributed outside the Study Area.

Sites that are critical for the survival of migratory species

329. The Study Area does not contain sites that are critical for the survival of migratory species. Sites important for migratory species are located outside the Study Area.

Areas supporting globally significant concentrations or numbers of individuals of congregatory species

330. The Study Area does not contain areas of globally significant concentrations or numbers of individuals of congregatory species. Sites important for congregatory species are located outside the Study Area.

Areas with unique assemblages of species that are associated with key evolutionary processes or provide key ecosystem services

331. The Study Area is not an area with unique assemblages of species that are associated with key evolutionary processes or provide key ecosystem services.

Areas with biodiversity that has significant social, cultural or economic importance to local communities

332. The Study Area is not an area with biodiversity that has significant social, cultural or economic importance to local communities.

333. Based on the criteria for Critical Habitat as applied above, the Study Area does not qualify as a Critical Habitat.

5.3.4 Summary of Ecological Baseline

334. The biodiversity of Adjara and in particular, Batumi, consists of a number of species of conservation importance based on both Georgia's Red List and the IUCN Red List. Also there are areas in and around Batumi which are important habitat for wildlife, most notably the IBAs of Batumi and the Chorokhi Delta. Another area of conservation importance near the Project is the Mtirala National Park, home to a number of endemic and relic plant species. In addition to this there are two herpetofauna species of conservation importance, whose ranges overlap with that of the Project area, which is of particular concern because of the limited mobility of herpetofauna.

335. Habitat distribution within the Study Area shows that the dominant habitat type is Vegetation Clusters, making up 65% of it with the second most dominant one being Builtup Area making up 20%. Builtup Area is spread throughout the Study Area, on either side of the Project. The Vegetation Clusters are patches of vegetation within an area that is very disturbed by Builtup Area and the associated human activity. Nevertheless, the presence

of species of conservation importance and habitat suitable for such species cannot be ignored especially because of the overlap of Batumi with the Eastern Black Sea Flyway and the nearby Chorokhi Delta, which is an important wetland habitat for migratory and congregatory bird species. In particular, the Egyptian Vulture, listed as Endangered, has been known to forage around human settlements; human disturbance along with electrocution and collisions with powerlines are amongst the reasons for its decline.

Terrestrial Flora

336. There are two main Project-related concerns including the presence of four species of conservation importance in the Project area and the risk of spread of invasive species. The species of conservation importance reported from the Project area include Colchic Boxwood (Near Threatened), and Common Walnut (Near Threatened). The spread of invasive species is a key concern because disturbance to native plants species, for example, by vegetation clearance, favors the spread of invasive species. This is of particular concern because the nearby Mtirala National Park, located 4 km from the Project, contains a number of species endemic to Georgia.

Mammals

337. There are three mammal species of conservation importance reported from the Project area which include two bat species and the Common Otter. Mehely's Horseshoe Bat is classified as Vulnerable and the Mediterranean Horseshoe Bat is classified as Near Threatened. Both bat species are protected under the Bonn Convention and Bern Convention. Threats to these bat species include habitat disturbance. However, considering the topography around the Project, it is unlikely that there is significant habitat for these species in the Study Area.

338. The Common Otter is listed as Near Threatened on the IUCN Red List. It is rare in Adjara. Threats to the species include removal and bank side vegetation, drainage of wetlands and man-made changes to aquatic ecosystems.

Birds

339. Of the 31 IBAs in Georgia, two of them are located close to the Project, including the IBA of Batumi and that of Chorokhi Delta. The IBA of Batumi overlaps with the Study Area whilst that of Chorokhi Delta is 3.75 km from it. The IBA of Batumi is part of the Eastern Black Sea Flyway, therefore, numerous species pass over it during the passage season. The IBA of Chorokhi Delta is also important for a number of species including three species of conservation importance the Yelkouan Shearwater (Vulnerable), Sociable Lapwing (Critically Endangered), and Black-winged Pratincole (Near Threatened). It is also an important wetland habitat where wintering waterbirds and migratory waterbirds are monitored.

340. There are a total of eight bird species of conservation importance reported from the Project area including the Egyptian Vulture (Endangered), Dalmatian Pelican (Vulnerable), the White-winged Scoter (Vulnerable), Imperial Eagle (Vulnerable), Greater Spotted Eagle (Vulnerable), Black Vulture (Near Threatened), Saker Falcon (Saker Falcon) and Red-footed Falcon (Near Threatened). Habitat degradation, pollution, human disturbance and wetland modification are amongst the reasons for population declines. In addition to this there are a total of 19 migratory and congregatory bird species reported from the Project area.

Herpetofauna

341. A total of two herpetofauna species are reported in the Project area including the Caucasian Viper (Endangered) and the Caucasian Salamander (Vulnerable). For both species threats include habitat loss and degradation as well as urbanization. The Caucasian Salamander is endemic to Georgia and Turkey and is reported to be present in Batumi.

Invertebrates

342. A total of 12 invertebrate species of conservation importance based on Georgia's Red List are reported to be found in the Project area. Of these one, the Fen Raft Spider, is listed as Vulnerable on the IUCN Red List. The species requires aquatic habitat and relies on clear water, in particular, for breeding. Pollution of water bodies and drainage are, therefore, serious threats to it.

Fish

343. The Black Sea and Georgia's rivers are important for a number of fish species, the most of notable of which are those belonging to the group of Sturgeons.

344. A total of five fish species of conservation importance based on the IUCN Red List are reported from the Project area. These include the Giant Sturgeon, the Atlantic Sturgeon, Fringebarbel Sturgeon, Starred Sturgeon, and Persian Sturgeon. All five species are Critically Endangered and migrate between the sea and the rivers, making both habitats important for their life cycles. The riverine habitats, in particular, are important for juveniles. Three of these, especially, rely on them including the Giant Sturgeon, Fringebarbel Sturgeon and Persian Sturgeon. All five species are found in other countries; even within Georgia, they are found in rivers outside the Study Area, most notably the Rioni River.

345. The major threats to all five species include over-exploitation for uses such as food (e.g. caviar), medicine and leather. Pollution is another major concern along with impoundment of rivers due to dam construction resulting in blockage of fish from reaching their spawning sites.

346. The distribution of the European Eel also overlaps with the Study Area. Threats to this species are not well understood but chemical pollution is considered one of them.

Phytoplankton

347. Phytoplankton is a primary producer in marine and freshwater food chains. Georgian Black Sea phytoplankton is characterized by instability and fluctuations which are contributed to by anthropogenic impact, particularly sea pollution by organic substances. As a result the main concern with Project-related activities is pollution of water bodies in the Study Area, both the rivers and the coastal habitat.

5.4 Socioeconomic Environment

348. This section describes the socioeconomic environment of the Study Area. Where values for the Study Area are reported they are based on surveys of affected households conducted for the corresponding LARP of the Project. Photographs were taken during the field visit in September and October 2016.

