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Adjaristsqali Georgia LLC

TRANSMISSION GRID STRENGTHENING PROJECT

CONSTRUCTION OF BATUMI-AKHALTSIKHE 220KV POWER TRANSMISSION LINE

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

Executive Summary

for Disclosure

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Introduction

The Government of Georgia, acting through Ministry of Energy and the Georgian State Electro-systems (GSE), would like to strengthen grid access for South Western Georgia by constructing a 220 kV double circuit overhead power transmission line (OHL), connecting the sub stations in Akhaltsikhe and Batumi. The new transmission line will ensure more stable electricity supply in the region, reducing outages and enable the GSE to meet the growing demand for electricity, as well as enhance export opportunities. The new transmission line will also allow the planned hydropower plants on the Adjaristsqali River, the 178 MW Shuakhevi HPP and the 150 MW Koromkheti HPP, under development by Adjaristsqali Georgia LLC, to be connected to the grid.

Adjaristsqali Georgia LLC (AGL), is a special purpose vehicle/company set up for the development of the Adjaristsqali Hydropower Cascade after Clean Energy Invest AS (CEI, Norway), through competitive tender, was awarded the rights to develop the hydropower potential of the Adjaristsqali River and its tributaries in the Autonomous Republic of Adjara. The company AGL is presently owned by Clean Energy Invest AS (Norway), Tata Power International (India) and InfraVentures (IFC, a member of the World Bank Group). Considering that AGL will benefit from the construction of the transmission line, the company has agreed with the GSE and the Government of Georgia to fund the development of the engineering and environmental studies required for the construction of the 220 kV Akhaltsikhe-Batumi OHL, whereas the construction works are to be financed from the World Bank loan. The Mott MacDonald Ltd (UK) has been assigned to undertake the engineering design for the transmission line and DG Consulting Ltd (Georgia) has been assigned to conduct the Environmental and Social Impact Assessment (ESIA). The GSE will be responsible for the construction and operation of the 220 kV OHL and will own the line. The GSE will also be responsible for land acquisition. AGL's responsibility for developing the project will end when the technical and environmental studies are approved/accepted by the GSE. Construction of the OHL will be part of the World Bank financed Transmission Grid Strengthening (TGS) project.

The ESIA report was developed based on Terms of Reference issued to DG Consulting by AGL in June 2013. The ToR, scope and content of the ESIA have been refined during the scoping stage consultations and are reflected in the scoping report. This ESIA report is structured in accordance with the ToR, Georgian regulations and the WB OP4.01 Annex B.

Legal and Regulatory Requirements

The ESIA process has been undertaken in compliance with the relevant national and international requirements. The Law of Georgia on Environmental Impact Permit (2008) sets out 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 examination of environmental documents presented to the Ministry of Environment and Natural Resources Protection (MoE) by the project proponent. Paragraph 6 of the law requires the project proponent to organize a public discussion of the ESIA prior to submission of the final version documentation to the Ministry.

TGS project is also required to meet the World Bank safeguard policies, including OP/BP 4.01 *Environmental Assessment*, OP/BP 4.12 *Involuntary Resettlement*, and OP 4.36 *Forests*. Decision on triggering of OP/BP 4.04 *Natural Habitats*, OP 4.09 *Pest Management*, OP/BP 4.11 *Physical Cultural Resources*, and OP/BP 47.50 *Projects on International Waterways* will be taken at a later stage of the project preparation. OP/BP 4.37 *Safety of Dams* is triggered although the TGS project does not finance construction/operation of dams. The reason for triggering this policy is that Adjaristskali Cascade Project includes construction of two high dams, and this project is associated with the World Bank financed TGS project.

The ESIA was also based on the World Bank Group's EHS General Guidelines and EHS Guidelines for Electric Power Transmission and Distribution, as technical reference documents with general and industry-specific examples of Good International Industry Practice. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. In line with Georgian environmental legislation and standards, the new *Draft Sector Guidelines on EIA: Electric Power Transmission and Distribution* (prepared by Dutch

consultants by the request of Georgian Ministry of Environment) have been used during the preparation of this ESIA.

In terms of technical standards and regulations, the OHL is designed according to EN 50341-1-2012 (Euro-Norms). This European Standard applies to new overhead electric lines with nominal system voltages exceeding AC 1 kV and with rated frequencies below 100 Hz. The design also considers *Rules of Installation of Electric Equipment - ПУЭ,* used by the GSE (Ministry of Energy, 1987).

In addition to the above standards, the GSE is following the regulations set up in the Presidential Decree #964 (dated 27 December 2009) *On the Protection Procedures for Electricity Grid Linear Facilities and Determination of its Protective Zones*. This document sets/regulates the procedures for the protection of power lines including the parameters (area, distances, width, clearances) of the safety zones, access roads, Right of Way (RoW) in forests and other treed/vegetated areas, conditions for locating/constructing buildings (other facilities) and conducting works in these protective/safety areas.

Environmental Screening and ESIA Process

Screening of the project has been undertaken to evaluate the need of conducting an ESIA study and the level of study. The screening stage was concluded based on the requirements of the Georgian legislation and the World Bank requirements.

According to the Law of Georgia on the Environmental Impact Permits (2008, Chapter II, Clause 4.1.k), projects related to construction of the high voltage transmission lines (above 35 kV) are subject to the State Ecological Examination and Environmental Impact Permitting (as a part of Construction Permit), and thus require a full scale ESIA.

