"Reconstruction of Tskaltubo – Senaki High Voltage Power Transmission Line and Rehabilitation of Menji and Tskaltubo Substations"

Non-Technical Summery of

Environmental Impact Assessment

Introduction

Georgia's infrastructure has not yet recovered from the damage caused by the civil war in 1993. There is still lack of regular maintenance and investment in infrastructure. In addition, new difficulties emerged since the 2008 conflict with Russia, especially with respect to energy production and transit. The task of stabilizing and rehabilitation of the country is extensive, however it requires assistance and support of the donors.

In view of the need for rehabilitation of Senaki 1, 2 Transition Line and two substations, in 2010 the Government of Georgia asked the United States Government, to provide financial support. Afterwards, an agreement (HGA) was signed in February between the Government of Georgia and US Government, under which funds were allocated to finance the rehabilitation works.

USAID will undertake works from 2010 to 2013 in the energy sector in collaboration with the Georgia State Electrosystem (GSE) to restore and upgrade selected sections of power transmission system.

The purpose of the rehabilitation is to promote energy security and assist in supply of electricity to the West Georgia and Poti Free Industrial Zone.

The existing Senaki electricity transmission line (see Figure below) was constructed in 1991 and was under operation; however, during the Civil War in 1991 – 1993 the system was totally robbed and destroyed. Therefore there is no system in place and an immediate and comprehensive rehabilitation reconstruction is in order to bring the infrastructure back to an acceptable level of technical integrity.

220kV high voltage power transmission line Senaki 1, 2 connecting 220/110/35/10 substation Tskaltubo 220 kV with 220 kV substation Menji was put into operation in 1987. However, during the Civil War in 1991 – 1993 the system was totally robbed and destroyed. Therefore there is no system in this place and requires immediate rehabilitation.

220kV high voltage power transmission line Senaki 1, 2 connects 220/110/35/10 substation Tskaltubo 220 kV with 220 kV substation Menji and its overall length is 58.1 km. Inspection showed the system is damaged or has been stolen, and one of the transformers in the Tskaltubo substation needs to be replaced. This project also involves rehabilitation of Menji and Tskhaltubo substations.

This project will facilitate the development of the West Georgia: secure supply of electricity to the population; assist in supply of natural gas to Poti Free Industrial Zone; economical and tourism development of West Georgia.

Project Description

The total length of Senaki 1-2 power transmission line is 58,1 km and runs through 4 regions of Georgia (Senaki, Abasha, Khoni and Tskhaltubo). The route of the power transmission line is mainly located in the flat area; however, the last section (near Senaki) of the transmission line is under the complex topographic conditions running through the mountainous relief.

The line has been out of operation since 1994 and was almost completely robbed. There is hardly any standard steel towers left.

At present, the towers near the substations (final at Tskhaltubo 220 substation and two towers including final one at Menji 220 substation) are still available. Two angle towers (No.7 and No.8) near Kutaisi-Tskaltubo railway crossing, two suspension towers (No.70 and No.73) on the territory of Ghaniri psychiatric hospital and along Samtredia-Khoni motorway and two angle towers (No.169 and No.173) on the territory of Senaki are maintained as well.

Suspension of 300 sq. m. section steel-aluminum cable must be provided for Tskaltubo 220kV power transmission line to be rehabilitated.

Tskaltubo 220kV power transmission line – 212 210 kV standard steel towers were used on Menji route, wherefrom ПС220-6/m – 122 units, У220-2 – 31 units, У220-2+5 – 24 units, У220-2+9 – 14 units, У220-2+14 - 12 units.

In the past the power transmission line Senaki 1, 2 was operated by using ПС220-6 standard towers and parts of remaining foundations can be used during rehabilitation works.

ПС220-6 standard towers to be used for AC-300÷AC-400 type wires and C-70 cable suspension in 5^{th} by wind and $3\text{-}4^{th}$ by glaze were checked for specific climatic conditions.

Calculations showed that suspension towers require modification by strengthening a number of elements.

Tower sections have bolts. Binding of sections into towers shall be made by installation bolts at the place of tower installation. To suppress tower robbery in the future, the existing screw-nuts are to be welded up to 5mm.

Reinforced concrete assembly foundations will be used for steel towers according to 7271TM type project.

To generate horizontal forces exceeding those allowable for foundation plates envisaged is arrangement of reinforced concrete grith rails. The grith rails will be fixed by means of special metal clips. Due to large corners and high wind loading on PTL route it was necessary to use ПБ1 model beams. Taking into account the necessity of reliable operation of angle tower, it was deemed appropriate to replace all the damaged foundations by new ones. As for the suspension towers one part of the foundation (foundation of 62 towers) will be subject to restoration proceeding from damage level.

Damaged foundations of the suspension towers will be done by stripping fittings in concrete and arranging special construction fitting frame on them and then concreting.