5.4.1 Administrative Set-up

349. Adjara, officially known as the Autonomous Republic of Adjara, is an historical, geographic and political-administrative region of Georgia. The status of the Adjaran Autonomous Republic is defined by Georgia's law on Adjara and the region's new constitution. The local legislative body is the Parliament. The head of the region's government—the Council of Ministers of Adjara—is nominated by the President of Georgia who also has powers to dissolve the assembly and government and to overrule local authorities on issues where the constitution of Georgia is contravened.

350. Adjara is subdivided into six administrative units namely: City of Batumi, Keda District, Kobuleti District, Khelvachauri District, Shuakhevi District, and Khulo District. These districts are shown in **Figure 5-27**.

Figure 5-27: Administrative Setting

351. The Project passes 8 villages as given in **Table 5-25**, all of which are in the Khelvachauri district.

Table 5-25: List of Villages in the Project Impact Zone

Name of Village	Legal Status	Sakrebulo	District/Rayon
Makhinjauri	Urban Village	Makhinjauri	Khelvachauri
Kapreshumi	Village	Ortabatumi	Khelvachauri
Salibauri	Village	Ortabatumi	Khelvachauri
Akhalsheni	Village	Akhalsheni	Khelvachauri
Sameba	Village	Akhalsheni	Khelvachauri
Ganakhleba	Village	Akhalsheni	Khelvachauri
Makhvilauri	Village	Sharabidzeebi	Khelvachauri
Khelvachauri	Urban Village	Khelvachauri	Khelvachauri

5.4.2 Demography

352. Population of Adjara as of 2009 statistics is 382 thousands (see **Table 5-26**). Approximately, 43.6% of the population live in urban whereas 56.4% live in rural areas. From 2003 to 2005, the population growth rate has remanded stable, at around 0.5%. Batumi is the most populated city, with a population of approximately 122,000.

Table 5-26: Population of Adjara Region (thousands)

	2002	2009	2015
Adjara Autonomous Republic	376.016	382.4	336.5
Batumi	121.806	122.5	151.4
Kobuleti Municipality	88.063	89.9	75.2
Khelvachauri Municipality	90.843	92.8	51.6
Keda Municipality	20.024	20.0	15.2
Shuakhevi Municipality	21.850	22.3	23.5
Khulo Municipality	33.430	35.0	

Source: National Statistics Service of Georgia

353. Ethnic groups of Adjara include Georgian, Russians, Armenians, Greeks, Abkhaz, etc. In the Study Area, about 97% are of Georgian ethnicity with the remaining ethnicities comprising of Armenians, Russians and others. The distribution is shown in **Table 5-27**.

Table 5-27: Ethnicity of Households in the Study Area

No	Ethnicity	Total No. of Households	% Age
1	Georgian	389	96.8
2	Armenian	8	2.0
3	Russian	1	0.25
4	Others	4	1.0
	Total	**402**	**100.0**

Source: Socioeconomic survey, Feasibility Study (2009)

5.4.3 Physical Infrastructure

Road Network

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

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

356. The road network of the Study Area is mapped in **Figure 5-28**.

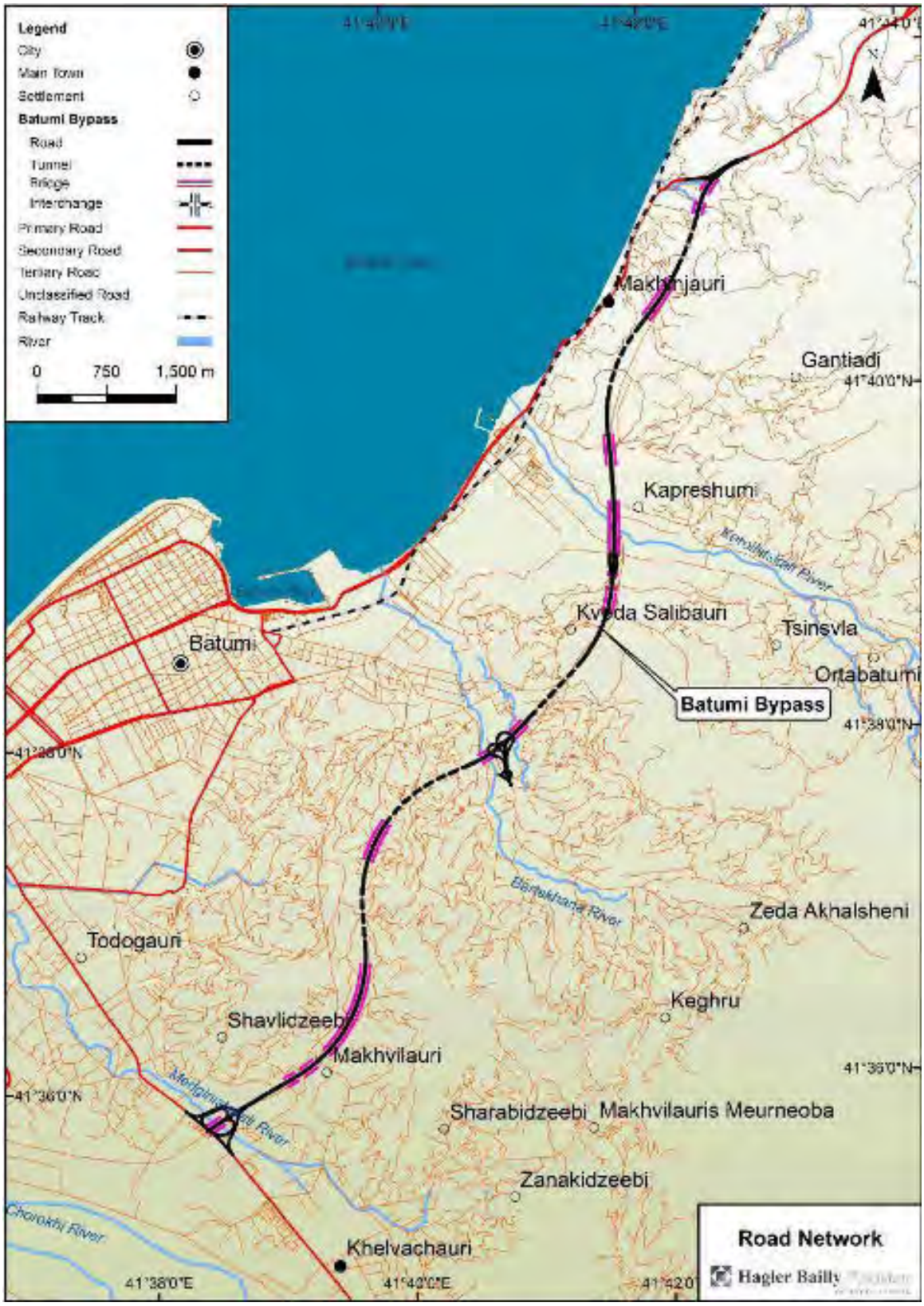

Figure 5-28: Road Network

357. The road network in the Study Area is poor with several rural areas which are not connected to the road network. Only national and regional highways are asphalted and most rural roads are graveled, and these graveled rural roads are difficult to drive on, during the rainy season. Asphalting of local roads is currently under way. Photographs of the various quality of roads that can be found in the Study Area is shown in **Figure 5-29**.