According to the World Bank's OP/BP 4.01, an environmental screening of the project has been undertaken to classify it into a relevant environmental category, and to determine the appropriate extent and type of Environmental Assessment (EA) needed. Based on screening exercise undertaken at the pre-feasibility and routing study stage (including visual assessment and check-lists), it has been concluded that the TGS project involves substantial new construction and some sections of the transmission line are crossing green-fields and sensitive environmental areas (forests). The project has the potential to cause adverse impacts on the community and on the environment. It is clear that project implementation is associated with the need for private land acquisition with the possibility of affecting households and assets, and maybe with the need for physical relocation. So the project may impact sensitive areas and has the potential to have diverse types of environmental and social effects. Therefore, the TGS project is classified as environmental **Category A.** Its preparation requires conduct of a full scale ESIA, a public participation process that involves consultations at least at two stages of the EA process, and development of a Resettlement Policy Framework and Resettlement Action Plans (RAPs).

Public Participation

The Stakeholders Engagement Plan (SEP) for the OHL is prepared as a stand-alone document to document consultation efforts linked to the ESIA process and define a strategy to maintain an adequate stakeholder engagement throughout the life of the project, including a public grievance redress mechanism. The public consultation process for the construction of OHL started with initiation of scoping for the ESIA in June-July 2013. Scoping process considered meetings with the MoE, Ministry of Energy/GSE, meetings with regional (Autonomous Republic of Adjara, Samtskhe-Javakheti Region), municipal and local authorities (Akhaltsikhe, Adigeni, Keda, Khulo, Shuakhevi, Khelvachauri, Batumi), several NGOs and affected communities along the transmission line route. The various engagement and disclosure activities have been undertaken for the Project and are planned ahead during the disclosure period (tentatively January-February 2014). Project stakeholders consultation activities are reflected in a Minutes of the Meetings, and the outcomes considered (feedback) in this ESIA report. The major concerns that were raised during scoping meetings in Tbilisi, Akhaltsikhe, Adigeni, Keda, Khulo, Shuakhevi, Khelvachauri and Batumi fell into several major categories:

Environmental:	-	Concern about impacts on flora and/or fauna, forests.
	-	Concerns about the potential impacts on landscapes and views.
Social:	-	Concern about potential health effects of high-voltage transmission lines
	-	Concern about having to relocate to a house farther away from the line.
	-	Concern about damage to existing houses from derelict towers.
Economic:	-	Concern that construction/maintenance could damage crops or affect grazing.
	-	Concern about loss of land to foundations and towers and to access roads.
	-	A desire that local workers be hired for construction and maintenance
	-	Concern about impacts on recreation at Beshumi new resort area
Cultural:	-	Concerns about impacts on the monuments and cemeteries.

Present draft ESIA report is now disclosed through the GSE's web page for public feedback. Consultation meetings on the draft ESIA report will be held in the capital city of Tbilisi and within the project area, where local stakeholders and people directly affected by the OHL construction will be able to participate. the ESIA report will then be finalized and re-disclosed.

Sensitive Environmental and Social Receptors and Potential Impacts

The TGS project area covers corridor from Akhaltsikhe towards Batumi through Goderdzi pass and Skhalta and Adjaristsqali rivers and finishes in Chorokhi valley below the confluence of Adjaristsqali and Chorokhi rivers. The OHL corridor avoids protected areas located in the mentioned part of Georgia, it passes in 9 km distance (closest distance) to Borjomi Kharagauli National park, which is located north from Akhaltsikhe. The project corridor also avoids Mtirala National park. The shortest distance to the park territory equals 2.7 km, in reality there is ridge separating national park from the project corridor. Because the project corridor mainly follows Skhalta and Adjaristsqali rivers, it is also away from a recently established National Park of Machakhela. As a result of screening and scoping process, it is concluded, that the project does not affect any legally protected areas. In terms of internationally recognised areas - about 10 km long lower section of the 150 km OHL RoW falls within the important international migratory corridor of birds, out of which the potential impacts of the OHL construction and operation may be significant within 5-6 km segment, where birds are known to fly closer to the earth surface.

Although being far from the protected areas, the Akhaltsikhe-Batumi transmission line passes through several sensitive forested areas and alpine meadows, where habitats have been carefully studied to identify receptors' sensitivity, avoid fragmentation and properly select relevant mitigation. The adverse environmental impacts of the proposed OHL construction will be generated by land clearance for RoW, earthworks for tower foundations and transportation of materials. The adverse social impacts of the OHL construction activities in populated areas will be related to land acquisition for towers foundation (which is minimized through avoiding the settlements), short term disturbances caused by noise, emissions, disruption of traffic patterns and limitation of access to sites, traffic safety etc. Usually, adherence to common good construction practices is sufficient for minimizing impacts. For sensitive environmental sites where magnitude of impacts and consequences are relatively high, specific protective, mitigation and offset measures are proposed.

Project Alternatives

Alternatives to the proposed transmission line were evaluated to determine whether they were reasonable and environmentally and socially preferable to the proposed action. The alternatives considered include the no-action alternative, alternative systems, design alternatives, route and tower location alternatives.

