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GSE
Georgian State Electrosystem

GSE – GEORGIAN STATE ELECTROSYSTEM
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ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR CONSTRUCTION AND OPERATION

OF THE

500 KV JVARI-TSKALTUBO TRANSMISSION LINE AND TSKALTUBO SUBSTATION

VOLUME 1 – MAIN TEXT

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The report is Prepared by:

DG consulting Ltd

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Environmental and social impact assessment team expresses gratitude to all specialists and colleagues involved in preparation of the present report:

- World Bank specialists and experts
- FICHTNER, feasibility study consultant
- GOPA–INTEC, technical design consultant

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List of Acronyms

Acronym	Definition
AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
amsl	Above mean sea level
ASCI	Areas of Special Conservation Interest
CENELEC	European Committee for Electrotechnical Standardization
CMNC	National Cultural Heritage Monuments
dB	Decibel
dB(A)	The unit used to measure the A-weighted decibel scale
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EC	European Council
EF	Electric field
EHS	Environmental, Health, and Safety
EHSG	Environmental, Health, and Safety Guidelines
EMF	Electromagnetic field
ENVSEC	Environment and Security Initiative
ESF	World Bank Environmental and Social Framework
ESMP	Environmental and Social Management Plan
ESCP	Environmental and Social Commitment Plan
E&S	Environmental and social
ESS	World Bank Environmental and Social Standards
EU	European Union
EUNIS	European Nature Information System
EUROBATS	Agreement on the Conservation of Populations of European Bats
GBV	Gender based violence
GDP	Gross Domestic Product
GEL	Georgian Lari
GIS	Geographical information system
GRL	Georgian Red List
GSE	Georgian State Electrosystem
ha	Hectare
HPP	Hydropower plant
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IDP	Internally Displaced People
IFC	International Finance Corporation
ICES	International Committee on Electromagnetic Safety
ILO	International Labour Organisation
IUCN	International Union for Conservation of Nature

Acronym	Definition
KfW	Kreditanstalt für Wiederaufbau German Development Bank
km	Kilometer
kPa	kilopascal
kV	Kilovolt
m	Meter
MF	Magnetic field
mm	Millimeter
MSIP	Management Strategies and Implementation Plans
µT	Microtesla
nT	Nanotesla
NAPR	National Agency of Public registry
NGO	Non-Governmental Organisation
NIEHS	National Institute of Environmental Health Sciences
NMNC	National Natural Heritage Monuments
OHL	Overhead transmission line
OHS	Occupational Health and Safety
PAP	Project affected person
PRRC	Property Rights Recognition Commission
RAP	Resettlement Action Plan
ROW	Right-of-way
RPF	Resettlement Policy Framework
sec	Second
SEP	Stakeholder Engagement Plan
T	Tesla
UNESCO	The United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organisation

Executive Summary

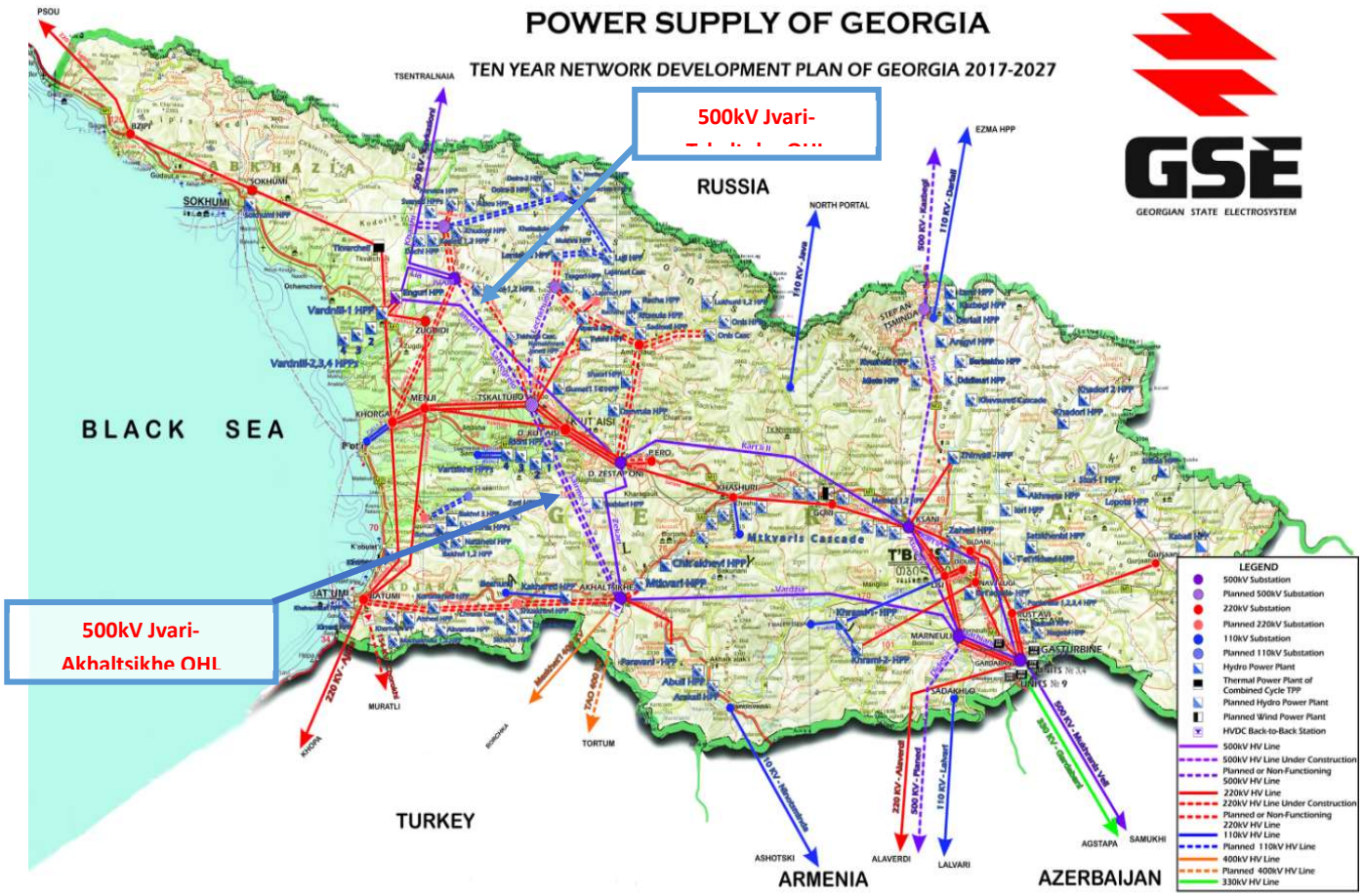
Background

Georgia is expanding and upgrading the country's high voltage power transmission grid. The goals of the development program are to increase system effectiveness, improve the independence of the energy system, and to ease energy relations with neighboring countries. Georgian State Electrosystem (GSE) is responsible to manage country's high voltage power transmission system and balance supply / demand parameters in order to provide an uninterrupted and reliable power supply in different regions of the country. The proposed 500kV Jvari-Tskaltubo Transmission Line and Tskaltubo Substation project is the part of the power supply network development plan of GSE (see map below).

The World Bank is considering providing financing to GSE for the Transmission Grid Strengthening project, which includes construction of the proposed transmission line and substation as one of the components. Based on the scale of the project and potential to impact environment and social sphere, the Environmental Impact Assessment is required to be implemented in accordance to the Georgian legislation. In addition, the World Bank requires conduct of the Environmental and Social Impact Assessment that meets requirements of the Bank's environmental and social policy and the Environmental and Social Framework.

Project Purpose and Need

The new transmission line and substation are intended to serve two main purposes. First, they will improve reliability of the existing grid. To accomplish this, it will provide necessary backup for existing Imereti and Zekari lines and will help ensure a steady energy supply to east Georgia and the Akhaltsikhe-Borchkha export line to Turkey. The new line will provide an alternative route for electricity in case there are interruptions on the 500kV lines between Zestafoni and Akhaltsikhe and between Akhaltsikhe and Gardabani. Second, the new Jvari-Tskaltubo overhead transmission line (OHL) and Tskaltubo substation will increase the capacity for electricity transmission from western Georgia to eastern Georgia, which will further improve reliability of existing supplies. The increase in transmission capacity will be increasingly important as new hydropower projects in western Georgia begin to supply additional electricity to the national grid. A German company Fichtner prepared a preliminary design of the project and determined it is technically and financially feasible.



Location of Tskaltubo-Jvari and Jvari-Akhaltsikhe 500 kV transmission lines within the Georgia power system

Legal Framework

Project planning and execution will be guided by the national legislation of Georgia and the World Bank's Environmental and Social Framework (2018).

Environmental and social aspects of the project will primarily be guided by the following key environmental and social legislation of Georgia:

- ***Law of Georgia on Environment Protection*** (adopted on 10.12.1996, last amended on 05.07.2018, 360.000.000.05.001.000.184)
- Environmental Assessment Code (adopted on 19.05.2016, last amended on 07.12.2017 r/c 360160000.22.023.016156)
- ***Law of Georgia on Licenses and Permits*** (adopted on 24.06.2005, last amended on 31.10.2018, 300.310.000.05.001.001.914)
- ***Labor Code of Georgia*** (adopted on 17.12.2010, last amended on 30.11.2018, 270000000.04.001.016012)
- ***Law of Georgia on Occupational Safety*** (adopted 07.03.2018, last amended 22.12.2018, 270000000.05.001.018780)

The project will also be subject to many other environmental laws (including laws for protected areas, pollution control and protection of animals and plants) and technical standards and guidelines.

International conventions and treaties signed and ratified by Georgia will also apply to the project, including conventions on biodiversity, climate change, protection of migratory and rare bird and animal species, protection of cultural resources, public consultation and information sharing and labor management.

Scope of the ESIA

The ESIA evaluates the following infrastructural component of the project:

- Construction of foundations and towers for around about 80 kilometers between Jvari and Tskaltubo, and of roads to allow access to tower locations.
- Conductoring, which is the stringing of lines between towers to allow electricity to be conducted.
- Construction of a 500kV substation near Tskaltubo, including connection of other transmission lines to the new substation.

This ESIA is intended to meet requirements established by the World Bank for high-risk projects and to meet national legislation of Georgia. The project will not be launched until the World Bank and GSE have been satisfied that:

- The project meets national legal requirements and relevant Environmental and Social Standards of the World Bank.
- The project includes measures as necessary to avoid or minimize significant adverse changes in environmental, health and safety, and socio-economic conditions.
- Disclosure of relevant information and meaningful public consultation have been undertaken in line with the national legislation of Georgia and the Environmental and Social Framework of the World Bank, thus ensuring that all reasonable public and other opinions are adequately considered prior to a commitment for proceeding with the project.

The Proposed Transmission Line and Corridor Alternatives

Initially, three alternatives of power line (two corridor routes and no-action alternative) were considered. Both corridor alternatives, including a number of sub-alternatives, involve a new 500 kV overhead transmission line that will connect the existing substation near Jvari to the new substation near Tskaltubo. Both routes will pass through two regions, Imereti and Samegrelo-Zemo Svaneti, and five municipalities: Tsalenjikha, Chkhorotskhu, Martvili, Khoni and Tskaltubo.

The evaluated alternatives include:

No-action alternative - This alternative assumes that the transmission line and Tskaltubo substation would not be constructed. If the line is not constructed, however, the existing power transmission system will not be able to meet the growing demand in power transmission and the overall efficiency of the system will decline year by year. For these reasons, this alternative is not preferred.

Alternative A: This alternative will run from the substation in Jvari to a new substation near Tskaltubo. This route is selected to avoid populated areas as far as practicable but affects more forested area and comes near to two Emerald Site (Samegrelo 1 and Samegrelo 2), which are sites protected for their biodiversity values. This is the preferred route.

Alternative B: This alternative follows the same corridor as in alternative A from Tskaltubo to Martvili municipality, then diverges and runs to the south of Alternative A. This route is at a greater distance from the Emerald Sites and affects less forest but is closer to populated areas.

After the preliminary route of alternative A was selected, the studies and analyses conducted as part of the ESIA allowed the Alternative A route to be optimized. This optimization improved constructability and reduced potential impacts on biodiversity. The corridor was mainly rerouted to avoid crossing non-fragmented forested areas, including passing through the Emerald Sites.

Alternatives A (optimized) and B are shown on the map below.

The main difference between alternatives A and B are that alternative B would be more visually intrusive than alternative A. Although both would be visible from most of the nearest villages, Alternative B is closer to most of them and so would appear much more prominent. Alternative B would also be visible from Martvili town and from more tourist and cultural heritage sites.

- Alternative A would affect less private land and the noise and other disruption from construction and then during operation would disturb fewer local people.
- Alternative B would require the relocation of five households and more vegetation control on private lands. Alternative A would require no relocation and most vegetation control would be on lands that are now Forest Fund lands.

Alternative A would require clearance of more trees and shrubs, including species of conservation concern. It would also be more difficult to construct and would involve higher costs for construction and maintenance.

Project Activities with Likely Impacts on People and Natural Environment

The project will involve a variety of activities, many of which could affect environmental resources and people if they are not carefully designed and implemented. The activities that could cause the most important effects include:

- Establishment of a 74.5-meter wide right-of-way along a corridor about 78.6 kilometers long. No houses or auxiliary buildings would be allowed in this corridor, and restrictions would be placed on how the land was used: no buildings and no use of equipment that could touch the wires. In forested areas, trees within the 54.5-meter central part of the corridor would be cut so they could not touch the line or fall on the line—on average, trees over four meters tall would be cut to a height of 0.7 to 1.0 meters. The construction works would also require clearing an area for vehicles and equipment to use for installing foundations.
- Construction of about 205 new towers, including about 50 angle towers. GSE will acquire about 400 square meters of land at each tower location and the contractor may need to lease another 400 square meters. The height of the towers will be about 33 to 44 meters.
- Clearing and maintenance of access roads for vehicles and equipment to drive to tower locations. Wherever possible, existing roads and tracks will be used. Where necessary, roads will be constructed. Establishment of roads may require creation of tracks across open land or bulldozing a path through forests.

- Conductoring (placing wires between towers) the entire line. This would involve unrolling conductor wire, raising it to towers and stringing the wires between the towers on either side of the two rail lines.
- Routine maintenance of the 54.5-meter vegetation control zone. Every 6-8 years, trees and other plants will be cut back as needed to maintain clearance from the line
- Construction and maintenance of a new substation. The new substation will be approximately square and will cover an area of about 14 hectares; the contractor would lease another 2-3 hectares for use as storage and offices. It would require land-clearing and construction of buildings and installation of equipment. The new substation will be placed on land that is currently being used for agriculture or not used at all.

Mitigation of Negative Environmental and Socio-Economic Impacts

Baseline conditions studied during the ESIA process

Environmental conditions	Socio-economic conditions
Climate and meteorology	Demography
Landscape and land use	Economy
Geology and geomorphology	Employment and income
Hydrogeology	Social services
Hydrology	Vulnerability of population and IDPs
Soils	Tourism and Cultural heritage
Flora and habitats	
Fauna	

When the ESIA found that the project could cause moderate or major impacts, then actions or procedures were developed to avoid, reduce, compensate or otherwise mitigate the effects and reduce their significance.

Impacts on views and landscapes. Direct impacts on views of the landscape would occur through obstruction of views or intrusion of new elements into views of receptors. In most cases, conductors will be visible from only a short distance and so are of limited concern. However, towers will be up to 44 meters tall and would extend above the landscape, including the tallest surrounding trees. Taking into consideration the lattice framework of the towers, their relative height compared to other structures (trees and buildings), and the sensitivity of the human eye, it is unlikely that most viewers would be able to see the towers or conductors at a distance greater than five kilometers. Although the towers could be visible from greater distances when located on high mountain ridges, this would happen only periodically during very clear weather conditions.

Potential visual receptors in the region would include local residents, travelers, visitors, and tourists. The most important impact could be expected to be on tourists and others who come to visit cultural and natural attractions such as Motena cave, Balda canyon and Monastery, the access road to Oniore and Toba waterfalls, Tsachkhuru Monastery and Ochkhamuri waterfall. In addition, people who live near the transmission line would experience a change in their customary views, with those who live in houses nearer the corridor would be most affected. Although towers could be seen for the distance up to about five kilometers, the more significant views would be within about 500 meters, with the line much less noticeable at longer distances. At about 3.5 occupants per household, the line could be intrusively visible to about 1,831 residents under alternative A and 3,203 under alternative B. However, residents would become accustomed to the view and the intrusiveness would diminish relatively quickly over time.

Impacts on land use. The effects of the project on the existing land use pattern would be temporary or permanent, direct or indirect. The 74.5-meter-wide corridor, including land acquired by GSE and land whose use will be restricted with easements will be impacted directly and permanently. Land will be acquired at the substation and tower locations. Grazing will be able to continue under towers on grasslands and crops can be planted and harvested in the entire corridor except on roads and under towers. Thus, the restriction on use will be legal but will not require changes in most uses. However, forests and orchards will be changed permanently, since trees will be cut to a height of 0.7 to 1.0 meters in the vegetation control zone and not allowed to grow over four meters high in future. In addition, small areas of land will be affected directly and temporarily during the construction phase for construction storage and staging areas near the tower locations and for a construction staging area and offices near the substation; these areas are expected to be leased by the contractor.

The most significant immediate impact will be in forests, in the areas that have to be cleared to the ground at tower sites and new roads, and where vegetation over four meters high will need to be cut initially and every 6-8 years thereafter. Non-forested land, including agricultural land, orchards, grasslands, shrubs, and non-vegetated rocky ground would be affected most by land clearing for towers, new roads.\

To reduce impacts on land use, the final design of the corridor will allow “micro location” of towers to avoid unnecessary damage to land, and contractors will be required to keep their activities in the smallest possible area. In addition, as noted, most agricultural activities will be able to continue along the entire corridor.

Impacts on geology and soils. A substantial number of towers under Alternative A will be on land that may be subject to erosion or even landslides. This will necessitate careful attention to the implementation of mitigation measures. Project activities with the greatest potential to affect geology and soils include land-clearing, vegetation removal, and excavation for tower foundations and the substation. Land clearing

and vegetation removal may cause erosion and topsoil loss. The risk is much higher on steeper slopes, although some extreme slopes may have little or no topsoil to erode. Furthermore, some areas could become more susceptible to landslides and mudslides, and valuable topsoil could be lost and this in turn could affect the success of the program to restore vegetation.

To install the tower foundations, it will be necessary to remove topsoil from an area of about 400square meters at the tower and about the same for the contractor's storage/staging area. If not properly stored and protected, soil and spoil can erode and damage other land where it is deposited, and topsoil can be lost. Again, the risk is higher in mountainous areas and on other steep slopes. Movement of vehicles and equipment can compact soil, leading to losses in fertility and hinder the re-establishment of vegetation.

Overall, potential impacts will be heavily influenced by geologic conditions in the mountainous terrain, with much lower risk of landslides with the presence of hard volcanogenic and limestone-dolomite formations. It is noted that the feasibility study placed substantial reliance on the results of geologic investigations to choose the current estimated corridor, including significant effort to avoid landslide-prone areas.

To reduce impacts, there will be a more detailed geotechnical study to identify and eliminate most risky locations and to identify the most favorable locations. In addition, the final micro location of towers will be able to avoid the most extreme locations. Contractors will be required to remove and store topsoil and to store spoil separately, and to protect them against erosion. Following construction, the contractor will then replace the materials and establish vegetation on the surface.

Impacts on air quality. Minor impacts on air quality are expected during the construction phase of the project. Dust will be generated due to the movement of heavy vehicles and during earthworks. Open piles of topsoil and spoil can also generate dust in windy conditions. Construction machinery will generate exhaust gases that contain air pollutants, including particulates, sulfur dioxide, nitrogen oxides, and volatile organic compounds. Operation of transmission lines will generate ozone and nitrogen oxides each of which can be harmful to health at high concentrations. In general emissions will be very low, much lower than Georgian standards and except for dust will be far too low to affect health. In summary, impacts could be minor or moderate if not mitigated, but are expected to be negligible with required dust (by watering) and emissions control (by maintaining engines) and low with even partial controls.

Impacts caused by noise propagation. Noise generated during the construction phase will be temporary and of low magnitude. They will be controlled by the use of well-maintained equipment and impacts will be avoided by having construction only during daylight hours. During the operation phase, once high-voltage lines are energized, a low crackling or hissing sound can be audible directly under the line and for tens of meters away, especially during humid or wet weather. The expected noise levels are generally low,

typically under 50 dB under the line and within the corridor. It should not be audible at the edge of the corridor, which would be 30 meters from the energized conductor. In general, noise impacts will be negligible, if proper mitigation measures are implemented.

Impacts on surface and groundwater. Direct impacts on groundwater are not likely to occur, or to be minimal, due to the small-scale nature of the project at individual locations. In addition, the corridor does not cross wetlands or important lakes or reservoirs. The risk to surface water, however, is more of a concern since the corridor and roads will cross several rivers. Towers will be required to be over 60 meters from rivers, which will reduce the risk. Higher risk will be where roads cross small streams. Such streams may be ephemeral in nature, and disturbance of drainage ways could lead to erosion when water flows through the drainageway following rainfall or snowmelt or could lead to contamination from materials carried on in the vehicles. In addition, stringing conductors between towers will require heavy equipment to cross some streams and drainage ways and to be near riverbanks of larger rivers, and this disturbance could lead to erosion and present the risk of spills. Contractors will be required to minimize stream crossings, and to protect them against erosion when there is a significant risk. In addition, fueling and other machine operations will not be allowed within 60 meters to open water.

Impacts on climate. The OHL construction and operation will not have tangible carbon footprint and is very unlikely to be significantly affected by any manifestation of climate change. At the same time, if compared with no-project alternative that implies additional gas-fired thermal generation required to fill in the gap of under-supply to customers from the existing hydro power plants, operation of Jvari-Tskaltubo OHL during the period of its economic life will lead to 2.8 million tCO2e reduction in emissions.

Impacts on flora and habitats. The preferred route passes through land with limited biodiversity value for a substantial proportion of its length. This includes agricultural land, grassland/grazing land, and sections of severely fragmented forests. Even in these areas, however, there are occasional specimens of trees or other plants of conservation concern. Most of the remaining sections of the line pass through Colchic broadleaved forests, with small amounts of riparian forest. Most of this forested land is affected to some degree by human activities and fragmented. However, the species composition and ecological functions remain viable along most of the corridor and are similar to those of the nearby Emerald Sites. Such areas are considered natural habitats as defined by the World Bank's Environmental and Social Standard (ESS) 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources.

ESIA concluded that none of the project-affected habitats should be considered critical and impacts on the natural habitats would be insignificant. However, additional studies are required to confirm these findings as well as to (i) deeper explore potential impacts of habitat fragmentation due to vegetation clearing under the transmission line, (ii) confirm that areas of habitats to be converted or impacted by the project prepresent a very small percentage of the total amounts of these habitats found in the region, (iii) explore if mitigation measrues described below in this list will ensure no net loss of biodiversity value, (iv) develop detailed plan of compensatory planting, if it is deemed feasible, pointing out species composition, planting areas, duration and nature of plantation management, needs for physical protection of young plantations, etc., (v) define relevance, feasibility and type of biodiversity offset that may be required for addressing residual impacts of the project, (vi) build detailed plan of biodiversity monitoring in the transmission line corridor for the construction and operaiton phases, and (vii) describe institutional set-up for monitoring application of prescribed mitigation measures and assess their effectiveness. Based on these studies, a Biodiversity Management Plan will be developed and implemented by GSE. Also, prior to commencement of works, contractor will conduct pre-construction survey along the entire corridor of the transmission line to select the final locations for individual towers. Pre-construction survey teams will include biodiversity experts who will identify individual specimen of plants belonging to species of high conservation value and will recommend to the design team adjusting micro location of towers to avoid vegetation clearing and other disturbance in such locations.

Impacts on protected areas. The transmission line corridor and substation will not affect national parks, reserves, or other areas that are protected or recognized for reasons of biodiversity value. Sataplia National Park, the nearest such park, is over six kilometers distance, and there nearest Important Bird Area is at least 20 kilometers away, which precludes any significant impact. Two Emerald Sites are located in proximity to the OHL corridor and the OHL infrastructure may be visible from certain locations of these sites, however, this visual impact is considered very minor.

Impacts on fauna. The main impact of the project on animals is likely to be habitat loss due to land-clearing and vegetation cutting. In order to estimate the potential impact of habitat loss on species of conservation concern – species included on the Red List of Georgia, species considered as endangered or vulnerable bhy IUCN etc. – the sensitivity of each protected species was assessed. Additionally, the potential impact from habitat loss on common species was identified. The most vulnerable species to habitat loss would be reptiles and bats. Most mammals (other than rodent colonies) and at least some reptiles present in the corridor would be able to relocate to adjacent areas for the length of construction, so impacts will be limited. Similarly, nesting birds would be able to move to adjacent areas and so would not be highly sensitive to habitat loss. It is also important to note that the area of permanent habitat loss would be at towers and access roads of the route, where forest would not be allowed to re-grow. Overall, the impacts on fauna that are described above are expected to be minor under chosen alternative and mitigation will reduce them even more.

Trees in which owls or bats roost and nest or where bats hibernate would be of concern. Such trees will be identified during the pre-construction survey aimed at identification of final micro locations of towers and be avoided wherever possible. If damage/extraction of trees that support bat roosting or hibernation cannot be avoided the contractor may be asked to place "bat boxes" suitable for roosting in nearby areas, provided effectiveness of this measure is confirmed and recommended in the BMP. In addition, if trees with nesting raptors are to be cut, their extraction will be delayed until after young birds have left the nest.

Impacts on community health and safety. A number of actions carried out by GSE, the contractor, and workers may affect community health and safety. The major risks are:

- Poor behavior by workers from outside the region can lead to disruption of local community cohesion, especially smaller communities. This can occur through unaccustomed or violent behavior, including gender-based violence, and/or an increase in communicable diseases. The risk is considered to be very low due to the small numbers of workers and the short-term nature of the works. A worker Code of Conduct will also reduce the risks.
- Inappropriate actions and responses by security personnel could injure or harm community members. Security personnel will not be armed and will be trained, and it will be verified they have no past history of abuses.
- Project traffic could interfere with normal public traffic and could cause an increase in accidents involving pedestrians and vehicles. Project vehicles and traffic will be subject to the contractor's traffic management plan, which will require driver training and place strict requirements on speed limits and other elements of vehicle operation.
- Accidents and emergencies caused by the project could affect communities. The most likely impacts during construction would be from fires and traffic accidents since there will be only limited use of hazardous or flammable chemicals. These will be controlled with the traffic management plan and an emergency preparedness and response plan.
- Towers will present fall and electrocution hazards to anyone who climbs the tower once the towers are in place and then when the line energized. This is particularly a hazard to young children and teenagers. Coming into contact with energized conductors could electrocute humans. This could happen if people, especially children, climb towers or if they come into contact with energized conductors that have fallen due to heavy snow, high winds, or tower failure. In addition, tall agricultural machinery being used under the lines could come into contact with the energized line and electrocute the driver/operator. The contractor will place signs on all sides of towers and at the substation, and GSE will implement a program in schools to warn against the hazards of playing near or on electrical equipment, including towers.

Potential impacts of electric and magnetic fields (EMF). Using a weight-of-evidence approach to evaluate this large body of research, the scientific consensus of numerous organizations is that no cause-and-effect relationship between EMF from any source and ill health has been established at the levels typically found in residential environments, even near to transmission lines. As a result, no scientific organizations have recommended standards to prevent long-term health effects (such as cancer), nor are there any standards in the U.S. or most other countries for limiting exposure to the levels of EMF typically encountered in people's everyday lives. Overall, no potential impacts are expected to occur when humans, animals, and plants are exposed to EMF. However, if household within 100 meters of the line make a request, GSE will monitor EMF levels within houses to verify they are below all recognized norms.

Impacts on workers' health and safety. Construction workers would be exposed to significant health and safety risks, as are all construction workers. Unsafe working conditions could place workers at risk of injury or death. Such conditions could be caused by vehicles and equipment that do not meet safety standards (seat belts, horns, lights, tires, etc.), unprotected access to dangerous locations (unmarked excavations), poor practices and equipment for lifting operations (during tower construction, conductoring, and maintenance), poor electrical safety (untrained workers, inadequate tools, etc.), inadequate safeguards on tools and equipment (unprotected saws, etc.), and other poor practices. Not giving workers to opportunity to express concerns can lead to worker dissatisfaction and affect productivity, and equally importantly it can lead to missed opportunities to identify unsafe conditions that workers are in the best position to recognize. Substandard accommodations can lead to illness or disease among workers, which in turn can result in increased turnover as well as reduced productivity. The contractor will be required to assess risks of all jobs in an occupational health and safety plan, and to control risks with such actions as making changes to the workplace, changing work requirements, equipping machinery and tools with safety devices, and, as a last resort, by providing personal protective equipment at no cost to workers.

Loss of land or livelihoods. No one will be allowed to live within the 74.5-meter corridor; under the preferred alternative, no one will have to move but under Alternative B a total of five household would have to be relocated. GSE will acquire about 400 square meters of land at each of the 200+ tower locations and 14 hectares at the substation location. In addition, restrictions will be placed on all private land in the corridor: no buildings, no use of tall equipment, and (in the 54.5-meter central corridor) no vegetation over four meters high. The Resettlement Policy Framework provides details on how affected people will be compensated for these losses – the goal of the program will be to improve, or at least restore, livelihoods and living standards. Vulnerable people and households will receive special assistance, as described in the Framework; these will include women-headed households, poor people, and possibly internally displace people.

Effects on power supply and key economic sectors. A reliable power transmission system is essential to continued economic development in the country and the regions the transmission line will cross. As

mentioned previously, the project will strengthen the power transmission capacity and reliability throughout the country, and thus contribute to long term economic development. It could also help maintain strong relations with neighboring countries as power is able to cross borders.

Impacts on cultural heritage. A total of 46 national monuments are within five kilometers of Alternative A, including seven natural heritage monuments and 39 cultural heritage monuments. One cultural monument, Motena Cave, is just over 400 meters from the line and Ochkhamuri Waterfalls are almost 600 meters away; no natural monuments are within 500 meters, but five are within 1000 meters. These distances mean that construction of towers and the substation will have no direct effects on any known sites with cultural or natural heritage value, except possibly from traffic or misbehaving workers. There could be indirect effects due to construction noise that carried a long distance, from traffic noise at a few sites, and from changes and disruptions to distant visual landscapes.

Below table summarizes potential impacts and the actions needed to prevent or reduce the impact.

Summary of potential moderate and major impacts and actions to mitigate them

Receptor	Potential Impact	Significance	Mitigation Measures
Landscapes and views			
Tourists	Disturbance of natural views due to construction, vegetation corridor and transmission line	Moderate adverse	Several towers were moved away so that line would be less visible, including from the Ochkhamuri waterfalls and Balda canyon. When the contractor makes the final design, more improvements may be possible. Blocking views of the line for some areas, the terrain will block views and help control the overall significance of the impact.
Land use			
Forests	Vegetation cut to <4m in 54.5m corridor; vegetation cleared at tower sites, substation, new roads	Moderate adverse	Wherever feasible, placing towers in forest land on high ground so that conductors can pass high over trees and not require cutting. Limiting the construction footprint to the absolute minimum needed. This will include demarcating and marking all construction areas and roads, and training workers to remain within authorized demarcated areas. Keeping all construction vehicles and equipment on prepared roads and construction areas and prohibiting moving onto adjacent lands.
Areas protected for cultural or natural heritage	No direct effects, but line will be visible in the distance from some monuments	Moderate adverse	
Soils and geological conditions			
Ground surface (rock & soil) at	Significant erosion of soil,	Major adverse	Contractor to be required to conduct additional surveys as

Summary of potential moderate and major impacts and actions to mitigate them

towers and roads on steep and moderate slopes (affected by land-clearing)	impaired ability to support vegetation, landslides		required to identify locations and areas at high risk of geologic hazards before locating towers. These locations and areas will need to be avoided, or if they cannot be avoided, the contractor will have to implement mitigation measures specified by a geological engineer or other qualified professional in order to prevent increases in future landslide potential. To decrease erosion risk, the contractor (and GSE during operation) will not cut trees and shrubs closer to the ground than at least 0.7-1.0 meters from the ground and will leave roots intact. The contractor will remove and store topsoil from construction sites where soil is deeper than a few centimeters and where steep slopes allow removal and will prevent erosion of topsoil from stockpiles. When construction is complete, the contractor will remove piles and depressions and will grade the area to a stable contour, using as much spoil as possible. The Supervision Consultant will monitor reinstatement and re-vegetation on a continuous basis and will report progress and issues in monthly reports to GSE.
Ground surface (rock & soil) at towers and roads in vegetation control zone on steep and moderate slopes (affected by vegetation control)	Soil erosion, impaired ability to support vegetation, landslides	Moderate adverse	
Ground surface on slight slopes and flat land	Slight to moderate erosion of topsoil, impaired ability to support vegetation	Moderate adverse	
Flora			
Common tree species	All trees cut at towers, construction zones, access roads, substation	Moderate adverse	Final design survey team(s) will include one or more qualified biologists to identify and mark locations where construction and vegetation cutting could affect natural habitats or species

Summary of potential moderate and major impacts and actions to mitigate them

	Trees >1-4m cut in corridor		of conservation concern.
Common shrub species	All plants cleared at towers, construction zones, access roads, substation Shrubs/bushes >1-4m cut in corridor	Moderate adverse	The contractor will maximize the number of towers that are placed in locations that will allow conductors to pass far above forest canopies and thus reduce or eliminate the need to control vegetation in that section. Final survey will identify, mark, and map specimens and local populations of flora species of conservation concern The contractor to be required to undertake detailed reconnaissance of area, consult with forest managers and private landowners to identify existing roads and then to use them wherever possible. GSE to require contractor to restore tower footprints and other areas disturbed by construction as soon as practicable once construction in that area is complete, and not to wait until construction is complete along the entire corridor.
Tree species of conservation concern	All trees cut at towers, construction zones, access roads, substation Trees >1-4m cut in corridor	Major adverse	
Shrub species of conservation concern	All plants cleared at towers, construction zones, access roads, substation Shrubs/bushes >1-4m cut in the vegetation control zone	Major adverse	
Habitats			
Natural habitat (most colchic forest and riparian forest)	Loss of natural habitat	Moderate adverse	GSE to develop Biodiversity Management Plan satisfactory to the World Bank prior to commencement of works. GSE and/or contractor will consult with National Forestry Agency and seek agreement to cut trees and shrubs in the vegetation control zone so a meter or more is left above the ground, which would leave root systems intact.
	Modification of primary ecological functions and species composition	Moderate adverse	
Fauna			

Summary of potential moderate and major impacts and actions to mitigate them

Common species of terrestrial fauna	Nest abandonment/disruption of breeding animals due to construction disturbance	Moderate adverse	Design towers so conductors are spaced at least 2.5-3m apart to prevent electrocution of large birds Final designs to locate towers so as to minimize impacts on natural habitat and species of conservation concern. As part of final design, implement flora/fauna surveys to inventory and map protected flora and nesting/roosting trees on lands required for construction purposes: minimize need for natural habitat and protected species as much as possible. Conduct final pre-construction fauna survey to identify and mark locations of hibernating bats and of nests/breeding behavior of fauna species of conservation concern. If surveys identify breeding or nesting fauna of conservation concern in or within 50m of construction zone, postpone clearing and other construction within 100m until young have left the nests. If pre-construction surveys detect hibernating bats or nesting owls, bats, or raptors in mature trees, delay cutting and construction within 150m until after bats have left roost and/or young have left nests. If surveys identify breeding or nesting fauna of conservation concern in or within 50m of areas to be disturbed, postpone clearing and other construction within 50m until young have left the nests. Place 2+ bat boxes for every mature tree with evidence of bat hibernation/roosting/ nesting, within 50m of tree that was cut
	Change in species composition due to change from tall trees to lower vegetation	Moderate adverse	
	Worker interference with animals or nests	Moderate adverse	
Terrestrial fauna of conservation concern	Animal death due to crushing or direct impact	Major adverse	
	Abandonment of home territories due to construction disturbance	Moderate mixed +/-	
	Nest abandonment/disruption of breeding animals due to construction disturbance	Moderate adverse	
	Change in species composition due to change from tall trees to lower vegetation	Moderate adverse	
Owls and bats	Loss of hibernating and nesting places in mature trees	Moderate adverse	

Summary of potential moderate and major impacts and actions to mitigate them

Community health and safety			
Community members living in vicinity of line	Violent behavior (including GBV)	Moderate adverse	Contractor develops and adheres to Community Health and Safety Plan and the Environment, Health and Safety Code of Conduct. Supervision consultant to review and recommend for GSE's approval Community Health and Safety Plan and Code of Conduct included in the C-ESMP. C-ESMP, including Community Health and Safety Plan and Code of Conduct ultimately approved by GSE and the World Bank and strictly enforced by GSE.
	Nuisance and safety: noise, dust, etc.	Moderate adverse	
	Accidents, emergencies	Moderate adverse	
Physical and economic displacement			
Land owners	Permanent loss of land at tower locations, some roads, substation site	Moderate adverse	Contractor to restore land that is not acquired for permanent use to its former use as soon as possible after construction is complete. Contractor to undertake, wherever possible, as much of the required land-clearing, road construction, construction of towers, and conductoring that will take place on agricultural land between the autumn harvest and spring planting in order to minimize disruption of agriculture. GSE to develop RAP consistent with RPF when the contractor selects final locations of towers, construction sites, and substation. RAP to be reviewed and approved by World Bank and Government of Georgia. GSE to identify and make special provisions for affected people

Summary of potential moderate and major impacts and actions to mitigate them

			who are considered vulnerable or disadvantaged. GSE not to authorize the contractor to begin construction until all compensation for physical and economic displacement has been paid as required by RAP.
Worker health, safety, and welfare			
Workers (contractors and Supervision Consultant)	Poor labor management practices	Moderate to major adverse	Contractor to develop Labor Management Procedure to guide conditions of employment conditions: Written contract of employment. Work hours and compensation. Leave. Job responsibilities/position. Tenure.
	Unsafe working conditions	Major adverse	Contractor to develop and implement Occupational Health and Safety Plan: Medical clearance for workers to perform their tasks. Assessment of risks and identification of mitigation measures for all tasks, with PPE as last resort. Tasks are designed for maximum safe operations. Workers provided with proper equipment and tools, and PPE, to accomplish tasks safely. Only trained workers allowed to complete tasks. Safety Officers oversee all works. Sufficient First Aiders to provide first-level medical care as needed.

Summary of potential moderate and major impacts and actions to mitigate them

			Fully supplied first aid kits in all vehicles and equipment and at all workplaces. Communications established with local medical facilities and personnel regarding works to be completed, arrange for support as appropriate. Record safety statistics (work hours, near misses, minor & incidents and accidents, fatalities). Worker transport (passenger vehicles only, no riding on heavy equipment, wear safety belts, etc.).
	Inability to express concerns	Moderate adverse	Contractor to develop and operate Grievance Redress Mechanism for workers.
	Substandard accommodations	Moderate adverse	If accommodation is provided, contractor to meet requirements of the OHS Guidelines of the World Bank Group.
	Unsanitary conditions	Moderate adverse	Toilets to be provided near all workplaces. Kitchens/break area to be kept in standard sanitary conditions.
Economic conditions			
Infrastructure	Damaged rural unpaved roads/tracks	Moderate adverse	Develop and implement a Traffic Management Plan that includes operating and safety requirements for drivers, vehicles, and other project activities in urban, rural, and remote areas. Ensure only vehicles suitable and licensed for use on public roads are used on public roads. Repair any damage to public roads to the satisfaction of local traffic authorities and repair damaged secondary and rural

Summary of potential moderate and major impacts and actions to mitigate them

			unpaved roads immediately to ensure no disruption of community activities.
Cultural heritage			
Undiscovered cultural heritage	Damage or destruction of archaeological site	Moderate adverse	In case of change finds, contractor will: (a) take all activities on hold, (b) immediately inform GSE, (c) not resume works until formal notice from the GSE. Require contractors to include induction training provided to all foremen and workers and at least annual refresher training. Require the contractor to include in the contractor's Worker Code of Conduct, and to enforce, prohibitions against disturbing or destroying any materials, areas, or items that could have cultural heritage or natural value. Prohibit the contactor from undertaking construction activities within five kilometers of a monastery or other religious monument on Sundays or religious holidays.
	Destruction of surficial artifacts or signs of potential archaeological site	Moderate adverse	

Environmental and Social Management and Monitoring Plan

ESIA report includes an Environmental and Social Management and Monitoring Plan that identifies measures that must be implemented to avoid, reduce, or otherwise mitigate potential moderate and major adverse impacts identified in the ESIA. It also identifies best management practices (BMPs) and other mitigation measures that will minimize, reduce, or eliminate many of the impacts of minor or even negligible significance which could escalate to become more important if they are not handled properly. Key mitigation measures are shown in the table above.

Primary responsibility for implementing mitigation measures during construction will rest with the contractors, although GSE will have responsibility for some of the actions. All works by the contractors, including implementation of mitigation measures, will be overseen and supervised by the Supervision Consultant, a company to be appointed by GSE to supervise the works on a day-to-day basis.

A program to monitor implementation of the project and the mitigation measures is also included in the ESIA. The plan outlines the actions to be implemented to monitor the compliance with the requirements described in the specific chapters of the ESIA and summarized in the present executive summary document.

Conclusion

In summary, the project may have significant impacts on people and the environment if proper measures are not taken to manage those impacts. The ESIA report, the Resettlement Policy Framework, and the Stakeholder Engagement Plan identify key measures summarized above that GSE and the contractor must implement to reduce impacts to acceptable levels. The monitoring programs described in the ESIA report and the Resettlement Policy Framework will ensure the required mitigation measures are fully implemented and that any unexpected impacts are identified and controlled quickly. This will allow the project to provide the benefits it is intended to bring to the people of Georgia.

1. Introduction

JSC Georgian State Electrosystem (GSE) is the largest of three electricity transmission companies in Georgia, responsible for conveying electricity from hydro, thermal, and wind power plants to power distribution companies (including JSC Telasi and JSC Energo-Pro Georgia) and to certain direct customers (that is, large companies).

GSE is owned by the state and is responsible for 3,350 kilometers of transmission lines and 90 substations throughout Georgia. GSE does not generate electricity or serve direct customers other than large industries, but only transmits electricity from generation facilities to distribution companies, large industries, and other countries. The distribution companies, in their turn, provide electricity to consumers.

GSE's responsibilities include overall coordination of Georgia's electricity system and balancing electricity supply and demand in order to provide an uninterrupted and reliable power supply. GSE actively works to develop and improve electricity transmission by reconstructing and maintaining existing transmission lines and by constructing new lines. The goals of the development program are to increase system effectiveness, improve the independence of the energy system, and to ease energy relations with neighboring countries.

The World Bank is considering providing financing to GSE for the Transmission Grid Strengthening project, which includes the construction and operation of a 77-kilometer 500 kiloVolt (KV) overhead transmission line (OHL) between Jvari and Tskaltubo and a new 500 kV substation near an existing substation in Tskaltubo (collectively, "the project"). Under Georgian law, the potential environmental impacts of the project must be evaluated in an Environmental Impact Assessment. In addition, as part of its decision-making process, the World Bank requires that proposed projects be evaluated in an Environmental and Social Assessment. This Environmental and Social Impact Assessment (ESIA) report has been prepared to meet World Bank requirements.

The new transmission line is intended to serve two main purposes. First, it will improve reliability of the existing grid. To accomplish this, it will provide necessary backup for existing Imereti and Zekari lines and will help ensure a steady energy supply to east Georgia and the Akhaltsikhe-Borchkha export line to Turkey. The new line will provide an alternative route for electricity in case there are interruptions on the 500kV lines between Zestafoni and Akhaltsikhe and between Akhaltsikhe and Gardabani. Second, the new Jvari-Tskaltubo OHL and Tskaltubo substation will increase the capacity for electricity transmission from western Georgia to eastern Georgia, which will further improve reliability of existing supplies. The increase in transmission capacity will be increasingly important as new hydropower projects in western Georgia begin to supply additional electricity to the national grid. The German company Fichtner prepared a preliminary design of the project and determined it is technically and financially feasible.

GSE will be responsible for the construction and operation of the 500kV transmission line and substation and will acquire the land. GSE will hire a contractor to complete the final design and then to construct the transmission line and a second contractor to design and construct the substation. GSE will also hire a third company to serve as the supervising engineer, responsible for overseeing the contractors' design and construction.

This draft ESIA will be disclosed to project stakeholders and the public in compliance with Georgian law and World Bank guidelines. All stakeholder and public comments on the draft ESIA will be considered in developing the final ESIA, and in the final decisions made by GSE and the World Bank.

1.1. *Scope and Organization of the ESIA*

This ESIA evaluates the following project components:

- Construction of foundations and towers for 77 kilometers between Jvari and Tskaltubo, and of roads to allow access to tower locations.
- Conductoring, which is the stringing of lines between towers to allow electricity to be conducted.
- Construction of a 500kV substation near Tskaltubo, including connection of other transmission lines to the new substation.

This ESIA is intended to meet requirements established by the World Bank for high-risk projects. Applicable requirements are described in Chapter 2. Prior to making a funding decision and proceeding with the project, the World Bank and GSE will have to be satisfied that:

- The program will meet Georgian national requirements and World Bank requirements, as described in section 2.
- The project includes measures as necessary to avoid or minimize significant adverse changes in environmental, health and safety, and socioeconomic conditions.
- Appropriate public consultation and disclosure are undertaken in line with Georgian national law and the World Bank Environmental and Social Framework (World Bank 2018), thus ensuring that all reasonable public and other opinions are adequately considered prior to a commitment for proceeding with the project.

1.2. *Organization of the ESIA*

The ESIA report is organized as follows:

- Chapter 2 describes the legal and other requirements that will apply to the project.
- Chapter 3 provides a description of the proposed project, including both the infrastructure to be constructed and the construction process, and of alternatives to the project.

- Chapter 4 identifies and describes an alternative to the proposed project.
- Chapter 5 describes the methodology by which potential impacts are evaluated.
- Chapter 6 describes the baseline conditions of environmental resources that could be affected by the project and the socioeconomic conditions in the area that could be affected.
- Chapter 7 describes how the project could affect environmental resources, infrastructure, people, and social conditions, and measures that are needed in order to avoid, reduce, or otherwise mitigate those potential impacts.
- Chapter 8 summarizes how environmental and social performance of the project will be managed and monitored.
- Chapter 9 summarizes how the ESIA will be disclosed to the public and how GSE has received and will receive comments and other input from affected people and other interested stakeholders.
- Chapter 10 lists references consulted during preparation of this ESIA.
- Annex 1 includes detailed maps of the OHL Corridor.
- Annex 2 provides the results of geotechnical surveys.
- Annex 3 provides the maps showing visibility of transmission line.
- Annex 4 presents the results of a floral surveys conducted along the OHL corridor.
- Annex 5 presents results of air emission modelling
- Annex 6 describes the public consultation process.
- Annex 7 provides templates of management plans

2. Legal and Regulatory Framework

This chapter describes the national and international legal framework that will apply to the Jvari-Tskaltubo transmission line, including standards and policies applicable to the project.

2.1. *National Legal and Regulatory Framework*

Georgia's legal framework for environmental protection is based on the Constitution of Georgia. Though the Constitution does not directly address environmental matters, it does confirm the right of any person to live in a healthy environment, use the natural and cultural environment, at the same time obliging any person to take care of the natural and cultural environment. The Constitution also establishes the legal framework that guarantees public access to information, stating that an individual has the right to obtain full, unbiased, and timely information regarding his or her living environment.

Under the Constitution, the legal framework includes environmental and labor laws, international agreements, subordinate legislation, normative acts, presidential orders and governmental decrees, ministerial orders, instructions and regulations. In addition to the national legal framework, Georgia is signatory to a number of international conventions, including several related to environmental and social protection.

The Ministry of Environment Protection and Agriculture is primarily responsible for environmental protection issues. As the competent authority, the Ministry's responsibilities include:

- To intermit, limit, or stop any activity having or likely to have adverse impact on the environment, as well as unreasonable use of natural resources.
- To review and approve environmental and social assessments and to issue a series of licenses and permits, including for environmental impact.
- To control the implementation of mitigation measures by the developer, which in this case is GSE.
- To receive free and unrestricted information from the developer about the use of natural resources, monitoring systems, waste management, etc., and explanations from authorities concerned with the project.
- To ensure public participation in environmental the decision-making process.

2.1.1. Environmental and social impact assessment in Georgia

During the time the project was being developed, and between preparation of the draft ESIA in 2017 and this revised draft, the Georgia law that guides environmental impact assessment changed. The first subsection below describes the legal requirements at the time the project was initiated and the initial draft ESIA was developed and disclosed, and the second subsection describes the legal

requirements in effect at the present time, which were also considered in developing this revised draft ESIA.

Legislation in force when initial report was submitted and disclosed

At the time the project was initially developed, the potential environmental impacts of the project were subject to study and evaluation under the law "Environment Impact Permit" (r/c 360.160.000.05.001.003.078) and the law on "Ecological Examination", which were adopted on 14.12.2007, last amended on 07.12.2017 and abolished from 01.01.2018. These were replaced in 2018 when a new law - Environmental Assessment Code. Since this project was first evaluated in a draft ESIA under the old legislation and submitted to the Ministry of Environment and Natural Resources (which is now the Ministry of Environment Protection and Agriculture) in 2017, those old laws are described here.

The *Law of Georgia on Environmental Impact Permit* listed the various activities that were subject to ecological examination and defined the EIA process as an obligatory step for obtaining authorization for planned developments, including the present project. An Environmental Impact Permit was the right granted by the Ministry of Environment Protection and Agriculture (formerly the Ministry of Environment and Natural Resources Protection) under the procedures and forms established by the legislation, and then a Construction Permit allowed construction to proceed.

The legislation set out the legal basis for issuance of an Environmental Impact Permit, including implementation of an ecological examination, public consultations, and community involvement in the processes. The decision to grant or refuse a permit was to be based on the findings of an EIA report and associated documentation which the project developer/proponent (in this case GSE) presented to the relevant Ministry. The applicant then had to organize and undertake public consultation on the draft EIA report, then to prepare and submit a final EIA based on those consultations. The draft EIA was disclosed to the public in December 2017 and public consultations were held in February 2018, as described in Chapter 9. GSE then prepared the final EIA and submitted it to the Ministry of Environmental Protection and Agriculture in January 2019.

The EIA process was also controlled by the *Law of Georgia on Ecological Examination* (r/c 360.130.000.05.001.003.079), which was adopted on 14.12.2007, last amended on 07.12.2017, and finally abolished from 01.01.2018). This Law made an ecological examination obligatory for issuance of development permits. Demonstration of sustainable ecological outcomes was necessary in order to obtain a development permit. The review of, and decisions related to, ecological examination was regulated by the Ministry of Environment Protection and Agriculture of Georgia (formerly the Ministry of Environment and Natural Resources Protection).

Legislation in force at present

Enacted in 2017 and with most requirements in effect since June 2018, a new Environmental Assessment Code now guides the evaluation of how potential projects can affect environmental and social resources. Administered by the Ministry of Environment Protection and Agriculture of Georgia, this Code harmonizes Georgian environmental legislation with European legislation.

The list of activities subject to environmental impact assessment was modified, extended, and prioritized based on scale and impact significance. The new Code introduces a screening procedure, which requires the project proponent, with Ministry agreement, to identify if the proposed project has potential to cause significant environmental impacts and thus require a full-scale environmental study. The new law replaced the previous Environmental Impact Permit with an Environmental Decision. In addition, the new Code includes new approaches for public participation and information disclosure. One of the main elements is that public participation has to be ensured at all stages of decision-making, not only at the time the ESIA report is prepared and disclosed. In addition, information disclosure and public consultations are now the obligation of the Ministry instead of the project developer.

As noted above, the Environmental Impact Assessment for the project was carried out under the previous legislation and disclosed to the public in December 2017. In order to meet World Bank requirements for environmental and social assessment, as described below, this updated and expanded ESIA was prepared.

Regulation on environment impact assessment (Decree #31 of the Minister, 19.05.2016, last amended on 07.12.2017 r/c 360160000.22.023.016156)

This regulation requires assessment and control of potential impacts that may be caused by various types of projects, including electricity transmission lines with voltage over 35kV and power substations with voltage over 110 kV. The regulation specifies the environmental resources that must be considered and evaluated and requires EIAs to be organized in a specific way, with very detailed quantitative information and analyses for certain aspects, such as air quality and emissions, and waste management. In December 2017 and January 2018 ESIA reports were prepared in accordance with the regulation.

2.1.2. Other relevant legislation on environmental and social issues

Other key laws and requirements, most of which were also modified in 2018, will also apply to the Jvari-Tskaltubo project, including:

Law of Georgia on Environment Protection (adopted on 10.12.1996, last amended on 05.07.2018, 360.000.000.05.001.000.184). The law establishes the main principles of environment protection. Provisions of the law that are relevant to the project include environmental management, licensing, standards, environmental impact assessment, ecosystem protection, protected areas, and biodiversity. The ESIA includes mitigation measures that are designed, in part, to ensure the project meets the requirements of this Law.

Law of Georgia on Licenses and Permits (adopted on 24.06.2005, last amended on 31.10.2018, 300.310.000.05.001.001.914). This Law regulates activities which may result an increased hazard to human life or health, involve interests of importance to the State or public, or are connected to consumption of State resources. The Law defines the full list of activities which require licenses and permits, and sets out the rules for granting, amending and abolishing licenses and permits. The project

will require a general license for forest usage. In addition, the construction contractor will use licensed companies for waste management, wastewater removal and discharge, and other such services.

Law of Georgia on Water (adopted on 26.10.1997, last amended on 20.07.2018, 400.000.000.05.001.000.253). The Law regulates water resources in Georgia, including the use and protection of surface and underground water. Project developer is obliged to prepare technical project for extraction of water from any surface water body, which shall be agreed with and approved by the Ministry of Environment and Agriculture of Georgia. It is noted that the project will use only small quantities of water, there will be no discharges of wastewater or other materials to water bodies, and there will be limited potential for significant impacts on water quality.

Law of Georgia on Soil Protection (adopted on 12.05.1994, last amended on 07.12.2017, 370.010.000.05.001.000.080). This law is intended to ensure preservation of soil integrity and improve soil fertility. Its primary applicability to the project will be to require excavations at towers to preserve topsoil by removing and storing it before using it to reinstate disturbed sites, and to take the same precautions to preserve topsoil and reinstate disturbed areas if soil or earthen materials are taken from borrow pits for use at tower locations or the substation. In addition, the project will be required to manage fuels and other hazardous substances, so they do not contaminate soils.

Law of Georgia on Protection of Atmospheric Air (adopted on 22.06.1999, last amended on 05.07.2018, 420.000.000.05.001.000.595). This law prohibits human activities that affect air quality from causing a negative impact on human health or the environment. The project will not require a permit but will control dust and prevent excessive emissions from vehicle and equipment engines.

Forest Code of Georgia (adopted on 22.06.1999, last amended on 27.06.2018, 390.000.000.05. 001.000.599). The Georgian State Forest Fund comprises lands held by the State, and its privatization is regulated by the law of Georgia *"On the Privatization of Georgian Forests"*. The Forest Code, implemented by the National Forestry Agency, establishes requirements for the Agency to tend, protect, control the use, and restore the forest fund and its resources in order to "maintain and improve climatic, water regulating, protective, cultural, recreational, and other natural useful properties." The Code establishes categories of lands in the forest fund, which may include certain categories of non-forested land, including open plantations and nurseries, clear-cut areas, fire-damaged and dead stands; agricultural lands, other non-forestry lands and lands of special use with hard surface roads and passage ways of various purpose, power and communication lines, and a variety of other non-forested lands. In addition, the Code establishes categories of protected areas and usable forest areas, depending on the environmental, social, and economic importance of these territories, and permissible uses. Land through which the transmission line will pass is not protected but is considered usable land. GSE will receive a permit for general use and have the land under towers transferred to GSE administration.

Law of Georgia on the System of Protected Areas (adopted on 07.03.1996, last amended on 20.07.2018, 360.050.000.05.001.000.127). The law establishes categories of protected areas and defines activities that are permissible within the boundaries of such areas. Protected areas in the vicinity of the transmission line project are cultural resource monuments and areas protected for biodiversity. The project will not cross or have any direct impact on any protected area.

Law of Georgia on "Red List" and "Red Book" of Georgia (adopted on 06.06.2003, last amended on 20.07.2018, 360.060.000.05.001.001.297). This law establishes the rules for compiling and maintaining the Red List and Red Book of Georgia, which identify endangered species of wild animals and plants that are found in Georgia. This law prohibits taking or causing significant effects on listed species and their habitats. Several species of plants and animals on the Georgia Red List are found in the forests and other land that will be crossed by the transmission line corridor, and it will be necessary to cut or damage at least some listed plant species and listed animals could also be disturbed by construction.

Law of Georgia on Cultural Heritage (adopted on 08.05.2007, last amended on 20.07.2018, 450.030.000.05.001.002.815). This law sets "compulsory conditions for the implementation of large scale earth works", which would include construction of towers and the substation. Before proceeding with the project, GSE will need a clearance letter issued by the Ministry of Education, Science, Culture and Sport of Georgia. Also, as required by the law, the project has a chance find procedure that requires the work to be stopped and the Ministry of Education, Science, Culture and Sport informed in case a find is encountered.

Law of Georgia on Public Health (adopted on 27.06.2007, last amended on 14.11.2018, 470.000.000.05.001.002.920). The law establishes rights and obligations related to public health, including the prevention of contagious diseases. To ensure a healthy environment, the Ministry of Labor, Health and Social Affairs of Georgia establishes environmental quality standards with which the project must comply, including maximum permissible concentrations and exposure limits for contaminants in air, water, soil, noise, and electromagnetic radiation. The Ministry also is responsible for monitoring compliance with the standards.

Law of Georgia on Wildlife (adopted on 25.12.1996, last amended on 20.07.2018, 410.000.000.05.001.000.186). The main goal of this law is to protect and restore wildlife as well as their habitats, including ensuring maintenance of species diversity and genetic resources, and general protection of wildlife, including *in situ* and *ex situ* conservation, translocation, and reproduction of wildlife, and the production of wildlife products. The law will apply to the project.

Waste Management Code (adopted on 26.12.2014, last amended on 05.07.2018, 360160000.05.001.017608). This Code establishes the legal framework for the management of hazardous and non-hazardous wastes, including minimizing waste generation and maximizing reuse and recycling. The law will require the project to manage all wastes in a way that protects the environment. It is likely that the project will generate more than 1,000 tons of inert wastes, mostly in the form of spoil from tower excavation, in which case GSE and/or the construction contractor will

have to develop and submit a waste management plan for review and approval by the Ministry of Environment Protection and Agriculture; this plan will have to be made publicly available. A Plan has been developed and is presented as Annex 5. Implementation of the waste management plan will have to supervise by an environmental manager. If the project will generate more than two tons of hazardous waste, which is not considered to be likely, it will have to develop and implement a hazardous wastes separation and collection system and provide information and appropriate training to workers.

Labor Code of Georgia (adopted on 17.12.2010, last amended on 30.11.2018, 270000000.04.001.016012). Administered primarily by the Ministry of Health, Labour and Social Affairs, this law regulates labor relations between workers and employers. It requires fair reimbursement and the creation of safe and healthy working conditions. The law includes a number of provisions relevant to the project, including employment guarantees, working time, government social insurance, benefits and pensions, age, internal labor regulations (i.e., human resources manual), and occupational health and safety. If the contractor employs expatriate workers, those persons have the same rights and obligations as citizens of Georgia. The law prohibits discrimination based on color, race, sex, sexual orientation, handicap, religion, political and social status, and other personal characteristics. In addition to the Labor Code, other laws concern risks to workers from specific hazards, such as the *Act on HIV Infection / AIDS* and the *Act on Tobacco Control*.

The Labor Code of Georgia defines the minimum age of the employees as 14 years. Employees under 18 years of age are not allowed to undertake certain jobs, as defined in the Code, and there are limits on working hours for workers between 14 and 18. For this project, GSE will prohibit the contractor from employing anyone under 18 years old.

***Law of Georgia on the Procedure for Expropriation of Property for Necessary Public Needs* (adopted 23.07. 1999, last amended 29.06.2018, 020.060.040.05.001.000.670).** Georgia has the constitutional power to seize any property from registered owners by means of expropriation for projects of imminent public necessity. The decision is made only through a Regional Court that must be preceded by the Decree of Minister of Economy and Sustainable Development of Georgia, justifying the imminent nature of the public necessity. The court decision must include a description of the property to be expropriated and an instruction on the necessity to pay due compensation. The expropriator (in this case, GSE) has to make every reasonable effort to acquire property by negotiation and is required to value the property at fair market value (at its own expense) before negotiations. GSE does not intend to expropriate any lands unless all other attempts to reach agreement fail and the line cannot be routed to avoid disputed land. The Resettlement Policy Framework will guide development of a more detailed Resettlement Action Plan, which will provide procedures for negotiations to reach agreement, losses for which compensation will be paid, and the means by which compensation will be paid.

***Law of Georgia on Payment of Substitute Land Reclamation Cost and Damages in Allocating Farm Land for Non-Farming Purposes* (adopted 02.10.1997, last amended 20.07.2018, 370.020.000.05.001.000.244).** This law establishes requirements for compensating the country and affected private landowners and users for property loss, plus lost profits by the beneficiary, of an allocation of agricultural land for non-agricultural purposes. In the event that agricultural land is taken out of agricultural use, the law requires that a land replacement fee be paid to cover costs of agricultural land of equivalent size and quality, and that the owner/user of such land be fully compensated for damages. This law will apply when GSE acquires agricultural land for towers, tower foundations, and the substation, and also will apply if agricultural land or crops are damaged during construction or maintenance activities. The Resettlement Policy Framework will guide compensation for impacts on agricultural land.

Law of Georgia on Occupational Safety (adopted 07.03.2018, last amended 22.12.2018, 270000000.05.001.018780). This new law defines basic requirements and general principles of occupational safety for jobs that are dangerous, hard, harmful, and/or hazardous. The above-mentioned activities are listed in the ordinance of government of Georgia #381. The activities related to civil construction, such as construction of electrical distribution facilities and works related to provision of electricity and telecommunications are considered as dangerous, hard, harmful, and/or hazardous activities. This law would apply to contractors and supervising engineers, and to GSE employees who visit project locations during construction and/or operation.

The law imposes a general obligation on employers to provide employees with a safe and healthy working environment and to inform workers of the potential risks their jobs may present to their health and safety. Measures that must be taken include, but are not limited to, training and information campaigns as well as adoption of relevant preventive measures. The law includes requirements for organizing and managing health and safety programs, providing emergency care and services, and responding to accidents. Other requirements include controlling access to hazardous workplaces, providing personal protective equipment at no charge to workers, and medical examinations.

The project implementation will require resettlement and restriction of land use under the easement, therefore the legislation bases for the resettlement and land ownership registration is important. Main governmental institutions involved in the land registration processes are presented below.

Public registry. The governmental office in charge for official registration of land ownership is National Agency of Public registry (NAPR). NAPR is also in charge of property transfer through purchase agreement from landowners to the GSE. Previously operating Municipality (Rayon) Archives are now transferred into the possession of Municipal Registration Offices of the NAPR and information is registered and stored in a centralized database. Municipality Archives are used for cross-verification of ownership documentation and validity of physical possession of land by persons seeking registration as legalizable owners. If valid registration in the NAPR database does not exist, the Aarchives can be used to prove the rights of for a particular land parcel and historical documentation can be used for legal registration.

Property Rights Recognition Commission. Under the Law of Georgia on Recognition of the Property Ownership Rights Regarding the Land Plots Owned/Used by Physical Persons or Legal Entities (2007), the Government of Georgia has established the Property Rights Recognition Commission (PRRC) at the municipal level for recognition of ownership rights of owners/users for registration. PRRC verifies and authorizes application of ownership for registration with the NAPR. PRRC authorizes application of only those interested persons, who are not registered but have non-agricultural or agricultural plots adjacent to the parcel where the applicant lives.

In cases when the project is important for public and state, and the land owner refuses to accept resettlement or compensation, the law of Georgia on "Procedure for the Expropriation of Property for Necessary Public Social Needs" can be used as last resort, as described above.

2.1.3. Technical standards and guidelines

A series of other ordinances, including several specific to high-voltage transmission lines, will also guide the development of the project. These ordinances, whose titles are self-explanatory, are listed in Table 2.1.1.

Table 2.1.1. Key Regulations Applicable to the Project

Legislation	Adoption Date	Last Amendment	Registration Code
Ordinance of Government of Georgia №366, on "Establishment of protection rules and protection zones for linear constructions of power grid"	24.12.2013	12.04.2017	300160070.10.003.017533
Ordinance of Government of Georgia №347, on "Establishment of safety rules during construction of power transmission lines and electrical installation works"	17.12.2013	Not amended	300160070.10.003.017514
Ordinance of Government of Georgia №340, on "Establishment of technical rules for operation of electrical installations"	17.12.2013	Not amended	300160070.10.003.017507
Ordinance of Government of Georgia №414, on "Establishment of technical regulation regarding calculations of maximum permissible discharge (MPD) of pollutants, with waste water, into the surface water bodies"	31.12.2013	Not amended	300160070.10.003.017621
Ordinance of Government of Georgia №425, on "Establishment of technical regulation regarding pollution protection of surface water bodies of Georgia"	31.12.2013	29.05.2018	300160070.10.003.017650
Ordinance of Government of Georgia №17, on Establishment of technical regulations regarding environmental protection"	03.01.2014	22.05.2018	300160070.10.003.017608
Ordinance of Government of Georgia №54, on "Establishment of technical regulation regarding environmental damage identification (calculation) method"	14.01.2014	19.12.2017	300160070.10.003.017673

Several key elements of the Ordinance of Government of Georgia №366, on "Establishment of protection rules and protection zones for linear constructions of power grid" will have far-reaching effects on the final design and construction of the project. The purpose is to facilitate the uninterrupted functioning of the power grid, ensure safe operations, meet sanitary and safety norms, and prevent accidents. Key standards include parameters for protective zones (distances, width, clearances), access roads, rights-of-way (ROWs) in forests and other treed/vegetated areas, conditions for locating/constructing buildings (other facilities), and conducting works in these buffer areas.

A key requirement of this ordinance is to require a safety zone for the 500kV OHL ROW that extends at least 30 meters beyond the conductor (wire) on each side of a tower. This safety zone will therefore be 74.5 meters wide: 30 meters on each side plus the 14.5 meters between the outermost conductors. For the purposes of this document ROW and safety zone refer to the same corridor of 74.5 meters. No residences, auxiliary buildings (barns, sheds, etc.) or other structures are allowed in the safety zone. There are also requirements for tree felling and clearing width in forests and forested areas in order to prevent damage to the line. The width of vegetation control zones for overhead power lines is defined for different situations. The vegetation control zone is defined for lines that are the only source of power supply for certain areas. Depending on the landscape, the zones are defined as following:

- In flat areas, the vegetation control zone extends to each side at least as far as the average height of vegetation. The purpose is to prevent trees from falling on the line. In this case, the average height is estimated to be 20 meters, so the vegetation control zone is 54.5 meters: 20 meters on each side plus 14.5 meters between the conductors. Trees may be no higher than four meters, and there must at least at least eight meters vertical clearance between vegetation and conductors. If taller trees outside the control zone could fall on the line, they have to be cut.
- On slopes, and when the vertical clearance of the conductor is more than eight meters from the top of vegetation, the vegetation control zone uphill is defined as the area with a width at least equal to the average height of vegetation in place and downhill as a two-meter wide corridor from the vertical projection of the corner conductor.
- In parks, wind protection belts, etc., the vegetation control zone is five meters wide from the projection of the corner conductor in the position of maximum swing.
- In parks and orchards, it is not necessary to clear vegetation that is not more than four meters high.
- In specific cases, the vegetation control zones are defined by the line operator.

The Ordinance states that agricultural activities are not restricted in the corridor so long as general rules are followed to prevent interference with the line, such as limited height of agricultural machinery, restriction on the use of cranes and lifting devices, and prohibitions of other activities that could touch the energized conductors.

The decree allows the line operator to register the ownership of the line and the corridor (that is the easement zone or right-of-way with the National Agency of Public Registry (NAPR).
Other requirements concern the distances transmission lines must be from water bodies, buildings in settlements, roads, and other overhead lines. The ordinance also establishes restrictions for construction and other development, planting and other agricultural activities, and other works/activities within safety zones as well as other safety requirements.

In addition to the above regulation Jvari –Tskaltubo 500 kV overhead Line is designed to meet the requirements of EN 50341-1-2012 (Euro-Norms).

2.2. *International Requirements and Standards*

2.2.1. Conformity with European Union requirements

In 2010, Georgia entered into an Association Agreement with the EU, and this agreement requires Georgia environmental and social laws to conform to EU legislation. The EU environmental legislation comprises approximately 300 legal instruments, mostly in the form of Directives, covering environmental protection, pollution control and other activities, production processes, procedures and procedural rights as well as products. In general, Georgia law now conforms to the requirements of the various Directives. The key EU environmental directives that are considered to be most relevant to the project include:

- European Commission (EC) Directive 85/337/EEC on Environmental Impact Assessment--EIA Directive, 1985). The new “Environmental Assessment Code” and “Regulation on Environment Impact Assessment”, described in sections 2.2.2 and 2.2.3 above, include equivalent requirements.
- EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (Natura 2000)--the Habitats Directive, 1992. Nature protection laws described in section 2.1 above are consistent with the Habitats Directive.
- EC Directive 2009/147/EC on the Conservation of Wild Birds—the Birds Directive, amended 2009. Similarly, nature protection laws described in section 2.1 above are consistent with the Birds Directive.

It is important to note that the EU directives do not apply directly to the project, but rather that Georgian laws relevant to environmental and social matters have been amended to conform to EU requirements. Besides the new laws on environmental impact assessment described in section 2.1.1, most other laws that are described in section 2.1.2 were amended in 2018. In addition, requirements for areas that are protected for their biodiversity values are particularly relevant and are discussed in the following subsection.

2.2.2. Emerald network

Georgia is a signatory to the Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979), which highlights the conservation of endangered species and their habitats, including migratory species. Under the Convention, Georgia is required to establish and maintain "Areas of Special Conservation Interest" (ASCI), also known as "Emerald Sites" (known in the EU as "Natura 2000" sites), which collectively comprise the "Emerald Network". Emerald Sites and the Network are established to conserve flora and fauna species and their habitats and to support the establishment of principles of sustainable usage of biological resources. The Habitats Directive and the Birds Directive establish requirements for assessing potential adverse effects on Emerald Network sites (in the European Union, on Natura 2000 sites) and require the implementation of measures to reduce potential impacts to acceptable levels, and to offset losses of valuable biodiversity.

The initial preliminary design of the Jvari-Tskaltubo OHS required the transmission line to cross one designated Emerald Site (Samegrelo 2) and another nominated Site (Samegrelo 1). Following early assessments of potential impacts, the corridor was relocated so that it now will bypass the sensitive areas. As a result, none of the alternative routes considered in this ESIA will cross or otherwise affect the Emerald Sites.

2.2.3. International conventions and standards

A number of international laws and conventions have been ratified by Georgia. The following are potentially relevant for this project:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)
- Vienna Convention for the Protection of the Ozone Layer (1985).
- Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters (1998). Georgia law and World Bank requirements for disclosure and public participation comply with this Convention.
- Convention on the Conservation of Migratory Species of Wild Animals (1979)
- Agreement on the Conservation of Bats in Europe (EUROBATS) (2001)
- Agreement on the Conservation of African-Eurasian Migratory Waterbirds (2001)
- UN (Rio) Convention on Biological Diversity (1992)
- Paris Convention on the Protection of the World Cultural and Natural Heritage (1972)
- European Convention on the Protection of the Archaeological Heritage (1992).

In addition, Georgia has ratified a number of core labor standards of the International Labor Organization (ILO), including the following:

- Forced labor (C105)
- Child Labor (C182)
- Discrimination (C111)
- Freedom of Association and the Right to Organize (C87)
- Equal Remuneration (C100)
- Minimum Age (C138).

2.3. *World Bank Environmental and Social Standards*

2.3.1. Environmental and Social Framework

GSE is seeking financing for the project from the World Bank, which requires that the project meet the Bank's environmental and social standards, as well as relevant Georgian legislation if it is more stringent. The World Bank's Environmental and Social Framework (ESF) includes the *Environmental and Social Policy for Investment Project Financing*, which describes the requirements the Bank must follow for projects it supports through Investment Project Financing, and 10 *Environmental and Social Standards* (ESSs), which establish requirements for Borrowers such as GSE to identify, assess, and control environmental and social risks and impacts of Bank-supported projects.

Just as happened with Georgia legislation, applicable World Bank requirements for environmental and social impact assessment changed during preparation of the current project, with the ESF replacing a series of Operational Policies that were in place at the time the initial draft ESIA report was first prepared. The new ESF became effective on October 1, 2018. Since the Bank's decision on project financing will be made following the ESF's effective date, GSE will be subject to the requirements of the ESSs, including preparation of this ESIA. Applicable ESSs include:

- ESS1: Assessment and Management of Environmental and Social Risks and Impacts: identification, control, and monitoring of risks and impacts, including identification of applicable requirements and monitoring outcomes.
- ESS2: Labor and Working Conditions: labor relations, rules of employment, occupational health and safety, workforce protection, worker grievance mechanism, with specific requirements for contractor and subcontractor employees.
- ESS3: Resource Efficiency and Pollution Prevention and Management: conservation of resources and control/prevention of wastes and pollution.
- ESS4: Community Health and Safety: avoidance and control of risks and impacts on communities from project activities and workers, emergencies, security, and other factors.
- ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement: identification, planning, avoidance/response to the need for physical and/or economic displacement due to project activities, including information disclosure and consultation.

- ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources: protection and conservation of biodiversity and habitats, support livelihood of local communities
- ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities. No such communities or people could be affected by the project, so this ESS does not apply.
- ESS8: Cultural Heritage: protection of tangible and intangible cultural heritage.
- ESS9: Financial Intermediaries. This applies when Bank funding is provided to financial institutions for further on-lending. Financing will not be provided through an intermediate lender, so this ESS does not apply.
- ESS10: Stakeholder Engagement and Information Disclosure: identification and engagement of local and other stakeholders throughout the project life cycle, disclosure of project information, grievance redress mechanism for external stakeholders.

The Bank classifies proposed projects into one of four risk categories and has classified this project as high-risk. This classification is due, in part, to the sensitive environments that may be affected, and the need for land acquisition and involuntary resettlement. If the Bank determines that risks are no longer high, it may reduce the classification as appropriate.

Table 2.4.1 provides a high-level summary of key gaps between the Bank's requirements and Georgia's requirements. As noted, the more stringent of the requirements will apply.