Cemented road.

Gravel road

Freshly asphalted road.

Main road to the south of the Study Area.

Figure 5-29: Photographs of Local Roads in the Study Area

358. Rural communities in the Study Area are serviced by private minibuses that collect people from stops at intervals between half an hour to an hour. The minibuses generally take a round trip to Batumi. A bus stop in the Study Area is shown in **Figure 5-30**.

Figure 5-30: Local Bus Stop

Rail

359. The Batumi railway station is close to the Study Area and the railway line cross the Study Area. Railway is used for both passenger and freight transport as shown in **Figure 5-31**. The railway line present in the area is shown in **Figure 5-28**.

New passenger train at Batumi Station

Cargo trains carry oil from Azerbaijan to Batumi Port

Figure 5-31: Photographs of Railway Infrastructure

Utilities

360. The major source of drinking water is dug-well and piped water supply. 29% of households use water from dug-well and 63% of households use water from piped supply, 8% of households reported other sources.[171]

361. Wood is the major source of fuel being used by the households (89%) for heating.[172]

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

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

362. During consultations it was determined that currently governmental projects are underway to connect houses to water and gas. Photographs of existing gas and water connections are shown in **Figure 5-32**.

Water connection Gas connection

Figure 5-32: Photographs of Utilities in the Study Area

Sanitation

363. 54% of surveyed households use flush toilet and 46% use latrine.[173] A photograph of a typical latrine is given in **Figure 5-33**.

Figure 5-33: Photograph of a Typical Latrine Facility

Housing

364. Almost all homes in the Study Area are of masonry construction. However, there is a large variation in structural quality as illustrated by photographs in **Figure 5-34**.

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

Apartment building

Single story home

House constructed with blocks as foundation

New doubly story structure

Figure 5-34: Housing Structures in the Study Area

5.4.4 Social Infrastructure

Education

365. About 20% of the population of the Study Area has a university education, 74% have primary and secondary level education and 6% have pre-school level education (see **Table 5-28**).

Table 5-28: Education of Households

No	Category	Male		Female		Total	
		No	%	No	%	No	%
1	Pre-School	32	8.9	17	4.2	49	6.4
2	Primary	243	67.7	322	79.3	565	73.9
4	University	84	23.4	67	16.5	151	19.7
5	Illiterate	0	0.0	0	0.0	0	0.0
	Total	**359**	**100**	**406**	**100**	**765**	**100**

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

366. Photographs of schools and playgrounds in the Study Area are shown in **Figure 5-35**.

School in Makhinjauri

School in Makhlivauri

Playground in Makhinjaurui

Playground in Makhlivauri

Figure 5-35: Schools and Playgrounds in the Study Area

Health

367. Details of health care facilities in Adjara are given in **Table 5-29**, which includes 19 hospitals and 248 first aid network facilities. 1252 medical professionals are working in these facilities. Among them 78 are physicians, 42 are surgeons, 122 are gynecologists, 115 are village doctors, and 93 are paramedics.

368. During consultations it was determined that there are no healthcare facilities directly in the rural portions of the Study Area. Residents go to Khelvachauri or Batumi for treatment. Residents are covered by national health insurance. Ambulances are available for transport to healthcare facilities.

Table 5-29: Health Care Facilities in Adjara

No	Facilities	In 2008	In 2009
1.	Number of Hospitals	18	19
2.	Neurological Centre (with Hospital)	1	1
3.	Blood transfusion station	1	1
4.	Ambulance Service	6	6

No	Facilities	In 2008	In 2009
	First Aid Network in Total Among them	245	248
5.	Centre for Family Medicine	2	2
6.	Independent Polyclinics	11	11
7.	Medical Centre for Polyclinic Profile	5	5
8.	Private Polyclinic Institutions	3	4
9.	Health Centre	3	3
10.	Centre for Primary Health Care	46	45
11.	Community Medical Centre	175	177

5.4.5 Cultural Resources

369. Images of cultural resources in the Study Area are shown in **Figure 5-36**.

Spring dedicated to individual

Memorial within Study Area

Mosque in Khelvachauri

Graveyard within Study Area

Figure 5-36: Cultural Resources

5.4.6 Archaeological Sites

370. Archeological sites as mentioned on the website of the Adjara Cultural Heritage Protection Agency are shown in **Figure 5-37**. There are no sites directly along the Project alignment. Photographs of these sites are shown in **Figure 5-38.**