Under the **no-action alternative**, the OHL would not be constructed and all direct environmental and social impacts associated with construction and operation of the proposed electric transmission lines would be avoided. Planning and design of the section from Akhaltsikhe to Batumi started in 80-ies aiming to eliminate the Batumi "dead-end" through connecting it to Akhaltsikhe and making system grid more effective and reliable. However, after 1992 the construction became impossible due to

political events in Georgia, and these plans have been postponed. So it is already more than 20 years of “no action” undergo. At the same time it is clear, that without the electric transmission infrastructure, the AGL and the GSE would not be able to provide electrical energy produced at the Adjaristsqali Cascade Hydropower Scheme (in particular Shuakhevi HPP, Koromkheti HPP, which are already under construction) to surrounding communities, Georgian grid and for the export to Turkey. So the consequences of “no-action” alternative for the proposed OHL project should be considered only in conjunction with “no-action” for the entire Adjaristsqali Cascade Hydropower Scheme, which is approved and already under construction.

The **system alternatives** are alternatives to the proposed actions that would make use of other existing, modified, or proposed electric transmission systems to meet the objectives of the TGS project. In this particular case the proposed OHL is related to elimination of the Batumi “dead end” of the grid, simply to “close” the system circuit, and also related to the construction of new HPPs in the area where the required power transmission capacities do not exist at all, and the new lines should be constructed anyway, simply to deliver produced power to the grid.

This TGS Project will be an integral part in the development of the Georgian State electricity grid. This work will provide a safe and secure link between Batumi and Akhaltsikhe whilst also allowing future connections to other area of Georgia such as in the north and far eastern side of the country. Two key positive effects of this work will be: secure provision of electricity to people even in the winter months and the generation of substantial sums of money from electricity sale to Turkey and the associated taxes that eventually filter back into the Georgian communities, which will help to ensure the sustainable social development of the area.

Two types of transmission line design, an underground cable and overhead transmission line can be considered for part or all of the transmission lines’ routes. As a **design alternative,** an underground cable system, though visually appealing in the long run, will cause more disruption during construction and decommissioning as it will involve a larger area for excavation and hence greater negative environmental and socio-economic impacts, especially in residential areas. In addition the line ROW runs through the areas prone to erosion and landslides in Zemo Adjara, making any extensive excavation activities in the area highly disruptive. So the reasons why underground options are not considered as alternatives to the project are, firstly, of technical nature, given the technical difficulties and complexity in terms of the safety and reliability of an underground line, secondly, due to significant cost, and thirdly, because the damage to environment from the trenching/earthworks and ancillary infrastructure required for underground cable is times higher than from OHL solution. These limitations are the reason why this type of project is not carried out in Georgia and is very seldom in Europe. Even for the section which has some potential to interfere with birds’ migratory route the cable alternative has been considered as having more significant impact comparably to impact on birds. The potential impact on birds may be effectively and more easily mitigated comparably to impact of continuous trenching onto geo-hazards in the area specially known for being prone to landslides.

There have been a large number of factors considered for selecting the **routing alternative and tower positions**. These factors include but not limited to: consideration of geotechnical, environmental and archaeological constraints and where the areas of natural parks, areas of scenic or historic value or posing geological hazards have been avoided; consideration of the most direct line possible to be taken, where sharp changes in direction should be avoided, with the minimum number of angle supports placed; consideration that the route line should follow natural lines created by topographic change, geology and vegetation that will help to minimise the visual impact. The project engineers have evaluated tower locations for the preliminary route and considered non-environmental factors such as the preferred and maximum spacing between the towers, as well as, environmental and social factors including avoiding or minimizing impacts to the local communities and agricultural lands.

Two alternative routes have been evaluated for the first section of the OHL at Akhaltsikhe (Zikilia) Substation between AP01 to AP05 - the Southern Alternative and the Northern Alternative (Aternative 1.1 and alternative 1.2 consistently). Eventually the Northern Alternative has been selected because it ensures that the **visual impacts** and **impact on communities** population will be significantly less for the entire operations of the line, i.e. entire lifetime of the project.

Two alternative routes have been proposed during the routing study for the section AP37 – AP60. One passes through Skhalta Gorge (Alternative 2.1). and the second follows unnamed gorge located between Skhalta and Adjaristskali rivers (alternative 2.2). The northern alternative route through the unnamed valley crosses non-impacted natural forest, which is the only area considered as a **natural habitat** remaining between Skhalta and Adjaristskali valleys. Based on reference sources and information collected at stakeholder consultations, the southern alternative through Skhalta valley (2.1) was chosen as a preferable alternative and is therefore being pursued.

Two alternative routes have been considered in the section from v.Otanaskhevi to v.Zamleti (AP 47 – AP 60; alternatives 3.1 and 3.2), which is located on south alternative section through Skhalta river gorge (2.2). The analysis of alternatives at this section clearly indicates that despite more difficulties in construction and slightly higher cost, the Alternative-3.1 has advantages in terms of reduction of river crossings, impact on **flora** and **fauna, social impact** on communities**,** impact **on landscapes and visibility,** as well as impact on **geo-hazards**.