For high-water bed towers floodplain foundations are used. They are assembled by casing pipe interconnected through reinforced concrete grill. Restoration of damaged prefabricates foundation plates are envisaged under the project by arranging new reinforced concrete grill, which will be connected by fitting and concrete fabric to the old construction. New bolts for arranging foundation will be arranged in new reinforced concrete grill and the concrete fabric beside the reinforced concrete grill will be covered by gunned material.

Crossing Barriers

220kV PTL to be rehabilitated crosses the following engineering facilities:

110kV PTL – 5 times;

35kV PTL – 3 times;

10kV PTL – 20 times;

Electrified railway by communication line and automatic block system - 2 times;

Low voltage lines – 20 times

Communication lines – 15 times;

Highways – 6 times;

Local roads – 8 times;

Field and rural roads – 61 times

Besides the engineering facilities the route crosses the river Tskhenistskali, Abasha and Tekhuri, the grove width and relief of which requires usage of special foundations.

Overvoltage Protection and Earthing Device

Lightning protection is made by suspending one of the C-70 model overhead ground wires along the whole route.

Rocks of various specific resistivity are spread on PTL route, though their resistivity exceeds 500 Ω.

Under the applicable normative documents, artificial earthing device is provided in all PTL tower foundations.

The existing earthing devices will be used on the foundations subject to restoration and fit for installation of new towers (including floodplain foundations on river crossing).

$12m^2$ section diameter plain fitting metal beams are used for artificial earthing device.

Power Transmission Line Route

Substation Tskaltubo-Menji of 220 kV PTL to be rehabilitated starts from substation Tskaltubo (No. 3 and No. 4 linear cells). Final tower No. 1 is located at a distance of 50 m from substation Tskaltubo 220 kV portal. After this final tower the PTL route goes to the left towards west, and after crossing several curves crosses Electrified Railway Kutaisi-Tskaltubo highway and goes to corner No. 3 (tower No. 6) and PTL route in this region crosses agricultural land and partially pasturelands.

Afterwards, the route mainly runs to the west, goes round the winery from the north, former furniture plant remaining and territory from the south and runs along the existing channel, till corner No. 7 (tower No. 16).

Afterwards, power transmission line route runs to the south-west, runs to the right corner no. 8 (tower No. 19) and keeps to the west, then crosses the forest, shrubs, arable land and rivers Tskaltubostskali and Gubistskali between the corners No. 8-11, crosses Kutaisi-Khoni highway, goes round the tea plantations of villages Didi Jikhaishi and Gocha Jikhaishi. From corner No. 22 (tower No. 65) PTL route to be rehabilitated goes round the territory of psychiatric hospital from the south and then to the south-west, crosses Kutiri agricultural lands and unfinished railway flat area and then river Tskhenistkali. The power transmission line route in this section crosses pasturelands, shrubs, arable land, partially tea plantations and crosses 0,4, 10, 35 and 110kV power transmission line communication line and Samtredia- Khoni highway.

Afterwards, PTL route will go through the agricultural lands of villages Samikao and Makhata, goes round village Vedidkari from the south and runs along the existing road and River Chitaghele (tower. 34).

From here (tower No. 117) PTL route crosses river Abashatskali and approaches arable land, shrubs, village Gejeti territory and crosses river Tekhuri. After crossing river Tekhuri power transmission line to be rehabiliteted goes to south-west, then makes for south and goes round the farmyard territory of village Dzveli Senaki, populated area from the east, routes through arable lands, forest and several small mountain regions.
Afterwards, (from corner 53) PTL keeps to southern direction crosses forest, shrubs, pasturelands, arable lands and privatized areas.

From the corner No. 6 (tower 180), the PTL route turns right in the direction of south-west, goes through arable lands, Shkhepi and Senaki agricultural lands till corner 67 (tower No. 195). Afterwards, PTL to be rehabilitated sharply turns left, crosses electrified railway and goes round Teklati settlement from the south, then goes to the east, crosses pasturelands, arable lands, agricultural lands, crosses river Tsivi, 35kV, 10kV, three 110 kV power transmission lines and enters the existing 220/110/35 sq. m. substation Menji from the south (No. 2 and No. 4 in linear cells).

Final tower No. 212 is located at a distance of 52m from substation linear portal

The total length of 220 kV PTL route to be rehabilitated is 58,086 km.

The mountainous section of the route is arranged with access roads, which were partially damaged in the course of time. However, two-axle vehicles may drive there. For continuous movement of the heavy-duty vehicles the restoration of these roads are envisaged under the project, which includes leveling the flat area and filling the pits. The existing roads fully meet the conditions required by technical specifications.

There are no newly built facilities on the PTL route that my prevent performance of construction and installation works and operation.

Project Alternatives

The total length of Senaki 1,2 power transmission line is 58.1 km and runs through 4 regions (Senaki, Abasha, Khoni and Tskhaltubo).