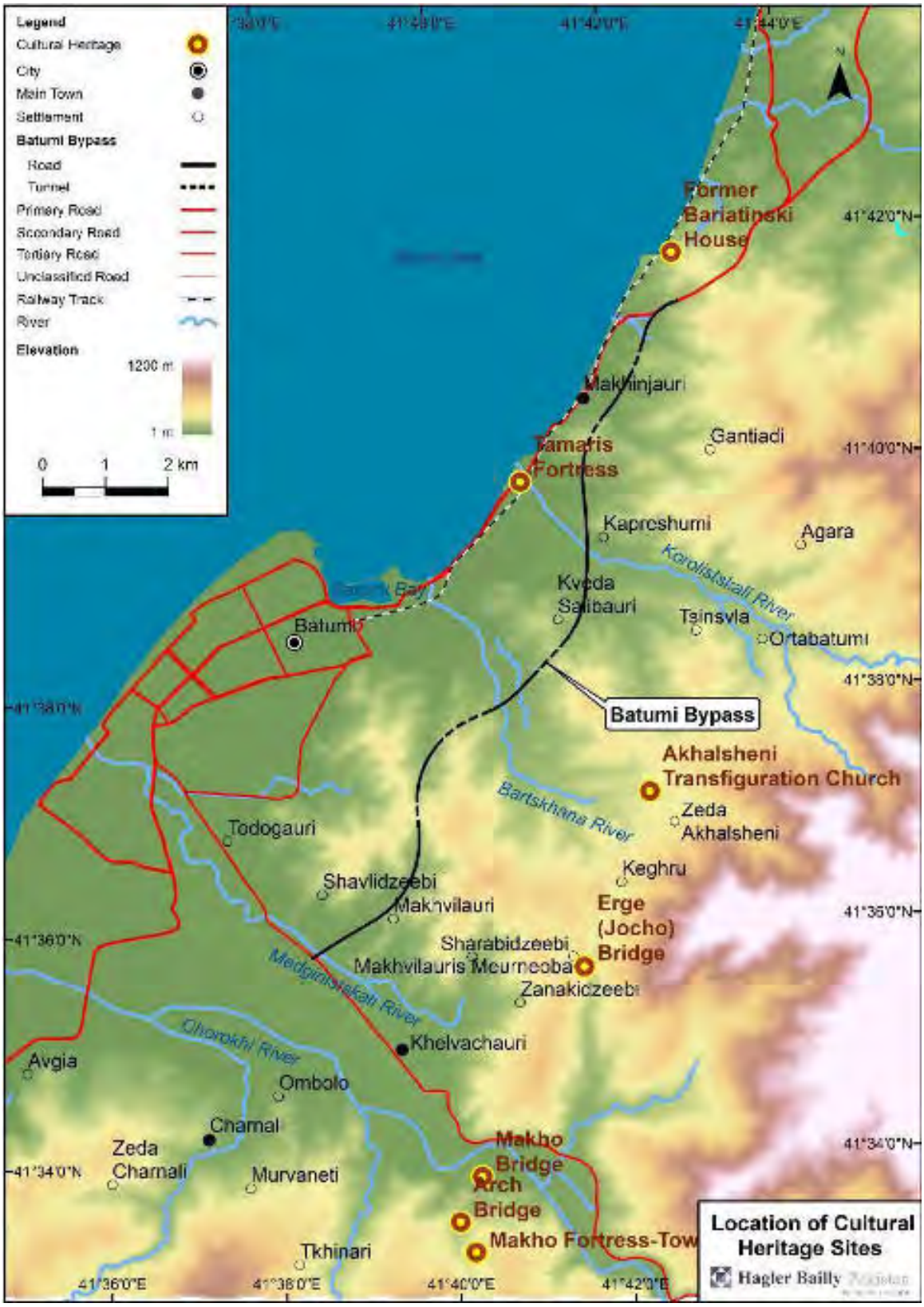

Figure 5-37: Cultural Heritage Sites around Project Site

Akhalsheni Transfiguration Church

Erge (Jocho) Bridge

Former Bariatinski House

Makho Bridge

Makho Fortress-Tower

Tamaris Fortress

Figure 5-38: Photographs of Cultural Heritage Sites around Project Site[174]

5.4.7 Economy

371. In 2004, the Gross Domestic Product of the Autonomous Republic of Adjara was GEL 490 million, which is 5% of the GDP of Georgia. The main industries in Adjara are manufacturing, agriculture and tourism. The manufacturing sector is dominated by food, tobacco, and woodworking industries and accounted for 5.9% of Adjara's GDP. As of 2005 there were 515 industrial enterprises in Adjara, 34 state enterprises and 117 non-governmental enterprises. The agricultural sector is dominated by tobacco, citrus plants, potatoes, tea, and livestock farming. The share of agriculture in the GDP of Adjara is

[174] Photographs taken from the website of the Adjara Cultural Heritage Protection Agency

18.7% (GEL 91.52 million). Private farms occupy 63.8% of the agricultural lands. State and non-governmental agricultural farms occupy the rest, 46.2%.

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

373. Citrus and vegetables are the major crops being cultivated in the Study Area. Details of major cropping pattern in the project area obtained from the affected households are given in **Table 5-30**.

Table 5-30: Major Cropping Pattern

No	Type of Crops	Households that have Crop Cultivated	% of Total Households	Average Area of Cultivation (HA)	Average Yield (Ton)	Average Total Yield (GEL)
1	Corn	52	21.3	0.16	0.48	258
2	Bean	32	13.1	0.06	0.04	126
3	Vegetables	49	20.1	0.08	0.10	96
4	Fruit	29	11.9	0.10	0.55	924
5	Grape	4	1.6	0.07	0.42	400
6	Citrus	53	21.7	0.19	4.91	2996
7	Others	25	10.2	0.04	0.23	355
Total Households		**244**				

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

374. Agriculture is the primary economic activity reported 41% households, 24% of the households reported government service as the primary economic activity. The third contributor is daily wage (11%) as primary economic activity including agriculture labor and non-agriculture daily labor. The details are given in **Table 5-31** below.

Table 5-31: Economic Activity of the Households

No	Type of Activities	No	Primary % (of total)	No	Secondary % (of total)
1	Agriculture	107	40.5	11	36.7
2	Working for other farmers (Agricultural Laborer)	12	4.5	3	10.0
3	Small enterprise	14	5.3	3	10.0
4	Government Service	64	24.2	2	6.7
5	Business and trading	21	8.0	3	10.0
6	Daily Wage	29	11.0	6	20.0
7	Others	17	6.4	2	6.7

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

Employment Status

375. About 15% working age people in the Study Area are wage employed, 24% are self-employed and about 15% are economically inactive (see **Table 5-32**). Unemployment is very high with 46% reporting that they are unemployed (see **Table 5-32**).

Table 5-32: Economic Activity of the Households Members

Gender	Economically Inactive		Wage Employed		Self Employed		Unemployed		Total	
	No	%	No	%	No	%	No	%	No	%
Male	32	10.8	44	14.8	87	29.3	134	45.1	297	100
Female	64	17.6	58	16.0	69	19.0	172	47.4	363	100
Total Average	**96**	**14.5**	**102**	**15.5**	**156**	**23.6**	**306**	**46.4**	**660**	**100**

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

Average Annual Income (household Income)

376. Agriculture, service and wage employment are major contributors to income in the Study Area. The survey found that 15% of the households get income from one single source, 36% from double sources and 49% from three or more sources. **Table 5-33** shows the distribution of incomes from various sources. Average annual income is GEL 15,658 per household as shown in **Table 5-34**.

Table 5-33: Average Monthly Household Income against Number of Sources

Number of Sources of Income	No. of AHs	% of Ahs	Average annual income
Single source	23	15	9631
Double Source	54	36	14270
Three + sources	73	49	17917
Total	**150**	**100**	

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

Table 5-34: Average Annual Income

No	Source of Income	No. of Households	Average Annual Income from Source (GEL)
1	Wage employment	149	6,135
2	Agriculture	114	4,685
3	Business/Service	50	2,056
4	Property income	9	361
5	Pension	16	674
6	Remittances	24	988
7	Other	18	759
Total	**Households Surveyed:**	**380**	**15,658**

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

6. Information Disclosure, Consultation, and Participation

377. As part of the Environmental Impact Assessment process, consultations are undertaken with communities and institutions that may have interest in the proposed project or may be affected by it. The objective of conducting stakeholder consultations during the ESIA process is to inform all the stakeholders about the Project, record and take into account their opinions, suggestions and concerns and establish confidence amongst the Project stakeholders that the Project is developed in a responsible way. This section documents the consultation process for the EIA of the proposed Project.