Table 2.3.1. Summary of World Bank Requirements and Key Gaps with Georgian Legal Requirements

ESS &Topic	Major requirements	Key requirements/gaps in Georgian framework
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts		
Scope of application	ESSs apply to Associated Facilities to extent of Borrower's control/influence	Associated facilities not covered by Georgia ESIA law
Borrower's E&S Framework	May use Borrower's framework if can meet objectives of ESSs	No provision for alternative requirements
A. E&S Assessment	Conduct E&S assessment, including stakeholder engagement Retain international expert(s) for high-risk projects Apply national framework, ESSs, EHSGs/GIIP Apply mitigation hierarchy Offset significant residual impacts Differential measures for vulnerable or disadvantaged people Consider primary suppliers	ESIA law has much less emphasis on social conditions and impacts, but other laws partly fill gaps, but with less specificity concerning community impacts No distinction between international and Georgian experts No reference to EHSGs or GIIP No equivalent provision for offsets No equivalent provisions for vulnerable and disadvantaged people No coverage of primary suppliers
B. ESCP	ESCP for compliance in a specified time	No provision in permits/approvals for delayed compliance
C. project monitoring & reporting	Monitor proportionate to nature of project, risks and impacts, and compliance requirements Reports to World Bank	Previously, focus on quantitative monitoring may overlook other performance and compliance issues
D. Stakeholder engagement and information disclosure	Engage stakeholders through life cycle	Previous law focused on disclosure of ESIA, not continuing engagement. New law requires life cycle engagement.
ESS2: Labor and Working Conditions		
Scope of application	ESS2 applies to workers employed by GSE who work on the project and to contracted workers, primary supply workers, and community workers	Labor code of Georgia applies to an employer's direct employees and contracted workers
A. Working conditions and management of labor relations	Written labor management procedures Terms and conditions of employment Nondiscrimination and equal opportunity	Written employment contract required, including procedures and employment conditions

Table 2.3.1. Summary of World Bank Requirements and Key Gaps with Georgian Legal Requirements

ESS &Topic	Major requirements	Key requirements/gaps in Georgian framework
	Worker's organizations	Specific nondiscrimination and equal opportunity requirements Organizations are allowed
B. Protecting the work force	Child labor Forced labor	No employment under age 16 except with guardian permission; or under or 18 for dangerous jobs No forced labor (requires free will)
C. Grievance mechanism	Grievance mechanism has to be provided for all direct and contracted workers	None required
D. Occupational Health and Safety (OHS)	Measures relating to occupational health and safety will be applied to the project: Apply World Bank Group General and sector-specific EHS Guidelines Requirements to protect workers, train workers, document incidents, emergency preparation, addressing issues Provide safe working environment Workers allowed to report safety issues and refuse to work under certain circumstances Provide appropriate facilities (canteens, toilets, etc.) and ensure accommodations meet needs of workers All employers to collaborate on applying OSH requirements Monitor OSH performance	New (2018) law is generally in line with EU requirements but implementation requirements are not yet fully developed Current legislation does not set minimum requirements for worker accommodations although it does require per diem for work at distances from home; the amount is low and payments over that level is subject to taxation.
E. Contracted workers	Reasonable efforts to verify contractors have labor management procedures to meet requirements of ESS2 (except those that apply to community and primary supply workers) Procedures for managing and monitoring performance Access to grievance mechanism	Georgian national law applies to contracted workers including employees of subcontractors Grievance mechanism has to be developed for contracted workers.
F. Community workers	Requirements for working conditions and OHS applied to community labor	No such requirements
G. Primary supply workers	Depending on level of GSE/contractor control/influence,	No such requirements, although Georgia law would apply to

Table 2.3.1. Summary of World Bank Requirements and Key Gaps with Georgian Legal Requirements

ESS &Topic	Major requirements	Key requirements/gaps in Georgian framework
	assess risk of child labor, forced labor, and safety issues and require suppliers to address significant risks	the suppliers
ESS3: Resource Efficiency and Pollution Prevention and Management		
Resource Efficiency		
Scope of application	Borrowers must apply feasible resource efficiency and pollution prevention measures in accordance with mitigation hierarchy	No specific requirements but Georgia law is generally consistent with EU legislation and directives
A. Energy use	Adopt measures in EHSGs if project is significant energy use	General requirements in EIA law. Not relevant for this project.
B. Water use	Assess water use and impacts and communities and adopt mitigation measures as needed	No specific requirements. Not relevant for this project.
C. Raw material use	Use GIIP to reduce significant resource usage	No specific requirements. Not relevant for this project.
Pollution prevention and management		
General requirements	Avoid, minimize, and control release of pollutants, apply the more stringent of EHSGs and national law Historic pollution and non-degradation requirements	In general, requirements are consistent with EU and ESS
A. Management of air pollution	Requires assessment of potential air emissions and implementation of technically and financially feasible and cost-effective options to minimize emissions	Numeric emission standards
B. Management of hazardous and nonhazardous wastes	Apply mitigation hierarchy to waste management National and international conventions for hazardous waste management and movement Verify hazardous waste management contractors are licensed and disposal sites operate to meet standards	No significant gaps, but enforcement is not consistent No specific requirements to verify contractor haulers or disposal sites
C. Management of chemicals and hazardous materials	Minimize use of hazardous materials Avoid use of internationally controlled materials	No gaps identified. Little or no relevance to this project.
D. Management of pesticides	Requirements for pesticide use	Not applicable for this project

Table 2.3.1. Summary of World Bank Requirements and Key Gaps with Georgian Legal Requirements

ESS &Topic	Major requirements	Key requirements/gaps in Georgian framework
ESS4: Community Health and Safety		
Community health and safety		
A. Community health and safety	Evaluate risks to community health and safety and apply mitigation hierarchy and GIIP to reduce risks Consider third-party safety risks in designing infrastructure and equipment, with regard to high-risk locations Ensure safety of services provided to communities Identify traffic/road risks, assess risks if needed, consider safety in fleet decisions, take measures to protect public Assess and avoid impacts on provisioning and regulating ecosystem services as appropriate Avoid or minimize potential for disease transmission and communication, considering vulnerable groups Address risks to community of hazardous materials management Prepare of and respond to emergencies, consider in EIAs, prepare response plans	EIA law requires assessment and control No specific requirements for design, or GIIP No services to be provided General traffic laws apply, and EIA law requires assessment of risks No specific requirement for ecosystem services No specific requirements for labor influx, including gender-based violence, communicable diseases, etc. General health requirements generally meet ESS, but no requirement for vulnerable groups Detailed requirements for emergency planning
B. Security personnel	Assess and address risks of security arrangements Apply principles of proportionality, GIIP, and law Verify contracted workers are not implicated in past abuses and are trained Investigate incidents, report unlawful acts to authorities	No specific requirements, but limitations on armed security personnel
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement		
Applicability	Assess need during ESIA process Applies to permanent and temporary displacement, listing types of infringements Limitations on applicability	Less specific requirements. Land use is recognized under law.

Table 2.3.1. Summary of World Bank Requirements and Key Gaps with Georgian Legal Requirements

ESS &Topic	Major requirements	Key requirements/gaps in Georgian framework
	Applies to land users and owners	
A. General	Affected people: land owners, users with legal claims, and users with no legal claims Design project to avoid/minimize displacement Provide replacement cost and assistance, disclose standards, offer land-for-land where possible, pay compensation before displacing people where possible Engaged with affected communities, including women Grievance mechanism Census, cut-off dates, notices; detailed plan and monitoring required; require audit if significant displacement	Land use is recognized and protected under law, but not illegal use Existing practice is to pay for expected harvest on land used by nonowners, but no further assistance is provided if land is lost No specific requirement to avoid displacement Procedures for establishing value and payments, no requirements for livelihood restoration, assistance, land-for-land Few specific requirements for consultation required, and no requirement to engage women No requirement for grievance mechanism
B. Displacement	Detailed requirements for physical displacement Detailed requirements for economic displacement, including livelihood restoration	Less detailed requirements for physical displacement Much less detailed requirements to address economic displacement, and no special consideration for vulnerable people
C. Collaboration with other responsible agencies or subnational jurisdiction	Collaborate with other involved agencies, provide support as needed; include arrangements in Plan	Requires involvement with other parties, no specific requirements to support
D. Technical and Financial Assistance	World Bank may provide support to resettlement planning	
Annex 1: Involuntary resettlement instruments	Detailed requirements for resettlement plans, resettlement frameworks, and process frameworks	No requirements for detailed written resettlement or other plans
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources		
A. General	Consider direct, indirect, & cumulative impacts in ESS1 EIA Characterize baseline conditions	Georgia law now is consistent with EU EIA Directive and Habitats Directive, although the laws are new, and procedures are not yet fully developed. Most requirements are more or

Table 2.3.1. Summary of World Bank Requirements and Key Gaps with Georgian Legal Requirements

ESS &Topic	Major requirements	Key requirements/gaps in Georgian framework
	Manage risks with mitigation hierarchy and GIIP, including adaptive management Differentiated habitats, ESS applies to all, provides for offsets ESS applies to modified habitat with significant biodiversity value Avoid natural habitats unless no feasible alternative; if affected, achieve no net loss of biodiversity Requirements if a project affects legally protected and international recognized areas of high biodiversity value Strict conditions on affecting critical habitats, requires Biodiversity Management Plan No introduction of spreading of invasive species Requirements for projects involving primary production and harvesting	less equivalent, except focus is on legally protected areas/habitats rather than biodiversity value. Specifically: No equivalent to requirements for unprotected habitats. Procedures to address impacts on critical habitat are analogous to those for Emerald Sites Protected areas: less restrictive requirements for impacts on most protected areas Invasive species: awareness but no specific requirements Project does not involve primary production
B. Primary suppliers	Requirements when Borrower purchases natural resource commodities	Not relevant for this project
ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities		
	Not applicable for the project	
ESS8: Cultural Heritage		
Application	Covers tangible and intangible (limited) cultural heritage, whether legally protected or not and whether previously identified or not	Equivalent applicability. Intangible cultural heritage can be registered, and it is protected similarly to other cultural heritage objects, although assessments for impacts is not generally not required or practiced.
A. General	Assess and avoid impacts on cultural heritage Follow chance find procedure if a find is encountered Involve experts if needed	Equivalent protections in EIA law and "cultural heritage impact report" that is submitted to Ministry of Education, Science, Culture and Sport of Georgia to obtain no objection to permitting process

Table 2.3.1. Summary of World Bank Requirements and Key Gaps with Georgian Legal Requirements

ESS &Topic	Major requirements	Key requirements/gaps in Georgian framework
B. Stakeholder consultation and identification of cultural heritage	Identify and consult with affected and interested stakeholders Maintain confidentiality if needed Allow continued access to affected sites	No specific requirements for stakeholder identification and consultation No provisions for confidentiality
C. Legally protected cultural heritage areas	Comply with regulations and plans, consult with sponsors	Designated cultural heritage sites specify legal activities No requirement to consult managers/sponsors
D. Provisions for specific types of cultural heritage	Desk-based and expert consultation to identify archaeological sites and specify protections Mitigate impacts on built heritage, preserve physical and visual context of structures Identify and protect treasured natural features Identify and protect movable cultural heritage	General rules for identifying and protecting heritage EIA law requirements assessments of impacts on heritage, also requires visual impact assessment although not specific for heritage buildings No equivalent for natural features Requirements for general heritage protection
E. Commercial use of cultural heritage	Not relevant for this project	
ESS9: Financial Intermediaries		
Not applicable for the project		
ESS10: Stakeholder Engagement and Information Disclosure		
Requirements	Engage stakeholders throughout project life cycle, determine how they wish to be engaged Provide stakeholders with information, Maintain documented record of engagements	ESIA legislation requires scoping as well as disclosure of and consultation on EIA. Previous legislation required consultations only at EIA disclosure
A. Engagement during project preparation	Identify and analyze stakeholders, including disadvantaged or vulnerable Stakeholder Engagement Plan (SEP) required, with detailed requirements for disclosure, timing of consultations, measures for disadvantaged or vulnerable, etc. Disclosure of information early to allow consultation on design	No specific requirements for stakeholder identification and analysis No Stakeholder Engagement Plan required Previously, only draft EIA report had to be disclosed but now screening and scoping reports, if developed, are also subject to disclosure; The official structures became responsible for the public information, information dissemination.

Table 2.3.1. Summary of World Bank Requirements and Key Gaps with Georgian Legal Requirements

ESS &Topic	Major requirements	Key requirements/gaps in Georgian framework
	Consultation to allow ongoing two-way communication throughout project life cycle	
B. Engagement during project implementation and external reporting	Engagement and disclosure of information to continue throughout implementation, following Plan	No similar requirement
C. Grievance mechanism	Establish and implement prompt, effective, culturally appropriate, and discreet grievance mechanism No limit on legal remedies	No equivalent requirement Project owner/developer has to respond only to formal correspondence and claims.
D. Organizational capacity and commitment	Define roles & responsibilities, assign personnel to implement stakeholder engagement activities	No similar requirement
Annex 1: Grievance mechanism	Options for managing mechanism: ways of submission, log, advertised procedures, appeals process, mediation	No requirement for grievance mechanism

2.3.2. World Bank Group's Environmental, Health, and Safety Guidelines

The World Bank Group has promulgated a number of Environmental, Health, and Safety Guidelines (EHS Guidelines), with the following being applicable to the project:

- General EHS Guidelines (April 30, 2007) includes guidelines for environmental controls during facility operation (air and water emissions, hazardous materials management, noise, contaminated land, etc.) and occupational and community health and safety during operation. This guideline also covers the same topics for construction.
- EHS Guidelines for Electric Power Transmission and Distribution (April 20, 2007) cover many of the same topics (environmental controls, occupational and community health and safety) during construction and operation, with a focus on activities involved in constructing and operating electricity transmission and distribution lines.

3. Project Description

This chapter describes the proposed project and is organized as follows:

- Section 3.1 introduces and describes the context within a larger GSE grid-strengthening program
- Section 3.2 describes the construction phase of the project, including the transmission line (3.2.1) and substation (3.2.2).
- Section 3.3 describes the operation phase of the project.
- Section 3.4 describes the decommissioning process.

3.1. *Introduction and Context of the Project*

The proposed Jvari-Tskaltubo 500kV overhead transmission line (OHL or "the project") is part of a larger program by the Government of Georgia, through the Georgian State Electro System (GSE), to strengthen the national power transmission system and improve grid access for Western Georgia. The project includes construction and operation of a new 500kV overhead transmission line between Jvari and Tskaltubo and a new 500/220kV substation in Tskaltubo. Figure 3.1 shows the location of the project.

The World Bank has multiple ongoing projects to support and improve the power transmission system in Georgia. The Transmission Grid Strengthening Project is financing a new transmission line in south-western Georgia and rehabilitation of other lines as well as studies of the overall energy sector in Georgia and support for project management and studies for the transmission system. In addition, the Energy Supply Reliability and Financial Recovery Project is providing financing for construction of two new 500kV transmission lines in western Georgia, including the current Jvari-Tskaltubo project that is the subject of this ESIA.

Construction of another 500kV transmission line, from Tskaltubo to Akhaltsikhe, is being financed by KfW. This facility is directly and significantly related to the Jvari-Tskaltubo transmission line that is the subject of present ESIA. Both transmission lines are shown on Figure 3.2 within the context of the overall Georgia grid. The two lines will be developed at approximately the same time, neither would be viable without the other, and neither would be constructed without the other. As a result, the Tskaltubo-Akhaltsikhe transmission line is considered an Associated Facility, as defined in the World Bank's Environmental and Social Standard 1, for the Jvari-Tskaltubo project. As such, GSE will require the Tskaltubo-Akhaltsikhe transmission line project to be implemented in a manner materially consistent with the World Bank's environmental and social standards as described in this ESIA report for the Jvari-Tskaltubo project.

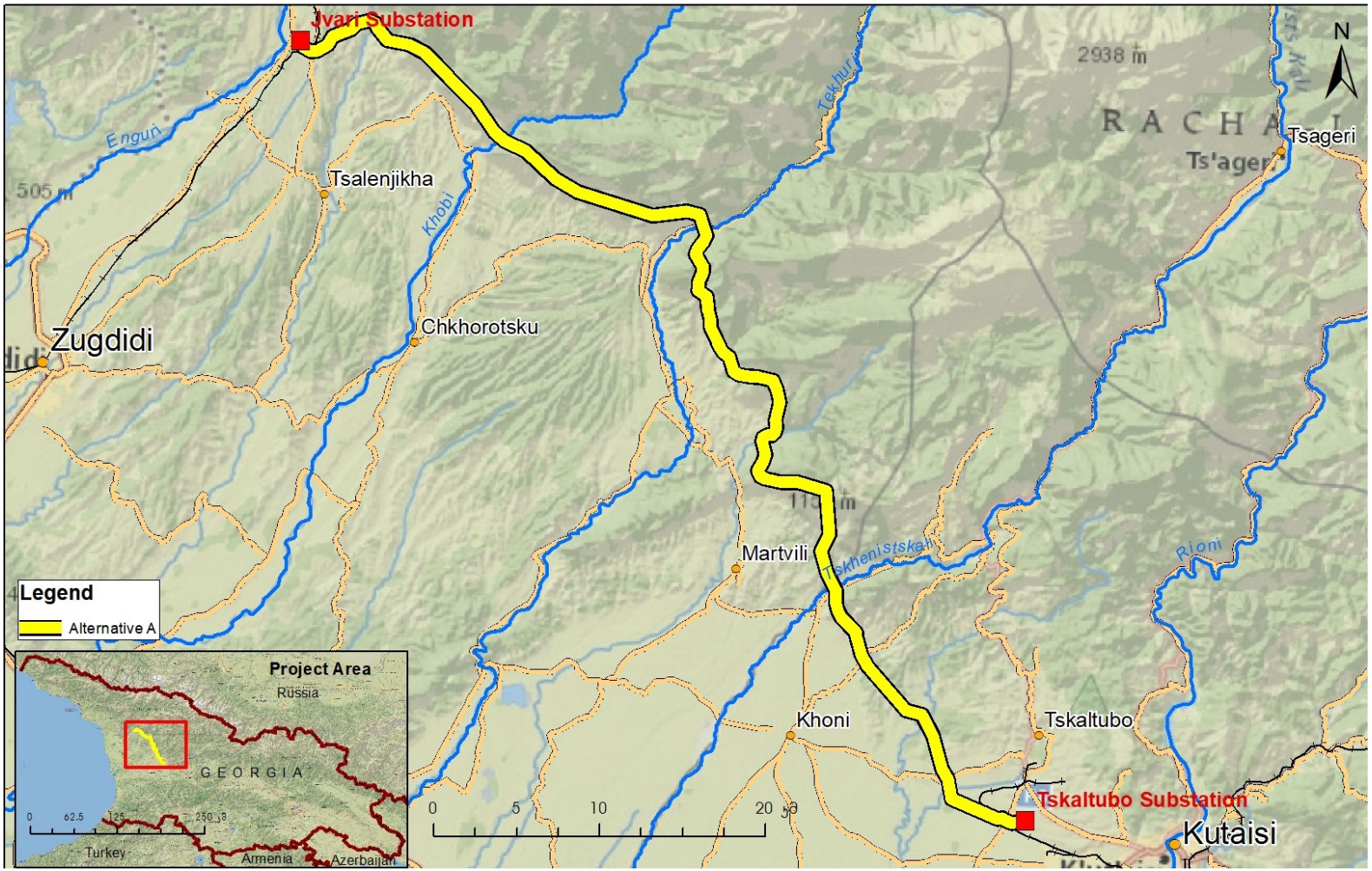


Figure 3.1.1 Location of Tskaltubo-Jvari 500 kV transmission line corridor

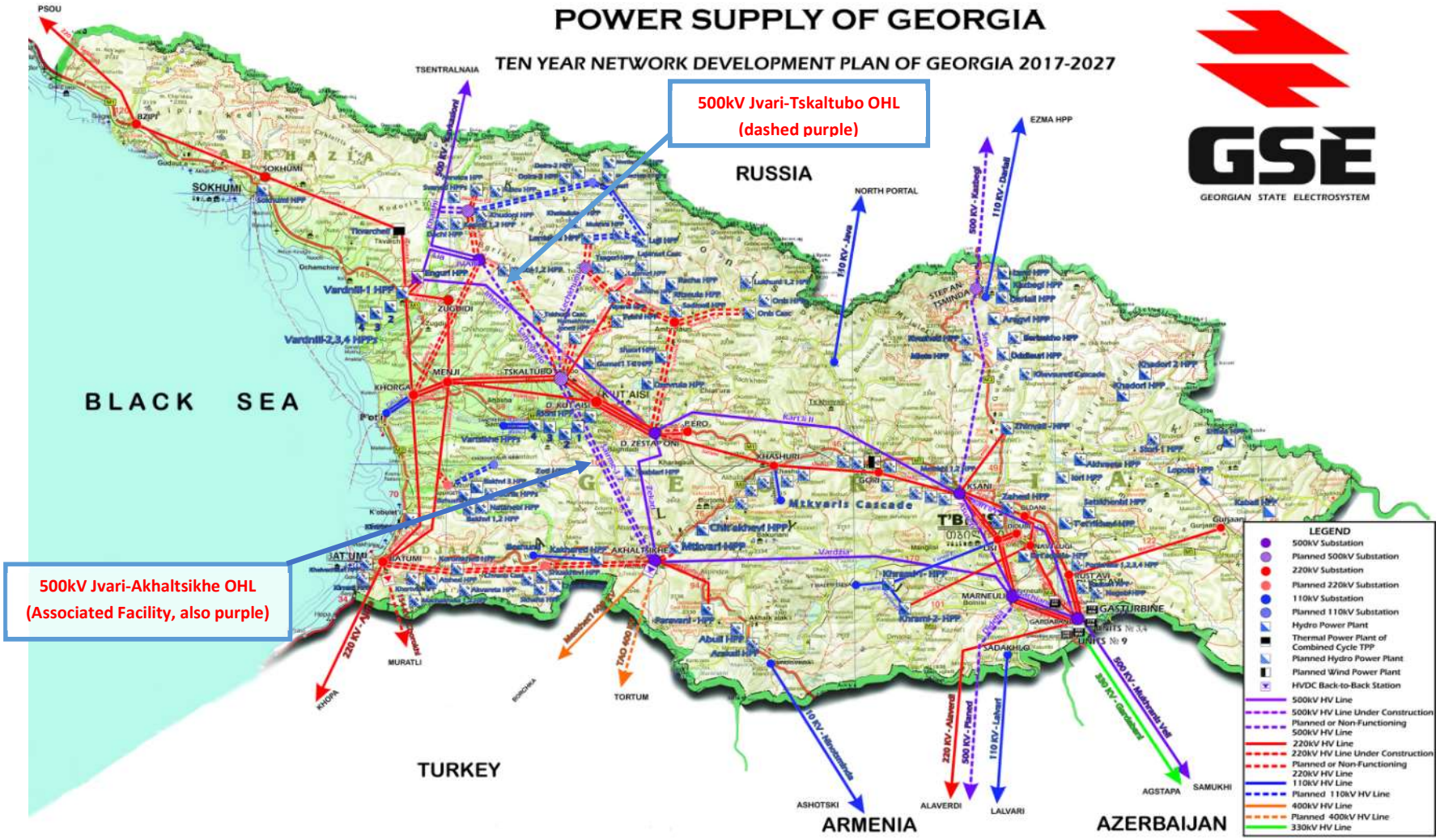


Figure 3.1.2 Location of Tskaltubo-Jvari and Jvari-Akhaltsikhe 500 kV transmission lines within the Georgia power system

3.2. *Construction Phase*

A variety of heavy equipment and tools will be used for construction of the transmission line and substation. The contractor will determine the exact equipment needs, but the following machines and equipment are among those that are likely to be used:

- Excavators to dig or cut foundations
- Loaders to move soil, spoil, and cut vegetation
- Dump trucks for removal of soil and other materials
- Bulldozer to cut roads through forests and move earth or rocks where necessary
- Cranes to move tower assemblies
- Tractor lifter
- Heavy truck to carry equipment
- Brigade truck vehicle 4WD with winch
- Brigade 4WD vehicle with winch
- Equipment for installation of line and fiber cables
- Passenger vehicles
- Chain saws and a variety of hand tools
- Wood chippers.

The contractors - one for the transmission line and one for the substation -- will also determine the number of workers that will be needed. Experience under the WB funded on-going Transmission Grid Strengthening Project as well as similar project conducted in Georgia indicate that it is likely the contractors will employ about 200 people on the line and about half that many on the substation. There will be at least two main crews (usually 3-4 crews) responsible for the construction the transmission line, each with about 100 workers and each made up of teams to complete specific jobs, such as land-clearing, foundation excavation, foundation installation, tower assembly and erection, conductoring (that is, stringing the wires between towers), land restoration, and tree-cutting. Half or more of the workers will be unskilled laborers, with semiskilled and skilled positions such as managers, engineers, forepersons, drivers and equipment operators, and electrical workers. Foreign firms are often employed as the main contractors, and they use Georgian subcontractors. Like other projects, most unskilled labor is likely to come from local communities, with most others from elsewhere in Georgia and managers and some staff from the contractor's home country. Similarly, most workers involved in substation construction will be unskilled, at least in the early stages. Once the land is cleared and foundations are installed, however, more skilled labor will install the electrical equipment.

In addition to the contractors, a Supervision Consultant will be appointed by GSE to oversee the contractors' work. The Consultant will employ approximately 20-30 engineers and support staff. The overall workforce will include managers, engineers, administrative and support personnel foremen, heavy equipment operators, electrical and other skilled workers, unskilled laborers, cooks, cleaners, drivers, and security guards.

The primary suppliers to the transmission line will be companies from which the Contractor will source transmission tower elements and conductors, which are sectors that are not known to involve significant risks of child labor. Where fill material is needed local quarries would be considered primary suppliers. For the substation, the primary suppliers would be companies from which the Contractor will source electrical switching equipment, transformers, and other electrical equipment. Except for the local quarries, it is not known if the suppliers will be Georgian or foreign. At this stage the suppliers are not known, so it is not possible to assess the risks that suppliers may use child or forced labor if workers are exposed to serious safety issues. For local suppliers, contractors will be required to identify if there are significant risks the suppliers are exploiting child or forced labor or exposing worker to serious safety issues. For foreign suppliers, contractors will be required to inquire during their acquisition of supplies whether the supplier has been accused or sanctioned for any of these issues. If they have, the contractor will be required to select another supplier with no such history.

3.2.1. Transmission line and corridor

The feasibility study considered many alternatives for the transmission line design (tower types, heights, insulators, etc.), the transmission line route, and the substation. This study evaluated the various options against technical, financial, environmental/social, and other factors, and identified the most feasible options. Among factors that were considered for the preliminary design were visual impact, length through forested territory, corridor width, construction materials required, overall length of corridor, difficulty of access, etc. In general, the feasible option that was the least disruptive to local communities and people was selected. The contractor for the transmission line will complete the final design of the line and corridor, so the current preferred route must still be considered a preliminary route. The location and characteristics of this preliminary design are sufficient to allow evaluation of potential environmental and social impacts in this ESIA. As noted below, further evaluations will be conducted during the final design process.

The corridor for the preferred route for the transmission line will be about 78.6 kilometers long and will run through mountainous territory in Imereti and Samegrelo-Zemo Svaneti regions, as shown in Figure 3.1.1. The line will include about 200 steel towers (the number of towers to be built may well change based on the result of detailed site-inspection to be conducted by the civil works contractor during implementation), which would consist of about 50 angle towers and 150 suspension towers; angle towers are slightly larger towers that support the line where it turns at an angle and thus puts the tower under different strains than if the line runs straight. Towers will be an average of 350-400 meters apart, depending on terrain, and could be up to 1,000 meters or more apart when towers are on high ground.

Towers will have a lattice design and will range from about 33 to 44 meters high. Other types of towers were considered in the Feasibility Study, but this type was selected because it is narrower than others which could be used, and it also occupies less space. Towers will have four legs that will each be anchored in concrete. The feasibility study recommended the type of tower shown in Figure 3.2.1; there may be up to five variations, but the basic design will be the same for each.

The foundations for the tower legs will form the corners of a square up to 14 meters on a side; therefore, the area of the land under each tower will be a maximum of 196 square meters, although GSE will acquire a slightly larger area, about 256 square meters. In addition, since excavations may extend farther out, to about 20 meters on a side, the total construction area for each tower could be up to about 400 square meters. Beyond this, the contractor will also require space for storage, parking, tower assembly, and other activities. Tor purposes of this ESIA it is assumed another 400 square meters would be affected, although this is likely to be an overestimate in most cases.

At each tower site, vegetation will be cleared and topsoil (if any) will be removed. Topsoil will be stored in a pile nearby for later reuse, and dead vegetation will be buried or taken away if it could create a fire hazard. Concrete foundations for the tower legs may be brought in from an outside vendor or may be poured in place where roads are too narrow or too steep for easy access. Either way, the concrete foundations will be placed or poured into holes of 1-2 square meters that have been excavated into the earth or anchored to solid rock. If conditions require, blasting may be necessary to prepare the excavation.

For planning purposes, the corridor for the transmission line is assumed to be 300 meters wide. Factors considered by Fichtner in selecting the preliminary corridor included technical (geology, topography, hydrology, etc.), environmental (avoid protected areas, minimize forest crossings, etc.), and social (avoid populated areas, etc.). Within that wider 300-meter corridor, the actual 74.5-meter ROW (safety zone) will be selected by the contractor, and approved by the Consultant, based upon final decisions about tower locations. Final tower locations will in turn be based on more detailed surveys of the corridor to determine geological conditions (e.g., ability of the soil and rock to support the towers), the angle of the slope (to avoid extreme slopes), environmental factors (e.g., presence of endangered or endemic species of plants and animals), and social factors (presence of occupied houses and populated areas).

As described above, the final corridor will include the area underneath the conductors (the wires) and a safety zone on both sides. For occupied houses, the ROW (safety zone) will be about 74.5 meters wide, including 14.5 meters between the conductors and 30 meters on each side of the conductors. No people will be allowed to live in this safety zone, although agriculture can continue with restrictions on the use of tall equipment that could touch the wires. In populated areas, the towers will be arranged so the line is at least 12 meters above the ground. In other areas, clearance will be at least 8.5 meters above vegetation height. The main dimensions of towers will be 12-14 meters wide at base and 35-40 meters high.

The average tree height in forested areas along the route is estimated to be about 18-22 meters. To prevent trees from falling onto the line, the vegetation clearance/control zone calculated under Georgian legislation would therefore be about 20 meters from the conductors (wires). The vegetation control zone may be slightly narrower or wider depending on the height of trees in that area, but will average about 54.5 meters, including 14.5 meters between the conductors and 20 meters on each side.

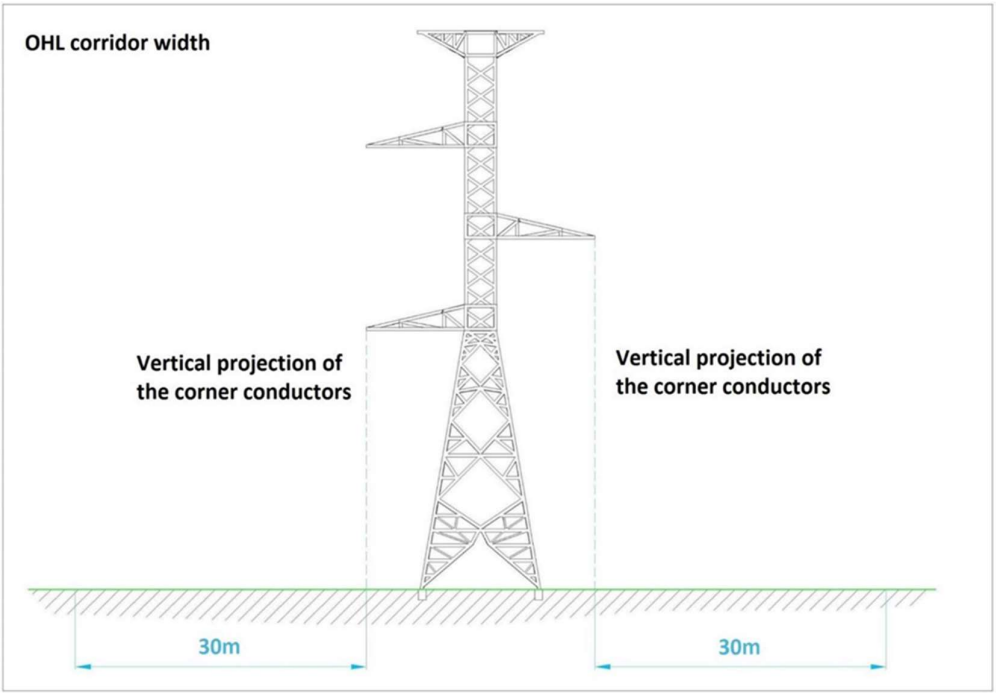


Figure 3.2.1 Approximate Tower and Corridor Configuration

GSE will acquire easements from landowners when the corridor is on private land; these easements will allow most activities, including grazing and crops, to continue but will not allow orchards to have trees over four meters high, construction of buildings, or the use of tall machinery. Figure 3.2.2 illustrates typical corridors for high-voltage transmission lines. See the Resettlement Policy Framework Chapter 7: *METHODS FOR VALUATION OF AFFECTED PRIVATE ASSETS* for easement arrangement to be applied under the Project.

The contractor will make final arrangements for the works, but the work is likely to proceed as follows. Towers will not be erected from one end of the line to the other, but two teams of crews will begin at opposite ends of the line and work toward the middle. Each of the two teams will involve several work crews, with about 10-15 workers, who will complete the work in several steps: indicative crews would include separate work crews responsible for transporting materials and equipment to the site, land-clearing and site preparation, excavation, completing foundations (concrete works and in some cases driving piles or drilling), erecting towers, and site restoration. Crews would work in sequence, which

means that several towers would be under construction at any one time. From beginning to end, each tower will take an average of about two weeks. Figure 3.2.3 and Figure 3.2.4 show typical construction activities. When construction of each tower, or every small set of towers, is complete, a crew will smooth the disturbed ground around the tower, spread stored soil over the disturbed area, arrange drainage channels if run-off from rain could cause erosion, and plant seeds or plants of native species to prevent future erosion.

Figure 3.2.2 Typical Transmission Line Corridors through Forested Land


Figure 3.2.3 Tower Assembly Works

Figure 3.2.4 Installing a Precast Concrete Foundation

Figure 3.2.5 Stringing Conductor Cables between Towers

Once all towers are in place, the contractor will bring in equipment to string conductors and other

wires and cables (e.g., ground wires, fiber-optic cables) between the towers. This is shown in Figure 3.2.5. Once this is complete, the line can be energized.

3.2.2. Roads

Roads will be necessary to allow access to and between each tower location along the transmission line corridor to transport workers and materials, implement tree cutting where necessary, excavate and install foundations, assemble and erect towers, and to place the conductors (wires). As the contractor develops the final design, roads and tracks will be identified and marked to avoid off-road driving and unnecessary land disturbance. Wherever possible, existing roads and tracks will be used, and drivers will be warned to stay on approved roads and tracks. Where necessary, roads will be constructed; such "construction" could be to simply create tracks across open land or bulldozing a path through forests. Only where necessary for road stability or to improve traction will roads be improved with gravel or other material. Roads will need to be about four meters wide but may be up to six meters in some locations. Where needed, drainage channels or other means to control run-off and erosion will be part of road construction, and if existing roads have such drainage controls, these will be protected or improved.

As much as possible, roads will be within the corridor to avoid unnecessary disturbance to otherwise unaffected land. In all cases, people whose land, crops, and/or property are damaged will be compensated for the loss. When transmission line construction is complete, many or most roads will be restored so that natural vegetation or crops will grow; this would involve breaking up the ground and planting native species of grasses, plants, or trees. In areas prone to erosion, drainage arrangements will be made until vegetation is planted or otherwise established. Prior to restoration, the contractor will consult with private landowners and forest managers, and if they prefer roads or tracks in specific locations to be left in place, those roads will not be restored. Figure 3.2.6 illustrates a typical access road through a forested area.

Figure 3.2.6 Typical Access Road through Forested Area

3.2.3. Offices and camps

The contractors will require space for offices, storage, minor maintenance, and possibly accommodations for part of the workforce. As noted in section 3.1, the total workforce is likely to be about 200, about equally divided among the two sets of crews. Workers who are not from the local area will probably reside near the substations near the ends of the line, in Jvari or Tskaltubo – probable locations for project offices and the main storage areas and work camps, are shown on Figure 3.2.7 and Figure 3.2.8. The contractor will determine, in consultation with GSE, whether workers will be responsible for their own lodgings and domestic arrangements or if the contractor will make such arrangements, which could be to rent lodgings in local communities.

Figure 3.2.7 Indicative Location of Construction Camp adjacent to Existing Tskaltubo Substation

Figure 3.2.8 Indicative Location of Construction Camp adjacent to Existing Jvari Substation

3.2.4. Tskaltubo substation

Besides the transmission line, the project includes construction of a new 500kV substation in Tskaltubo to connect the Jvari-Tskaltubo transmission line and the future Tskaltubo-Akhaltsikhe transmission line. The new substation will be approximately square and will cover an area of about 14 hectares. As shown on Figure 3.3.1, it will be a short distance north of an existing 220/110/10kV substation via a 220kV line that will be 800 meters long and will connect the new and existing substations (since the new and existing substations are very near to each other, the new substation could be considered an extension of the existing one). The new substation (or extension) will be placed on land that is currently being used for agriculture or not used at all.

The new substation will include one breaker installation and voltage transformers. There will also be a small control building. Transmission lines and roads that will connect to the new substation are shown on Figure 3.3.1 and will include:

The Jvari-Tskaltubo 500kV single circuit Samegrelo line (to Jvari Substation)—this is the project line described in section 3.2.1 and evaluated in this ESIA.

The Tskaltubo-Akhaltsikhe 500kV double circuit Sairme line that will connect to Akhaltsikhe substation—this is the Associated Facility mentioned in section 3.1;

A 500kV single circuit connector line to a new Tsageri 500 kV substation that is planned for the future.

The substation is in an agricultural area that is not cultivated at present. Besides land on which the substation will be located, the contractor will require additional land for offices, equipment and materials storage, and possibly for worker accommodations; the contractor will determine if workers will arrange their own accommodations or if they are to be provided. This construction zone will be established during the project preparation phase before main construction begins.

The contractor will strip and store topsoil from the substation area, make excavations as needed, and install concrete and electrical works. When construction is complete, the contractor will break up the ground in the construction zone and other disturbed areas, spread topsoil, and replant native species of grass and other vegetation.

3.2.5. Duration of construction

It is expected that construction will begin in 2019 and take between 24 and 36 months, with an additional six months for line testing and commissioning.

3.3. *Operation Phase*

3.3.1. Transmission line

The transmission line corridor, the towers, and the line itself will need to be maintained once the line is commissioned and carries electricity. In general, transmission lines require minimal maintenance. After a period of many years, the entire system requires a detailed survey and overhaul. In addition, trees and branches will need to be removed periodically when they grow too close to the line.

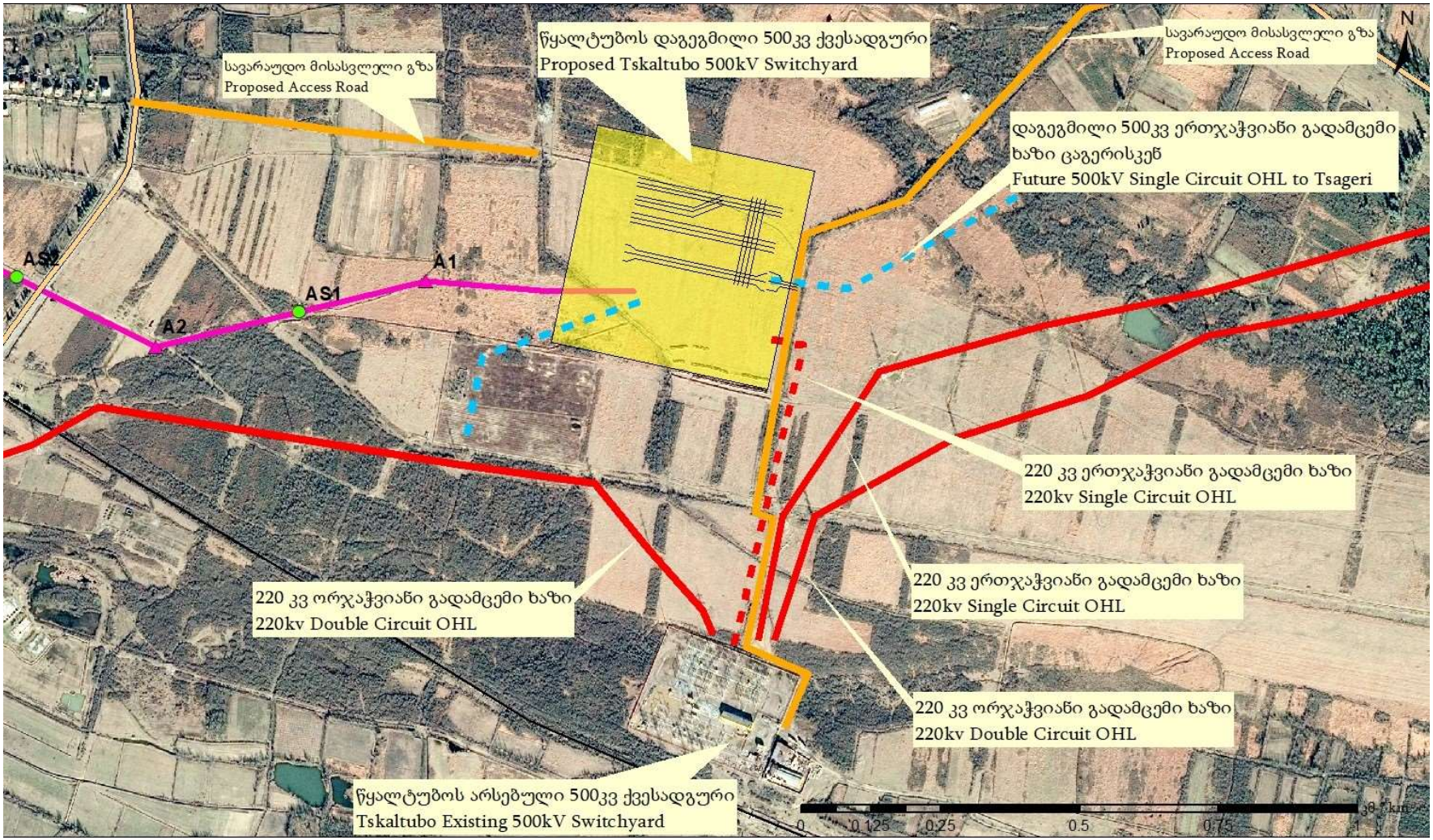


Figure 3.3.1 Existing and New Roads and Transmission Lines at the New Tskaltubo Substation

GSE has specific procedures for the operation and maintenance of its lines as set out in a "GSE Rules and Regulations" manual. Primary activities that will be carried out during operations will include:

- *Pedestrian patrol*. A GSE line maintenance team will complete a physical examination of the entire route of the transmission line and its components at least twice a year in order to ensure the safety, security, and integrity of the line and the effectiveness of land restoration at tower locations and roads.
- *Security patrol*. In populated areas, further checks are done routinely to identify signs of vandalism or tampering and to verify the general security of the line, and GSE maintains a "hotline" that people can call to report issues with the line. This allows early detection and rapid response so that damaged or compromised components can be rectified as promptly as possible.
- *Vegetation control*. Pedestrian and security patrols will identify vegetation that is growing too close to the line and it will be cut back as necessary. In addition, in forested areas, young trees in the vegetation control zone that are growing too high will need to be back every 6-8 years. Deadwood and debris will be buried or taken away, at the discretion of the National Forestry Agency. Vegetation control will be conducted mechanically and/or manually, with no use of herbicides.
- *Tower auditing and repairs*. As the line ages, it will be subject to wear and tear that can result in fatigue that may not be noticeable by a distant visual inspection. Every year, 10 percent of towers (and 100 percent of dead-end towers) will be thoroughly examined to assess the aging process. As needed, parts will be maintained or replaced. For example, loose bolts would be tightened, worn components would be replaced before they fail, tower components would be repainted as needed, and any permanent access roads would be maintained.

To perform repairs and maintenance, vehicles and equipment may need to come to tower locations. As with initial construction, existing roads and tracks will be used where possible; in some cases, however, temporary roads may need to be used. Any damage to land that occurs during repair and maintenance operations will be reinstated when activities are complete.

3.4. *Decommissioning*

The transmission line and substation are intended to remain in place for many years, so decommissioning works would not take place for many decades. Decommissioning will involve dismantling, decontamination (if necessary), shipment and final recycling, reuse, or disposal of materials, and site rehabilitation.

When the line is decommissioned, GSE would dismantle and remove towers and conductors, with materials recycled or reused as much as possible. The same would occur when the substation is to be decommissioned. Materials would be managed by selling, reusing, storing for future use, or disposing in a landfill. Once towers are removed, which could include removal of foundations but could also

allow them to remain if landowners agree, disturbed land would be restored to pre-project conditions or to conditions acceptable to the Ministry of Environment Protection and Agriculture and landowners. Similarly, substation land would be restored to the satisfaction of the Ministry.

GSE (or the then-current operator if different) will be required to develop a Closure Plan prior to decommissioning. This Plan would be submitted to the Ministry of Environment Protection and Agriculture of Georgia for review and approval. The Plan would include measures to avoid or minimize impacts on environmental resources, people, and property.

3.5. *Associated Facility*

KfW-financed investments "Georgia Electricity Transmission Network Development projects" are being prepared and planned to be implemented contemporaneously with the World Bank-funded project. The KfW project which includes co-financing from EBRD includes five components (transmission lines): (i) Tskaltubo – Ahkaltsikhe – Vale (Turkish border); (ii) connection from the Zoti HPP to Ozurgeti; (iii) Jvari-Nenskra-Mestia; (iv) Lajanuri connections to Kheledula HPP, Oni HPP, and Tskaltubo; (v) reinforcement of the Kakheti network. The first of these components, the Tskaltubo-Akhaltsikhe-Vale line, is directly and significantly related to the World Bank-financed Jvari-Tskaltubo line, [it is necessary for Jvari-Tskaltubi to be viable] and will be implemented contemporaneously with the World Bank project. Therefore, this component can be considered an Associated Facility. The other four components, based on available information, do not meet all the criteria of Associated Facility. The KfW project is prepared in alignment with EBRD Environmental and Social Policy and related Performance Requirements. An ESIA Scoping Report for the KfW-funded investments has been prepared by GSE and shared with the World Bank. An ESIA, RPF, and Stakeholder Engagement Plan for Tskaltubo-Akhaltsikhe-Vale are also under preparation and will be shared with the Bank by end of March 2019. Based on the available scoping study, environmental and social impacts to be assessed for the associated transmission line activity are closely aligned with the impacts identified in the present ESIA.

4. Analysis of Project Alternatives

The feasibility study for the project was conducted during the period of November 2016 – June 2017. A number of alternatives to the proposed Jvari – Tskaltubo transmission line have been evaluated to determine whether they were both reasonable and environmentally and socially preferable to the preliminary corridor and line. The alternatives considered included: not building the line or substation (section 4.1 below), alternative systems (section 4.2), tower and foundation design alternatives (section 4.3), alternative tower and corridor locations (section 4.4). These alternatives are described in the subsections below.

4.1. *No-action Alternative*

Under the no-action alternative, the Jvari – Tskaltubo overhead power transmission line and Tskaltubo substation would not be constructed. This would avoid all the environmental and social impacts associated with construction and operation of the transmission line and corridor that are described in Chapter 7. Not building the line and substation would not achieve any of the goals described in the Introduction to Chapter 1 and in section 3.1. However, the proposed line is an integral part of the transmission grid strengthening project, which has been under the development for several years. If the line is not constructed, existing power transmission system will not be able to meet the growing demand in power transmission and the overall efficiency of the system will decline year by year. For these reasons, this alternative is not preferred.

4.2. *System Alternatives*

System alternatives would include using existing, modified, or proposed electric transmission systems to meet the objectives of the project. The electrical transmission system of Georgia consists of 500kV, 220kV and110 kV transmission lines. Connections to neighboring countries include a 500kV line to Russia, a 220kV line to Turkey, a 500kV/400 kV link between Georgia and Turkey, a 220kV line to Armenia, and two lines to Azerbaijan, one 500kV and one 330kV. The existing and proposed system was shown on Figure 3.1.2.

It is not considered possible to overcome current issues with existing lines lower than 500kV. Just transferring energy that will be generated into the overall system would require the support of new parallel transmission lines, which would increase environmental and social impact and also increase losses during the transferring process. This in turn would decrease the efficiency of the overall transmission line system.

As for line configuration, the beginning and final points of transmission lines are defined based on the location of existing grids. In particular, the objective of the Jvari-Tskaltubo project is to connect the existing substation in Jvari (constructed in 2016) to the Imereti grid system. The closest point for this

connection is Tskaltubo, at a new 500kV substation that would expand a current substation. Thus, alternative the end points were not considered. Similarly, alternative locations for the Tskaltubo substation were not considered, as the new substation will need to be located close to the existing substation.

For planning the future network development, GSE in close cooperation with the Ministry of Energy and with involvement of international experts has prepared a 10-year transmission grid strengthening project. The latest plan is for the period of 2016-2026 and has been approved by the Government of Georgia.

The current system is considered to be overloaded. As a result, it is not feasible to use the existing lines, as this network is already overloaded. In addition, lower, voltage alternatives were not considered for the current project because the required transfer capacity cannot be ensured with lower voltage lines. Therefore, the 500kV line and Tskaltubo substation became the preferred system alternative.

4.3. *Design Alternatives*

The primary characteristics and requirements for the design were based on the simulations of grid operation in the future considering different scenarios for the high voltage network. The designs are constrained by the applicable technical standards, which include:

- Standards and recommendations of the International Electrotechnical Commission
- European Committee for Electrotechnical Standardization (CENELEC) Standard EN 50341-1:2012 for overhead lines over 1 kV
- Relevant European Union standards
- Georgian standards (PUE), regulations and codes.

Most technical details are not provided here but can be reviewed in the feasibility study. The need to meet these standards led to the selection of materials and equipment to satisfy requirements for current-carrying capacity, conductors, insulators, and other elements of the line and substation. In general, the choices that satisfied applicable technical standards and are important for environmental and social impacts are discussed in the following sections.

4.3.1. Tower alternatives

Alternative solutions were considered for the tower types and dimensions. Concrete towers, wood poles, and solid steel towers and poles were considered but are not considered practical due to the landscape and terrain of the project corridor, the difficult access to many locations, and the difficult construction conditions at many sites. Instead, lattice towers of the type used in most of Georgia were selected; these are the towers GSE is most familiar with and has developed standards for, which will

aid in GSE's operation and maintenance of the line. Figure 4.3.1 shows different lattice-type towers.

Among the lattice towers, the narrow 'pine' type lattice towers were selected, as shown on Figure 4.3.1. These are narrower than most other lattice towers, and thus require less space under the tower, which in turn allows for smaller foundations. These advantages reduce the environmental footprint and impact. This type of tower also allows the use of different types of foundation, which is necessary in mountainous terrain that may require the use of bedrock anchors in places.

It would also be possible to use different tower types in specific zones of the proposed power line. This could reduce impact to some degree at some locations. However, the difficulties associated with construction of different types of towers is considered to overshadow the benefits. This approach may be considered further by the contractor, which will make the final selection.

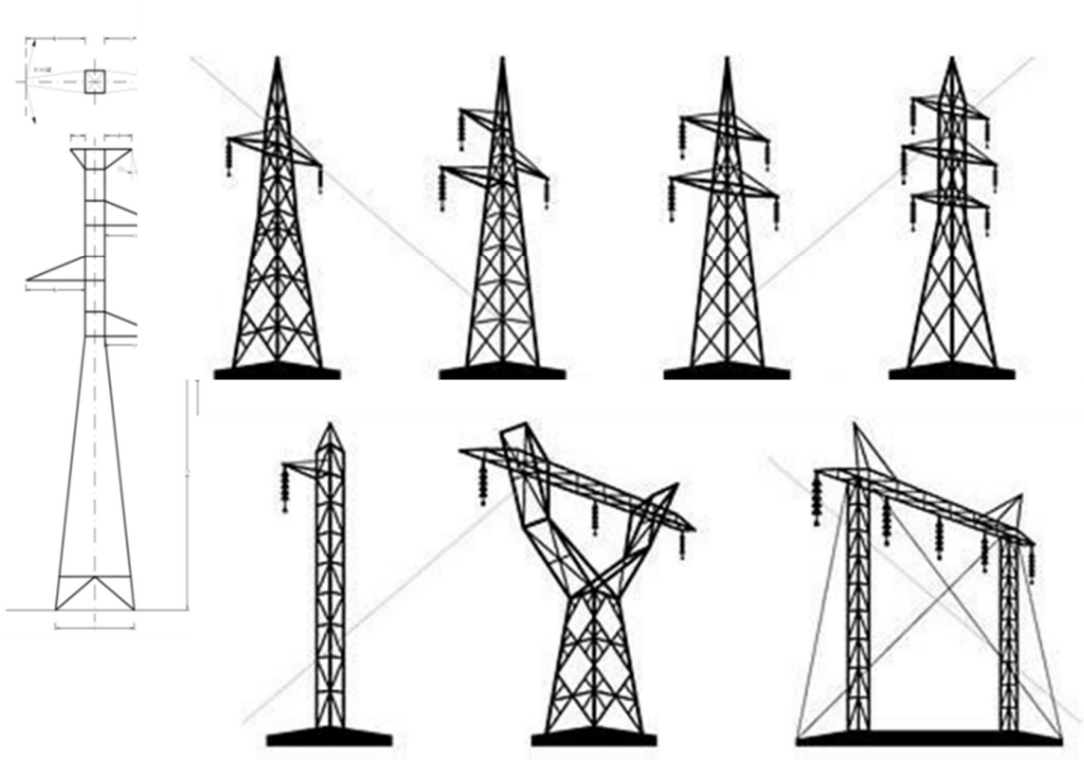


Figure 4.3.1 Different Types of Lattice Towers

4.3.2. Tower foundations

Alternative foundation types were considered as well. The preliminary evaluation of existing geological conditions and terrain determined that different type of foundations should be used in the different sections of the transmission line (Figure 4.3.2). The foundations will need to differ for flat, moderately hilly, and mountainous areas. Standard "pad and chimney"-type foundations were selected for the flat

and moderately hilly areas due to their reliability, the ability to use precast foundations as well as *in situ* construction, the overall simplicity of construction, wide experience with this type, and other factors.

A number of different constructions were evaluated for the more hilly and mountainous areas. Standard foundations would have several disadvantages in such areas compared to anchoring or micro-piling: a larger area is required for construction and the level platform required for tower legs would require more excavation. Depending on soil conditions at specific locations, either anchoring or micro-piling will have a significant advantage and will also have a smaller footprint and environmental impact.

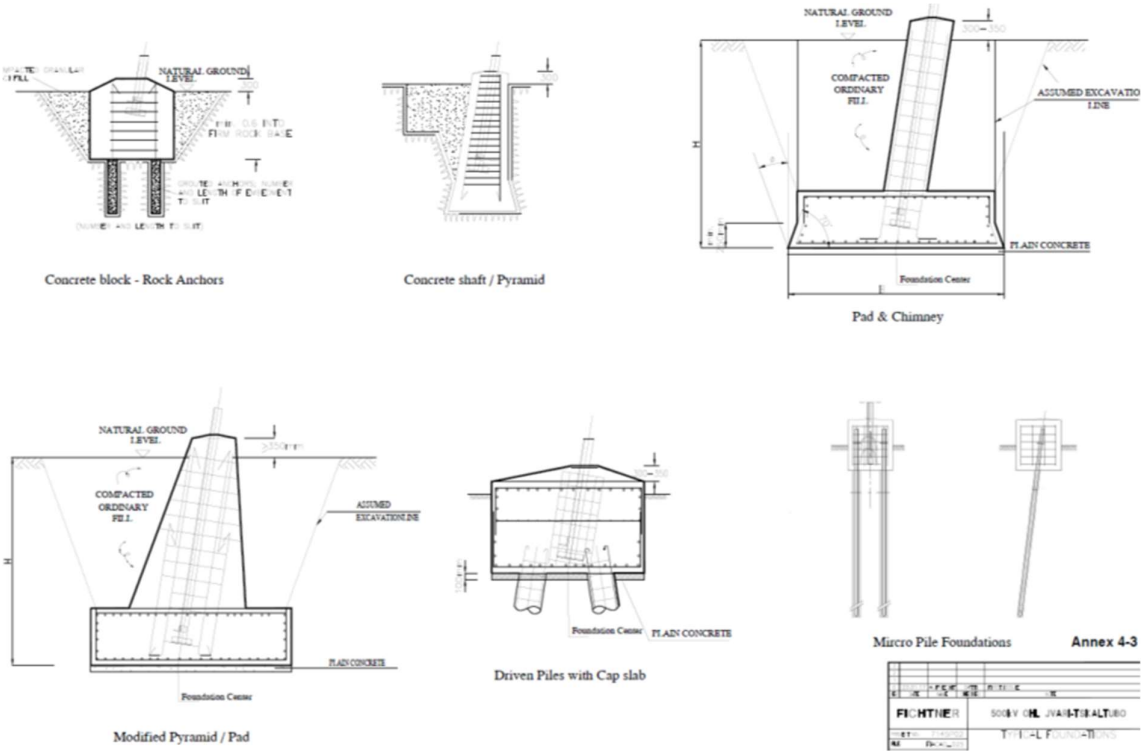


Figure 4.3.2 Types of Tower Foundations

4.4. *Corridor Alternatives*

As noted in Chapter 3, the feasibility study evaluated many environmental and social factors in the consideration of alternative routes for the transmission line route. These included potential visual impact, length through forested territory, corridor width, construction materials required, overall length of corridor, difficulty of access, etc. In general, the more disruptive options were eliminated. This ESIA considers only two alternatives, which are shown on Figure 4.4.1. Both alternatives, including a number of sub-alternatives, involve a new 500kV overhead transmission line that will connect the existing substation near Jvari to the new substation near Tskaltubo. These two alternatives are:

- Alternative A: As shown in Figure 3.1.1, the transmission line will run from an existing substation in Jvari to a new substation near Tskaltubo. This route is farther from populated areas but affects more forested area. This is the preferred route.
- Alternative B: This alternative follows the same corridor from Tskaltubo to Martvili municipality, then diverges and runs to the south of Alternative 1. This route is at a greater distance from the Emerald Sites and affects less forest but is closer to populated areas.

Under both alternative routes, the line will pass through two regions, Imereti and Samegrelo-Zemo Svaneti, and five municipalities: Tsalenjikha, Chkhorotskhu, Martvili, Khoni and Tskaltubo.

4.4.1. Alternative A

The corridor under Alternative A would be 79 km long. The route contains total of about 205 towers, including 51 angle towers, including the end-points. The route generally runs northwest from the Tskaltubo substation. The first 22 kilometers (section 1, angle points A1 to A17) pass through mainly flat agricultural land and mildly hilly terrain. It crosses municipal roads six times, railroad tracks once, and between A16 and A17 crosses the river Tskhenistskali. The line will then run parallel to the existing 500 kV Enguri-Zestafoni transmission line for a short distance between A13 and A14.

The longest section of the corridor (Section 2, between A17 and A40) is in more mountainous terrain and has difficult access, which will make vegetation control difficult as well. It contains about ten large crossings of deep valleys or canyons. At present, the corridor in this section is mostly forested and is largely inaccessible except along some existing logging trails. Geology in this area provides stable rock that will be suitable for micro-piled rock anchors. This type of foundations will significantly reduce excavations and the required quantity of concrete for foundations. This technological option has slightly increased cost but enables significant environmental benefits over pad-and-shoulder foundations.

The last 5-6 kilometers (section 3, A40 to A51) approaches the existing Jvari substation across mildly hilly terrain of well compacted silty, gravelly glacial tills, where no foundation problems are expected.

Optimization of Alternative A

After the preliminary route of the corridor was selected in the Feasibility Study, the studies and analyses conducted as part of this ESIA allowed the Alternative A route to be optimized. This optimization improved constructability and reduced potential impacts on infrastructure and biodiversity. Important adjustments included the following:

- The first section of the initial corridor originally followed the route called “sub-alternative Aa-1-Aa10” on Figure 4.4.2. The route was modified to reduce impacts on agricultural land and

infrastructure by aligning it along an existing motorway and railway. Also, the optimized route will require fewer new access roads.

- Another section of the initial corridor, "sub-alternative Aa20-Aa27" on Figure 4.4.3, Figure 4.4.4 and Figure 4.4.5, passed through mountainous territory and crossed non-fragmented forested areas, including passing through an Emerald Site. By altering the route to the south, it will cross much more fragmented forests and human-modified landscapes. The landscape is less mountainous, so would present fewer technical difficulties during construction.
- The initial corridor between angle points A29 and A36, "sub-alternative Ab29-Ab36" as shown Figure 4.4.6 and Figure 4.4.7, also passed through extreme mountainous terrain, which is very difficult in terms of access and altitude and also is covered in non-fragmented forests that is considered sensitive habitat similar to that in the adjacent Emerald Site; a short part of this sub-alternative also passes through an Emerald Site. Altering the route to the south reduces construction difficulties and will have reduced impact on sensitive habitats, although it will be more visible from populated areas.
- The initial section between angle points A36 and A39, shown as "sub-alternative A36-A39" on Figure 4.4.8, was located so the line would be exposed to high winds that would large towers and a wide corridor. It was determined that a more northerly final route will pass through a valley and be less exposed and allow smaller towers and narrower corridor, although it will affect a larger area.

4.4.2. Alternative B

The corridor under Alternative B would be about 74 kilometers long. For the first 23 kilometers, up to angle tower A18, and the last three kilometers (tower A 47 to Jvari substation), Alternative B is identical to Alternative A. In the 48-kilometer central section between these points, however, Alternative B avoids the mountains and remains in relatively low altitudes (up to 600 meters). This section of the corridor is just north of populated areas, much closer than Alternative A. The soil is mainly silty till, with some gravel and alluvial sediment and no special foundations will be required. Some protection of towers on slopes (to reduce erosion and stabilize slopes) is likely to be necessary, particularly between B37 and B44 where the line passes barren and eroded slopes.

4.4.3. Alternative A versus Alternative B

This subsection previews the results of Chapter 7. In summary:

- Alternative B would be more visually intrusive than alternative A. Although both would be visible from most of the nearest villages, Alternative B is closer to most of them and so would appear much more prominent. Alternative B would also be visible from Martvili town and from more tourist and cultural heritage sites.

- Alternative A would affect less private land and the noise and other disruption from construction would disturb fewer local people.
- Alternative B would require the relocation of five households and more vegetation control on private lands. Alternative A would require no relocation and most vegetation control would be on lands that are now Forest Fund lands.
- Alternative A would require more trees and shrubs to be cut, including species of conservation concern and it would be more difficult to construct and involve higher costs for construction and maintenance.
-

4.5. *Vegetation Control Alternatives*

During initial construction, trees in the forested sections of the corridor will need to be cut mechanically and manually. However, during future vegetation control, vegetation in the corridor could be controlled by the application of herbicides. This option was eliminated due to the increased risks to workers, local communities, aquatic communities, and flora that was not being targeted (for example, low-growing shrubs that do not need control). All vegetation control will be mechanical and manual.

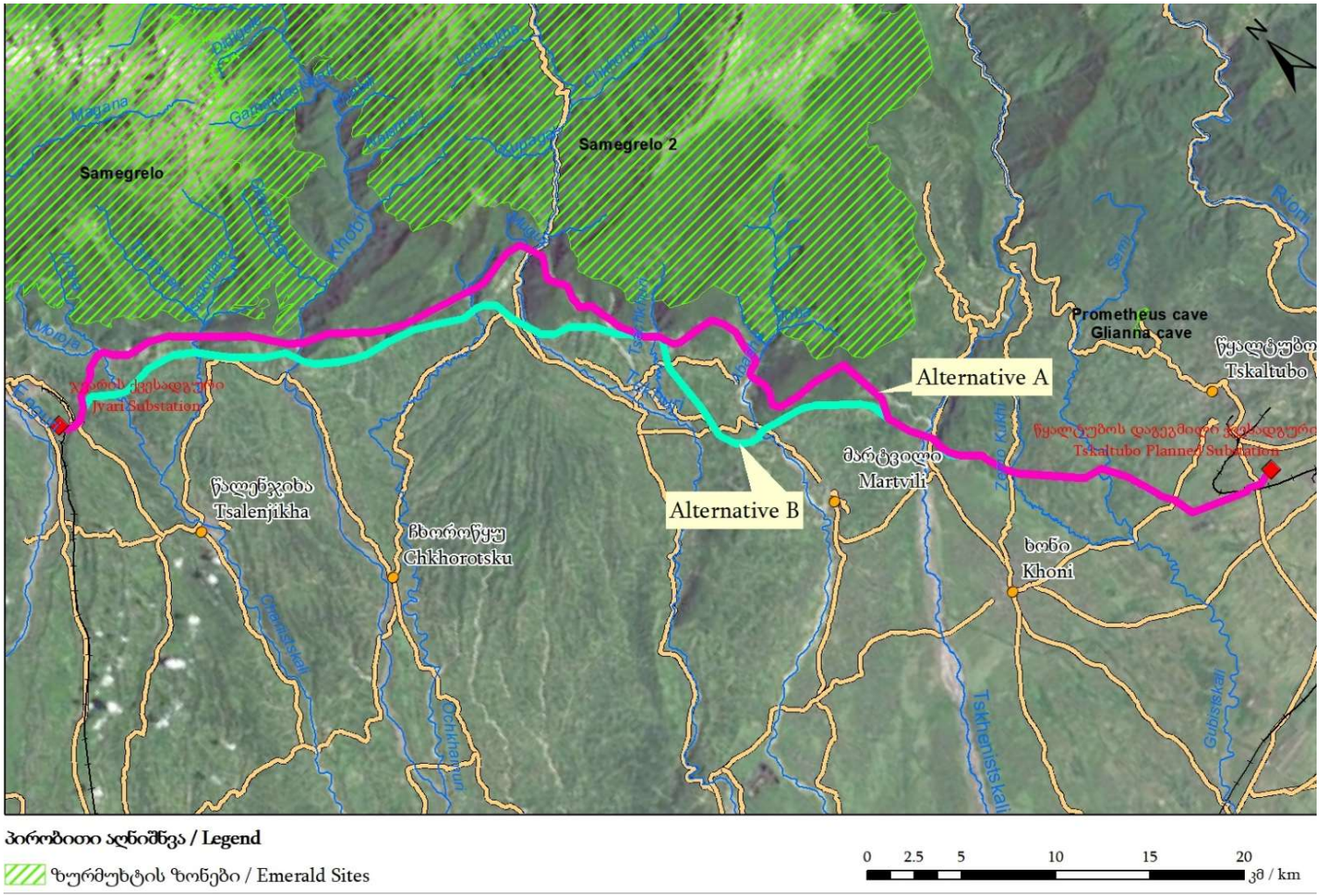


Figure 4.5.1 Alternative Routes A and B

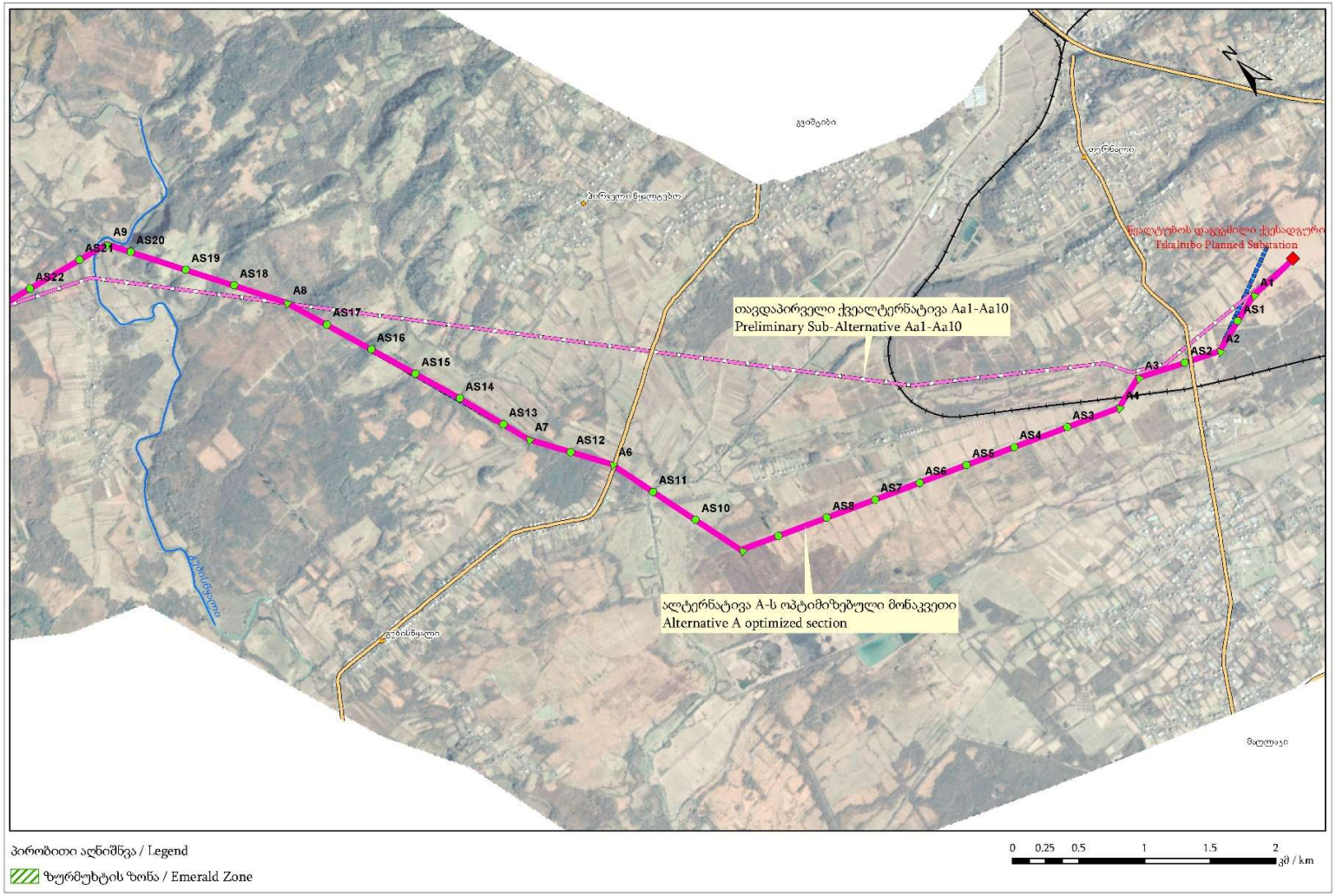


Figure 4.5.2 Optimization of Alternative A between Towers A01 and A10

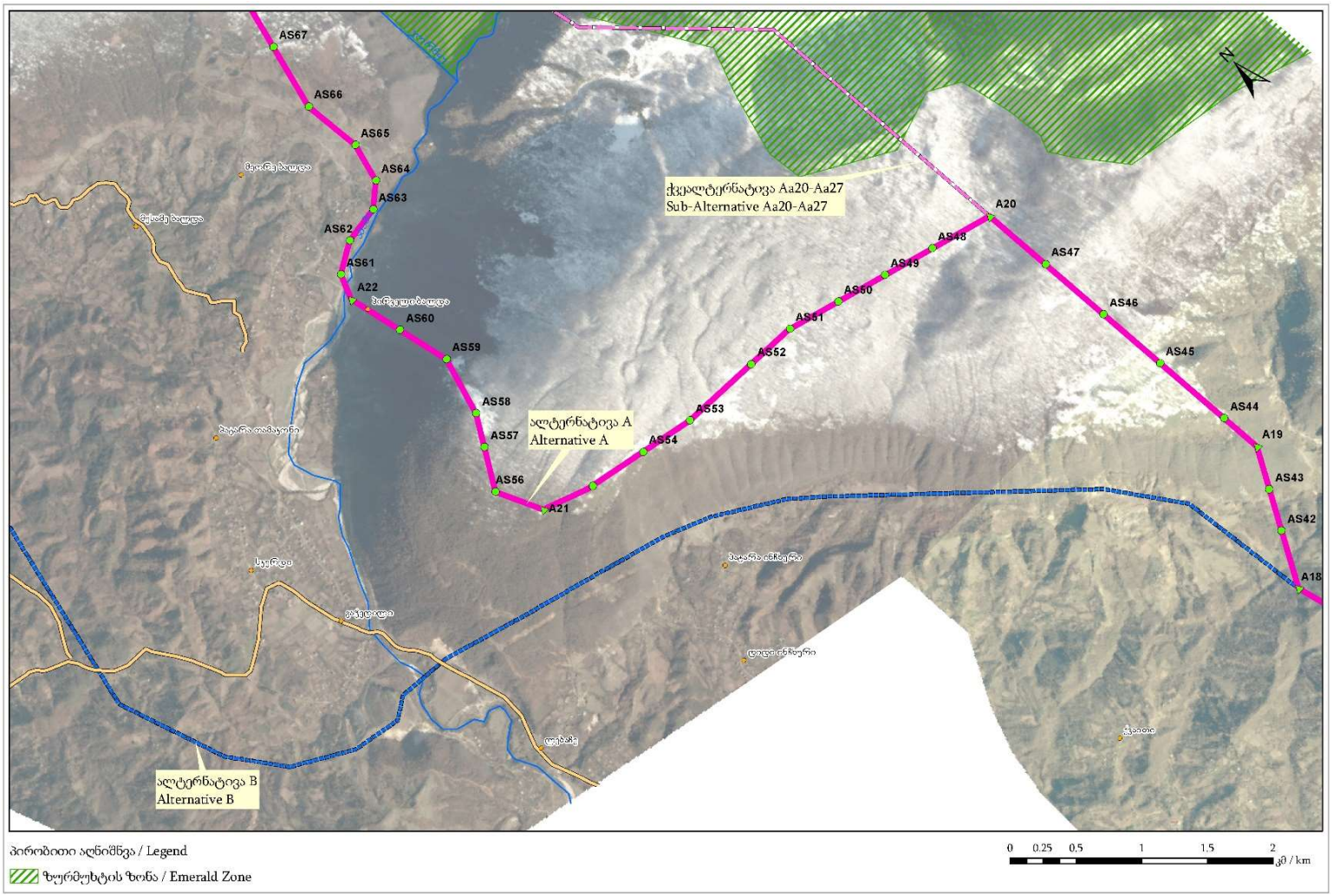


Figure 4.5.3 Optimization of Alternative A between Towers A20 and A26 (Part 1)

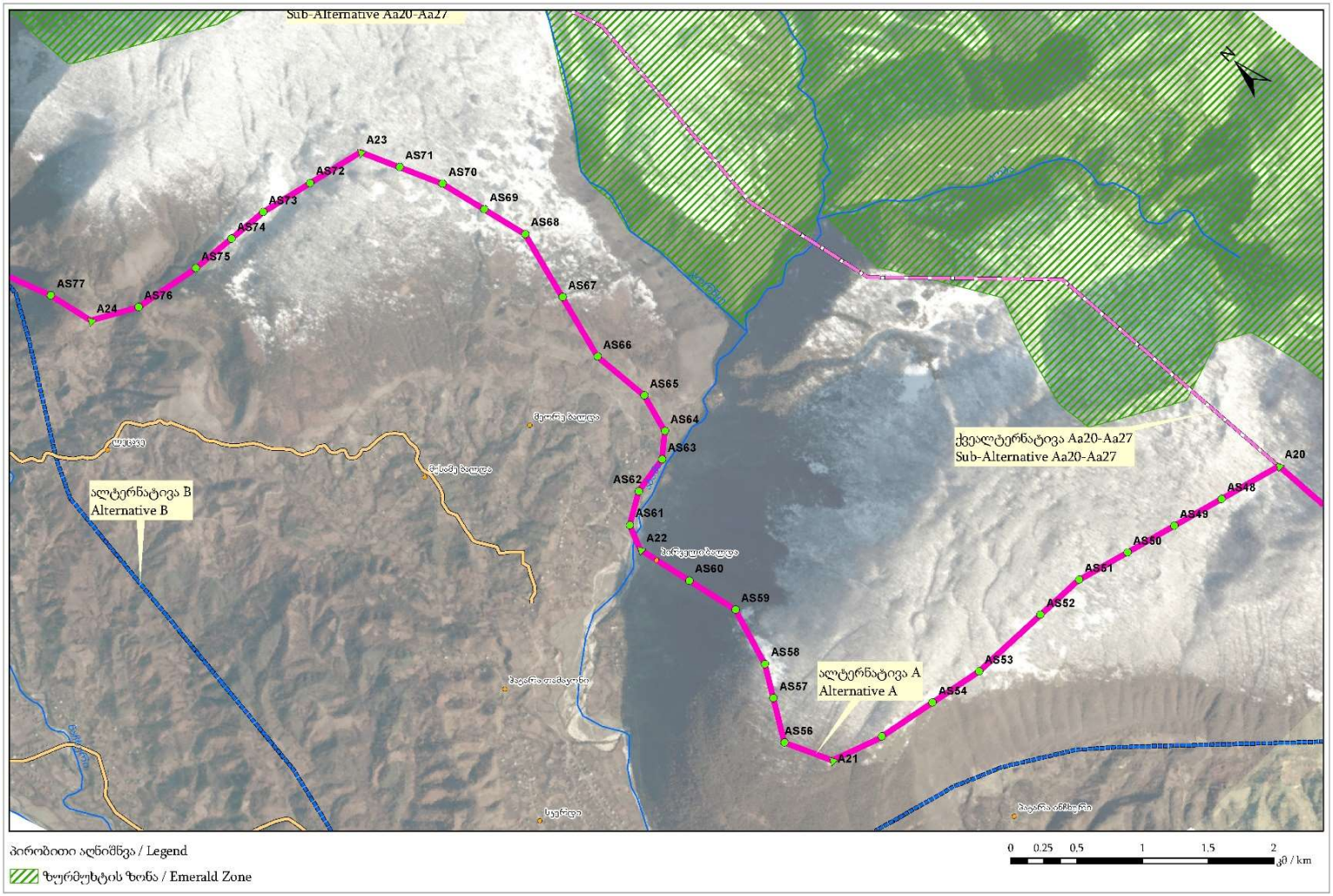


Figure 4.5.4 Optimization of Alternative A between Towers A20 and A26 (Part 2)