Whereas the rehabilitation of the existing power transmission lines are being planned, and in addition PTL Senaki 1,2, was built by using ПС220-6 unified towers and the part of remained foundation may be used during construction works, the existing route will be selected as a priority alternative. In case of selecting existing alternative, the activities will have lesser impact on environment, compared to the new corridor.

No Action (Zero) Alternative 1

Considering rapid development of Georgian economy and power utilization, maximum requirements will be set on main and interconnection line transmitting capacity, which must be satisfied by project line. In case of non-performance of the project the development of main and interconnection line will not be perspective. In addition the existing line is located on the developed area and its rehabilitation shall have less impact on the environment compared to the new route (construction of new transmission line). This alternative is favorable from the view of economy, as implies fewer expenses.

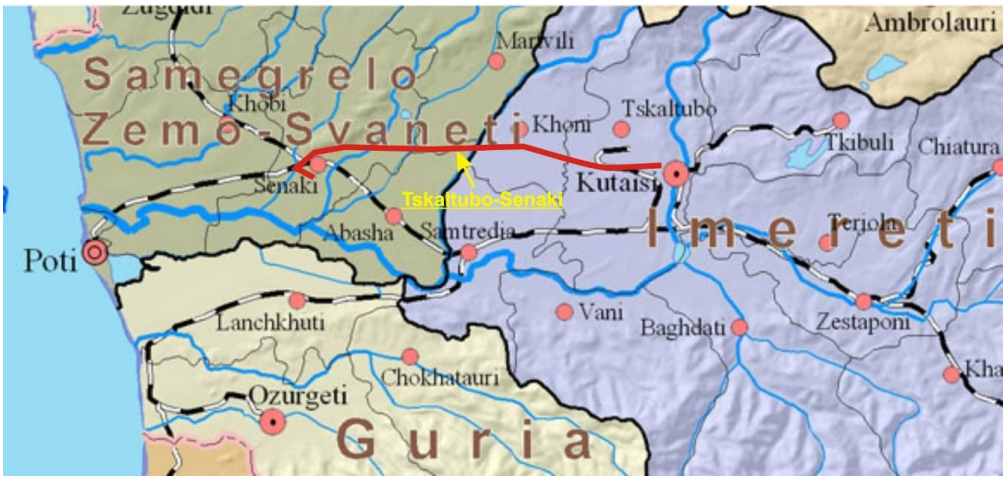
Alternative 2: Use the Existing RoW

The total length of Tskhaltubo- Senaki power transmission line is 58.1 km and runs through four regions of Georgia (Senaki, Abasha, Khoni and Tskhaltubo). The route of the transmission line is mainly located in the flat area, however the last section (near Senaki) of the transmission line is under the complex topographic conditions running through the mountainous near Senaki.

The line crosses the main railway (Senaki-Zugdidi and Kutaisi-Tskhaltubo) in two locations, river-beds – in 8 locations (Tsivi – in two locations, Tekhuri, Abasha, Noghela, Tskhenistskali, Gubistskali and Tskaltubostskali), 110 kV power transmission line – in two locations and 35 kV PTL – in three locations. Moreover, transmission line crosses low voltage (10kV and 0,4 kV) and communication lines.

Alternative 3: Avoid Water Crossings

The proposed line right of way crosses 8 big and small rivers (named Tsivi – in two locations, Tekhuri, Abasha, Noghela, Tskhenistskali, Gubistskali and Tskaltubostskali). These rivers run from the North to South in the North are the Caucasus Mountains. The rivers empty into the Rioni River, which runs from the East to the West. Thus, to avoid crossing of these rivers the alternatives are to either (a) re-route the line up high into the mountains, or (b) move the line down to the Rioni River. See map.



The alternate routes have disadvantages and advantages.

(a) If the route is designed further north in order to avoid the river crossings, it will require additional kilometers of the new green fields to be utilized for the tower footings. The trees will be cutted resulting in worry of the animal world and in certain cases Georgia Red List plants and animal species may be damaged. In addition the route will end in the ridges of Caucasus Mountains resulting in impact on High Mountain plants, which is unfavorable in view of ground protection function. Therefore, these additional towers to be constructed and installation activities will cause more environmental impact on surroundings than the proposed routing.

(b) Another option to avoid river crossings is to move line down to the South to edge of the Rioni River. As in the above option (a) the line will be longer with more towers and more environmental impact from the tower footings and their construction. In addition it will be necessary to cross Rioni River at 2 places resulting in more large-scale damage of water bio-diversity because in this case a contact with river bed couldn't be avoided as the towers will be installed there. Also, a line routing along the Rioni River (left bank) will go through a major environmental wetlands area of the Kolkheti National Park and have adverse impact on bio-diversity and habitat of protected territory.