There are two alternative routes considered for the last section (AP155–AP160; Alternatives 4.1 and 4.2) where the OHL approaches Batumi Substation. Considering the request of the local administration and population, expressed at the public consultation meeting in Khelvachauri, as well as number of **affected households,** the Alternative 4.2 has been developed along the right bank of Chorokhi River. Both alternatives are generally acceptable from environmental point of view, but may differ with respect to potential impacts on bird migration and requirements for land acquisition. Further evaluation of the environmental and social impacts and costs of their mitigation under these two options will be undertaken based on more detailed information that will be available at the detailed design stage.

Project Description

The OHL will start from existing Akhaltsikhe 500/400 kV back-to-back substation and will connect to existing Batumi 220 kV substation. The total length of the line is about 150 km and it will be a double-circuit line with Aluminium-cold Steel Reinforced (ACSR) conductors and an Optical Ground Wire (OPGW). Activities envisaged by the project include right-of-way acquisition, land clearing, arrangement of access roads to the towers/poles where required, construction of foundations and towers, stringing – installation of conductors, insulators, other equipment. Various features/sections of the project are located in each of the following municipalities: Akhaltsikhe, Adigeni, Khulo, Shuakhevi, Keda, Khelvarchauri and Batumi. The final design is based on the outcomes of the routing study, geo-technical and cadastral surveys, towers spotting and the present ESIA. The construction cost is estimated to be around 40 million USD.

The Routing Study has been undertaken in 2012-2013 to identify a preferred corridor for the construction of a proposed 220 kV overhead line connecting Akhaltsikhe and Batumi substations. The main considerations during the selection of route corridor were: the ease with which the route can be accessed for construction and maintenance; the constructability of the line taking into account the topography; environmental constraints; minimization of social impacts and ground conditions, including areas prone to landslides. The transmission line corridor practically follows the main river gorges, where the most population and infrastructure are concentrated. The corridor passes the plateau area in vicinity of Akhaltsikhe city located to the south from lesser Caucasus ridge. Then the corridor continues west, crosses the highland section near to the Beshumi Ski Resort and dives into the Skhalta River gorge. The corridor follows Skhalta River down to confluence with Adjaristskali River and after follows the river and main road down to Batumi, where overhead line will be connected to the existing substation in Batumi. The proposed corridor uses an existing line (called the 110 kV “Adigeni-Beshumi”) corridor for approximately 11 km of the route (east of Beshumi). Short sections of OHL are parallel to the public road. The tower heights will be at a minimum distance from the edge of road equivalent to the height of the tower.

Tower spotting work has been undertaken following the topography survey/walkover and in collaboration with the environmental and social constraints mapping. The concept developed largely avoids built up areas, thus minimizing the need for private land acquisition and resettlement. The line route itself has been chosen to avoid settlements and their associated infrastructure as well as tourist areas. The land parcels for pole foundations will be acquired and will become property of the GSE.

Each tower needs up to 200 square meters of land dedicated for construction of foundations. The OHL route is designed in a way to go over the minimal number of living houses. However, excluding such incidence is not possible and the exact number of affected houses will be known once the detailed design of the OHL is produced. Houses and land plots falling within the RoW will have to be vacated. Relocation and compensation will be carried out following the guiding principles and compensation methodology provided in the Resettlement Policy Framework (RPF) and according to the site-specific Resettlement Action Plans (RAPs). Parcels required for installation and stringing will be impacted only for short period of time, accordingly the land parcel will be temporarily used and the compensation will be paid only for temporary damage if such happens as per the project's Resettlement Framework and corresponding Resettlement Action Plan. The significant number of parcels required for the positioning of poles is located on the State owned land, particularly forest land. For these parcels full topography information will be submitted to the National Forestry Agency (under the MoE) in order to exclude them from the State Forest Fund and transfer it to the GSE.

The transmission line towers will have around 300-400 m spans on average, be approximately 35 meters high, and require around 50-200 m^2 area for the foundation (depending on location, at steep slopes the bigger area may be required). The ROW of a transmission line includes land set aside for the transmission line and associated facilities, land needed to facilitate maintenance, and to avoid risks of fires and other accidents. It provides a safety clearance between the high-voltage lines and surrounding structures. The proposed OHL will require average 65-meter-wide RoW. The span will be determined during the design in order to ensure the line will maintain a minimum vertical clearance of 8.0 m from ground obstructions, roads, or trees.

During construction of the line the access roads will be used to bring workers and materials to the tower sites to conduct tree-cutting operations (where needed), construct foundations, assemble and raise the towers and install/string the conductors. Some local roads used by the local population and quite well-established will be partially used as access roads for the proposed line. Where needed, clearing for new access roads will be 4 to 5 meters wide.

Once constructed, the transmission line will require minimal maintenance. Yearly visual inspection of the OHL towers and conductors is expected to remove tree or branches where these start to grow too close to the OHL. The operation and maintenance of the transmission line will be based on accepted international standards. The GSE has its own specific procedures for the operation and maintenance of its lines.

ESIA Methodology

This ESIA addresses all the areas affected by the construction of the transmission line related to all phases of the project. The evaluation of impacts is proportionately based on an assessment of their extent (local/regional/national), duration (short, medium or long term effects) and reversibility (temporary or irreversible effects). The ESIA study has been undertaken in compliance with Georgian laws and requirements, international best practice including World Bank and the IFC standards and relevant WBG Guidelines and is covering the entire planned route including ancillary facilities/infrastructure such as access roads, substations, camp sites, etc.