6.1 Framework for Consultations

378. The EIA of the proposed Project is undertaken in compliance with relevant national legislation and in accordance with the environmental and social safeguards laid out under ADB's safeguard policy (SPS 2009).[175]

6.1.1 ADB Safeguard Policy Statement

379. Public consultation is mandated under Asian Development Bank's Safeguard Policy Statement (SPS 2009).[176]

SPS 2009 on Pubic Consultations

The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. Meaningful consultation is a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues. Consultation will be carried out in a manner commensurate with the impacts on affected communities. The consultation process and its results are to be documented and reflected in the environmental assessment report.

6.1.2 Georgian Requirement

380. As discussed in **Chapter 2** the Law on Environmental Impact Permit contains details on consultation and disclosure that must happen after the draft EIA has been prepared and is ready for submission. The EIA process will follow all regulations laid down by Georgian Law. However information regarding final public disclosure is not available at the time of writing of this report.

6.2 Overview of Stakeholders

381. Stakeholders can be divided into two groups: communities that lie along the RoW and institutional stakeholders. A list of identified stakeholders is given in **Table 6-1**.

[175] Safeguard Policy Statement, Asian Development Bank, June 2009

[176] Safeguard Policy Statement, Asian Development Bank, June 2009

Table 6-1: List of Stakeholders

Stakeholder	Date and Location Consulted
Community Stakeholders	
Makhinjauri and surrounding communities	Oct 22, 2016 Makhinjauri
Kapreshumi and surrounding communities	Oct 22, 2016 Kapreshumi
Makhlivauri and surrounding communities	Oct 23, 2016 Makhlivauri
Institutional Stakeholders	
Local Government	
Khelvachauri Municipality	Oct 13, 2016 Era Palace
Batumi City Hall	Oct 13, 2016 Era Palace
Ministry of Environment	Oct 13, 2016 Era Palace
Department of Tourism	
Biodiversity	
Batumi Shota University, Biodiversity Department	Oct 9, 2016 Batumi Shota University
World Wildlife Fund	Nov 23-25, 2016 Email correspondence
Batumi Raptor Count	Oct 21 - Nov 10, Email correspondence
Transboundary Joint Secretariat for Southern Caucuses	Oct 4-20, 2016 Email correspondence
Batumi Botanical Garden	Oct 11, 2016 Batumi Botanical Garden
Businesses in Batumi	
Including: fuel stations, hotels, shops, car washes, shops, workshops and others.	Oct 5-8, 2016 at business venues in Batumi
Transport	
Batumi Public Transport	Oct 13, 2016 Era Palace
Adjara Road Department Office	Oct 13, 2016 Era Palace
Batumi Port	
Georgia Railways	
Cultural Heritage	
Adjara Cultural Heritage Protection Agency	
Batumi Archaeological Museum	

6.3 Consultation Methodology

6.3.1 Scoping and Feedback Consultation

382. Scoping consultations for the Project were undertaken in 2009, 2011 and 2016 as described below:

- Two public consultations were conducted during the feasibility study for the entire alignment (Kobuleti and Batumi bypasses) in April and June, 2009.
- Additional consultations were held for the preparation of the previous EIA in March and April, 2011. These included 5 institutional consultations and 6 community consultations.

- To get updated information, additional scoping consultations were undertaken for this study. These consultations were conducted in October, 2016. These consultations were conducted informally during the baseline surveys.
- A workshop was arranged in Batumi for institutional consultations. The RD facilitated contact with the institutional stakeholders. Important stakeholders who could not make it to the workshop were met separately or contacted via email or telephone. The attendance list is provided in **Appendix 4**.

383. Feedback consultations were held with communities on Oct 22 and 23, 2016. Three meetings along the RoW were organized to which over 63 community representatives attended. The meetings were arranged with the support of the local Road Department. The attendance lists are provided in **Appendix 4**. An overview of the EIA methodology was provided to explain how the concerns of the communities as ascertained by scoping consultations were being addressed.

384. The public consultations proceeded in the following manner:

- An overview of the Project was provided
- Discussion of modelling procedure to quantify potential impacts and expected mitigation measures for noise and air quality deterioration due to the Project.
- Other impacts that were being investigated such as vibration, water and soil contamination and impacts to ecology and socioeconomic conditions.
- An overview of the EIA review and approval process based on ADB, AIIB and Georgian requirements.
- Further questions and comments from the community were addressed and recorded.
- After the general consultation small sessions were conducted with individual households which wanted to convey specific concerns,

385. Consultation locations for the 3 community consultations and the institutional consultations workshop are shown in **Figure 6-1** and photographs in **Figure 6-2** for consultations conducted during this study.