From the description of the above options (a) and (b) it is obvious that selected option will have less impact on the environment. Furthermore the following addition restrictions can be given to the construction companies:

- not to have river crossing by equipment;
- require construction companies to install temporary bridges;
- conduct construction during shallow water to avoid impact on water bio-diversity;
- In addition they also can use helicopters to install towers and cabling in order to minimize environmental impact;

Existing Environmental Condition

Required Land Resource

The land plots according to the districts necessary for the construction of power transmission lines are given in the Table.

Temporary right of way for line construction is divided into two categories: agricultural and non-agricultural land plots: after privatization of agricultural land it is not cleared for what purposes will it be used by its owner.

As for the allocation of land plots for a permanent use, it has been already performed during the construction of PTL Senaki 1,2 and the land plots under the towers are state-owned.

Tabe 3.1 Land Plot Allocation Report

Type of Alienation	Tskaltubo land area /ha	Khoni land area /ha	Abasha land area /ha	Senaki land area /ha	Total land area /ha
Temporary for installation of towers	2,4	4,4	2,2	7,2	16,2
Temporary for installation of wires and cable	13,6	25,5	14,5	45,2	98,8
Total:	16,0	29,9	16,7	52,4	115,0
Including agricultural	11,2	26,7	15,5	42,8	96,2
Permanent, under towers	2,7	4,7	2,3	8,6	18,3

Henceforth, 115 ha land plot area will be allocated with the right of temporary use for the performance of rehabilitation works, including 96,2 ha agricultural land plots.

Allocation of 18,3 ha land plots under power transmission line towers with the right of permanent use is not necessary.

Climatic Data and Weather Conditions

220 kV line route to be rehabilitated is located in the north part of Kolkheti lowland and runs through from the east to the west.

Relief of the route location area is lowland, with the general flatness to the west.

The climate of the region is humid, sea climate, sub-tropic, characterized by a warm winter and a hot summer. Meteorological factors of the region are well investigated, especially wind and glaze icing events having significant impact on power line elements.

In consideration of the climatic conditions, the line route is divided into three sections: Section I – from the corner No. 1 up to corner No. 32, Section II – from corner No. 32 up to corner No. 51 and Section III – from corner No. 51 up to corner No. 83.

The table below shows the characteristics of meteorological factors.

Table 3.14 characteristics of meteorological factors

№	Meteorological Factors	Units		
		I Section	II Section	III Section
1	Air temperature:			
	Maximum	+40	+40	+40
	Minimum	−10	−10	−10
	Annual average	+15	+15	+15
	Icing periods	−5	−5	−5
	The coldest five-day periods	−3	−3	−3
2	Maximum wind velocity, m/sec.	45	43	41
3	Ice cover thickness, mm	20	20	20
4	Thunderstorm duration, annual average, hr	>70	>70	>70
5	Annual average precipitation, mm	1586	1793	1830
6	Maximum snow cover thickness, cm	80	70	60

Atmospheric Air

At present, there are neither functioning industrial companies that could cause air pollution by their emissions, nor any natural air pollutants in the region of 220 kV line route. Vehicle emission may be considered as the only air pollutant factor.

Geology and Hydrogeology Conditions of the Route

Along the power transmission line route, friable quaternary deposits mainly represent geological cross-section, with the thickness often exceeding 10m.

Genetically, alluvial and dealluvial deposits prevail.

Main rocks are exposed to air or covered by dealluvial layers on the south slope of Egrisi mountain range.

Geological cross-section of the power transmission line route region is comprised of:

1 layer – soil-plant layer with shingle-pebbles;

2 payer – bright-yellow clay shale with the mixture of shingle-pebbles of semi-solid consistency (with no more than 10% in volume);

3 layer – shingles, with thoroughly processed pebbles from deposit rocks, with 30% mixture of boulders and sandy loam/clay shale fillings;

4 layer – bright gray limestone, slightly cracked, depleted, layered, solid;

5 layer – tufa, layered, of medium strength and coarse grain.

The line route crosses the following rivers: Tskaltubostskali, Gubistskali, Tskhenistskali, Abashistskali, Tekhuri and Tsivi.

The relief of the route location at the crossings of rivers Tskhenistskali, Abashistskali, Tekhuri does not allow crossing these rivers with one span. Therefore, the rehabilitation of special foundations No. 86, 87, 88, 118, 119, 136 and 137 in the grove of these rivers is planned to be carried out under the rehabilitation project.

Description of the Vegetation Cover

It should be noted that floristic survey within the project corridor of Senaki 1, 2 power transmission line 4 district territories (Senaki, Abasha, Khoni and Tskaltubo) was carried out to identify eventual negative and waste impact of the project construction and operations on fauna and flora within the project corridor as well as adjacent territories. Plant communities and rare species having different conservation value and plants having economic value presented in project impact zone were identified. During operation monitoring observation and completing of information will be done. compensation and mitigation measures. If new circumstances are identified – proper mitigation, compensation measures will be followed to minimize and avoid impacts on plants.