This impact assessment accounts for all of the activities involved in the project, and describes direct, indirect and cumulative impacts on physical, biological and social-economic-cultural resources at the construction, operation and maintenance phases of the project. The following baseline data collection/survey methods have been applied and actions undertaken:

1. The study area has been defined from 500 m to 1000 m along the RoW center line, wide enough to include all the territories likely to be significantly affected by the Project.
2. All relevant national and local agencies have been contacted to collect information on the baseline environment and sources of data and information on the existing environment are adequately referenced.
3. The desk study reviews and field reconnaissance/surveys were used in order to ensure the complex analysis of data collected and verification during the field surveys.
4. The social studies include collection of information via field surveys (general questionnaires) in all municipalities crossed by the power line or supporting infrastructure (access roads);

5. Visits by the environmental team to the line corridor in July-September 2013 for in-depth study of the physical and biological resources based on outcomes of the scoping stage and finalising the identification of potential receptors.

Detailed field works have been undertaken to study Flora in the project corridor. On the first stage (scoping stage), the entire OHL corridor was walked through by the botanists to provide general description of vegetation cover. It was followed by the second session of field surveys, when zones with similar ecosystems/ habitats were identified. The outcome of second assessment was used for production of Flora Constraints Maps passed to Engineers and used during the fine tuning of project corridor. The representative parcels in each zone were selected for detailed description of plant species, communities and vegetation coverage; the later was assessed using Drude's methodology. In total 35 parcels were described in detail for the corridor. Special attention was dedicated to the forested areas, as the significant part of the corridor is covered with different type of forests.

The detailed field works for Fauna baseline and impact assessment included rapid and detailed field surveys, Rapid survey was conducted through the walk over of entire project corridor and identification of most important and sensitive areas. The outcome of rapid assessment was used for production of Fauna Constrains Maps used during the fine tuning of project corridor. Later on detailed investigations of sensitive areas were conducted in order to identify the areas of high likelihood to impact sensitive fauna species. Transact method was used on this stage for identification animals vital activity signs.

Two detailed bird studies were accomplished prior to the ESIA stage in order to cover bird migration periods and identify sensitive areas in terms of migratory birds and especially raptors. Findings of mentioned studies plus surveys carried out in sensitive spots, created good basis for further impact analysis.

The following **direct/primary** impacts have been identified and analysed during the assessment:

- effects on land uses, people and property, geological features and characteristics of soils, fauna and flora, air quality, hydrology, uses of the water environment, acoustic environment (noise or vibration) - have been described and where appropriate quantified;
- effects on locations or features of cultural importance are described;
- effects on landscapes, on views and viewpoints are described and partially illustrated;
- effects on demography, social and socio-economic conditions in the area are described;
- effects on human health and welfare are described and where appropriate quantified (e.g. health risks arising from major hazards associated with the Project, changes in living conditions, effects on vulnerable groups).

The ESIA also covers any **indirect, secondary, cumulative, short-, medium- and long-term, permanent and temporary, reversible and irreversible, beneficial and adverse impacts** of the proposed OHL Project, determining their significance. For each major receptor the level of sensitivity has been determined and assessed together with parameters of impact consequences (such as extent, intensity, duration, probability) to evaluate overall significance of each particular impact. For each major receptor, with relevant possible impacts considered, the corresponding generic and specific mitigation measures are identified for the design, construction and operations phases of the Project. All these mitigation measures with corresponding monitoring are reflected in the Environmental and Social Management Plan.

Baseline Data

The baseline study of the conditions of physical, biological and socio-economic environment along the OHL route comprises outcomes of the desk review of publically available literature/studies/reports and the field survey of environmental and social components, which were considered sensitive to the proposed development.

Physical Environment - In terms of geology and geohazards - prominent feature of deposits in the project region is high erosion potential, especially due to action surface runoffs. This imposes high landslide risk in steep slope areas. Many new and relict landslides are recorded during the Routing Study (Mott MacDonalds, 2012). This is of particular importance for the OHL section between the Beshumi and Khelvachauri, which is known for steep slopes. Great number of active, relict and potential landslides is recorded on this section during Routing Study; many of them are large-scale.

Winds blowing along the Adjaristskali River valley predetermine good ventilation and high quality of the air. The only sources of noise in the project area are – rivers and the road. No industrial sources of noise/vibration are available. Major land use types in the area are agricultural, which could be encountered along the entire project corridor. This comprises croplands, as well as meadows for *mowing* or pasture.

Biological Environment - In terms of **flora** the Caucasus biodiversity hotspot supports a large number of endemic plant species, where the unique biodiversity of this area is threatened by forest clearing, illegal hunting and plant collecting. There are no specific restrictions for development or human activities within the hotspot boundaries, however high sensitivity of the area itself has been considered during the environmental constraints mapping for routing/design and during the preparation of ESIA. As it has already been mentioned, the OHL line corridor avoids protected areas located in South-West part of Georgia. The desk study was conducted during the Summer 2013 followed by the field works for reconnaissance of proposed route 500-1000 m wide corridor inclusive the alternatives. The field work has clarified available information regarding the flora species within the corridor. The **habitats** are changing very rapidly in V shape deep gorges of Adjaristskali and Skhalta rivers. Within the proposed corridor practically all different types of habitats are observed, starting from riparian forests located near to the rivers, mixed forest covering the sharp slopes and alpine meadows at the tops of forested slopes. As a result of detailed botanical investigation of project corridor, five plant species included **in the Georgia Red List** were identified in the designed project corridor: Juglans regia L., Ostrya carpinifolia Scop., Buxus colchica Pojark., Castanea sativa Mill., Ulmus glabra Hudds. There are also few populations of some rare, endangered and endemic species in the project corridor. In terms of **fauna** the most important impact is expected on avifauna/birds and especially migratory birds, however impact on small mammals should be also considered during the construction period.