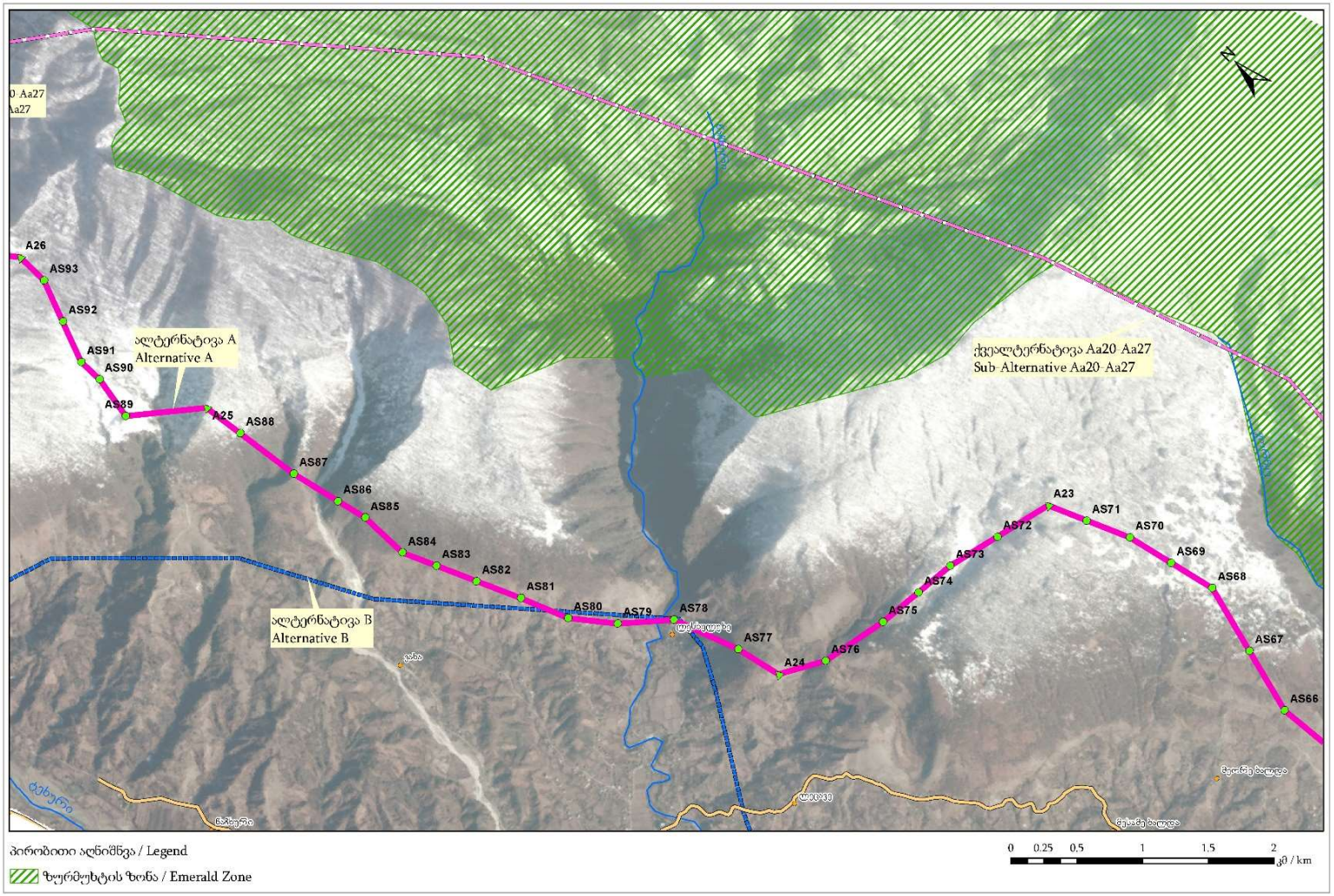


Figure 4.5.5 Optimization of Alternative A between Towers A20 and A26 (Part 3)

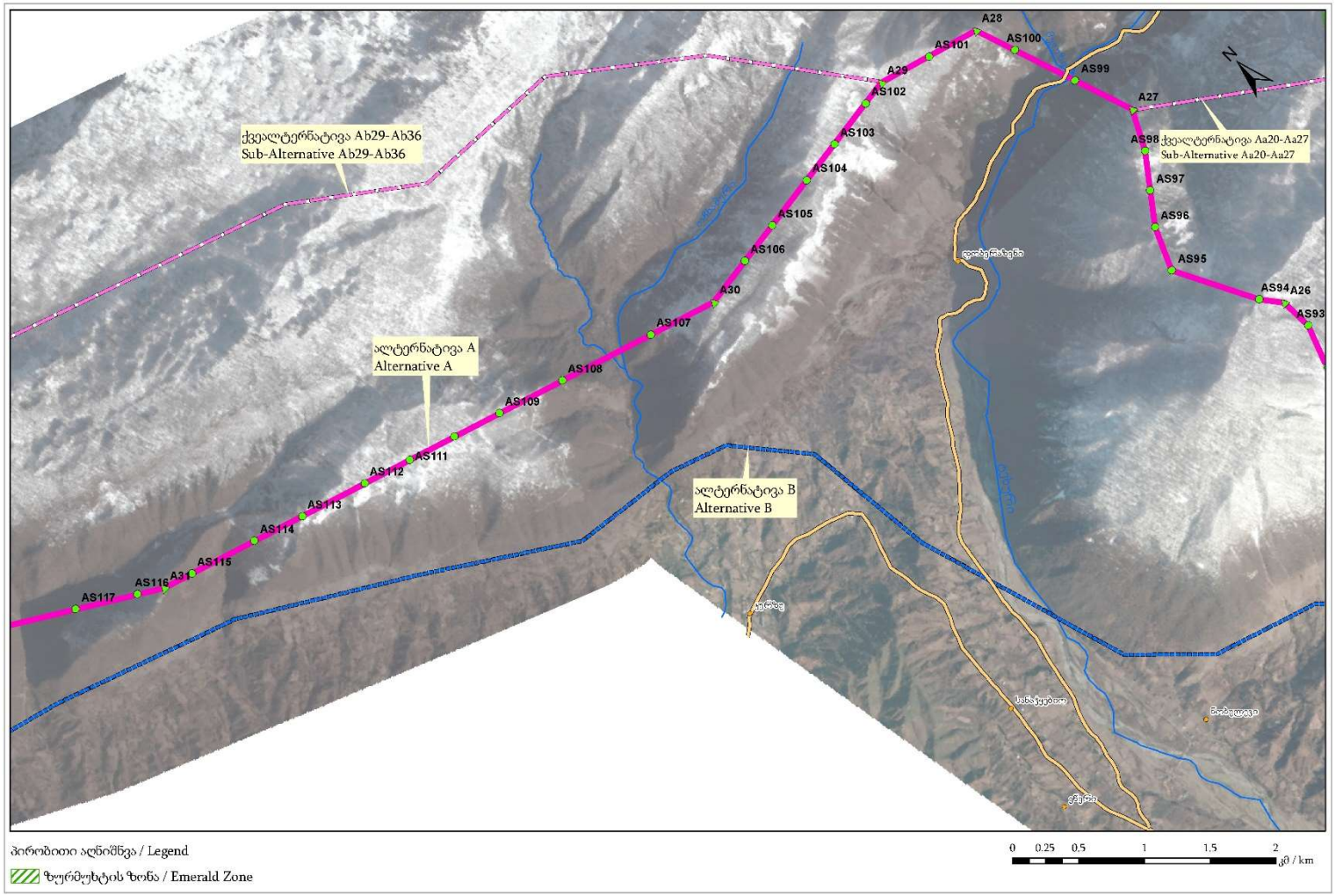


Figure 4.5.6 Optimization of Alternative A between Towers A29 and A36 (Part 1)

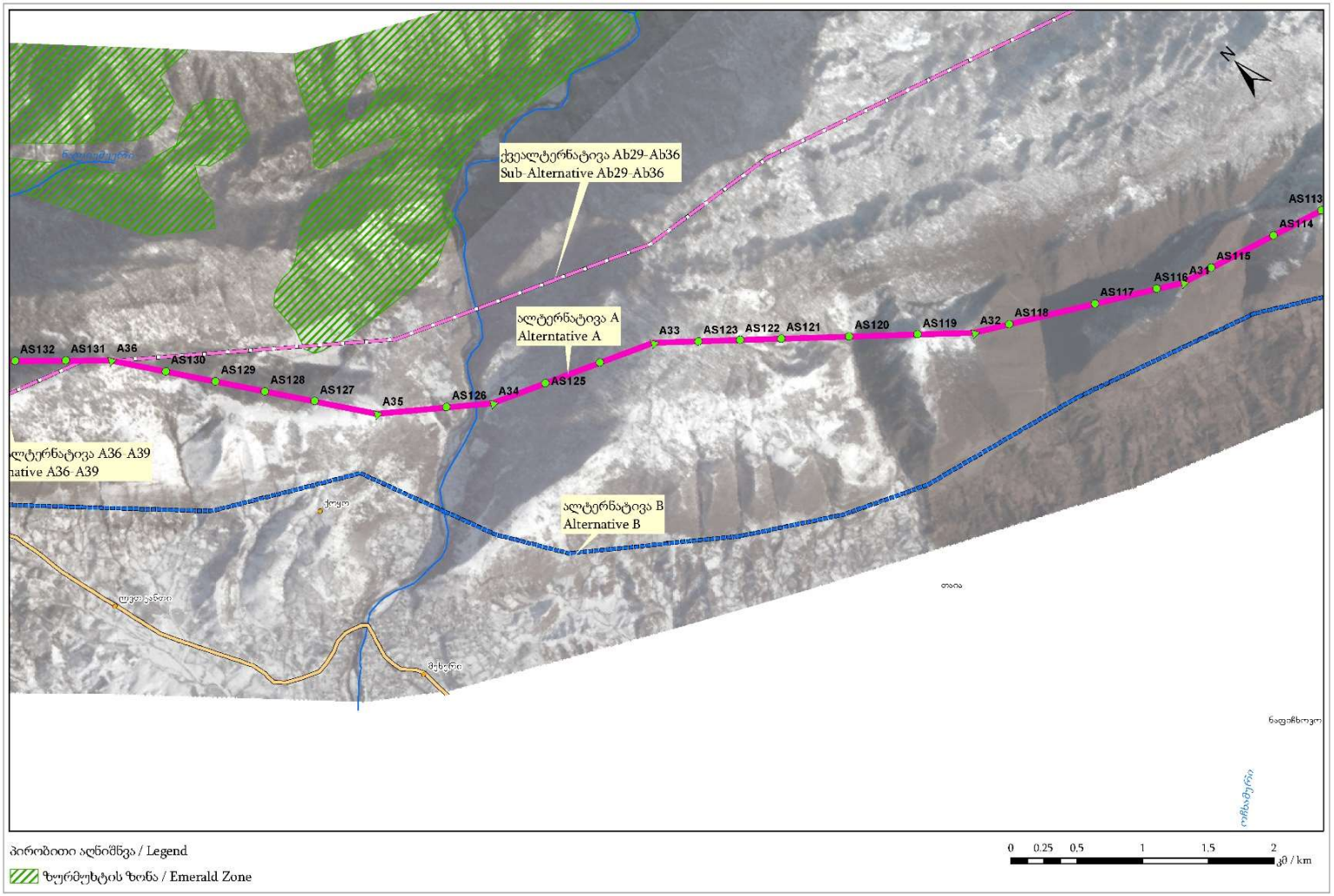


Figure 4.5.7 Optimization of Alternative A between Towers A29 and A36 (Part 2)

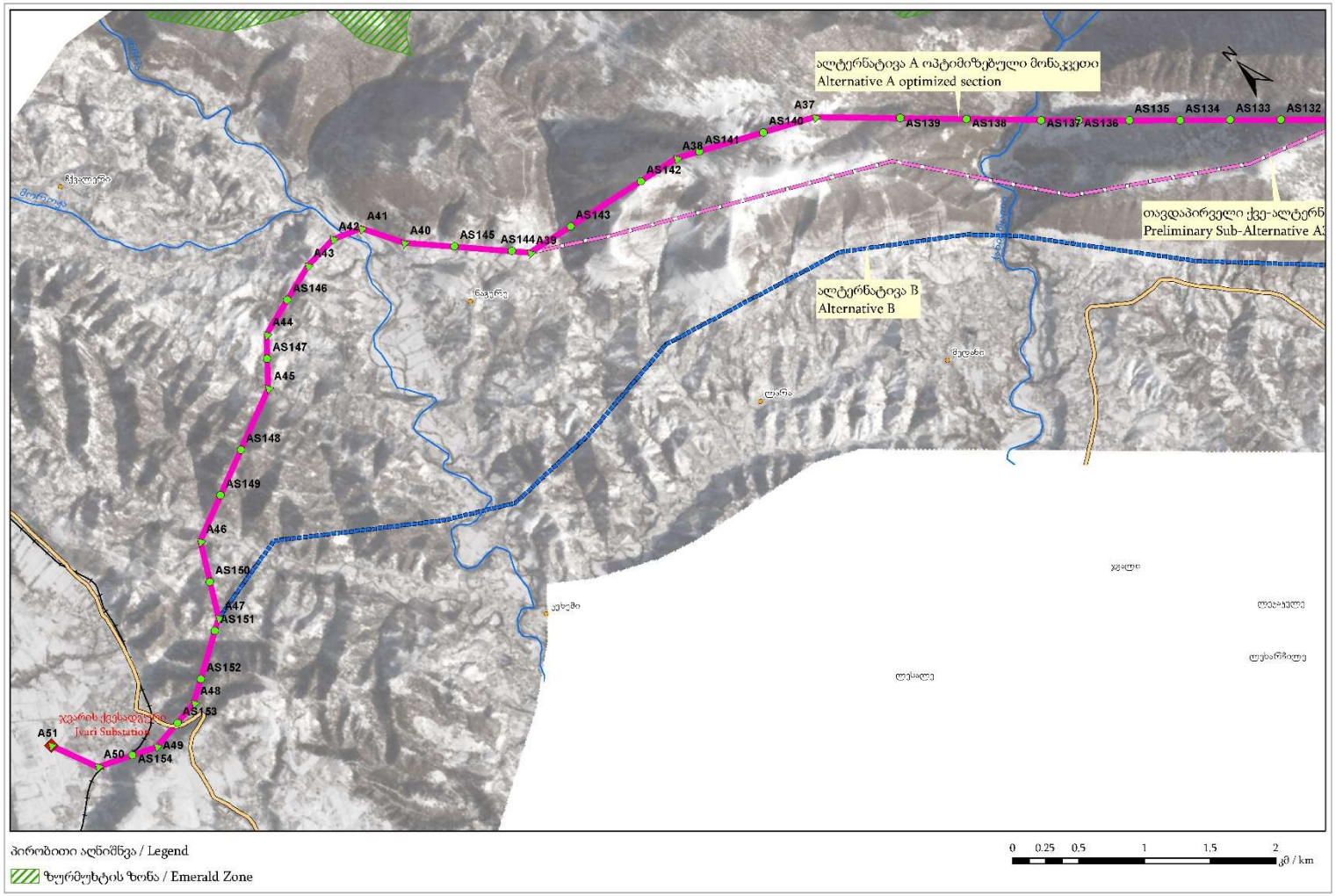


Figure 4.5.8 Optimization of Alternative A between Towers A36 and A39

4.6. *Vegetation Control Alternatives*

During initial construction, trees in the forested sections of the corridor will need to be cut mechanically and manually. However, during future vegetation control, vegetation in the corridor could be controlled by the application of herbicides. This option was eliminated due to the increased risks to workers, local communities, aquatic communities, and flora that was not being targeted (for example, low-growing shrubs that do not need control). All vegetation control will be mechanical and manual.

5. ESIA Methodology

This ESIA evaluates potential environmental and social impacts from construction and operation of the Jvari-Tskaltubo transmission line and Tskaltubo substation. The evaluation of impacts is based on an assessment of their extent (local, regional, national), duration (short, medium, long-term) and reversibility (temporary or irreversible effects).

It should be noted that the Feasibility Study did not identify the final location of towers or the exact route of the corridor. Rather, the study was carried out within a 300-meter-wide corridor, within which the locations of angle towers were proposed. Although the transmission line will run through this corrido, the exact location of the line and towers is not yet known. The final locations will be selected by the construction contractor. This selection process (known as "tower spotting") will take into account geological conditions, topography, accessibility, ability to acquire the land, local biodiversity and other factors. A team of engineers and scientists will conduct pre-construction surveys in order to optimize the final corridor. As noted in Chapter 7, the fact that the final 74.5-meter corridor will be within the 300-meter study corridor allows environmental and social impacts to be evaluated with sufficient accuracy to satisfy Georgian law and World Bank requirements.

5.1. *Methodology for Screening and Scoping Process*

The following methodology was applied for initial screening and collection of baseline information important for the project:

- Screening and categorization of the project by GSE and the Ministry of Environment Protection and Agriculture against Georgian legislation and by the World Bank against World Bank requirements in terms of project categorization and the level of impact assessment needed.
- Preliminary screening of key receptors and potential impacts during the feasibility study carried out in 2016-2017 by Fichtner.
- Detailed study of baseline environmental conditions within and adjacent to the project area conducted in 2017.

5.2. *Public Participation*

As described in section 2.1, current Georgia law requires early consultation with potential stakeholders so that potential concerns and impacts can be identified at an early stage. However, the law in force at the time the draft ESIA report was prepared and disclosed did not require such early public participation. The law required public consultations only after disclosure of the draft ESIA. The ESIA was disclosed in December 2017. In addition, World Bank requirements when the draft ESIA was prepared were not as specific as those now in force, which require engagement of stakeholders as early as possible in project development and to continue engagement throughout the project life cycle.

Chapter 9 describes the public consultation process and summarizes comments received from stakeholders and responses to those comments.

5.3. *Methodology for Baseline Study*

Baseline data was collected by conducting various field studies within and near a 300-meter-wide corridor that includes the actual 74.5-meter corridor, and so includes most if not all of the areas likely to be significantly affected by the project. The following methods were used to characterize baseline conditions:

- National and local agencies with an interest and jurisdiction were contacted to collect information and sources of information on baseline conditions.
- Scientific and other literature sources were reviewed, and field reconnaissance surveys were conducted to gain an understanding of environmental and social resources in and near the corridor, and of the wider region.
- Detailed field surveys of the corridor were conducted by teams of specialists during 2017 to verify information on physical and biological resources that was collected from reference materials and to fill gaps in knowledge and finalize the identification of potential receptors.

Data sources reviewed include scientific literature/publications, open data sources and specific reports such as the "Feasibility Study and Preliminary Design for the 500 kV Jvari-Tskaltubo Overhead Transmission Line and Associated 500 kV Substation in Tskaltubo" (Fichtner 2017) and "Environmental And Social Impact Assessment and Preparation Of Land Acquisition And Resettlement Policy Framework For Construction of 500kV Jvari-Tskaltubo Overhead Transmission Line and Associated Substation Inception Report" (DG Consulting 2017).

Field surveys were conducted for specific environmental and social components of particular concern, including:

- Landscapes and visual receptors
- Soils and ground conditions
- Geology and geo-engineering conditions
- Botanical survey of the corridor
- Fauna and ornithology
- Protected areas
- Land use
- Cultural heritage and archaeology
- Locations of buildings in certain sections.

Section 5.3.1 provides more detail on the surveys. Relevant information from the baseline studies and field surveys were digitized and included in a GIS database to allow the environmental and social attributes of the area to be understood in relation to the spatial context of the transmission line corridor.

5.3.1. Methodology for detailed environmental survey of the corridor

The desk study was conducted during spring 2017, followed by field works. For environmental resources, the 300-meter corridor was assumed to be sufficient to characterize conditions and assess impacts, but for certain special cases (e.g., visual impact), longer distances were considered.

Although the final tower locations will not be identified until final design, the 300-meter corridor was selected in such a manner that relatively minor changes in tower locations from their indicative locations would not make significant differences in the results of the analysis. The study area along one section of the corridor is depicted in Figure 5.3.1. The outer lines show the 300-meter-wide corridor, the blue lines show the indicative 74.5-meter "safety zone" in which buildings will be prohibited, and the red line shows the indicative locations of the towers and transmission line. The 54.5-meter "vegetation control zone" is shown by yellow hatching—it is shown only in forests since little or no vegetation control will be needed except in forests. Although an effort was made to make sure conditions in the 300-meter corridor were similar across its width, there is necessarily some variation along most of the corridor. This will provide flexibility for the contractor to adjust the line from its indicative position in order to satisfy geological or other requirements, including protection of people and of biodiversity, at many or most prospective tower locations.

The reconnaissance team visited the corridor and in all accessible areas investigated the area in terms of environmental features, general environmental sensitivity, evaluation of possible access road routes, and issues that needed further studies and evaluation by specialists. The corridor is partly located in a remote area where there is limited access by vehicle. The team was equipped with GPS devices, satellite imagery of the study area, and maps and information from the desk study. The corridor was also evaluated with aerial equipment (i.e., drone), which gave the opportunity to study other details of the corridor and more precisely identify all sensitive areas.

The teams completed three sessions of reconnaissance works. First was a preliminary field screening (of landscapes, access roads, accessibility) to allow planning of detailed investigations and identification of areas where more detailed field surveys were required. One outcome of the initial session was a "constraints" map, which identified areas that were inaccessible as well as areas of very high sensitivity or interest that had to be studied in more detail. The remaining two sessions included the investigations of the various features described above.

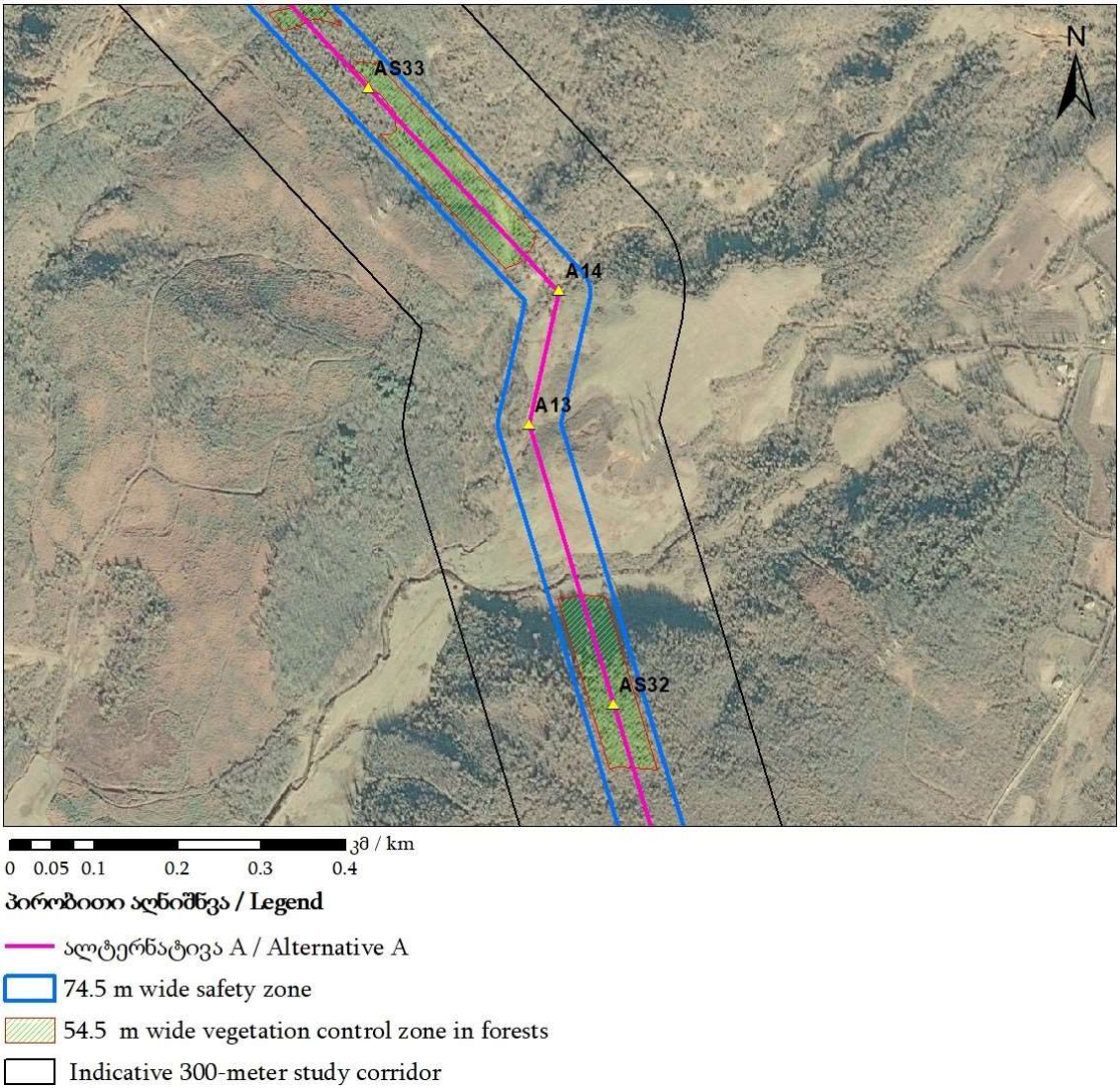


Figure 5.3.1 Typical Section of the 300-meter Corridor showing the 74.5-meter Safety Zone and 54.5-meter Vegetation Control Zone

5.3.2. Methodology for GIS database development

The length and complexity of the corridor required a spatial analysis in order to characterize potentially affected environmental and social conditions and to evaluate potential impacts. For the analysis, a detailed GIS database was developed with satellite photos as the base. Two sets of geo-referenced satellite photos were used for the development of the GIS model. In addition, a hexacopter with a three-dimensional geo-positioning system and two cameras for continuous recording was remotely controlled as it flew over the corridor to allow a more accurate inspection and characterization of the corridor. In addition, historical topographic maps were also used to support the baseline and impact assessment work. Finally, handheld GPS instruments and other geo-positioning tools were used during reconnaissance visits. Of particular concern were the 300-meter study area and, within that, the

indicative 74.5-meter safety zone and 54.5-meter vegetation control zone along the centerline of the study area. As noted previously, the corridor, buffer zone, and vegetation control zone are indicative at this point, as are locations of access roads and angle towers; the GIS database was used to develop indicative roads and better understand the works required for road clearing and conductor stringing operations. Since only 51 angle tower locations had been proposed in the feasibility study, the GIS database was used to select indicative locations for an additional 151 suspension towers between the angle towers.

The thematic layers developed in the GIS database for the corridor included data "layers" for administrative boundaries, topography, geology and geotechnical, flora, fauna, vegetation and habitats, safety buffer zone, vegetation control/clearance zone, angle and suspension towers, zone of archaeological and cultural influence, land use, ownership, and various other categories of social information.

5.3.3. Methodology for botanical surveys

The floral study was undertaken during the spring and summer of 2017. The botanical team began the initial desk study in the spring and completed an initial field survey in early spring to record species in their early emergence/growth period to ensure they could be identified in later visits. Another field survey was conducted in late spring, during the period of most active vegetation growth, in order to record a full picture of floral biodiversity.

The surveys covered both alternative routes, including a 500-meter corridor for Alternative A, indicative access roads, and the substation site. The initial survey results and satellite imagery were used to identify sections of similar habitat and similar biodiversity to allow categorization of habitats in the corridor and selection of representative parcels so future quantitative surveys could be extrapolated over areas of similar habitat.

Late spring surveys were conducted in May-July 2018 and involved a more detailed and more quantitative assessment. During these latter surveys, vegetation density and coverage parameters were recorded and evaluated, with results given according to the Drude scale and used to construct the biodiversity and habitats layer of the GIS database. The results then contributed to optimization of the alternative A corridor, as described in Chapter 4, and were used to construct the fauna and habitats layer of the GIS database and to construct maps showing relative sensitivity of the corridor with regards to potential impacts on flora and habitats, in particular Red List species. It is noted that although the presence of Red List plant species was recorded at survey points, it was not possible to conduct a comprehensive survey of the entire corridor. That will have to be accomplished during further surveys prior to final design and construction.

5.3.4. Methodology for surveys of terrestrial and avian fauna

The baseline for animals and birds was based on a desk study of publicly available reference materials

and the scientific literature (e.g., articles and letters in local and international periodic publications) and visits to the corridor. The objectives were to describe the primary wildlife habitats and animal species in the project region, to identify known sensitive habitats and species requiring particular attention or protection, identify major wildlife data gaps, and to provide basic information for proper planning and implementation of field surveys.

Surveys of fauna were undertaken during spring and summer of 2017, with special attention to bird migration since power lines can present a risk to migrating birds. The survey covered the entire corridor, with objectives to describe wildlife habitats along the route, identify which sensitive fauna habitats that are reported and unreported in the literature could fall within the corridor, and identify areas of high sensitivity that should be avoided to reduce potentially significant impacts on wildlife. The "walkthrough" method was used to achieve these objectives. Observers recorded animal species observed as well as signs of their vital activity (traces, droppings, dens, feather, etc.) encountered during the survey within or near the corridor. A key observation was that the Alternative A corridor roughly follows the edge of forested areas and in most cases the forest has been affected by past tree cutting.

As with the flora and habitat surveys, the results contributed to optimization of the Alternative A corridor, as described in Chapter 4, and the results were used to construct the fauna and habitats layer of the GIS database and to construct maps showing relative sensitivity of the corridor with regards to potential impacts on fauna, in particular Red List species.

5.3.5. Methodology for cultural heritage and archaeology survey

As with flora and fauna, surveys began with a review of the literature, in particular the database of registered cultural heritage sites maintained by the Ministry of Education, Science, Culture and Sport of Georgia and information on tourist attractions such as Balda Canyon, waterfalls, and monasteries.

At an early stage of the ESIA, a desk study was undertaken to identify settlements within five kilometers of the corridor and to fix the locations of known natural and cultural heritage sites. A field visit was conducted in order to interview local people and learn more about sites that may not be widely known or registered in databases. Additional information was collected regarding cemeteries in the area, both older ones and more recent ones. During the visit, a number of cultural heritage sites were visited to gain more information regarding current conditions.

Aerial photographs were then examined to fix the exact locations of cultural heritage, touristic, cemeteries, and other locations of interest within about 5-6 kilometres of the corridor, which were then entered into the GIS database.

5.3.6. Methodology for socioeconomic study

The socioeconomic baseline study along the project route was carried out through review of existing

information from state statistics department as well as other studies that were previously carried out by local and international institutions in the region. Baseline data collected included cadastral information on land ownership and use within the corridor, and demographic data on population characteristics within the two regions and five municipalities crossed by the corridor.

In addition, the socioeconomic study included interviews with local authorities, representatives of villages, and local people along the corridor. It also included information from preliminary consultations with the public that were organized in two sessions in the spring of 2018 and summer period during the time the ESIA team was working in the field and organizing discussions regarding proposed line.

In parallel, the framework for the resettlement policy framework was developed based on information and assumptions regarding the status of unregistered land parcels, including their owners.

5.4. *Methodology for Assessing Potential Environmental and Social Impacts*

Chapter 7 identifies the potential environmental and socioeconomic impacts that may result from project construction and operation, determines whether the potential impacts are likely to be significant, and compares the potential impacts for the two alternatives. A number of criteria were used to determine whether or not a potential impact of the proposed project could be considered "significant." These are outlined with reference to specific environmental and social issues in this ESIA.

Wherever possible, a quantitative assessment of the impacts was undertaken. Where this was not possible, a qualitative assessment of impacts was undertaken, based on existing information available for the corridor, and experience with other transmission line projects. The ESIA covers the direct impacts and any indirect, secondary, cumulative, short-term medium-term, and long-term, permanent and temporary, reversible and irreversible, beneficial and adverse impacts of the proposed scheme.

Where relevant, the anticipated impacts were compared against appropriate legal requirements and standards. Where no such standards exist, assessment methods involving interpretation and the application of professional judgement were employed. The assessment of significance in all cases took into account the changes that would occur to the established baseline conditions, considering the sensitivity of the environment.

For impacts considered to be significant (that is, "moderate" or "major" in Table 5.4.1) and for many lesser impacts, GSE will implement a variety of mitigation measures, as discussed in Chapters 7 and 8.

5.4.1. Methodology for assessing environmental impacts

A general method for grading the significance of environmental impacts was adopted to ensure

consistency in the terminology of significance, whether for a beneficial or an adverse impact. The two principal criteria determining significance are the sensitivity of the receptor and the magnitude of the change arising from the scheme, as shown in Table 5.4.1.

The table shows that the significance of impacts was classed as major, moderate, minor, or none; and either positive (beneficial) or negative (adverse). This categorization is widely recognized and accepted in the field of environmental impact assessment. Where appropriate, topic-specific assessment methods and criteria for determining significance are described in Chapter 7.

Table 5.4.1. Determination of Environmental Impact Significance

Magnitude of change	**Sensitivity of receptor**		
	High *(e.g. international, national protection)*	***Medium*** *(e.g. regional, local protection)*	***Low*** *(e.g. no protection)*
High *All or significant proportion affected*	Major (H,H)	Major (H, M)	Moderate (H, L)
Medium *Substantial amount affected*	Major (M, H)	Moderate (M, M)	Minor (M, L)
Low *Relatively small proportion affected*	Moderate (L, H)	Minor (L, M)	Negligible (L, L)
Very Low *Very small amount affected*	Minor (VL, H)	Negligible (VL, M)	Negligible (VL, L)
No Change	None (NC, H)	None (NC, M)	None (NC, L)

Another consideration was the duration of the impact -- whether the impact would be temporary or permanent -- and if they were temporary whether it would be short-, medium-, or-long term. It is recognized that defining the duration of the impact can be subjective, depending on the receptor. For instance, following construction, it may then take some time for vegetation to become fully re-established. Although in ecological terms, this period may not be a long time in forests, for the people who use the land for orchards or pasture the period could be significant in relation to their lifetime and could therefore be considered permanent. Similarly, a person's initial reaction to the new presence of a tower in a landscape could be very negative, but over time the reaction would be subdued until there was little or no reaction at all. Table 5.4.2 sets out how the duration of impact was used.

Table 5.4.2. Duration of Impacts

Nature of change	Duration	Definition/ Description
Temporary	Short-term	Impact continues during construction (1-2 years) and up to 1 year following construction
	Medium-term	Impact continues 1-5 years following construction
	Long-term	Impact continues 5-10 years after construction
Permanent	-	Due to the length of time period for human beings, impacts over 10 years can subjectively be defined as permanent.

5.4.2. Methodology for assessing social impacts

The objective of the social impact assessment was to identify major risks to social and economic conditions in the area of the proposed transmission line and substation and to assess impacts of construction and operation on those conditions. The impacts can be direct and indirect, intended and unintended, positive and negative. For significant impacts, GSE would implement a variety of mitigation measures, and these are discussed in Chapters 7 and 8.

Generally, the social impact assessment process involved the following major tasks:

- Identifying types of adverse and beneficial impacts of the proposed transmission line
- Assessing the level of socioeconomic risks in terms of frequency (how likely is it to happen) and consequences.
- Assessing the acceptability of the risks.
- Introducing mitigation measures to reduce risks to acceptable levels.

The social impact assessment typically addressed the following issues:

- Demographics, including changes in local population size, emigration/immigration in the area, migration of people in search of work, and other issues.
- Economic issues, including supply chain impacts, local sourcing opportunities, potential impacts on local markets for goods and services, employment opportunities for construction, operation and decommissioning phases of the project.
- Health issues, including risks of new diseases to indigenous communities, impacts on health and safety of workers and local communities, impact of local diseases on workers.

- Social infrastructure, including adequacy of health care and education facilities, transport and roads, power supply, fresh water supply to support project activities and personnel as well as the local communities.
- Resources, including land use changes, increased access to rural or remote areas, and use of natural resources.
- Cultural, including issues associated with sites that have archaeological, historical, religious, cultural, or aesthetic values.
- Social equity, including local social groups who might gain or lose as a result of the project or operation.

As with environmental impacts, a general method for grading the significance of socioeconomic impacts was adopted to ensure consistency in the terminology of significance, whether for a beneficial or adverse impact. The two principal criteria used were the nature of the impact and the magnitude of the change arising from the scheme, as shown in Table 5.4.3.

Table 5.4.3. Determination of Social Impact Significance

Magnitude of change	**Nature of impact**		
	Avoidance	*Disruption/Habituation*	*Permanence*
Negligible	No avoidance needed	Not noticeable under normal conditions	Not noticeable
Minor	Mitigation or design change prevents impact(s)	No effect on daily life or routine of affected party	Ephemeral: <1 year
Moderate	Mitigation or design change reduces impact	Possible initial change on daily life/routine, rapid habituation reduces to below nuisance level	Temporary: recovery to pre-existing conditions after one or a few years (e.g., after construction)
Major	Mitigation or design change cannot significantly reduce impact(s)	Requires change to daily life or routine activities	Permanent: life of transmission line, or beyond

5.4.3. Environmental and social impact mitigation and enhancement

Where potential impacts could be significant, measures to avoid, reduce, or mitigate the impacts were developed by applying the mitigation hierarchy, as outlined in the text box.

> "The environmental and social assessment will apply a mitigation hierarchy, which will:
> "(a) Anticipate and avoid risks and impacts;
> "(b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels;
> "(c) Once risks and impacts have been minimized or reduced, mitigate; and
> "d) Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible."
>
> *World Bank ESS1, paragraph 27*

These measures are intended to avoid, reduce, compensate, and/or remediate adverse impacts, or to enhance potentially beneficial impacts. Wherever possible, mitigation is undertaken was part of the project design, so the measures could feed back into impact assessment. An example of this was the optimization of the corridors, which allowed many impacts on people to be avoided. Another will be to include erosion control measures into the design of roads, which will minimize or reduce impacts.

The mitigation and enhancement which should be undertaken as part of the project are set out as an Environmental and Social Management Plan which can then be applied in order to manage different phases of the project. For this project, the plan is presented in Chapter 8.

Table 5.4.1, and Table 5.4.3 show that impact significance has been classed as major, moderate, minor, or negligible (none). As noted, impacts can be either positive (beneficial) or negative (adverse). Where appropriate, topic-specific assessment methods and criteria for determining significance are described in relevant sections of Chapter 7.

5.4.4. Environmental and social monitoring

The success of most mitigation measures is necessarily uncertain and must be monitored to verify it is being implemented and is working as planned. Various monitoring results will need to be reported by the contractor to the Supervision Consultant, by the Consultant to GSE, and by GSE to Georgian ministries, the World Bank, or others. The Environmental and Social Monitoring Plan for this project is presented in Chapter 8.

6. Baseline Conditions

This Chapter describes the current environmental and social conditions that could be affected by the project. The Chapter is organized as follows:

Section 6.1 provides an overview of the landscape and physical conditions along the Alternative A project route

Section 6.2 describes regional climate and weather

Section 6.3 provides information on categories of landscapes and land use

Section 6.4 describes geologic conditions, including geomorphology and tectonics (6.4.1), karst formations (6.4.2), hydrogeology (6.4.3), and geoengineering conditions (6.4.4), and soils (6.4.5)

Section 6.5 describes hydrologic conditions

Section 6.6 describes flora and habitat, including a general description of the corridor (6.6.1), literature date (6.6.2), field surveys (6.6.3), species of conservation concern (6.6.4), and habitats of concern (6.6.5)

Section 6.7 describes fauna, including animal species in the project area (6.7.1) and sensitive fauna (6.7.2)

Section 6.8 describes socioeconomic conditions, beginning with subsectionsthat introduce and provide a general description (subsections 6.8.1 and 6.8.2), then subsections that cover demography (6.8.3), economic activity (6.8.4), and employment and income (6.8.5).

Section 6.10 describes important cultural heritage in the region.

6.1. *Physical Description of Route under Alternative A*

This section provides an overview of existing conditions along the proposed transmission line route. The route can be divided into three sections:

- Section 1 runs from angle points A1 to A17. It has flat and slightly hilly terrain and is easily accessible.
- Section 2 runs from angle points A17 to A40 and is in very difficult mountainous terrain. Most of the tower locations could not be reached during the surveys, although enough could be to characterize the section.
- Section 3 runs from A40 to A51 and is in hilly terrain but is mostly accessible.

For detailed maps of the sections, see Annex 1, “Maps of OHL Corridor”. The following paragraphs describe existing baseline conditions recorded during field reconnaissance works that were completed during the route optimization and environmental baseline studies.

The area between towers A1-A5 flat and mostly covered in grass and shrubs. In some sections, agricultural parcels are surrounded by small trees. The landscapes are typical for the Kolkheti lowlands. Views are shown in Figure 6.1.1. The existing situation is heavily modified by human activity. Some parcels were used as an agricultural land but have been abandoned and now have developed secondary vegetation. Any existing environmental pollution would be from agricultural chemicals used in the past. The transmission line route crosses a railway line and then runs parallel to the village road.

This section of the corridor avoids populated areas and privately-owned land as much as possible. Distances to private houses exceed 200 meters except one house located 120 meters from the centerline.

Figure 6.1.1 The Views between Poles A1-A3

After tower A6, the route crosses a regional motorway and heads northwest through agricultural land parcels. Between towers A6 and A7, it crosses a tree-covered zone surrounded by agricultural land parcels. The section between towers A7 and A9 is mostly represented by modified fragments of trees shrubs, with A9 located near the river Gubistskali—see Figure 6.1.2. After the river crossing, the line crosses more active and abandoned agricultural lands and sections covered with modified forests. It also crosses local roads. This section of the power line passes village Dedalauri from the south. The distance to the closest house is about 150 meters from the centerline and 5-6 more houses are at a distance of about 200-250 meters. The section is mostly agricultural with annual crops and the walnut orchards.

Tower A10 is located on a small hill after the river crossing and village Dedalauri. Here the power line corridor turns to the north to avoid the small settlement and crosses agricultural parcels. The distance to the closest house is again around 120 meters from the centerline. There are another 3-4 houses at a distance of 150 meters. Typical views of the section are present on Figure 6.1.2.

Figure 6.1.2 The River Gubistskali Crossing - A9 Area and Shrubs at A10

The corridor in this section covers about two kilometers of modified forestland between towers A9 and A11, significantly modified due to human influence.

Between towers A10 and A11, the corridor route crosses agricultural parcels surrounded by trees in windbreaks and hilly areas partially covered with trees and bushes. Tower A11 is located on the top of a hill and the line then crosses a deep valley below Kukhi reservoir. The distance between the towers is around 700-800 meters. The line crosses small reservoirs that were previously used as fish farms, but they are not used at present. The view of the ponds below the Kukhi reservoir and the dam itself is shown on Figure 6.1.3.

Figure 6.1.3 View of Kukhi Reservoir

After Tower A12, the route crosses an existing 500kV line. To be sure the line crosses at the correct angle, there will be one tower on each side of the existing line.

After tower A14, the line corridor passes through hilly terrain covered with partially fragmented forest.

The existing forest is significantly impacted due to its proximity to populated areas and is affected by traditional use of the forest resources. The section is also used for cattle grazing. This section is mostly hilly, with a number of valleys crossed by the powerline. The main direction of the gorges is from north to the south, except a depression after tower A15, where a river gorge runs east to west. Although vegetation clearance will be required, access to the corridor is not complicated and an access road can be arranged through the corridor where vegetation has to be cleared.

Tower A15 is located northeast of Matkhoji village. At the north-east edge of the village Matkhoji the monastery is located. The line will pass about 450 meters from the monastery, but the existing 500kV line lies between the monastery and the new line.

The section between towers A15 and A16 passes over a ridge in parallel to the existing 500kV line on the north side of that line (see Figure 6.1.4). Some cumulative visual impact is expected for residents of Matkhoji and Zemo Khuntsi villages. It is expected that the two suspension towers will be required to support the line over the ridge crossing. The vertical clearance will not be high so vegetation clearance in the fragmented forest will be necessary.

Figure 6.1.4 View to the West from A16 (the Existing Line is Visible), View to the r. Tskhenistskali Floodplain (North – West Direction)

Between towers A16 and A17, the river Tskhenistskali will be crossed and tower A17 is located within partly agricultural and partly fragmented forest land. Towers will not be close enough to the river to affect floodwaters.

From tower A17, the corridor crosses a forested section toward A18. The forested section belongs to the National Forestry Agency but is significantly fragmented due to logging.

The section between A18 and A19 crosses forested land, again highly fragmented. The forest is typical to the mountain outcrops of the Caucasus ridge, and is dominated by tall beech trees.

From A19, the route goes up in a mostly forested hill before it connects to A20. After A20 the line turns left and goes along the mountain edge to A21, where access is extremely difficult due to the densely

forested area. Here, A20 is near (within a 0.5 kilometer) of an Emerald Site, as shown on Figure 6.1.5.

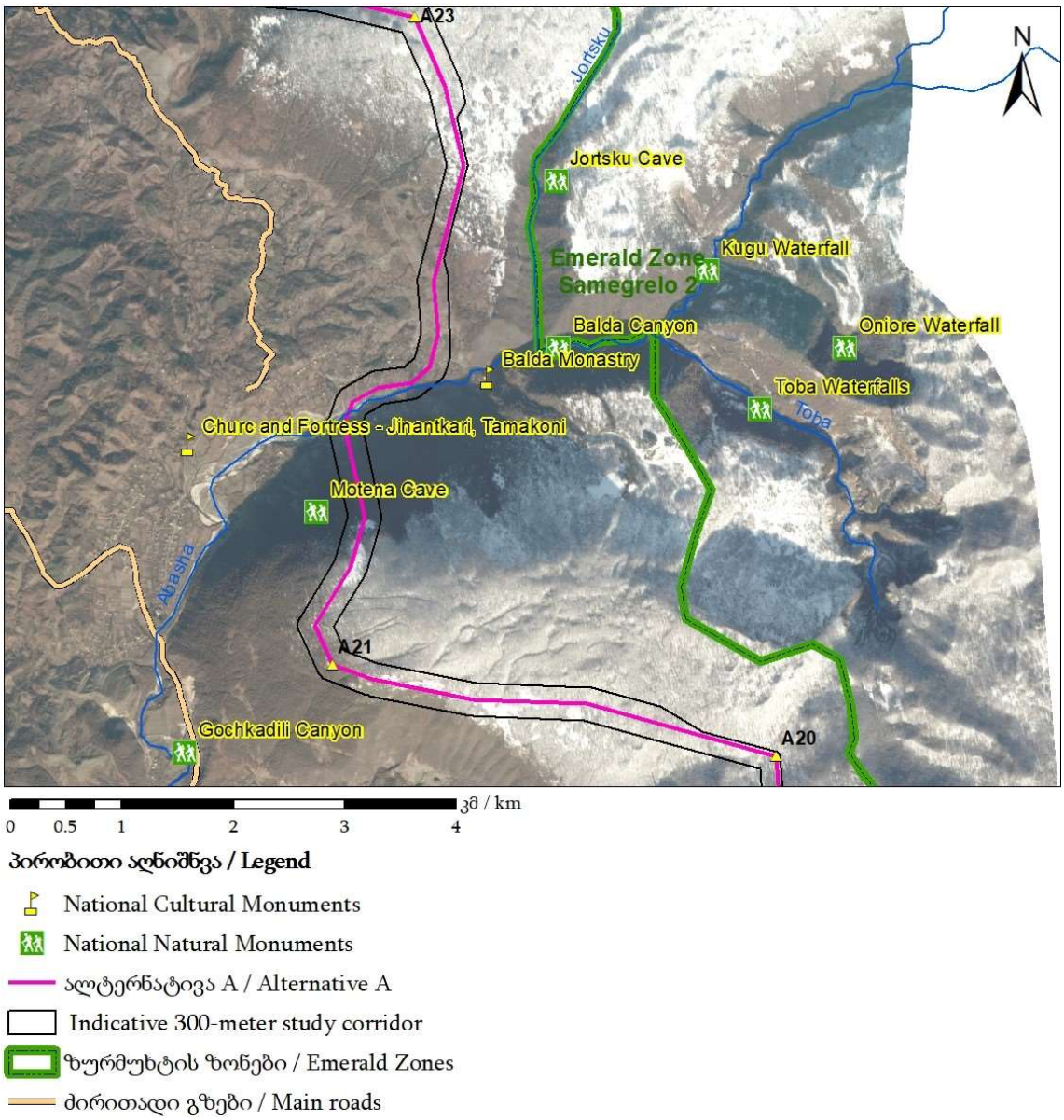


Figure 6.1.5 Google Map View of Section between A20 and A23 and Nearby Protected Areas

The section between A21 and A22 is also fully forested. The route goes along the edge of the mountain and then down to the river Abasha, near the villages Patara Tamakoni and Meore Balda. The topography is very steep, and access is limited. Near this section, the Motena Cave natural monument is located in the lower part of the mountain slope. See Figure 6.1.6.

At the beginning of the span between A22 and A23 section the line crosses the river Abasha and then runs beside the river Abasha for approximately 1.5 kilometers, then up the hill in the northern part of the village Meore Balda. Figure 6.1.7 shows this area. The mountainous part of the section is covered mainly with forest and shrubs.

Figure 6.1.6 Motena Cave Natural Monument near A21-A22

Figure 6.1.7 View from Mesame Balda to Meore Balda and River Abasha Crossing near A22

The section between A24 and A25 is located on the northern side of the villages Leskhulukhe and Vakha. The line goes along the bottom part of the mountain edge, where there is fragmented forest and some smaller vegetation. The line crosses river Tsachkhuri and near A25 it also crosses the valley, where an unnamed seasonal river flows down from the mountains and connects to the river Tekhuri

near village Salkhino. A quarry is in the mountains to the north of A24-A25 (Figure 6.1.8 and Figure 6.1.9).

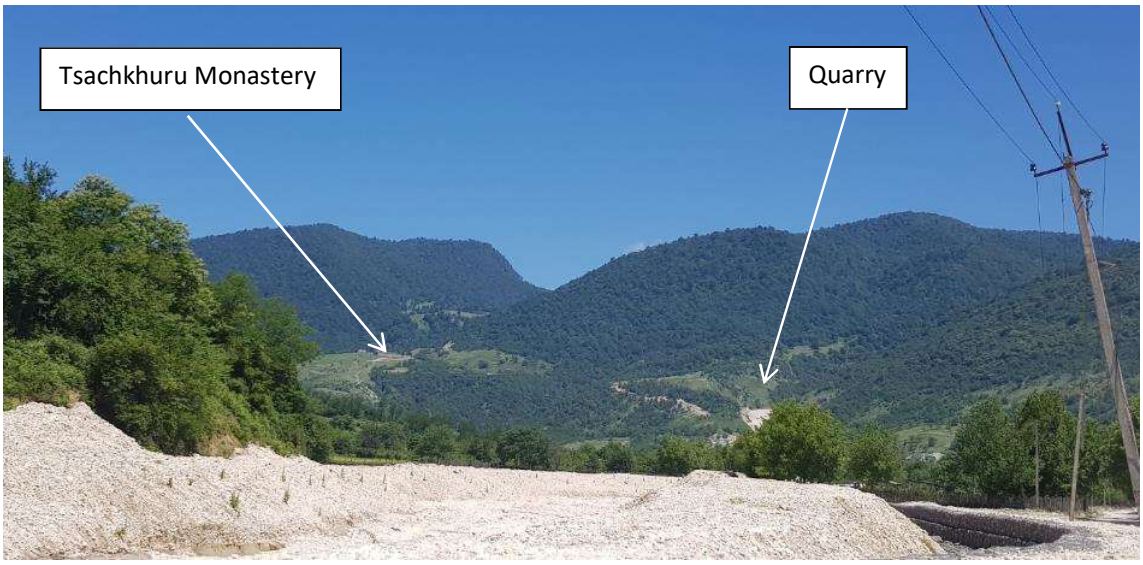


Figure 6.1.8 View from Village Vakha showing the Quarry Access Road Cross Section and the Tsachkhuru Monastery

Figure 6.1.9 View from Village Leskhulukhe Showing the A24-A25 Section

After A25, the line goes up a hill to A26 is located and passes the Tsachkhuru monastery at a distance of about 400 meters. After the monastery, the section goes uphill through fragmented forested to A27 on the northern part of the mountain.

The span between A27 and A28 crosses Tekhuri River and is in difficult terrain. Tower 28 is located

between Tekhuri and Muguz rivers; the Muguz is tributary to the latter. Access again is extremely difficult. The access to tower A28 can only come from tower A29, which in turn can be only from A30. Older maps show some paths, but the road was not accessible during the surveys. In general, the section between towers A28 and A30 will be extremely difficult to access. The section is fragmented forest with small areas of grassland used for grazing; the trees will need to be cut. Figure 6.1.10 shows views of this section.

Figure 6.1.10 View of Pole A28 from Tekhuri Gorge and Watershed at Section A29-A30

The section between A30 and A31 includes a crossing of the Ochkhamuri River and then crosses Mountain Tsekami from the south and follows the ridge to a crossing of an unnamed seasonal stream in a deep gorge. The Ochkhamuri river valley is 1.8 kilometers wide, with steep slopes on each side. Power line will go high over the ground surface in this long span no cecessiating vegetation clearance underneath. About 500 meters from the corridor is the Ockhamuri waterfall, which is a tourist attraction on hiking trails. After the river crossing, the corridor passes through dense forest with small sections of grassland. The line will be visible from the Kurzu and Naphichkhovo villages. The access to the corridor is very difficult; there is one old road in very bad condition, which allows access to the corridor only with off-road vehicles with high clearance.

The section from A31 to A32 crosses an unnamed river gorge, again with very steep slopes on both sides. There is no access road access to A32 will be very difficult (currently reachable only by walking though very steep slopes).

The section from A32 to A33 continues through very difficult terrain and crosses a seasonal river gorge. In the middle part of the section to the south, a cultural heritage site and monastery are located at a distance of about 800 meters. At present, it cannot be determined if the line will be visible from the monastery. There is a “road” that starts in the river gorge, climbs up to the monastery, and splits into two forest tracks, one leading to the middle section between A32 and A33 and the second one leading to A33. The condition of the road is very bad and passable only with off-road vehicles with high clearance. Figure 6.1.11 shows the monastery and the access road to A32-A33 section.

Figure 6.1.11 The View of Monastery and Access Road to the Middle Part of A32-A33 Section

Figure 6.1.12 A33-A34 Views from the River Gorge

After Tower A33, the line goes down to the Khobi river gorge, where the A34 is located on the left wall of the canyon. Clearance will be required on this the steep slope, which is densely forested. After the river crossing, the line goes up the steep slope on the west side of the river and crosses over a limestone quarry. The line runs to a Tower located on the top of the mountain and follows the ridge to A36. The corridor is in a densely forested area adjacent to steep slopes with limited vegetation, as shown in Figure 6.1.12.

From A36 to A37, the line crosses down to the river Chanistskali, passing through a densely forested area until it hits a flat area over an existing limestone quarry. After the Chanistskali crossing, the corridor passes south from residences at a distance of about 120 meters and climbs up a densely forested moderate slope to Tower A37.

The section between A37 and A38 runs on the highland and crosses summer shelters used by local farmers. From A38 to A39 the line crosses the river gorge north of Naguru village. Tower A39 is then located on the plateau and can be reached only on an access road covered with big rocks that is difficult to drive. The section between A39 and A40 (Figure 6.1.13) runs along a hill along the access road. The corridor is slightly vegetated, and clearance will not be necessary. After A40, the corridor goes down to the river floodplain. Here, topography is practically flat, and the corridor is covered with bushes and small trees.

Figure 6.1.13 Views of Section A38-A39

The environmental sensitivity of this section is relatively low because of the degraded vegetation cover and the presence of exposed dolomite and limestone bedrock. The areas for these Towers footprints are shown on Figure 6.1.13. The area is generally not affected by humans except cattle grazing areas used by the farmers during summer. During the summer, cattle are moved to these uplands and the herders stay in shelters mentioned above. There has been small-scale rock quarrying in the past, but there are no longer any such activities.

Tower A41 is located on the left bank of river Intsra river, where the centerline turns to the west, crosses the river, and goes up to the hill toward a populated area.

Figure 6.1.14 A42 Location View, Intsra River on the Right Side and A44 Area with Private Agricultural Land on the Left Side

The section between Towers A42 and A43 is mostly flat and covered with limited vegetation. The corridor crosses agricultural lands and passes about 100 meters north of several residences. The section from A43 to A44 is covered with partially fragmented forest, then section from A44 to A45 crosses densely forested hills where vegetation clearance will be required. Here a cemetery is located 100 meters away from the centerline. Figure 6.1.14 shows small portions of this section.

The section between A45 and A46 is hilly terrain. It is covered with vegetation that will have to be

cleared and with some private agricultural lands. Tower A46 is located adjacent to the existing regional road shown in Figure 6.1.15. The corridor between Towers A46 to A47 is similar, but with residences within about 120 meters of the centerline. The section is vegetated and densely forested and will need to be cleared (Figure 6.1.16)

Figure 6.1.15 A46 Location View from 150m Height Taken with the Drone

Figure 6.1.16 Pole A47 Area, the Access Road Needs Cleaning and Vegetation Removal

The section from A48 to A49 crosses the regional road that runs from Jvari to Paluri village. The area is covered with bushes and trees, with some agricultural lands. Tower A49 is located on the top of a hill, from which the corridor goes down to the last two towers, A50 and A51. The area is mostly covered with agricultural land and small vegetation, as can be seen on Figure 6.1.17.

Figure 6.1.17 A50-A51 Section, View of Substation Area

Overall, in the lowland areas, most of the corridor is through land that is highly impacted by human activity. In the highlands, however, the corridor, the corridor passes through fragmented and non-fragmented forests, some of which are affected by commercial logging activities and firewood cutting.

6.2. *Climate and meteorological conditions*

The project corridor crosses Imereti and Samegrelo-Zemo Svaneti regions and the following five municipalities: Martvili, Chkhorotskhu, Tsalenjikha, Tskaltubo and Khoni. The line crosses the area of the southern slope of Caucasus mountain ridge in the zone where the mountains become hilly and then merge into the Kolkheti lowland zone that is characterized by flat sedimentary landscapes.

The climate is a moderately humid subtropical climate that transitions into mountainous semi-humid to dry climate as elevation increases. In general, the climate becomes more humid and warmer at lower altitudes and toward the west.

According to the climate map of Georgia (Figure 6.2.1), the north-western section of the transmission line will run through mountain steppe climatic subzone characterized by cold and not very snowy winters and long, warm summers. The mean annual temperature is 13-14°C with the monthly mean varying from 3 °C in January to 23 °C in August.

Mean annual precipitation is around 1600-2200 millimeters per year, with lower precipitation in Imereti and notably higher in Samegrelo-Zemo Svaneti. The period with most rainfall is late spring and early summer, when about half of annual precipitation falls.

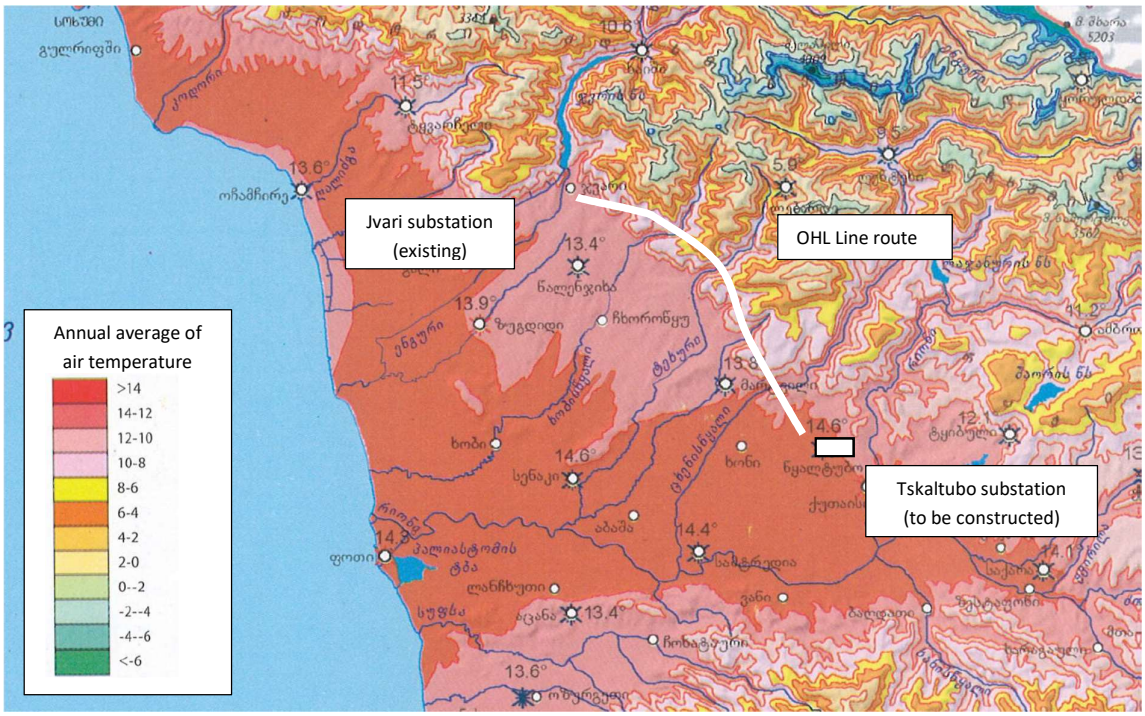


Figure 6.2.1 Air Temperature Map

Mean annual air humidity of the target regions ranges between 73-78 percent. The daily precipitation maximum is in 190 millimeters, observed in Martvili, followed by the other two municipalities of the

Samegrelo-Zemo Svaneti Region. The south-eastern part of the corridor through Imereti will be less subject to maximum daily precipitations.

Table 6.2.1 summarizes climate characteristics for municipalities along the corridor, whilst Figure 6.2.2 and Figure 6.2.3 show temperature and precipitation variability along the route.

Table 6.2.1. Ambient Temperature, Precipitation, and Humidity

Administrative Unit	Mean Annual Air Temperature, °C	Precipitation		
		Total annual, mm	Daily maximum, mm	Mean Annual Air Humidity, %
Martvili	13.8	1904	190	78
Chkhorotskhu	13.4	2053	173	74
Tsalenjikha	13.3	2016	105	74
Tskaltubo	14.6	1818	131	73
Khoni	14.3	1793	134	74

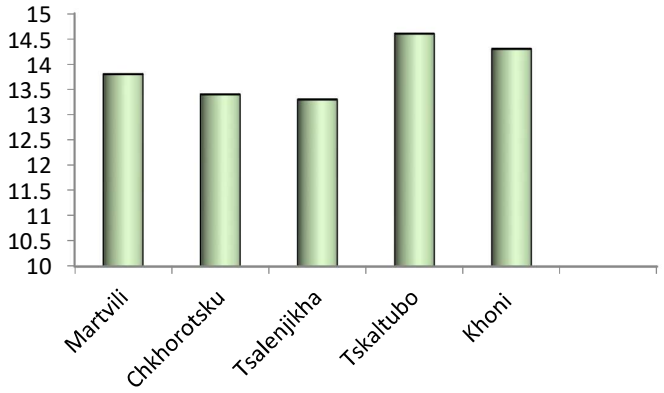


Figure 6.2.2 Mean Annual air Temperature along the Powerline Route

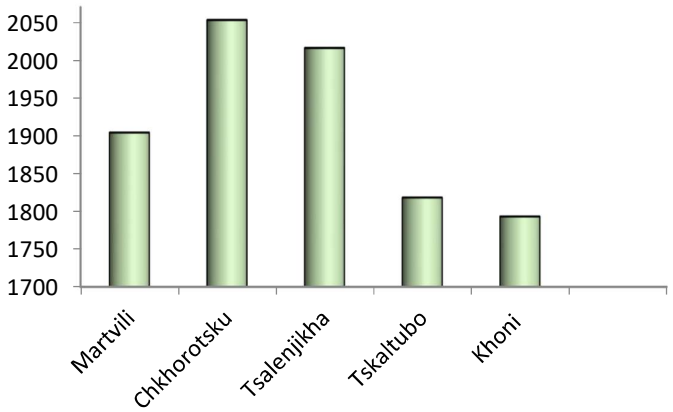


Figure 6.2.3 Mean Annual Precipitation along the Route

Wind data by municipality are displayed in Table 6.1.2 and 6.1.3. The windiest municipalities crossed by the transmission line route are Khoni and Martvili, with average winds being stronger during winter in all municipalities. Estimated maximum wind velocities of various recurrence times are also higher in Martvili than in other municipalities. The table also shows calculated maximum wind velocities at various intervals of up to 20 years.

Table 6.2.2. Wind Characteristics for the OHL Route

Administrative Unit	Wind Velocity, m/sec								
	January		July		Maximum Likely Wind Velocity (m/sec) for Recurrence Time of:				
	Max	Min	Max	Min	1 year	5 years	10 years	15 years	20 years
Martvili	5.1	0.8	2.8	0.7	28	36	39	42	43
Chkhorotskhu	N.A.	N.A.	N.A.	N.A.	21	24	27	28	28
Tsalenjikha	4.1	1.6	5.2	1.7	18	22	24	25	26
Tskaltubo	3.9	0.5	2.5	0.4	18	23	25	26	27
Khoni	4.9	0.9	2.9	0.7	25	31	34	36	37

Table 6.2.3. Prevailing Wind Directions in January and July

Administrative Unit	%, January, July								
	N	NE	E	SE	S	SW	W	NW	Still
Martvili	9/7	9/4	42/14	6/5	6/11	3/13	22/39	3/7	9/7
Chkhorotskhu	-	-	-	-	-	-	-	-	-
Tsalenjikha	18/5	24/8	7/4	11/13	5/12	10/40	2/4	23/14	4,1/1,6
Tskaltubo	4/1	31/5	27/13	4/2	2/0	5/21	25/57	2/1	4/1
Khoni	1/2	12/3	51/12	9/3	2/4	10/40	13/33	2/3	1/2

Table 6.2.4. Recurrence of Wind Directions and Still During Year

Administrative Unit	Recurrence of wind directions and still during year, %								
	N	NE	E	SE	S	SW	W	NW	Still
Martvili	7	7	29	5	8	8	31	5	30
Chkhorotskhu	-	-	-	-	-	-	-	-	-
Tsalenjikha	13	15	5	12	8	23	4	20	9
Tskaltubo	2	18	26	4	1	11	36	2	60
Khoni	1	8	35	8	2	23	21	2	41

Average relative humidity in municipalities along the corridor is presented in Table 6.2.5.

Table 6.2.5. Average Relative Humidity by Month

Administrative Unit	Relative humidity of ambient air, %												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	A n
Martvili	70	69	69	68	72	76	81	80	80	74	69	67	78
Chkhorotskhu	70	72	72	70	74	78	82	82	80	74	70	67	74
Tsalenjikha	70	72	71	70	74	78	83	82	80	74	69	67	74
Tskaltubo	73	72	70	69	72	74	78	76	78	76	71	70	73
Khoni	72	71	71	70	72	76	80	80	79	76	70	72	71

The weight of snow cover is similar in all municipalities, while the duration of snow cover is the longest in Chkhorotskhu Municipality (45 days). The snow cover mostly depends on altitude, so the sections of line, in terms of snow cover, will be significantly different from the data provided in the table below. The rest of the target municipalities display lower number of snow days ranging from 18 to 24 days per year. The summary information regarding snow cover along the route is presented in Table 6.2.6 below.

Table 6.2.6. The Snow Cover Parameters along Power Line Route

Administrative Unit	Weight of snow cover (kPa)	Duration of snow cover (day_
Martvili	0,50	18
Chkhorotskhu	0,50	45
Tsalenjikha	0,50	24
Tskaltubo	0,50	19
Khoni	0,50	18

KPa – kilopascal, which is a measure of pressure equal to 1 newton per square meter

6.3. *Major landscapes and land use*

The landscapes of Georgia are very rich, with up 50 types having been recognized by different scientific papers on natural resources and landscape types of Georgia. One of the best-known classifications is based on scientific work developed by N. Beruchashvili. The first maps of Caucasus landscapes were published in 1979 and later clarifications and updates were periodically issued.

The main landscapes of Georgia are classified differently by various authors, with one of the well-known classifications being based on the height of the absolute range of landscapes of plain and foothills. Each group consists of certain subgroups that are classified based on specific characteristics. Another approach is a classification based on the prevailing vegetation cover of the area, with forests, holes / meadows, steppe, glacier landscapes and desert types widespread in this area. In addition to

vegetation, the characteristic of main geological formations is also considered as well as humidity patterns.

The map below (Figure 6.3.1) shows the proposed power line and landscape zoning in the project area. As mentioned in the project route description, the sections of the corridor near Jvari and Tskaltubo as well as the Tskaltubo substation are characterized as North Subtropical Humid landscapes. The middle part of the corridor is characterized as Thermo-Moderate Humid landscape, which has is described as Colchic middle-mountain landscapes with beech forests mainly with evergreen underwood. In the north of the area, with the increase in elevation, several distinguished landscapes are encountered, including High Mountain Meadow (V1) Category, (U1) Cold moderate and (M1) Thermo moderate Humid.

The land use pattern at Jvari substation and the northernmost 5-7 km of the corridor is characterized as agricultural / fragmented forests / shrubs, and this is evident in Figure 6.3.2.

Agricultural land use is typically based on small-scale farming and garden/farm use. Typically, annual crops are maize, beans and soya vegetables and some land is devoted to orchards, mostly walnuts and different types of fruits. The areas between cultivated parcels are covered either shrubs or pastures (Figure 6.3.3) or fragmented forests significantly impacted by the human activities. The local population exploits the fragmented forests by collecting firewood and/or wild berries and other naturally growing fruits.

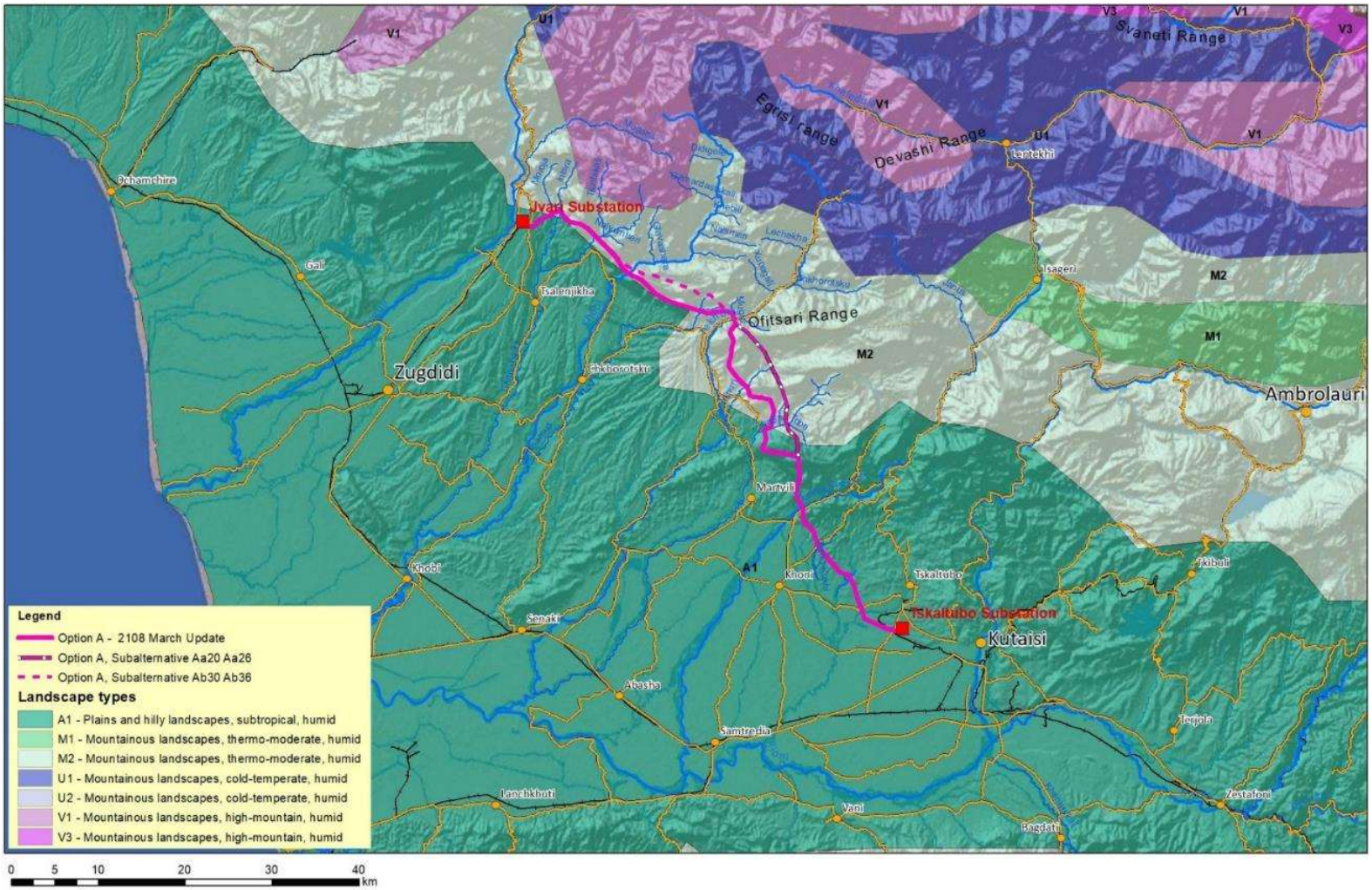


Figure 6.3.1 The Landscape Zoning of Georgia (by Beruchashvili)

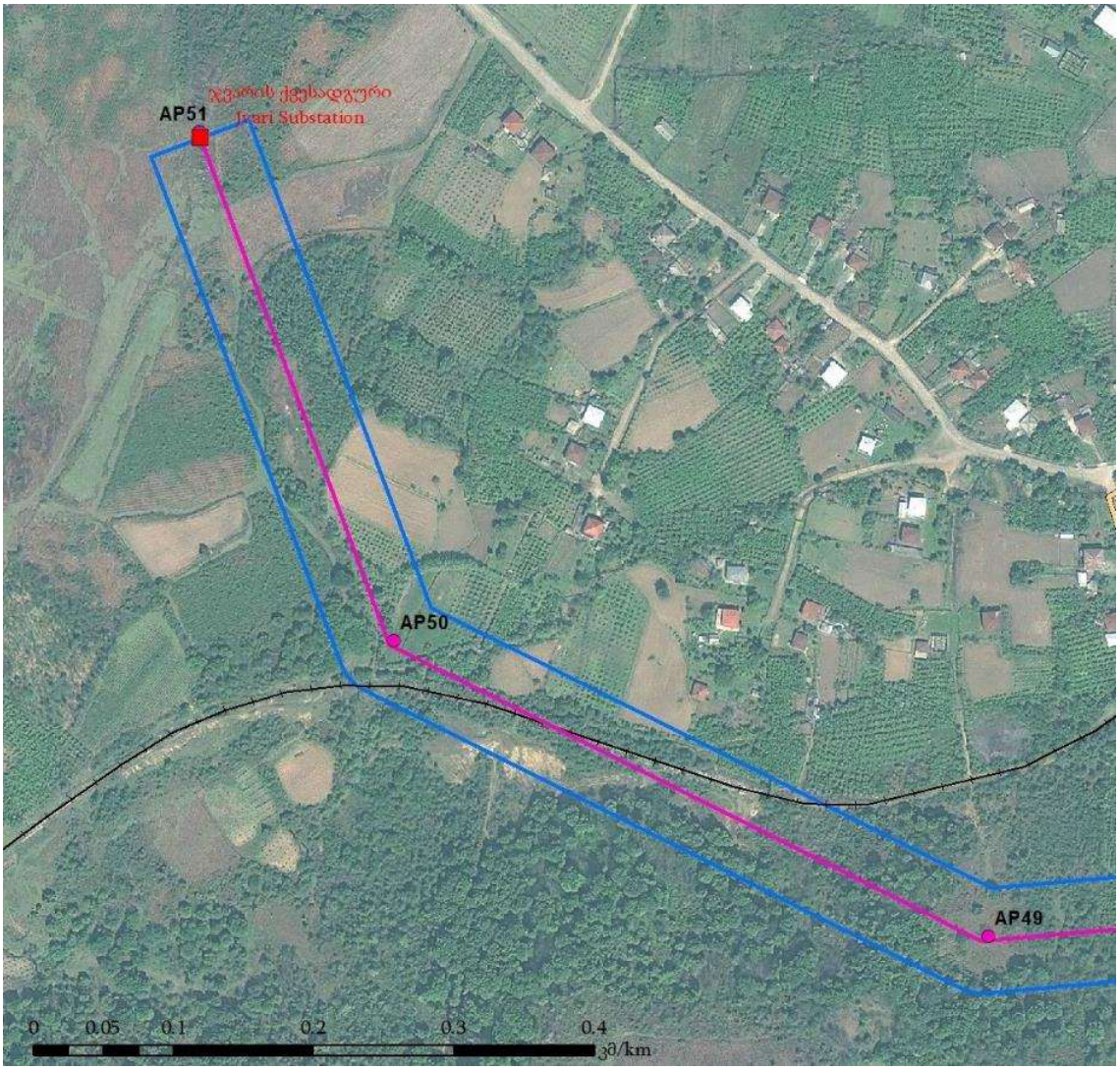


Figure 6.3.2 The View of Land Use and Jvari Substation

Figure 6.3.3 Typical Views of Shrubs in Hilly Areas and Mountain Slopes

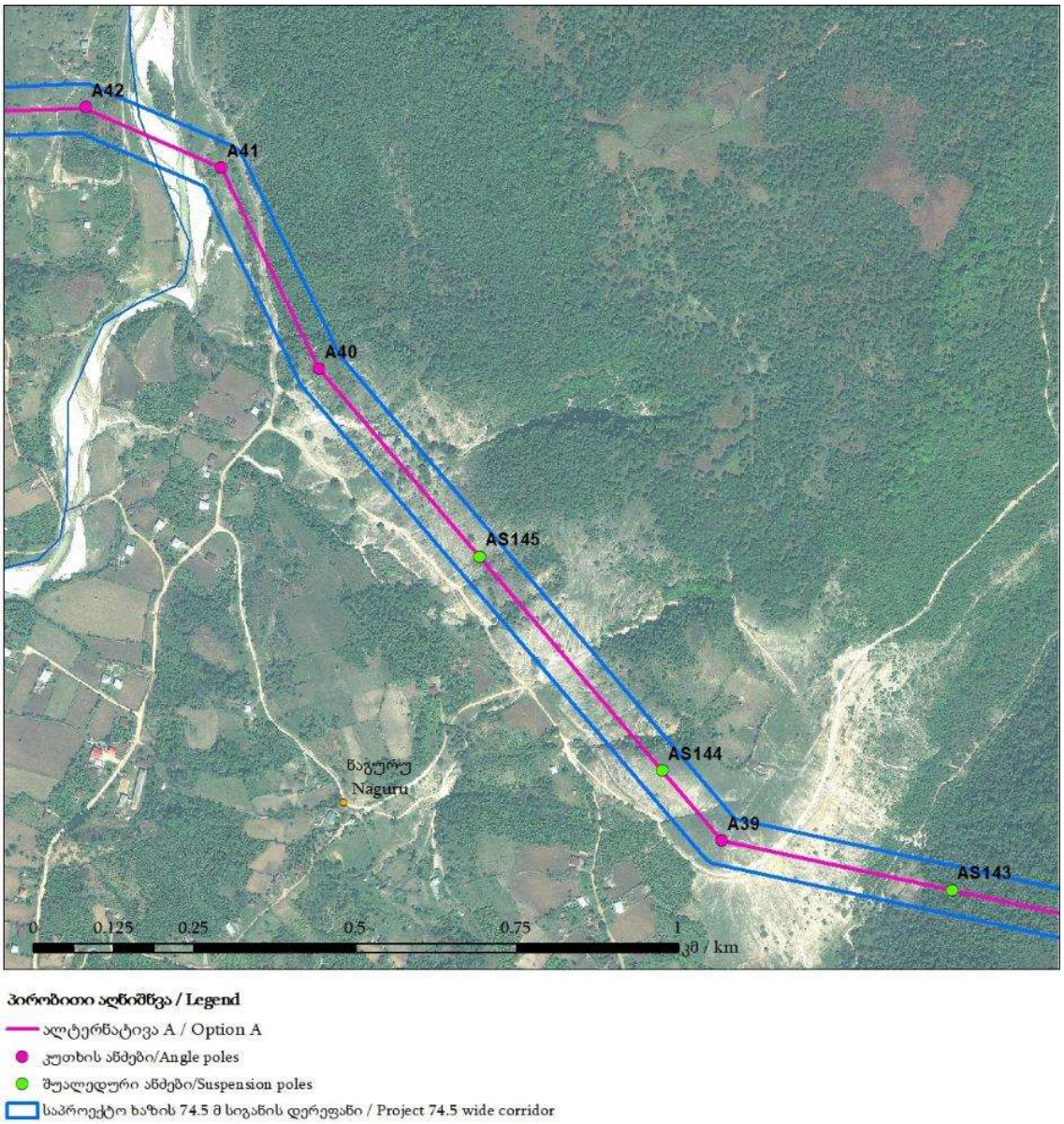


Figure 6.3.4 Typical Views of Mountain Slopes along the Corridor

In the mountainous part of the line corridor, the land use pattern changes from agricultural to more bushland and fragmented forest with small sections of grassland. This land is mostly used for open pasture for cattle grazing. Typical shrubs mixed with forest in hilly areas adjacent to mountain slopes is shown on Figure 6.3.4.