I section from Tskaltubo Substation – till River Tskhenistkali Crossing:

220 kV power transmission line route to be rehabilitated starts from Tskaltubo then runs on the left to the west and crosses the electrified railway Kutaisi-Tskaltubo highways. The power transmission lines route in this region crosses agricultural lands and partially pasturelands.

Afterwards, the route mainly runs to the west, goes round the winery from the north, former furniture plant remaining and territory from the south and runs along the existing channel. Afterwards, power transmission line route runs to the south-west, crosses the forest, shrubs, arable land and rivers Tskaltubostskali and Gubistskali, crosses Kutaisi-Khoni highway, goes round the tea plantations of villages Didi Jikhaishi and Gocha Jikhaishi, territory of psychiatric hospital from the south and then to the south-west, crosses agricultural lands and unfinished railway flat area and then river Tskhenistkali. The power transmission line route in this section crosses pasturelands, shrubs, arable land, partially tea plantations and crosses power transmission line communication line and Samtredia- Khoni highway.

Plot # 1 GPS coordinates N $42^0\ 16^{'}\ 33.5^{''}$; E $042^0\ 35^{'}55.6^{''}$. 107 m from see level. pasturelands, alder regions strongly degraded (trees are cut). Habitat of low conservation value.

Plot # 2 GPS coordinates N $42^0\ 16^I\ 46.2^{II}$; E $042^0\ 34^I\ 53.6^{II}$. 104 m from see level. agro-landscape, personal plots, pasturelands, alder regions are strongly degraded. Habitat of low conservation value.

Plot # 3 GPS coordinates N $42^0\ 16^I\ 25.5^{II}$; E $042^0\ 27^I\ 06.3^{II}$. 92 m from see level. pasturelands, agro-landscape, alder regions strongly degraded, arable lands. Habitat of low conservation value.

Plot # 4 GPS coordinates N $42^0\ 16^I\ 25.5^{II}$; E $042^0\ 27^I\ 06.2^{II}$. 84 m from see level. wild tee plantations, pasturelands. Habitat of low conservation value.

Plot # 5 GPS coordinates N $42^0\ 16^I\ 58.0^{II}$; E $042^0\ 25^I\ 27.1^{II}$. 90 m from see level, poplar tree windbreak, cornfields, wild tee plantations, personal plots, Habitat of low conservation value.

Plot # 6 GPS coordinates N $42^0\ 17^I\ 10.0^{II}$; E $042^0\ 23^I\ 28.3^{II}$. 81 m from see level, agro-landscape – pasturelands, earlier mulberry trees and orchards. Habitat of low conservation value.

Plot # 7 GPS coordinates N $42^0\ 17^I\ 31.1^{II}$; E $042^0\ 21^I\ 57.2^{II}$. 81 m from see level, agro-landscape – pasturelands, orchards, cornfields, alder fragments strongly degraded hear and there. Habitat of low conservation value.

Plot # 8 GPS coordinates N $42^0\ 15^I\ 56.8^{II}$; E $042^0\ 19^I\ 50.1^{II}$. 66 m from see level, pasturelands, young alder developed in strongly degraded three-thorned acacia orchards (*Gleditschia triacanthos*) windbreak. Habitat of low conservation value.

II section from Tskhenistkali Crossing till Menji Substation: Afterwards, power transmission line route will go through the agricultural lands of villages Samikao and Makhata, goes round village Vedidkari from the south and runs along the existing road and River Chitaghele. Therefrom power transmission line route crosses river Abashatskali and approaches arable land, shrubs, village Gejeti territory and crosses river Tekhuri. After crossing river Tekhuri power transmission line to be rehabiliteted goes to south-west, then makes for south and goes round the farmyard territory of village Dzveli Senaki, populated area from the east, routes through arable lands, forest and several small mountain regions.

Afterwards, power transmission line maintains southern direction crosses forest, shrubs, pasturelands, arable lands and privatized areas. On the following section, power transmission line route turns right in the direction of south-west, goes through arable lands, Shkhepi and Senaki agricultural lands. Afterwards, power transmission line to be rehabilitated sharply turns left, crosses electrified railway and goes round Teklati settlement from the south, goes through pasturelands, agricultural lands, crosses river Tsivi, power transmission lines and enters the existing Menji substation from the south. The total length of 220 kV PTL route to be rehabilitated is 58,086 km.

Plot # 9 GPS coordinates N $42^0\ 18^I\ 15.1^{II}$; E $042^0\ 12^I\ 02.2^{II}$. 55 m from see level. marshlands dominated by rush (*Juncus effusus*), mixed with bur-reed - *Sparganium neglectum*. Hear and there strongly degraded alder fragments - traveller's-joy (*Clematis vitalba*), wild plum (*Prunus divaricata*), gaiter-tree (*Thelycrania australis*), etc. Habitat of average conservation value.