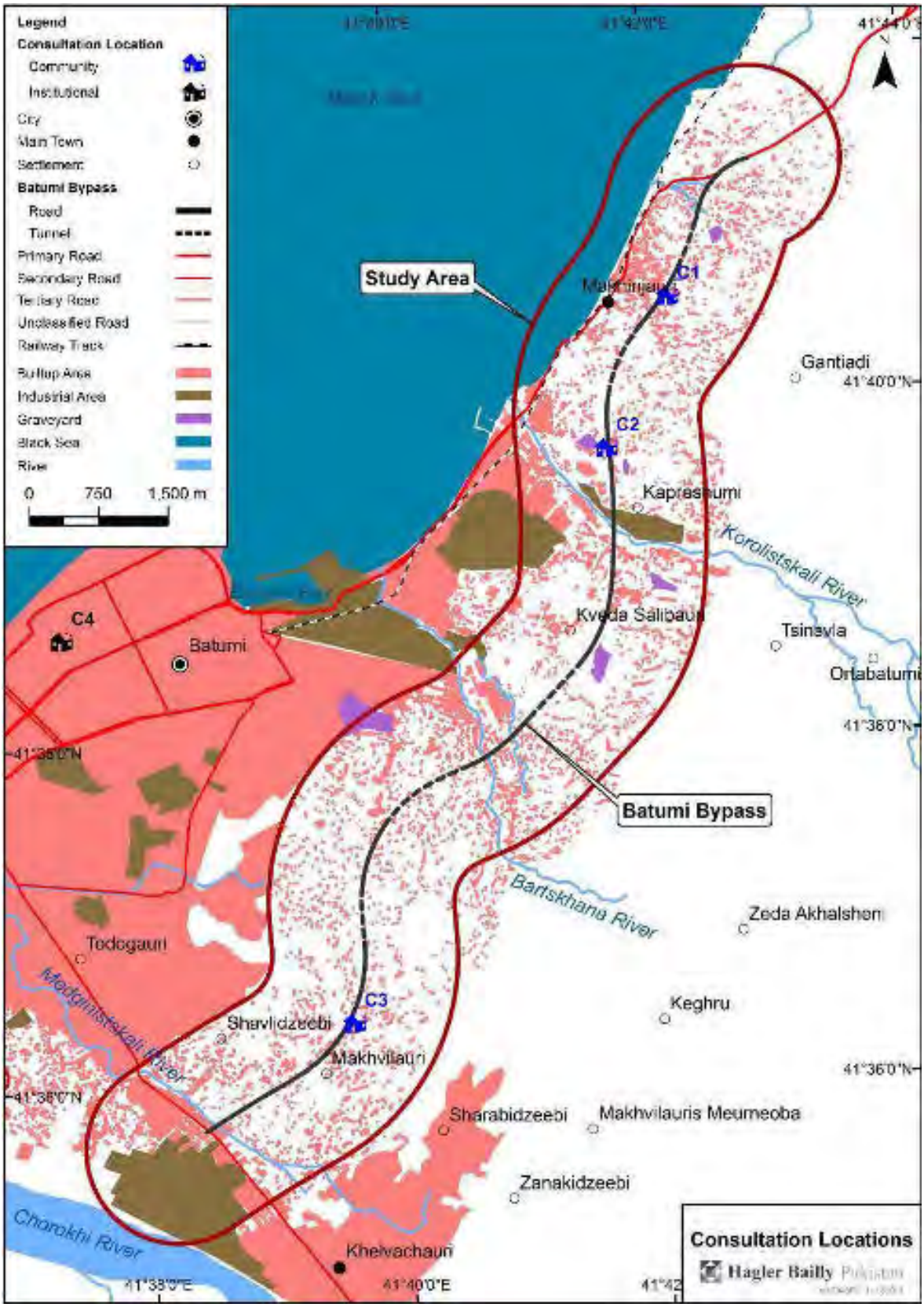

Figure 6-1: Consultation Locations

Informal consultation along RoW. Participants concerned with landslides and employment.

Participant concerned regarding spring water infrastructure.

Informal consultation along RoW.

Informal consultation along RoW. Participants concerned about noise and vibration impacts.

Consultation with shops along right of way.

Consultation with shops along right of way.

Institutional consultation workshop.

Institutional consultation workshop.

Formal consultation session at C1.

Individual consultations at C1.

Formal consultation session at C2.

Formal consultation session at C2.

Breakout session at C2. Participants are conversing with the EIA consultants (HBP), ADB representatives and RD representatives.

Small group discussions at C2.

Formal public consultation session at C3.

Formal public consultation session at C3.

Participants were explained the Project using large printouts of the RoW at C3.

Figure 6-2: Consultation Photographs

6.3.2 Consultation Material

386. The main document for distribution to stakeholders during the consultations was the Background Information Document (BID). The BID contained information on the Project and the EIA process. The BID for the Project is included as **Appendix 5**. The consultation material was made available to the stakeholders in English and Georgian to suit their language preference. The BID was distributed in both the institutional consultation workshop and in the formal public consultations. A PowerPoint presentation was given at the institutional consultation workshop.

6.3.3 Consultation Team

387. The consultation team consisted of the persons detailed, along with their roles and designations, in **Table 6-2**.

Table 6-2: Consultation Team

Organization	Name	Designation	Role
Hagler Bailly Pakistan	Hidayat Hasan	Principal Project Consultant	Led consultations in English and answered questions
	Paata Tchankotadze	National Expert	Facilitated consultations and translated to Georgian
	Hassan Bukhari	Environmental Expert	Administrative and logistic support
Road Department	Irakli Khergiani	Deputy Chairman	Provided a brief introduction and answered road department specific questions
	Mr Zurab	Director, Ajara RD	Answered local road department specific questions
Asian Development Bank	Mr Metger	Resettlement Expert, ADB Georgia	Answered resettlement related queries
	Keti Dgebuadze	Environmental Expert, ADB Georgia	Observer
	Jeffery Bowyer	Environmental Expert, ADB Manilla	Observer

6.4 Summary of Consultations

388. **Table 6-3** summarizes the key concerns emerging from consultations and explains how each concern was addressed in the EIA. The detailed log of consultations is provided in **Appendix 6**.

389. The photographs of the consultations are given in **Figure 6-2**.

Table 6-3: Summary of Concerns Expressed in Scoping Consultation and How They Have Been Addressed in the EIA

Issues Raised by Stakeholders	Addressed in the EIA
Resettlement and Related Issues	
The bridge passes in close proximity to some houses that are not included in the LARP. Concern was shown regarding noise levels generated by disturbance due to construction and traffic during operation. Some participants informed that resettlement of their houses will be decided based on calculation of noise impacts during the EIA.	Detailed noise modelling was conducted to ascertain noise impacts due to the road. Mitigation measures were identified and houses were noises levels were still above acceptable limits have been identified for inclusion in the LARP. See **Section 8.3.2** for details.
Land plots in close proximity of the road, but with no houses currently constructed, but with potential of future construction, will be rendered unusable due to the road.	Devaluation of asset price is discussed in **Section 8.13**. Strictly speaking asset devaluation is not compensated as per ADB policy.
Rates for land acquisition are low compared to the market price.	Price determination is discussed in the associated LARP. Specific grievances should be communicated to the GRM (see **Chapter 11**).
Complete land plots were not acquired and small portions of large plots are not usable for agriculture.	Land acquisition is discussed in the associated LARP. Specific grievances should be communicated to the GRM (see **Chapter 11**).
A graveyard with around 25 graves belonging to a single family is present on the right of way. The family stated that while they have not had an agreement as yet they have an agreement that an agreement will be reached in the future.	After discussion with the affected family the EIA suggests that the graveyard be shifted on available land a few hundred meters away the right of way.
Land acquisition and resettlement will be the major issue. According to participants, this can be mitigated through proper compensation and assistance to the affected persons.	Land acquisition is discussed in the associated LARP. Specific grievances should be communicated to the GRM (see **Chapter 11**).
Other Social issues	
Communities inquired regarding the start date of the Project and what sort of employment opportunities would be available. Many people were interested in working for the Project.	Good practice measures that will be put in place to ensure local employment are discussed in **Section 8.13**.
In village Makhvilauri it was suggested to build shops along the road, so local people could have trade points.	According to the design the Project is designed as a freeway and will not have local access points other than the 4 interchanges.