In highland areas, the land is fully covered with forests, so there is little human activity other than commercial logging and recreation. In general, such non-fragmented forests can be considered natural habitat, as described in later sections.

6.4. *Baseline Geological Conditions*

The baseline study of geological conditions within the corridor was carried out in several stages. The initial study was based on review of the available literature and geological and geotechnical maps. Later geological field studies (including drilling works) were conducted along the corridor during the Feasibility Study.

6.4.1. Geomorphology and tectonics

According to the geomorphological zoning of Georgia, several sections of corridor (A51-A38, A19-A01 excluding section between A14-A09) are located within the periphery zones of depression between the mountain ridges. This zone is represented with significantly eroded hilly mountain slopes. Terraces of post-Pliocene-age sea bottom and river bed sediments are underlain by tertiary age material (ref. – A. Javakhishvili).

The sections between A38 – A19 and A15-A6 crosses the southern slope of the Caucasus ridge, characterized by A. Javakhishvili as high mountains zone crossed with deep canyons developed in volcanogenic rocks. The Geomorphology Atlas of Georgia clearly defines the zone, which is called 'between the mountain ridge depression zone', which includes the subzone of the hilly periphery, slightly elevated towards the mountain ridge. This subzone is developed on the tertiary-age marine sediments and continental rocks.

The lowland sections at either end of the corridor, are located in the periphery of the subzone in an area called ravine subzone. The mountainous part of the corridor is located within the karst landscape zone that has developed on carbonate deposits.

The transmission line route crosses two tectonic zones defined by P. Gamkrelidze (1961): south slope of folded Caucasus ridge and plate of Georgia. The corridor crosses four subzones:

- The Odishi Subzone of the western part of Georgian Tectonic plate (Between Mountain Depression)
- The subzone of Amzar-Mukhuri located in the Gagra-Java area of folded southern slope zone of Caucasus ridge
- The Askhi subzone of the western part of Georgian Tectonic plate
- Kolkheti subzone of the western part of Georgian Tectonic plate.

The southern slope of the Caucasus ridge is one of the most complicated tectonic formations and is separated from the Caucasus main anticline by significant overthrust folding. The Georgian tectonic plate mainly includes the area between Bigger and lesser Caucasus mountains.

The western depression zone of the Georgian tectonic plate is generated by the Quaternary and

Neogene age formations under which the cretaceous layers are located. The border with Dzirula massif follows the meridian at Zestafoni city. The distribution of the geological formations is provided on Figure 6.4.1.

The corridor, in accordance with "Seismic resistant construction" PN 01.01-09, is located within the 8 and 9 ball seismic risk zone of Georgia. The 8-ball seismic rating is given to the western part of Georgian Tectonic plate (Between Mountain depression) and the 9-ball rating is given to the folded system of South Caucasus slope.

6.4.2. Karst formations

Karst formations are common for the south slopes of the Caucasus ridge, where Cretaceous strata are prevailing. The corridor passes through the zone, which is characterized by a number of large caves and other karst formations. They are important, since some installation of foundations and towers in karst areas requires special care to ensure they are stable, since such areas are characterized by underground voids.

The Geomorphology map of Georgia developed by Sh. Kipiani (1974) shows that some areas crossed by the corridor is in the karst zone of Humid Sub-tropical climate, specifically the section between A19 and A45. The actual locations fall into the subzone of medium and low mountains of South slope of the Caucasus ridge, within the Karst regions of Kviri, Gauchi, Mingaria, and Askhi.

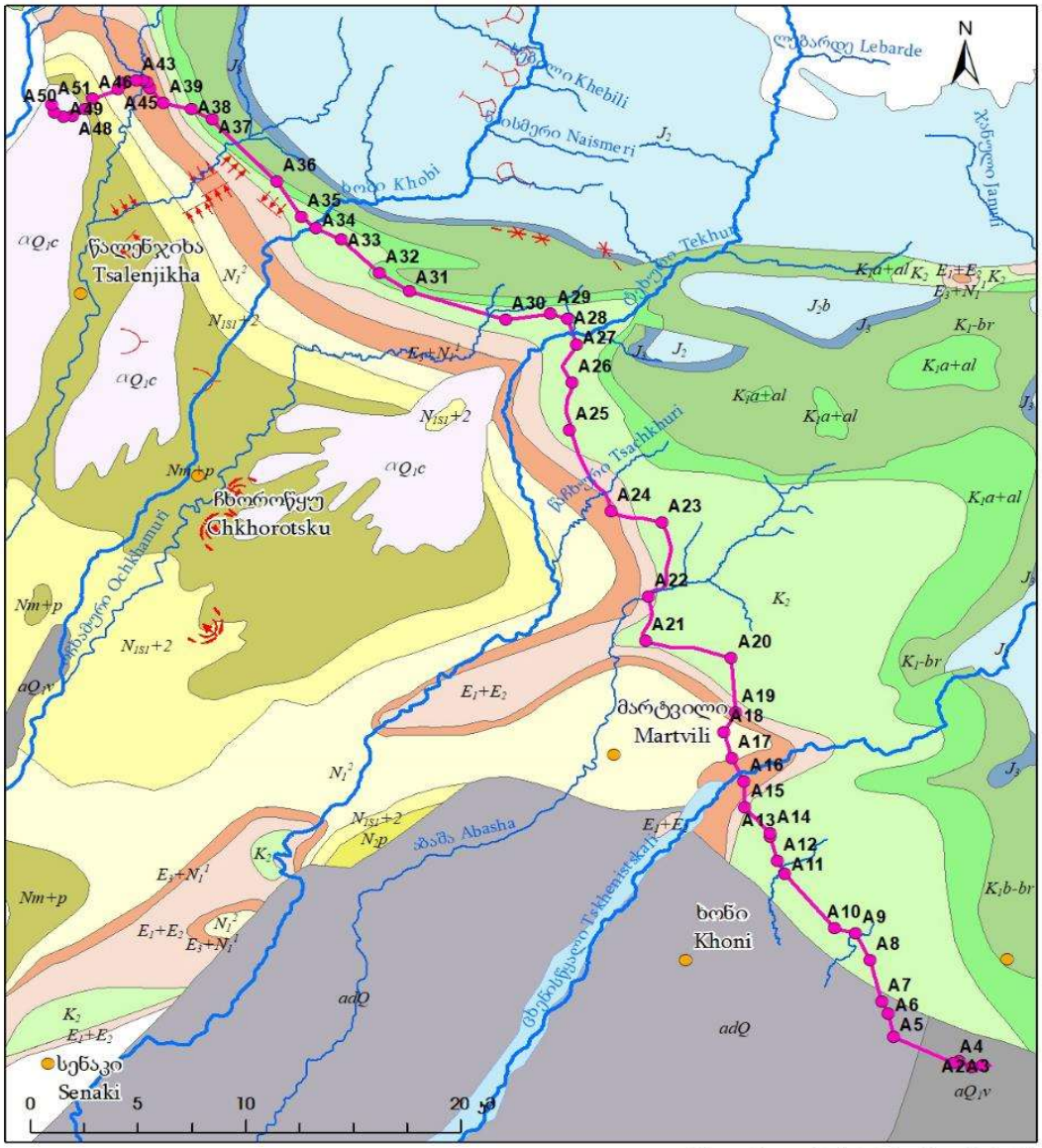
The Kviri subregion is located between the rivers Magana and Chanistskali and the Gauchi subregion lies between Chanistskali, Khobi and Tekhuri rivers. The geological strata are Barremian Limestones of Urgon facie. In the south-southwest part of the zone, Paleocene middle and higher Cretaceous age. In some cases, other limestones are also present.

6.4.3. Hydrogeology conditions

The main characteristics and zoning of hydrogeological conditions in Georgia were evaluated by I. Buachidze (1970). He concluded that the area that is crossed by most of the corridor, from Jvari to Tower A20, is located within the Samegrelo hydrogeology zone of the fracture (fault)–karst type underground waters. From Tower A20 to A1 at the Tskaltubo substation, the corridor is within Tskaltubo hydrogeological zone of the water of fracture–fracture karst circulation. Figures 6.2.3 and 6.2.4 show hydrogeology of the area and Figure 6.2.5 shows the legend for the previous two maps.

Geologic strata of the Samegrelo hydrogeology zone is represented by layers of high water permeability Cretaceous and low permeability (practically impermeable) Tertiary deposits. This interlayering of different permeability characteristics supports development of multiple water-containing horizons at different depth. Most water horizons are considered to be of closed – artesian (confined water table) character. The water content of the Cretaceous limestone layer is very high,

which is confirmed by the exploration boreholes, with especially high volumes of groundwater noticeable in the lower Cretaceous rocks. The groundwater is characterized by high temperatures (80-100 C) since the depth of this layer is significant (300-3500 meters), and thermal waters of the region are well-studied.



პირობითი აღნიშნვა

- საპროექტო ხაზი ალტერნატივა A / Project Line Option A
- ერთეული კარსტი / Single karst
- რთული მეწყერი / Complex landslide
- ძირითადი ქანების მეწყერი / Bedrock landslide
- გვერდითა ეროზია / Lateral erosion
- ღვარცოფი / Mudflow
- აქტიური გრავიტაციული დრიფტის მოწაკვეთები / Active gravitational drift segments

ე. წერეთლის, ა. ვოლსკის, მ. ქურდაძის და მ. კახაძის 1985 წ. საინჟინრო-გეოლოგიური რუკის მიხედვით.
According to the Engineering-Geology Map from 1985 by E. Tsereteli, A. Volski, M. Kakhadze.

Figure 6.4.1 Geological Map of Project Area

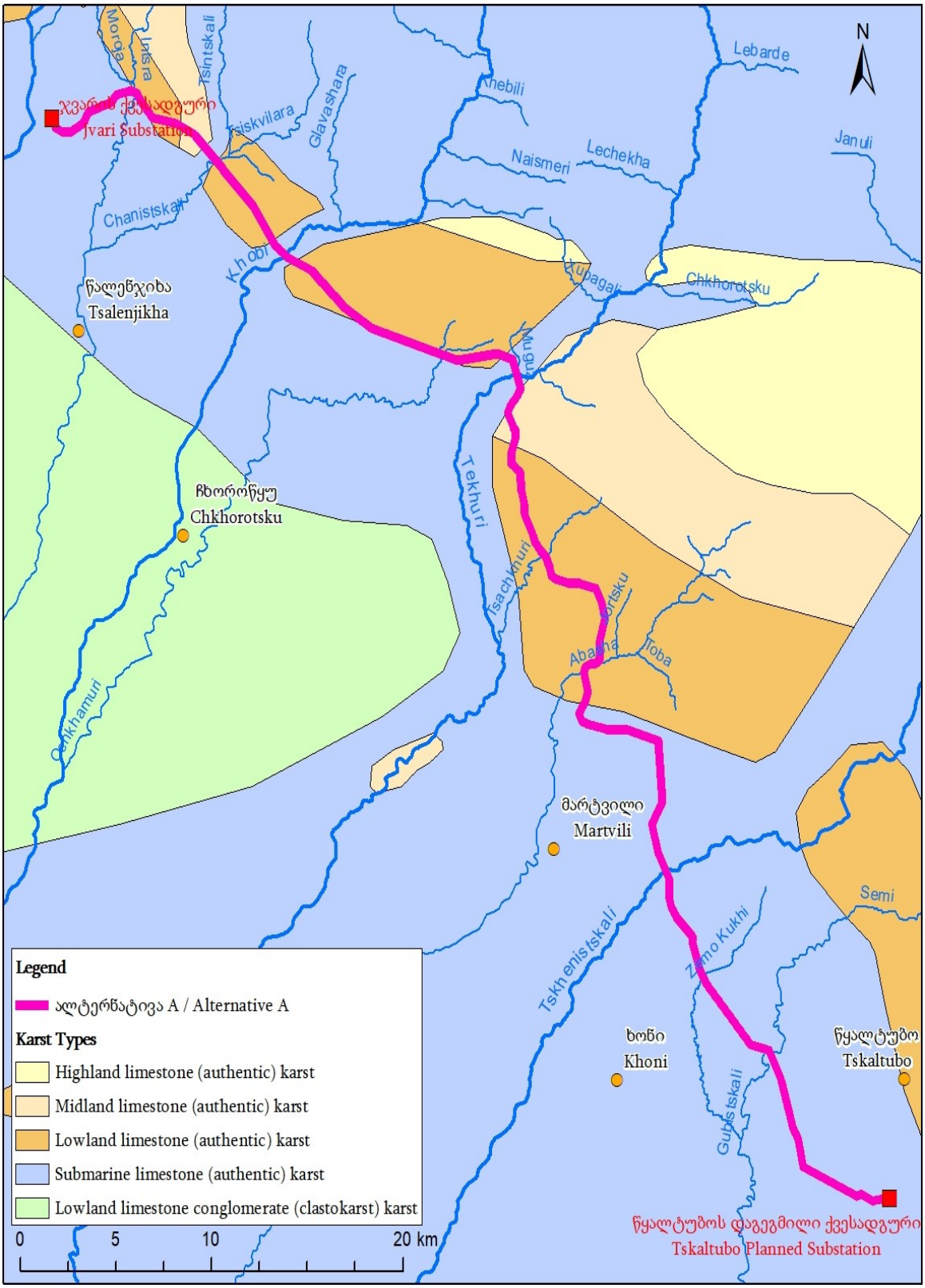


Figure 6.4.2 The Karst Map of West Georgia and Location of the Powerline Route

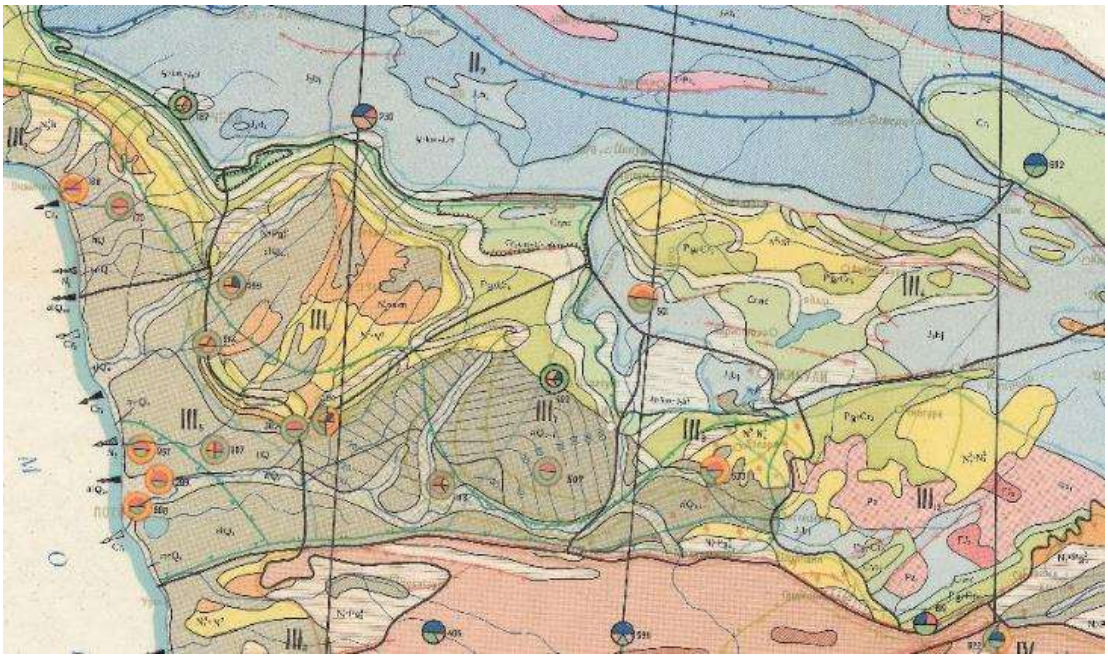


Figure 6.4.3 Excerpt from Hydrogeology Map of Georgia

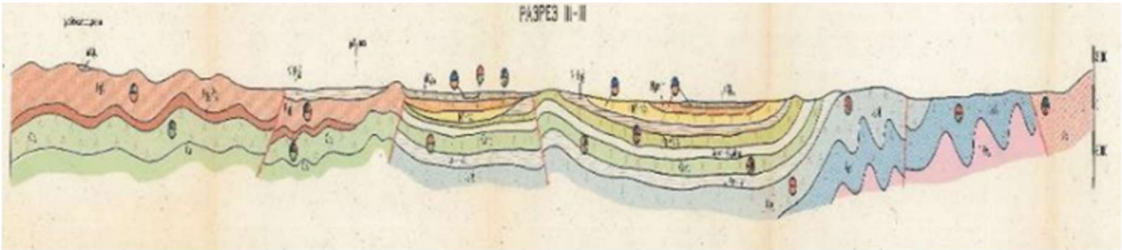


Figure 6.4.4 Cross-Section of Hydrogeology Map Crossed by the OHL Line

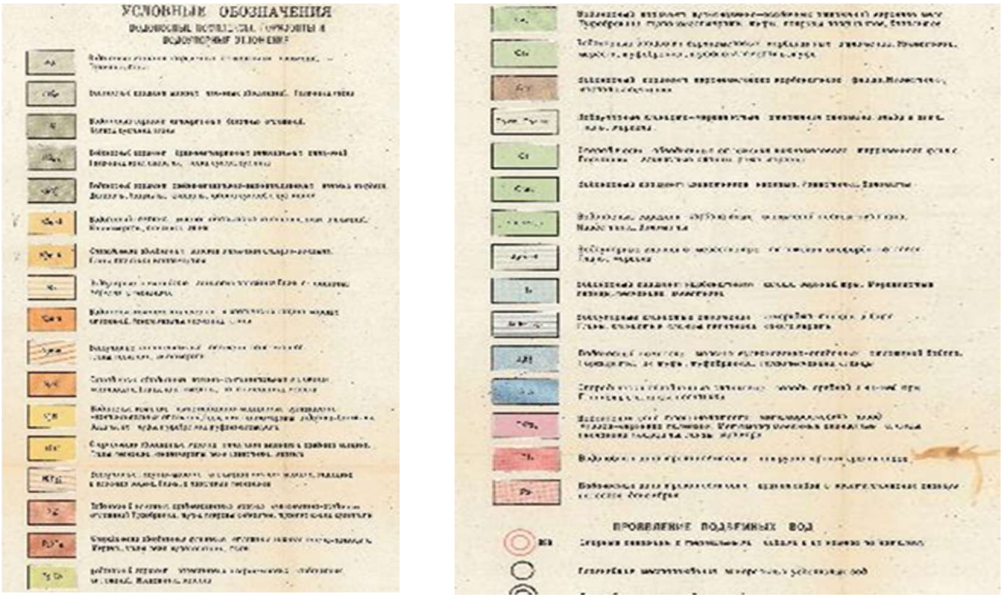


Figure 6.4.5 Formations Indicated on the Hydrogeology Map (Legend for Figures 6.4.3 and 6.4.4))

The Tskaltubo underground water basin of fractured layers mostly covers the Kolkheti lowland and adjacent Samguali mountain ridge. The well-known Tskaltubo thermal deposit is one of the examples

of artesian self-flowing springs related with lower cretaceous fractured and fractured-karst type layers, which indicates that significant resources are located in the water table, thus can produce high-flow natural springs.

The Paleocene and lower cretaceous water horizons have localized character; i.e. the horizon is not widely available, and the water quantity related with horizon is limited. The thickness of formation in the eastern part of the basin, i.e. in vicinity of Tskaltubo does not exceed 100 m. In the south south-west parts of the basin, the mentioned layer is covered with impermeable Maikop strata. The water availability in this layer is significantly less than in upper cretaceous layers, accordingly it is practically not used.

The thickness of quaternary layer in the eastern part of Kolkheti lowland is around 120 meters, which increases in the western part up to 400 meters. In this area, groundwater is available in nearly all places where this layer is present. The water quantity differs from insignificant for exploitation to large flows up to thousands of liters per second. The groundwater becomes artesian (self-flowing) in the western direction. Water quality is very high, with low mineralization and pleasant for drinking.

6.4.4. Geoengineering

The engineering geology company "Khuro" completed a detailed engineering geological survey along the corridor and at the Tskaltubo substation in February and March 2017. The purpose of the survey was to assess the general geotechnical conditions at representative points along the corridor. The survey included collecting geologic and groundwater samples from a number of boreholes and test pits (Figure 6.4.6 and Figure 6.4.7).

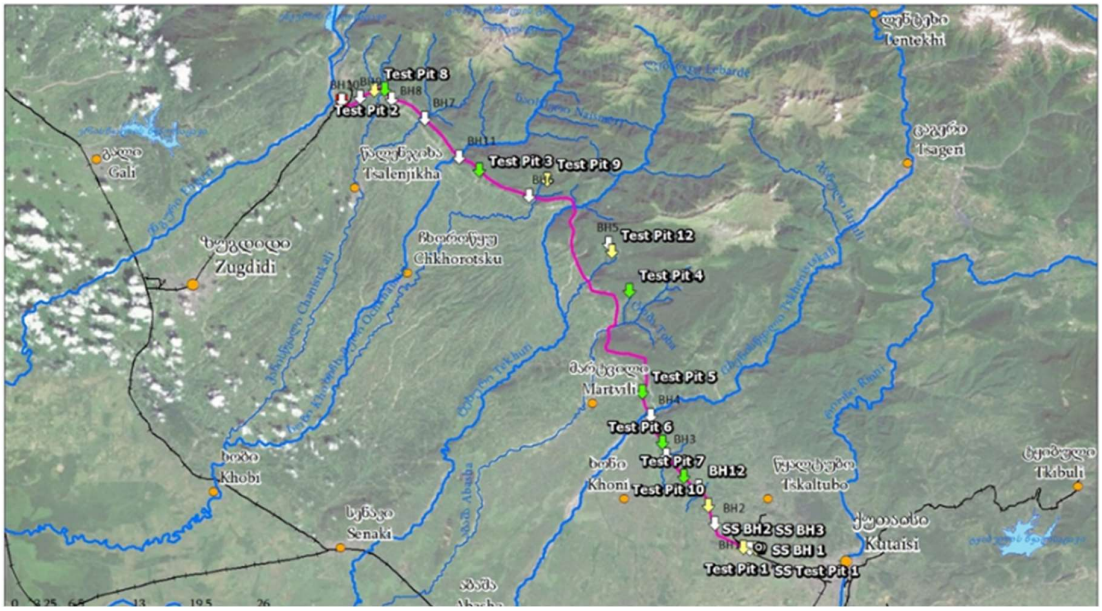


Figure 6.4.6 Location of Test Pits and Exploration Boreholes

Figure 6.4.7 Borehole Drilling

The full report is presented in Annex 3. In summary, the study concluded that:

- Engineering-geological conditions for construction of the Alternative A transmission line corridor and the Tskaltubo substation 500 s/s construction is favorable, and Alternative A has more favorable engineering geological characteristics than Alternative B.
- Construction of the transmission line will not have a negative impact on hydrogeological conditions (that is, will not affect artesian or other groundwater resources).

Soil engineering-geological characteristics will need to be specified through additional studies during the detailed design stage, with separate consideration for specific engineering-geological districts.

Special studies will need to be conducted on areas determined to be high-risk, including assessment of erosive potential.

6.4.5. Soils

The project corridor will pass through Imereti and Samegrelo regions. Soils were characterized based on examination of representative sections. The description of soils within each section of the corridor follows the international classification of soils.

Imereti is characterized by podzol type soils, with some intrusions of silts and clays that are presented by two large massifs. The following types of are encountered: alluvial, subtropical yellow podzols, red soils, humus and limestone containing soils, and brown soils (forest soils). In mountainous terrains at high altitudes, podzolized brown soils, yellow and thin red soils are encountered.

In Samegrelo region, there are also many soil types: humus and limestone containing soils, brown

forest and acidic brown forest soils at altitudes from 500-1000 meters above mean sea level (amsl). At higher altitudes, 1000-1500 meters amsl, mountain-meadow soils are present.

The transmission line corridor will pass mostly through subtropical podzols, alluvial carbonated soils, yellow and humus containing soils (Figure 6.4.8). These include:

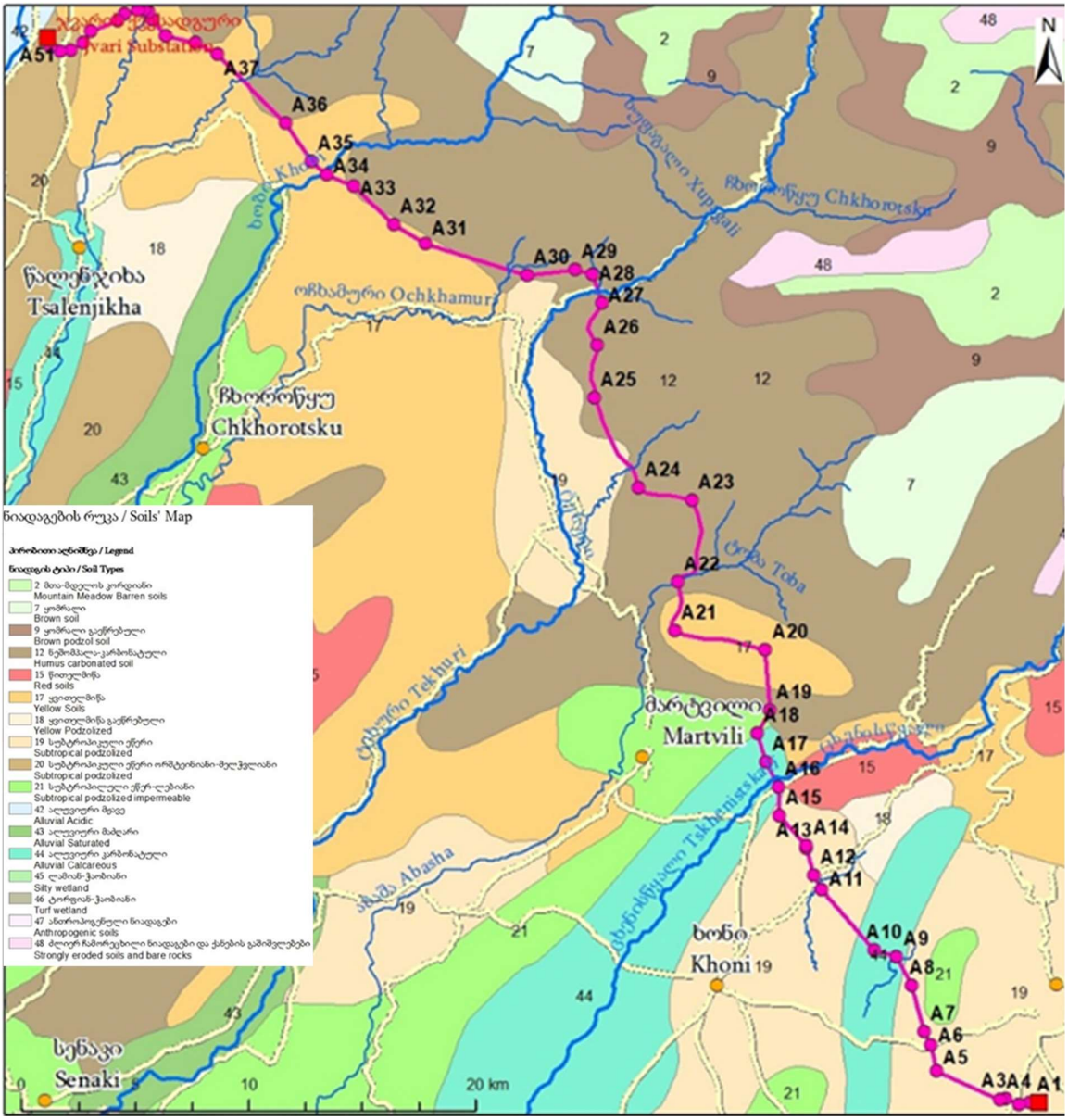


Figure 6.4.8 Soil Types Present within the Project Corridor

- **Podzol soils:** podzol and podzol barren soils are present on significant part of subtropical zones in Georgia. Such soils are formed on the bases of different rocks on plain terrain and in the forests. These soils form dsense alluvial layer with low water permeability and prone to formation of seasonal wetlands. Podzolized soils frequently contain large concentrations of iron and aluminum oxides throughout the layer thickness. In the top layer of soil, humus and

quartz sand are observed. These soils contain low concentrations of potassium, magnesium, and other substances important for vegetation growth. In western part of the country, podzol and wetland soils are widespread. They are frequently encountered in Martvili and Tsklatubo municipalities.

- **Yellow Soils** - Similar to red soils, yellow soils are formed in warm and humid subtropical climates on clay and silty shale rocks. The content of aluminum and iron oxides is significantly less in such soils. Therefore, they are less pigmented than red soils. Yellow soils contain clay and are characterized lower thickness of humus-containing layer than red ones.
- **Humus containing barren soils** are mostly widespread in forests of mountainous terrains. Such soils are found in both regions the transmission line crosses. Formation of such soils are associated with barrens, mergels, and other carbonate-containing (limestone) rocks. They are rich in humus – the concentration in some places reaches up to 8 percent. Despite their heavy composition, these soils have strongly established geo-structure which enables good physical and water permeability characteristics. Thee soils are also prone to erosion.

6.5. *Hydrology*

The Samegrelo Zemo Svaneti region is rich in water resources. There are 2,400 large and small rivers in the region, with the longest being the Enguri, Khobistskali, Tekhuri, and Abashistskali rivers. The region is also rich in lakes and mineral and thermal waters, with 13 lakes with a total area of 65 square kilometers. Groundwater volume constitutes 25 percent of the water resources of the region. There are plentiful reserves of both fresh groundwater and mineral waters in the region.

The corridor will cross several large and tens of small meadows and streams of Imereti and Samegrelo regions. The main ones include the rivers Tskaltubostskali, Gubistskali, Zemokukhi, Rikhini, Shuakukhi, Tskhenistskali, Abasha, Chachkhuri, Tekhuri, Ochkhamuri, Khobistskali, Chanistskali, Intsra, Lebakha. Table 6.5.1 lists the main rivers crossed by the corridor. The corridor does not cross any important natural or artificial reservoirs and lakes.

Table 6.5.1. Rivers Crossed by the Jvari-Tskaltubo Transmission Line Corridor

River	River Length, km	River Basin, sq. m
Tskaltubostskali	23	-
Gubistskali	36	442
Tskhenistskali	176	2120
Abasha	66	370
Tekhuri	108	1040
Ochkhamuri	21,4	65.2
Khobistskali	150	1340

Table 6.5.1. Rivers Crossed by the Jvari-Tskaltubo Transmission Line Corridor

River	River Length, km	River Basin, sq. m
Chanistskali	63	315

6.6. *Flora and Habitat*

This chapter describes the baseline conditions of flora and habitats along the transmission line corridor. It is based on a comprehensive review of the scientific literature and a botanical field survey of the general area conducted by expert botanists from the Georgian environmental consultancy Dzelkva Ltd in May-July 2017. The key objective of the survey was the identification and visual assessment of major habitats and vegetation units present along the route and confirmation of reports in the literature. A further field survey of the transmission line corridor was conducted during the summer of 2018. This survey was based on existing information from reference sources and data collected during 2017.

6.6.1. Brief physical-geographic description of survey area

Altitudes along the corridor range from 150 meters to 1,500 meters amsl. The area features plateau-like terrain dissected into parallel hills of similar height separated by shallow long gorges. The mean annual temperature is 13-14°C above zero and mean annual precipitation varies within 1,600-2,100 millimeters. Most precipitation occurs between late spring and fall. There is a well-developed hydrographic network in the survey area, which supports high plant and animal diversity. Soil cover is represented by red, brown, humus-carbonate, yellow and alluvial soils, as described in section 6.4 (Kordzakhia, 1961; Maruashvili, 1964; Sabashvili, 1965; Urushadze et al, 2000).

6.6.2. Literature data on flora and vegetation in the project area

The project corridor is located in Euxine province of Circumboreal Region of Boreal subkingdom of Holarctic kingdom according to the phytogeographic classification of the world (Takhtajan, 1986); it belongs to Colchis lowland and foothill area (okrug) of Colchis or East Euxine province of the ancient Mediterranean kingdom in terms of systematic structure of its flora (Kolakovski, 1961; Gagnidze, 2000).

Colchis was a refugium of relict species in the glaciation period, and this has shaped diversity and uniqueness of its flora and vegetation. The Tertiary relict species such as Strandzha oak (*Quercus hartwissiana*), Pontic rhododendron (*Rhododendron ponticum*), Colchic butcher's broom (*Ruscus cochicus*), etc., are still widely distributed here (Dolukhanov, 2010).

Studies of flora and vegetation have a long history in Samegrelo-Zemo Svaneti and Imereti regions. The first publications date from 1895-1896 and are associated with the first researcher of the Colchis,

N. Albov; his “Materials for Studies of Colchis Flora” was published in 1895 and “General Description of Colchis Vegetation” in 1896. Research and publications by such scientists as I. Voronov, V. Maleev, A. Grosheim, D. Sosnovski, S. Golitsin, P. Panyutin, S. Sokolov, M. Popov, A. Dolukhanov, M. Sakhokia, A. Kharadze, A. Dmitrieva, A. Kolakovski, etc have high significance in terms of studies and analysis of the flora and vegetation of Colchis including those of Samegrelo-Zemo Svaneti and Imereti regions.

The project area is characterized by lowland vegetation and vegetation of the lower and medium mountain belts. Relict mixed broadleaved woodlands with lianas and natural climbers represent one of the characteristic landscapes in Odishi lowland (Samegrelo). These woodlands have been modified substantially due to long-term anthropogenic pressure and survive only in fragments with difficult access where there is very low human-induced disturbance. AS noted elsewhere, the transmission line corridor roughly corresponds to the line where mountain foothills border the Kolkheti lowlands. Populated and cultivated areas are relatively close to the corridor, typically within 5-7 kilometres, so most of the forests have been disturbed to some degree by human activities.

Relict mixed broadleaved woodland patches are found in the lowland and foothills at the altitudes of 250-300 meters amsl, in particular in the river Enguri basin up to village Jvari. The woodland fragments are composed of Strandzha oak (*Quercus hartwissiana*) and Imeretian oak (*Quercus imeretina*). They also support Caucasian wingnut (*Pterocarya pterocarpa*), Common alder (*Alnus barbata*), Sweet chestnut (*Castanea sativa*), and Oriental beech (*Fagus orientalis*). Lianas are common such as Colchis ivy (*Hedera colchica*), Green brier (*Smilax excelsa*), Common hop (*Humulus lupulus*), Silkvine (*Periploca graeca*).

The understorey supports high diversity of evergreen and deciduous shrubs including species characteristic to Colchis phytogeographic unit such as Pontic rhododendron (*Rhododendron ponticum*), Colchic holly (*Ilex colchica*), Colchic butcher’s broom (*Ruscus colchicus*), Imeretian buckthorn (*Rhamnus imeretina*), etc.

Broadleaved woodlands are found from 350 to 1,000-1,500 meters amsl in the survey area. Broadleaved woodland is a vegetation unit of Colchis encompassing woodlands occurring in river gorges. Colchic broadleaved woodlands support almost all mesophilous woody plants found in this phytogeographic unit. In total, up to 50 species of trees and shrubs and 80 species of herbaceous plants, including numerous ferns, have been recorded in these woodlands. They are mostly spread within the Samgrelo, Svaneti and upper Imereti regions. The woodlands at lower altitudes are more impacted due to easier access compared with the territories located at higher altitudes. The woodlands in the river gorges and close to roads are also more disturbed compared with the upland areas of more difficult access.

Broadleaved woodlands are characterized by polidominance of canopy-forming species. However, woodland fragments dominated by Chestnut (soils without limestones), Ash, Beech and Oak are found occasionally in this ecosystem. The dominant species are associated with Caucasian lime (*Tilia caucasica*), Maples (*Acer platanoides, A. laetum, A. campestre*), Elms (*Ulmus glabra, U. minor*), etc.

Caucasian hornbeam (*Carpinus caucasica*), Oriental beech (*Fagus orientalis*), Sweet chestnut (*Castanea sativa*), Common alder (*Alnus barbata*) are the main canopy-forming species in polidominant Colchic woodlands; they are associated with Caucasian lime (*Tilia caucasica*), Maples (*Acer platanoides, A. laetum, A. campestre*), Caucasian persimmon (*Dyospirus lotus*), Wych elm (*Ulmus glabra*), Common fig (*Ficus carica*), Black mulberry (*Morus nigra*), Wild apple (*Malus orientalis*), Caucasian pear (*Pyrus cacasicua*).

The understorey is composed of diverse deciduous and evergreen shrubs such as Pontic rhododendron (*Rhododendron ponticum*), Cherry laurel (*Laurocerasus officinalis*), Yellow azalea (*Rhododendron luteum*), Colchic holly (*Ilex colchica*), European bladdernut (*Staphylea pinnata*), Caucasian mock-orange (*Philadelphus caucasica*), Caucasian whortleberry (*Vaccinium arctostaphylos*), Common elder (*Sambucus nigra*), Spindle (*Euonymus europaea*), Pomegranate (*Punica granatum*), Bay laurel (*Laurus nobilis*), etc.

Mixed broadleaved Colchic woodland is characterized by diversity of lianas and the following species are of wide occurrence: Colchis ivy (*Hedera colchica*), Silkvine (*Periploca graeca*), Old man's beard (*Clematis vitalba*), Common hop (*Humulus lupulus*), Green brier (*Smilax excelsa*). The following ferns are abundant: Shuttlecock fern (*Matteuchia strutiopteris*), Cretan brake (*Pteris cretica*), Lady fern (*Athyrium filix-femina*), Hart's tongue fern (*Phyllitis scolopendrium*), Black spleenwort (*Asplenium nigrum*), etc.

The floristic composition of Colchic woodland varies depending on the substrata, with Boxwood abundant in the understory of woodlands on limestone soils and Chestnut absent or very rare. Signs indicating xerophytization are evident in ecosystems developed on limestones and this results in the dominance of Hornbeam or, rarely, Oriental hornbeam, at low and moderate altitudes. Boxwood, which is of high ecological plasticity, is found both on rocky outcrops of slopes with abundant sunshine and very shaded river gorges. Altitudinal range of the Boxwood is relatively narrow, from 800-900 meters. It occurs frequently in the understory of Hornbeam, Oriental Hornbeam, Beech - Hornbeam dominated woodlands and other mixed deciduous forests.

Besides the forested woodlands, part of the project area located in Imereti region supports lowland vegetation, which is largely represented by segetal plant groupings associated with arable land and riparian woodland patches (Maleev, 1941; Grosheim, 1948; Kolakovski, 1961).

6.6.3. Field survey findings

Major Habitats

The following major habitats were recorded along the proposed Jvari-Tskaltubo 500 kV power transmission line route during the field surveys:

- Colchic broadleaved mixed woodland;
- Riparian woodland;

- Secondary vegetation.

Colchic broadleaved mixed woodland occupies practically all of the territory of Samegrelo and Imereti regions between altitudes of 200 and 800 meters amsl, above which is the coniferous forest belt. This covers practically all foothills of the Greater Caucasus Mountains. The total area of Georgia covered with such forests equals about 2.8 million hectares. Both Samegrelo and Imereti regions are among the top three regions in forest cover: 354,000 hectares in Imereti and 306,000 hectares in Samegrelo region. Most of the forest within the project area is significantly modified due to the high anthropogenic impact and significant use of resources as building material and firewood. Also, woodlands closer to the settlements (along the Alternative B corridor, especially) are highly fragmented and significantly modified.

The field surveys found that relatively better-preserved large fragments are in the western part of the survey corridor, in Tsalenjikha municipality, close to Lebarde Resort. According to the data collected at separate sampling plots, canopy density of the Colchic mixed woodland is 80 to 90 percent, with the average canopy height about 15-18 meters.

Deciduous species such as Common hazel (*Corylus avellana*), Black elder (*Sambucus nigra*), European bladdernut (*Staphylea pinnata*), Colchic bladdernut (*Staphylea colchica*), Small-flowered black hawthorn (*Crataegus pentagyna*), Common medlar (*Mespilus germanica*), Pomegranate (*Punica granatum*), Yellow azalea (*Rhododendron luteum*) prevail in the understorey.

An evergreen shrub layer formed by Pontic rhododendron (*Rhododendron ponticum*), Colchic boxwood (*Buxus colchica*), Cherry laurel (*Laurocerasus officinalis*), and Colchic butcher's broom (*Ruscus colchicus*) was recorded in some areas. The ground vegetation is composed of Bigleaf periwinkle (*Vinca major*), Stiff hedgenettle (*Stachys sylvestris*), Siberian bugloss (*Brunerra macrophylla*), Vetch (*Vicia angustifolia*), Jupiter's sage (*Salvia glutinosa*), etc.

Colchic broadleaved mixed woodlands are represented by severely modified patches in the project corridors. There are small sections in the middle part of the corridor where anthropogenic impact is less compared to other more severely modified sections (the detailed information is provided below). The less modified sections are considered as the more sensitive zones within the study area. North and northwest of the transmission line corridors, there are less impacted similar woodlands that are protected under the Emerald Network. In general, this habitat is characterized by mosaic woodland types and high number of associated species, which may include endemic and rare taxa of Georgia and the Caucasus.

As already noted, the project area crosses difficult, rough terrain, which includes deep river gorges and steep slopes. Steep slopes are largely occupied by woodland vegetation with less evidence of human activities. It was not possible to survey some steep slopes due to very difficult access; in such cases, the predominant vegetation cover was described, and other similar representative areas were surveyed. Vegetation cover on these slopes was classified as deciduous woodland habitat. The tree layer is composed of Caucasian hornbeam (*Carpinus caucasica*), Oriental beech (*Fagus orientalis*),

Sweet chestnut (*Castanea sativa*), Common walnut (*Juglans regia*), European ash (*Fraxinus excelsior*); the understorey is formed by Common fig (*Ficus carica*), Colchic boxwood (*Buxus colchica*) (dead), Common hazel (*Corylus avellana*), Small-flowered black hawthorn (*Crataegus pentagyna*). The floristic composition of the deciduous woodland is diverse. The list of dominant species in Colchic woodlands is presented in Table 6.6.1.

Table 6.6.1. Dominant Species in Colchic Woodlands

English Name	Scientific Name	Protection Status
Oriental hornbeam	*Carpinus caucasica*	Not Protected
Oriental beech	*Fagus orientalis*	Not Protected
Sweet chestnut	*Castanea sativa*	Georgia Red List, IUCN LC
Cappadocian maple	*Acer laetum*	Not Protected
Field maple	*Acer campestre*	Not Protected
European hop-hornbeam	*Ostrya carpinifolia*	Georgia Red List, IUCN LC

Figure 6.6.1 Colchic Broadleaved Mixed Woodland

As noted, significant parts of the Colchic broadleaved mixed woodlands are affected by human activity. Some parts are severely degraded and thinned due to logging, and some parts of the Chestnut-dominated fragments are impacted by the pathogenic fungal disease, bark cancer (virulent necrosis). The fungal disease-impacted sections (see Figure 6.6.6) are considered as of low sensitivity, because the natural woodlands are already degraded. During the field surveys, the impacted zones were not described in great detail, due to the low sensitivity status. The typical view of the Colchic

broadleaved mixed woodlands is presented on Figure 6.6.1.

There are also belts of riparian woodlands along rivers and streams. In these woodlands (Figure 6.6.2) the tree layer is almost completely dominated by Common alder; in some areas Common walnut trees have been planted in the Alder woodlands; all walnut trees are planted, with none naturally occurring.

Figure 6.6.2 Riparian Alder Woodland

The list of dominant species in riparian woodlands is presented in Table 6.6.2. The understory is either absent or poorly developed, dominated by the species in Table 6.6.3. Most of the Alder woodlands (that is, the riparian woodlands) are severely or moderately disturbed.

Table 6.6.2. Dominant Species in Riparian Woodlands

English Name	Scientific Name	Protection Status
Common alder	*Alnus barbata*	Not Protected
Field maple	*Acer campestre*	Not Protected
Caucasian wingnut associated with Field maple	*Pterocarya pterocarpa*	Georgia Red List, IUCN LC

Table 6.6.3. Dominant Understory Species in Riparian Woodlands

English Name	Scientific Name	Protection Status
Yellow azalea	*Rhododendron luteum*	Not Protected
Blackberry	*Rubus* sp.	Not Protected
Scarlet firethorn	*Pyracantha coccinea*	Not Protected
Green brier	*Smilax excels*	Not Protected
Common hazel	*Corylus avellana*	Not Protected

Where forests no longer occur along large areas on either end of the corridor, secondary vegetation covers nonagricultural land. This includes secondary grassland and shrubbery, pastures and segetal plant communities, such as shown in Figure 6.6.3. This mosaic habitat is largely composed of widespread common species that are characterized by effective dispersal mechanisms, notably weeds and non-native plants. There are also invasive species that thrive in disturbed and anthropogenic landscapes. The common species present in this type of habitat are listed in Table 6.6.4.

Shrubs are present in most secondary grasslands, including Blackberry and Yellow azalea. There are also solitary trees, such as Common alder and Black locust (*Robinia pseudoacacia*).

Table 6.6.4. Dominant Species on Secondary Grasslands

English Name	Scientific Name	Protection Status
Annual meadow grass *Poa annua*	*Poa annua*	Not Protected
Spanish stonecrop	*Sedum hispanicum*	Not Protected
Common daisy	*Bellis perennis*	Not Protected
Common wormwood	*Artemisia vulgaris*	Not Protected
Common ragweed	*Ambrosia artemisifolia*	Not Protected, invasive
Buttercup	*Ranunculus* sp	Not Protected
Bracken	*Pteridium tauricum*	Not Protected

Figure 6.6.3 Typical View of Secondary Grassland

Abandoned tea plantations are found in some places in the survey area (see detailed maps in annex). Yellow azalea (*Rhododendron luteum*), Green brier (*Smilax excelsa*), Blackberry (*Rubus* sp.), Bracken (*Pteridium tauricum*) is present in these abandoned plantations. It should be noted that plantations of exotic woody species such as Eucalyptus, Japanese red cedar and Black locust were recorded adjacent to the former tea plantations; they were artificially planted as wind protection belts.

Segetal species such as Golden foxtail (*Setaria glauca*), Redroot amaranth (*Amaranthus retroflexus*), Eyebane (*Euphorbia nutans*), Bermuda grass (*Cynodon dactylon*), etc., are associated with the arable land parcels. Johnson grass (*Sorghum halepense*) is also frequent.

Secondary riparian shrubbery (Figure 6.6.4) has developed in some places where tree logging was active in riparian woodlands. The shrubbery is composed of Blackberry (*Rubus sp.),* Scarlet firethorn (*Pyracantha coccinea*), and Green brier (*Smilax excelsa*). Solitary trees, mostly specimens of Common alder (*Alnus barbata*) and Caucasian wingnut (*Pterocarya pterocarpa*) still survive in some areas of secondary habitat. Common walnut plantations are in some sites, which are fully artificially planted.

One important goal of the field surveys was to identify specific types of habitats along the transmission line route, and then to select representative plots for more detailed surveys. Each plot was classified according to the internationally adopted EUNIS scale (Table 6.6.5).

Figure 6.6.4 Secondary Riparian Shrubbery

Table 6.6.5. Habitats according to EUNIS Classification

Plot №	Habitat types identified during the field work	EUNIS ref No	Habitat description in accordance to EUNIS habitat classification system
№ 1	Secondary vegetation	I+F3	Regularly or recently cultivated agricultural, horticultural and domestic habitats, temperate and Mediterranean-montane scrub.
№ 2	Secondary vegetation	I+F3	Regularly or recently cultivated agricultural, horticultural and domestic habitats, temperate and Mediterranean-montane scrub.
№ 3	Riparian woodland	G 1. 1.	Riparian and gallery woodland, with dominant alder, birch, poplar or willow.
№ 4a	Secondary vegetation	I+F3	Regularly or recently cultivated agricultural, horticultural and domestic habitats, temperate and Mediterranean-montane scrub.
№ 4	Secondary vegetation	I	Regularly or recently cultivated agricultural, horticultural and domestic habitats.
№ 5	Secondary vegetation	F3.	Temperate and Mediterranean-montane scrub.

Table 6.6.5. Habitats according to EUNIS Classification

Plot №	Habitat types identified during the field work	EUNIS ref No	Habitat description in accordance to EUNIS habitat classification system
№ 6	Secondary vegetation	I+F3	Regularly or recently cultivated agricultural, horticultural and domestic habitats, temperate and Mediterranean-montane scrub.
№ 7	Secondary vegetation	I.	Regularly or recently cultivated agricultural, horticultural and domestic habitats.
№ 8	Secondary vegetation	I.	Regularly or recently cultivated agricultural, horticultural and domestic habitats.
№ 9	Secondary vegetation	I+F3	Regularly or recently cultivated agricultural, horticultural and domestic habitats, temperate and Mediterranean-montane scrub.
№ 10	Colchic broadleaved mixed woodland	G 1. 7D	Chestnut forests.
№ 11	Secondary vegetation	F3	Temperate and Mediterranean-montane scrub.
№ 12	Colchic broadleaved mixed woodland	G1.7C	Mixed thermophylous forests.
№ 13	Deciduous woodland established on slopes	G 1.A	Meso- and eutrophic oak, hornbeam, ash, sycamore, lime, elm and related woodland.
№ 14	Colchic broadleaved mixed woodland	G 1.7D	Chestnut forests
№ 15	Colchic broadleaved mixed woodland	G 1.7D	Chestnut forests
№ 16	Deciduous woodland established on slopes	G 1.A1	Oak - ash - hornbeam woodland on eutrophic and mesotrophic soils.
№ 17	Secondary vegetation	I+F3	Regularly or recently cultivated agricultural, horticultural and domestic habitats, temperate and Mediterranean-montane scrub.
№ 18	Colchic broadleaved mixed woodland	G1.A3	Hornbeam forests.
№ 19	Colchic broadleaved mixed woodland	G1.A3	Hornbeam forests.
№ 20	Secondary vegetation	I+F3	Regularly or recently cultivated agricultural, horticultural and domestic habitats, temperate and Mediterranean-montane scrub.
№ 21	Colchic broadleaved mixed woodland	G1.A3	Hornbeam forests.

Table 6.6.5. Habitats according to EUNIS Classification

Plot №	Habitat types identified during the field work	EUNIS ref No	Habitat description in accordance to EUNIS habitat classification system
№ 22	Secondary vegetation	I+F3	Regularly or recently cultivated agricultural, horticultural and domestic habitats, temperate and Mediterranean-montane scrub.
№ 23	Secondary vegetation	I+F3	Regularly or recently cultivated agricultural, horticultural and domestic habitats, temperate and Mediterranean-montane scrub.
№ 24	Colchic broadleaved mixed woodland	G 1.A3	Hornbeam forests+castanea.
№ 25	Colchic broadleaved mixed woodland	G 1.7D	Chestnut forests.
№ 26	Colchic broadleaved mixed woodland	G1.A3	Hornbeam forests.
№ 27	Colchic broadleaved mixed woodland	G1.7C	Mixed thermophyllous forests.
№ 28	Secondary vegetation	F3	Temperate and Mediterranean-montane scrub.
№ 29	Riparian woodland	G 1.1	Riparian and gallery woodland, with dominant alder, birch, poplar or willow.
№ 30	Riparian woodland	G 1.1	Riparian and gallery woodland, with dominant alder, birch, poplar or willow.
№ 31	Deciduous woodland established on slopes	G 1.A	Meso- and eutrophic oak, hornbeam, ash, sycamore, lime, elm and related woodland.
№ 32	Colchic broadleaved mixed woodland	G 1.A3	Hornbeam forests + Chestnut.
№ 33	Secondary vegetation	F3	Temperate and Mediterranean-montane scrub.
№ 34	Secondary vegetation	I. I+F3	Regularly or recently cultivated agricultural, horticultural and domestic habitats, temperate and Mediterranean-montane scrub and G1.A. Meso- and eutrophic oak, hornbeam, ash, sycamore, lime, elm and related woodland.
№ 35	Deciduous woodland established on slopes	G 1.A	Meso- and eutrophic oak, hornbeam, ash, sycamore, lime, elm and related woodland.
№ 36	Deciduous woodland established on slopes	G 1.A	Meso- and eutrophic oak, hornbeam, ash, sycamore, lime, elm and related woodland+chestnut.
№ 37	Secondary vegetation	I.	Regularly or recently cultivated agricultural, horticultural and domestic habitats.

Table 6.6.5. Habitats according to EUNIS Classification

Plot №	Habitat types identified during the field work	EUNIS ref No	Habitat description in accordance to EUNIS habitat classification system
№ 38	Secondary vegetation	I.	Regularly or recently cultivated agricultural, horticultural and domestic habitats, temperate and Mediterranean-montane scrub.
№ 39	Secondary vegetation	I.	Regularly or recently cultivated agricultural, horticultural and domestic habitats.
№ 40a	Secondary vegetation	I	Regularly or recently cultivated agricultural, horticultural and domestic habitats.
№ 40	Secondary vegetation	I.	Regularly or recently cultivated agricultural, horticultural and domestic habitats.
№ 41	Secondary vegetation	I.	Regularly or recently cultivated agricultural, horticultural and domestic habitats.
№ 42	Deciduous woodland established on slopes	G 1.A	Meso- and eutrophic oak, hornbeam, ash, sycamore, lime, elm and related woodland+chestnut.
№ 43	Secondary vegetation	I.	Regularly or recently cultivated agricultural, horticultural and domestic habitats.
№ 44	Deciduous woodland established on slopes	G 1.A	Meso- and eutrophic oak, hornbeam, ash, sycamore, lime, elm and related woodland+chestnut.
№ 45	Deciduous woodland established on slopes	G 1.A	Meso- and eutrophic oak, hornbeam, ash, sycamore, lime, elm and related woodland.
№ 46	Secondary vegetation	I	Regularly or recently cultivated agricultural, horticultural and domestic habitats and G1.A. Meso- and eutrophic oak, hornbeam, ash, sycamore, lime, elm and related woodland.
№ 47	Secondary vegetation	I	Regularly or recently cultivated agricultural, horticultural and domestic habitats.
№ 48	Secondary vegetation	I	Regularly or recently cultivated agricultural, horticultural and domestic habitats.
Upward-slanted shading denotes high-sensitivity, horizontal shading denotes medium-sensitivity. Others are considered low-sensitivity. See section 6.5.			

6.6.4. Species of conservation concern

The surveys made special efforts to identify species that protected by virtue of being included in the Georgia Red List, either because they could be or were found in the corridor and thus could be affected by construction of the line. (It is noted this is the 300-meter study corridor, in which the 54.5-meter vegetation control zone will be located.) Ten Red List species were identified, as listed in the Table

6.6.6, of which nine are trees.

Table 6.6.6. Red List Species in the Project Corridor (300 m wide)

№	English name	Scientific Name	Conservation status
1	Imeretian oak	*Quercus imeretina*	VU
2	Colchic oak	*Quercus hartwissiana*	VU
3	Chestnut	*Castanea sativa*	VU
4	Colchic box tree	*Buxus colchica*	VU
5	Caucasian wingnut	*Pterocarya pterocarpa*	VU
6	European yew	*Taxus baccata*	VU
7	Walnut	*Juglans regia*	VU
8	Field elm	*Ulmus foliacea (=Ulmus minor)*	VU
9	Colchis bladdernut	*Staphyllea colchica*	VU
10	True laurel (shrub)	*Laurus nobilis*	VU

Beyond the formally protected species listed above. Table 6.6.7 lists a number of other endemic, relict, otherwise rare and valuable species that are or could be found in the corridor. These species are also of conservation concern.

Table 6.6.7. Endemic (Rare and Vulnerable) Species in the Project Corridor

English name	Scientific Name	*Description*
Colchis ivy	*Hedera colchica*	Subendemic species of the Caucasus
Voronov primerose	*Primula woronowii*	Subendemic species of the Caucasus
Shovits lily	*Lilium schovitzianum*	Subendemic species of the Caucasus
Cherry laurel	*Laurocerasus officinalis*	Relict species
Sweet-amber	*Hypericum androsaemum*	Relict species
Oriental beech	*Fagus orientalis*	Relict species
Pontic rhododendron	*Rhododendron ponticum*	Relict species
N/A	*Trachystemon orientalis*	Monotypic Caucasian species
N/A	*Pachyphragma macrophyllum*	Monotypic Caucasian species
Caucasian hellebores	*Helleborus caucasica*	Endemic species of the Caucasus
Caucasian lime tree	*Tilia begoniifolia*	Endemic species of the Caucasus
large-flowered comfrey	*Symphytum grandiflorum-*	Endemic species of Georgia
Imeretian pink	*Dianthus imereticus*	Endemic species of Georgia
N/A	*Paracynoglossum imeretinum*	Endemic species of Georgia
Common fig	*Ficus carica*	Rare species
Caucasian persimmon	*Diospyros lotus*	Rare species
Iberian oak	*Quercus iberica*	Rare species

English name	Scientific Name	*Description*
pomegranate	*Punica granatum*	Rare species
Caucasian whortleberry	*Vaccinium arctostaphylos*	Listed in Bern Convention

Figure 6.6.5 European Hop-Hornbeam (*Ostrya carpinifolia*)

Figure 6.6.6 Mass Mortality in Sweet Chestnut Dominated Stand

Specimens of all the species of concern, except Common walnut, are associated with the Colchic woodland ecosystem. All individuals of Common walnut have been planted artificially, as this species does not occur naturally in the survey area. Field surveys found that sweet chestnut and Boxwood populations were heavily damaged and stands of these species have signs of mass mortality due to pathogenic fungal diseases.

6.6.5. Habitats of Concern

As noted in section 5.4.1, one of the key factors in the assessment of the significance of potential impacts is the sensitivity of the receptor. The sensitivity of the various types of receptors is provided in Chapter 7. In the case of habitats, the most sensitive habitats are critical habitats, which are those that are protected for reasons of biodiversity, and natural habitats, which are those with largely intact ecosystems and species assemblages. In addition, smaller areas of modified habitat that support plant species of conservation concern are considered to be highly sensitive to disturbance. Various habitats that were identified during the field surveys, as listed in Table 6.6.5, were classified using these criteria. Classification was based on the assessment of representative plots within relatively uniform sections of the corridor. In summary, there are no critical habitats, but there are substantial areas of natural and modified habitats that could be adversely affected by the project (that is, of high and medium sensitivity to disturbance). Detailed descriptions of vegetation cover in selected representative sections are provided in the Annex 4 and short descriptions of the high- and medium-sensitivity plots are provided below--EUNIS classification codes were shown in Table 6.6.5.

Natural habitats (high sensitivity)

Plot 4. Altitude 120 meters amsl. Although this is a highly disturbed area, a single specimen of Imeretian oak (*Quercus imeretina*) 12 meters high was found. This tree is endemic in west Georgia Colchis and is included in the Georgia Red Book.

Plot 10. Chestnut-hornbeam forest. Right bank of river tskhenistkali, village Matkhogi. Altitude above 197 meters amsl. Aspect north-western, slope is 40-45 degrees. Tree species include *Carpinus caucasica, Castanea sativa* – red data book species, *Tilia begoniifolia* – endemic species of the Caucasus, Ficus carica – rare species. From shrubbery important taxa are *Corylus avellana, Smilax excelsa, Swida australis, Hedera colchica* – subendemic species of the Caucasus with irradiation in Turkey, *Laurocerasus officinalis* – relict species, *Ruscus ponticus, Staphyllea colchica* – Georgian red data list species. From herbaceous plants important taxa are *Hypericum androsaemum* – relict species, *Pachyphragma macrophyllum* – monotypic Colchic Caucasian species with irradiation in Turkey, *Primula woronowii* – subendemic species of the Caucasus, *Lilium schovitsianum* – subendemic species of the Caucasus with irradiation in Turkey. Moss cover is well developed

Plot 16. Hornbeam forest. Oak - ash - hornbeam woodland on eutrophic and mesotrophic soils). Village Pirveli balda surroundings of cave Motena. Altitude 502 meters amsl. Aspect northern-west, slope is 40-45 degrees. Tree species include *Carpinus caucasica, Quercus hartwissiana* – subendemic plant of the Caucasus with irradiation in Turkey, *Ulmus minor* – species of Gerogian red data book, oriental beech *Fagus orientalis* – relict species. From shrubbery following taxa are important *Smilax excelsa,*

Rhododendron luteum, Clematis vitalba – rare plant*, Hedera colchica* – subendemic plant of the Caucasus with irradiation in Turkey, *Diospyros lotus* - rare species. From herbaceous plants followin taxa are important: T*rachystemon orientalis* - monotypic colchic species with irradiation in Turkey.

Plot 21. Hornbeam forests were observed to be present here.

Plot 25. Chestnut-hornbeam forests with box tree understory. Valley of river Tekhura, village Doberazeni.

Plot 32. Church of village Taia. Hornbeam-Alder forest is developed with some Beech. Conservation value is medium to high.

Plot 36. Visual observation showed alder-hornbeam forest is dominating with understory of *Laurocerasus officinalis* – relict species, *Rhododendron ponticum* and *Hedera colchica* – subendemic species of the Caucasus.

Plot 40a. Relict species *Pterocarya fraxonifolia* is growing here, 14 meters high at altitude of 337 meters. Herbaceous plants *Polypodium vulgare* and relict species *Pterocarya fraxonifolia*.

Modified habitats of concern (medium sensitivity)

Plot 31. Hornbeam-alder forest.

Plot 35. Village Medani, valley of river Chanistskali. Alder-hornbeam forest is developed with understory of *Laurocerasus officinalis* – relict species and *Rhododendron ponticum*.

Plot 42. Village Kukheshi. Visual observation showed fragments of chestnuts-alder forests are developed.

Plot 44. Alder forest with yellow azalea. + chestnut.

6.7. *Fauna*

This section describes fauna that may be found in the Alternative A corridor of the transmission line. Relatively few animals and species would be found along the corridor of Alternative B, as it is much more affected b by human activities. Very few species would be found at the substation site. For these reasons, the descriptions in this section focus on Alternative A.

6.7.1. Animal species in the project area

The scientific literatures reports there are, or have been, a relatively high number of animal species in the region where the project is located. However, human impacts in and near the corridor, including proximity of settlements, overgrazing of meadows, and tree cutting has already impacted the area, resulting in degradation of the fauna population and diversity of species. As noted in Chapter 5, fauna baseline studies were accomplished in two sessions between the end of 2017 and the summer of 2018. The section below provides detailed information regarding the presence of fauna species in the project corridor and impact zone, organized by groups.

This section lists animal species that are reported to have been found can be found in or near the area of the project corridor during different seasons of the year. The lists are based on literature review and findings of field studies.

Amphibians (Class: Amphibia)

Twenty-one species of amphibians are recorded in Georgia. Eight species were found within the study territory. These species are listed in Table 6.7.1.

Table 6.7.1. Amphibian Species Reported in the Project Area

No.	English name	Scientific name	Conservation status / Endemism
1	Southern banded newt	Ommatotriton (sin. Triturus) vittatus	Not protected
2	Smooth newt	Lissotriton vulgaris	Not protected
3	Southern crested newt	Triturus karelinii	Not protected
4	European tree frog	Hyla arborea	Not protected
5	European green toad	Bufo viridis	Not protected
6	Caucasian toad	Bufo verrucosissimus	**Caucasus endemic**
7	Marsh frog	Rana ridibunda	Not protected
8	Long-legged wood frog	Rana macrocnemis	**Caucasus endemic**
9	Northern banded newt	Ommatotriton ophryticus	**Caucasus endemic**

There were no wetlands found in the project corridor. Even though the corridor borders the Kolkheti lowland, which begins within 10-15 kilometers of the corridor, it is primarily located on well-drained mountain slopes. Survey of the corridor found no areas that appeared suitable for amphibians other than small areas near rivers and small streams crossed by the corridor.

As seen in Table 6.7.1, three species are recognized as Caucasus Endemic species: Northern banded newt (*Ommatotriton ophryticus)*, Long-legged wood frog (*Rana macrocnemis*) and Caucasian toad (*Bufo verrucosissimus*).

Reptiles (Class: Reptilia)

Fifty species of reptiles are recorded in Georgia, of which 11 are reported in the project area. Three of these were identified during the field surveys of the corridor. The list of reptiles is provided in Table 6.7.2.

Table 6.7.2. Reptile Species Reported in the Project Area

No.	English name	Scientific name	Conservation status / Endemism	Category
1.	Slow worm	*Anguilis fragilis*	Not protected	
2.	Sand lizard	*Lacerta agilis*	Not protected	
3.	Derjugin's Lizard	*Darevskia derjugini*	Caucasus Endemic	

Table 6.7.2. Reptile Species Reported in the Project Area

No.	English name	Scientific name	Conservation status / Endemism	Category
4.	Georgian Lizard	*Darevskia rudis*	Caucasus Endemic	
5.	Caucasus Lizard	*Darevskia caucasica*	Caucasus Endemic	
6.	Grass snake	*Natrix natrix*	Not protected	
7.	Dice snake	*Natrix tesselata*	Not protected	
8.	Coluber	*Colber najdum*	Not protected	
9.	Aesculapian snake	*Elaphe longissima*	Not protected	
10.	Coronella austriaca	*Coronella austriaca*	Not protected	
11.	Caucasus Viper	*Vipera kaznakovi*	Red List of Georgia, Caucasus endemic	EN

Note: EN – Endangered

Field surveys did not note areas that appeared to be especially suitable for concentrations of reptiles were identified during the field surveys.

Three species of lizards reported to be in the project area are recognized as endemic to the Caucasus: (*Darevskia rudis*), (*Darevskia caucasica*) and (*Darevskia derjugini*). A very rare snake species, Caucasus viper (*Vipera kaznakovi*) is listed as endangered on the Georgia Red List and is also endemic to the Caucasus. Its presence was not confirmed.

Birds (Class: Aves)

The project corridor passes through the different types of habitats, each of which support a variety of bird species. Table 6.7.3 summarizes bird species that could be present within the project territory on the basis of literature review and field studies.

Table 6.7.3. Bird Species Recorded in the Project Area

No.	English Name	Scientific Name	Conservation Status / Endemism	Category
1	Mallard	*Anas platyrhynchos*	AEWA	
2	Common quail	*Coturnix coturnix*	Not protected	
3	Little grebe	*Tachybaptus ruficollis*	AEWA	
4	Black-crowned night heron	*Nycticorax nycticorax*	AEWA	
5	Little bittern	*Ixobrychus minutus*	AEWA	
6	Little egret	*Egretta garzetta*	AEWA	
7	Grey heron	*Ardea cinerea*	AEWA	

Table 6.7.3. Bird Species Recorded in the Project Area

No.	English Name	Scientific Name	Conservation Status / Endemism	Category
8	Purple heron	*Ardea purpurea*	AEWA	
9	Griffon vulture	*Gyps fulvus*	GRL	VU
10	Egyptian vulture	*Neophron percnopterus*	GRL	VU
11	Golden eagle	*Aquila chrysaetos*	GRL	VU
12	Lesser spotted eagle	*Aquila pomarina*	Not protected	
13	Greater spotted eagle	*Aquila clanga*	GRL	VU
14	Short-toed snake eagle	*Circaetus gallicus*	Not protected	
15	Booted eagle	*Aquila pennatus*		
16	Black kite	*Milvus migrans*	AEWA	
17	Eurasian marsh harrier	*Circus aeruginosus*	AEWA	
18	Hen harrier	*Circus cyaneus*	AEWA	
19	Montagu's harrier	*Circus pygargus*	AEWA	
20	Long-legged buzzard	*Buteo rufinus*	GRL	VU
21	Common buzzard	*Buteo*		
22	European honey buzzard	*Pernis apivorus*		
23	Eurasian sparrowhawk	*Accipiter nisus*		
24	Northern goshawk	*Accipiter gentilis*		
25	Levant sparrowhawk	*Accipiter brevipes*	GRL	VU
26	Common kestrel	*Falco tinnunculus*		
27	Red-footed falcon	*Falco vespertinus*	GRL	EN
28	Eurasian hobby	*Falco subbuteo*		
29	Peregrine falcon	*Falco peregrinus*		
30	Merlin	*Falco columbarius*		
31	Water rail	*Rallus aquaticus*	AEWA	
32	Spotted crake	*Porzana porzana*	AEWA	
33	Common moorhen	*Gallinula chloropus*	AEWA	
34	Corn crake	*Crex crex*	AEWA	
35	Common crane	*Grus*	AEWA, GRL	EN
36	Little ringed plover	*Charadrius dubius*	AEWA	
37	Wood sandpiper	*Tringa glareola*	AEWA	
38	Green sandpiper	*Tringa ochropus*	AEWA	

Table 6.7.3. Bird Species Recorded in the Project Area

No.	English Name	Scientific Name	Conservation Status / Endemism	Category
39	Common sandpiper	*Actitis hypoleucos*	AEWA	
40	Eurasian woodcock	*Scolopax rusticola*	AEWA	
41	Common snipe	*Gallinago gallinago*	AEWA	
42	Yellow-legged gull	*Larus michahellis*	AEWA	
43	Stock dove	*Columba oenas*		
44	Common wood pigeon	*Columba palumbus*		
45	European turtle dove	*Streptopelia turtur*		
46	Common cuckoo	*Columba palumbus*		
47	Eurasian eagle-owl	*Bubo*		
48	Boreal owl	*Aegolius funereus*	GRL	VU
49	Tawny owl	*Strix aluco*		
50	Barn owl	*Tyto alba*	GRL	EN
51	Eurasian scops owl	*Otus scops*		
52	European nightjar	*Caprimulgus europaeus*		
53	Hoopoe	*Upupa epops*		
54	Common kingfisher	*Alcedo atthis*		
55	European bee-eater	*Merops apiaster*		
56	European roller	*Coracias garrulus*		
57	Common swift	*Apus apus*		
58	Alpine swift	*Apus melba*		
509	Black woodpecker	*Dryocopus martius*		
60	European green woodpecker	*Picus viridis*		
61	Great spotted woodpecker	*Dendrocopos major*		
62	Middle spotted woodpecker	*Dendrocopos medius*		
63	Lesser spotted woodpecker	*Dendrocopos minor*		
64	Eurasian wryneck	*Jynx torquilla*		
65	Eurasian skylark	*Alauda arvensis*		
66	Woodlark	*Lullula arborea*		
67	Sand martin	*Riparia riparia*		
68	Barn swallow	*Hirundo rustica*		
69	Common house martin	*Delichon urbicum*		

Table 6.7.3. Bird Species Recorded in the Project Area

No.	English Name	Scientific Name	Conservation Status / Endemism	Category
70	Water pipit	*Anthus spinoletta*		
71	Tree pipit	*Anthus trivialis*		
72	White wagtail	*Motacilla alba*		
73	Western yellow wagtail	*Motacilla flava*		
74	Grey wagtail	*Motacilla cinerea*		
75	White-throated dipper	*Cinclus cinclus*		
76	Dunnock	*Prunella modularis*		
77	European robin	*Erithacus rubecula*		
78	Common nightingale	*Luscinia megarchynchos*		
79	Common redstart	*Phoenicurus phoenicurus*		
80	Northern wheatear	*Oenanthe oenanthe*		
81	European stonechat	*Saxicola rubicola*		
82	Whinchat	*Saxicola rubetra*		
83	Song thrush	*Turdus philomelos*		
84	Mistle thrush	*Turdus viscivorus*		
85	Common blackbird	*Turdus merula*		
86	Ring ouzel	*Turdus torquatus*		
87	Common rock thrush	*Monticola saxatilis*		
88	Eurasian blackcap	*Sylvia atricapilla*		
89	Common whitethroat	*Sylvia communis*		
90	Green warbler	*Phylloscopus nitidus*		
91	Common chiffchaff	*Phylloscopus lorenzii*	Cauc. endemic	
92	Eurasian wren	*Troglodites troglodites*		
93	Spotted flycatcher	*Muscicapa striata*		
94	Red-breasted flycatcher	*Ficedula parva*		
95	European pied flycatcher	*Ficedula hypoleuca*		
96	Great tit	*Parus major*		
97	Coal tit	*Parus ater*		
98	Eurasian blue tit	*Parus caeruleus*		
99	Long-tailed tit	*Aegithalos caudatus*		
100	Eurasian nuthatch	*Sitta europaea*		

Table 6.7.3. Bird Species Recorded in the Project Area

No.	English Name	Scientific Name	Conservation Status / Endemism	Category
101	Eurasian treecreeper	*Certhia familiaris*		
102	Red-backed shrike	*Lanius collurio*		
103	Lesser grey shrike	*Lanius minor*		
104	Eurasian golden oriole	*Oriolus oriolus*		
105	Eurasian jay	Garrulus glandarius		
106	Rook	*Corvus frugilegus*		
107	Hooded crow	*Corvus cornix*		
107	Common raven	*Corvus corax*		
108	Common chaffinch	*Fringilla coelebs*		
109	Brambling	*Fringilla montifringilla*		
110	Common linnet	*Carduelis cannabina*		
111	European goldfinch	*Carduelis carduelis*		
112	European greenfinch	*Carduelis chloris*		
113	Red-fronted serin	*Serinus pussilus*		
114	Eurasian siskin	*Carduelis spinus*		
115	Hawfinch	*Coccothraustes coccothraustes*		
116	Rock bunting	*Ebberiza cia*		
117	Corn bunting	*Miliaria calandra*.		