Plot # 10 GPS coordinates N $42^0\ 18'58.4\ ''$; E $042^0\ 09'\ 49.8''$. 60 m from see level. agro-landscape – cornfields, pasturelands. Habitat of low conservation value.

Plot # 12 GPS coordinates N $42^0\ 19^I\ 08.0^{II}$; E $042^0\ 09^I\ 05.6^{II}$. 74 m from see level. agro-landscape – pasturelands, cornfields. Habitat of low conservation value.

Plot # 13 GPS coordinates N $42^0\ 19^I\ 05.7^{II}$; E $042^0\ 08^I\ 43.0^{II}$. 72 m from see level. degraded graining-grass meadow-pasturelands, sparsely grows oriental hornbeam (*Carpinus orientalis*) shrubs. Habitat of low conservation value.

Plot # 14 GPS coordinates N $42^0\ 18^I\ 48.2^{II}$; E $042^0\ 08^I\ 14.2^{II}$. 113 m from see level. strongly degraded oriental hornbeam with bracken fern (*Pteridium tauricum*). Habitat of low conservation value.

Plot # 15 GPS coordinates N $42^0\ 18^I\ 02.1^{II}$; E $042^0\ 07^I\ 47.5^{II}$. 88 m from see level. degraded graining-grass meadow-pasturelands. Habitat of low conservation value.

Plot # 16 GPS coordinates N 42^0 18^I 05.5 ^{II}; E 042^0 07^I 40.9^{II}. 112 m from see level. strongly degraded oriental hornbeam with bracken fern (*Pteridium tauricum*). Habitat of low conservation value.

Plot # 17 GPS coordinates N 42^0 17^I 41.5 ^{II}; E 042^0 06^I 37.3^{II}. 168 m from see level. pasturelands, strongly degraded oriental hornbeam, alder (*Alnus barbata*). Habitat of low conservation value.

Plot # 18 GPS coordinates N 42^0 17^I 17.7 ^{II}; E 042^0 05^I 40.0^{II}. 141 m from see level. Shkhepi Tsikhe west slope, strongly degraded oriental hornbeam, pasturelands. Here and there strongly degraded alder (*Alnus barbata*). Habitat of low conservation value.

Plot # 19 GPS coordinates N 42^0 17^I 03.6 ^{II}; E 042^0 02^I 18.1^{II}. 75 m from see level. strongly degraded Kolkhuri forest fragments - three-thorned acacia *Gleditschia triacanthos, Ficus carica, Prunus divaricata, Sambucus ebulus, Clematis vitalba*. Habitat of low conservation value.

Plot # 20 GPS coordinates N 42^0 16^I 59.2 ^{II}; E 042^0 02^I 41.2^{II}. 152 m from see level. pasturelands, strongly degraded forest fragments - *Alnus barbata, Thelycrania australis, Corylus avellana, Clematis vitalba,* Rubus sp. Habitat of low conservation value.

SENSITIVE SITES

This floristic survey of planned project corridor allow sensitive sites and habitats to be identified. Thus based on literature review and field surveys there is only one habitat of average conservation value:

Plot # 9 GPS coordinates N 42^0 18^I 15.1^{II}; E 042^0 12^I 02.2^{II}. 55 m from see level. marshlands dominated by rush (*Juncus effusus*), mixed with bur-reed - *Sparganium neglectum*. Hear and there strongly degraded alder fragments - traveller's-joy (*Clematis vitalba*), wild plum (*Prunus divaricata*), gaiter-tree (*Thelycrania australis*), etc..

In the transmission line section to be rehabilitated the presence of Georgia Red lists species is not confirmed. It should be noted that according to the preliminary evaluation no tree felling is planned neither. The corridor may be cleaned from separate trees and shrubs developed during inactive infrastructure.

Description of Animal Species across Study Area

The project territory is inhabited by the following mammal species: common wolf (*Canis lupus),* jackal (*Canis aureus*), fox (*Vulpes vulpes*), brown bear (*Ursus arctos*) - Georgia Red List badger (*Meles meles*), pine marten (*Martes martes*), stone-marten (*Martes foina*), wildcat (*Felis silvestris*), roedeer (*Capreolus capreolus*), otter (*Lutra lutra*) - Georgia Red List caracal (*Lynx lynx*) - Georgia Red List wild boar (*Sus scrofa*), etc.

Though, no important section essential for habitat of mammal species is identified on the study area. As described above, the rehabilitation of power transmission line is being planned. Correspondingly, the major part of the activities will be carried out on the urban territories (assimilated by population) and on small sections, where line routes through uninhabited areas, old infrastructure (the rehabilitation of which is provided hereunder) of high voltage power transmission line already exists and the environment is modified.

Up to 200 bird species are identified across study area regions. Therefrom around 50 species are breeding birds and others migratory birds (in summer for reproduction and during seasonal migration in spring and autumn).