Issues Raised by Stakeholders	Addressed in the EIA
Participants suggested signage (speed limits, warnings etc.), pedestrian crossings in front of social institutions and to ensure that there are footpaths along the road.	These measures are already included in the project design
Shops, hotels and other businesses within Batumi are optimistic regarding the diversion as it will reduce traffic jams and improve the environment in Batumi.	No response.
Alignment	
Participants were concerned regarding the alignment of the remaining segment of the bypass, which is not clear.	The remaining portion of the alignment is beyond the scope of this study.
Physical Environment Related Issues	
The area is very pristine, in terms of good air quality, low anthropogenic noise sources and few disturbances. The physical environment of the area will change significantly after construction of the Project.	The air quality impacts of the Project have been evaluated to be minimal (see **Section 8.4.3**). Extensive mitigation measures including noise walls and speed controls have been identified to control noise impacts (see **Section 8.4.1**). Construction impacts will be managebale and temporary.
Some households are completely dependent, (others partially) on mountain springs. Some of the water collecting infrastructure is close to the RoW, and some will be acquired. Concern was shown by the community regarding proper reconstruction of water infrastructure and possibility of disruption in the water supply.	All springs that are impacted by the Project will be repaired or replaced by an alternate source of water
Affected and surrounding households had understanding and awareness regarding the proposed RoW of the Project. Some households could quote the distance in meters from their house to the RoW. However, having no previous experience regarding such construction they were unable to identify what the number of meters meant in terms of disturbance to the physical environment.	Impacts will be mitigated to meet Georgian and international standards (see **Chapter 8**)
Many homes, especially those near the tunnel portal (therefore, on a cliff edge) showed signs of cracks and repairs which had occurred during landslides in the area. They were concerns regarding additional landslides and rockfall during construction of the road and tunnel.	The baseline discusses the geology of the area (see **Section 5.1**). Areas that are prone to such impacts are identified for detailed preconstruction surveys (see **Section 8.3.3**).
Communities expressed concern that the construction activities will generate air, noise and water pollution which will impact their quality of life.	Each of these impacts have been evaluated and appropriate mitgation measures suggested in **Chapter 8**.

Issues Raised by Stakeholders	Addressed in the EIA
Biodiversity Related Issues	
No very important species grows within the area. There may be some very protected plants present in the area but it is because they have been introduced by people and it is not within the natural range.	See Section 8.5.
There are a large number of large eucalyptus trees along the right of way that help control the water levels in the valley. If these are cut down then it may disturb the current balance in the water table.	Any trees that are removed will be replanted (see **Section 8.3.1**)

6.5 Future Consultations

6.5.1 Information Disclosure

390. The electronic versions of the draft EIA will be placed on the RD, Adjara Government and ADB websites. Hard copies of Georgian version of draft EIA report will be placed in:

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

391. The EIA will be available in both English and Georgian languages.

6.5.2 Public Hearing

392. According to Georgian Law, detailed in **Chapter 2**, public consultation meetings will be conducted following 50 days after the disclosure of EIA documentation at Batumi. Information about the public consultation process will be made available for public through:

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

393. The disseminated announcement will contain information on:

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

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

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

6.5.3 Consultations for Implementation of Specific Mitigation Measures

395. **Chapter 10** presents the impact assessment and proposed mitigation measures for the Project. Specific mitigation measures require additional consultations so that the community is aware and on board thereby ensuring that the mitigation measures are socially feasible as well as being technically feasible. The following additional consultations will be conducted for these mitigation measures:

396. Consultations are to be conducted regarding the construction of the noise wall. The community should be made aware of issues regarding its effectiveness, any potential connectivity issues regarding its construction and any additional resettlement that is required for areas where the noise wall is ineffective. See **Section 8.6** for further details on impacts due to noise.

397. Consultations are to be conducted regarding the preconstruction survey that is to be conducted in areas at risk of damage due to construction vibration. The at risk homes should be made aware the scope of the survey, and where they should go in case of any grievance with regards to vibration related impacts. See **Section 8.7** for further details on impacts due to vibration.

6.5.4 Consultations during the Life of the Project

398. The RD will continue stakeholder engagement activities throughout the life of the Project. Further details of RD's future stakeholder engagement activities are given in **Chapter 10**. Stakeholder engagement activities will include:

- ongoing reporting on progress on the implementation of environmental and social management measures identified during the EIA process and recording of comments on the effectiveness of these measures;
- updating communities about new project developments and recording comments on these; and,
- ongoing operation of the grievance redress mechanism.

7. Analysis of Alternatives

399. This section discusses the alternatives considered for the Project and compares their environmental and economic benefits and drawbacks. The project initiated in 2009. Details of early options that were considered are not available. The following chapter is based on limited information discussed in the feasibility study.

7.1 No Project Option

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

401. Furthermore, there has been significant increase in congestion and accidents on the existing road especially during the tourist season in summer. The without project scenario will continue to increase the negative impacts generated by increased traffic loads on insufficient capacity of the existing road (traffic congestion, noise, low speed, higher emissions, accidents, etc.). Continuous growth of tourist and residential infrastructure along the existing road will further deteriorate the movement of international and transit traffic, smooth access of the local population, and tourists.

7.2 Alternatives to the Proposed Project

7.2.1 Alternate Method of Service Delivery

402. A major reason for the development of the Project is to reroute transit traffic. Alternate methods such as developing public transit cannot sufficiently meet this goal. Therefore, alternate service delivery methods were not discussed in the feasibility or design stages.

7.2.2 Alternative Project Design

403. Multiple alternates were considered before the selection of the final Project design discussed in **Chapter 4**. These include both location (alignment routes) and design (road tunnel vs overland) alternates. Technology alternates were considered for specific construction process such as tunneling and process alternates such as speed limits are discussed as mitigation measures in **Chapter 8**.

Process Alternates

404. The bypass is designed as a freeway and therefore has a speed limit of 90 kph according to Georgian standards. However, for specific portions where noise impacts cannot be mitigated by noise walls, lower speed limits have been suggested. This is discussed in detail in **Chapter 8**.

Location and Design Alternates

405. **Table 7-1** discusses the merits and demerits of each alternate alignment that was considered during the planning phases. Three alignments were considered during the Prefeasibility stage. These are discussed first. Further alternates were considered to the

prefeasibility selected alignment during the Feasibility and Detailed Design stages which are discussed in **Table 7-1** and shown in **Figure 7-1**.

7.2.3 Discussion

406. Overall, the selected alignment is the environmentally, technically and financially the best alternative as shown in **Table 7-1**. The resettlement impact is minimized as the alignment passes outside the built-up area however by keep the alignment as close to the city as possible, the length remains short and hence the cost does not increase significantly.

Table 7-1: Discussion of Alternate Alignments

Alternate	Economic	Environmental	Social	Conclusion
Prefeasibility Stage Alignments				
The westernmost alignment encroaches on the Batumi Municipal Development Area and passes through some heavily built-up areas; even more built-up now than when the prefeasibility study was carried out.	**Benefit:** The alignment is 0.5 km shorter than the central alignment and passes through easier terrain, removing the need for a tunnel.	**Benefit:** The alignment is relatively in flat are and will, therefore require, cuts and fill and disturbance to land	**Cost:** Increase in built-up area along route since feasibility study which would require large amounts of resettlement.	Unfeasible due to large resettlement impacts.
The central alignment follows the line of the Batumi Municipal Development Area to the west of Batumi, and runs along but outside the development plan margin.	**Neutral:** Price is between the western and eastern alignments.	**Benefit:** Is outside the Batumi Municipal Area and so does not cross major built up areas.		Selected as economically and environmentally most feasible alignment.
The easternmost alignment bypasses the developed area around the Bartskhana River and staying up to 2–3 km east of the Batumi Development Plan boundary.	**Cost:** This alignment is 0.5 km longer and an estimated 8% more expensive than central alignment.	**Cost:** The alignment is passes through relatively higher hills and will therefore result in more environmental disturbance.	Benefit: This alignment is likely to require least resettlement	Unfeasible due to larger costs involved without significant environmental benefits.