Note: VU – Vulnerable; EN – Endangered, GRL- Red List of Georgia
AEWA – Agreement on the Conservation of African-Eurasian Migratory Waterbirds

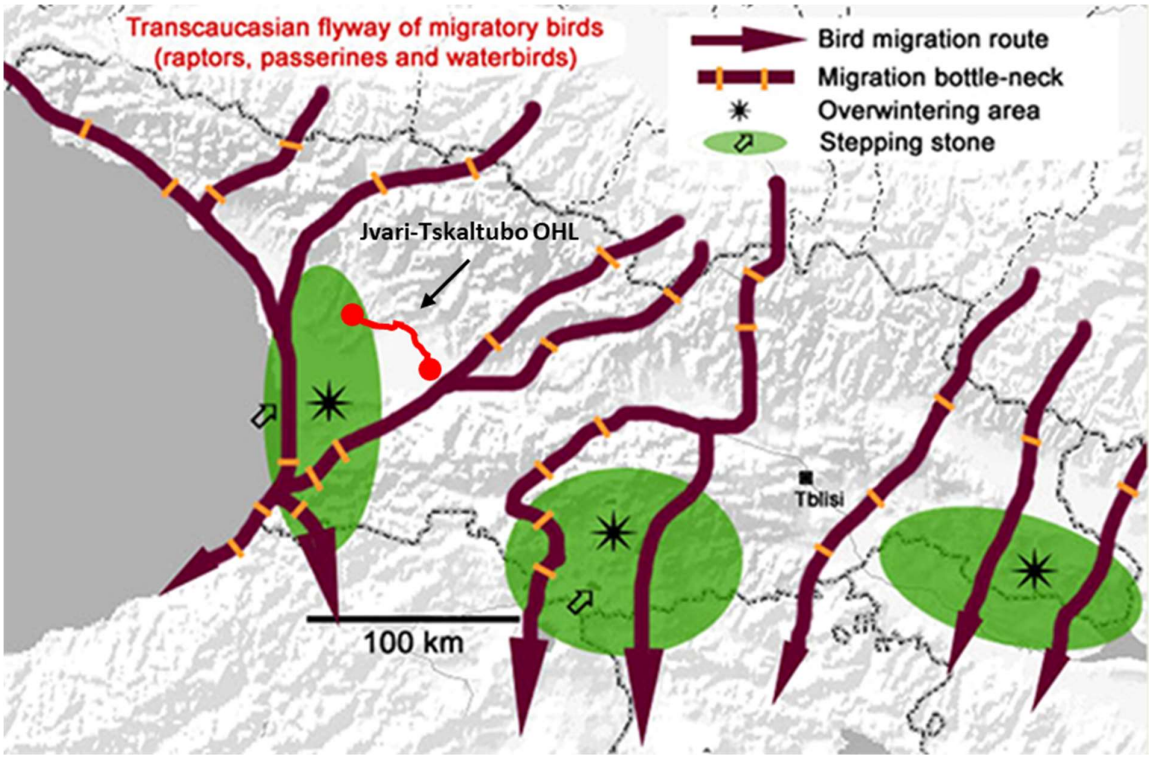
Since 2001, Georgia has been a party of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds. The agreement protects all waterbirds and birds whose common habitats are located near water. Migrating waterfowl (ducks, geese, cranes, etc.) and raptors (hawks and eagles) are the types of birds that are at most risk from collisions with transmission lines. There is a major migratory flyway that passes to and along the east coastline of the Black Sea. In general, the autumn migration is the season of most concern since spring migrations are more diffuse and also are smaller, as they do not have such a large number of young birds as are present in autumn. In autumn, most birds follow the Enguri River gorge, which is to the west of the project area, with smaller numbers on other major "corridors" that pass through and over gaps in the mountains. Although the project is away from the Enguri gorge and none of these corridors cross the transmission line route, the Tskaltubo area is near one of these corridors that leads toward the Black Sea and the Jvari area is near major overwintering areas; this is shown on Figure 6.7.1. Thus, some migrating birds would be likely

to cross the corridor of the transmission line during migration, at least during some years. Overwintering birds are unlikely to be affected as they would be flying from the west toward agricultural fields, not flying up into the edge of the mountains where the line will be located.

As shown in Table 6.7.3, ten bird species protected by the Red List of Georgia are reported to be or have been present in the project area. Three of these species are categorized as endangered, and seven as vulnerable. Among these species of conservation concern species, three are known to be nesting in the project area (Eurasian Griffon Vulture, Tengmalm's Owl, and Barn Owl); all others would be considered as visitors.

Nesting birds such as little ringed plover, common sandpiper and green sandpiper were observed in project area. All other bird species, including western marsh harrier, which nests in many places in Georgia, would be found in the project area only during migration. The project route study did not identify any particular areas that would attract waterfowl.

Because most species of concern are migrants, it is considered that the most attention should be given to river gorges and river valleys crossed by the transmission line because migrating birds typically follow such routes through mountainous areas.



Source: Adapted from Van Maanen et al. 2001

Figure 6.7.1 Location of Major Autumn Bird Migration Routes and the Jvari Tskaltubo Corridor

Mammals (Class: Mammalia)

110 species of mammals are recorded in Georgia of which the eight listed in Table 6.7.4 were seen or detected during field surveys.

Table 6.7.4. Mammal Species Recorded within the Project Area

No.	English name	Scientific name	Conservation status / Endemism
1	Eastern white-breasted hedgehog	*Erinaceus concolor*	
2	Caucasian mole	*Talpa caucasica*	Caucasus endemic
3	Levant mole	*Talpa levantis*	
4	Radde's shrew	*Sorex raddei*	Caucasus endemic
5	Caucasian pygmy shrew	*Sorex volnuchini*	
6	Transcaucasian water shrew	*Neomys teres*	
7	Gueldenstaedt's shrew	*Crocidura gualdenstaedtii*	
8	Robert's snow vole	*Chionomys roberti*	Caucasus endemic

Three other mammal species that are reported in the literature to have been in the project areas are protected by the Red List of Georgia (2014). These species are listed in Table 6.7.5.

Table 6.7.5. Mammal Species of Conservation Concern Reported in the Project Area

No.	English name	Scientific name	Category	Residence Type
1.	Caucasian squirrel	*Sciurus anomalus*	VU	Resident
2.	Brown Bear	*Ursus arctos*	EN	Resident
3.	Otter	*Lutra lutra*	VU	Resident

Note: VU – Vulnerable; EN – Endangered

It is very unlikely that Brown bear would be encountered in the corridor, as it is closer to populated areas than bears typically prefer. If they do occur, the most likely period would be in early spring when they can move down to lower altitudes from their preferred habitat in higher mountains to the north, but even in spring it would be very unlikely. Caucasus squirrels are also unlikely to be present, as they prefer forests that are less disturbed than most of those found in the corridor. The presence of otter was not confirmed, but they are likely to be present in the rivers.

Bats

According to I. Natridze and A. Bukhnikashvili, the bat species listed in Table 6.7.6 can be found in the region.

Table 6.7.6. Bat Species Recorded within the Region

No.	English name	Scientific name	Conservation status / Endemism	Category
1	Greater horseshoe bat	*Rhinolophus ferrumequinum*	EUROBATS	LC
2	Lesser horseshoe bat	*Rhinolophus hipposideros*	EUROBATS	LC
3	Mediterranean horseshoe bat	*Rhinolophus euryale*	GRL, EUROBATS	VU
4	Lesser mouse-eared bat	*Myotis blythii*	EUROBATS	LC
5	Natterer's bat	*Myotis natereri*	EUROBATS	LC
6	Whiskered bat	*Myotis mystacinus/brandti*	EUROBATS	LC
7	Alcathoe bat	*Myotis alcathoe*	EUROBATS	LC
8	Common Barbastelle	*Barbastella barbastellus*	GRL, EUROBATS	VU
9	Brown long-eared bat	*Plecotus auritus*	EUROBATS	LC
10	Common pipistrelle	*Pipistrellus pipistrellus*	EUROBATS	LC
11	Kuhl's pipistrelle	*Pipistrellus kuhlii*	EUROBATS	LC
12	Nathusius's pipistrelle	*Pipistrellus nathusii*	EUROBATS	LC
13	Common bent-wing bat	*Miniopterus schreibersii*	EUROBATS	LC
14	Lesser noctule	*Nyctalus leisleri*	EUROBATS	LC
15	Common noctule	*Nyctalus nocula*	EUROBATS	LC
16	Serotine bat	*Eptesicus serotinus*	EUROBATS	LC
17	Parti-coloured bat	*Vespertilio murinus*	EUROBATS	LC

Note: VU – Vulnerable, LC – Least Concern, GRL – Red List of Georgia

All bat species recorded in Georgia are included in and protected by Annex II of the Bern Convention, the “Agreement on the Conservation of Bats in Europe” (EUROBATS). Two bat species protected by the Georgia Red List are known to visit the project area, although they are not known to nest there. The main habitat for bat species is older trees and caves in karst areas, including near Balda. Only one cave, the Motena Cave, is known to be close to the corridor, and no concentration of bats was observed during a field survey. In general, relatively little is known about bats in the project area.

6.7.2. Sensitivity of the corridor for fauna

Field studies confirmed that the project area is under significant anthropogenic pressure, although as described in section 6.5 and in Chapter 7 there are sections where the corridor will pass near more natural landscapes and natural conditions. Corridor sensitivity thus varies from the perspective of the number of species and the density of individuals of certain species.

It is considered that the most sections of the corridor most sensitive to potential impacts on fauna are

at and near where the line crosses rivers south from Egrisi Ridge, especially river crossings of the Chanistskali, Khobi, and Tekhuri rivers. In general, the forests close to the settlements are significantly impacted and timber is cut inside the forested areas, the steep slopes of the river gorges are less affected and are covered with broadleaved Colchic forests. The forest remaining on these slopes provides sufficient habitat to support many fauna species. Also, there is increasingly good forest habitat to the north of the corridor, in the direction of the Emerald Sites, from the left bank of the Abasha River towards Inchkhuri village.

This section has the highest biodiversity and the densest populations of any section along the corridor. Most of the species are common species and not of conservation concern, but this zone is also important for protected species such as Caucasus viper (*Vipera kaznakovi*), Boreal owl (*Aegolius funereus*), Caucasian squirrel (*Sciurus anomalus*) and possibly Brown bear (*Ursus arctos*). In this area European roe deer (*Capreolus capreolus*) are present and Eurasian otter (*Lutra Lutra*) are probably present in the rivers.

The forests would also provide attractive habitat for some species of bats, especially those that prefer to nest in hollows of mature trees. As noted above, there would be limited numbers of migrating birds, but those that did occur would be passing along the river valleys. In the more modified areas, where habitats are most degraded, the most common fauna species would be those accustomed to human presence, such as rodents and small mammals, typical small bird species, and possibly some bats. Overall, fauna sensitivity would be low during the breeding season.

6.8. *Baseline Socioeconomic Conditions*

6.8.1. Introduction

This section describes socioeconomic conditions in and near the Jvari-Tskaltubo transmission line corridor. The data were collected from public statistical sources and other public sources. In addition, field surveys were conducted of cultural heritage monuments located near the project corridor.

This section and the following three sections discuss topics of concern, including demography, economy, employment and unemployment, infrastructure, land and water resources, social services, cultural heritage, etc. Data are analyzed on regional and municipal levels. Data sources include:

1. General Population Census, 2014, Geostat, Tbilisi, 2016;
2. Demography of Georgia, Geostat, Tbilisi, 2016;
3. Migration Profile, 2015, Government Commission of Migration Issues, 2015
4. Public data provided by Geostat: www.geostat.ge

5. Official web-pages of Imereti and Samegrelo-Zemo Svaneti State Attorney-Governor Administration: www.imereti.gov.ge and www.szs.gov.ge
6. Website of the National Association of Local Authorities of Georgia: www.nala.ge

These resources do not always reflect the most current situation, although they are the most recently available data that are accessible. In addition, as noted in Chapter 5, information was obtained from local authorities and from interviews with officials, village leaders, and potentially affected people who live in settlements near the corridor.

6.8.2. General description of the region

The transmission line crosses two regions of Georgia: Samegrelo-Zemo Svaneti and Imereti. The socioeconomic characteristics of the two regions differ from each other in many ways, including social structure, economic development, access to public infrastructure, access to agricultural land and other resources.

Samegrelo-Zemo Svaneti

Samegrelo-Zemo Svaneti is located in western Georgia on the Kolkheti lowlands and the south slope of the Caucasus ridge. The region is bordered by the Black Sea on the west, the Autonomous Republic of Abkhazia on the northwest, the Russian Federation on the north, Imereti and Racha-Lechkhumi regions on the east, and Guria region on the south. The overall region area comprises 7,500 square kilometers, constituting 10.8 percent of the country's territory. Samegrelo-Zemo Svaneti had a population of 330,761 in 2014, or almost 10 percent of the country's population.

There are 497 settlements in the region, including eight towns, two small towns, and 487 villages. About 40 percent of the population reside in towns and small towns, with the remaining people in villages and rural areas. Of the villages, 137 of them (one in Martvili and 136 in Mestia) are in the

mountains at elevations over 1,000 meters. There are nine municipalities in the Samegrelo-Zemo Svaneti region: Poti, Zugdidi, Abasha, Martvili, Mestia, Senaki, Chkhorotskhu, Tsalenjikha and Khobi Municipalities. The transmission line will cross three: from southeast to northwest, Martvili, Chkhorotskhu and Tsalenjikha. The northern end of the line will be at the existing substation near Jvari.

Imereti region

Imereti is an important historical-geographical region of western Georgia. Imereti is bordered by Likhi ridge on the east, the river Tskhenistskali on the west, the Caucasus ridge on the north and Meskheti Mountains on the south. Imereti is bordered by on all sides by other regions: Racha-Lechkhumi-Kvemo Svaneti on the north, Shida Kartli on east, Samtshke-Javakheti on the south, Guria on the southwest, Samegrelo-Zemo Svaneti on the west, including two that will be crossed by the line: Tskaltubo and

Khoni. The new substation will be in Tskaltubo municipality at the southern end of the corridor. The region is generally considered to be divided into two parts, upper and lower Imereti.

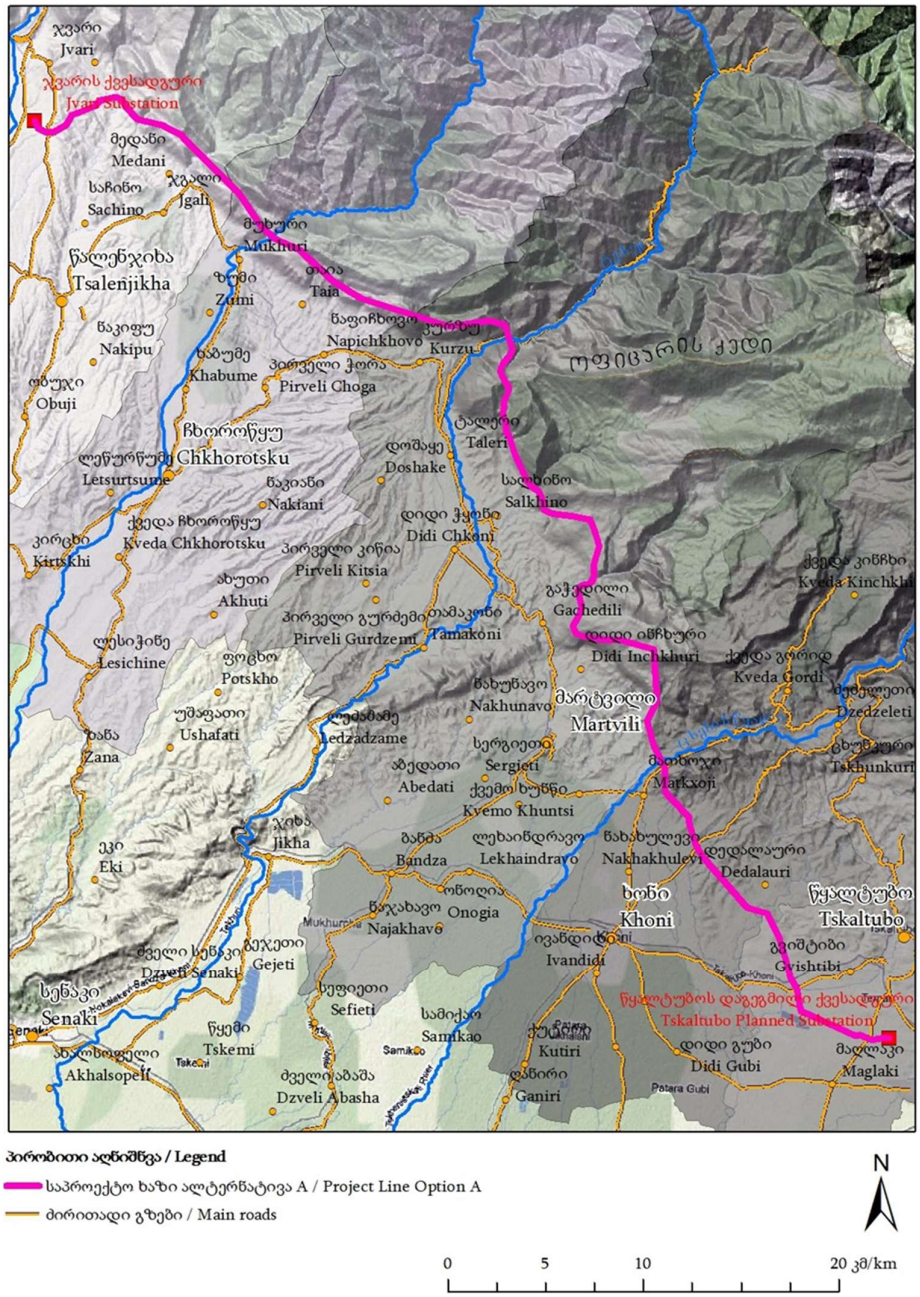


Figure 6.8.1 Municipalities Crossed by the Jvari-Tskaltubo Transmission Line

The region covers an area of 6,552 square kilometers and had a population of 533,906 in 2014, for a population density of 81 persons per square kilometers. The administrative center of the region is Kutaisi. There are 542 settlements areas in Imereti, including: 10 towns (Kutaisi, Vani, Tkibuli, Tskaltubo, Chiatura, Baghdati, Zestafoni, Terjola, Samtredia, Sachkhere, Khoni), three small towns (Shorapani, Kulashi, Kharagauli), and 529 villages. There are 11 municipalities in the region: Tchiatura,

Tkibuli, Tskaltubo, Baghdati, Vani, Zestafoni, Terjola, Samtredia, Sachkhere, Kharagauli and Khoni.

Figure 6.8.1 shows the municipalities crossed by the corridor.

6.8.3. Demography

Figure 6.8.2 depicts the distribution of population in the target regions and municipalities, and the capital and country average indicators. The population of Imereti is nearly equally split between urban and rural settlements, while the population of Samegrelo-Zemo Svaneti is more rural.

Among the target municipalities, Khoni has the largest share of urban population (38 percent) while the rest of the municipalities have 20 percent or less. The line will mostly cross agricultural land, especially for Alternative B; as described earlier, the Alternative A corridor was intentionally located so as to bypass settlements as much as possible.

Among the municipalities of the Samegrelo-Zemo Svaneti reigon, Martvili is the largest by area (about 880 square kilometers), followed by Tsalenjikha (647 square kilometers), and Chkhorotskhu (619 square kilometers); together they cover 29 percent of the region's territory. In Imereti, Tskaltubo municipality occupies 707.5 square kilometers and Khoni another 428,5 square kilometers; they cover 17 percent of Imereti region's area.

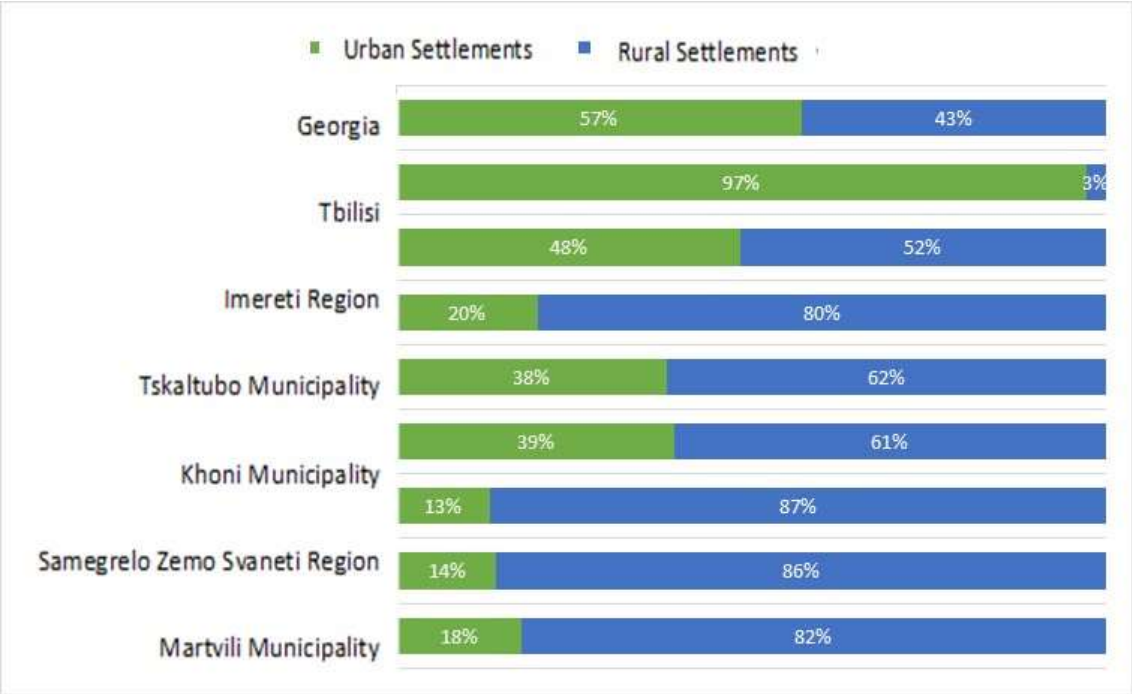


Figure 6.8.2 Distribution of Regional and Municipal Populations in Urban and Rural Settlements

As of 2017, Martvili municipality with 33,500 people had the largest population of municipalities in the Samegrelo Zemo-Svaneti region, followed by Tsalenjikha with 26,200 and Chkhorotskhu with 22,300. Tskaltubo Municipality has the largest population of municipalities crossed by the corridor in Imereti, with a population of 56,900, followed by Khoni with 23,600; together they have only about 1.6 percent of the region's population. Table 6.8.1 shows population and gender distribution in the municipalities.

Table 6.8.1. Population and Gender Distribution in Municipalities (2017)

Municipality	Total	Male	Female
Chkhorotskhu	22,309	11,037	11,272
		49%	*51%*
Martvili	33,463	16,433	17,030
		49%	*51%*
Khoni	23,570	11,469	12,101
		49%	*51%*
Tsalenjikha	26,158	12,677	13,481
		48%	*52%*
Tskaltubo	56,883	28,343	28,540
		50%	*50%*

The figures provided in the table are average values for each municipality that will be crossed by the power line. Population and gender breakdown for each of the 22 villages whose lands are to be crossed by the transmission line are provided in the Stakeholder Engagement Plan (SEP). The male/female ratio is quite even and is similar across the project-affected settlements. No gender-specific trend, for example related to labor migration, can be observed in the project area.

If alternatives A and B are compared from the point of view of population composition, there is practically no difference in the social profile of the villages affected under each Alternative.

Figure 6.8.3 shows that a decrease in population from 2013 to 2017 in all municipalities, which corresponds to demographic dynamics in Georgia. Much of the decrease is not real but is a result of different methodologies used between censuses. However, there was some decrease caused by emigration out of the country, primarily to Russia, the European Union, and the United States.

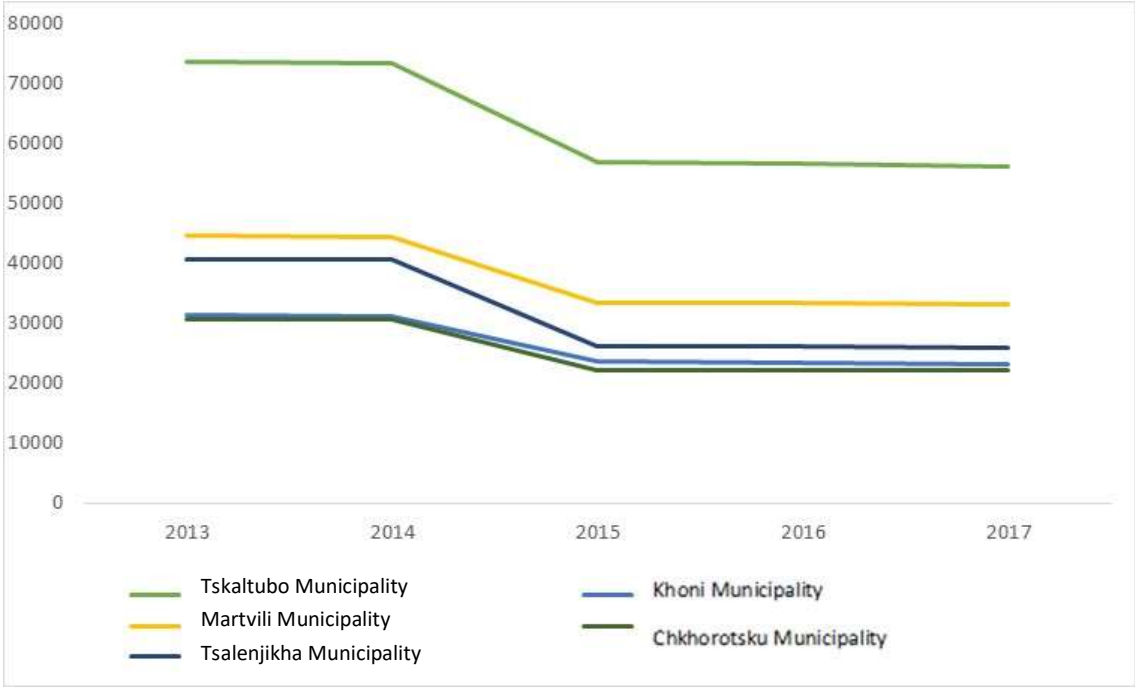


Figure 6.8.3 Population Dynamics, 2013-2017

During the past decade, internal migration within Georgia has been caused by armed conflicts and other factors. Most internal migrants consist of internally displaced persons (IDPs) from the Abkhazia and South Ossetia/Tskhinvali area, as well as people who relocated to improve socioeconomic conditions.

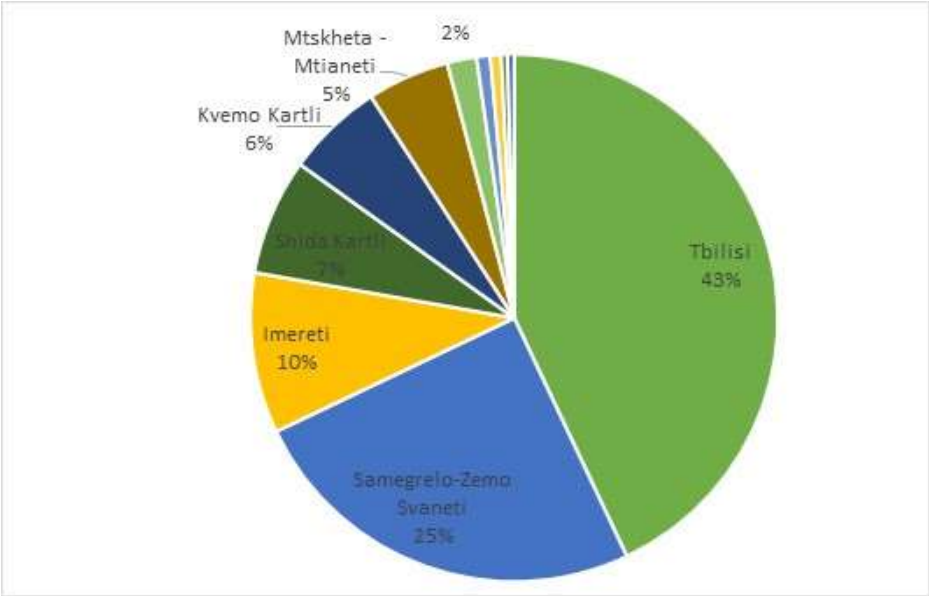


Figure 6.8.4 Residence of IDPs in Georgia, 2017

As of 2017, there were 189,639 IDPs registered in the country. Most IPDs currently were in Tbilisi, but about 25 percent were in Samegrelo – Zemo Svaneti and 10 percent in Imereti, as shown in Figure 6.8.4.

Over 99 percent of the population in the municipalities and the regions is ethnically Georgian, with a small minority being of Slavic (Russian or Ukrainian) descent. Representatives of neighboring Caucasian groups are also encountered periodically. Correlated with the ethnicity, orthodox Christians represent the absolute majority of the target regions. Very small numbers of Muslims, followers of the Armenian Apostolic Church, and Yazidis may also be present in the regions.

6.8.4. Economy

Overview of the economy

The Georgia economy has grown steadily for much of the past decade, although the rate of growth has declined since about 2014. In 2010, the country's gross domestic product (Figure 6.8.5) was 20,743,400,000 Georgian lari (GEL), and by 2015 it had increased to 31,755,600,000 GEL and then to 33,921,600,000 GEL in 2016. Real growth has begun decreasing since 2014, to 2.9 percent growth in 2015 and 2.8 percent in 2016.

Figure 6.8.5 Nominal GDP and Real Growth during 2010-2016

Figure 6.8.6 displays the GDP structure as of 2016. Data from the National Statistics Office of Georgia show that industry accounted for the largest share of GDP with 17 percent, followed by trade (16 percent), Transport and Communication (16 percent), Construction (9 percent) and Agriculture (9 percent).

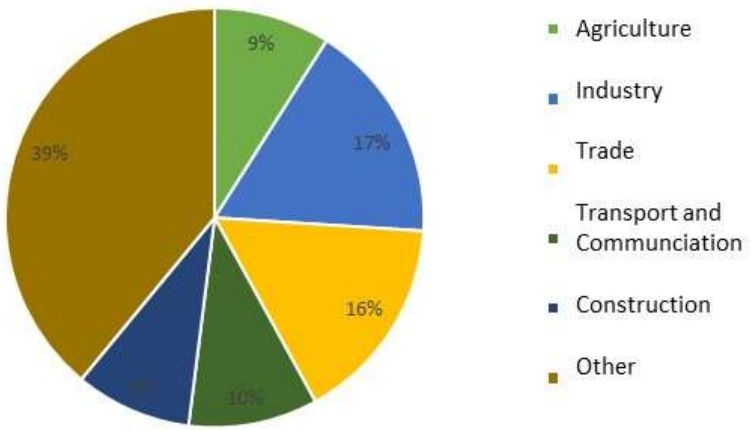


Figure 6.8.6 GDP Sectors (2016)

Economies of the target regions

In considering the importance of regional contributions to the national economy, the contribution to added value is an important measure. Over recent years, Samegrelo-Zemo Svaneti region has accounted for seven percent of added value in the country, and Imereti region (with Racha-Lechkhumi and Kvemo Svaneti regions) for 11 percent. The respective shares by region are given on Figure 6.8.7.

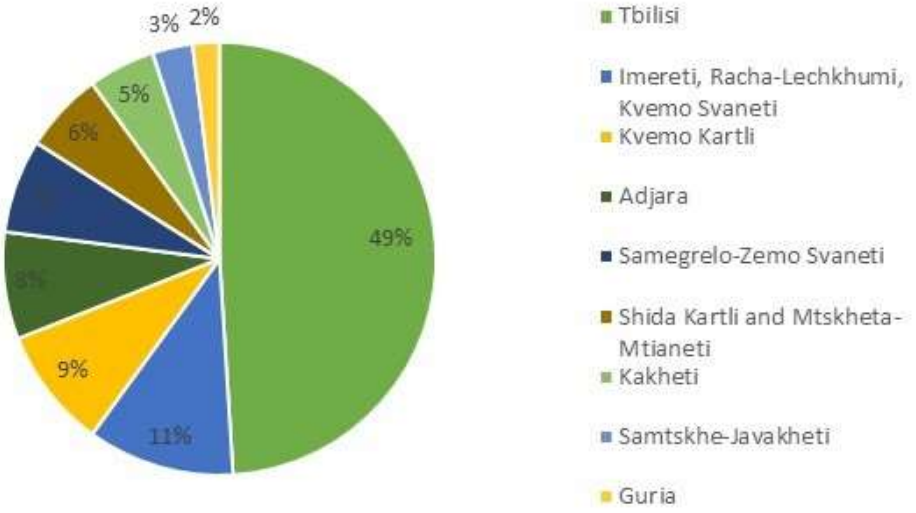


Figure 6.8.7 Value Added Contributed by Regions to National Economy

Parallel with growth of national GDP, total value added has also increased. In Imereti, the value added more than doubled from 2006 to 2015, from 1,288,500,000 to 2,940,500,000 GEL, while in Samegrelo-Zemo Svaneti the increase was from 918,200,00 to 1,995,100,000 GEL

In 2015, the sectors other than Services that contributed most to creation of added value in Samegrelo-Zemo Svaneti were agriculture, hunting, forestry, and fishing; transportation and communications; industry; and state governance. For Imereti, the leading sectors other than Services were agriculture, hunting, forestry, and fishing; industry; state governance; and education. These are shown in Figure 6.8.8.

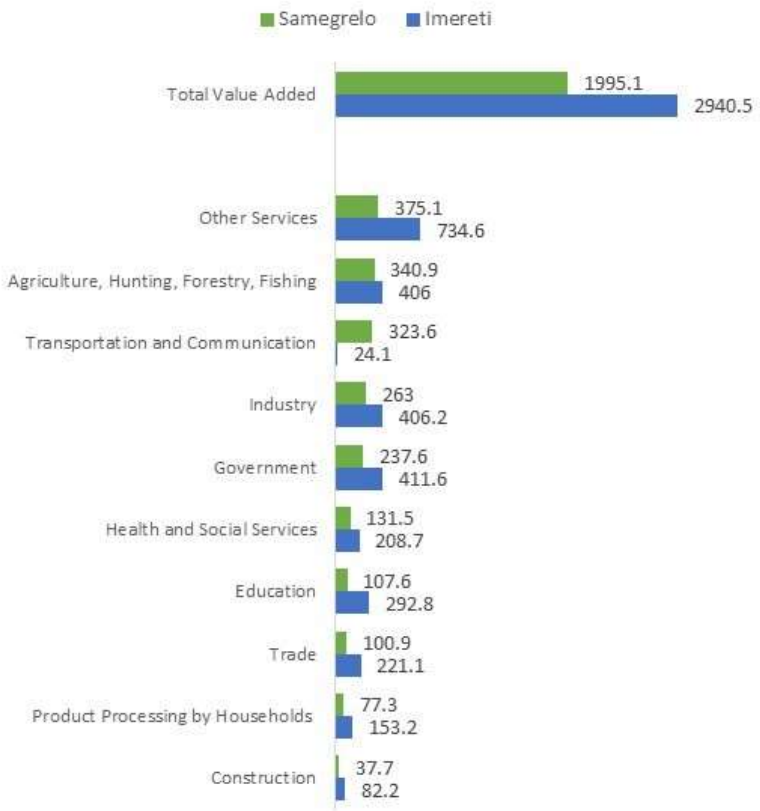


Figure 6.8.8 Added Values for Imereti and Samegrelo-Zemo Svaneti Regions 2015 (million GEL)

Industry

Since the beginning of the 1990s, a sharp decline has been observed in the industrial sector, and this contributed to a substantial reduction in its share in the country's GDP. This decreasing trend was observed in the target regions as well.

Industrial activity in Imereti includes metallurgy and metal products, power generation, food and light industry. Industry is relatively poorly developed in Samegrelo-Zemo Svaneti. The major industrial products of the region are processed nuts and timber. More specifically, Zugdidi municipality is known for nut and tea cultivation, Abasha for confectionery production, Tsalenjikha for timber processing and tea production, Martvili for tea processing and wine production, Poti for production of fish oil, fish flour, meat and dairy products, Chkhorotskhu for nut production, Mestia for timber processing. Samegrelo-Zemo Svaneti is also a popular tourist destination, especially Mestia municipality.

Energy

Imereti is also rich in energy resources and is home to five hydropower plants (HPPs): Rioni HPP, Gumati HPP, Dzevrula HPP, Shaori HPP, and Vartsikhe HPP. Their potential (installed) capacity is 997.4 megawatts. Consequently, electricity production could be considered the most important field of industrial production in the region. Energy production is also important in Samegrelo-Zemo Svaneti, where Enguri HPP, the country's largest, is situation on the eponymous river and impounds the Jvari reservoir.

Agriculture

Agriculture is a key component of the economy in both target regions. Imereti crops include maize, grapes, various vegetables, and herbs and spices. Agriculture was responsible for 14 percent of Imereti's total value-added indicator in 2015 and 17 percent of Samegrelo-Zemo Svaneti's.

A wide variety of vegetables, fruit, and spices are grown in the regions as well as tea. Subsistence farming and animal husbandry is prevalent in both regions, with nuts from Samegrelo-Zemo Svaneti the primary agricultural export. The total area of agricultural land in Imereti is 65,737 hectares, with 78 percent used for annual crops, 13 percent (8831 hectares) used for perennial crops, eight percent (5,410 hectares) in uncultivated arable land, and 0.7 percent supporting greenhouses. The total area of agricultural land in Samegrelo-Zemo Svaneti region is 66,662 hectares, with 55 percent (36,608 hectares) in crops, including 27,003 hectares in perennial crops, and five percent (3,027 hectares) supporting grasslands.

Transport and Communication

The target regions play an important role in the transport and communication systems of the country. The Imereti region in particular is a transit corridor connecting European and Asian countries. Kutaisi, the region's administrative center, is 102 kilometers from the nearest sea port, and 236 kilometers from Tbilisi. Air transport is well developed, with two airports in Kutaisi; vehicular and rail transportation is also well developed.

Samegrelo-Zemo Svaneti also supports significant marine and land transit. Poti port is a commercial center for the Europe-Caucasus-Asia transit corridor ("Traceka"), and the Kulevi port and oil terminal is a major gateway for petroleum products. As a result, the transport and communication sector is the third largest contributor to the regional value added. Additionally, the future Anaklia port will significantly increase cargo turnover of the region, directly promoting business growth. Samegrelo-Zemo Svaneti also benefits from air transport from Mestia as well as well-developed rail and road systems, mostly developed in the lowlands.

Exports

Zestafoni Ferroalloy Factory (metallurgy and metal products) contributes 88 percent of Imereti's industry exports. In addition, food products such as wine and spirits, tea, and herbs are exported to Europe and Russia.

The main products exported from Samegrelo – Zemo Svaneti to the European Union, former Soviet Union countries, Asia, and United States markets are nuts, wine, tea, honey, persimmon and fish flour. Exports are steadily rising, which is mainly due to the growth of nut exports.

6.8.5. Employment and income

Georgia's labor force reached 2,021,500 in 2015, having increased six percent from 1,900,000 in 2010. Of these, 1,779,900 or 88 percent were self-employed or employed. Per capita income has increased significantly in recent years, growing from 63 GEL per month in 2001 to 284.5 GEL in 2015.

Figure 6.8.9 shows unemployment rates for all regions and compares them to the country's average. The highest unemployment rate was observed in Tbilisi (21 percent), while the rates in Imereti and Samegrelo-Zemo Svaneti were 9 percent and 13 percent, respectively.

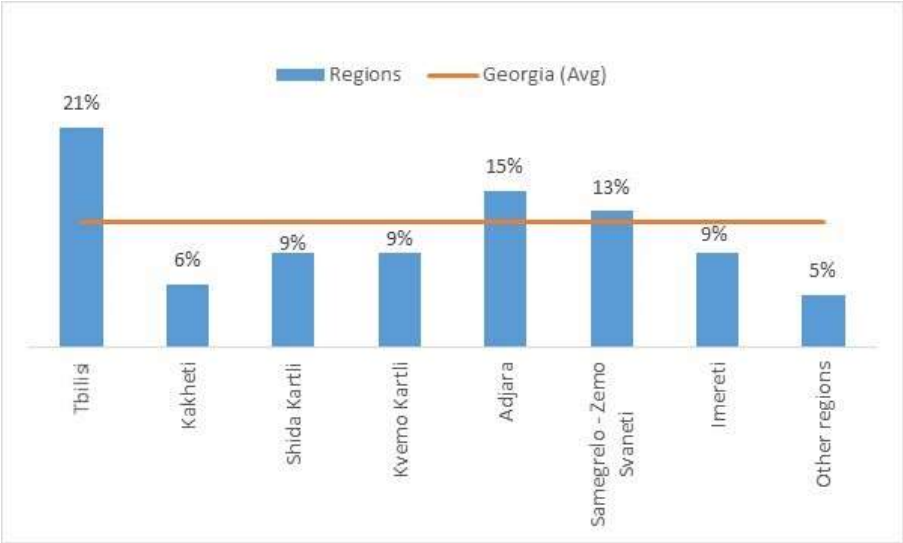


Figure 6.8.9 Unemployment Rates in 2015 (%)

The employment rate in the villages, adjacent to the proposed power line is similar to the average values indicated for the municipalities. The people in the villages are mostly self-employed involved in non-intensive agricultural activities. The main sectors of agricultural activities are related with cattle breeding and cultivation of annual crops like maize, beans and vegetables. It should be mentioned, that majority of population is presented by aged people, mostly pensioners, due to the fact, that the young population has already migrated in country to the main cities looking for employment opportunities or abroad, with the same reason.

The self-employment in agricultural activities is the main source of income for local population. Locals are selling primarily cheese to the local markets or to the cities in western Georgia.

The number of employed people in the target villages is very low. The industrial facilities or large-scale farms practically does not exist and employment is related mostly with Government structures, education sector and services in the region.

6.8.6. Social Services

Education

As of 2016, there were 2331 secondary schools operating in the country, providing education to 553 914 students. Additionally, there are 20 higher educational institutions in the country, with the majority in Tbilisi. There are 663 schools operating in the two target regions, plus and six higher education institutions, in Kutaisi and Zugdidi. Table 6.8.2 shows the number of schools and students in the regions (none are in or near the transmission line corridor).

Table 6.8.2. Locations of Secondary Schools, 2016

Region	Municipality	Number of Schools	Number of Students
Imereti	Tskaltubo Municipality	42	5559
	Khoni Municipality	26	2783
Samegrelo-Zemo Svaneti	Martvili Municipality	39	4194
	Chkhorotskhu Municipality	19	2609
	Tsalenjikha Municipality	31	3471

Healthcare and social assistance

The universal healthcare program was introduced in Georgia in 2013 to ensure access to medical care for the population. Private insurance is also widely spread, mostly among the employed citizens of the country. In 2016, social assistance and/or pension was received by 887 338 individuals, with 28 percent of the recipients of aid residing in Imereti and Samegrelo-Zemo Svaneti regions. Additionally, about 40 000 residents of the target regions received subsistence allowance in 2016.

Samegrelo-Zemo Svaneti and Imereti regions offer a wide range of medical facilities. In fact, these two regions offer more hospital and outpatient facilities than any other region: as of 2015, 29 hospitals and 385 outpatient facilities were operating in Imereti, while 19 hospitals and 287 establishments served patients in Samegrelo-Zemo Svaneti.

In General, the health Care facilities are available in Kutaisi and Zugdidi, where the main hospitals are located. Additionally, health care facilities are also available in Poti and Senaki, so maximum travel time from the target regions to the closest hospitals is around 1 to 1,5 hour driving distance (40-50 km). The municipality roads are mostly paved with asphalt, the climate in the region is mild, accordingly the roads are easily drivable during all seasons.

The whole territory under the project impact is served by Ambulance service, who is equipped with 4WD ambulance cars capable to reach each village in the municipality. The ambulance service was significantly improved during the last three four years. There were number of projects focusing on health care implemented by the ministry of health and department of the emergency situations in Georgia. There is centralized call center in country “112”, which provides the services and manages the ambulance provision in the regions.

Infrastructure

All households of the target regions have access to electricity, but access to water and gas is not as common. As of 2015, 40 percent of Imereti households were served by a centralized water supply system. In Samegrelo-Zemo Svaneti, 32 percent area served by centralized water and 44 percent by groundwater from wells. Almost half of households in Imereti had access to natural gas in 2015, while only 15.5 percent had access in Samegrelo-Zemo Svaneti.

6.8.7. Vulnerability of population and IDP's

Gender

There is relatively little information on gender and vulnerability status of people in Georgia. However, some information exists that is useful for the analysis. As noted, there are approximately equal numbers of men and women in the regions and municipalities. Employment is not so balanced, however, with women making up only about one-third of employed people. For example, in Samegrelo Zemo Svaneti region there are 681 people employed in the governmental sector, but only 237 of them are women (38.4 percent). The situation is different in the business sector, where over half of employed persons are women (8800 out of 16300).

Income for men is also much higher than for women: average salaries for men in the region in 2014 was 540 GEL, but less than half of that (246 GEL) for women. There are no data on positions and qualifications, so no explanation for the discrepancy can be given.

Internally displaced people (IDPs)

There are approximately 85,000 IDPs in the Samegrelo – Zemo Svaneti and 25,228 in Imereti. Most IDPs are from Abkhazia and most of them will have been in the region for 25 years; relatively few will be from the Tskinvali region known as South Ossetia and thus having been in the region only since 2008. IDPs are concentrated on the territory The IDP's distribution in the target regions by the distribution places is following. There are only two known concentrations of IDPs, on former military bases in Senaki 1760 IDPs) and Khoni (1313 IDPs) (data from *idfi.ge)*. Other IDPs are distributed in villages and settlements across the territories of the municipalities, with many more in large villages with good access rather than in the mountainous zone where access is difficult. No concentrations of IDPS were identified in the areas near the transmission line corridor.

6.9. *Tourism and Cultural Heritage*

There are literally hundreds of cultural heritage sites in the two regions. As a result, only the ones within five kilometers of the centerline of the transmission line corridor are listed in this section. In total, there are 81 known tourism and heritage sites within five kilometers of the transmission line, including 46 registered as national monuments: 39 cultural and seven natural monuments.

Due to its favorable geographic location between east Georgia, on the one hand, and Upper Svaneti, Abkhazia and the Black Sea on the other, the regions crossed by the transmission line corridor were of special interest to ancient traders and were under the control of various powers for over 2,000 years. According to Classical authors, the earliest known long-distance trade route connecting India with the countries of the Mediterranean, through Central Asia and the South Caucasus, was functional since at least the 4th century BCE. It has been suggested that the route running through the passes of Likhi (Surami) Mountain Range, which connects the lands of eastern and western Georgia, including the areas crossed by the transmission line corridor, was a significant part of this ancient trade route. The archaeology of Georgia can trace even longer traditions of its territory serving as a 'bridge' between east and west. This important geographical location of the country led to a a unique archaeological heritage in the wider area, including the regions of Imereti and Samegrelo Zemo Svaneti.

Almost all archeological periods are well represented in Imereti, but the region is particularly characterized by many Paleolithic sites. Occupation of the region has been traced to the Lower Paleolithic period, but among the 200 sites of the Middle and Upper Paleolithic period in the whole Caucasus, most are located in Imereti, apparently due to the favorable climatic and, above all, geological factors; the presence of numerous natural caves that could have been used as shelters by hunter-gatherers is thought to have played a crucial role in the formation of a unique culture of the Early Stone Age of Imereti.

Unlike Imereti, the neighboring region of Samegrelo Zemo has many fewer Paleolithic sites. There are only six sites known of this period from the target municipalities of Samegrelo, one from Martvili and five from Tsalenjikha. The Early Bronze Age is also better represented in Imereti than in Samegrelo Zemo Svaneti, but the Late Bronze-Early Iron Age, as well as Classical and Medieval sites, are almost evenly distributed in both regions.

Imereti is the historic home to 78 churches, 13 fortresses and 39 archaeological monuments preserved from the ancient and medieval periods. Two of the most remarkable monuments, Gelati Monastery and Bagrati Cathedral represent the core of Imereti tourist attractions and have been UNESCO World Heritage sites since 1994; neither could be affected by the transmission line or substation. Tskaltubo Resort in Imereti is not a national monument but it is a world-renowned resort distinguished by springs and mineral baths, famous for its subtropical marine climate. It is one of the warmest areas in Georgia, with short winters and hot summers. The Sataplia Nature Reserve, with a karst cave and dinosaur footprint, is also in Tskaltubo, although over six kilometers from the transmission line.

Imereti was visited by 175,500 tourists in 2015 and slightly more in 2016. Tourism in Samegrelo-Zemo Svaneti is thought to have increased during recent years, especially in Anaklia and Mestia, but official data show a slight decrease; the reason for this anomaly is not known. The number of visitors in 2016 was 69,200, compared to 69,700 in 2015.

Many of the cultural and natural heritage sites, including monasteries, caves, and waterfalls, are

recognized as national monuments. Table 6.9.1 lists the natural and cultural monuments and other important sites that are within five kilometers of the Alternative A corridor; other than national monuments, a similar list is not available for Alternative B, but there would be many fewer than are near the Alternative A. corridor.

Tourism in Samegrelo-Zemo Svaneti is thought to have increased during recent years, especially in Anaklia and Mestia, but official data show a slight decrease; the reason for this anomaly is not known. The number of visitors in 2016 was 69,200, compared to 69,700 in 2015. The region has significant potential for further development of tourism due to the presence of the ancient culture of Kolkheti and Svaneti, unique cultural-historical monuments, museums, caves, places for rafting and picnicking, landscape mosaics and biological diversity, Zemo Svaneti glaciers, Black Sea proximity, and developing resort zones. Three winter resorts being constructed on Hatsvali and Tetnuldi mountains that will further increase Zemo Svaneti's attraction to tourists. Natural monuments and other notable sites are listed Table 6.9.1.

Table 6.9.1. Cultural and Natural Heritage Sites within Five Kilometers of the Alternative A Corridor

Village Name	Municipality	Region	Monument type	Site Description
Gumbra	Tskaltubo	Imereti	CMNC	
Gumbra	Tskaltubo	Imereti	NMNC	Sataplia Nature Reserve - Natural Monument of National Category.
Tskaltubo	Tskaltubo	Imereti	CMNC	Church of St. George - 1866, at the 2nd district cemetery Church of St. Barbara – Rustaveli Str. Church of the Transfiguration of the Redeemer Church of Presentation of Jesus at The Temple – Shanidze Str.
Chuneshi	Khoni	Imereti	CMNC	"Tsikhis Gverdi" Church - Late Middle Ages, near the village at the old cemetery Church of St. George and the Monastery Niko Lortkipanidze Museum.
Gvishtibi	Tskaltubo	Imereti	N/A	St. George Church – 19th century
Maghlaki	Tskaltubo	Imereti	CMNC	Church of Ascension of Redeemer Church of the Elijah the Prophet *The first mention of the village goes back to 13th century.*
Dedalauri	Khoni	Imereti	N/A	Remains of old bridge.
Udzlouri	Khoni	Imereti	N/A	Church of Redeemer – 1319 century.
Khidi	Khoni	Imereti	CMNC	Remains of old bridge named *Bumbua* – believed to be built by Gnaeus Pompeius Magnus in the 1st century BC.

Table 6.9.1. Cultural and Natural Heritage Sites within Five Kilometers of the Alternative A Corridor

Village Name	Municipality	Region	Monument type	Site Description
				Remains of *Obuji* St. George Church – Late Middle.
Dedalauri	Khoni	Imereti	N/A	Remains of old bridge Church of Virgin Mary – Middle Ages.
Sukhcha	Khoni	Imereti	N/A	
Zemo Khuntsi	Martvili	Samegrelo	CMNC	St. Nino Church – Late Middle Ages Wooden house *Oda* – 19th-20th centuries.
Satsulukidzeo	Khoni	Imereti	CMNC	Remains of St. Kvirike and Ivlita Church – 19th century.
Matkhoji	Khoni	Imereti	CMNC	Matkhoji Castle – Early Middle Ages Archangel Gabriel Church -19th century St. Nino Church (current nunnery) – 11th century renovated in 19th century Tchirkari Cave *The village is first mentioned in 16th century historical chronicles. Near the village was Matkhoji Battle in 1789*
Nakhakhulevi	Khoni	Imereti	N/A	St. Barbaba Church – modern- Modern St. George Church – Modern
Martvili	Martvili	Samegrelo	CMNC	Church of Martvili, 6th-12th centuries
Kvaiti	Martvili	Samegrelo	N/A	
Patara Inchkhuri	Martvili	Samegrelo	CMNC NMNC	Leperchkhelave Church – Late Middle Ages Toba waterfall and Arsen Okrojanashvili Cave natural monument Oniore waterfall natural monument.
Didi Inchkhuri	Martvili	Samegrelo	N/A	
Kvemo Khuntsi	Martvili	Samegrelo	CMNC	Kvemo Khuntsi Church of Redeemer – Late Middle Ages, North of the village on an elevated place.
Meore Balda	Martvili	Samegrelo	NMNC	Motena Cave Natural Monument.
Pirveli Balda	Martvili	Samegrelo	N/A	*Church of* the *Death* of the *Virgin Mary* – 17th century.
Mesame Balda	Martvili	Samegrelo	N/A	
Lebache	Martvili	Samegrelo	N/A	
Patar Tamakoni	Martvili	Samegrelo	CMNC	Jinaantkari Redeemer Church – Middle Ages

Table 6.9.1. Cultural and Natural Heritage Sites within Five Kilometers of the Alternative A Corridor

Village Name	Municipality	Region	Monument type	Site Description
				Tamakoni Castle and remains of a Church– Middle Ages.
Gatchedili	Martvili	Samegrelo	NMNC	Gatchedili Canyon Natural Monument.
Skurdi	Martvili	Samegrelo	NMNC	Motena Cave Natural Monument, 1.5-2 km. east of village Skurdi.
Leskhulukhe	Martvili	Samegrelo	N/A	Cave – Upper Paleolithic and presumably Chalcolichic, Bronze Age and Medieval.
Letsave	Martvili	Samegrelo	N/A	
Vakha	Martvili	Samegrelo	N/A	Church of St. George at the modern cemetery where presumably was an old Church Remains of Jvarishi Church – at the old cemetery.
Salkhino	Martvili	Samegrelo	CMNC	Remains of Castle – Middle Ages Salkhino Garden Remains of Lekvartskhe-Jinota St. George Church Remains of Lekhulordave St. George Church – currently at this place is a small shrine Church of Virgin Mary – Built by Katsia II Dadiani in 1782, newly renovated Remains of Legulordave Castle – Middle Ages Castle – Middle Ages, at the confluence of Tsachkhuri and Tekhuri rivers Dadiani Palace of Salkhino – built by Levan V Dadiani
Tsachkhuri	Martvili	Samegrelo	N/A	Tsachkhuri Archangel Church – built in 7th century, rebuilt in 18th century and renovated in 1967 Khirzeni Castle – Middle Ages, east of Tsachkhuri in 1.5-2 km on a high mountain Remains of a Castle (tower) – Middle Ages, south-east of Tsachkhuri Archangel Church in about 3-4 km.
Etseri	Martvili	Samegrelo	CMNC	Remains of Church "Butchies Sakdari" – Middle Ages, at the cemetery
Kurzu	Martvili	Samegrelo	CMNC	Godobani Church – Middle Ages, at the cemetery Castle – Middle Ages Wooden house *Oda* – 19th-20th centuries, at land of A. Kalandia.
Taia	Chkhorotskhu	Samegrelo	CMNC	Otsindale St. George Church – 14th century, at a high mountain Otsindale north of the village Taia, place Letodue

Table 6.9.1. Cultural and Natural Heritage Sites within Five Kilometers of the Alternative A Corridor

Village Name	Municipality	Region	Monument type	Site Description
				Remains of Lemorgoshie Church – at the cemetery, earlier here was the Darsalia family shrine Remains of Lekare St. George Church – 19th century, in the gorge of river Khasha Otsindale Castle – Middle Ages, located next to Otsindale Church Shrine of Aguna – ancient shrine where Arguna or Aguna was worshiped. Shrine belonged to Todua family.
Mukhuri	Chkhorotskhu	Samegrelo	CMNC	Otsindale Church - 14th century Basilica – Late Middle Ages, altered. At the village cemetery Castle – Developed Middle Ages Sachikvano St. George Church – 18th-19th centuries right bank of the river Khobistskali Remains of Church of Holy Mother of God – Middle Ages, located in the village of Meore Mukhuri Church of St. Nikolas and St. George – modern, located at the right bank of the river Khobistskali next to the bridge "Natskha".
Kanti (Letkanti)	Tsalenjikha	Samegrelo	CMNC	Remains of a Church – Middle Ages, located below the Tarzeni mountain in front of Jumber Kvarackhelia house Tarzeni Naokhvamu – various historical sites including remains of a castle.
Lekakule	Tsalenjikha	Samegrelo	N/A	
Medani	Tsalenjikha	Samegrelo	CMNC	Remains of a Castle – Late Middle Ages, next to the road, on the right bank of the river Chanistskali Remains of Chikovani family Church – 18th-19th centuries, in 200 meters from the castle. The church was wooden.
Lekharchile	Tsalenjikha	Samegrelo	N/A	Lekharchile St. George Church – modern, under construction Lekharchile Alert-Kharchili Shrine. The shrine belongs to Kharchilava family.
Jgali	Tsalenjikha	Samegrelo	CMNC	Church – 13th-14th centuries, in the vicinity of the village Jgali Remains of Archangel's Church – Middle Ages St. George Church of Jgali – Modern. There was an old church at the same place, which was ruined after the Sovietization.
Lesale	Tsalenjikha	Samegrelo	CMNC	Lesale Castle – 15th-16th centuries.
Naguru	Tsalenjikha	Samegrelo	CMNC	Remains of a Church – Middle Ages

Table 6.9.1. Cultural and Natural Heritage Sites within Five Kilometers of the Alternative A Corridor

Village Name	Municipality	Region	Monument type	Site Description
				Mikamgaios (Michael and Gabriel) Church – Middle Ages, located at the right bank of the river Intsira. The church belongs to the Chikovani family.
Chkvaleri	Tsalenjikha	Samegrelo	N/A	Remains of a Church – Middle Ages, located on the Ledzobe Mountain Ledzobe (Kirtlishi) Jikha – Castle of the Middle Ages, located next to the rever Intsra, bellow the mount Ledzobe Remains of Naokhvamu Church – presumably dated to the Middle Ages. It is said that there was a church to the south-west from Mount Ledzebe, on a hill.
Leshamuge	Tsalenjikha	Samegrelo	CMNC	Leshamuge Redeemer Church ("Kirse Mantskhvari") – 6th-7th centuries, recently restored.
Etseri	Tsalenjikha	Samegrelo	CMNC	Remains of Butchie Church (Letsimite St. George Church) - Middle Ages.
Jvari	Tsalenjikha	Samegrelo	CMNC	Remains of a Castle (Gagachi Jikha) – Late Middle Ages, located on the mountain between the rivers Magana and Enguri Remains of Gubani Domed Church – Earli Middle Ages Castle of Omune (Omunes Jikha) – Late Middle Ages, located next to the Svaneti-Samegrelo road All Saints Church – Modern, in Zemo (Upper) Jvari Remains of Khudoni Tower – Late Middle Ages, located next to the Enguri HPP reservoir Remains of Khudoni Kardava family Church – the church was wooden Remains of Tskavashi Church – at the right bank of the river Magana. The church was wooden Remains of Lepie Church (wooden) – located in the goarge 5 mk from the village Jvari Lematue Church of the Andrew the First-Called (Prōtoklētos) – modern, located in the Matua family district Remains of Zemo Lematue Church (wooden)- located at the Pipia family cemetery Naka Tower – Middle Ages, location is unknown Laberashi Castle – Early Middle Ages, located on the moumtain chain between the revers Enguri and Magana.

Table 6.9.1. Cultural and Natural Heritage Sites within Five Kilometers of the Alternative A Corridor

Village Name	Municipality	Region	Monument type	Site Description
Paluri	Tsalenjikha	Samegrelo	N/A	Open air Neolithic site – Materials are stored at the Dadiani Palaces Historical and Architectural Museum Early Iron Age Cemetery – 8th -6th c. BC
Etserperdi	Tsalenjikha	Samegrelo	N/A	Church of St. George, "Cheokhvame" (White Shrine) – 14th-15th centuries.
Tchale	Tsalenjikha	Samegrelo	CMNC	Open air Middle Paleolithic site "Cheokhvame" Church – Late Middle Ages Wooden house (*Oda)* and a wine cellar – 19th century.
Lia	Tsalenjikha	Samegrelo	CMNC	Dia Kirsa Castle – Middle Ages, located at the east of the village on a hill Remains of Dida Kirsa Church – Earli middle Ages, located in about 100 m. east from the castle (archaeological excavations) Remains of Makharia Church and a fortification wall – Middle Ages, located between the villages of Lia and Chkhori Makharia St. George Church (wooden) – 2nd half of 19th century, renovated in 2000 under the leadership of nun Akempsime Remains of the Lia St. George Church – next to the village centre is said the there was a cemetery and a wooden church Remains of two churches next to Kosta Chikovani yard.

CMNC = National Cultural Heritage Monuments
NMNC = National Natural Heritage Monuments
N/A = Not Applicable. Monument is not given a formal status

7. Environmental and Social Risks and Impacts

This Chapter describes potential environmental and socioeconomic impacts during construction and operation phases of the project. The assessment was conducted using the methodology described in Chapter 5. The assessment of potential impacts was based on the activities described in chapter 3 and the baseline conditions in Chapter 6 and covers both project alternatives. When potential impacts could be more than minor, the assessment describes measures that will be taken to avoid or reduce the potential impacts. The Environmental and Social Management Plan and the Monitoring Plan in Chapter 8 then summarizes all mitigation requirements and describes how impacts will be monitored.

The impact assessment was conducted considering all major receptors both for construction and operation phases. When there could be adverse impacts, mitigation measures were identified and selected using the mitigation hierarchy.

The chapter is organized as follows:

Section 7.1: potential impacts on the physical environment, including landscapes and views of residents and visitors (subsection 7.1.1), land use (7.1.2), geology, geohazards, and soil (7.1.3), air quality (7.1.4), noise (7.1.5), and surface water and groundwater (7.1.6); the effects of climate change on the line are described in subsection 7.1.7

Section 7.2: potential impacts on the biological environment, including flora (7.2.1) and fauna (7.2.2)

Section 7.3: potential impacts on people and socioeconomic conditions, including health and safety (7.3.1), physical and economic displacement (7.3.2), worker health, safety, and welfare (7.3.3), economic conditions (7.3.4)

Section 7.4: potential impacts on cultural heritage

Section 7.5: comparison of alternatives

Section 7.6: summary of potential impacts (7.6.1) and preferred alternative (7.6.2).

Each chapter summarizes activities that have potential to affect sensitive receptors, evaluates sensitivity of potential receptors, evaluates the significance of potential impacts, and identifies actions to avoid or reduce the potential impacts.

7.1. *Potential Impacts on Physical Environment*

7.1.1. Potential impacts on landscapes and views

This section describes project impacts on landscapes and visual receptors. Several aspects of the project will be visible to residents and visitors to the area, including construction activities, towers, roads, and corridors.

In most cases, conductors (wires) will be visible from only a short distance and so are of limited concern. However, towers will be up to 44 meters tall and would extend above the landscape, including the tallest surrounding trees. Taking into consideration the lattice framework of the towers, their height, their relative height compared to other structures (trees and buildings), and the sensitivity of the human eye, it is unlikely that most viewers would be able to see the towers or conductors at a distance greater than five kilometers. Although the towers could be visible from greater distances when located on high mountain ridges, this would be most likely to happen only periodically during very clear weather conditions. Therefore, a five-kilometer limit, measured from the centerline of the corridor, was used in visual modelling. Figure 7.1.1 and Figure 7.1.2 show the areas within five kilometers of the corridor from which one or more towers and/or parts of the transmission line could be visible, based on topography. The maps also show protected cultural and natural sites.

As described in Chapter 6, the Alternative A corridor primarily runs through forest and land currently or previously used for agriculture. Forests are fragmented in most cases although in some areas they are more intact. In populated areas, particularly at the ends of the line, the transmission line will take its place among other lines.

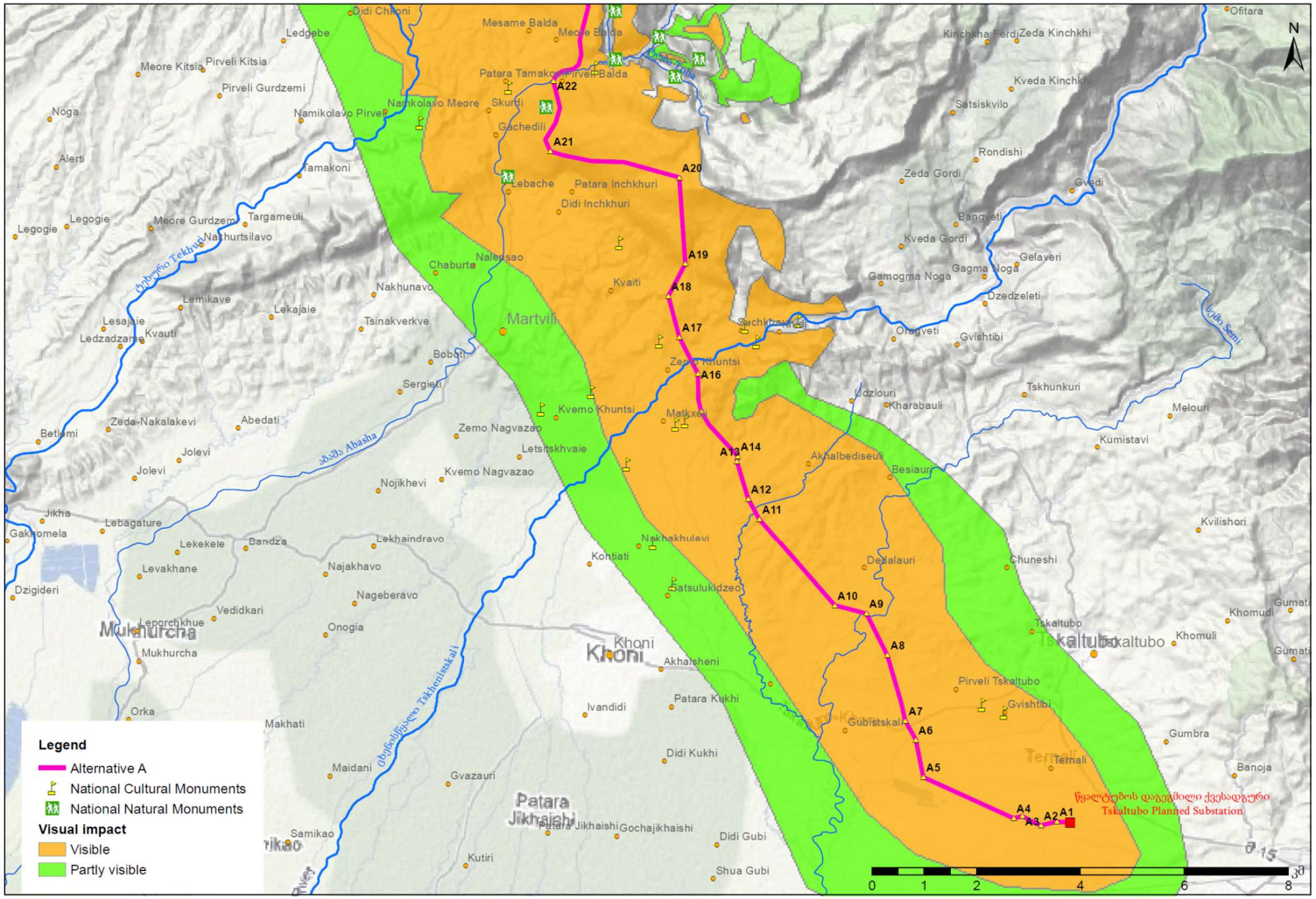


Figure 7.1.1 Areas from which towers and line could be visible within 5km of Alternative A centerline (Part 1)

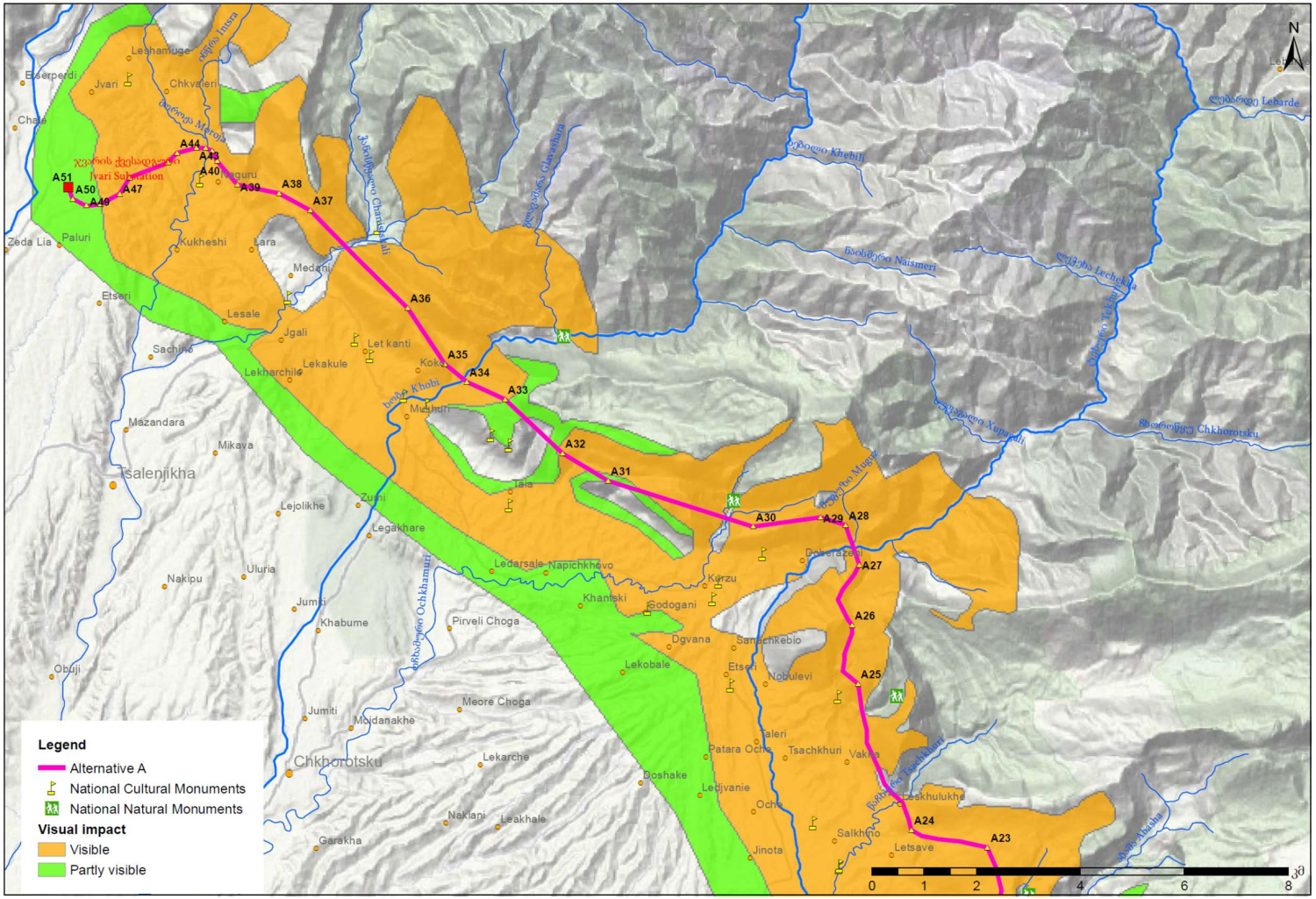


Figure 7.1.2 Areas from which towers and line could be visible within 5km of Alternative A centerline (Part 2)

Potential impacts on landscapes and views

Direct impacts on views of the landscape could occur through obstruction of views or intrusion of new elements into views of receptors. The selection of lattice towers will eliminate obstruction and reduce intrusion to some extent. However, the insertion of new steel towers and the conductors between towers will have an intrusive effect on those who have become accustomed to current views or who expect something different.

Construction and maintenance activities. In general, construction and maintenance activities in the corridor could be visible, especially in areas that are obscured by trees. In forests, construction and maintenance itself would be less visible, and very localized. Other than at the Tskaltubo substation, construction in any one location will take only a few weeks so activities would be visible for only a few days or weeks.

Presence of the towers and conductors. The towers could be visible above the forest for several kilometers, and the conductors may be visible from a somewhat shorter distance. Similarly, the towers will intrude on the views of tourists and recreational visitors to in the area.

Visual impact Is generally determined by the way human receptors perceive the landscape changes. The degree of impact is subjective and thus will vary between individuals. However, general statements concerning sensitivity can still be made. The sensitivity of visual receptors and views over the transmission line will depend on the location and type of visual receptor, as well as the nature of the landscape itself and the expectations of the receptor. Potential visual receptors in the region would include local residents, travelers, visitors, and tourists. Table 7.1.1 describes the sensitivity to changes in landscape and views by various receptors.

Table 7.1.1. Sensitivity of Visual Receptors

Receptor	Sensitivity to Change	Sensitive Areas
Tourists	High	Cultural and natural attractions, resorts: Most sensitive would be visitors to cultural and natural attractions, who would come to visit cultural sites and enjoy the natural environment.
Residents	Medium	Populated areas: local residents will find the change in views to be intrusive initially, but most would become accustomed to the changed views quickly.
Travelers	Low	Roads and rail line: travelers would be exposed for only very brief periods.

The most important impact could be expected to be on tourists and others who come to visit cultural and natural attractions such as Motena cave, Balda canyon and monastery, the access road to Oniore and Toba waterfalls, Tsachkhuru monastery and Ochkhamuri waterfall. The duration of visits would

be limited, but enjoyment of the tourist area could be diminished during their visits to the area. This would be most important on sites on high ground, since sites surrounded by forests would have restricted visibility. The impacts would be greater under Alternative A because more cultural heritage sites are near the corridor, but that would be at least partly balanced by the larger number of residents whose customary views would change.

People who live near the transmission line would experience a change in their customary views, and those who live in houses nearer the corridor would be most affected. Although towers could be seen in the distance up to about five kilometers away, the more significant views would be within about 500 meters, with the line much less noticeable at longer distances. Table 7.1.2 shows the number of residential houses at distances up to 500 meters from the centerline of the corridor. At about 3.5 occupants per household, the line could be intrusively visible to about 1,831 people under alternative A and 3,203 under alternative B. However, residents would become accustomed to the view and the intrusiveness would diminish relatively quickly over time.

Table 7.1.2. Distance of Residences from Centerline of Transmission Line Corridors

Municipality	Number of residential houses within distance from centrerline (m)							
	Alternative A				Alternative B			
	37.5	150	250	500	37.5	150	250	500
Tskaltubo	0	0	2	81	0	0	2	81
Khoni	0	13	32	101	0	13	31	97
Martvili	0	43	84	186	2	47	113	365
Chkhorotsku	0	0	1	5	2	15	49	122
Tsalenjikha	0	21	56	150	1	38	86	250
Totals	*0*	*77*	*175*	*523*	*5*	*113*	*281*	*915*

Mitigation measures

During corridor optimization, Alternative A corridor was designed to be farther away from populated areas, which also made it closer to many tourist and natural attractions. Being aware of this, several towers were moved slightly so the line would be less visible, including from the Ochkhomuri waterfalls and Balda canyon. When the contractor makes the final design, even more improvements may be possible.