The ESIA has identified number of spots with medium and high sensitivity to flora and fauna species. In terms of flora species the highly sensitive areas are related either to alpine meadows or forests. Approximately 40km of forested areas are crossed by the OHL corridor. The most sensitive and valuable forest, where the human activities is very limited, was initially crossed by the alternative 2.1 which has been eventually rejected due to the impact on valuable forest. The selected corridor passes through the variety of forested areas, however, due to the character of anticipated works, no significant fragmentation of forest habitats is expected. Clearing of vegetation along the RoW will be required during construction, however natural regeneration will be allowed afterwards and only high growing trees will be eliminated permanently. Because the mild climate and high humidity are favourable for rapid natural re-vegetation in the project area, partial recovery of the land strip under the OHL is expected soon after the completion of construction, bringing impacts on terrestrial fauna to insignificant minimum. Overall, the area of Project's impact on the forested land makes less than 0.2% (350 ha from 200 000 ha) of the total forest ecosystem in project affected municipalities. Furthermore, no plant or animal populations of the species occurring in the project area are significantly dependant on the forest stands falling within the RoW of the OHL. Therefore, construction and operation of the OHL will not affect habitats that are critical for the viability of the existing populations.

In regards of migratory birds, the Khelvachauri municipality is located on the one of the most important corridors of bird migration. The OHL projected route is very close to the mentioned corridor at the confluence of the rivers Adjaristskali and Chorokhi. Some sections of the OHL will cross this migration route, known as Batumi Bottleneck. The bottleneck is autumn flyway for migratory raptors. The development of re-routing alternative to avoid this sensitive area is impossible, as the final connection point - that is the Khelvachauri sub-station - is already built and operating there for decades. Therefore, the only option is to design the OHL towers and conductors applying best practice features to reduce the likelihood of bird collisions and electrocutions. This will include placing of conductors within the distance established to avoid electrocutions while perching, and equipping the cables with bird reflectors to increase their visibility and rescue collisions. Bird monitoring will be ensured at the OHL operation phase to check birds' mortality rate, verify effectiveness of mitigation, and determine the need for additional measures. The bird studies have been conducted in Autumn 2012 and Spring 2013 in order to establish informative baseline and to propose adequate mitigation measures where/if necessary.

As for the protected bats, the number of bat species is higher in middle section of Adjaristskali river. Usually the bats populations are concentrated along the rivers close to the food base and where they live in tree hollows. The known bat migration corridors are not located within the proposed OHL

corridor. It is well known, that the major impacts on bat's caused by the OHL lines are limited to EMF impacts interfering with radiolocation system of the bats. The risk of bat collision with OHL is usually negligible. The loss of habitat is caused by corridor clearance, where the aged, large size trees are removed from the corridor. This issue was well covered in constrains maps prepared during the design stage and route selection of the OHL line. The line corridor was moved to mountain slopes to minimize impact near to river banks. In case of Batumi-Akhaltsikhe 220KV line, the area of high EMF zone is rather limited, it rapidly decreases with increase of distance. The cumulative EMF effect is not an issue, as there are no high voltage lines in the project area sensitive to bats. Accordingly impact on bat population is defined as low.

Socio-Economic and Cultural Environment - Number of large and small scale settlements are scattered along the ROW, some of which will be crossed by the OHL, whilst others will be bypassed. Some industrial areas could be also found in proximity of larger towns. About 30 settlements are found within the 500 m corridor of the OHL. Of these 15 belong to Keda Municipality. All these settlements are mountainous. Great majority of population are ethnic Georgians. No indigenous people identified neither in Samtskhe-Javakheti nor in Adjara region. Agricultural land resources are rather limited in the region due to complex topographic conditions and comprise only 25% of the total territory. Arable lands are even more scant, comprising only about 15% of total agricultural lands. Availability of arable lands is very limited in middle and high mountainous municipalities of Khulo, Keda, Khelvachauri and Shuakhevi. The OHL corridor at some locations crosses public and private infrastructure or runs in the close proximity. These include public roads (main roads and secondary roads), water supply pipelines, BTC/SCP pipelines, other overhead lines, etc. The routing study has identified major infrastructural objects in the proximity of and within the proposed OHL corridor. Number of historical sites are located along the OHL route, such as late medieval religious structures in the vicinity of Didachara and Beghleti, medieval fortress in the Diakonidzeebi Village, medieval bridges near the villages of Zamleti and Okruashvilebi (Khulo Municipality), etc; number of 19th century religious buildings in Keda Municipality; cemetery near the Mugareti Village (Akhaltsikhe Municipality), etc.