Alternate	Economic	Environmental	Social	Conclusion
Detail Design Stage				
Section 0 – 4500				
Use of the one km section of the existing highway that passes though Makhinjauri town and start of Batumi Bypass after the town.	**Cost:** Bypass uses existing main road that has traffic jams during the tourist season, thereby reducing the total positive impact of the Project. **Benefit**: Lower Project cost as the existing section road section is used.	**Cost:** Major impediments and difficulty in traffic control to tourist traffic during the tourist season as construction of the interchange will take place on the existing and only main road (S2). **Cost:** Passes in close proximity of a graveyard.	**Cost:** Large amount of resettlement of crowded houses, buildings and shopping district. Predicted environmental damages and civil complaints during construction and operation of road.	Unfeasible due to unfavorable impacts on tourism during construction and large required resettlement.
Start of the Batumi bypass before Makhinjauri town bypassing the densely populated section in Makhinjauri town.	**Cost:** More expensive as approximately an additional 2 km of alignment is added and 2 tunnels and 3 bridges incorporated into design to minimize resettlement. **Benefit**: Bypasses section of S2 running through Makhinjauri which is also prone to traffic jams in the tourist season.	**Benefit:** The two tunnels and three bridges in this portion of the alignment minimize resettlement as opposed to an on grade route through the same area.	**Cost:** Passes through the densely populated Makhinjauri town. **Benefit:** Alignment avoids graveyards	Selected due to lower social and environmental impacts than alternate and additional economic benefits.
Section 4500 – 10360				
Alignment contains 4 continuous curves in short distance		**Cost:** The frequent change of driver's vision due to 4 curves in short distance will raise the risk of accident.		
Alignment has one curve with large radius.	**Cost:** An additional tunnel had to be included in the Project Design (between chainage 4500 and 6850 mark in **Figure 7-1**).	**Benefit:** One curve with larger radius improves drivability as compared to 4 curves.	**Benefit:** Less land acquisition due to inclusion of tunnel.	Selected as alignment provides safer travel conditions.

Alternate	Economic	Environmental	Social	Conclusion
Section 10360 to End				
Towards the end of the alignment the land use consists of mostly agricultural fields.		The different alternates have similar environmental impacts.	The different alternates have similar social impacts.	Project alignment selected on design considerations.

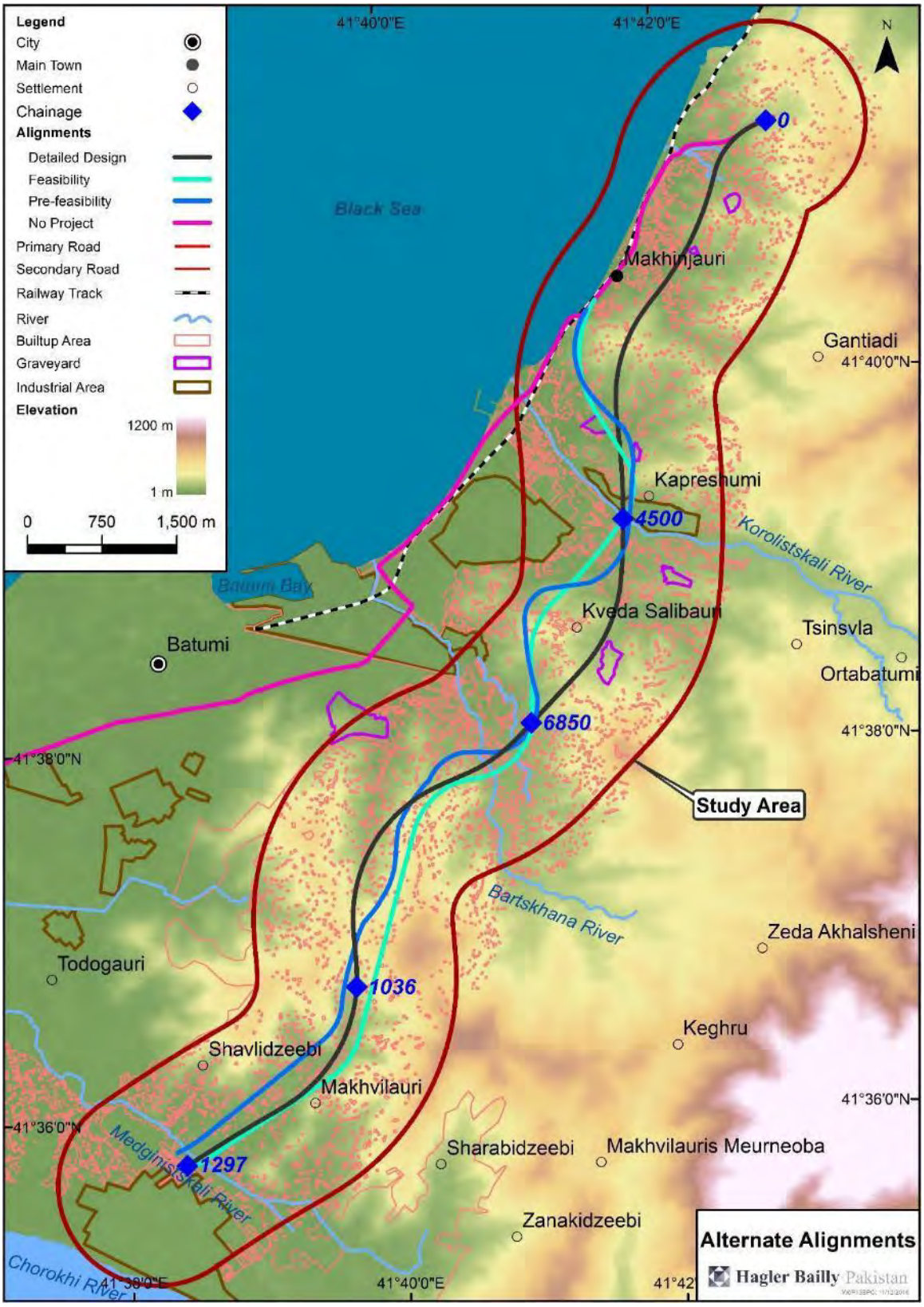

Figure 7-1: Alternate Alignments