Regardless, however, there is little that can be done to avoid some intrusion on residents' and tourists' viewsheds in some areas, as described above. However, by blocking views of the line for some areas, the terrain will block views and help control the overall significance of the impact. Overall, it is not expected that the visual impact would significantly detract from the overall attractiveness of the tourist areas, and residents would quickly become accustomed to the change in views of the corridor, towers and conductors. Residents near the substation would hardly notice the towers and line after

construction since there is another substation nearby. In forested areas it will be important that trees not be cut to the ground, but rather at a height of one or more meters. This will reduce the visual impact at least a small amount as well as providing other benefits, as described in other sections. Travellers on roads will be within view of the line for only the few minutes it would take to pass the corridor, so there would be limited or no impact. Table 7.1.3 summarizes the significance of the potential impacts.

Table 7.1.3. Significance of potential impacts on landscapes and views

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A	
			Magnitude & duration of impact	Significance
Alternatives A and B				
Tourists	High	Disruption of views from heritage sites due to construction and permanent presence of towers, conductors, and corridor of lower vegetation	Medium permanent (temporary for individuals)	Moderate adverse
Residents near corridor	Medium	Disruption of current views due to construction and permanent presence of towers, conductors, and corridor of lower vegetation	Low permanent	Negligible adverse
Residents near substation	Low	Disruption to current views of unused agricultural land due to construction and permanent presence of towers, lines and substation	Low permanent	Negligible adverse
Travelers/ visitors	Low	Disruption of natural views due to construction and permanent presence of towers, line, and corridor of lower vegetation	Very low temporary	Negligible Adverse
Alternative B				
Tourists	High	Disruption of views due to construction and permanent presence of towers, conductors, and corridor of lower vegetation	Medium permanent (temporary for individuals)	Moderate adverse
Residents (more for Alternative B)	Medium	Disruption of current views due to construction and permanent presence of towers, conductors, and corridor of lower vegetation	Medium permanent	Minor adverse
Residents near substation	Low	Disruption to current views of unused agricultural land due to construction and permanent presence of towers, lines and substation	Low permanent	Negligible adverse
Travellers/visitors	Low	Disruption of current views due to construction and permanent presence of towers, line, and corridor of lower vegetation	Very low temporary	Negligible Adverse
Others are the same as for Alternative B				

7.1.2. Potential impacts on land use

This section describes the potential impacts of the project on existing land uses. Land use categories for the transmission line corridor and substation are described in Chapter 6. The approximate extent of each land use category that could be affected was estimated using detailed aerial photographs, pilotless drones with video and photo recording, Google Earth images, cadastral registration maps, and site reconnaissance visits. Land use (and habitat) sensitivity criteria are also introduced in this section, together with other characteristics of potential impacts (e.g. magnitude of change, duration, reversibility, etc.). It is noted that remote sensing had to be used in some areas since some sections of the corridor are located in areas with difficult access.

Activities with potential impacts on land use, and area affected

Table 7.1.4 shows the categories of land use and the amount of land that would be affected temporarily or permanently. All land in the 74.5-meter safety zone will be indirectly affected, as there will be restrictions on future use and a few buildings to demolish.

Table 7.1.4. Land Use Affected by Transmission Line and Substation

Category of land	No. towers	Length of corridor	Land to be acquired (ha)	Land to be under easement (ha)
Alternative A				
Forest Fund land	111	46.59	n/a	
Unused, partially forested and bush land	64	23.43	2.56	121.37
Annual crops	20	6.81	0.80	52.89
Perennial crops (orchards)	10	2.45	0.4	17.4436
Substation (agricultural not cultivated)	0	0.0	14.0	0.0
Totals	205	79.2	3.76	191.71
Alternative B				
Forest Fund land	15	21	n/a	
Unused, partially forested and bush land	149	32.05	5.96	227.58
Annual crops	30	10	1	72
Perennial crops (orchards)	17	5.2	0.7	38.4
Substation (agricultural not cultivated)	0	0.0	14.0	0.0
Totals	211	72	21.84	337.62

- Notes:
- Totals may not add up due to rounding error
- Length of corridor in each land use type based on number of towers and the average distance between towers
- Assumes all access roads are new, permanent, and in corridor, which leads to significant worst-case overestimates
- Land to be acquired includes 400m^2 per tower and 14 hectares for the Tskaltubo substation
- Land to be under easement includes land in 74.5m corridor, excluding land to be acquired and land that may be leased by the contractors

As can be seen, changes could be permanent or temporary, and direct or indirect, as follows:

Permanent direct impacts. Such impacts will occur on the entire 74.5-meter-wide corridor, including land acquired by GSE and land whose use will be restricted with easements. Land will be acquired at the substation, tower locations and, under Alternative B, a few residential plots, and also for roads (in practice, relatively little land will be needed for roads). It is noted that, following the on-going World Bank-funded Transmission Grid Strengthening project, most livelihoods activities such as production of annual crops, fruits trees that do not grow over 4 meters in height, and grazing of livestock are allowed under easement agreements.[1] Thus, the restriction on use will be legal but will not require changes in most uses. However, forests and orchards will be changed permanently, since trees will be cut in the vegetation control zone and not allowed to grow over four meters high in future (this is also an overestimate, as not all trees will need to be cut, especially in the 10-15 percent of the corridor where the conductors will pass high over the trees). Note that for Alternative B, vegetation control is assumed to be necessary only on land that is actually in forest, not land categorized as forest land.

Temporary direct impacts. Land use will be affected temporarily during the construction phase for construction storage and staging areas near the tower locations and for a construction staging area and offices near the substation. Conductoring (that is, stringing the wires) would stay mostly on access roads and in the corridor, so would affect little or no additional land; however, it is possible that conductor stringing would cause some impacts on land plots (damage to crops, fences, etc.).

Temporary restriction of access to land. Access to areas under construction will be limited while construction is underway. Such restrictions will be temporary, no more than a few hours or days, and would apply to relatively small areas at any one time. Since it is unknown where such temporary restriction may apply and for how long, such temporary impacts are not provided in the table. In addition, improper construction practices can lead to temporary or permanent changes in land use due to erosion, landslides, unnecessary vegetation clearance, landslides, and other undesirable events. These can be controlled with appropriate mitigation measures, as described below and in various other sections of this Chapter.

As described in Chapter 3, the exact locations of the towers, roads and the exact route of the corridor will not be known until the construction contractor completes the final design. Therefore, potentially affected land resources are based on the corridors proposed in the Feasibility Study, with Alternative A and optimized during development of the ESIA. Potential impacts on land use pattern presented below are thus an estimate although, given the very low intensity in land use in project areas, the actual scale of project impact on land use pattern will not be very different.

[1] See Resettlement Policy Framework (RPF) of the Project for more details about land use restrictions

The most significant immediate impact to forests will be in the areas that have to be cleared to the ground at tower sites and new roads, and where vegetation over four meters high will need to be cut initially and every 6-8 years thereafter. Non-forested land, including agricultural land, orchards, grasslands, shrubs, and non-vegetated rocky ground would be affected most by land clearing for towers, new roads, and the substation. Vegetation control should affect very little of this land because most vegetation on these lands is generally not over four meters high and so does not need cutting; only very small areas have nut and fruit orchards and thus will need to be cut. In addition, there could be minor and short-term effects on land in the corridor between towers during conductoring (that is, while wires are being strung between towers). Such impacts will be confined mostly to the roads although prior experience shows that they may also cause some disturbance to local populations. The permanent impact in forests would be a permanent transition from tall trees to a vegetated zone of shrubs and lower trees.

There would also be restrictions on land uses in the entire corridor, including prohibitions on constructing buildings in the corridor and on using equipment if it could come into contact with the line. Other than in orchards, which could not be over four meters tall, other non-forested land should be able to continue with the same use, since agriculture could continue throughout the corridor and grazing could continue across the entire corridor and even in the area between tower foundations. Only for orchards and
lands where there are buildings would restrictions have any real effect on current land use. [2]

To aid in the impact analysis, land use sensitivity criteria were developed based on land use types and relative environmental and social value. Land use sensitivity criteria are shown in Table 7.1.5.

Table 7.1.5. Land Use Sensitivity Criteria

Sensitivity	Criteria
High	– Protected areas: Samegrelo 1 and 2 Emerald Sites and immediately adjacent land – Largely intact forests – Small areas surrounding trees or shrubs of conservation concern in agricultural or other disturbed areas
Medium	– Regionally and economically important land uses: actively used agricultural and pasture lands – Fragmented and modified forests, mostly intact shrubs – Orchards
Low	– Abandoned brownfield areas and degraded landscapes – Areas of urban intrusion or uncontrolled development – Agricultural land not in use

[2] See Resettlement Policy Framework (RPF) of this project for more details.

Mitigation measures

To prevent unnecessary impacts on land use, the contractor will be required to implement a number of mitigation measures, including:

Wherever feasible, placing towers in forest land on high ground so that conductors can pass high over trees and not require cutting. As it was mentioned previously, the rules set by the European Standard EN 50341-1:2012 regarding conductor clearances considering maximum conductor sag and swing due to wind will be applied together with the requirements of Georgian Decree #366 regarding the protection zones of high voltage transmission lines.

Limiting the construction footprint to the absolute minimum needed. This will include demarcating and marking all construction areas and roads, and training workers to remain within authorized demarcated areas.

Keeping all construction vehicles and equipment on prepared roads and construction areas and prohibiting moving onto adjacent lands.

Limiting impacts away from construction zones by controlling drainage and erosion, implementing proper spoil and waste management practices

Providing prompt compensation in case of damages to crops or property, as required by the RPF.

Impact summary and significance

As described in previous sections, most forest land is fragmented and under significant anthropogenic pressure and even some relatively intact forested areas are being affected by commercial or personal logging. Nearly all the land that could affected is considered to be of medium sensitivity. Agricultural land not being used, and small areas of roads and developed lands, are of low sensitivity. In addition, the small plots where individual plant species of conservation concern are found could be considered highly sensitive, and these plots are generally found in larger areas of medium and even low sensitivity where isolated specimens may persist. Equally important, the amount of land in any land use category that could be affected by the transmission line and substation is only a tiny fraction of the total land in these categories in the regions and the municipalities. This is discussed in more detail in section 7.2.1 on flora and habitats.

As summarized in Table 7.1.6, the overall impact on land uses will be minor, although impacts from towers and permanent roads in the best-preserved forest fragments and where species of conservation concern are located would be higher.

Table 7.1.6. Summary of Significance of Potential Impacts to Land Use

Type of land	Sensitivity	Potential Impact	Magnitude and duration	Impact significance
Alternative A				
Protected areas	High	No direct impact except visual from a few locations	Very low permanent	Negligible adverse
Forests	Medium	Cut to <4m in corridor	Medium permanent	Moderate adverse
Agricultural land	Medium	Land acquired and cleared for use by towers and substation	Medium permanent	Moderate adverse
Agricultural land	Medium	Land under transmission line and at construcation storage areas	Low temporary	Minor adverse
Developed areas	Low-medium	Temporary disturbance during construction & conductoring	Very low temporary	Negligible adverse
Alternative B				
Protected areas	High	No direct impact except visual from a few locations	Very low permanent	Negligible adverse
Forests	Medium	Cut to <4m in corridor	Minor permanent	Minor to negligible adverse
Agricultural land	Medium	Land cleared for use by towers and substation	High permanent or temporary	Moderate adverse
Agricultural land	Medium	Land under transmission line and at construction storage areas	Medium temporary	Minor adverse
Developed areas	Low-medium	Temporary disturbance during construction & conductoring	Low temporary	Negligible adverse

7.1.3. Potential impacts on geology, soils and geohazards

This section describes potential impacts of the project on geologic conditions and soils, which are described in 6.4. The section also addresses potential geohazards associated with project implementation. The assessment is based on observations made during visits to the corridor, descriptions of geological conditions in the scientific literature, and samples of rock and soil taken by core drilling and test pits.

The sensitivity of local soil and geological conditions, which largely determines the magnitude of the potential impact, is presented in Table 7.1.7. The primary factors affecting sensitivity include slope, susceptibility of soil to erosion, vegetation condition, presence/potential of landslides, and rock stability.

Table 7.1.7. Sensitivity Criteria for Geology, Soils and Geohazards

Sensitivity	Criteria
High	- Steep slopes where roads or towers will be located - Large areas already prone to landslide - Areas where towers cannot be anchored on stable bedrock - Karst formations
Medium	- Moderate slopes where roads or towers will be located - Small-size landslide-prone areas - Areas where stable bedrock is difficult to reach or anchor into
Low	- Minor slopes and flat lands - Areas where complete vegetation clearing is not required, or vegetation could be restored post construction

As can be seen in Table 7.1.7, the slope of the land where construction takes place is a key factor in sensitivity, in particular sensitivity to the potential for significant erosion and landslide. Table 7.1.8 shows the relative slope of estimated tower locations and the length of the corridor. As can be seen, a substantial number of towers under Alternative A will be on land that may be subject to erosion or even landslides, with a lesser number under Alternative B. This will necessitate careful attention to the implementation of mitigation measures.

Table 7.1.8. Topography of tower locations and corridor

Degree of slope	Alternative A		Alternative B	
	No. towers	Area affected (ha)	No. towers	Area affected (ha)
Flat	65	5.2	85	6.8
Slight slope	30	2.4	52	4.2
Moderate slope	36	2.9	73	5.8
Steep slope	74	5.9	5	0.04
Totals	***205***	***16.4***	***211***	***16.9***

Note:
- Steepness of slopes at tower locations are based on visits to selected locations and review of aerial photographs and topographic maps
- Area is based on 400 square meters for towers and 400 square meters for construction areas per tower

Activities with potential impacts on geology, soils and geohazards

Project activities with the greatest potential to affect geology and soils include land-clearing and vegetation removal, and excavation for tower foundations and the substation. Specific activities and potential effects include:

Erosion and topsoil loss due to land clearing and vegetation removal along roads, at tower foundations/excavations, at construction staging areas, along new roads, and at the substation. As noted, the risk is much higher on steeper slopes, although some extreme slopes may have little or no topsoil to erode. Exposing the soil to precipitation and run-off makes it subject to erosion, which in turn leads to loss of topsoil and less fertile soils, and erosion can smother areas where the eroded material comes to rest. Loss of fertile top soil may impact agricultural productivity, causing loss in livelihoods. Depending on weather conditions, permanent or temporary measures to ensure proper drainage may need to be taken. If proper care is not taken, some areas could become more susceptible to landslides and mudslides, and valuable topsoil could be lost and this in turn could affect the success of the program to restore vegetation.

It is important to note that the standard of the roads does not need to be high, as they must only ensure that heavy equipment can pass one or a few times. Although the ESIA assumes that permanent roads will be established all along the corridor, this is a significant overestimate of the actual program: some existing roads will be used, and most roads will not require actual construction but only minor or no preparation.

Erosion and topsoil loss due to excavation. To install the tower foundations, it will be necessary to remove topsoil from an area of about 1.5-2 meters square (that is, up to four square meters) at each of the four corners of each tower and then dig through soil and rock to a depth of 1-2 meters. At the substation site, the substation will be built on top of the current ground surface, but some excavation may be required. Excavations will generate up to several cubic meters of topsoil and spoil at each tower location and some amount at the substation. If not properly stored and protected, soil and spoil can erode and damage other land where it is deposited, and topsoil can be lost. Again, the risk is higher in mountainous areas and on other steep slopes.

Blasting may be required for excavations in rocky terrain. Blasting activities produce seismic waves that could locally produce rockslides, landslides or mudslides in geologically unstable areas. Blasting in mountainous terrain during the late winter and early spring could also set off avalanches in areas of a heavy snowpack.

Tower installation. The presence of the heavy towers will increase the burden on rock and soil, and in steep terrain could lead to failure and to mass movement of material down slopes (that is, landslide) if the bearing capacity is not sufficient to withstand the increased load.

Machinery operations. Movement of vehicles and equipment can compact soil, leading to losses in fertility and hinder the re-establishment of vegetation; particularly in wet weather conditions, it can also cause rutting, disturb soil, and increase the potential for erosion. The risk is higher in areas that have not been disturbed and in areas where the rocks pass through lowlands with clay soils. The risk is very low in the Colchis lowlands and the nearby Jvari territory.

Opening borrow pits or other excavations to acquire fill material. If spoil generated at individual sites is not enough for site stabilization and restoration, the contractor may need to buy rock and spoil or to exploit suitable deposits. It is likely that little or no additional spoil will be needed. However, without proper management and closure, quarries or borrow pits lead to significant erosion and, in steep terrain, landslides or mudslides.

Tower failures can occur if they are installed on weak foundation rock and this can both disrupt electricity transmission and disturb the ground surface and damage surrounding land.

Other than tower failure, all the foregoing activities and impacts would take place during construction. Some minor maintenance of roads will be needed during operation, especially to maintain proper drainage and prevent erosion, but such minor works will not cause significant impacts. On occasions, towers or conductors may need to be replaced, in which case many of the same risks would apply but on a much smaller scale.

Mitigation measures

To ensure that impacts on soil and geological conditions are avoided or minimized, GSE will require the contractor to undertake the following measures:

As noted above and in Chapter 3, the construction contractor will select the final locations of towers, which will in turn determine the exact corridor, and of access roads that may be required. As recommended in the geoengineering study that was part of the Feasibility Study, the contractor will be required to conduct more intense surveys and identify locations and areas at high risk of geologic hazards before locating towers. These locations and areas will need to be avoided, or if they cannot be avoided, the contractor will have to implement mitigation measures specified by a geological engineer or other qualified professional in order to prevent increases in future landslide potential.

The contractor will control precipitation run-on and run-off from construction sites as necessary to prevent erosion from affecting areas outside the demarcated construction zone or access roads. The contractor will ensure that proper drainage is maintained throughout construction and on permanent works (roads, towers) so that it cannot destabilize slopes, damage vegetation, or erode topsoil.

If additional soil and spoil is needed beyond that generated by the project, the contractor will take it only from licensed quarries/vendors, and/or ensure that any self-exploitation activities be properly licensed, with full site restoration and reinstatement of vegetation when more soil and spoil are no longer needed.

To decrease erosion risk, the contractor (and GSE during operation) will not cut trees and shrubs closer to the ground than at least 0.7-1.0 meters from the ground and will leave roots intact. This is different than common practice in Georgia forests, where timber volume is maximized by cutting to the top of roots. The contractor and/or GSE will be required to consult with the National Forestry Agency to determine if 0.7-1.0 meters of the trunks of trees and shrubs will be allowed. In addition, trees will be felled in such a way that trunks do not roll down hillsides but are well-controlled.

The contractor will remove and store topsoil from construction sites where soil is deeper than a few centimeters and where steep slopes allow removal and will prevent erosion of topsoil from stockpiles.

The contractor will manage spoil from excavations in a way that prevents damage outside the boundaries of the construction zone. The contractor will be prohibited from dumping spoil down hillsides, or onto living vegetation in any area, and will be required to return excess spoil to the site once construction is complete.

When construction is complete, the contractor will remove piles and depressions and will grade the area to a stable contour, using as much spoil as possible. The contractor will then spread the stored topsoil over the site before planting or broadcasting seeds of native species of grass and/or shrubs. The contractor will monitor the success of the revegetation program and make repairs as needed to ensure the establishment of self-sustaining maximum ground cover before demobilization.

The contractor will restore tower footprints and other areas disturbed by construction as soon as practicable once major construction activity in that area is complete, and while construction is continuing at other sites, and not to wait until construction is complete along the entire corridor.

The Supervision Consultant will monitor reinstatement and revegetation on a continuous basis and will report progress and issues in monthly reports to GSE. In addition. GSE will monitor site restoration at least once per quarter during construction and require remedial action as needed.

Before the contractor is paid the final invoice and allowed to demobilize, the Supervision Consultant and GSE will inspect all construction sites and areas to verify tower footprints, temporary roads, assembly and support areas, temporary roads, and all other areas disturbed by construction have been restored as required. If the contractor does not take action to correct damages, the Supervision Consultant has the option to employ a third party to restore damaged areas and reduce contractor payments by the amount paid to the third party.

If blasting is required, it will be designed and supervised by licensed and authorized professionals. Explosives will be transported, stored, used, and debris managed in full compliance with national law and good international industry practice.

Impact summary and significance

The significance of potential on soils, geology and geohazards is summarized in Table 7.1.9. Besides the mitigations identified above, potential impacts will be heavily influenced by geologic conditions in the mountainous terrain, with much lower risk of landslides with the presence of hard volcanogenic and limestone-dolomite formations. It is noted that the feasibility placed substantial reliance on the results of geologic investigations to choose the current estimated corridor, including significant effort to avoid landslide-prone areas.

Table 7.1.9. Significance of Potential Impacts to Soils and Geohazards

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & Duration of Impact	Significance
Alternative A				
Ground surface (rock & soil) on steep & moderate slopes affected by land-clearing	High	Significant erosion of topsoil, impaired ability to support vegetation, increased landslide potential	High permanent	Moderate adverse
Ground surface (rock & soil) on steep & moderate slopes affected by vegetation cutting	High	Minor erosion, minor increase in landslide risk	Medium permanent or temporary	Minor adverse
Ground surface on slight slopes and flat land	Low-medium	Slight to moderate erosion of topsoil	Medium temporary	Low to moderate

Table 7.1.9. Significance of Potential Impacts to Soils and Geohazards

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & Duration of Impact	Significance
				adverse
Alternative B				
Ground surface (rock & soil) on steep & moderate slopes affected by land-clearing	High	Significant erosion of topsoil, impaired ability to support vegetation, increased landslide potential	Low permanent	Minor adverse
Ground surface (rock & soil) on steep & moderate slopes affected by vegetation cutting	High	Minor erosion, minor increase in landslide risk	Low permanent or temporary	Minor to negligible adverse
Ground surface on slight slopes and flat land	Low-medium	Slight to moderate erosion of topsoil	Medium-high temporary	Moderate adverse

7.1.4. Potential impacts on air quality

This section describes the potential impacts the project may have on air quality and noise. Georgia law requires that ESIAs include air quality modelling, an inventory of air emission sources, and establishment of maximum permissible concentrations. Annex 5 provides such modelling, inventory, and concentrations. This section describes potential impacts in simpler terms.

Activities with potential impacts on air quality

The primary activities that could generate air pollution include:

Movement of vehicles and equipment on unpaved roads and construction zones will create dust. Dust can be a nuisance by interfering with driving and breathing and can damage vegetation and property. The amount of dust will depend on vehicle speed (higher speeds and larger size vehicles generate more dust), silt content (smaller particle size of silt vs sand will increase dust generation), and moisture content of the ground surface (wet vs dry). Very small particles can be carried relatively long distances by high winds, but usually dust settles within a few tens of meters of where it is created.

Earthworks (clearing and grubbing) and excavations at construction sites will also create dust. Again, the distance dust is carried would depend on particle size and wind; most dust would settle within a short distance of the site except under windy conditions.

Open piles of topsoil and spoil, and areas of bare earth at constructions sites can generate dust in windy conditions.

Operation of combustion engines in vehicles, heavy equipment, generators, and other equipment will generate exhaust gases that contain air pollutants, including particulates (soot), sulfur dioxide, nitrogen oxides, and volatile organic compounds. These pollutants can affect visibility, create smog, and damage health. Even during peak levels of construction, the project will be using a relatively small number of vehicles and machines, especially when compared with the number already operating in

the region. Unless engines are not maintained properly, emissions can be expected to be low and within Georgian standards.

Sulfur hexafluoride (SF6) may leak from gas-insulated equipment, which is typically used as an insulator for electrical switching equipment and in cables, tubular transmission lines, and transformers. If gas-insulated equipment is installed and used at the substation, it could lead SF6 into the air. SF6 is a powerful greenhouse gas that must be managed carefully to avoid leaks and emissions.

Operation of transmission lines will generate ozone and nitrogen oxides each of which can be harmful to health at high concentrations. In general, emissions are very low, and concentrations of these pollutants will be much lower than Georgian standards.

Mitigation measures

GSE will require the contractor to implement the following measures during construction:

Dampen roads and construction areas during dry conditions, as needed to prevent visible dust

Dampen or cover soil and spoil stockpiles to eliminate dust generation

Maintain all vehicles and other engines according to manufacturers' instructions

If any vehicle or other combustion engine emit black smoke, take it out of service until properly maintained and there are no longer visible emissions

Include the cost and practicality of SF6 management in the analysis of options for dielectric equipment selection

If SF6 is to be used, install and use only equipment with low leakage rate (>99% control), ensure equipment is properly labelled/marked, train staff in proper inspection and maintenance to prevent leakage, and manage decommissioning to minimize SF6 leakage.

Impact summary and significance

Table 7.1.10 summarizes the significance of potential impacts. Sensitivity of residents and visitors is classified as "high" since current air quality is generally good. In summary, impacts could be minor or moderate if not mitigated, but are expected to be negligible with proper dust and emissions control and low with even partial controls.

Table 7.1.10. Significance of Potential Impacts to Air Quality

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude of Impact and Duration	Significance
Alternatives A and B				
Residents and visitors	High	Fugitive dust generation during construction and maintenance	Very low (Alt A) Low (Alt B), temporary	Minor adverse
		Vehicle emissions during construction and	Very low temporary	Negligible adverse

Table 7.1.10. Significance of Potential Impacts to Air Quality

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude of Impact and Duration	Significance
		maintenance		
		SF6 emissions during operation of substation	Very low permanent	Negligible adverse
		Ozone and NOx emissions during operation of transmission line	Very low permanent	Minor adverse
Vegetation	Medium	Fugitive dust settling on plant and interfering with growth	Low temporary	Minor adverse

7.1.5. Potential impacts due to noise

Noise can be defined as unwanted sound. The sound pressure level emitted from any activity that can be heard by a receiver depends on several factors. The impact of the noise depends not only on the sound pressure level but on such things as the frequency spectrum, the duration of the noise, the time of day, the activity causing the noise, and the attitude of the receiver. All these aspects must be considered in assessing the impact of noise.

There is no information on existing background noise levels in the study area. However, the area is largely rural and from social interviews and visits to the site, it appears there are no major noise sources along much of the Alternative A corridor, although at road crossings and the rail crossing there would be intermittent traffic noise and at either end of the line there would be noise from human activities. Noise levels would be slightly higher along the Alternative B corridor, since it is closer to settlements.

Table 7.1.11 provides examples of common noises and the average subjective response. These levels have been used to interpret the noise levels discussed in this assessment and in establishing criteria for the assessment of impact significance.

Table 7.1.11. Typical Sound Pressure Levels Associated with Common Noise Sources

Sound Pressure Level (dBA)	Subjective Evaluation	Environment	
		Outdoor	Indoor
140	Deafening	Jet aircraft at 25m	
130	Threshold of pain	Jet aircraft during take-off at a distance of 100m	
120	Threshold of feeling	Elevated Train	Hard rock band
110		Jet flyover at 300m	Inside propeller plane

Table 7.1.11. Typical Sound Pressure Levels Associated with Common Noise Sources

Sound Pressure Level (dBA)	Subjective Evaluation	Environment	
		Outdoor	Indoor
100	Very Loud	Power mower, motorcycle at 8m, car horn at 3m, crowd noise at football game	
90		Propeller plane flyover at 300m, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately Loud	Diesel truck (65kph) at 16m	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	Jet aircraft cabin during flight	Close conversation, vacuum cleaner, electric typewriter
60	Moderate	Air-conditioner condenser at 5m, near highway traffic	General office
50	Quiet		Private office
40		Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV and stereo)
20		Rustling leaves	Quiet theater, whisper
10	Just audible		Human breathing
0	Threshold of hearing		

Adapted from Egan 1988 and from Ramsey and Sleeper, 1994.

Various standards exist for noise; this assessment uses those developed by the World Health Organization (WHO), which are shown in Table 7.1.12.

Table 7.1.12. Noise Level Guidelines

Location	General effect	Noise level, LAeq [dB] Time base [hours]	
		Daytime (0700-2200)	Night (2200-0700)
Residential	Annoyance when outdoors	55	45
Industrial, commercial	Interference with hearing	70	70

Source: WHO 1999 and World Bank Group EHS General Guidelines 2007

The sensitivity of the receptor depends on the type of receptor and proximity to the noise. The persons nearest the transmission line would be those living in residences, the nearest of which is about 150 meters from the corridor's edge under Alternative A and somewhat closer under Alternative B.

Sources of noise from the project:

The primary sources of noise will include:

Machinery and equipment used during construction

Vehicles moving along roads

Workforce activities (voices, movement, etc.) at construction and maintenance sites during construction and maintenance

Energized transmission line, especially in wet or humid weather

Operating electrical equipment at the substation

Workforce activities at the operating substation and occasional maintenance activities on the transmission line.

The loudest noise could be expected to come from vehicles, machinery, and equipment. Table 7.1.13 gives typical noise levels a short distance from a construction site.

Table 7.1.13. Typical Noise Levels near Construction Sites

Equipment Description	Average measured noise level @ 15m (L_{max} dBA	Equipment Description	Average measured noise level @ 15m (L_{max} dBA
Auger Drill Rig	84	Excavator	81
Backhoe	78	Front End Loader	79
Chain Saw	84	Generator	81
Compressor (air)	78	Jackhammer	89
Concrete Mixer Truck	79	Man Lift	75
Concrete Pump Truck	81	Pickup Truck	75
Crane	81	Pneumatic Tools	85
Dozer	82	Scraper	84
Dump Truck	76		

Source: US Federal Highway Administration 2017

Distance reduces the sound level that can be heard, with an average of about six decibel (dB) reduction with each doubling of distance. Thus, noise levels from a backhoe (78dB at 15 meters) would be reduced to 72dB at 30 meters, 66db at 60 meters, 60db at 120 meters, and 54dB at 240 meters. Since the nearest residence is about 150 meters away from the corridor, this noise level would only slightly exceed the 55dB standard during daytime hours, even if there were no intervening trees or obstructions and no other noises.

When high-voltage lines are energized, a low crackling or hissing sound (so-called "corona" noise) can be audible directly under the line and for tens of meters away, especially during humid or wet weather. Noise levels are generally low, typically under 50dB under the line and within the corridor. It should not be audible at the edge of the corridor, which would be 30 meters from the energized conductor.

Mitigation measures

To reduce potential impacts from noise, the following measures will be required:

The contractor will mobilize to work sites only between the hours of 0700 and 1900.

When residences are within 0.5 kilometers of the corridor, the contractor will notify occupants before initiating construction works.

If blasting is to take place, the contractor will notify nearby residents as required by Georgian law.

If residences complain of noise, the contractor or GSE will monitor noise at the location of concern and implement mitigation measures if noise levels exceed the standards in Table 7.1.12 or Georgian law.

Ensure that sound mufflers and dampeners on vehicles and equipment are working properly and remove from service any vehicles and equipment that emit excessive noise until noise levels are reduced.

Impact summary and significance

In general, noise will not be a problem if proper mitigation measures are implemented. Table 7.1.14 summarizes the significance of potential impacts.

Table 7.1.14. Significance of Potential Impacts due to Noise

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & Duration of Impact	Significance
Alternatives A and B				
Residents and visitors in rural areas	High	Construction noise	Low temporary	Minor adverse (Moderate for Alternative B)
		Corona noise during operation	Low permanent (in corridor) Negligible (away from corridor)	Negligible to minor adverse
Residents and	Medium to	Construction noise	Low temporary	Minor adverse

Table 7.1.14. Significance of Potential Impacts due to Noise

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & Duration of Impact	Significance
visitors near substation	Low	Corona noise	Very low (>50m) to low (<50m), permanent	Negligible
Fauna within 100-200m	Medium to High	Construction noise	Low permanent	Minor adverse
		Corona noise	Low permanent (in corridor) No change (away from corridor)	Negligible adverse

7.1.6. Potential impact on surface water and groundwater

This section describes direct and indirect impacts of the project on surface water and groundwater resources. GIS-based maps were evaluated to identify and assess surface water drainage systems, floodplains, and groundwater resources in the study area. Each project activity was evaluated with respect to its direct and indirect impacts on hydrologic features, and these impacts are assessed in terms of potentially affected area, sensitivity of receptor, likelihood of occurrence, duration, severity of outcomes, etc., in accordance with the methodology in Chapter 5.

Direct impacts on groundwater are not likely to occur, or to be minimal, due to the small-scale nature of the project at individual locations. In addition, the corridor does not cross wetlands or important lakes or reservoirs.

Activities with potential impacts on surface water or groundwater

Surface water and groundwater could be affected by construction activities near rivers or other surface water, excavations in areas of shallow groundwater, and spills of fuel or other materials into or near water. These are briefly described below.

Construction activities would include land clearing at towers, construction sites, roads, and the substation site as well as vehicle fueling or maintenance that is undertaken near water bodies. Disturbing the ground surface will allow precipitation run-on and run-off to erode soil into nearby surface waters; this could increase total solids and turbidity in surface water, which could affect its use by humans or wildlife and also affect fisheries. Compaction of roads and land clearing could increase surface runoff, which could reduce infiltration, and this in turn could affect groundwater. Finally, working near rivers or streams and crossing small streams with vehicles and equipment could contaminate water with petroleum products and by increase erosion of streambanks and streambeds.

Excavations for tower foundations could intercept shallow groundwater, which may have to be pumped out until foundations are installed.

Spills of fuel, lubricants, paints, or other materials could contaminate surface water and/or groundwater directly or could contaminate soils that are then eroded into surface water.

Concrete works can also contaminate water and contribute excess alkalinity, which would make it less useful by people or wildlife.

Herbicides used for vegetation control could contaminate water. The project will not use herbicides, so there is no risk.

Withdrawal of water for construction purposes (for washing equipment, for use in cement, etc.) could reduce availability of water for other purposes. Consumptive use of water is not considered to be an issue for the project, as the region has adequate water supplies and construction will require only small amounts of water for concrete and other minor uses.

Interruption of floodwaters. Similarly, towers will not be located in drainageways or occupy a significant portion of floodplains, so there is limited or no risk of towers interfering with floodwaters and making floods worse.

The risk to groundwater is considered negligible, as only small localized areas could be affected. The risk to surface water, however, is more of a concern since the corridor and roads will cross several rivers. The sensitivity of surface and groundwater is shown in Table 7.1.15.

Table 7.1.15. Examples of General Sensitivity of the Water Environment to Project Impacts

Sensitivity	Examples
High	River that supports fish with conservation status or provides major fisheries resources Smaller river with good water quality (no pollution sources) Surface or groundwater used for drinking water
Medium	Medium-sized river that supports common fish or provides resource for small-scale fishing River with fair water quality (occasional pollution sources) Surface or groundwater used for industry or agriculture. Small floodplain
Low	Larger rivers Smaller river that do not support fish resources. Waters with poor water quality (pollution discharge sources). Intermittent or no use of surface or groundwater by humans

In general, construction activities would need to take place very close to the rivers, perhaps within 25-50 meters, to have serious potential to affect surface water. Table 7.1.16 gives the distance from the estimated tower locations to rivers crossed by the line.

Table 7.1.16. Towers Located Within 100 Meters of a River

River	Closest Tower	Distance (m)
TskaltubosTskali	AS11	50
Gubistskali	A9	45
Rikhini	A12	78
Abasha	A22	95
Abasha	AS61	45
Abasha	AS62	70
Abasha	AS63	50
Intsra	A41	60
Intsra	A42	90
No name	A46	80
Lebakha	A50	60

As can be seen, only 11 tower locations under Alternative A proposed in the Feasibility Study are within 100 meters of a river, with two being less than 50 meters. No tower location under Alternative B is within 60 meters to a river. At this distance, it is unlikely that erosion from a tower site would reach the water if proper precautions are taken, or that spillage or other activities could affect water.

Since towers will be away from rivers, a higher risk will be where roads cross small streams; such streams may be ephemeral in nature, and disturbance of drainageways could lead to erosion when water flows through the drainage way following rainfall or snowmelt or could lead to contamination from materials carried or on in the vehicles. In addition, stringing conductors between towers will require heavy equipment to cross some streams and drainage ways and to be near riverbanks of larger rivers, and this disturbance could lead to erosion and present the risk of spills.

Mitigation measures

The contractor will be required to implement the following measures during construction, and will implement the relevant measures during operation and maintenance:

Final locations of towers and construction areas will be farther than 50 meters from a flowing stream or saturated land unless the contractor demonstrates to the Supervision Consultant that there is no feasible alternative.

Final locations towers and construction areas will be farther than 15 meters from the drainageway of an ephemeral stream unless the contactor demonstrates to the Supervision Consultant that there is no feasible alternative.

Vehicles and equipment may not work within 50 meters of a flowing stream or 15 meters of an ephemeral stream unless a road is required to run beside or through the streambed/drainageway. The contractor will mark this distance from streams and drainageways.

Vehicles and equipment may not cross streams when the ground is wet. Damage to streambeds caused at road crossings must be repaired as soon as major construction works are completed in the area. For road crossings on unimproved roads that must be used for extended periods, the contractor will use gravel or other material to harden the crossing and prevent damage to the streambed from vehicles and equipment.

Sanitary facilities (toilets) will be provided or otherwise available at or near all work locations. Workers will always be strictly required to use the facilities with penalties for violations. If vendors are used for portable toilets or sewage disposal, the contactor will verify the vendor has proper permits.

Sediment controls will be placed at the downhill/downstream boundary of the construction zone when there is a risk that sediment-laden run-off could leave the construction site and either damage vegetation or reach rivers or streams. Such controls could include sedimentation ponds, silt fences, and/or other measures.

Runon and runoff will be diverted around or otherwise prevented from coming into contact with concrete, including waste concrete, until concrete is fully cured.

Local surface water may not be used to wash trucks and equipment, including especially equipment, batching, and ready-mix truck washing and cleaning.

Washwater from washing trucks, equipment, or concrete will be contained and evaporated, taken for discharge to a sewer, or otherwise managed so it does not contaminate soil or vegetation.

Fueling and vehicle maintenance will take place over drip trays or other impermeable surfaces.

All vehicles and mobile equipment will have spill cleanup kits, and drivers will be trained in the use of the kits.

Herbicides will not be used for vegetation control.

Impact summary and significance

The significance of potential impacts to surface and groundwater resources is summarized in Table 7.1.17. In summary, impacts will be negligible with proper mitigation.

Table 7.1.17. Significance of Potential Impacts on Surface Water and Groundwater

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & Duration of Impact	Significance
Alternatives A and B				
Large streams and rivers	Low-Medium	Sedimentation of streams from erosion due to compaction and soil disturbance	Low temporary	Negligible adverse
		Disruption of flood flows	Very low permanent	None
		Contamination from spills	Low temporary	Negligible adverse
		Contamination from herbicides	No change	None

Table 7.1.17. Significance of Potential Impacts on Surface Water and Groundwater

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & Duration of Impact	Significance
Small streams and drainageways	High	Sedimentation of streams from erosion due to compaction, soil disturbance, and rutting	Medium temporary	Minor adverse
		Disruption of flood flows	Low permanent	Negligible adverse
		Contamination from spills	Medium temporary	Moderate adverse
		Contamination from herbicides	No change	None
Small ponds	Medium	Sedimentation from erosion and bank disturbance	Medium temporary	Minor adverse
		Contamination from spills	Medium temporary, possibly permanent	Moderate adverse
		Contamination from herbicides	No change	None
Groundwater	Medium to High	Reduced recharge due to soil compaction	Low temporary	Negligible adverse
		Contamination from spills	Low permanent	Minor adverse
		Reduced availability due to withdrawals	Very low permanent	None

7.1.7. Potential impacts on climate and from climate change

According to the Environment and Security Initiative (ENVSEC), climate change will affect Georgia by causing higher temperatures, increased precipitation and snow, and more extreme weather events.[3] The United National Development Program has determined the system in Georgia most vulnerable to climate change in Georgia is the Black Sea coastline, followed by agriculture, in particular wheat in eastern Georgia[4].

In general, the transmission line and substation will not affect climate change itself – total carbon emissions from vehicles and engines will be far too low to have any effect. Thus, it will not cause or contribute to changes in weather patterns, precipitation totals or timing, wind, weather, or other events.

[3] Zoï Environment Network. 2011. Climate Change in the South Caucasus.

[4] https://adaptation-undp.org/explore/western-asia/georgia, accessed 27 December 2018.

It is considered unlikely that climate would change enough over the few decades of the project's life to have a significant effect on the line. However, some events exacerbated by climate change could affect the line under some circumstances. Such events could include:

Floods and flash floods. Although the line will cross several rivers, damage from floods is unlikely, as tower foundations will not be in or close to any rivers or waterways (see previous section).

Landslides and mudslides. Rainfall- or snowmelt-induced landslides and mudslides could occur, but the risk to the line is not likely to be significant. Relatively little of the corridor is in areas that could be affected by landslide or mudslide, and required geologic investigations are intended in part to avoid areas prone to slides. In addition, foundations and towers were designed with a safety factor that would lead to resistance to major damage from all but the most severe slides.

Wind. More extreme winds would cause more line breakage or even tower failure. Relatively few towers are on ridgelines exposed to the most extreme winds, and designs are intended to protect against all but the most extreme winds.

Avalanches. Most of the line is on or near the top of low mountains, with no snowpack or glaciers above, and annual snowfall is not enough to allow sufficiently large concentrations of snow that there could be avalanches.

In summary, the line will not contribute to climate change, and is very unlikely to be significantly affected by any manifestation of climate change.

7.2. *Potential Impacts on Biological Environment*

This section describes the potential impact of construction and operation of the transmission line and substation on biodiversity, including flora, fauna, and habitats. It is again emphasized that the final design of the line is not complete – that is, the location of the 74.5-meter corridor within which most impacts will occur has not been selected, but rather only a 300-meter "study" corridor within which the final corridor will be located.

7.2.1. Potential impacts on flora and habitats

Activities with potential impacts on flora and habitats

Project activities with the greatest potential to impact habitats, flora, and fauna include establishment of construction areas at towers and substation, construction of towers, clearing the vegetation control zone, construction of new substation, installation of conductor wires, and routine maintenance activities of the transmission line. The total area that could be affected by construction and operation of the transmission line was shown in Table 7.1.4

Clearing and Construction. Clearing of the land at areas to be used for construction, for placing towers and substation and laying access/service roads will involve removal of most or all vegetation to the ground and will transform floral composition (depending on the characteristics of existing vegetation),

topographic features, and installed height of the transmission lines. Habitat alteration could include destruction or fragmentation of forest, loss of wildlife feeding/hunting and areas, and introduction of nonnative invasive plant species. In addition, animals and plants could be injured or crushed, and individual animals could be disturbed by noise and visual disturbance due to the presence of machinery, construction workers, transmission towers, and associated equipment. Some impacts would be permanent (for example, tree removal, use of land for foundations/towers, establishment of roads, etc.) and some would be temporary (for example, vegetation removal/crushing in construction preparation areas, human activities during construction and maintenance).

Up to 800 square meters will be cleared for every tower, including 400 square meters to be acquired for the tower itself and 400 square meters for temporary use as a construction storage and staging area. Land will be cleared for new roads, which will be four to six meters wide, averaging about five. The figures shown in Table 7.1.4 are significant overestimates, as they assume all new roads that will be in the corridor and will be permanent. Most roads will be four meters wide. Some access roads will be in place only during construction, while a few will be retained as service roads. Also, there are some existing local roads – forest roads or those leading to agricultural farms – that will be suitable for the use during project implementation.

Vegetation clearance. Cutting trees and other vegetation within the 54.5-meter vegetation control zone will alter forest habitats by converting them either to a different type of forest or to grasslands or shrublands. This will affect forest vegetation but little or no vegetation control should be necessary on other categories of land use, as described in section 7.1.2. In forests, trees and other high vegetation will have to be cut to a height of less than four meters but not necessarily to the ground, if that the National Forestry Agency finds that advisable and agrees. In the cleared forest lands, low-growing vegetative cover will be restored while tall trees cannot be allowed to grow back. The area where tree cutting will be necessary is overestimated in this ESIA report because there will be 11 or more spans between two towers that would have conductors stringed high above the forest canopy and not requiring vegetation control. This will amount to over ten percent of the total corridor length.

Conductor Installation. Impacts from installation of transmission conductor wires would be relatively short-term and temporary and would be confined to roads as much as possible. Vehicular traffic to pull the conductor wire and undertake unloading at laydown areas could cause physical impacts such as damaging or crushing plants; all within the corridor. Installation of conductor wires over the entire length of the transmission corridor will cause noise and visual disturbance that could temporarily disturb and displace various animal and bird species.

Maintenance. Every 6-8 years, trees and other high-growing plants will be cut back as needed to maintain clearance from the line. In addition, disturbance from noise and physical presence of machinery and workers will occur during periodic activities such as mowing, tree cutting/trimming, inspections, tower and foundation repairs, and repairs or replacement of damaged or downed transmission wires.

As described in sections 7.1.2 and 7.2.1, the corridor passes through land with limited biodiversity value for a substantial part of its length under Alternative A and over for 80 percent of its length under Alternative B. This includes agricultural land, grassland/grazing land, and sections of severely

fragmented forests. Even in these areas, however, there are occasional specimens of trees or other plants of conservation concern.

Most of the remaining sections of the transmission line pass through Colchic broadleaved forests with small areas of riparian forest. Although most of this forested land (nearly all under Alternative B) is affected by human activities and is mostly fragmented, the species composition and ecological functions remain viable along most of the corridor. Under Alternative A they are like those of the nearby Emerald Sites.

Important habitats falling under the project influence should be view in the context. Table 7.2.1 shows the corridor length passing through the State Forest Fund in each municipality and in total, and the area within the 54.5-meter vegetation control zone. This area is placed in the context by columns 4 and 5, which show the total forested area within each municipality and overall, and the percentage of the total forested areas that could be affected by establishment of the towers, roads, temporary construction zones, and vegetation control. As can be seen, the potentially affected areas will represent a small fraction of the overall forested area in the regions, substantially less than one percent in every municipality.

Table 7.2.1. Forests Potentially Affected by Vegetation Control under Alternative A

1	2	3	4	5
Municipality	**Length of corridor through forests (km)**	**Forested area subject to vegetation control (ha)**	**Forest Fund territory (ha)**	**% total forest land potentially affected**
Tskaltubo	0.0	0.0	50325	0.00%
Khoni	2.0	7.5	16578	0.04%
Martvili	28.2	153.1	45460	0.34%
Chkhorotskhu	10.8	59.6	29534	0.20%
Tsalenjikha	3.1	16.9	36100	0.05%
Totals	*44.2*	*237.1*	*177997*	*0.13%*
Figures may different slightly from other tables due to rounding errors				

Table 7.2.2 below shows the total area that will be affected by three main types of vegetation, which effectively represent major categories of habitats. It is important to note that the land affected is significantly overestimated: all trees will not need to be cut in forests, access roads will neither be all in the corridor, nor all new, nor all permanent, and the construction zones and tower sites are assumed to be much larger than they will actually be. As noted earlier, the area of affected Colchic forest under Alternative A would be reduced by well over 10 percent due to the 11 long spans where the conductor will pass high above the trees, with no danger of damage to the line in case of treefall. Within the context of similar and even higher quality forest habitat in the regions, the amount of forest habitat to be affected is insignificant under Alternative A and even less under Alternative B.

Table 7.2.2. Area of Habitats to be Affected

Type of habitat	Alternative A			Alternative B		
	Number of towers	Length of corridor (km)	Area of direct impact (ha)	Number of towers	Length of corridor (km)	Area of direct impact (ha)
Colchic mixed forest	100	38.7	187.5	16	5.4	6.2
Riparian forest	10	3.9	18.7	4	1.4	5.1
Secondary vegetation	95	36.7	44.8	191	64.8	61.7
Total	***205***	***79.3***	***251.1***	***211***	***71.6***	***73.0***

Notes:
Area of direct impact for forests would be the vegetation control zone, which would include roads, tower sites, construction areas
Areas of direct impact in secondary vegetation would be roads, tower sites, substation, and construction areas at tower sites and substation
Assumes access roads are all new, in the corridor, and permanent
Does not account for conductoring operations, which are assumed to affect only roads

Invasive species

Invasive species tend to occupy disturbed places after vegetation clearing, most significantly when it is cleared to the ground. In the areas near the transmission line and substation at least two invasive species are known: Ragweed (*Ambrosia artemisifoia*) and Canada goldenrod (*Solidago canadensis*). Both species occupy disturbed places in west Georgia, including in all habitats crossed by the corridor, and spread very intensively. Therefore, it is likely that these species will appear in the corridor where land is cleared for towers and roads, if they are not a. already present. They would not be expected to come where vegetation is only cut but the land is not cleared.

In order to decrease risk of spread of invasive plants, the land cleared for placement of towers and roads will be seeded or planted with native plants when construction is complete. In addition, transmission line corridor will be periodically inspected during operation by a qualified specialist and if invasive species are found, they will be removed manually, and the area be re-seeded with native species.

Natural and critical habitats

The World Bank places special requirements on projects if they may have impacts on “natural habitat” or “critical habitat”. Table 7.2.3 presents the World Bank’s definitions and the applicability to the transmission line corridor.

Table 7.2.3. World Bank Habitat Categories

World Bank Definition	Applicability
Critical habitat *(ESS6, paragraph 23)* is defined as areas with high biodiversity importance or value including:	
Habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches	Under alternative A, affected forest habitats may be supporting CR or EN flora and fauna species but are not of significant importance to those species as potentially impacted habitats represent only a small fraction of similar higher-value forest habitats with similar flora and fauna in the region. The detailed botanical and zoological baseline studies of the project corridor have identified 10 protected species listed in the table 7.2.5. All mentioned species are vulnerable, but none of them is critically endangered. Also, the protected species do not form dense stands and appear in the study area mostly as solitary individuals (see annex 4). The list of protected animal species occurring in the corridor is provided in the table 7.2.10. 4 endangered and 5 endemic species may be present in the project corridor. Others listed in the table are considered as vulnerable. The habitat area of all endangered and endemic species is much wider, and the project will impact only very small portion of habitats occupied by the mentioned species. Large portion of similar habitats is located to the north from the corridor and is protected under the Emerald network.
Habitat of significant importance to endemic or restricted-range species	Forest habitats affected under Alternative A may support endemic or restricted-range species but are not considered significant to those species as they represent only a small fraction of similar higher-value forest habitats in the regions.
Habitat supporting globally or nationally significant concentrations of migratory or congregatory species	Habitats under both alternatives do not support significant concentrations of migratory or congregatory species; major migratory flyways are closer to the Black Sea coast.
Highly threatened or unique ecosystems	Ecosystems falling under the project impact are not highly threatened or unique. They represent fraction of similar habitats present elsewhere in Georgia.
Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above	Corridors under both alternatives do not serve ecological functions that are needed to maintain the viability of biodiversity values.
Natural habitats (*ESS6, paragraph 21)* are areas composed of viable assemblages of plant and/or animal species of largely native origin and/or	The entire region demonstrates features of anthropological impact. However, well over half of the Alternative A corridor supports mostly native species and relatively intact assemblages of species, although fragmentation has

Table 7.2.3. World Bank Habitat Categories

World Bank Definition	Applicability
where human activity has not essentially modified an area's primary ecology function and species composition.	damaged assemblages somewhat in most sections. A small percentage of the natural habitat is mostly intact and not significantly fragmented. Alternative B corridor supports little or no natural habitat.
Modified habitats *(ESS 6, paragraph 19)* are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition… The ESS applies to those areas of modified habitat that includes significant biodiversity value.	About one-fourth of the forest affected under Alternative A and all non-forested sections are modified. However, some sections of forest affected under Alternative A and small portions of the secondary vegetation provide significant biodiversity value, including flora species of concern, with the remainder significantly degraded.

Surveys undertaken as part of this ESIA did not identify any critical habitat. Although some areas affected under Alternative A are of high biodiversity value, none of them are significantly important to species of conservation concern, support significant concentrations of migratory or congregatory species, or have ecological functions or characteristics that are needed to maintain the areas' biodiversity values. Although the forest habitats are threatened, the Category A corridor is sufficiently far into the difficult mountainous terrain; so, these habitat types are not considered to be in significant danger for the foreseeable future, and the forests are not unique, in that they are widely spread over the regions.

Colchic and riparian forests could be considered natural habitats, particularly the small intact sections and the more common larger fragments, since their ecological functions and species compositions still resemble more unmodified areas in the Emerald Sites and elsewhere. As a result, these forests are considered of medium or high sensitivity as shown in Table 7.2.6 below. The specific level of fragmentation and human impact in each section determine whether flora and habitat should be considered of medium or high sensitivity. Figure 7.2.3 and 7.2.4 show habitats considered natural or modified, which closely corresponds to the sensitivity maps. Table 7.2.4 shows the area that could be affected in each category of habitat. All the natural habitats are in forests, while modified habitat includes both forested and non-forested land.

Table 7.2.4. Areas of Habitat that could be Affected

Type of habitat	Alternative A		Alternative B	
	Length (km)	Area (ha)	Length (km)	Area (ha)
Critical	0	0.0	0	0.0
Natural	38.6	210.4	0	0.0

Table 7.2.4. Areas of Habitat that could be Affected

Type of habitat	Alternative A		Alternative B	
	Length (km)	Area (ha)	Length (km)	Area (ha)
Modified	40.7	221.8	73.6	400.8
Totals	*79.3*	*432.2*	*73.6*	*400.8*

Types of habitats are from World Bank's ESS 6 (see section 2.3.1 for definitions). Totals may not match other tables due to rounding errors

Potential impacts on plant species of conservation concern

Table 7.2.5 lists the 10 species of trees and one species of shrub encountered in the transmission line corridor that are on the Georgia Red List. Based on the literature review and surveys, other species of concern are not considered likely to be found in the corridor.

Table 7.2.5. Species of Conservation Concern in the Transmission Line Corridor

№	English name	Scientific Name	Conservation status
1	Imeretian oak	*Quercus imeretina*	VU
2	Colchic oak	*Quercus hartwissiana*	VU
3	Chestnut	*Castanea sativa*	VU
4	Colchic box tree	*Buxus colchica*	VU
5	Caucasian wingnut	*Pterocarya pterocarpa*	VU
6	European yew	*Taxus baccata*	VU
7	Walnut	*Juglans regia*	VU
8	Field elm	*Ulmus foliacea (=Ulmus minor)*	VU
9	Colchis bladdernut	*Staphyllea colchica*	VU
10	True laurel (shrub)	*Laurus nobilis*	VU

The likelihood of encountering Imeretian and Colchic Oak is considered low. These species occur at lower elevations (0-300 meters amsl) and most habitats at low elevations are agricultural land with isolated trees in the vicinity of settlements. The forests in these areas are completely modified and/or severely fragmented, and as a result most or all individual trees can be avoided during the detailed design works.

The likelihood of impacts on Colchic box trees is also low but could occur. The height of box trees does not exceed two meters; since vegetation within the corridor can be up to four meters high, the impact would occur only where land was cleared at tower locations and roads, since vegetation within the corridor can be up to four meters high. The impact can also be avoided or reduced through effective planning of access road routes and tower locations at the detailed design stage.

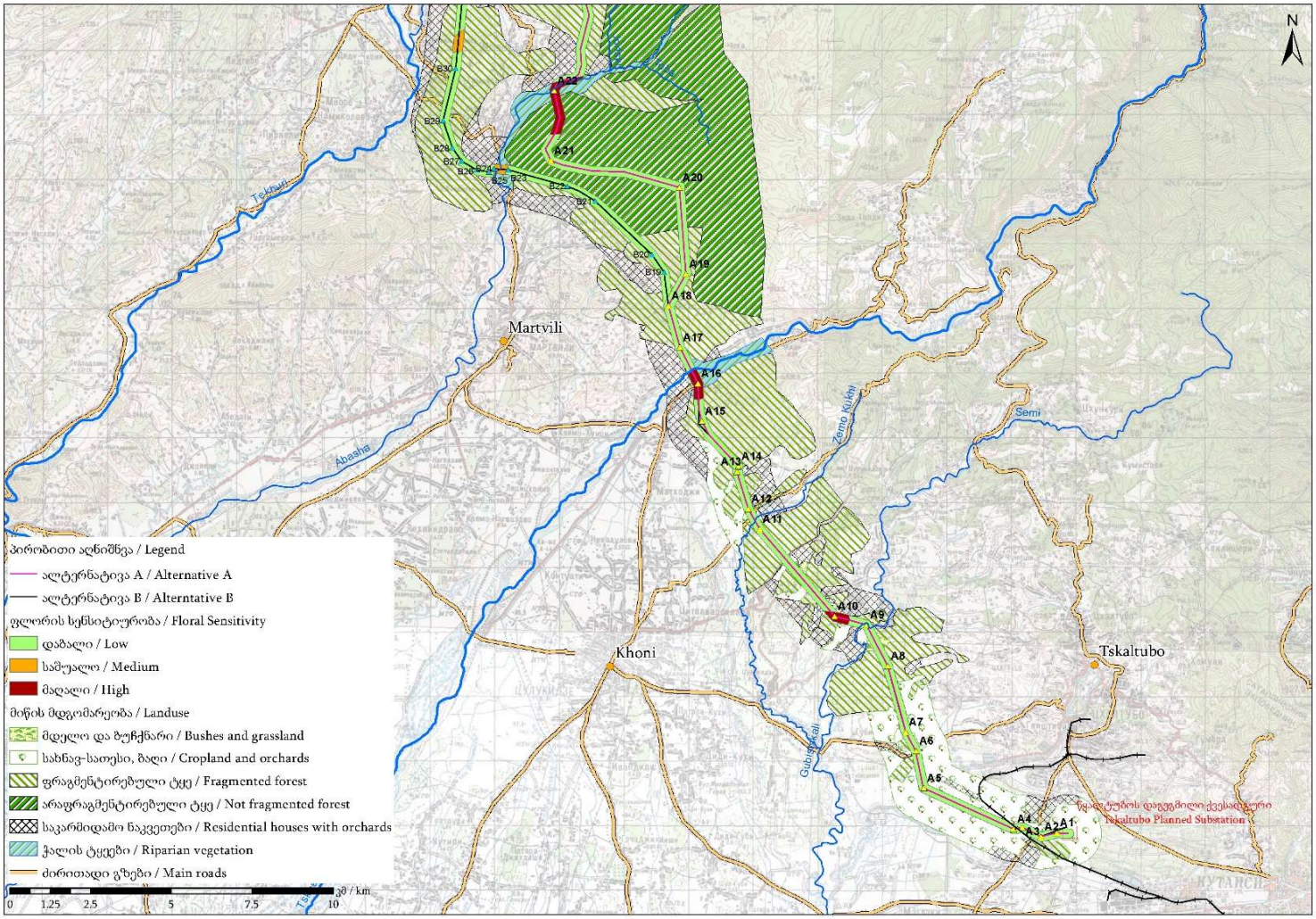


Figure 7.2.1 Floral and Habitat Sensitivity and Land Uses on the Transmission Line Corridor (Part 1)

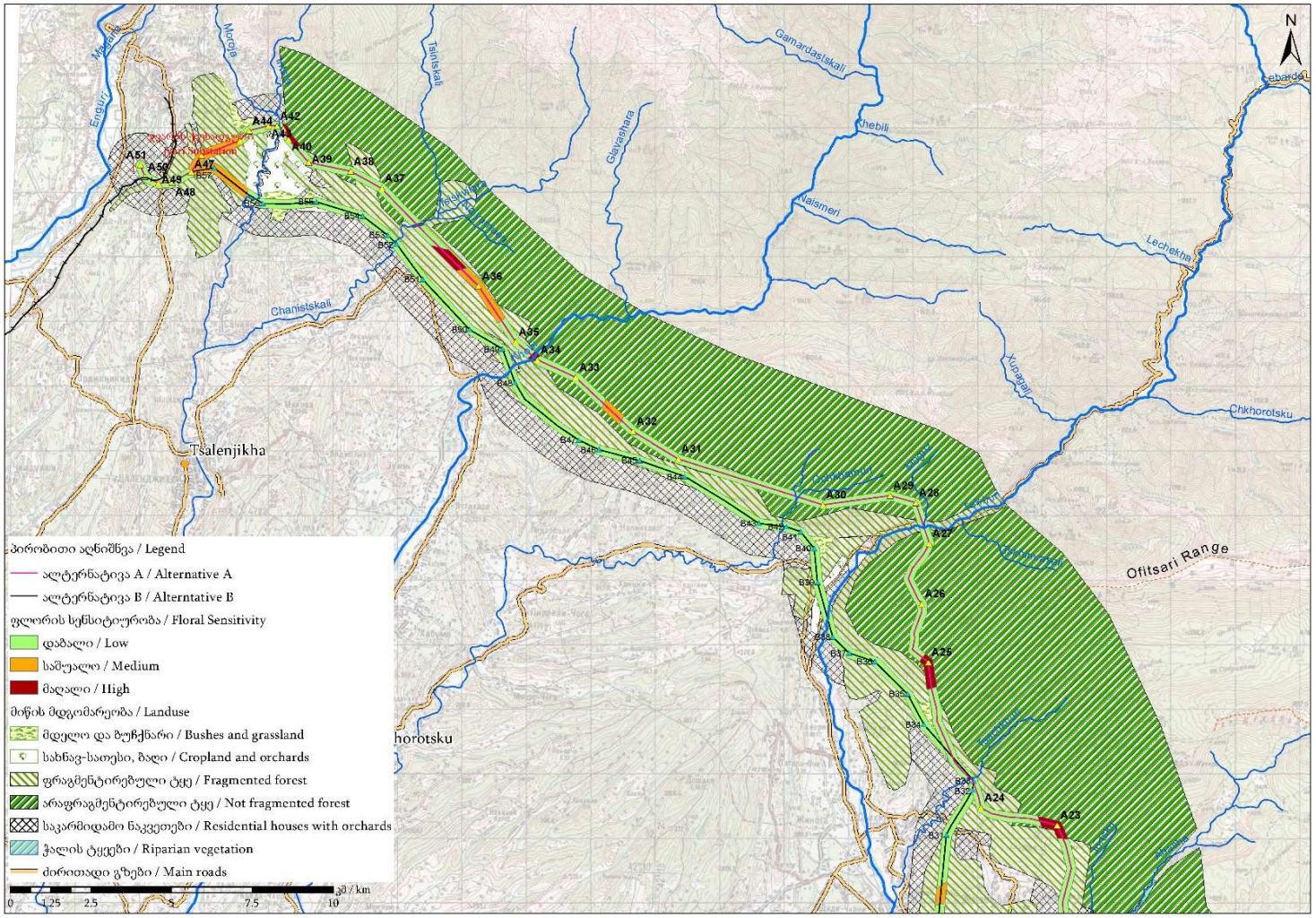


Figure 7.2.2 Floral and Habitat Sensitivity and Land Uses on the Transmission Line Corridor (Part 2)

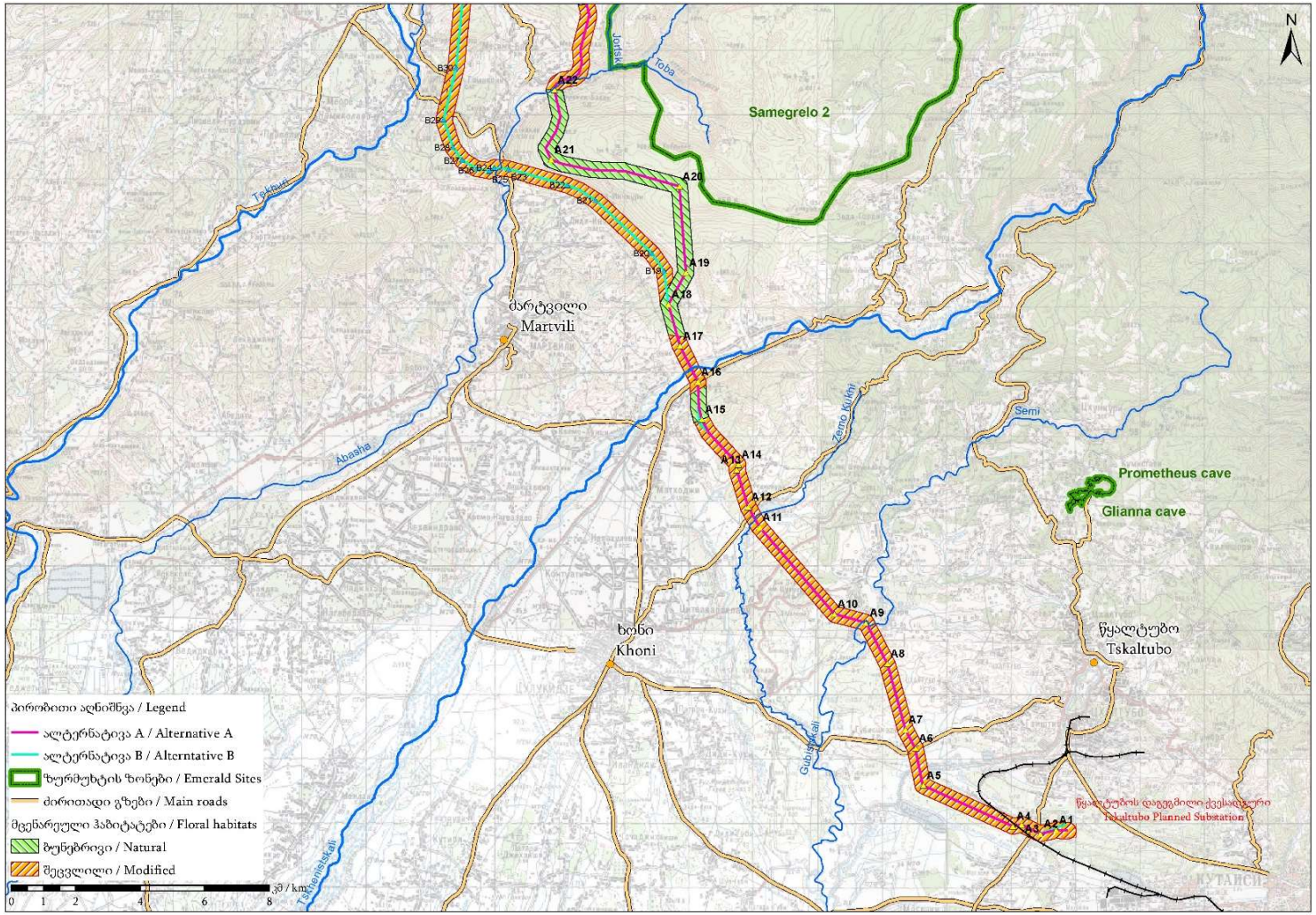


Figure 7.2.3 Natural and Modified Habitat on the Transmission Line Corridor (Part 1)

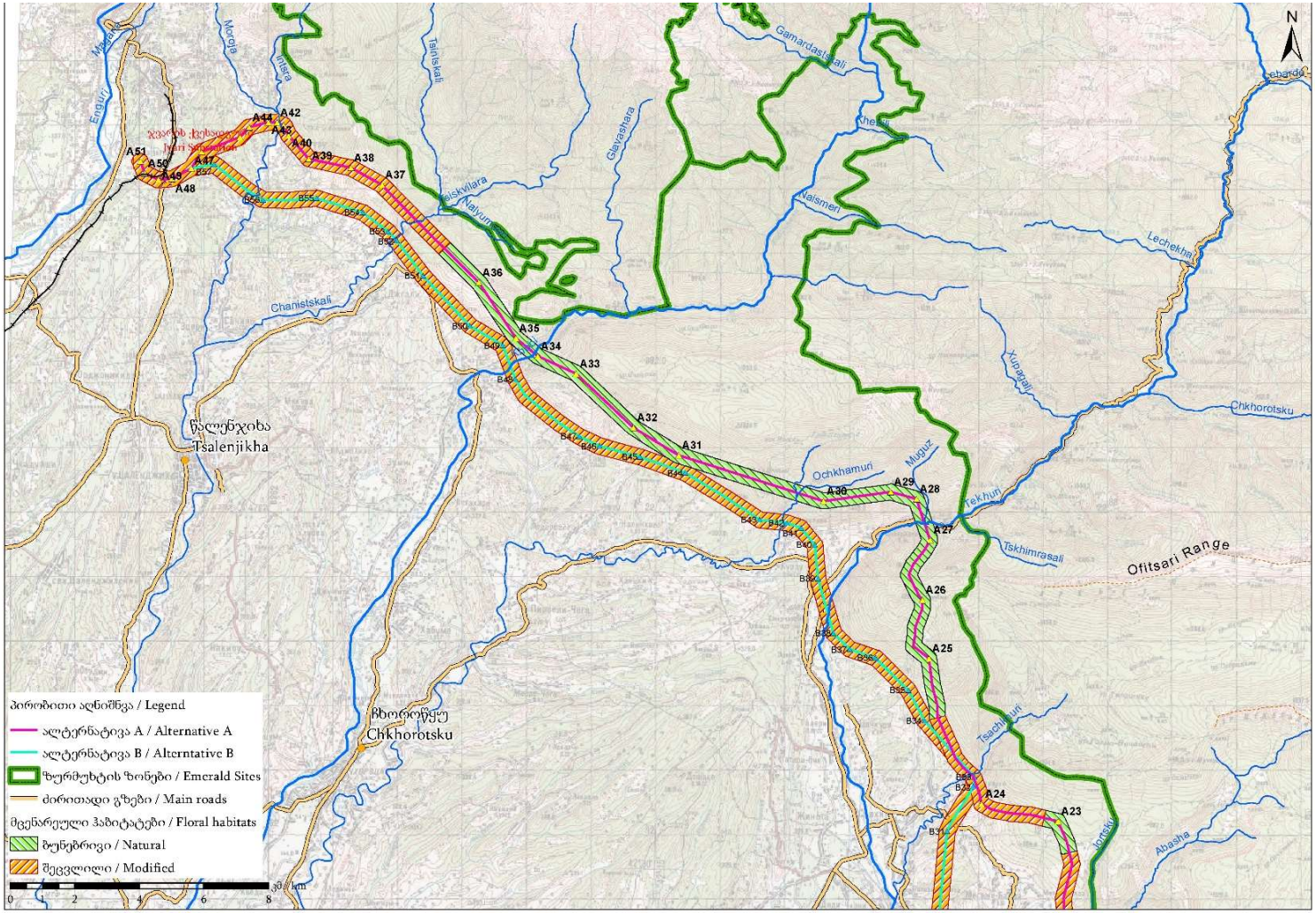


Figure 7.2.4 Natural and Modified Habitat on the Transmission Line Corridor (Part 2)

Sweet chestnut has very wide distribution in the forests of western Georgia, including within the corridor. Although it may be possible to avoid some trees and stands of trees, it is likely that some will need to cut under Alternative A.

Similarly, it will be difficult to entirely avoid Walnut (Persian walnut) trees entirely, which would be most encountered in riparian and secondary vegetation areas. However, these trees are planted and artificially cultivated, so owners would be compensated under Georgian law and World Bank requirements. Thus, the impact on Walnuts is expected to be negligible even under Alternative A.

Concerning Caucasian wingnut, the survey identified only a few individuals in the Alternative A project corridor (only three trees), which suggests that impacts can be avoided. Even if individual trees are found in the vegetation control zone of the corridor, the loss from trimming would not be significant because this species is tolerant to trimming and easily develops dense offspring.

The European yew is widely distributed plant in Georgia and it appears in every forest type. Thus, there is a high chance of impacting European yew in the project corridor (the detailed survey located only about 10 individual trees). It is likely that at least a few trees will need to be cut under Alternative A and some may need to be removed at tower locations. However, the overall impact would be low and significant risk for the species is not expected.

Colchic bladdernut is a rare species that appears only in the foothills of forests of the greater Caucasus. This tree is up to three meters in height and easily tolerates trimming. The detailed field survey indicated the presence of at least a few individuals in the Alternative A project corridor. The extent of Colchic bladdernut distribution area is limited, but impact on Colchic bladdernut can probably be avoided because trees are not high and will not have to be cut in complete clearance zone. In case trees are cut, planting new trees will be necessary.

Field elm is widely distributed in Georgia, even so only very limited number of trees were identified during the surveys. Even if a few trees need to be cut, there would be no impact on the species.

Laurel has restricted distribution in the wild and appears only in few places in west Georgia. However, the trees are also low and can be considered as bushes. Only if laurel is found at tower locations or along routes of new roads would there be any impact, since it could be left alone in the vegetation control zone in the rest of the corridor. In addition, it is important to note that laurel is widely cultivated in agricultural zones and gardens. The project would have no impact on laurel populations.

Significance of Potential Impacts on Flora and Habitats

Two main criteria were used in considering the potential impact on flora and habitat: the area of impact and the sensitivity of impacted area, including the likely presence of species and populations of conservation concern.

One of the principal requirements of the World Bank is that biodiversity offsets should be considered when residual negative impacts on natural habitats remain despite best efforts to avoid, minimize and mitigate them; and where offsets are appropriate, follow "like-for-like or better" principle and are supported by stakeholders. Need for and feasibility of biodiversity offsets to address residual impacts of Jvari-Tskaltubo transmission line construction and operation on the natural habitats will be analyzed during preparation of a Biodiversity Management Plan (BMP) prior to commencement of works. As noted previously, the area of Colchic and riparian forests that could be affected constitutes a very small percentage of similar and even more valuable habitat in this and nearby regions. The habitats present in the middle section of the power line corridor are considered natural only because of presence of solitary appearance of protected species. Noteworthily, the potentially impacted area is defined in a highly conservative manner because assumptions pertaining new roads, tree-felling and other factors are overestimated. Actual impacts are going to be considerably less than these estimates, because some existing roads will be used rather than constructing new; not entire areas under the power line will require clearance of high-growing vegetation, etc. These habitats have suffered from anthropogenic pressure in the area. However, habitat clearance, where that is required, will affect protected species. Therefore, mitigation measures will be required to support impacted vulnerable species.

Sensitivity for flora and habitats is shown in Table 7.2.6.

Table 7.2.6. Flora and Habitat Sensitivity Criteria

Sensitivity	Criteria
Flora	
High	Protected areas: Samegrelo 1 and 2 Emerald Sites and immediately adjacent land Largely intact (non-fragmented) forests Small areas surrounding trees or shrubs of conservation concern in forests or non-forested land in agricultural or other disturbed areas
Medium	Fragmented and modified forests with at least partly intact ecosystems, mostly intact shrublands Orchards
Low	Used and unused agricultural land, grazing land/grasslands Mostly rocky or barren land, overgrazed grasslands Areas of urban intrusion or uncontrolled development in rural areas
Habitats	
High	Insignificantly fragmented natural habitat
Medium	Significantly fragmented natural habitat Modified habitats supporting populations/species of conservation concern
Low	Severely degraded modified forest habitats Agricultural land and other non-forested land of secondary vegetation (except isolated plant specimens of conservation concern

Table 7.2.7 shows the significance of potential impacts on flora and habitats. There will be some areas of natural habitat where impacts will be moderate, which would be those of high sensitivity. These non-fragmented forest areas cover only small sections of the line, as was shown on figures 7.2.1 and

7.2.2. The overall significance of potential impacts on natural habitats under Alternative A is estimated to be minor for three primary reasons: only relatively small amounts of highly sensitive areas will be affected there, these areas represent only a very small percentage of similar habitats of even more biodiversity value in the regions, and the areas estimated to be potentially affected are considerably overestimated. Under Alternative B, the overall impact on habitats is expected to be minor or negligible, since there is very little forested habitat remaining and nearly all sections are significantly affected by human activities.

The expected impact from spreading of invasive species is considered low, since there will be no import of seeds or seedlings and proper mitigation will reduce the risk even further.