Potential Impacts and Mitigation Measures

The **construction of the OHL** requires limited land clearance: (a) only tower installation sites will be permanently occupied and cleared from vegetation; (b) for the sections between the towers tall trees will be felled, while the bushes and grass vegetation will be maintained unaffected. Adverse social impacts of construction activities are related to short term disturbances caused by noise, emissions, disruption of traffic patterns and limitation of access to sites, increased truck traffic and traffic safety, etc. All these impacts will be managed through relevant mitigation measures and proper community liaison mechanisms, as it is presented in Sections 8 and 9 of this report Beneficial social impacts for the local communities could be associated with some additional employment opportunities and the improved prospective for economic development due to better power supply conditions.

The **operation and maintenance of the proposed OHL** are related to number of specific environmental and social impacts: certain limitations to the land use within the RoW, avian collisions and electrocutions causing loss of bird species, impact of electro-magnetic fields (EMF) on workers and communities (are expected very low/negligible due to voltage doesn't exceed 220 kV), community and occupational health and safety risks associated with accidents, emergencies, risks of electrocution, risk of fire. Impacts of the maintenance works during operation phase are much less significant and diverse. However, all these impacts will also be managed through relevant mitigation measures and proper community liaison mechanisms, as it is presented in Sections 8 and 9 of this report.

The following **impacts on natural environment** are expected and mitigation proposed for the construction and operation phases:

Soils - Soils excavated for tower foundations will be used for backfilling excavations and will not be left exposed to wind or water for long periods. Construction traffic will follow defined temporary access routes to be established as part of the works so as to avoid damaging the soil structure in the wider area. Degraded areas will be re-planted with local species endemic to the area to improve ground cover and provide erosion control.

Geology and Geohazards - Prominent feature of deposits in the project region has high erosion potential, especially due to action of surface runoffs. This imposes high landslide risk in steep slope areas. Many new and relict landslides are recorded during the Routing Study. The alternatives ensure that landslide areas of high risks are avoided, and it is accomplished by the design team at the design stage. However, the erosion control measures and regular observations and landslides monitoring during the routine maintenance are considered.

Drainage, Surface Waters and Water Resources – During the design the route has been selected with consideration of minimum river crossings and only very few towers located in the floodplain. The towers within a floodplain will be constructed in a way that existing water flow regimes in rivers, streams and other natural or manmade channels will be maintained or not affected. The contractors will develop and implement run-off and erosion control measures, especially in mountainous, hilly terrain areas and on slopes. Implement these measures for both construction and operation periods to avoid surface water siltation. This is especially true for the towers located on the floodplains, stream terraces and hill slopes. Silt fences will be placed downgradient of all areas of exposed soil within ROW to capture sediment in runoff.

Access Roads - Temporary access roads will be ripped and rehabilitated after the completion of the construction phase where these would not serve either the on-going maintenance of the OHL or the local community. In general, vehicles and equipment will travel across unprepared ground, with no preparation or road construction unless efforts are needed to control erosion or excess land disturbance.

Traffic and Transport - The transport of heavy and abnormal loads will be undertaken out of normal working hours whenever possible. The locating of access roads and design of detours shall be undertaken in consultation with the local community. Impacts on structures along access roads (i.e. cracks on houses) associated to vibration will be assessed, including a baseline of pre-project conditions, and mitigated.

Air Pollution, Noise, Liquid and Solid Wastes, Materials Usage - these impacts are temporary/short term during the construction phase and are addressed in ESMP through applying common management practices and mitigation measures.

Flora and Fauna, Loss of Biodiversity and Impact on Habitats - The OHL route is designed in a way that doesn't affect any critical habitats or endangered species. Considering the very limited footprint of the project (towers foundations only) and the remaining low vegetation along the RoW, it allows to reduce the impact on flora. In order to further mitigate impacts on biodiversity, the pre-construction survey and Contractor's Biodiversity Management Plan will ensure that there is minimum clearing of vegetation and the Reinstatement Management Plan will ensure that re-vegetation of disturbed areas occurs following construction.

Avifauna/Birds - Considering that the proposed project is located close to the bird migration route, in addition to design solutions keeping low profile along the slopes within the migration corridor, towers and cables are designed up to best practices to minimize bird's collision and electrocution cases. The cables will be equipped with bird reflectors to increase their visibility and farther rescue bird collisions. Bird monitoring will be ensured on the OHL operation phase to verify effectiveness of mitigation and determine the need for additional measures.

Landscape and Visual Impact - From the perspective of a traveller, these would be temporary effects, occurring only when passing through areas within the viewshed of the OHL. For residents living within the viewshed of the transmission line, the change in landscape would be significant only for those living within two kilometers of the OHL, considering the lattice structure of the towers. In addition to the mitigation already incorporated into the design of the line route (reducing viewsheds), the awareness raising through public consultation should also help to lessen adverse reaction to the OHL.

The following **impacts on socio-economic environment** are expected and mitigation proposed for the construction and operation phases:

Displacement and Relocation of Project Affected Parties Construction of the OHL will require physical relocation of the small amount of the project affected people as well as temporary restriction of land use leading to crop loss. All cases of resettlement will be handled by the GSE according to the RPF through the development and implementation of RAPs. Mobilization of works contractor to a construction site will not be allowed until the site-specific RAP is implemented to the satisfaction of the World Bank.