Breeding avifauna of the study area, especially the impact zone can be classified as poor, represented in general by common, widely distributed and numerous bird species. The dominating group of breeding birds are small forest passerines.

54 species of reptiles are recorded in Georgia. The reptiles of this group are spread in the limit of southern-eastern part of Georgia and would hardly be affected by project activities.

Only 14 species of reptiles were recorded within the district of Tskaltubo. Georgia Red List Caucasian viper (*Vipera kaznakovi*) is listed among them. More species are presumed to occur within the study area: Aesculapian snake *(Zamenis longissimus*), Artvin lizard (*Darevskia derjugini*) and Meadow lizard (*Darevskia praticola*).

However, there is also a low probability (subject to results of visual inspection of the route) that the species of reptiles that are of higher sensitivity; Caucasian viper (*Vipera kaznakovi*) and Mediterranean tortoise (*Testudo graeca*) inhabit the study area.

12 species of amphibians are recorded in Georgia. Eight species of amphibians were recorded within the district of Tskaltubo. None of them is recorded in Georgia Red List. Namely, no diverse species of amphibians are observed within the study area. There are no Georgia Red-Listed amphibians inhibited there.

Among the fish species inhabiting this section of the river the following species can be found in upstream areas: Brook trout (*Salmo fario*), Georgia Red List Chub (*Leuciscus cephalus orientalis*), Colcheti khramulya (*Capoeta sieboldi*), Georgia Red List Colcheti barbell *(Barbus tauricus escherichii*), Riffle minnow (*Alburnoides bipunctatus fasciatus*), Angora stone loach (*Noemacheilus angorae*), Spiny loach (*Gobitis taenia*), Ginger goby (*Neogobius cephalarges constructor*), etc.

It is notable that during project activities river-bed will not be impacted and correspondingly bio-diversity of the water will not be affected if relevant safety measures are observed (avoid oil and inert materials spillage into the river, training of staff, etc.)

Protected Areas

Imereti Caves Protected Area

Imereti Caves Protected Areas was established in 2007. It is located in Tskaltubo, Terjola, Tkibuli and Khoni districts and consist of: Sataplia State Nature Reserve, Kumistavi Cave, Tetri Cave, Khomuli Cave, Tsutskhvati Cave, Navenakhevi Cave, Nagarevi Cave, Iazoni Cave, Sakajia Cave, Tskaltsitela Cave, Okatse Canyon and Okatse waterfall Natural Monuments. The Imereti Caves Protected Areas were created on the basis of Sataplia State Nature Reserve, located in Tskaltubo district municipality in the West Georgia, within 10 minutes driving distance from both Kutaisi and Tskaltubo.

The Sataplia Nature Reserve is the diverse and very unique monument of Georgia. It is of complex nature and includes geological, paleontology, speleological and botanic monuments. Sataplia Mount became popular by its rare and most beautiful caves. There are karst caves and footprints of gigantic reptile – dinosaurs on the territory. In view of activity (rehabilitation of transmission line) and due to the distance it is not likely that the project will have adverse impacts on protected areas.

Impact on Separate Environmental Receptors

Emissions into Atmospheric Air

There will be emissions to air from engines of special equipments and construction machinery; due to aerosols produced during welding and dust resulting during movements of construction vehicles.

Considering that only rehabilitation works are being planned, and the impact will be short-term and temporary and end immediately upon completion of excavation works (maximum 2 days for each tower) the construction works don't represent essential source of atmospheric air pollution.

Impacts of Noise

Proceeding from the specific character of the works, the noise level will be within or insignificantly exceed the allowable limit in daylight hours. Considering that the construction works on each section of project route are short-term and basic sources of noise (excavator and dozers) will not be operated simultaneously, one may assume that the voice impact on population will not be significant.

Damage of Soils

During construction phase of the project it is expected that the excavation works will result in damage of soil integrity or its vegetation cover.

According to the project data the damaged soil area will not be large and have insignificant impact on the environment.

The construction process is connected with soil pollution, which may result due to:

- fuel and oil spillage from construction machinery and other equipments
- poor construction waste management

Major part of power transmission line towers are located on already developed areas, where the topsoil has no conservative value.

However, the measures will be taken during construction phase to avoid land degradation:

Impacts on Aquatic Environment

Risk of impact on surface and groundwater generally occurs during construction works.

Groundwater pollution will probably be caused by the following factors:

- performance of the construction works directly in the riverbed, arrangement and running of construction machinery near the water mirror;
- discharge of water contaminated during excavation works;
- washing of the vehicles and construction equipment with river water along the river bank;
- drilling works and excavation of pits when impact with groundwater is long-term and hydraulical connection between the surface and groundwater exists;
- spillage or leaking of oil products during their storing and arrangement of construction technique.
- poorly managed wastewater;

Some precautions must be taken to avoid river water contamination during construction.