Table 7.2.7. Potential Impacts on Flora and Habitats

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Signifcance	Magnitude & duration of impact	Significance
Flora						
Common tree species	Low	All trees cut at towers, construction zones, access roads Trees >1-4m cut in vegetation control zone	Medium permanent	Moderate adverse	Low permanent	Low adverse
Common shrub species	Low	All plants cleared at towers, construction zones, access roads, substation Shrubs/bushes >1-4m cut in vegetation control zone	Medium permanent	Moderate adverse	Low permanent	Low adverse
Tree species of conservation concern	High	All trees cut at towers, construction zones, access roads Trees >1-4m cut in vegetation control zone	Medium permanent	Moderate adverse	Low permanent	Minor adverse
Shrub species of conservation concern	High	All plants cleared at towers, construction zones, access roads, substation Shrubs/bushes >1-4m cut in vegetation control zone	Medium permanent	Moderate adverse	Low permanent	Minor adverse
Fruit & nut trees (orchards)	High	All trees cut at towers, construction zones, access roads, substation Trees >1-4m cut in vegetation control zone	Low permanent	Minor adverse	Very low permanent	Negligible adverse

Table 7.2.7. Potential Impacts on Flora and Habitats

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Signifcance	Magnitude & duration of impact	Significance
Habitats						
Natural habitat	Medium-High	Loss of natural habitat	Medium permanent	Moderate adverse	No change	None
		Modification of primary ecological functions and species composition	Medium permanent	Moderate adverse	No change	None
		Introduction of or increase in invasive species	Medium permanent	Moderate adverse	Low permanent	Minor adverse
Modified habitat	Medium-Low	Reduction in biodiversity value	Low permanent	Minor adverse	Medium permanent	Minor adverse

Mitigation measures for habitats and species

Even though the transmission line is not expected to have significant impacts on species or populations of conservation concern and on protected areas, and have localized impacts on forest habitats, it is established that the forest habitats falling under impact of the selected Alternative A of the corridor alignment support species of conservation concern and have biodiversity value. Therefore, mitigation hierarchy will be applied to address possible negative impacts. This would include:

Prior to construction, GSE will commission additional biodiversity studies in the project area and preparation of BMP satisfactory to the World Bank. BMP will: (i) include additional information regarding the distribution and ranges species of conservation interest in order to confirm that the project-affected areas do not carry any critical habitats; (ii) deeper explore potential impacts of habitat fragmentation due to vegetation clearing under the transmission line, (iii) confirm that areas of habitats to be converted or impacted by the project represent a very small percentage of the total amounts of these habitats found in the region, (iv) explore if mitigation measures described below in this list will ensure no net loss of biodiversity value, (v) develop detailed plan of compensatory planting, if it is deemed feasible, pointing out species composition, planting areas, duration and nature of plantation management, needs for physical protection of young plantations, etc. (vi) define relevance, feasibility and type of biodiversity offset that may be required for addressing residual impacts of the project, (vii) build detailed plan of biodiversity monitoring in the transmission line corridor for the construction and operation phases, and (vii) describe institutional set-up for implementing BMP.

As noted above and in Chapter 3, the construction contractor will select the final locations of towers, which will in turn determine the exact corridor, and of access roads that may be required. This will involve detailed ore-construction surveys by engineers and scientists of the entire length of the 300-

meter "study" corridor identified in the Feasibility Study. To ensure maximum protection of biodiversity values, in particular - plant specimens and populations of conservation value, the survey team(s) will include one or more qualified biologists who will identify and mark locations where construction and vegetation cutting could affect natural habitats or species of conservation concern. The contractor will be required to avoid such areas unless there are no feasible alternatives, and the Supervision Consultant agrees there are no feasible alternative location(s).

The contractor will maximize the number of towers that are placed in locations that will allow conductors to pass high above forest canopies and thus reduce or eliminate the need to control vegetation in that section.

The contractor will demarcate the boundaries of areas where construction activities, including towers, roads, and vegetation control will take place and will limit disturbance to within the boundaries. In addition, the contractor will train workers not to stray into the forest outside marked areas and will prohibit workers from collecting or damaging plants or the ground surface.

Prior to vegetation clearing in the corridor, there will be a detailed survey to identify, mark, and map specimens and local populations of flora species of conservation concern (see Table 7.2.5) in sufficient detail that the number, size, and condition of specimens that must be cut will be known.

In agricultural land with isolated specimens of protected tree species (see Table 7.2.8), final routing of the vegetation control zone must avoid these specimens unless there is no economically or technically feasible alternative. If such trees must be cut, at least two trees of the same species will be planted in the outer edge of the corridor, beyond the vegetation control zone. The young trees will be monitored and replaced as needed until they have reached maturity.

It will be in the contractor's interest to minimize new road construction, since new construction would typically cost more than using existing roads. Even so, the contractor will be required to consult with forest managers and private landowners to identify existing roads and then to use them wherever possible.

GSE and/or contractor will consult with National Forestry Agency and seek agreement to cut trees and shrubs in the vegetation control zone so a meter or more is left above the ground, which would leave root systems intact, rather than cutting down to the ground, and not to cut trees and shrubs of conservation concern (see Table 7.2.8) that do not grow more than four meters high.

If deemed relevant and effective my BMP, for every specimen of a protected flora species (Table 7.2.8) that must be cut or that is otherwise damaged or killed, at least two others of the same species will be planted elsewhere in the corridor but outside the vegetation control zone. Extraction of plants of conservation concern will be required on approximately 1/3 of the corridor which passes a natural habitat indicated in the baseline study and figure 7.2.3.-7.2.4 (approximately 10-12 kms out of 38 km section). Similar species will be planted in remaining 40km section of the line. The success of such plantings will be monitored until specimen are well-established, with replanting as needed to replace unsuccessful specimens.

The contractor will remove and store topsoil at all construction sites and will deposit it over the cut areas to provide enabling environment for natural regeneration of vegetation safe to grow in given locations without threatening safety of the power line.

The contractor will be required to manage spoil from excavations in a way that prevents damage outside the marked construction area boundaries. The contractor will be prohibited from dumping spoil down hillsides, or onto living vegetation in any area, and will be required to return excess spoil to the site once construction is complete. The contractor will remove piles and depressions and will grade the area to its approximate original contour, then spread topsoil over the site before planting or broadcasting seeds of native species of grass and/or shrubs. Finally, the contractor will monitor the success of the re-vegetation program and to make repairs as needed to ensure the establishment of self-sustaining maximum ground cover before demobilization.

GSE will require the contractor to restore tower footprints and other areas disturbed by construction as soon as practicable once construction in that area is complete, and not to wait until construction is complete along the entire corridor. GSE will monitor site restoration at least once per quarter during construction and require remedial action as needed.

Before the contractor is paid the final invoice and allowed to demobilize, GSE will inspect all construction sites and areas to verify tower footprints, temporary roads, assembly and support areas, temporary roads, and all other areas disturbed by construction have been restored as required and the vegetation cover is established and self-sustaining. GSE will require remedial action as required, and if the contractor does not act and correct damages, GSE will employ a third party to restore damaged areas and reduce contractor payments by the amount paid to the third party.

Table 7.2.8. Plant species of conservation concern

English name	Scientific Name	Conservation status
Red List of Georgia		
Imeretian oak	*Quercus imeretina*	VU
Colchic oak	*Quercus hartwissiana*	VU
Chestnut	*Castanea sativa*	VU
Colchic box tree	*Buxus colchica*	VU
Caucasian wingnut	*Pterocarya pterocarpa*	VU
European yew	*Taxus baccata*	VU
Walnut	*Juglans regia*	VU
Field elm	*Ulmus foliacea (=Ulmus minor)*	VU
Colchis bladdernut	*Staphyllea colchica*	VU
True laurel (shrub)	*Laurus nobilis*	VU
Endemic species or otherwise considered rare/valuable		
Colchis ivy	*Hedera colchica*	Caucasus subendemic species

Table 7.2.8. Plant species of conservation concern

English name	Scientific Name	Conservation status
Voronov primerose	*Primula woronowii*	Caucasus subendemic species
Shovits lily	*Lilium schovitzianum*	Caucasus subendemic species
Cherry laurel	*Laurocerasus officinalis*	Relict species
Sweet-amber	*Hypericum androsaemum*	Relict species
Oriental beech	*Fagus orientalis*	Relict species
Pontic rhododendron	*Rhododendron ponticum*	Relict species
N/A	*Trachystemon orientalis*	Monotypic colchic species
N/A	*Pachyphragma macrophyllum*	Monotypic Caucasian species
Caucasian hellebores	*Helleborus caucasica*	Caucasus endemic species
Caucasian lime tree	*Tilia begoniifolia*	Caucasus endemic species
large-flowered comfrey	*Symphytum grandiflorum-*	Georgia endemic species
Imeretian pink	*Dianthus imereticus*	Georgia endemic species
N/A	*Paracynoglossum imeretinum*	Georgia endemic species
Common fig	*Ficus carica*	Rare species
Caucasian persimmon	*Diospyros lotus*	Rare species
Iberian oak	*Quercus iberica*	Rare species
pomegranate	*Punica granatum*	Rare species
Caucasian whortleberry	*Vaccinium arctostaphylos*	Bern Convention

7.2.2. Potential impacts on protected areas of high biodiversity value

The transmission line corridor and substation will not affect national parks, reserves, or other areas that are protected or recognized for reasons of biodiversity value. Satalpia National Park, the nearest such park, is over six kilometers distant, and there nearest Important Bird Area is at least six kilometers away, which precludes any significant impact.

Two Emerald sites are in the regions crossed by the transmission line corridor: Samegrelo 2 (registration code GE0000057) is officially adopted and Samegrelo 1 (GE0000021) is nominated. The sites are recognized because of the presence of habitats of significant importance, including critically endangered and endangered species of plants and animals. The boundaries of these areas near the transmission line corridor and tower locations were shown on Figure 7.2.1 and Figure 7.2.2. Indeed, the original corridor passed through these areas, but during corridor optimization during early stages of ESIA development, the corridor was moved some distance to the southeast to avoid these sites. A total of 12 towers will be within one kilometer of the boundary of one of the Emerald Network sites, but only one tower would be within 500 meters, as shown by Table 7.2.9.

Table 7.2.9. Towers within One Kilometer of Emerald Network Sites

Tower no.	Distance to Emerald Network boundary (m)	Tower no.	Distance to Emerald Network boundary (m)
A20	655	AS67	715
AS48	755	AS68	625
AS49	895	AS127	363
AS64	990	AS136	880
AS65	895	AS138	860
AS66	925	AS139	760

In every case, a valley or ridge separates the transmission line corridor from the Emerald Sites; a ridge is between towers AS64-AS68 and the Sites, so these sections of the corridor could not be seen from the protected area. The distance is sufficient in every case that there would be no significant impact on the protected area; during construction, there may be very brief periods during construction when noise could be heard across a valley, but this would not represent a significant impact on the biodiversity values of the Sites.

7.2.3. Potential impacts on fauna

Transmission line projects have the potential to cause direct and indirect impacts on fauna as a result of short-term construction and maintenance activities and the long-term presence of the towers and conductors. Construction and maintenance works will involve cutting and clearing vegetation, excavating soils, moving vehicles and equipment over roads, terrain, and even streams, and general human activities. These in turn can lead to:

Injury or death of animals. Construction activities can crush, suffocate, remove from their habitats, destroy nests, and otherwise affect animals. These usually result in the immediate or eventual death of affected animals. Such impacts can be significant if they involve large numbers of organisms, occur on a regular basis, or affect animal populations/species that are particularly sensitive, unable to reasonably compensate for losses, or already low in numbers.

- *Destruction or damage to habitat*, including nesting areas, breeding areas, or important proportions of their habitat can lead to the death of affected animals, or to the movement of animals to other areas, where they may not survive.
- *Migration from home territories*, either permanently or temporarily, can be caused by noise, dust, traffic and vehicles/machinery operating onsite, and project workers. Usually, disturbance from transmission line projects are short term and cover only a relatively small area. Thus, animals may need to migrate only short distances and for limited times; however,

in new areas they would be more vulnerable to predation and would have to compete with existing populations. After completion of work, when all sources of disturbance are removed, most surviving animals can return to traditional habitats except those that require tall trees.

Habitat fragmentation, which is related to vegetation clearance. This has a long-term impact by isolating populations and limiting movements of individual organisms.

Collision with conductors and towers. Towers and especially conductors represent barriers that large birds cannot always avoid. As a result, they can be killed or injured, sometimes in large numbers in the case of migrating birds. Small birds are much less at risk than larger and less agile birds.

Interference with bat echolocation can be caused by electromagnetic fields emitted by energized transmission lines.

Electrocution is a risk to large birds if they come into contact with two energized conductors (wires) or when it perches on a metal tower at the same time it is in contact with an energized conductor.

The baseline study of fauna was conducted with awareness of these potential impacts on fauna and the intent to identify areas that are sensitive to impacts on fauna. It is considered that the most significant risks to fauna will be to birds and bats, and particularly raptors, as the transmission line corridor is near an important migratory flyway and includes other potentially sensitive bird/bat areas. Due to the higher sensitivity, a separate subsection is devoted to discussion of potential impacts on birds and bats (see below).

Impacts during construction

Direct impacts. In general, larger mammals, reptiles, amphibians – including those of conservation concern - will be able to avoid direct impacts since they can readily move away from construction zones to adjacent areas although, as noted, even those that move may not survive. However, smaller animals such as shrews and moles, although they could move if given time, would probably not be able to relocate in time to avoid construction activities at tower sites and roads. In order to minimize the impacts on such mammals, the final design team that will select tower and road locations will include a biologist who will focus on identifying any colonies of the three endemic rodent species identified in Table 6.7.5 in Chapter 6. Should any such colonies be identified, those areas will be considered unsuitable for location of towers or roads and avoided. It is noted that such colonies were not identified during the baseline surveys, so the risk is considered low. Even so, mitigation will require avoidance of colonies or individuals of endemic species wherever possible, including during breeding seasons, and relocation of colonies if there are no feasible alternative routes.

Impacts caused by habitat loss. The main impact of the project on animals is likely to be habitat loss due to land-clearing and vegetation cutting. As described in Chapter 6 and above, some amount of natural habitat would be changed under Alternative A due to cutting of forests and transition to a different habitat with lower trees, shrubs, and grass. The amount of habitat that will be affected by the project is a tiny fraction of similar and higher-value habitat in the region – in each of the five municipalities crossed by the line, far less than one percent of forest will be affected, and even less of

riparian forest, as was shown in Table 7.2.1 above. In addition, the forest habitat along the Alternative A corridor is among the most modified in the region, as it is near the boundary between more populated areas and the much less affected mountain forests to the north. Mitigation measures will ensure that, when damage or destruction of trees and shrubs of conservation concern cannot be avoided, they will be replaced in greater numbers so that over time there is no net loss, and possibly a net gain, of floral biodiversity and thus of habitat and fauna.

To estimate the potential impact of habitat loss on species of conservation concern – species included on the Red List of Georgia, species considered as endangered (EN) or vulnerable (VU) by IUCN, and endemic species – the sensitivity of each protected species was assessed. Additionally, the potential impact from habitat loss on common species was identified. The most vulnerable species to habitat loss would be reptiles and bats. Most mammals (other than rodent colonies) and at least some reptiles present in the corridor would be able to relocate to adjacent areas for the length of construction, so impacts will be limited. Similarly, nesting birds would be able to move to adjacent areas and so would not be highly sensitive to habitat loss. It is also important to note that the area of permanent habitat loss would be at towers and access roads under Alternative A, where forest would not be allowed to re-grow. These occupy very small areas in comparison to similar and more valuable habitat in the region. The vegetation control zone is much bigger, but even this is a relatively small area in comparison to similar but higher-value habitat to the northeast. Changing habitat from trees to smaller trees and shrubs will lead to changes in flora and fauna species composition, with the modified habitats and populations stabilizing over time.

The forests that will be affected provide habitat for birds, but local ornithological diversity in most of these mostly fragmented forest areas is lower than in less affected forests in the Emerald Sites and other areas to the north, and not of exceptional importance in terms of the number of bird species or the density of birds in various species.

A possible exception could be species of owls that nest and live in the forest. Owls prefer mature trees with hollows, which they use for nesting and roosting. Construction will need to cut such trees in the vegetation control zone, and trees will not be allowed to grow back. Another exception would be bats, many of which which also use mature trees (they also use caves, but none will be affected) for hibernation, roosting, and/or nesting, and mature trees in the vegetation control zone will be cut. Any impact on bat species would be considered significant, as all species are of conservation concern.

Several measures will be taken to avoid or minimize impacts. As noted above, a biologist will be on the preconstruction design survey team and will be determine if any mature trees are used by bats owls, or Caucasian squirrels (or other species) for roosting or nesting. If they are, cutting of those trees will be avoided, or at least postponed until young birds/bats have successfully left their nests in late spring or summer, and/or bats have left their roosts at the end of winter hibernation. Construction would not take place until hibernating bats had left, and young birds and bats had left their nests. In addition, if trees that support bat hibernation, roosting, or nesting do have to be cut, bat boxes will be placed nearby to provide alternative living sites, with two or more boxes placed for every tree cut).

These measures will ensure there is no net loss of biodiversity.

Impact of electromagnetic field on bats. As mentioned above, electromagnetic fields emitted by high-voltage transmission lines may affect bat echolocation. Although the risk of bats colliding with conductors is usually low, the loss of echolocation can result in more collisions if bats need to cross the line on their daily migration to feeding areas and can also interfere with their ability to detect their food prey. It is not known if large numbers of bats are in the forests that will be affected or near the affected area, so it cannot be determined if there could be an important impact. If preconstruction surveys detect signs of large numbers of bats along the corridor, additional monitoring will be required to determine if measures are needed to reduce impacts.

Bird collisions with the transmission line. As noted, large birds are less maneuverable and thus less like to avoid collision with conductors if they only see them when they approach the line. Raptors would be most vulnerable. Smaller raptors (such as the smaller falcons and accipiters), however, have good eyesight and have evolved to avoid collisions in dense forests, so they have only limited risk. Based on existing experience in Georgia, collisions of small raptors with transmission lines is considered to be of very low risk.

The impact on migratory birds, primarily raptors but also waterfowl, that could result from the presence of the transmission line is also expected to be low. The OHL corridor does not cross major bird migration routes, so relatively small numbers of migrants would be expected in the project area except possibly passing through river valleys in autumn. However, monitoring of bird passage will be required during autumn migration for at least two years beginning in 2019, and if a qualified ornithologist concludes there is significant risk, GSE will be required to take additional mitigation measures, such as addition of flashers, spinners, or other types of bird diverters on the line where it crosses river valleys.

Bird electrocution. This is not expected to be an issue, as the final design solutions will be required to comply with good international industry practices to avoid electrocution, including the separation of conductors and towers and making sure the distance between conductors is larger than the wingspan of the largest bird that could be expected in Georgia.

Noise impacts. Noise from construction activities will disturb animals for tens of hundreds of meters from the source of the noise. It will disrupt animals as they perform their daily activities and could affect their ability to find food. This cannot be avoided. However, the preconstruction surveys will have identified species of conservation concern, which in turn will allow such areas to be avoided during critical periods and thus prevent impacts on those species. In addition, it is important to note that many or most animal species are nocturnal; since all construction will be during daylight hours, noise will have little impact on these species.

As noted in Chapter 3 and in section 7.1.5, high-voltage transmission lines cause a hissing or snapping "coronal" noise that can reach a level under the lines of 40-50dB or possibly higher, especially in wet or foggy weather. This level of noise could disturb fauna species. However, the noise would only occur under foggy or wet conditions and would not start and stop but would be relatively constant as long as the weather conditions lasted. Thus, animals would become accustomed to the noise. Impacts would be minor, and no special mitigation is needed.

Other impacts. The presence of humans is inherently disruptive to animal behavior and can result in major impacts on individuals and local populations. If workers go into undisturbed forest, and if they are allowed to hunt or collect animal specimens, there could be significant local impacts. This will be prevented by requiring the contractor to adopt and enforce a strict code of conduct that prohibits hunting, going beyond construction sites, and disturbing animals for any reason.

Indirect impacts. The clearing of access roads can provide easier access to forests for local people. This can lead to increases in hunting and logging, which in turn can have significant impacts on animal and bird populations and destroys habitat. Logging in the local forests is already common and has resulted in significant forest fragmentation. It is possible that project roads would allow access to some areas that have been difficult to access in the past and thus lead to more logging. Mitigation measures will include the removal and rehabilitation of the road corridor in forested areas except as requested by the National Forestry Agency or landowners, and in areas that are otherwise not accessible. If roads in inaccessible areas have to be left in place, the contractor will block these road corridors with trenches or berms before demobilization.

***Cumulative impacts*.** Beyond the impacts of a single project, the combined, incremental effects of human activity, can pose a serious threat to environmental and social resources. Such cumulative impacts can occur if other projects in the region will affect the same or similar resources and lead to even more significant impacts. Although there are no other major construction projects that are known to be planned for the immediate area, the ongoing logging is already having an adverse effect on local forests and sensitive species and the project could add to that effect. However, the relatively small area that will be affected by the project will make the incremental impacts of this project insignificant in comparison to ongoing impacts. Other transmission lines that are being constructed or will be constructed in the future, including those mentioned in Chapter 3, will have similar impacts. Since they do not run through the same territories, there will be limited or no cumulative impacts.

***Positive impacts*.** As noted in Chapter 3, the transmission line will upgrade and improve the reliability of the overall power transmission system in Georgia, which will benefit all Georgians. On a smaller scale, improving access to forested areas could improve the efficiency of forest fire fighting activities; however, this is balanced and possibly outweighed by the increased risk of forest fire due to increased access to the forest.

Mitigation Measures

As described above in the discussions of potential impacts, GSE will have to require the construction contractor to implement mitigation measures to avoid or reduce impacts on fauna from construction and operation of the transmission line. No specific measures are required for construction and operation of the substation.

As part of the contractor's surveys to support final designs and and again immediately before construction, one or more biodiversity experts will inventory the presence of flora and fauna species of conservation concern in and near the corridor and advise the contractor of areas that must or should be avoided permanently or temporarily. Surveys will include:

- Identifying possible routes of the line and 54.5-meter vegetation control zone that will avoid areas most valuable to fauna wherever possible.
- Identifying and mapping the current presence or signs of past presence of protected species, including colonies and burrows of endemic rodent species: Caucasian mole (*Talpa caucasica*), Radde's shrew (*Sorex raddei*), and Robert's snow vole (*Chionomys roberti*).
- Identifying, marking, and mapping mature trees with cavities that support or have supported bat hibernation and/or nesting by owls, bats, or Caucasian squirrels (*Sciurus anomalus*).
- Identifying and mapping locations where protected fauna species (see Table 7.2.10 below) are present or have left signs of frequent past presence.
- Identifying and mapping past and present nests of raptors.

If cutting and/or construction within 100 meters of mature trees with cavities used by owls or bats cannot be avoided, cutting and/or construction within 100 meters must be delayed until after bats have emerged from hibernation, young owlets and bats have permanently left the nests, and roosts are not being actively used.

If mature trees with hollows that support or have supported hibernating or nesting bats must be cut, the contractor will place "bat boxes", approved by a qualified expert, in a place approved by the expert within 20 meters of the former tree. GSE will replace bat boxes as needed for the first five years of operation. At least two bat boxes will be placed for each such tree that is cut.

Towers, construction sites, and roads may not be located so they destroy colonies of endemic rodent species; such locations will be marked and off limits to workers and all disturbance. If construction must take place within 50 meters of locations where endemic rodents are breeding, construction will be delayed until breeding season has ended and young have left the nests.

The contractor must establish and enforce rules to prohibit workers from hunting, exploiting, feeding, or disturbing animals and birds, and must train workers in those rules and enforce penalties for violations, including dismissal.

The contractor must place ramps of some sort (e.g., logs or boards placed in the excavation, so they reach the top) in excavations that remain open at night to allow small animals to escape if they fall into the excavation.

At the end of construction, the contractor will restore or otherwise block new roads and tracks in forests in order to prevent public access to areas that are otherwise difficult to reach, except as directed by the National Forestry Agency. GSE maintenance patrols during operation will be trained to be alert for public use of such roads so that the roads can be blocked.

The contractor will clearly mark construction zones and train workers to remain within demarcated areas. Within such zones, specific areas will be designated for washing, eating, smoking, toilets, and other personal activities, and such activities will be confined to those areas.

The contractor will adopt rules against disturbing or destroying plants and wildlife, and provide induction training for workers these rules. The contractor will enforce these rules with appropriate penalties, up to and including dismissal.

GSE will appoint a qualified ornithologist will be appointed to design a program to monitor the passage of birds through river valleys during autumn migration, and to implement the monitoring program for at least two migration seasons, beginning in the autumn of 2019. If large numbers of migrating waterfowl and raptors are observed passing the future location of the line at altitudes that would put them at risk of collision, the expert may recommend the addition of bird diverters or other devices to alert birds to the presence of the line in locations of particular concern. GSE will install or require to be installed such diverters or avoidance devices that are recommended by the expert.

Table 7.2.10. Animal species of conservation concern (except AEWA wading birds and waterfowl)

English name	Scientific name	Conservation status / Endemism
Amphibians		
Caucasian toad	*Bufo verrucosissimus*	Caucasus endemic
Long-legged wood frog	*Rana macrocnemis*	Caucasus endemic
Northern banded newt	*Ommatotriton ophryticus*	Caucasus endemic
Reptiles		
Derjugin's Lizard	*Darevskia derjugini*	Caucasus Endemic
Georgian Lizard	*Darevskia rudis*	Caucasus Endemic
Caucasus Lizard	*Darevskia caucasica*	Caucasus Endemic
Caucasus Viper	*Vipera kaznakovi*	Red List of Georgia, Caucasus endemic, EN
Birds		
Griffon vulture	*Gyps fulvus*	GRL, VU
Egyptian vulture	*Neophron percnopterus*	GRL, VU
Golden eagle	*Aquila chrysaetos*	GRL, VU
Greater spotted eagle	*Aquila clanga*	GRL, VU
Long-legged buzzard	*Buteo rufinus*	GRL, VU
Red-footed falcon	*Falco vespertinus*	GRL, EN

Table 7.2.10. Animal species of conservation concern (except AEWA wading birds and waterfowl)

English name	Scientific name	Conservation status / Endemism
Common crane	*Grus*	GRL, EN
Boreal owl	*Aegolius funereus*	GRL, VU
Barn owl	*Tyto alba*	GRL, EN
Common chiffchaff	*Phylloscopus lorenzii*	Caucasus endemic
Terrestrial mammals		
Caucasian mole	*Talpa caucasica*	Caucasus endemic
Radde's shrew	*Sorex raddei*	Caucasus endemic
Robert's snow vole	*Chionomys roberti*	Caucasus endemic
Caucasian squirrel	*Sciurus anomalus*	VU
Brown Bear	*Ursus arctos*	VU
Otter	*Lutra lutra*	VU
Bats		
Greater horseshoe bat	*Rhinolophus ferrumequinum*	EUROBATS
Lesser horseshoe bat	*Rhinolophus hipposideros*	EUROBATS
Mediterranean horseshoe bat	*Rhinolophus euryale*	GRL, EUROBATS, VU
Lesser mouse-eared bat	*Myotis blythii*	EUROBATS
Natterer's bat	*Myotis natereri*	EUROBATS
Whiskered bat	*Myotis mystacinus/brandti*	EUROBATS
Alcathoe bat	*Myotis alcathoe*	EUROBATS
Common Barbastelle	*Barbastella barbastellus*	GRL, EUROBATS, VU
Brown long-eared bat	*Plecotus auritus*	EUROBATS
Common pipistrelle	*Pipistrellus pipistrellus*	EUROBATS
Kuhl's pipistrelle	*Pipistrellus kuhlii*	EUROBATS
Nathusius's pipistrelle	*Pipistrellus nathusii*	EUROBATS
Common bent-wing bat	*Miniopterus schreibersii*	EUROBATS
Lesser noctule	*Nyctalus leisleri*	EUROBATS
Common noctule	*Nyctalus nocula*	EUROBATS
Serotine bat	*Eptesicus serotinus*	EUROBATS
Parti-coloured bat	*Vespertilio murinus*	EUROBATS
GRL: Green List of Georgia, VU: Vulnerable, EN: Endangered, eurobats: see Table 6.6.3		

Impact summary and significance

Overall, the impacts on fauna that are described above are expected to be minor under Alternative A, and mitigation will reduce them even more. Impacts under Alternative B will be negligible since there are few or no sections that support valuable fauna species. Especially under Alternative A, however, some plants of conservation concern, especially tree species, will need to be cut, and this results in some moderate under Alternative A. Even then, however, mitgaition measures can be expected to reduce significance to minor or negligible. Significance of impacts on fauna are shown in Table 7.2.11.

Table 7.2.11. Summary of Potential Impacts on Fauna

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
Fauna						
Common species of terrestrial fauna	Medium-low	Animal death due to crushing or direct impact	Low permanent	Minor adverse	Very low permanent	Negligible adverse
		Abandonment of home territories due to construction disturbance	Low temporary	Minor adverse	Very low temporary	Negligible adverse
		Nest abandonment/disruption of breeding animals due to construction disturbance	Low temporary	Minor adverse	Very low temporary	Negligible adverse
		Change in species composition due to change from tall trees to lower vegetation	Low permanent	Minor adverse	Very low permanent	Negligible adverse
		Worker interference with animals or nests	Very low temporary	Negligible adverse	Very low tempoary	Negligible adverse
Terrestrial fauna of conservation concern	High	Animal death due to crushing or direct impact	Low permanent	Moderate adverse	Very low permanent	Minor adverse
		Abandonment of home territories due to construction disturbance	Low temporary	Moderate adverse	Very low temporary	Minor adverse
		Nest abandonment/disruption of breeding animals due to construction disturbance	Low temporary	Moderate adverse	Very low temporary	Minor adverse
		Change in species composition due to change from tall trees to lower vegetation	Low permanent	Moderate adverse	Very low permanent	Minor adverse

Table 7.2.11. Summary of Potential Impacts on Fauna

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
		Worker interference with animals or nests	Very low temporary	Minor adverse	Very low temporary	Minor adverse
Owls and bats	High	Loss of hibernating and nesting places in mature trees	Low permanent	Moderate adverse	Very low permanent	Minor adverse
Migratory birds (raptors, waterfowl, wading birds)	Low-medium	Death or injury due to collision with line	Low permanent	Minor adverse	Low permanent	Minor adverse
Large birds (raptors, cranes, etc.)	High	Death due to electrocution	Low permanent	Minor adverse	Low permanent	Minor adverse

7.3. *Potential Impacts on Socioeconomic Conditions*

This section identifies and assesses the potential impacts the project will have on socioeconomic conditions – that is, on people and the economy. As is also true for environment impacts, socioeconomic impacts can occur during construction and/or operation and can be both - positive and negative. These impacts will vary by location, size, duration, distance to communities, land ownership and other factors. This section is organized as follows:

- Section 7.4.1 examines potential impacts on community health and safety
- Section 7.4.2 summarizes potential impacts of physical and economic displacement.
- Section 7.4.3 examines potential impacts on worker health, safety, and welfare
- Section 7.4.4 examines potential impacts on economic conditions in the region
- Section 7.4.5 examines potential impacts on cultural heritage.

7.3.1. Potential impacts on community health and safety

In general, the potential for impacts of construction and operation on communities and community members is related to the distance that people live from the transmission line. Table 7.3.1 shows the number of occupied houses within certain distances of the transmission line. As can be seen, many more households will be subject to direct and indirect effects of Alternative B than Alternative A.

Table 7.3.1. Residences within 500 Meters of the Centerline of Transmission Line Corridors

Municipality	Alternative A				Alternative B			
	Number of residential houses within distance from centerline (meters)							
	37	150	250	500	37	150	250	500
Tskaltubo	0	0	2	81	0	0	2	81
Khoni	0	13	32	101	0	13	31	97
Martvili	0	43	84	186	2	47	113	365
Chkhorotskhu	0	0	1	5	2	15	49	122
Tsalenjikha	0	21	56	150	1	38	86	250
Totals	***0***	***77***	***175***	***523***	***5***	***113***	***281***	***915***

Activities with potential impacts on community health and safety, and mitigation measures

A number of actions and activities by GSE, the contractor, and workers could affect community health and safety. Activities that could cause impacts, and measures that will be taken to avoid or reduce impacts are listed below:

Activities that result from labor Influx

Poor behavior by workers from outside the region can lead to disruption of local community cohesion, especially smaller communities. This can occur through unaccustomed or violent behavior, including gender-based violence, and/or an increase in communicable diseases. This will be controlled by requiring workers to abide by a Worker Code of Conduct that will prescribe certain behaviors and require others; the contractor will be required to enforce the Code, with penalties leading up to dismissal. In addition, GSE, the Supervision Consultant, and the contractor will consult with local authorities and community leaders, which will ensure they (that is, project managers) are aware of incidents and can take appropriate action if the issue arises. Finally, GSE (through the Supervision Consultant) and the contractor will establish communications with local law enforcement authorities, so they are aware of the influx of workers, including where they will be working and where they will reside, and can take appropriate precautions. Based on prior experience with similar projects in the country, approximately 35 percent of workers may be expected to be international, and another 30-35 percent Georgian from other regions of the country. The risk of gender-based violence under this project is assessed to be low given the small size of workers' teams, availability of GBV-related legislation and support services in the country, and lack of precedents that indicate such risks in Georgia. Nevertheless, a number of mitigation measures will be taken to prevent GBV-associated risks, such as sensitization for project employees and communities and adoption and monitoring of Codes of Conduct for all project workers.

Increased demand on community services, such as medical and law enforcement, due to use of the services by project workers from outside the region could leave fewer services for community members. The relatively low number of workers and the requirement for the contractor to consult and coordinate with community leaders and law enforcement will ensure that added demand for community services will not cause significant reductions in services available to the community.

Increase in HIV/AIDS and/or other communicable diseases could occur due to the increase of male construction workers into rural communities and an increase in prostitutes or other sex workers who came to serve them. The relatively low numbers of nonlocal workers (likely to be no more than 100-150), who work will be primarily in rural areas away from settlements and who will likely reside in larger towns and cities, would be expected to make this risk not significant. If ongoing engagement with community leaders or others suggests there may be problems of this sort, GSE and the contractor will enhance training on the Code of Conduct, monitor worker behaviour ore closely, and dismiss offending workers.

Other activities

Inappropriate actions and responses by security personnel could injure or harm community members. The contractor will probably appoint a subcontractor to provide security. Georgian law prohibits security personnel from having firearms, but they can have a variety of other nonlethal devices. GSE will require the contractor to hire only licensed security providers, and to verify the subcontractor and security personnel have not been involved in past abuses. The contractor will also have to ensure security personnel are trained in the appropriate use of force.

Project traffic could interfere with normal public traffic and could cause an increase in accidents involving pedestrians and vehicles. The contractor will be required to develop and implement a Traffic Management Plan that provides for driver training, vehicle safety, route planning to avoid sensitive areas, and coordination with local traffic authorities.

Accidents and emergencies caused by the project could affect communities. The most likely impacts during construction would be from fires and traffic accidents since there will be only limited use of hazardous or flammable chemicals. Workers will be trained in fire prevention, and implementation of a Traffic Management Plan will reduce the potential for accidents. During operation, the most likely emergency would be forest fires due to sparking or other problems with lines. Proper maintenance will reduce the likelihood of such failures.

Nuisances such as noise and dust during construction could disturb nearby residents and other community members. Given the distance between construction activities and populated areas, including cultural heritage monuments, this is not likely to be an issue under Alternative A except very locally and for very short periods, although because the Alternative B corridor would be closer to settlements more people could be affected by noise and dust. GSE will require the contractor to maintain vehicles and equipment to minimize noise, and to consider the timing of construction activities so they can avoid periods when specific areas would be most sensitive. In addition, the contractor will be required to control dust from unpaved roads and construction sites during dry periods.

Nuisance noise during operation could be generated by the transmission line and under Alternative B could also disturb the nearest residents in wet and humid weather. During operation, low buzzing, crackling, or hissing sounds could be audible directly under the line and for some distance away. These sounds are produced as a result of corona discharge from air contact with conductors, from damaged or dirty insulators, or due to wind blowing through conductors and tower lattice. The noise is usually louder during wet and foggy weather, when the relative humidity of ambient air is over 80 percent, and in windy conditions. The noise level also increases with voltage. According to various literature sources, during relatively dry and calm conditions noise level is usually in the range of 40-50dBA and could increase to about 50-60dBA in wet and windy weather. Noise would decrease rapidly away from the corridor, becoming inaudible in no more than 20-30 meters; therefore, it should not be heard at the nearest occupied house under Alternative A but could be audible under Alternative B. Other than occasional maintenance workers, the only people who will spend any time in the corridor will be

agricultural workers and they would spend only short periods on a few days of the year. Overall, corona noise could be a minor nuisance, but only for a few people for short periods of time.

Uncontrolled or poorly controlled access to work sites could expose members of the public to extreme hazards, including areas near excavations, around heavy equipment and vehicles, under lifting operations or overhead work, and other such situations. To control access, all construction areas will be marked with barriers or safety tape with limited access points. Excavations will have physical barriers or intact safety tape placed on all sides of the excavation at any time there is no active work in the excavation. Lifting operations will have one or more flagmen on duty who can warn people away. *Towers will present fall and electrocution hazards* to anyone who climbs the tower once the towers are in place and then when the line energized. This is particularly a hazard to young children and teenagers. When towers are in place, there will be signs on all four sides to warn of danger and prohibit climbing, with signs in the Georgian language (and any other language known to spoken by nearby residents) and with graphic danger symbols demonstrating dangers of falls and of electrocution.

Coming into contact with energized conductors could electrocute children or others. This could happen if people, especially children, climb towers or if they come into contact with energized conductors that have fallen due to heavy snow, high winds, or tower failure. In addition, tall agricultural machinery being used under the lines could come into contact with the energized line and electrocute the driver/operator. GSE will provide information on such risks and precautionary measures to local schools to help prevent such accidents. In addition, GSE will ensure that each tower will have signs, in Georgian, that warn trespassers of the risk of electrocution, falls, and other dangers. The sign will have a 24-hour telephone number to which emergency calls can be made.

Electromagnetic fields. Due to the complexity of this issue and the high level of interest in potential impacts that has been shown at other projects, this topic is discussed in some detail in the following subsection.

Potential impacts of electric and magnetic fields (EMF)

An electromagnetic field (EMF) is emitted by any electrical device, including power lines. The electric field (EF) is produced by the difference of potential between two points (that is, the voltage) and is measured in kV per meter. The magnetic field (MF) is produced by electric current and is measured in microteslas (µT) or nanoteslas (nT)—one tesla (T) is equal to 10,000 Gauss. Unlike electric fields, magnetic fields pass through most materials and are difficult to shield. Both electric and magnetic fields decrease inversely to the square of the distance, therefore reduction in voltage takes place quickly over very short distances, as is illustrated in Figure 7.3.1. Directly under a high-voltage line, EMF can reach levels of 100 µT or more, but after 25 meters can be as low as 1 µT, although typically 10-20 µT.

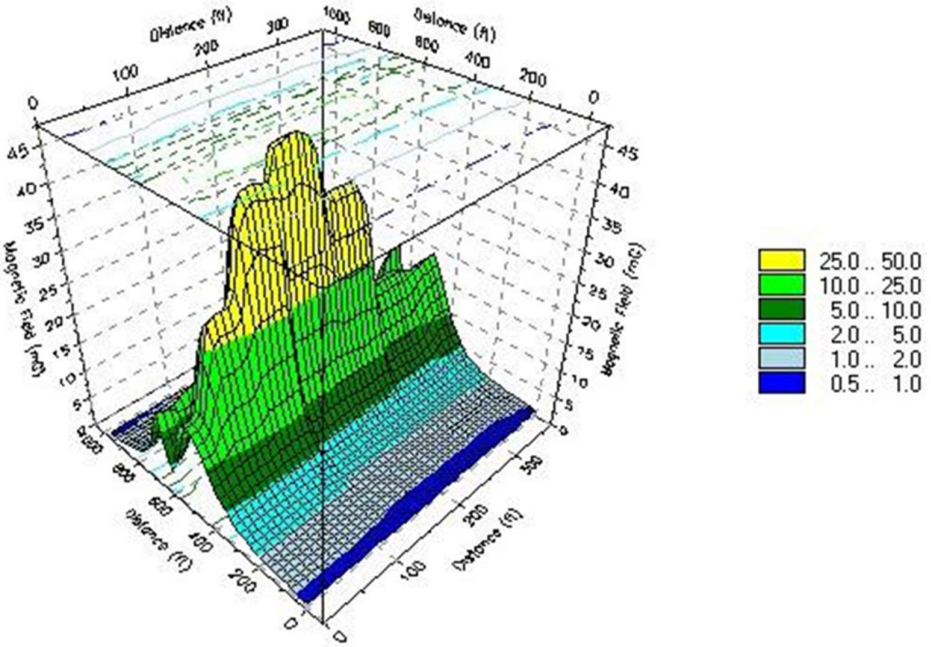


Figure 7.3.1 Decrease in Electromagnetic Field Strength with Distance from 500kV Circuit (Horizontal Axis is in Feet (0.331), Vertical Axis is mG (See Scale))

Over the last 30 years, extensive research has been conducted in the European Union, the United States, and around the world to examine whether exposure to EMF has adverse health or environmental effects. In general, exposure to EMF is affected by the types of electrical sources, the distance from these sources, and the amount of time spent near these sources. Scientific research has focused on magnetic fields, since objects such as trees and walls act as physical barriers that easily block and shield electric fields.

Since the intensity of magnetic fields diminishes quickly with distance from the source, few homes are close enough to transmission lines for the lines to have an impact on the magnetic field level within the home. Rather, the major sources of residential magnetic field levels are electrical appliances within the home. To provide some context, in many homes the background alternating current magnetic field levels average about 0.1 to 10 µT and are the result of electricity passing through wiring within the home and appliances, and through power lines outside the home. The average daily exposure is the composite of instantaneous, higher exposures (such as driving under a power line) and long-term, low exposures (such as wiring within a home).

Most countries do not have limits on exposure to occupational or public exposure to EMF. Many countries, including the United Kingdom, however, adopt the positions of the International Commission on Non-Ionizing Radiation Protection (ICNIRP), which has several times reviewed the epidemiological and experimental evidence and concluded that there was insufficient evidence to warrant the development of standards limiting long-term exposure to EMF. Rather, the guidelines put forth in its 1998 and 2010 documents set limits at much higher field levels to protect against direct

short-term health effects (for example, stimulation of nerves and muscles, a shock-like effect) that are known to occur at very high exposure levels. The ICNIRP in 1998 recommended a residential exposure limit of 833 mG (or 83.3 µT) and an occupational exposure limit of 4,200 mG (ICNIRP, 1998). Also, the International Committee on Electromagnetic Safety (ICES) recommends that exposures of the general public be limited to 9,040 mG (ICES, 2002). Both standards are designed to provide a very large margin of safety.

The exposures of workers and persons living in close proximity to the proposed project transmission lines should be well below these guidelines. Based on EMF exposure levels cited in the U.S. National Institute of Environmental Health Sciences June 2002 report titled "EMF, Electric and Magnetic Fields Associated with the Use of Electric Power" (NIEHS, 2002), an electrical worker has an average EMF exposure of 9.6 mG, and typical EMF levels 20 meters from a 500kV transmission line is 29.4 mG, decreasing to 12.6 mG at 30 meters. Based on these data, the EMF field levels within and at the edges of the 74.5-meter wide corridor of the proposed project, will be well below the levels recommended by the ICNIRP and the ICES—on the order of a 12.6 mG exposure compared to ICNIRP recommendation of 833 mG. In general, EMF levels outside the corridor will be extremely low, much lower than research has shown to present a hazard to human health.

In the corridor, extended exposures over a long period of time could lead to some risk, although even in such cases scientists do not agree on the degree of hazard. Short-term exposures such as would occur for agricultural workers would present no risk.

Research on EMF in residential settings and health was prompted by a 1979 epidemiology study of children exposed to EMF, mostly from neighborhood transmission lines. A weak statistical association has been reported in some studies between childhood leukemia or other health problems and average exposure to magnetic fields greater than 3 - 4 mG. Hundreds of studies have subsequently addressed almost all issues that have been raised about EMF and health. These later studies have not found convincing or consistent evidence to suggest that EMF exposure was higher or more frequent in children with leukemia. Since there is very little support in other areas important for evaluating causation (for example, similar findings in animal studies and a plausible biological mechanism), the scientific consensus is that these findings are insufficient to establish a cause-and-effect relationship between residential EMF exposure and childhood leukemia or other disease. Rather, most researchers agree that where associations exist in epidemiology studies, they are likely the result of study design issues such as bias or confounding. The World Health Organization (WHO) concluded in their June 2007 review of EMF and health (WHO, 2007) that no consistent adverse health effects including cancer, were reported in animals even after exposure to high levels of electric and magnetic fields. Overall, the research does not establish that EMF exposure causes or contributes to any disease or illness.

Using a weight-of-evidence approach to evaluate this large body of research, the scientific consensus of numerous organizations is that no cause-and-effect relationship between EMF from any source and ill health has been established at the levels typically found in residential environments, even near to transmission lines. As a result, no scientific organizations have recommended standards to prevent

long-term health effects (such as cancer), nor are there any standards in the U.S. or most other countries for limiting exposure to the levels of EMF typically encountered in people's everyday lives.

Overall, no potential impacts are expected to occur when humans, animals, and plants are exposed to EMF. However, mitigation is called for in order to comply with the Georgian norm and ICNIRP guidelines. As described above in Chapter 3, the primary mitigation is that no one may live within 30 meters of the energized conductors of the transmission line. In addition, any person who lives within 150 meters of the line may request that electromagnetic fields be measured in their house. If monitoring shows that EMF levels exceed 0.5kV/m or 10uT, GSE will shield or otherwise reduce levels to below that standard or will relocate the people in accordance with the RCAP. In addition, consultations with communities following disclosure of this ESIA and other documentation will specifically include presentations by GSE on EMF levels, potential risks, and mitigations. If community concern remains high, GSE will hold special consultation sessions specifically to discuss EMF issues.
The Stakeholder Engagement Plan will include specific requirements for including EMF discussions in consultations with leaders and community members. GSE will also develop and post a page on its website that discusses levels and risks that result from high-voltage transmission lines (and from other sources such as cellular telephones).

Impact summary and significance

Potential impacts on community health and safety are briefly noted in the paragraphs above. With proper implementation of mitigation measures, there should be limited or no impacts. Table 7.3.2 summarizes the potential significant of impacts on community health and safety. With proper implementation of mitigation measures, potential impacts should be no more than minor and negligible in most cases.

Table 7.3.2. Significance of Potential Impacts on Community Health and Safety

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & Duration of Impact	Significance
Alternatives A and B				
Community	Medium	Worker influx	Low temporary	Minor adverse
		Pressure on services (medical, etc.)	Very low temporary	Negligible adverse
Community members (individuals)	High	Disease	Very low temporary	Minor adverse
		Violent behavior (including GBV)	Low temporary	Moderate adverse
		Nuisance and safety: noise, dust, etc.	Low temporary	Moderate adverse
		Accidents, emergencies	Low temporary	Moderate adverse

Table 7.3.2. Significance of Potential Impacts on Community Health and Safety

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & Duration of Impact	Significance
		EMF	Very low permanent	Minor adverse
Impacts for Alternative B would be similar to Alternative A but magnitude could be slightly higher since more people could be affected because the route passes closer to settlements and there could be more interactions with workers				

7.3.2. Potential Impacts due to physical or economic displacement

As noted in Chapter 2, 500kV transmission lines must have a safety zone on each side of the conductors: the zone is 74.5 meters wide, including 14.5 meters between conductors and 30 meters on each side. No occupied dwelling or auxiliary building may be located within this safety zone. If people do live in the proposed corridor, they will be required to move—this is called "physical displacement" or "resettlement". In addition, the economic losses (that is, the loss of income or the value of property) that people may suffer is called "economic displacement", and can result from such things as loss of land used for crops, pastures, or other purposes; from damages to property or animals; or from other project-related causes. As noted in Chapter 2, Georgian law and World Bank standards each include requirements for dealing with physical and economic displacement.

Activities that could cause physical or economic displacement

Physical or economic displacement can result from:

Acquisition by GSE of houses, property, and land in the transmission line safety zone, at the substation site, and along new access roads can result in physical displacement if households have to relocate away from the safety zone. It can cause economic displacement if land is currently used for agriculture, grazing, orchards, or other economic purposes and can no longer be used.

Damage to crops, animals, or other property could cause economic displacement when vehicles and equipment cross croplands or collide with animals or other property.

Cutting trees or other vegetation in the 54.5-meter vegetation control zone of forests and orchards, or other valuable property could cause economic displacement.

Cutting trees in the vegetation control zone on forest fund lands could cause economic displacement to timber companies or those who cut wood for personal use if such cutting interferes with their own rights to the wood.

Restricting the use of land can lead to economic displacement if owners are prevented from undertaking economic activities as a result.

Mitigation measures

To avoid or minimize potential economic and physical displacement, GSE will:

Require the contractor to restore land that is not acquired for permanent use to its former use as soon as possible after construction is complete. This would be on land the contractor leased for construction storage and staging. Restoration would be agreed with the owner and could include de-compacting agricultural land where vehicles and equipment have driven, parked, or worked; and/or re-vegetation with native or grass species. If grazing lands or other lands are revegetated with native species, the contractor will monitor during the following growing season to verify that grasses or other vegetation are successfully established.

Require the contractor to undertake, wherever possible, as much of the required land-clearing, road construction, construction of towers, and conductoring that will take place on agricultural land between the autumn harvest and spring planting in order to minimize disruption of agriculture (and required compensation for damages).

When the contractor selects final locations of towers, construction sites, and substation, prepare a Resettlement Action Plan for review and approval by the World Bank and the Government of Georgia when the contractor selects final locations of towers, construction sites, and substation. The Plan will identify the land that will be purchased and/or used, owners and persons to be resettled and compensated, the methods by which compensation amounts will be determined, the rates of compensation for various losses and land uses and the amounts. It is noted that some information may be withheld from disclosure to protect privacy.

Require the contractor to consult with the National Forestry Agency concerning whether wood from trees cut in the vegetation control zone can be donated to local people, with preference to those who lose land and those who currently exploit timber resources in the forest for personal use.

Not authorize the contractor to begin construction until all compensation for physical and economic displacement has been paid (except compensation for damages that will occur during construction).

Identifying and making special provisions for affected people who are considered vulnerable or disadvantaged, and thus more likely to be adversely affected and/or less able to participate in the consultation process. These could include elderly households, women-headed households, poor households and those receiving other assistance, internally displaced people, and individuals in specific minority groups. The presence in the project area of people or households in any such minority groups has not been confirmed and is considered to be unlikely; it would be determined with certainty during preparation of the Resettlement Action Plan. The more immediate concern is that the elderly, poor, and displaced people make up 43 percent of the total population of the five municipalities and so are likely to be heavily represented in the project area. The RCAP will provide for special provisions such as higher rates of compensation, special funds, and/or other assistance and support as needed to ensure their living conditions and livelihoods are improved, or at least restored. Once the final design is complete, affected people can be identified with certainty in the RCAP, including those who are actually vulnerable and who may require assistance or special attention.

Impact summary and significance

Table 7.3.1 shows the number of households within 37, 150, 250, and 500 meters of the centerline of the preliminary corridor -- houses within 37 meters would need to be relocated, as they would be within the 74.5-meter safety zone.

In the case of Alternative A, the preliminary corridor was selected so there were no occupied dwellings or auxiliary buildings within the safety zone, and therefore no physical displacement or resettlement would be necessary under this Alternative. In the case of Alternative B, a total of five households currently live in the proposed corridor and would have to be relocated. Since Alternative B is located nearer to settlements, the transmission line corridor would cross lands owned and/or used by greater number of owners affected by the line, since much of Alternative A is on Forest Fund lands.

It is important to note that the selection of the final corridor will be made by the contractor, as described in Chapter 3. This may result in differences in the number of people who may be physically displaced and have to move.

Land that does not have to be purchased for the substation and towers will have permanent restrictions placed on the land through easements: the line will be allowed to cross the land, no buildings may be built in the 74.5-meter corridor, and tall machinery or equipment may not be used under the lines. However, those restricted lands can return to use for growing crops or animals, except that trees in orchards will have to be kept lower than four meters. Even though land under the towers will have to be sold to GSE, it could also be used for crops or grazing except for the small concrete foundations. It is noted that GSE will make every effort to acquire land through negotiation, and wil resort to legal expropriation only where negotiations fail and there is no other feasible location for the tower.

The effect of the loss of wood resources due to tree cutting in the vegetation control zone will not be significant under Alternative A. The area to be cut comprises only a small fraction, far less than one percent, of forests in the five municipalities with timber of similar or better quality, and commercial and personal cutting could continue in those forests.

Table 7.3.3 shows the significance of potential impacts. With mitigation as described in the Resettlement Policy Framework, impacts can be reduced from potentially significant to minor. It will be possible to achieve the goal of having no displaced people worse off than they were before the project.

Table 7.3.3. Potential Significance of Physical and Economic Displacement

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude of Impact and Duration	Significance
Alternative A				

Table 7.3.3. Potential Significance of Physical and Economic Displacement

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude of Impact and Duration	Significance
Residents in corridor	High	Physical displacement	No change	None
Land owners	Medium-high	Permanent loss of land at tower locations, some roads, substation site	Very low permanent	Negligible adverse
		Temporary loss of land in corridor (construction)	Low temporary	Minor adverse
		Restriction on land use in corridor	Very low permanent	Negligible adverse
Land users (non-owners)	Medium	Loss of use of acquired land	Low permanent	Minor adverse
		Loss of use of other land	Low permanent	Minor adverse
Commercial timber operations	Low	Loss of timber resource	Low permanent	Minor adverse
Private wood users	Medium	Loss of wood resource	Low permanent	Minor adverse
		Wood donation for community use	Low temporary	Minor positive
Alternative B				
Residents in corridor	High	Physical displacement	Low permanent	Moderate adverse
Land owners	Medium-high	Permanent loss of land at tower locations, some roads, substation site	Medium permanent	Moderate adverse
		Temporary loss of land in corridor (construction)	Medium temporary	Moderate adverse
		Restriction on land use in corridor	Low permanent	Minor adverse
Land users (non-owners)	Medium	Loss of use of acquired land	Low permanent	Minor adverse
		Loss of use of other land	Very low permanent	Negligible adverse
Commercial timber operations	Low	Loss of timber resource	Low permanent	Minor adverse
Private wood users	Medium	Loss of wood resource	Low permanent	Minor adverse
		Wood donation for community use	Low temporary	Minor positive

7.3.3. Potential impacts on worker health, safety and welfare

Protection of workers is increasingly recognized as being extremely important, as witnessed by the new (2018) Law of Georgia on Occupational Safety, and also is receiving increased emphasis by the World Bank with the adoption in 2018 of Environmental and Social Standard 2, "Labor and Working Conditions". Actions that could cause potential impacts on worker health, welfare, and safety could include:

Poor labor management practices by the contractor and/or subcontractors could lead to situations where workers are exploited or taken advantage of. This could happen if the contractor did not have written labor management procedures or did not to enter into written contracts that inform workers of compensation, work hours and leave, and other information required by Georgia law. This can lead to problems between workers and employers, which in turn can put work and schedules at risk, not to mention the effects on the workers. GSE has developed a Labor Management Procedure (LMP), which sets out the general principles that will govern the management of project workers by the contractor and subcontractors as well as supervision consultant. The procedure is based on Georgian legislation and World Bank's ESS2, including written employment contracts. It also requires contractors to include equivalent provisions in subcontracts and to enforce compliance. GSE and the supervision consultant will also monitor working hours to ensure that daily and weekly hours do not exceed legal limits, and also do not place fatigued workers in high-risk situations near the end of their workdays and workweeks. The need to limit working hours, especially when completing high-risk tasks, will also be emphasized in the induction training and toolbox talks.

Unsafe working conditions could place workers at risk of injury or death. Such conditions could be caused by vehicles and equipment that do not meet safety standards (seat belts, horns, lights, tires, etc.), unprotected access to dangerous locations (unmarked excavations), poor practices and equipment for lifting operations (during tower construction, conductoring, and maintenance), poor electrical safety (untrained workers, inadequate tools, etc.), inadequate safeguards on tools and equipment (unprotected saws, etc.), and other poor practices. In addition, contractors could fail to provide, free of charge to the workers, adequate personal protective equipment, including head, hand, hearing, eye, and foot protection, and could provide insufficient training to workers in the risks of their jobs and how to perform their work safety. To ensure workers are provided with a safe working environment, the contractor will be required to develop and implement, and to train all workers in the requirements of, an Occupational Health and Safety Plan that includes requirements that meet Georgia law, the World Bank Group EHS Guidelines, and good international industry practice; the Plan will need to be submitted with bidders' proposals and will be considered in the selection of contractors. The final Plan will have to be approved by the Supervision Consultant before the contractor is allowed to mobilize and begin any works or investigations. In addition, contractors will have to require subcontractors to comply with this Plan or to develop equivalent Plans. Finally, contractors will report on monthly basis key safety statistics to the Supervision Consultant.

Not giving workers to opportunity to express concerns can lead to worker dissatisfaction and affect productivity, and equally importantly it can lead to missed opportunities to identify unsafe conditions

that workers are in the best position to recognize. When workers are allowed to freely express opinions and to make their grievances known to management, with the knowledge that management will take action as needed, it can lead to more efficient and safer working conditions and also increase worker satisfaction. GSE will require the contractor to develop and implement a mechanism by which workers can submit, including anonymously, their opinions and grievances, and to take action in response to all such submissions. The contractor will also make the mechanism available to subcontract employees, and ensure their grievance are addressed. Further, the contractor will be required to include in their monthly reports to the Supervision Consultant a summary of grievances, and how they were resolved.

Substandard accommodations can lead to illness or disease among workers, which in turn can result in increased turnover as well as reduced productivity. At present, it is not known if the contractors will provide accommodations for workers, but if they do, they will be required to comply with good international industry practice for accommodation, as recorded in the EHS Guidelines of the World Bank Group (Workers' Accommodation: Processes and Standards).

Inadequate water and/or sanitation can affect workers' health, contaminate soil and surface water, and lead to worker illness or disease. Contractors will be required to provide workers with potable water, at no cost to the workers. Contractors will also have to provide sanitary facilities, including portable toilets in remote areas, and to enforce the Code of Conduct's prohibition on using the bush.

Special attention will be given to the issues related to gender equality. Taking into account the nature of the project, the number of women workers who are employed for construction and operation of high voltage transmission lines is very low. There are many reasons for this, including the historic absence of women from employment in general and hard labor in particular. It is not expected that many women would be employed on construction crews, although there could be some involved in engineering designs and in technical teams. In addition, women would be more likely to fill support roles at offices and camps. During selection of the contractors, GSE will consider their labor management policies, including gender nondiscrimination policies and will require contractors to establish realistic (and nonbinding) goals for hiring women in different positions.

Impact summary and significance

Table 7.3.4 summarizes the significance of potential impacts on worker health, safety, and welfare.

Table 7.3.4. Potential Significance of Impacts on Worker Health, Safety and Welfare

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude of Impact and Duration	Significance
Alternatives A and B				
Workers (contractors and Supervision Consultant)	High	Poor labor management practices	Medium temporary	Moderate to major adverse
		Unsafe working conditions	High temporary or permanent	Major adverse

Table 7.3.4. Potential Significance of Impacts on Worker Health, Safety and Welfare

Receptor	Sensitivity of Receptor	Potential Impact	Magnitude of Impact and Duration	Significance
		Inability to express concerns	Medium temporary	Moderate adverse
		Substandard accommodations	Medium temporary	Moderate adverse
		Unsanitary conditions	Medium temporary	Moderate adverse

7.3.4. Potential impacts on economic conditions

Potential impacts on local incomes

The loss of income due to land acquisition and the loss of use of agricultural and forest lands is addressed in section 7.3.2. Other than those impacts, the project can affect local income in two ways: by employing local people and by purchasing materials and supplies from local suppliers. More direct impacts can be felt by the improvement to the regional and national electrical supply, which in turn can help development of industrial and manufacturing potential.

Construction of the transmission line will require up to 200 workers and the substation will employ approximately the half of this number, with the actual number of workers to be determined by the contractors. At present, it is not known if the contractor will be a local or Georgian firm or will come from another country. Contractors on most other recent high-voltage lines have been foreign firms and they often use local subcontractors to support the final design and to construct the line. GSE will encourage the contractor to hire local subcontractors and local workers. It is expected, that minimum 20% of the workers will be locals, preferably from the adjacent villages. It is also expected, that support staff working in camps, auxiliary infrastructure and other support facilities will be mostly of local population. This will definitely have positive impact on the project image on the local level and will smooth the project implementation process. The unemployment and lack of the work opportunities is one of the main problems in the local community. This was clearly indicated during the baseline studies. GSE has positive and negative experience from other projects, usually the increase of local population in the construction and operation of the OHL's has very positive effect on the local level. In case if the work opportunities are not considered by contractor and GSE, the risks will be significantly increased.

It is important to consider the Gender equality and non-discrimination issues in employment opportunities and impact on local population. As it is stated in the socio-economic baseline, the employment rate of men is much higher than women, resulting, that women are more depending on agricultural activities and self-employment. In the target region this is mainly related with little breeding and cheese production, as well cultivation of the hazelnuts and trading of agricultural products. Male employees are usually the majority in construction works, which requires extensive

soil works, erection of high structures etc. even more, women in such projects are involved only as managerial and support personnel, sometimes truck drivers etc. In actual construction and stringing the women workers are absolute minimum. Based on above mentioned, the employment possibilities for women will be not more than 5% (based on experience with high voltage lines in Georgia). Women will have opportunity to be employed mostly as support staff in the camps.

Regarding the potential impacts on women income, the majority of local women are involved in agriculture and milk/cheese processing. The impact on agricultural sector as a result of the OHL construction activities will be negligible. The loss of the territory is minimum, and the restrictions in the line corridor will not affect agricultural activities. In terms of the kettle breeding, the opportunities will even rise, because the zone of vegetation control will create new, more attractive pastures. As a result, construction of power line will not impact the sector, which is important for the women in the region. Moreover, there will be increased demand for the community services, accordingly women will have more opportunity for offering goods and services to the project.

The overall impact of increased income is expected to be insignificant, given the small scale of the project and the uncertainty as to the source of labor. Similarly, the impact on local economies from local sourcing of materials and supplies will not be more than very minor given the scale of the project and thus the relatively limited materials and supplies that will be required.

On the other hand, the project has the potential to cause some loss of income. This is particularly important considering that a significant proportion of the populations in the affected municipalities is considered to be vulnerable (elderly, poor, and displaced people). Most of the population is self-employed and income is generated from agricultural activities. Income from exploitation of forest resources is considered to be very low, some families collect products from the forest for personal use and for selling on the market (chestnut, berries, mushrooms, etc.) and there is some collection of wood for personal use and a few timber companies. It was not possible to quantify information regarding the importance of forest products in incomes of local communities, but it is considered to be very low. Tree cutting and collection of wood for personal use is more widespread, but the area where trees will be cut for the transmission line is so low compared to forest resources in the immediate vicinity that impacts will be a minor, probably negligible except possibly in isolated cases.

The primary main source of agricultural income for local communities is from livestock, milk and cheese production. The project will have a limited impact on such activities, although clearance of the corridor could even increase pastureland. Overall, however, neither negative nor positive impacts are considered to be significant.

The need to cut trees in orchards has the may affect livelihoods. However, ground surveys (where possible), careful review of aerial photographs and imagery from drone overflights showed there is very little land used for fruit or nut production other than a few plantations of hazelnut trees, which are less than four meters high and thus will not need to be cut. Overall, there are less than two hectares of orchards under either alternative. Even so, this could be important for a few households,

and this will be determined in detail and compensated as part of the RAP program.

Table 7.3.5 provides estimates of the affected houses, parcels, PAP's and vulnerable persons. The assumptions used in the estimations include: For alternative A it is assumed that a minimum of 30 percent and a maximum of 40 percent of the corridor is privately owned, and for corridor B 50 and 60 percent, respectively. These proportions are based on observations and general knowledge of the territory and reviews of aerial imagery. The number of parcels is estimated from minimum and the maximum values of average parcels in the regions and the number of persons per family is based on statistical data (Geostat Data show 3.2 persons per family). The average percentage of the vulnerable persons is based also on statistical data.

Table 7.3.5. Residences and number of impacted PAP's within the RoW

Private Ownership	Parcels	Alternative A				Alternative B			
		Number of residential houses and PAPs affected							
		Houses	Parcels	Impacted Persons	Impacted Vulnerable persons	Houses	Parcels	Impacted Persons	Vulnerable persons
Considering minimum of corridor is private	Min	0	883	2,825	339	5	1,360	4,351	522
	Max	0	1,177	3,767	452	8	1,813	5,801	696
Considering maximum of corridor is private	Min	0	1,177	3,767	452	5	1,632	5,221	626
	Max	0	1,569	5,022	602	8	2,175	6,961	835

It is likely that very few of these people and households would be significantly affected by loss of land or restrictions on the use of their land under easement, although some may be. The RAP will provide the details of the land that GSE will need to acquire for towers, the substation, and some roads, and where land use restriction will be applied under easement (on such lands no buildings, no tall trees or use of equipment that could reach the wires will be allowed) and the compensation that owners and users of such affected lands will be provided. This will include market value for land (or replacement land if that is what the owner desires), compensation for buildings, crops, and other assets that are lost, and easement fees; if households have to move from the corridor, GSE will provide further compensation and assistance. Overall, the project will improve, or at least restore any reduction in living standards or income.

Potential impacts on power supply and key economic sectors

A reliable power transmission system is essential to continued economic development in the country and the regions the transmission line will cross. As mentioned previously, the project will strengthen the power transmission capacity and reliability throughout the country, and thus contribute to long term economic development. It could also help maintain strong relations with neighboring countries

as power is more able to cross borders.

Agriculture sector: The area of affected agricultural land will be very small, especially in comparison to other agricultural land in the municipalities. Under Alternative A, only about 5.4 hectares of land classified as agricultural, both being used for crops and not being used, would be directly affected by the transmission line; another 12.4 hectares of grasslands and shrubland, some of which is used for grazing, would be directly affected, and 17 acres would be affected by the substation. Under Alternative B, there would be about 6.3 hectares of agricultural land directly affected, plus about 22.7 hectares of grassland and shrubland and the same 17 hectares for the substation. Only very small portion of the agricultural land will require vegetation to be controlled, generally only orchards with trees over four meters high; this would amount to only 1.3 hectares under Alternative A and a smaller but undetermined area under Alternative B. Thus, the impact on agricultural production due to construction activities and placement of towers and substation on the land is expected to be small. Following construction, all agricultural land can return to its original use except orchards with trees higher than 4 meters and areas occupied by towers; this would affect only a few hectares, again too small to result in any significant impact on agriculture. Small amount of agricultural land that could be affected

Tourism sector: The tourism sector has an important economic role in some areas along the transmission line corridor. These include natural and cultural heritage sites and resorts that are described in Chapter 6. Potential impacts on tourism could result from the following activities. These are also described in section 7.3.5.

Nuisance factors during construction works, including noise, dust, land disturbance, and visual intrusion. Since the nearest national monument is several hundred meters away, this impact should be negligible except for visual intrusion, which would last only the few days or weeks that construction would take at any location.

Nuisance factors during operations, including visual disturbance and maintenance operations. Some sections of the transmission line corridor and the line itself will be visible from natural and cultural heritage sites, although not from resorts. This could have a minor temporary effect on visitors but would not be significant.

Accidental damage to cultural heritage sites or resorts during construction or maintenance works. These would not be expected to occur since all activities will be several hundred meters away. Only accidents involving project vehicles passing sites of concern could affect such sites, and this is considered very unlikely.

Potential Impacts on vulnerable people and groups

Section 6.8.7 provided baseline information regarding vulnerable groups in the region. Project implementation will require land acquisition and easement restrictions in the project corridor as well as some vegetation clearance and establishment of roads, which will cause impacts on those who own or use land and its assets and products. Thus, some impacts are foreseen on vulnerable groups as well.

The optimization of project corridor for the Alternative A route resulted in significant reduction of impacts on people, including vulnerable people. The expected impact on households and the agricultural land is sedately discussed in the relevant subchapters of the present report. In case of Alternative B, the impact on households and communities is significantly higher.

The gender composition of the population in impact zone is provided in the chapter 6.8.7; it is stated, that the majority of population in the project impact area is involved in not intensive agricultural activities with the leading sectors of cheese production and crop production – mainly maize. IDP's in the project area are not concentrated in the compact communities and are spread over the villages, however the number in remote area close to the mountainous zone is low.

Even minor impacts can have added significance to vulnerable people, especially the poor. For that reason, GSE will provide additional compensation for permanent loss of land, buildings, or other assets and for restrictions on future land use when the land or assets are owned or used by vulnerable people such as the elderly, poor, and internally displaced. GSE also will provide special assistance as needed to ensure these people will not suffer any reduction in their standard of living or income.

Potential Impacts on Infrastructure

Infrastructure. The only infrastructure that would be at risk would be other transmission lines, roads, and rail lines. The line will cross five major roadways and two rail lines. In addition, the line will cross or be near other transmission lines near the southern end of the line near the new Tskaltubo substation and at the Jvari substation. Limited or no activity will occur in any other areas close to buildings.

Activities that could affect infrastructure will include:

Conductoring (that is, stringing the wires) between the towers on either side of the two rail lines would normally have no potential impact, unless there is some difficulty in the conductoring process and the line interfered with a passing train or with road traffic. In addition, conductoring could interfere with traffic on the roads while wires are being strung between towers on each side.

- *Project traffic* could interfere with traffic on public roads, especially at locations where vehicles and equipment turn off the road onto side roads or tracks. Accidents by project vehicles in urban areas could also affect buildings or other infrastructure.
- *Heavy machinery* could damage roads and interfere with public traffic. On unpaved rural roads, even light vehicles can cause damage in wet weather, and this could interfere with community use of these roads.
- *Conductoring* will take place near other transmission lines near the Jvari and Tskaltubo substations, and this could interfere with other transmission lines, causing power outages and/or endangering workers and members of the public as well as damage to the other lines.

To avoid adverse impacts on infrastructure, GSE will require the contractor to:

Consult with railroad companies to coordinate conductoring activities so that no trains will pass while the conductors are being strung between the towers on either side of the rail line.

Consulting with traffic authorities if there will be road intersections where significant numbers of project vehicles and equipment will be leaving and entering public roads, and taking measures (time of travel, signs, flag persons, etc.) as recommended by traffic authorities.

Develop and implement a Traffic Management Plan that includes operating and safety requirements for drivers, vehicles, and other project activities in urban, rural, and remote areas.

Provide flag persons or other signals when heavy equipment and vehicles could disrupt normal traffic.

In consultation with and as directed by traffic authorities, stop traffic when conductoring operations that require conductors to cross a road are underway.

Ensure only vehicles suitable and licensed for use on public roads are used on public roads.

Repair any damage to public roads to the satisfaction of local traffic authorities and repair damaged secondary and rural unpaved roads immediately to ensure no disruption of community activities

Follow standard GSE procedures and good international industry practice when working near other transmission lines.

It is considered unlikely there could be significant impacts to infrastructure if mitigation measures are implemented carefully.

Impact summary and significance

Table 7.3.6 summarizes the potential significance of impacts on economic conditions.

Table 7.3.6. Potential Significance of Impacts on Economic Conditions

Affected factor	Sensitivity of Receptor	Potential Impact	Magnitude & Duration of Impact	Significance
Alternatives A and B				
Local incomes	Medium	Increased employment and income	Low temporary	Minor positive
		Increased income by local suppliers	Low temporary	Minor positive
		Decreased income for commercial timber companies	Low permanent	Minor adverse
Key economic sectors	Low-high	More reliable power supply	High permanent	Major positive
		Reduced agricultural output	Low temporary	Negligible adverse
		Reduced tourism	Low temporary	Negligible adverse
Infrastructure	Low-	Damaged public roads	Low temporary	Minor adverse

Table 7.3.6. Potential Significance of Impacts on Economic Conditions

Affected factor	Sensitivity of Receptor	Potential Impact	Magnitude & Duration of Impact	Significance
	medium	Damaged rural unpaved roads/tracks	Medium temporary	Moderate adverse
		Damaged rail line & train traffic	Low temporary	Minor adverse

7.3.5. Potential impacts on cultural heritage

This section identifies and assesses potential impacts of the project on cultural heritage. As noted in Chapter 6, the transmission line corridor crosses regions that are rich in prehistorical and historical heritage, with many natural and cultural features that are protected by national law.

Activities with potential impacts on cultural heritage

The following activities could affect cultural heritage sites:

Excavation at tower sites and the substation could destroy or damage artifacts or archaeological sites if the cultural resource is not detected.

Blasting for excavations at tower sites, if required, could cause vibrations that could damage structures at cultural heritage sites or cause damage to caves, or flyrock could damage buildings or other physical features on the surface.

Land clearing at tower sites, construction sites, substation, and roads could damage or destroy surface artifacts and signs of underground archaeological remains.

Vegetation clearance would have limited or no potential to directly affect cultural and natural heritage directly except at staging areas where land may be cleared to the ground. However, the establishment of corridors with different vegetation could have an indirect effect due to changing the visual landscape for visitors to cultural heritage sites; this impact was discussed in section 7.1.1.

Construction activities could disturb visitors to cultural heritage sites with noise, traffic, visible intrusion, or worker misbehavior.

Project activities could result in the following types of impacts:

Physical damage. Excavations at tower sites or the substation could disturb, damage, or destroy previously unknown archaeological remains, and construction of roads and other activities could damage aboveground structures or artifacts through collision, crushing. If there is blasting at tower sites, vibration could damage monasteries, fortresses, churches, and other monuments. In addition, workers could exploit or damage items of cultural importance. Such impacts could occur to artifacts and monuments that were in the project corridor or along access roads.

Visual and "experience" deterioration of cultural heritage sites. This type of impact would result from alteration of the landscape in areas that can be seen from cultural sites, which in turn could detract from the cultural value and the enjoyment of visitors. The presence of corridors with different vegetation types, construction activities at tower sites, and the long-term presence of towers and conductors would have the greatest effect on landscapes and views. The removal of trees within the corridor and the erection of towers would result in permanent changes to landscape, while construction activities themselves would be short-term, no more than a few days or weeks at any location. It is likely the impact on visitors to natural heritage monuments would be more significant since they are presumably visiting for the natural conditions, which the project would alter to some extent. However, impacts would be short-term in nature for most individual visitors, which would diminish the overall significance. Potential impacts due to disruption of visual landscapes are described further in section 7.1.1.

Potential impacts

In general, proximity of cultural heritage sites to the transmission line would be the most important factor in determining the significance of potential impacts. Natural and cultural heritage monuments under national protection that are within five kilometers of the Alternative A and B corridors are listed in Table 7.3.7.