Land Use - The impact on crops will be reduced either by undertaking the construction works after the crops harvest or by compensating for all damaged crops. Farmers will be compensated for any disruption to or loss of crops and land arising from the construction. Awareness campaigns will be undertaken to ensure that farmers are aware that the RoW can be used for grazing and arable crop farming but not for tree planting. It has been constantly explained at the public meetings with the community representatives along the OHL that most farming and grazing activities of low height crops will be allowed in the RoW.

Employment of Local Labour/Gender Issues - The use of local labour should be maximised during the operational phase of the projects (e.g. in providing security, undertaking vegetation control, etc.) and training provided so as to provide capacity building. As an enhancement measure, it is recommenced that equal employment opportunities are given to women within the project skills requirements and that the procurement of local products and services is maximized.

Electro-Magnetic Fields - amongst the negative social impacts on local communities, impact of EMF on workers and households residing close to the high voltage power transmission lines should be considered. Mitigation: the sanitary protection zones and safe distance of transmission line facilities and substation from the residential and public areas should be regarded. Monitoring of the sanitary protection zones and safe distances will be undertaken annually, as well as measurements of the EMF strength at the boundaries of the sanitary zone.

H&S, Emergency Situations and Accidents - line break along the transmission line may cause fatalities among the local residents and/or their animals. Mitigation: earthing and lightning protection system of transmission lines will be installed according standards; Emergency Response Plan developed by the GSE and preparedness ensured. Safety requirements and signs installation fulfilled and PPE provided to the operating personnel, permanent monitoring and maintenance of transmission lines.

It is considered feasible to mitigate and manage the majority of impacts associated with the project through appropriate environmental and social management together with the monitoring, specified in the Environmental and Social Management Plan that represents the outcome of this ESIA process.

Environmental and Social Management Plan

The Environmental and Social Management Plan (ESMP) for this project consists of Environmental and Social Mitigation Plan, developed to clearly identify mitigation measures and management practices that should be implemented to minimize, reduce or eliminate the adverse impacts identified in the ESIA, and the Monitoring Program for the monitoring over the implementation of mitigation measures and of the residual impacts at the construction and operation phases of the Project, following the best management practices.

Generic environmental and social management practices, as well as specific mitigation measures for the OHL, are identified and presented in Environmental and Social Mitigation Plan matrix. The **Mitigation Plan** will be provided to prospective bidders for the construction contracts, to ensure that detailed environmental and social mitigation measures and costs are included into their technical and financial proposals. The GSE will ultimately be responsible for ensuring that the Mitigation Plan is implemented on site via **Monitoring Program** and its own Environmental and Social Management System (ESMS), which considers environmental and social supervision capacities/resources (within the GSE, or contracted out to Supervision Consultant) for the monitoring over the construction and operation of the Project and operation of the Line.

Environmental and social impact mitigation measures have to be further developed upon Pre-Construction Survey undertaken by selected/awarded Contractor before proceeding with initial stages of construction (i.e., RoW clearance, topsoil stripping for foundations, arrangement of access roads, conductors stringing, etc.), to ensure that they consider and carefully plan the implementation of each mitigation measure under their responsibility. Documents to be prepared by Contractor and cleared by the GSE prior to contractor's mobilization to each discrete work site include: Waste Management Plan, Traffic Management Plan, Pollution Prevention Plan, Biodiversity Management Plan, Reinstatement Plan, and Health & Safety Management Plan (including working on heights and prevent electric caution, etc.).

In response to environmental impacts identified and mitigation proposed during this ESIA study, the Monitoring Program has been developed as an integrated part of Environmental Management Plan. Environmental and social monitoring is needed to verify the effectiveness of the proposed mitigation measures in reducing impacts and also to allow mitigation measures to be refined or developed as needed to address actual impacts and future effects/developments. The Monitoring Program describes the parameters to be monitored, the activities to be executed, locations, time and frequency of monitoring activities. The monitoring will comprise supervision and surveillance to check whether the contractor is meeting the provisions of the contract during construction. Environmental supervision and monitoring, as part of the Developer's (GSE) ESMS are to be conducted throughout all phases of TGS project. It is assumed that the GSE through the qualified environmental staff and a consulting company will be responsible for all monitoring activities, and that the results would be reported to the GSE, the Ministry of Energy, MoE and other stakeholders as appropriate. The GSE will be responsible for reporting on the outcomes of environmental and social monitoring and the status of contractor's compliance with ESMP to the Bank as part of the monthly reporting on the progress of the TGS project.

Operation of the Transmission Line

As it has already been mentioned above, the GSE will be responsible for the construction and operation of the OHL and will own the line. The operational phase of the project will involve the commissioning of the line and maintenance of the ROW, the power lines and the towers. The operation and maintenance of the transmission line will be based on accepted international standards, such as those of the International Electro-Technical Commission (IEC). The GSE also has its own specific procedures for the operation and maintenance of its lines as set out in the *GSE Rules and Regulations*. The main activities to be carried out during the operating life of the transmission line include: routine running maintenance (surveillance of the condition of the transmission line, towers and ROW), emergency maintenance (when/if accidents), and major maintenance (vegetation control, repairs, replacements). The GSE maintains a department that is responsible for the operation and maintenance of its transmission network. The GSE will maintain an EHS Management System for operations in line with the principles of ISO 14000 to ensure continuous identification and management of environmental, social and health and safety issues associated with the OHL.