Measures will be taken to prevent water pollution during activities connected with riverbeds to avoid potential pollution by fuel and oils and scattering of construction and other waste into the river.

In condition of proper management of works and impact avoidance/mitigation measures put in place, activity will not cause any significant deterioration of water environment.

Impact on Flora

Prior to commencement of construction works the areas allocated for poles and the right of way strip will be cleared. According to the transmission line operation rules regulation of vegetation growth under the line is necessary to avoid contact with trees and the risk of short circuit/fire. Therefore on operation stage the branches of high trees will be periodically pruned. However, it should be noted that according to the preliminary investigation and the result of floristic studies no Georgia Red List species will be subject to impact.

Impact on Fauna

Transmission line construction works will cause disturbance and temporary trouble of birds and animals from the project impact areas. They will migrate at a short distance and after completion of construction work the animals will return to initial habitats.

It should be noted that the major part of the route runs through urban territories and only small part may be inhabited by animal species. During survey of this territory Georgia Red List species were identifies.

Notwithstanding the above, all precautions will be taken to minimize environmental impact on animals;

Waste Management

Proceeding from peculiar features of the work types of waste generated during construction works include: wood residue, polymer waste (packaging and hermetization materials), used electrodes, scrap metal, construction waste (inert materials, construction block, etc) and domestic waste.

None of the waste generated during construction works is toxic and therefore they will be temporally placed in vicinity of construction site, specially allocated places, in containers and will be removed from the site in accordance with the law.

During construction works small amount of toxic materials, such as material polluted by oil products, vehicle produced oil, welding waste, etc. may be produced. Therefore, it is necessary to perform separation of waste according to their types and qualitative and quantitative classification to enable reuse-utilization.

All kind of waste will be removed from the site in agreement with state authority and in compliance with the established procedure.

Waste management shall be performed according to the waste management plan developed.

Mitigation Measures Planned during the Performance of the Work

To minimize negative effects on environment the following should be taken into consideration:

- strict observance of the agreed traffic routes;
- taking of fire precaution measures;
- observance of the boundaries of construction areas;
- adhere to the Environmental Monitoring Service requirements;

Below are given the mitigation measures to be taken in order to minimize the potential impacts on the fauna, including:

- Fragmentation of habitats;
- Destruction of sites of breeding and sheltering for fauna;
- Fragmentation of individual sections;
- Mortality of small animals in pits and trenches;
- Discharge of hazardous materials in the reservoir.

Suggested Mitigation Measures

Impacts on breeding (nesting) places of birds species during breeding and nesting season must be prohibited (eventually from March till July).

Measures must be taken to reduce the dust formed during construction activities.

Measures must be taken to reduce the noise and vibration level during construction activities.

Collection of domestic and construction waste and its disposal to the water must be prohibited.

Spilling of oil products into the water and soil must be controlled.

Pits, trenches, etc. must be secured by temporary fencing or any barriers to prevent falling of animals into the trenches. Long board or wooden logs must be placed in the pits and trenches on one side at night to allow the animals to scramble. Pits and trenches must be checked before filling.

The works close to the surface water or directly in the riverbed must be performed during shallow water to avoid impact on water bio-diversity.

Conclusions and Recommendations

- High voltage PTL during normal operation shall have no harmful emissions into atmospheric air; emissions will be observed during operation of transport facilities and construction machinery in the process of rehabilitation works. The impact will be short term and insignificant.

- In condition of environmental management and planned mitigation measures put in place, construction and operation of PTL will not cause any significant deterioration of soil and water environment.
- Underground water is not aggressive towards reinforced concrete and implies no risk to reduce its resistance;
- During rehabilitation of the object right of way will be cleared from plants grown during line standstill period – some trees will be cut and territory will be cleared from shrubs. Construction activities will cause disturbance and temporary migration of fauna. The rehabilitation works are temporary and short-term and therefore after completion of the construction works the animals will return to their old habitats. Impact on flora and fauna and/or any changes in populations during operation is not expected;

- Taking into account specificity of the task and limited overflow, impact on the traffic flow during construction will be short term and low and an impact during its operation is not expected;

- Neither residential nor public buildings are in the PTL impact zone. In the event that mitigation measures are taken impact of electron waves on staff will not be significant;

- Taking into account that mainly local residents will be employed any demographic changes in the region is not expected;

- In the event that planned environmental measures are taken at the stage of the operation of object no negative on health of population is expected. Social impact of the project will be only positive;

- If all conditions of PTL construction and operation regulations are observed, any negative impact on environment will not be significant.

- Timely sorting and storage of construction wastes to avoid scattering, collection and storing in specially allocated places. Prepare and implement waste management manual containing waste monitoring scheme during construction and operation stages of PTL;

- It is necessary to timely perform recultivation of damaged soil and vegetation cover;