Table 7.3.7. Distance from National Heritage Monuments to Centerlines of Alternatives A and B

No.	English name	Georgian Name	Type	Distance to Centerline of Alternative (m)	
				A	B
1	Church	ეკლესია, გვიშტიბი	NCHM	2846	2846
2	Church	ეკლესია, გვიშტიბი	NCHM	2793	2793
3	Church remnants	კვირიკე და ივლიტას ნაეკლესიარი	NCHM	3373	3373
4	Church remnants	ნაეკლესიარი, ნახახულევი	NCHM	3248	3248
5	Matkhoji Fortress	მათხოჯის ციხე	NCHM	2808	2715
6	Church and cemetery	მთავარანგელოზ გაბრიელის ეკლესია	NCHM	885	780
7	St. Nino Monastry	წმ. ნინოს მონასტერი	NCHM	588	481
8	Legulordave Jikha fortress remnants	ლეგულორდავეს ჯიხა	NCHM	4830	4830
9	Kveda Khuntsi Church	ქვედა ხუნწის ეკლესია	NCHM	3196	3196
10	St. Nino Church	წმ. ნინოს ეკლესია	NCHM	622	622
11	Church	ღვთისმშობლის ეკლესია	NCHM	1967	1967
12	Bumbuas Khidi (Bumbua Bridge)	ბუმბუას ხიდი	NCHM	2055	2055
13	Obuji, late medieval church remnants	ობუჯი, ნაეკლესიარი	NCHM	3534	3534

Table 7.3.7. Distance from National Heritage Monuments to Centerlines of Alternatives A and B

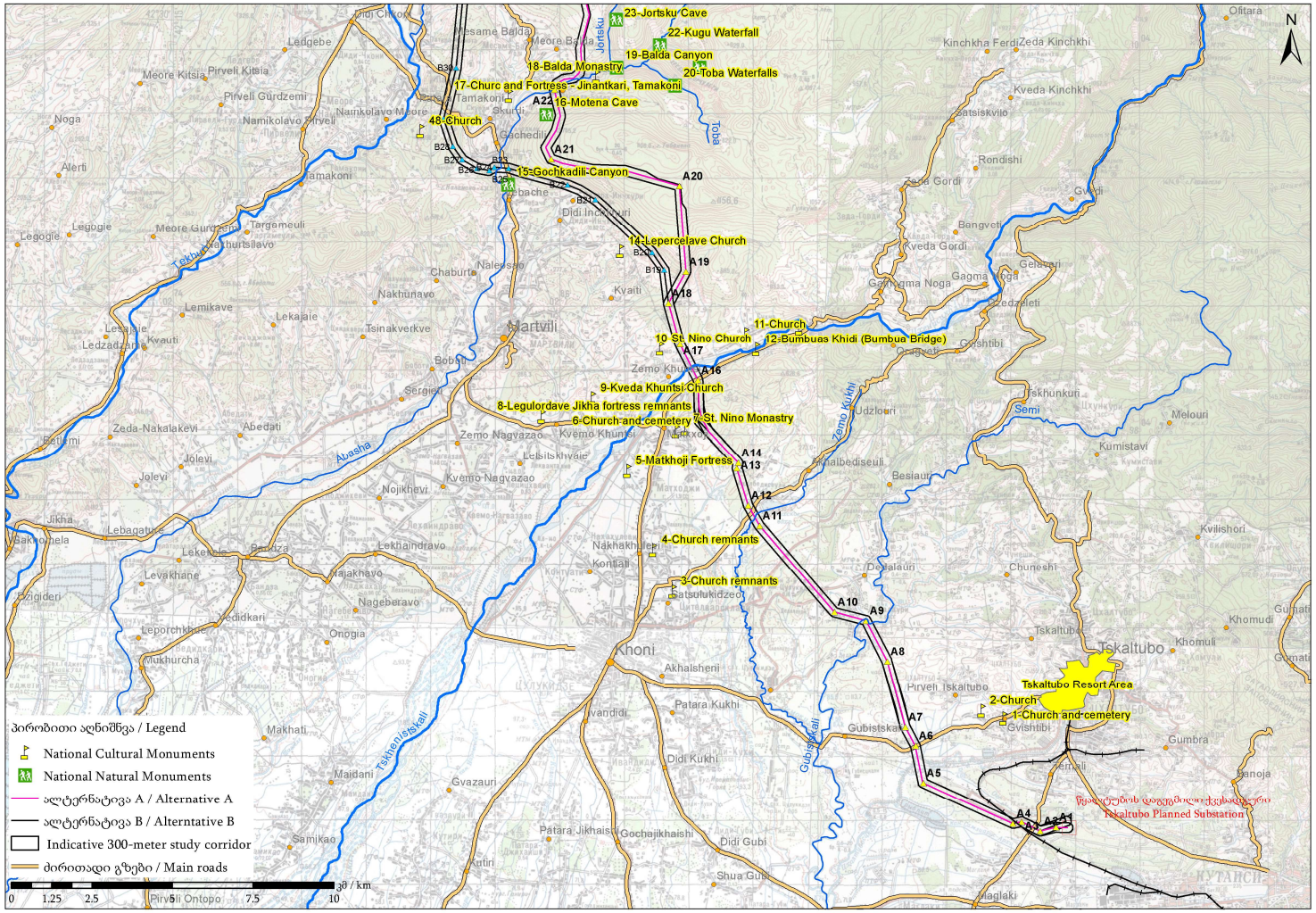
No.	English name	Georgian Name	Type	Distance to Centerline of Alternative (m)	
				A	B
14	Lepercelave Church	ლეფერცელავეს (პეტრეპავლობის) ტაძარი	NCHM	1980	637
15	Gochkadili Canyon	გოჭკადილის კანიონი	NCHM	1550	492
16	Motena Cave	მოთენას მღვიმე	NCHM	418	3060
17	Church and Fortress - Jinantkari, Tamakoni	ჯინანთკარის ეკლესია, თამაკონის ჯიხა	NCHM	1410	1807
18	Balda Monastry	ბალდას მონასტერი	NCHM	532	4352
19	Balda Canyon	ბალდას კანიონი	NNHM	1089	4957
20	Toba Waterfalls	ტობას ჩანჩქერი	NNHM	3682	>5000
21	Oniore Waterfall	ონიორეს ჩანჩქერი და ტობას მღვიმე	NNHM	4543	>5000
22	Kugu Waterfall	კუღუს ჩანჩქერი	NNHM	2457	>5000
23	Jortsku Cave	ჯორწყუს მღვიმე	NNHM	846	>5000
24	Dadiani Castle	დადიანების სასახლე, სალხინო	NCHM	2507	1141
25	Church	მარიამ ღვთისმშობლის ტაძარი, სალხინო	NCHM	2450	1099
26	Church	ეკლესია, სალხინო	NCHM	2518	2509
27	Tsachkhuru Monastry	წაჩხურუს მონასტერი	NCHM	682	423
28	Khirzeni Waterfalls	ხირზენის ჩანჩქერი	NNHM	1118	1890
29	Church remnants	ნაეკლესიარი, ეწერი	NCHM	3496	1302
30	Godobani Church	გოდობნის ეკლესია	NCHM	3417	2344
31	Kurzu Fortress	კურზუს ციხე	NCHM	2527	1048
32	G. Akhalaia house	გ. ახალაიას კარმიდამო	NCHM	1943	795
33	Monastry	მონასტერი, დობერაზენი	NCHM	900	759
34	Ochkhomuri Waterfalls	ოჩხომურის ჩანჩქერები	NNHM	592	1588
35	Tower	ციხე-კოშკი	NCHM	2305	1219
36	Otsindale Church	ოცინდალეს ეკლესია	NCHM	954	452
37	Church	ეკლესია, თაია	NCHM	1093	407
38	Church	სამნავიანი ბაზილიკა, მე-4 - მე-18 სს., მუხური	NCHM	1359	529
39	St. George and St. Nikolos Church	წმ. გიორგისა და წმ. ნიკოლოზის სახ. ეკლესია	NCHM	1594	1058
40	M. Kvaratskhelia house	მ. კვარაცხელისას კარმიდამო	NCHM	1769	721
41	Church remnants	ნაეკლესიარი, ლეთკანთი	NCHM	1837	731
42	Tower	კოშკი, მედანი	NCHM	2375	1493

Table 7.3.7. Distance from National Heritage Monuments to Centerlines of Alternatives A and B

No.	English name	Georgian Name	Type	Distance to Centerline of Alternative (m)	
				A	B
43	Skuri Church	სქურის ეკლესია	NCHM	1116	2020
44	Church remnants	ნაეკლესიარი, ნაგურუ	NCHM	991	1338
45	Leshamge Church	ლეშამგეს ეკლესია	NCHM	2857	3465
46	Church	ღვთისმშობლის სახ. ეკლესია, სკურდი	NCHM	4322	786
NCHM – National Cultural Heritage Monument NNHM – National Natural Heritage Monument					

A total of 46 national monuments are within five kilometers of Alternative A, including seven natural heritage monuments and 39 cultural heritage monuments. One cultural monument, Motena Cave, is just over 400 meters from the line and Ochkhomuri Waterfalls are almost 600 meters away; no natural monuments are within 500 meters, but five are within 1000 meters. Forty-two of the monuments are within five kilometers of Alternative B. Four cultural monuments (St. Nino and Tsachkhuru Monasteries, Otsindale Church and one other church) and no natural monuments are within 500 meters, with St. Nino's the nearest at 418 meters. Another 10 cultural monuments and no natural monuments are within 1000 metres. In addition, near angle tower 7, the Alternative A line will pass within 170 meters of one cemetery at 170 meters and within 365 meters of another. The locations of monuments are shown on Figure 7.3.2 and Figure 7.3.3. They were also pinted on Figures 7.1.1 and 7.1.2, which show areas within five kilometers from where towers or conductors could be seen.

National legislation allows intangible cultural heritage to be registered and protected. There is no known intangible heritage in the area that could be affected by the project.



Legend

- National Cultural Monuments
- National Natural Monuments
- ალტერნატივა A / Alternative A
- ალტერნატივა B / Alterntative B
- Indicative 300-meter study corridor
- ძირითადი გზები / Main roads

Figure 7.3.2 National Cultural & Natural Monuments Within 5 Kilometers of the Corridors (part 1)

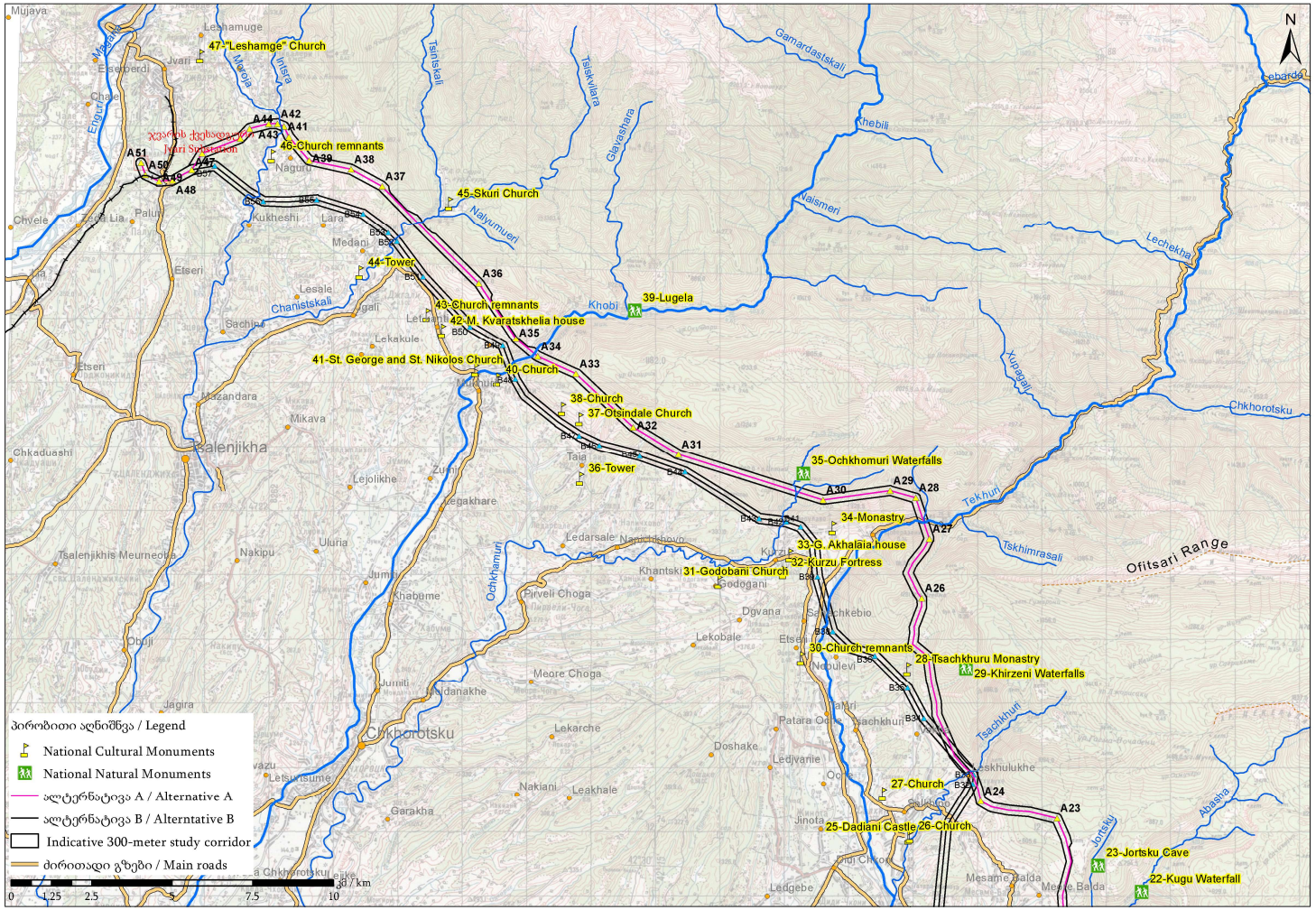


Figure 7.3.3 National Cultural & Natural Monuments Within 5 Kilometers of the Corridors (part 2)

These distances mean that construction of towers and the substation will have no direct effects on any known sites with cultural or natural heritage value, except possibly from traffic or misbehaving workers. There could be indirect effects due to construction noise that carried a long distance, from traffic noise at a few sites, and from changes and disruptions to distant visual landscapes.

Given the long and rich history of human occupation of this area, there is some risk of encountering previously undiscovered archaeological remains or artifacts. If not sensitive and alert, excavations at tower sites or, less likely, at the substation could damage or destroy artifacts and their context and provenance. While not likely to occur at the small areas of excavations, impacts could be highly significant depending on the site itself. Even surface disturbance at construction locations and around excavations and at new roads could affect surficial artifacts and signs of hidden archaeological remains. These are also not likely to occur, although more likely than encountering an undiscovered archaeological site. The impact would be less significant for surficial artifacts but could be significant if surface signs of hidden archaeological remains were damaged or destroyed.

Mitigation Measures

To avoid or reduce the potential for impacts, GSE will:

Require the contractor to consult with the e Ministry of Education, Science, Culture and Sport of Georgia, and if possible with local experts, to identify locations in the preliminary corridor that are most likely to have cultural and natural heritage value. If the contractor proposes that final locations of towers, construction sites, roads, and the substation will directly affect any of those likely locations, a qualified archaeologist will visit the proposed final locations and advice as to the presence of cultural resources, which case those locations would be avoided. If the expert advises avoidance of specific areas, the contractor will modify the proposed locations to avoid these areas.

To comply with the requirements for World Bank-supported infrastructure projects in Georgia, the contractor will: (a) take all activities on hold upon encountering a chance find, (b) immediately inform Employer, (c) do not resume works until formal notice from the Employer.

Contractor will be requested to take all physical activities on hold if a chance find is encountered and to promptly notify GSE. GSE will inform the Ministry of Education, Science, Culture and Sport on the chance find and agree further course of action with the Ministry. GSE will be obligated to facilitate assessment of the site, excavation, packaging and transportation of finds, and conservation of any remaining segments of the archaeological site by the Ministry. GSE will order resumption of works upon written notice from the Ministry of Education, Science, Culture and Sport.

Require contractors to include in induction training provided to all foremen and workers, and at least annual refresher training, instructions as to the what kind of possible discoveries that might be made and the responses that must be taken in case of chance finds.

Require the contractor to include in the contractor's Worker Code of Conduct, and to enforce, prohibitions against disturbing or destroying any materials, areas, or items that could have cultural heritage or natural value.

Require the contractor's Traffic Management Plan to include cultural heritage sites as sensitive areas for purposes of establishing requirements to avoid or minimize impacts.

Prohibit the contactor from undertaking construction activities within five kilometres of a monastery or other religious monument on Sundays or religious holidays.

Impact summary and significance

Table 7.3.8 shows the sensitivity criteria used to assess potential impacts on cultural heritage sites. As noted above, the distance of the line from any natural or cultural monuments will prevent direct impacts from construction or operation, except the very low risk of impacts from traffic or worker activities. The required mitigation measures will result in the risk of significant impacts being very low. Potential significance of impacts is shown in Table 7.3.9.

Table 7.3.8. Sensitivity Criteria for Cultural Heritage

Sensitivity	Criteria
High	Physical damage to cultural heritage sites of national or international importance Significant long-term alteration of near-field visual landscape at sites of national or international importance Significant damage or destruction of undiscovered archaeological site or surface sign of unknown archaeological site Intentional removal of artifacts of cultural significance from their surroundings Permanent disruption of access to cultural heritage sites
Medium	Physical damage to cultural heritage sites of local or regional importance Limited damage to undiscovered archaeological site or artifacts Longer-term disruption of access to cultural heritage sites Damage to individual artifacts on the surface
Low	Minor disruption or damage to undiscovered archaeological site or artifacts Short-term alteration of near-field visual landscapes or permanent alteration of distant landscapes Short-term disruption at cultural heritage sites due to noise, increased traffic, or other nearby construction activity Temporary disruption of access to cultural heritage sites

Table 7.3.9. Significance of Potential Impacts to Cultural Heritage

Environmental Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & Duration of Impact	Significance
Alternatives A and B				
Cultural and Natural Monuments	High	Noise from construction	Low temporary	Moderate adverse
		Worker disruption	Very low temporary	Minor adverse

Table 7.3.9. Significance of Potential Impacts to Cultural Heritage

Environmental Receptor	Sensitivity of Receptor	Potential Impact	Magnitude & Duration of Impact	Significance
		Direct impacts	Very low permanent	Minor adverse
Undiscovered cultural heritage	High	Damage or destruction of archaeological site	Low permanent	Minor adverse
		Destruction of surficial artifact or sign of archaeological remains	Low permanent	Minor adverse

7.4. *Comparison of Alternatives*

Table 7.4.1 summarizes information for the two alternatives. As noted previously, Alternative B was routed just at the "border" between settled areas and the mountains and would affect more people. Alternative A, on the other hand, was intentionally routed so as to bypass settlements and avoid private land and resettlement. Even though it will have more impact on biodiversity, it will have much less impact on people.

Table 7.4.1. Comparison of Key Impacts of Alternatives A and B

Source of potential impact	Alternative A	Alternative B
Total length (km)	78.6	71.7
Length through forest (km)	49.1	24.1
Length through agricultural land/grassland/other (km)	29.4	45.8
Length through developed land (km)	0.4	0.6
Length through protected areas (km)	0.0	0.0
Length through critical habitat (km)	0.0	0.0
Length through natural habitat (km)	40.6	0.0
Number of towers	205	211
	Note: 68 towers would be the same for both alternatives	
Number of towers in agricultural land (mostly private)	76	172
Number of towers in forests (mostly government)	127	38
No. of rivers (and tributaries) crossed	11	10
No. natural & cultural monuments within 500m	1	4

Table 7.4.1. Comparison of Key Impacts of Alternatives A and B

Source of potential impact	Alternative A	Alternative B
No. natural & cultural monuments within 1000m	6	13
Closest natural or cultural monument to line (km)	0.418 Motena Cave	0.407 Unspecified church
No. monuments within 5km	52	48
Number of households within 1km	1075	2214
Number of households within 5km	17583	19390
Number of households within 150m	77	113
Approx. number of households to be resettled	0	5

7.5. *Summary of Potential Impacts and Preferred Alternative*

Table 7.5.1 summarizes the potential impacts of Alternatives A and B on all the environmental and socioeconomic resources. The No-Action Alternative is not shown since there would be no direct impacts on people or the environment, but rather adverse impacts to the country and region from overloaded transmission capacity and a less reliable energy supply.

Many or most potential impacts of construction and operation of the transmission line and substation are considered to be generally insignificant and would not typically require specific measures to avoid or mitigate the impact other than the implementation of routine good international industry practices. However, there are several moderate to major adverse impacts associated with this project that will require specific measures to avoid or mitigate impacts. These are primarily associated with potential impacts on biodiversity (flora, fauna, and habitats) and impacts due to physical and economic displacement. The moderate and major potential impacts and the measures that will be required to avoid or reduce the impacts are summarized in Table 7.5.1 and include the following:

- For both Alternatives, construction and operation of the transmission line will create a minor to moderate adverse impact on aesthetics and views for tourists and naturalists, perhaps more on naturalists since they will have come to the area to enjoy the natural environment. This cannot be completely avoided, except possibly by adjusting some locations so that hilly terrain will hide some towers from specific high-use areas.
- For Alternative A, the construction of towers, access roads, and future maintenance would have a major adverse impact on flora in some natural habitat in fragmented and non-fragmented forest areas due to destruction of individual plants and habitat modification. Prior to design (that is, final selection of exact locations of towers, construction areas, roads, and corridor) in areas of medium and high sensitivity, and prior to construction in areas of medium and low sensitivity, detailed pre-construction botanical surveys of tower locations and

corridors will be conducted by a qualified biologist. The purpose will be to identify, mark, and count all tree and shrub specimens and populations of conservation concern, and to mark their habitats. Wherever feasible, the contractor will "micro-locate" towers and the corridor to minimize the number of such trees and shrubs that must be cut. If effectiveness of compensatory planting is confirmed by additional studies, for each plant specimen of conservation interest that should be extracted, at least two specimens of the same species will be planted. For Alternative B, the affected area and the consequent impacts would be much smaller, but the same mitigation measures would apply. Proposed measures for mitigating of negative impacts on habitats and species will be further analyzed along with the need for and feasibility of any biodiversity offsets, and Biodiverstiy Management Plan will be developed prior to commencement of works.

- For both Alternatives, the clearance of tall vegetation in the vegetation control zone in agricultural and other non-forested land, including at the substation site, may have a major adverse impact on isolated specimens of trees and shrubs of conservation concern. Such specimens will be identified in the surveys described in the previous bullet. Unless the Supervision Consultant agrees there is no other feasible location, the contractor will avoid such specimens. If there is no feasible alternative, then for each tree or shrub of conservation concern that is cut, the contractor will plant at least two specimens in a sheltered location and ensure they are protected (and replaced if necessary) for at least three years. This program will be included in the Biodiversity Conservation Plan noted above.
- For Alternatives A and B, the establishment and continued presence of the transmission lines could have a minor to moderate impact on migratory birds and bats due to collisions with the conductors, especially in areas where the transmission line crosses river valleys. During construction and the first year of operation, GSE will appoint one or more experts to monitor these areas during the autumn migration period to determine if migrating birds pass through the corridor, and if so whether they are at an altitude that could lead to collisions in the future. If, in the opinion of the expert, there is a significant risk of future mortality due to collisions, GSE will install so-called "bird diverters" at intervals on transmission lines at valley crossings to discourage perching and loafing, and to discourage birds from approaching the line.
- For Alternatives A and B, the presence of the energized transmission lines could have a minor to moderate impact if large birds (primarily raptors and cranes) land on them and are electrocuted. For the entire line, the contractor's design will require that conductors (lines) and insulators be spaced so as to prevent electrocution by the bird with the largest wingspan that is likely to be present (approximately 2.5-3 meters for the Griffon vulture).
- For Alternatives A and B, but more significantly for Alternative A, cutting mature trees in the vegetation control zone could have a moderate to major adverse impact on bats that may hibernate in tree hollows, bats and owls that roost and nest in hollows, and other raptors that nest in the trees. Prior to beginning tree-cutting in the vegetation control zone and access roads, as part of the biodiversity surveys described above under flora, the contractor will appoint a qualified expert to conduct a survey for mature trees with active or previously used hollows and nests in and near tower locations and the vegetation control zone in those areas.

If trees that have active nests are found within 0.5 kilometer of the corridor, construction and other activities within 200 meters of nests will be delayed until at least 30 days after young birds and bats fledge and leave the nest. If an old nest is found, another survey will be completed immediately before construction to determine if the nest has become active; if it has, the same delay will be required. For every tree with a hollow where bats are found, or where there is evidence of past presence, at least two "bat boxes" or "bat houses" suitable for bat roosting and nesting will be installed; locations where the boxes will be placed will be selected by the expert but should be within 50 meters of the tree that was cut. These requirements will be recorded in the "Flora, Fauna, and Habitat Survey Plan" and the "Biodiversity Conservation Plan" noted above.

- For Alternatives A and B, construction of towers, access roads, and ongoing maintenance activities have a moderate adverse impact on fauna in non-fragmented forests due to disturbance of individual animals as well as destruction of dens, nests, and foraging habitat. Alternative A would have the most impact since the forest habitat is less fragmented than Alternative B. Prior to construction during breeding seasons (roughly, March to August) in non-fragmented forest (see section 7.3.1), the flora and fauna surveys will include one or more qualified experts, who will conduct detailed surveys to determine whether animal species of conservation concern are present and/or use the areas and to determine whether construction should be delayed until after breeding seasons for species of concern. This program will be covered in the Biodiversity Conservation Plan described above.
- For Alternatives A and B, construction workers would be exposed to significant health and safety risks, as are all construction workers. Employers will be required to provide equipment and materials that are sufficient to provide a safe working environment, and to provide, at no cost to worker, personal protective equipment. In addition, workers will be trained in the risks of their jobs and how to protect themselves from injury or death. Requirements will be recorded in a Worker Health and Safety Plan that will be submitted with bidders' proposals so that GSE will be able to evaluate the bidders' commitment to safety. The Plan will be finalized before construction begins and updated as needed throughout construction. In addition, GSE is required to update its own safety procedures to meet the requirements of the new Georgia Occupational Health and Safety Law, which was described in Chapter 2, and to review its Human Resources Manual to verify it meets the requirements of World Bank Environmental and Social Standard 2 and Georgia law.
- For the preliminary corridor under Alternatives A, no households are within 30 meters of the energized conductors, so none will be physically displaced and need to be relocated. For Alternative B, there would be a major adverse impact on about five households that would need to be relocated. Once the final location of towers is determined, GSE will negotiate with households in accordance with Georgian law and the Resettlement Policy Framework (and specifically with a future Resettlement and Compensation Action Plan), with compensation and/or alternative housing agreed to by the landowner and/or resident. Overall, the RACP will require that no people who are affected by the project be worse off financially/economically

due to construction and operation of the line and substation. If relocation or compensation is necessary, it will be complete before construction begins.

- For both Alternatives, but especially for Alternative B, some landowners would have to sell small plots of land where the towers and permanent access roads will be located. In additions, some landowners will have restrictions placed on future use of their land: within the 54.5-meter vegetation control zone, no vegetation will be allowed to grow over four meters high and within the 74.5-meter safety zone, no buildings may be constructed, or tall machinery used. Compensation for the loss of land and for the restricted use of land will be in accordance with Georgian law and the RACP. All compensation will be paid before construction begins.
- For alternatives A and B, but much less for B, construction or future maintenance could damage crops or herds and have a minor to moderate impact on subsistence farmers and herders. This will be avoided or reduced by adherence to best management practices and required mitigation measures for vehicle movements and tower construction sites, and further mitigated by prompt compensation in accordance with the future RACP.

As noted above, most adverse impacts that are minor or negligible will be reduced or avoided altogether by the use of good international industry practices and required mitigation measures. More serious potential impacts will be avoided or reduced to acceptable levels by implementation of the mitigation measures. Avoidance strategies, mitigation measures, and best management practices are presented as part of the Management and Monitoring Plans in Chapter 8.

7.5.1. Preferred alternative

The evaluation of alternatives was conducted as described in Chapter 5 and 7, and the alternative was selected following visits to the area to evaluate land ownership and use, flora and fauna, cultural heritage, and other characteristics of the area. As noted previously, the Alternative A corridor was designed so as to avoid biodiversity-rich sites in the Emerald Network and to minimize social impacts, including land take and relocation. The key advantages of this alternative are that there would be much less disturbance of local populations than under Alternative B, and far fewer towers would be located on agricultural and grazing land. Thus, much less private land would need to be acquired, and no households would need to be relocated. This Alternative would damage natural habitat, however, and there would be more impacts on flora and fauna species of conservation concern. Implementation of required mitigation measures would ensure there is no net loss of biodiversity over the long term.

Under Alternative B, much more private land would have to acquired, at least a few households would have to be resettled, and more people would be disturbed during construction. In addition, there would be many more land owners for which easements with land use restrictions would have to be agreed or imposed, which is a formidable legal task that could require a substantial period of time.

Alternative A was selected as GSE's preferred alternative following the evaluation of potential social and environmental impacts for both alternatives.

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
Landscapes and views						
Residents	Medium	Disturbance to current landscape views due to construction, vegetation corridor in forests, and presence of towers and conductors	Low permanent	Minor adverse	Low permanent	Minor adverse
Residents near substation	Low	Disturbance to current views of agricultural land due to construction, towers, conductors, and substation	Low permanent	Negligible adverse	Low permanent	Negligible adverse
Tourists	High	Disturbance of natural views due to construction, vegetation corridor and transmission line	Medium permanent (temporary for individuals)	Moderate adverse	Medium permanent (temporary by individuals)	Moderate adverse
Travelers/visitors	Low	Disturbance of natural views due to construction, vegetation corridor and transmission line	Very low temporary	Negligible Adverse	Very low temporary	Negligible Adverse
Land use						
Residential areas	High	Relocation and demolition of houses and buildings	No change	None	Medium permanent	Moderate adverse
Forests	High	Vegetation cut to <4m in 54.5m corridor; vegetation cleared at tower sites, substation, new roads	Medium permanent	Moderate adverse	Low permanent	Minor adverse

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
Areas protected for biodiversity value	High	No direct impact except sections may be visible from a few locations in Emerald Sites	Very low permanent (temporary for individuals)	Negligible adverse	Very low permanent (temporary for individuals)	Negligible adverse
Areas protected for cultural or natural heritage	High	See Tourists under "Landscapes and views" above. No direct effects, but line will be visible in the distance from some monuments	Medium permanent (temporary by individuals)	Moderate adverse	Medium permanent (temporary by individuals)	Moderate adverse
Agricultural land used for annual crops	Medium	Private land at towers, roads substations will be lost (acquired by GSE), restrictions but no change in use of other land in 74.5m corridor	Minor permanent	Minor adverse	Minor permanent	Minor adverse
Agricultural land not cultivated	Low	Private land at towers, roads substations will be lost (acquired by GSE); restrictions but no change in use of other land in 74.5m corridor	Low permanent	Minor adverse	Low permanent	Minor adverse
Perennial crops	High	Orchards will be cut to <4m	Low permanent	Minor adverse	Low permanent	Minor adverse
Grassland/ bushland/ barren land	Low	Private land at towers, roads substations will be lost (acquired by GSE), restrictions but no change in use of land in 74.5m corridor	Low permanent	Minor adverse	Low permanent	Minor adverse
Other land (developed)	Low	Restrictions on use of land in safety zone	Very low permanent	Negligible adverse	Low permanent	Minor adverse

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
Soils and geological conditions						
Ground surface (rock & soil) at towers and roads on steep and moderate slopes (affected by land-clearing)	High	Significant erosion of soil, impaired ability to support vegetation, landslides	High permanent	Major adverse	Low permanent	Moderate adverse
Ground surface (rock & soil) at towers and roads in vegetation control zone on steep and moderate slopes (affected by vegetation control)	High	Soil erosion, impaired ability to support vegetation, landslides	Medium permanent or permanent	Moderate adverse	Medium permanent or temporary	Minor adverse
Ground surface on slight slopes and flat land	Medium	Slight to moderate erosion of topsoil, impaired ability to support vegetation	Medium temporary	Moderate adverse	Medium-high temporary	Moderate adverse
Air quality						
Residents and visitors	High	Fugitive dust generation during construction and maintenance	Low temporary	Minor adverse	Low temporary	Minor adverse

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
		Vehicle emissions during construction and maintenance	Very low temporary	Negligible adverse	Low temporary	Negligible adverse
		SF6 emissions during operation of substation	Very low permanent	Negligible adverse	Low permanent	Negligible adverse
		Ozone and NOx emissions during operation of transmission line	Very low permanent	Negligible adverse	Low permanent	Negligible adverse
Vegetation	Medium	Fugitive dust settling on plant and interfering with growth	Low temporary	Minor adverse	Low temporary	Minor adverse
Noise						
Residents and visitors in rural areas	High	Line & road construction noise	Low temporary	Minor adverse	Medium temporary	Moderate adverse
		Corona noise during operation	Low permanent (in corridor) Negligible (away from corridor)	Minor adverse in corridor, Negligible outside	Low permanent (in corridor) Negligible (away from corridor)	Minor adverse in corridor, Negligible outside
Residents and visitors near substation	Medium to Low	Construction noise	Low temporary	Negligible adverse	Low temporary	Negligible adverse

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
		Corona noise during operation	Very low (>50m) to low (<50m), permanent	Negligible to minor adverse	Very low (>50m) to Minor (<50m), permanent	Negligible to minor adverse
Fauna within 100-200m	Medium to High	Construction noise	Medium temporary	Moderate adverse	Medium temporary	Minor adverse
		Corona noise	Low permanent	Minor adverse	Minor permanent	Minor adverse
Water supplies and quality						
Large streams and rivers	Low-Medium	Sedimentation of streams from erosion due to compaction and soil disturbance	Low temporary	Negligible adverse	Low temporary	Negligible adverse
		Disruption of flood flows	Negligible permanent	Negligible adverse	Negligible permanent	Negligible adverse
		Contamination from spills	Low temporary	Negligible adverse	Minor temporary	Negligible adverse
		Contamination from herbicide use	Low temporary	n/a	Minor temporary	n/a
Small streams and drainageways	High	Sedimentation of streams from erosion due to compaction, soil disturbance, rutting, road crossing	Medium temporary	Minor adverse	Medium temporary	Minor adverse
		Disruption of flood flows	Low permanent	Negligible adverse	Negligible permanent	Negligible adverse

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
		Contamination from spills	Medium temporary	Minor adverse	Medium temporary	Minor adverse
		Contamination from herbicide use	High temporary	n/a	Major temporary	n/a
Groundwater	High	Reduced recharge due to compaction of soil	Low temporary	Minor adverse	Low temporary	Minor adverse
		Contamination from spills	Low permanent	Minor adverse	Medium permanent	Moderate adverse
		Reduced availability due to withdrawals	Low permanent	Negligible adverse	Medium permanent	Minor adverse
Climate						
Climate	High	Increased greenhouse gas emissions (CO^2, SF6), removal of carbon "sink" by removal of vegetation	Negligible permanent	Negligible adverse	Negligible permanent	Negligible adverse
Transmission line	Medium	Increased power outages due to tower collapse from storms and landslides, or from breaks in line due to wind	Medium temporary	Minor adverse	Medium temporary	Minor adverse
Flora						
Common tree species	Low	- All trees cut at towers, construction zones, access roads, substation - Trees >1-4m cut in corridor	Medium permanent	Moderate adverse	Low permanent	Low adverse

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
Common shrub species	Low	- All plants cleared at towers, construction zones, access roads, substation - Shrubs/bushes >1-4m cut in corridor	Medium permanent	Moderate adverse	Low permanent	Low adverse
Tree species of conservation concern	High	- All trees cut at towers, construction zones, access roads, substation - Trees >1-4m cut in corridor	Medium permanent	Major adverse	Low permanent	Moderate adverse
Shrub species of conservation concern	High	- All plants cleared at towers, construction zones, access roads, substation - Shrubs/bushes >1-4m cut in corridor	High permanent	Major adverse	Low permanent	Moderate adverse
Fruit & nut trees (orchards)	High	- All trees cut at towers, construction zones, access roads, substation - Trees >1-4m cut in corridor	Low permanent	Minor adverse	Very low permanent	Negligible adverse
Habitats						
Natural habitat	Medium	Loss of natural habitat	Medium permanent	Moderate adverse	Low permanent	Low adverse
		Modification of primary ecological functions and species composition	Medium permanent	Moderate adverse	Moderate permanent	Low adverse
		Introduction of or increase in invasive species	Low permanent	Minor adverse	Low permanent	Negligible adverse
Modified habitat	Low	Reduction in biodiversity value	Low permanent	Minor adverse	Medium permanent	Minor adverse

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
Fauna						
Common species of terrestrial fauna	Medium-low	Animal death due to crushing or direct impact	Low permanent	Minor adverse	Very low permanent	Negligible adverse
		Abandonment of home territories due to construction disturbance	Low temporary	Minor adverse	Very low temporary	Negligible adverse
		Nest abandonment/disruption of breeding animals due to construction disturbance	Low temporary	Moderate adverse	Very low temporary	Negligible adverse
		Change in species composition due to change from tall trees to lower vegetation	Low permanent	Moderate adverse	Very low permanent	Negligible adverse
		Worker interference with animals or nests	Low temporary	Moderate adverse	Very low permanent	Negligible adverse
Terrestrial fauna of conservation concern	High	Animal death due to crushing or direct impact	Low permanent	Major adverse	Very low permanent	Moderate adverse
		Abandonment of home territories due to construction disturbance	Low temporary	Moderate mixed +/-	Very low temporary	Minor adverse-
		Nest abandonment/disruption of breeding animals due to construction disturbance	Low temporary	Moderate adverse	Very low temporary	Minor adverse
		Change in species composition due to change from tall trees to lower vegetation	Low permanent	Moderate adverse	Very low permanent	Minor adverse

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
		Worker interference with animals or nests	Low temporary	Minor adverse	Very low temporary	Minor adverse
Owls and bats	High	Loss of hibernating and nesting places in mature trees	Low permanent	Moderate adverse	Very low permanent	Minor adverse
Migratory birds (raptors, waterfowl, wading birds)	Low-medium	Death or injury due to collision with line	Low permanent	Minor adverse	Low permanent	Minor adverse
Large birds (raptors, cranes, etc.)	Medium	Death due to electrocution	Low permanent	Minor	Low permanent	Minor adverse
Community health and safety						
Community	Medium	Worker influx: community disruption, crime, etc.	Low temporary	Minor adverse	Low temporary	Minor adverse
		Direct impacts: pressure on services, emergencies etc.	Very low temporary	Negligible adverse	Very low temporary	Negligible adverse
Community members (individuals)	High	Disease	Very low temporary	Minor adverse	Very low temporary	Minor adverse
		Violent behavior (including GBV)	Low temporary	Moderate adverse	Low temporary	Moderate adverse
		Nuisance and safety: noise, dust, etc.	Low temporary	Moderate adverse	Low temporary	Moderate adverse

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
		Accidents, emergencies	Low temporary	Moderate adverse	Low temporary	Moderate adverse
		EMF	Very low permanent	Minor adverse	Very low permanent	Minor adverse
Physical and economic displacement						
Households in 74.5m corridor	High	Physical displacement / relocation	No change	None	Low permanent	Moderate adverse
Land owners	Medium-high	Permanent loss of land at tower locations, some roads, substation site	Medium permanent	Moderate adverse	High permanent	Major adverse
		Temporary loss of land in 54.5m corridor (construction)	Low temporary	Minor adverse	Medium temporary	Moderate adverse
		Restriction on land use in 74.5m corridor	Low permanent	Minor adverse	Low permanent	Minor adverse
Land users (nonowners)	Medium	Loss of use of land acquired by GSE	Low permanent	Minor adverse	Low permanent	Minor adverse
		Loss of use of other land	Very low temporary	Negligible adverse	Very low temporary	Negligible adverse
Commercial timber operations	Low	Loss of timber resource	Low permanent	Minor adverse	Very low permanent	Negligible adverse

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
Private wood users	Medium	Loss of wood resource	Low permanent	Minor adverse	Very low permanent	Negligible adverse
		Wood donation for personal use	Low temporary	Minor positive	Low temporary	Minor positive
Worker health, safety, and welfare						
Workers (contractors and Supervision Consultant)	High	Poor labor management practices	Medium temporary	Moderate to major adverse	Medium temporary	Moderate to major adverse
		Unsafe working conditions	High permanent or temporary	Major adverse	High permanent or temporary	Major adverse
		Inability to express concerns	Medium temporary	Moderate adverse	Medium temporary	Moderate adverse
		Substandard accommodations	Medium temporary	Moderate adverse	Medium temporary	Moderate adverse
		Unsanitary conditions	Medium temporary	Moderate adverse	Medium temporary	Moderate adverse
Economic conditions						
Income	Low	National and regional income due to increased employment	Very low temporary	Negligible positive	Negligible temporary	Negligible positive

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
	Medium	Local income due to increased employment	Low temporary	Minor positive	Low temporary	Minor positive
	Medium	Increased income by local suppliers	Low temporary	Minor positive	Low temporary	Minor positive
	Medium	Decreased income for commercial timber companies	Low permanent	Minor adverse	Very low permanent	Negligible adverse
Key economic sectors	Low-high	More reliable power supply	High permanent	Major positive	High permanent	Major positive
		Reduced agricultural output	Low temporary	Minor adverse	Low temporary	Minor adverse
		Reduced tourism	Low temporary	Negligible adverse	Low temporary	Negligible adverse
Infrastructure	Low-medium	Damaged public roads	Low temporary	Minor adverse	Low temporary	Minor adverse
		Damaged rural unpaved roads/tracks	Medium temporary	Moderate adverse	Medium temporary	Moderate adverse
		Damaged rail line & train traffic	Low temporary	Minor adverse	Low temporary	Minor adverse

Table 7.5.1. Summary of Potential Impacts

Receptor	Sensitivity of Receptor	Potential Impact	Alternative A		Alternative B	
			Magnitude & duration of impact	Significance	Magnitude & duration of impact	Significance
Cultural heritage						
Cultural and Natural Monuments	High	Noise from construction	Low temporary	Moderate adverse	Low temporary	Moderate adverse
		Worker disruption	Very low temporary	Minor adverse	Very low temporary	Minor adverse
		Direct impacts	Very low permanent	Minor adverse	Very low permanent	Minor adverse
Chance finds	High	Damage or destruction of an archaeological site or individual artifacts	Low permanent	Moderate adverse	Low permanent	Moderate adverse

8. Environmental and Social Management and Monitoring Plan

The environmental and social impacts that could result from construction, operation, and maintenance of the Jvari-Tskaltubo 500kV transmission line and substation are described in Chapter 7 and summarized in Table 7.5.1. As described in that Chapter, some activities during the construction, operation, and maintenance of the transmission line and substation could have a moderate or even major adverse impact on specific environment and social resources. That makes it imperative for precautions to be taken to ensure that significant adverse effects are avoided, reduced, or otherwise mitigated. This will take a concerted effort by the GSE, the Supervision Consultant, and the contractors selected for design and construction to ensure that proper design and operating procedures are implemented throughout the procurement, project preparation, construction, and operation phases of the project, and that the mitigation measures proposed in this Chapter are incorporated into requirements for bidding, design, construction, operation, and maintenance of the line and substation.

Table 8.1.1 describes and outlines the Environmental and Social Management Plan (ESMP) developed by GSE for the project. It has been developed to clearly identify measures that must be implemented to avoid, reduce, or otherwise mitigate potential moderate and major adverse impacts identified during the ESIA. It also identifies best management practices (BMPs) and other mitigation measures that will minimize, reduce, or eliminate many of the impacts of minor or even negligible significance which could escalate to become more important if they are not handled properly. It is expected that mitigation measures will be sufficient to reduce all risks to acceptable levels. In many cases, the ESMP requires development of detailed plans to manage specific risks and hazards and includes an overview of the relevant requirements of those plans. Primary responsibility for implementing mitigation measures during construction will rest with the contractors, although GSE will have responsibility for some of the actions. All works by the contractors, including implementation of mitigation measures, will be overseen and supervised by the Supervision Consultant (also known as the Consulting Engineer, Owner's Engineer, or other names).

It is important to note that GSE, in part through its contractors, will also be responsible for complying with relevant requirements of Georgian law, the World Bank Environmental and Social Framework, the World Bank Group's General Environmental, Health, and Safety (EHS) Guidelines, and the EHS Guidelines for Electric Power Transmission and Distribution, which may be have much more detailed requirements than the Plan presented here.

The ESMP table is organized as follows:

Section 1.0 includes measures for the procurement phase (that is, the process by which GSE will select the contractors)

Section 2.0 includes measures to be implemented during the project preparation stage, between the time the contractor is appointed, and main construction begins. This will include employing workers and specialists, developing detailed plans, conducting surveys, selecting final sites for the construction

areas, substation, corridor, and towers, and then establishing initial access roads, construction storage and preparation areas, and camps.

Section 3.0 includes measures during construction, which for the transmission line will include installation of foundations, erection of towers, vegetation clearing, and conductoring; and for the substation will include excavation and installation of breakers, transformers, and a control room.

Section 4.0 includes measures to be implemented during demobilization by the contractor.

Section 5.0 includes measures to be implemented by GSE during operation and maintenance of the line and substation.

Section 6.0 includes measures that must be implemented during all phases of activities that could have an impact on environmental or social resources.

Following the table of mitigation measures, Table 8.1.2 provides the Environmental and Social Monitoring Plan. This Plan is necessary to ensure there is close scrutiny over actual environmental and socioeconomic performance so that prompt action can be taken if mitigation measures are not being implemented or if the measures are not adequately mitigating actual impacts. Since the Supervision Consultant will oversee all actions by the contractors, most of their monitoring responsibilities are not shown in the Table. The objectives of the monitoring program are to:

- Meet legal, World Bank, GSE, and community obligations
- Identify project impacts during preconstruction, construction, demobilization, and operation
- Verify that mitigation measures are being implemented as required
- Evaluate the effectiveness of mitigation measures and identify any shortcomings
- Allow refinement and enhancement of mitigation measures if needed to further reduce impacts
- Allow development of mitigation measures to deal with unforeseen issues or changes in operations
- Allow GSE, Georgian authorities, and the World Bank to verify that their respective requirements are being met.

The GSE will oversee the Supervision Consultant, who will in turn oversee the design and construction contractors to ensure these companies, their subcontractors, and all workers are fully implementing proper mitigation measures during the preconstruction, construction, and demobilization phases. These measures include training for workers, so they are familiar with their own responsibilities as well as their employer's. The first level of monitoring during construction will be conducted by the contractor as part of routine management of ongoing activities. This will be supplemented by nearly continuous monitoring by the Supervision Consultant and somewhat less frequent monitoring by GSE, and by the World Bank. In addition, there will be at least one third-party audit during construction and another before the contractor has completed demobilization. During operations, there will be fewer

activities that could result in significant impacts, so monitoring will be less intense, with monitoring conducted by GSE or various government agencies, with periodic reviews by the World Bank.

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
1.0 Procurement phase					
1.1	Preparation of bidding/ procurement documents for transmission line	Failure of bidders to recognize E&S requirements, to plan for E&S management, and to consider E&S requirements in cost proposal	As required by World Bank Standard Procurement Documents, include relevant documentation (ESIA, RPF, SEP, ESCP) in procurement documents Require proposals to include the following plans as part of Management Strategies and Implementation Plan: – Labor Management Procedure – EHS Code of Conduct and workers'Grievance Redress Mechanism – Occupational Health and Safety Plan Include reqirement for contractor to prepare prior to commencement of works: - Wate Managemenet Plan - Landscape Resintatement Plan - Community Health and Safety Plan Define key personnel of contractor to include for the project (that is, not corporate-level): – E&S manager – Safety manager – Biodiversity specialist – Community liaison/social specialist – HR manager	– Bidders understand E&S requirements and prepare responsive proposals – Higher E&S capacity by bidders	GSE World Bank (approval)
1.2	Preparation of bidding/ procurement documents for substation	Failure of bidders to recognize E&S requirements, to plan for E&S management, and to consider E&S requirements in cost proposal	As required by World Bank Standard Procurement Documents, include relevant documentation (ESIA, RPF, SEP, ESCP) in procurement documents Require proposals to include the following plans as part of Management Strategies and Implementation Plan: – Labor Management Procedure	– Bidders understand E&S requirements and prepare responsive proposals – Higher E&S capacity by bidders	GSE World Bank (approval)

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– EHS Code of Conduct and workers'Grievance Redress Mechanism – Occupational Health and Safety Plan Include reqirement for contractor to prepare prior to commencement of works: - Wate Managemenet Plan - Landscape Resintatement Plan - Community Health and Safety Plan Define key personnel to include for the project (that is, not corporate-level): – E&S manager – Safety manager – Community liaison/social specialist – HR manager		
1.3	Review and evaluation of proposals	Failure to consider bidders' E&S qualifications and experience in scoring proposals	– Inclusion of E&S specialist(s) in proposal review team, with sufficient time provided – Awareness by entire evaluation team of key E&S requirements – Scoring includes corporate E&S experience and qualifications, E&S staff experience and qualifications and evaluation of management plans in MSIP – Recognition of unqualified bidders	– Bidders' E&S qualifications and experience receive full consideration in evaluations – Bidders disqualified for inadequate E&S qualifications and experience or inadequate MSIP (that is, inadequate understanding of requirements)	GSE
1.4	Selection of contractors	Award of contract to contractor unqualified or unprepared to develop and/or implement full C-ESMP	– MSIP plans sufficient to avoid or control impacts – Key staff qualified and available – Award only to contractors with E&S qualifications and experience that meet specific criteria	– Award to contractor able to implement this ESMP – Contractor ultimately implements ESMP satisfactorily – Fewer delays in project preparation and construction	GSE World Bank (approval)
2.0 Project preparation phase ("pre-construction")					
2.1	Implementation of Stakeholder Engagement Plan	– Uninformed local people and other stakeholders	– Outreach to identified stakeholders	– Well-informed supportive community	GSE manages

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
		– Unrealistic expectations by local people and others – Long-term distrust of contractors and GSE – Protests or other disruptions – Vandalism	– Realistic information on employment opportunities – Meetings with community leaders and citizens as appropriate – Implementation of Grievance Redress Mechanism – Train contractor workers and supervisors in relevant requirements of SEP, including receiving and reporting grievances	– Realistic expectations – Trust of contractor and GSE to resolve issues – Timely resolution of grievances	overall program and deals with high-level grievances Contractor implements on day-to-day basis during construction
2.2	Management of E&S issues	– Failure to hire qualified specialists with sufficient time to manage issues – Excessive E&S impacts due to mismanagement or failure to manage E&S issues	– Assign key E&S personnel defined in items 1.2 (transmission line) and 1.3 (substation) and provide sufficient time to perform duties – Employ and train sufficient safety officers: at least one per work crew and overall ratio of at least 1 per 50 workers – Train managers and supervisors/foremen in key requirements for E&S mitigation (i.e.., this ESMP and monitoring plan) – Develop checklists for use by E&S staff to record findings – Develop templates for monthly E&S reports to Supervisions Consultant – Develop templates for investigating and addressing root cause of serious incidents /injuries/accidents – Develop registers for recording grievances from external stakeholders and from workers	Qualified staff in sufficient numbers to implement/oversee C-ESMP	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
2.3	Update Contractor's ESMP (C-ESMP) by including all relevant technical details into; - Waste Management Plan; - Landscape Reinstatement Plan; - Community Engagement, Health and Safety Plan; and - Labor Management Procedure. Develop detailed method statements on: – Tower and corridor location; – Traffic management; – Emergency response; – Pre-construction flora, fauna, and habitat survey required for finalization of design; – Working in or near surface water bodies; – Noise management; – Explosives and blasting *(if explosives are to be used)* – Worker accommodation and work camp management – Any other if required by Environmental Conclusion issued by MESPA	– Contractor begins works without program to avoid or minimize impacts on human and environmental resources: – Unsafe vehicles, accidents – Damage to protected flora – Subcontractor E&S performance not managed – Noise disturbances to communities – Community disruption, violence, crime, disease due to worker influx – Unsafe and/or unsanitary accommodations	– Plans prepared by qualified E&S specialists and project managers – Supervision Consultant to review and approve C-ESMP, including C-MSIP plans that had been submitted in contractor's proposal – All plans reviewed and ultimately approved by qualified experts – Awareness-raising sessions on GBV conducted for all workers – Code of Conduct adopted, acknowledged and signed by all workers on site (Contractor, Sub-Contractors, Supervisor, as applicable)	– No activities undertaken without underlying procedure or plan to protect E&S – Comprehensive contractor program for avoiding and minimizing impacts – Subcontractor compliance with plans – All activities in accordance with C-ESMP – No unacceptable or unpredictable impacts	Contractor (prepare) Supervision Consultant (approve) GSE Review
2.4	Conduct detailed study of geomorphology/geology to identify high-risk locations (see preliminary study in Annex 4 for details)	– Foundations placed on unstable ground – Tower collapse – Landslides and/or severe erosion	Implement geological studies recommended by preliminary study (Annex 4) that was part of Feasibility Study so high-risk locations can be avoided or overcome	Stable towers on stable ground	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
2.5	Final design/locations of equipment, towers, roads, construction sites/camps, 74.5m corridor, and substation	– Tower and corridor locations selected without adequate consideration of impacts on biodiversity and people – Excessive land required for roads	Final design team to include flora & fauna specialists and implementation of pre-construction flora/fauna survey, which is to include: – Survey of entire corridor using non-intrusive means, except possibly some drilling for geologic investigations – Tower selection process considers biodiversity impacts – Mapping of sensitive locations/species Team to select tower locations that, where possible: – Are within 300m "study" corridor – Maximize tower locations with long spans that suspend conductors high above trees so no cutting is needed – Maximize use of existing roads/tracks, minimize need for new access roads and permanent roads – Minimize impacts on natural habitat and species of conservation concern – Avoid direct impacts on people and valuable property – Design towers so conductors are spaced at least 2.5-3m apart to prevent electrocution of large birds – Where possible, select electrical switching equipment, cables, and transformers without SF6 as a gas insulato. If it must be used, use equipment with a low leakage rate (less than 99%)	Locations of towers, corridor, roads, and substation minimize impact on people and on biodiversity to extent possible	Contractors (design) Supervision Consultant (approve)
2.6	Develop and implement Resettlement and Compensation	– All Project Affected Persons (PAPs) not identified	– Appoint qualified consultant to develop RACP	– Physical and economic displacement compensated at	GSE

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
	Plan (RACP) based on Resettlement Policy Framework	– All physical and economic displacement not compensated or replaced – Inadequate compensation – Violations of Georgia law and/or World Bank ESS5 for land take and compensation – Hardships for PAPs prior to compensation – Loss of community support	– Based on final design/locations, identify PAPs and impacts, identify vulnerable people, land ownership, land use, valuations, etc. – Consult with PAPs – Consult with authorities on valuation and compensation – Acquire land for towers, substation, and permanent roads: compensation or like-for-like replacement for physical and/or economic displacement prior to displacement occurring – Placement of restrictions on use of land in 74.5m safety zone and 54.5m vegetation control zone	replacement cost or more, or like-for-like compensation – RAP implementation meets requirements of ESS5 – Affected people are fully compensated for losses at replacement value or land-for-land – Compensation paid to all PAPs prior to issuing authorization to proceed to contractor – Participation by authorities and PAPs in process – Community support	
2.7	Reach agreement with subsoil fund on exploitation of rock/soil with forest fund on need for forest land, and with other ministries/ authorities to receive permits/ authorizations/ permissions necessary to implement construction works	Delays in implementation and/or violations of law due to lack of permits/authorizations/agreements	Consultations and agreements with relevant authorities prior to undertaking activities that require approvals and/or are on forest fund or other government land	– All activities in compliance with legal requirements – No delays in implementation – No violations of law	Contractor, with GSE assistance as needed
2.8	Recruit and employ workers and subcontractors	– Unqualified contractors and workers – Poor labor practices (substandard pay, uninformed workers, etc.) – Excessive staff turnover	– Implement Contractor's Labor Management Procedure (LMP) – Preference for local hiring, with PAPs given preference – Written contracts with workers per LMP and Georgia law – Other provisions per Labor Code of Georgia – Subcontracts include and require compliance with contractor's LMP	– Maximum hiring of PAPs and other locals.; At least 20% of workforce to be of local population; – Workers employed in compliance with law (nondiscrimination, equal opportunity, income, etc.) – Low staff turnover	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– Subcontracts include and require compliance with C-ESMP – Workers receive full induction training		
2.9	Establishment of construction camps/laydown areas, storage areas, nonpermanent access roads, quarries/borrow areas, etc. and other land contractor will need for temporary use/possession	– Contractor trespasses on land – Placement of construction zones in natural habitat or areas that require cutting protected flora – Impacts outside boundary of designated area – Unrecorded damage to biodiversity – Excess damage to topsoil/subsoil, vegetation cover, erosion, spills and soil/water contamination, impacts on communities	– Implement C-ESMP requirements for noise, fuel and hazardous materials, noise, worker safety, and community safety, etc., including worker training – Reach written agreements with private landowners prior to undertaking activities on their lands – Consult with National Forestry Agency prior to undertaking activities on Forest Fund lands and with municipalities prior to undertaking activities on land they control – Implement flora/fauna surveys to inventory and map protected flora and nesting/roosting trees on lands required for construction purposes: minimize need for natural habitat and protected species as much as possible – Train/warn workers to remain within boundaries and penalize for violations – Maximize use of existing roads – Consult with roads authority concerning traffic management and damages to public roads – Minimize movement of vehicles and equipment on unpaved roads in wet conditions – Repair rutting and other damages to unpaved roads as soon as possible to minimize disruption to traffic Implement Biodiversity Management Plan, including at a minimum:	– Compliance with approved C-ESMP – No unexpected or unacceptable impacts – All work within marked boundaries – Minimal disruption to breeding fauna – Minimal disruption to bats and owls – Minimal disruption to fauna and flora of conservation concern – Minimal disruption to traffic – Wood and flammable debris material removed before it becomes a fire hazard	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– Avoid placement of facilities in natural habitat without express authorization by Supervision Consultant – If surveys detect hibernating bats or nesting owls, bats, or raptors in mature trees, delay cutting and construction within 150m until after bats have left roost and/or young have left nests – If surveys identify breeding or nesting fauna of conservation concern in or within 50m of areas to be disturbed, postpone clearing and other construction within 50m until young have left the nests - Minimize cutting of mature trees and trees of conservation concern: maintain log of all trees cut - Maintain photographic and written log of plants of conservation concern that are cut - Place 2+ bat boxes for every mature tree with evidence of bat hibernation/roosting/ nesting, within 50m of tree that was cut - In an area within corridor but outside vegetation control zone, plant 2+ trees of same species for every tree or shrub of conservation concern that is cut, and or every mature tree with hibernating/ roosting/nesting bats, owls, or raptors that is cut Implement land management and erosion control procedures, including at a minimum:		

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– To extent possible, avoid landslide-prone areas and areas with severe erosion potential – Establish and mark boundaries of construction zone – Keep all activities inside boundaries – Strip and store topsoil within boundaries, protect from erosion – Store excavated subsoil separately, protect from erosion – Install drainage control as needed to control erosion that would affect off-site – Place gabions, walls, silt fences or other measures as necessary to prevent erosion from leaving construction areas – Agree with Forestry Fund and/or landowners how debris/wood will be managed, with preference for donation to PAPs and loggers. Wood and debris to be removed before dry season.		
2.10	Establishment of accommodations, kitchens, sanitary facilities	– Worker illness or death – Worker dissatisfaction and lower productivity – Contamination of land and water	– If accommodations are to be provided, comply with World Bank Group's guidance Workers' Accommodation: Processes and Standards (2009) – Develop and use operating and maintenance checklists for operation of canteens/kitchens – Appoint persons to be responsible for cleanliness of accommodations, kitchens, canteens, break areas, etc. – Provide toilets at or near all work locations, establish and enforce rules prohibiting workers from using the bush	– Sanitary and compliant facilities and amenities – Healthy workers – Toilets in place where needed	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
2.11	Access road planning and detailed survey of the transmission line corridor	– Unnecessary impact on biodiversity and protected species – Excessive erosion and off-site impacts	– Maximize use of existing roads – Minimize roads through Natural Habitat – Avoid trees and shrubs of concern to extent possible – Undertake pre-construction Flora and Fauna Survey prior to clearing/construction: – Inventory and mark all specimens of tree and shrub species of conservation concern – Identify and mark mature trees if there are signs of current or recent hibernating bats or nesting owls, bats, or raptors – Identify trees and locations with nests and other signs of breeding fauna species of conservation concern and raptors – To extent possible, route corridor to minimize disruption of fauna species of conservation concern, and trees of conservation concern – Maintain photographic and written log of plants of conservation concern that will need to be cut	– Roads and corridor placed to minimize impacts on natural habitat and species of conservation concern – Species of concern identified and properly managed	Contractor
2.12	Identify risks to migratory birds	No knowledge of potential risks to migrating birds from collisions Potential bird mortality due to collisions	– Appoint expert to develop program to monitor passage of raptors and waterbirds in river valleys – Appoint consultant(s) to implement monitoring program during autumn migration periods of 2019 & 2020 – Based on results, expert to prepare summary report that includes recommendations on (a) if bird diverters (spinners, flashers, etc.) should be installed	– Expert appointed and monitoring program developed – Consultants appointed and program implemented – Results reviewed and recommendations developed – Recommendations implemented (no action,	GSE

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			at valley crossings to reduce significant risk of collisions and (b) if additional monitoring is needed before final recommendations can be made.	continue monitoring, or install diverters)	
2.13	Develop biodiversity management plan	Impacts on species and habitats of conservation concern	Appoint expert(s) to develop BMP, to include: - Program to plant trees/plants to replace those that are cut - Area to be revegetated/planted - Species to be replaced/planted - Indicators of successful plantings - Monitoring program - Identification of parties responsible for implementation and monitoring - Program to place bat boxes to replace roosts/nests that are cut/damaged: numbers, locations, design of boxes, etc. - Schedule for implementation - Budget for implementation and monitoring	– Consultancy/expert(s) appointed – BMP developed and approved – Requirements implemented – No net loss of biodiversity, or net gain	GSE
3.0 Construction phase					
3.1	All activities	– Worker injury or death – Damage to vegetation, land, property outside construction zone	– Implement Occupational health and Safety Plan: – Medical clearance for workers to perform their tasks – Assessment of risks and identification of mitigation measures for all tasks, with PPE as last resort – Tasks are designed for maximum safe operations – Workers provided with proper equipment and tools, and PPE, to accomplish tasks safely	– Tasks completed with no worker injuries or death – Tasks completed with no damage to vegetation, land or property outside construction zone	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– Only trained workers allowed to complete tasks – Safety Officers oversee all works – Sufficient First Aiders to provide first-level medical care as needed – Fully supplied first aid kits in all vehicles and equipment and at all workplaces – Communications established with local medical facilities and personnel regarding works to be completed, arrange for support as appropriate – Record safety statistics (work hours, near misses, minor & incidents and accidents, fatalities) – Worker transport (passenger vehicles only, no riding on heavy equipment, wear safety belts, etc.) – Mark boundaries of construction zone before operations – Work within boundaries, penalize supervisors and workers for violations – Install physical barriers at deep excavations to prevent accidents Implement traffic management procedures, to include: – Drivers/operators licensed for vehicles and equipment – Driver trained as needed and tested – Vehicles properly licensed/registered – Vehicles/equipment checked for safety daily by drivers/operators (horns, tires, fire extinguisher, headlights and taillights, safety belts, intact glass, etc.) – Speed limits are imposed as relevant		

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– Sensitive areas with special precautions (hospitals, schools, etc.) – Keys never left in vehicle/equipment when driver/operator not present – Consultations with roads authorities concerning use of public roads (timing, locations, etc.) – Flaggers trained and placed on public roads to control traffic at locations where heavy project traffic enters and leaves roadways		
3.2	Implement relevant C-ESMP plans as part of all activities (see 2.1)	– Excessive impacts on people and environmental resources	– Management of activities as planned to avoid or minimize potential impacts on people and environment	– Implementation of mitigation measures – Adaptive management for unexpected impacts – Compliance with law and ESSs	
3.3	Manage subcontractors	– Subcontractors not aware of E&S requirements – Poor labor practices and poorly trained workers – Failure to implement C-ESMP – Poor E&S performance, including safety, leading to environmental impacts, impacts on local communities, and worker injury or death	– Include relevant portions of C-ESMP in procurement documents and subcontracts – Require compliance with contractor's LMP safety, and other requirements, or equivalent requirements approved by contractor – Supervision of C-ESMP implementation by contractor and Supervision Consultant – Structure milestone payments to include C-ESMP implementation and withhold payments for failure to comply (see row 3.15 below).	– Subcontractor implementation of C-ESMP – No unacceptable E&S impacts	Contractor Supervision Consultant (supervision, with contractor)
3.4	Land clearing at tower locations, construction zones, and new access roads (tree & vegetation cutting, land clearing, earth-moving in some places,	– Worker injury or death – Excess damage to surrounding areas, including biodiversity and private land and property	– Train workers and implement Occupational Health and Safety Plan: working with machinery and tools, working on steep slopes, animal/plant hazards, working in hot or cold environments, etc.	– Minimum biodiversity damage due to land clearing – No damage outside boundaries	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
	equipment/building placement, etc.)		– Consult with National Forestry Agency prior to clearing operations on forest fund lands – Agree with local forest managers and/or landowners how debris/wood will be managed, with preference for donation to PAPs and loggers. – Remove excess wood and flammable debris before dry season. – Consult with National Forest Agency on the height to which trees will be cut, with preference for at least 0.7-1m – Conduct final pre-construction fauna survey to identify and mark locations of hibernating bats and of nests/breeding behavior of fauna species of conservation concern – To extent possible, micro-locate construction boundaries to minimize cutting/clearing flora of conservation concern – Mark and stay within boundaries of construction zone and of new roads – Train/warn workers to remain within boundaries, penalize supervisors and workers for violations – Strip and store topsoil and subsoil/spoil in separate piles within construction boundaries, protect from erosion – Install drainage control as needed to control erosion that would affect off-site areas - Implement Biodviersity Management Plan, including at a minimum: – If surveys detect hibernating bats or nesting owls, bats, or raptors in mature trees, delay construction/clearing activities within 150m	– Limited damage to ground surface and root zone – Survey completed, trees and shrubs marked – Bat box placement and tree/shrub plantings completed as required	

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			until after bats have left roost and/or young bats, raptors, and/or species of conservation concern have left nests – If surveys identify breeding or nesting fauna of conservation concern in or within 50m of construction zone, postpone clearing and other construction within 100m until young have left the nests – Maintain photographic and written log of plants of conservation concern that are cut – Place 2+ bat boxes for every mature tree with evidence of bat hibernation/roosting/ nesting, within 50m of tree that was cut – In an area outside vegetation control zone, plant 2+ trees/shrubs of same species for every tree or shrub of conservation concern that is cut – Do not cut trees to the ground but leave as much of the trunk as possible, at least 0.7-1m if agreed by agreed with National Forestry Agency – Do not cut shrubs if they are less than 4m high – Restore inadvertent damage to land outside boundaries per Landscape Reinstatement Plan		
3.5	Corridor vegetation cutting/clearing	– Excessive impact on biodiversity (flora, fauna, natural habitats) – Unnecessary landscape and viewshed impacts – Excessive erosion – Landslides	– Consult with National Forestry Agency (local managers) prior to clearing operations – Agree with local forest managers and/or landowners how debris/wood will be managed, with preference for donation to PAPs and loggers	– Minimal impact on biodiversity – Minimal impact on landscapes and views – No direct impacts off-site – Minimal erosion, no landslides – Restored land	Contractor GSE (monitoring after demobili-zation)

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– Agree with National Forestry Agency the height to which trees will be cut, with preference of at least 0.7-1m – Remove excess wood and debris before dry season. – Conduct final pre-construction fauna survey to identify and mark locations of hibernating bats and of nests/breeding behavior of fauna species of conservation concern, owls, and bats – Train/warn workers to remain within boundaries, penalize supervisors and workers for violations – Plan and manage treefall to prevent logs from rolling downhill – Implement land management and erosion control procedures, including at a minimum: – Establish and mark boundaries of corridor and of 54.5m vegetation control zone – Keep all activities inside boundaries – Cut as few trees as possible, ensuring that no tree could fall on the line – Minimize land and soil disturbance. If soil has to be cleared, strip and store topsoil and subsoil separately within boundaries, protect from erosion – Install drainage control as needed to control erosion that would affect off-site – Place topsoil and plant plants/seeds of native species on broken ground Implement Biodiversity Managemetn Plan, including at a minimum: – If surveys detect hibernating bats or nesting owls, bats, or raptors in mature trees, delay		

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			cutting within 100m until after bats have left roost and/or young bats, raptors, and/or species of conservation concern have left nests – If surveys identify breeding or nesting fauna of conservation concern in or within 50m of areas to be cleared, postpone clearing and other construction within 50m until young have left the nests – To extent possible, micro-locate corridor boundaries to minimize cutting of mature trees and trees of conservation concern – Maintain photographic and written log of plants of conservation concern that are cut – Place 2+ bat boxes for every mature tree with evidence of bat hibernation/ roosting/nesting, within 50m of tree that was cut – In an area within corridor but outside vegetation control zone, plant 2+ trees of same species for every tree or shrub of conservation concern that is cut – For every tree with evidence of raptor nesting, place 2+ nesting platforms on towers or on similar trees outside the vegetation control zone – Do not cut trees to the ground but leave at as much of the trunk as possible, up to 4m – Do not cut shrubs if they are less than 4m high		
3.6	Excavations of tower foundations and substation	– Worker injury or death – Excessive soil and spoil removed	Train workers and supervisors in Occupational Health and Safety Plan: – Working in/near excavations/ confined spaces	– Works completed safely – No damage outside boundaries – Safe and efficient operations	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– Working around heavy equipment – Workers trained in use of all tools and equipment – Use of harnesses on extremely steep slopes – Implement relevant provisions of land management and erosion control procedures: strip and store topsoil and spoil, protect against erosion – Mark and work within boundaries		
3.7	Excavations and cuts on steep and moderate slopes	– Worker injury or death – Loss or damage to equipment – Excessive land affected – Landslides – Erosion	– Locate towers and roads to minimize activities on steep slopes to extent possible – Train workers and supervisors on Occupational Health and Safety Plan: – Working in steep terrain – Working with hand and mechanical tools – Working around heavy equipment Implement land management and erosion control procedures: – Mark construction zone boundaries – Strip and store topsoil (if any) and spoil on site, allowing none escape downhill – Grade surfaces, install gabions, walls, silt fences, etc., as necessary to prevent landslides, slope failure, mass erosion and stabilize slopes – Clear site of all debris and waste when works are complete – Restore land (grade to stable contour, replace topsoil if possible, plant native species until plants are self-sustaining)	– Works completed safely – No works or damage outside construction zone boundaries – No landslides and no severe erosion – Land restored and stabilized after works completed	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
3.8	Blasting at tower locations or roads	– Worker injury or death – Off-site damage from flyrock or vibration – Theft of explosives	Implement explosives and blasting management procedures *(if blasting is required)*: – Licensed subcontractor with proper permits from authorities – Transport and storage per Georgia law, storage at distance from other works – Licensed blaster – Notice to communities – Pre- and post-blast surveys of buildings – Compensation per RAP	– Explosives transported and used safely – Minimal off-site damage – Off-site damaged identified and compensated per RAP, as necessary	Contractor
3.9	Excavations of tower foundations and substation	– Worker injury or death – Excessive soil and spoil removed	Implement Occupational Health and Safety Plan: – Working in/near excavations/ confined spaces – Working around heavy equipment – Working with concrete – Workers trained in use of all tools and equipment – Harnesses used as required on extremely steep slopes Implement land clearing and erosion control procedures, including: – Disturb as small an area as possible – Remove and store topsoil and spoil separately on construction site, protect from erosion – Provide physical barriers when the deep excavation is left over night	– Works completed safely – No damage outside boundaries – Safe and efficient operations	Contractor
3.10	Erection of towers	– Worker injury or death – Damage outside construction zone	– Train workers and supervisors in Occupational health and Safety Plan: lifting, working at heights, electrical safety, general works, steep slopes	– Works completed safely – No damage outside boundaries	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– Mark and work within boundaries of construction zone, penalize supervisors and workers for violations – Plan the construction with aim to minimise the need for subsoil disposal on permanent stockpiles. – Restore land per item 3.11 below		
3.11	Restoration of land at construction sites (towers, construction zones/areas, temporary access roads, other damaged lands)	– Failure of vegetation to be restored – Continued erosion – Reduced production from cropland and grasslands – Landslides	Restore all disturbed areas per Landskape Reinstatement Plan: – Remove all wastes and debris – Grade surface as necessary for stable contours (except roads) – Spread spoil and topsoil (except on rocky barren terrain) – Remove excess spoil/soil for use elsewhere – Plant native species of grasses and shrubs. – On private land used by contractor for construction zones and roads: restore land as above unless landowner requests modification (for example, no planting on cropland, leave roads in place, etc.)	Land returned to productive use	Contractor
3.12	Protection of camps, storage areas, equipment, property, substation, etc. (security)	– Abuse of local population or workers, including injury or death – Loss of community support, possibly active opposition – Liability for contractor and GSE	Implement pre-agreed security procedures: – No armed security – Subcontractor and guards checked for licenses, past abuses – Guards trained in appropriate use of force – Consultations with local law enforcement authorities	No vandalism, theft, or incidents involving security	Contractor Supervision Consultant (to approve security sub-contractor)
3.13	Placing conductors (stringing wires)	– Worker injury or death – Excess damage to land, crops, and forest	– Train workers and supervisors in Occupational Health and Safety Plan – Work within corridor boundaries, including working from roads as much as possible	– Works completed safely – Minimal damage within corridor – No damage outside corridor	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– Place notice boards or otherwise notify landowners of upcoming activities – Consult with railway authorities to stop trains while placing conductors over rail line – Consult with road/traffic authorities before placing conductors over highways and public roads – Train and place flaggers to control traffic on public roads/highways while conductors are being placed overhead and when there is heavy project traffic entering and leaving roadways – Repair damage to land surface immediately after operations are complete at that location – As recommended by the avian expert, install bird diverters on conductors at specific valley crossings	– Losses due to damages compensated per RAP	
3.14	Protect workers employed by primary suppliers	Child labor, forced labor, and/or serious safety issues at primary suppliers	If GSE or contractor has significant control or influence over primary suppliers (specifically, towers and conductors), contractor to monitor supplier and require improvement in labor safety practices or remedies in case of child or forced labor	– No child labor or forced labor or serious safety issues at primary suppliers	Contractor (supported by GSE if GSE has significant influence or control)
3.15	Payment of invoices for completion of milestones	Failure to implement E-CSMP in completion of construction milestones: poor drainage on roads, works/damage outside construction zone boundaries, poor soil/spoil management, poor safety practices, risks to community, etc.	– Consider relevant E&S management requirements to be an integral part of each construction milestones – Penalize initial failures to implement mitigations by withholding partial payment until mitigations are properly implemented – Penalize repeated failures to implement mitigations by considering milestones	– Proper implementation of C-ESMP – Minimal impacts on biodiversity, people, and property	Supervision Consultant

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			incomplete and reducing payments permanently		
4.0	***Demobilization***				
4.1	Closure of construction areas, camps, accommodations, etc.	– Contaminated soil, waters remain after contactor departs – Liability for GSE	Implement Ladscape Reinstatmenet Plan prior to departure: – Remove all equipment, storage units/tanks, debris, wastes, etc. – Remove any contaminated soil – Grade and contour to eliminate standing water, to provide stable contours, and to match surrounding terrain as much as possible – Spread spoil and replace topsoil – Plant native species or take final action as requested by private landowners. – Monitor plantings until established and self-sustaining	– Areas used for construction operations restored to pre-construction uses or as agreed with landowners – No residual liability or damages	Contractor
4.2	Payment of final invoice	Demobilization incomplete, with residual damage, unrestored land, improper drainage, etc.	– Withhold payment until Supervision Consultant and GSE confirm demobilization is complete from E&S perspective – Appoint third party to complete restoration activities if contractor fails, at contractor's expense	No continuing or residual damages or contamination, land restored to former use as required	Supervision Consultant & GSE
5.0	***Operation and maintenance***				
5.1	Energizing transmission line and substation	– Electrocution of workers or others – Forest fires	– Consult with National Forestry Agency for line over forests before energizing – Workers trained per Occupational Health and Safety Plan: electrical safety, working at heights, lifting – Follow GSE technical protocols/procedures for energizing lines/components	Works completed safely	Contractor and GSE

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– Keep bystanders/observers away from corridor and substation during procedure – Inspect entire corridor in case of malfunction		
5.2	Updates of LMP and Occupational Health and Safety Plans	– Lack of compliance with new safety law – Worker injuries and deaths – Poor labor relations	– GSE Safety Manual updated per new OHS Law – LMP updated to reflect World Bank ESS2 requirements	– Updated management programs – Safe working environment – Good labor relations	GSE
5.3	Routine maintenance and security patrols	– Worker injury or death – Damage to ground surface and cover vegetation, soil erosion – Traffic accident – Damage to private property (trees, crops, etc.)	– Workers trained in requirements of GSE Safety Manual specific to their jobs – Workers trained in requirement of traffic management procedures – Compensation per RAP	– Works completed safely – Damages compensated promptly per RAP	GSE
5.4	Tower repairs or replacement	– Worker injury or death – Excess damage to ground surface, vegetation, drainage, leading to erosion – Longer power outages	Same as tower construction above (see 3.10)	– Works completed safely – Minimal damage in immediate vicinity of tower, no damage outside that area – Damages to land repaired and land restored to previous use – Compensation paid promptly per RAP	GSE
5.5	Replacement of conductors	– Worker death or injury – Damage to land from equipment and vehicles – Longer power outages	– Implement Safety Manual – Restore damages to land immediately upon completion (grading, revegetation per Land Management and Erosion Control Plan) – Compensate promptly for losses due to damages to vegetation, crops, property	– Work completed safely – Damages to land repaired and land restored to previous use – Compensation paid per RAP	GSE
5.6	Vegetation control in corridor	– Worker death or injury – Trees cut too close to ground	– Workers trained in risks and mitigations of tasks per GSE Safety Manual	– Work completed safely	GSE

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
		– Trees cut outside vegetation control zone – Fire hazard due to flammable debris left in corridor	– Workers provided proper and safe equipment and tools – Workers knowledgeable of boundaries of vegetation control zone and remain within zone – Debris removed quickly to reduce fire hazard – No use of herbicides or pesticides	– Minimal disturbance to ground surface and tree/plant roots – All works within vegetation control zone – Debris removed before becoming a fire hazard	
6.0	***Preconstruction, construction, and demobilization phases***				
6.1	Oversight of E&S performance of project	– Lack of timely knowledge about E&S performance – Poor E&S performance by contractor and Supervision Consultant – Minor issues become major problems	Appoint qualified professional to oversee E&S performance on the project – Maintain communications with Supervision Consultant on at least weekly basis – Review monthly progress reports, and contractor reports – Attend monthly progress meetings – Visit site unannounced at least quarterly – Provide data for website updates – Participate in consultation meetings and informal interviews – Periodically consult with municipal and village authorities – Review grievance logs periodically – Maintain communications with important NGOs – Maintain communications with Ministry of Environmental Protection and Agriculture and National Forestry Agency	– GSE knowledgeable and up to date on E&S performance – GSE management well-informed of issues before they become problems	GSE
6.2	Operating passenger and heavy vehicles	– Traffic accidents – Injury or death to drivers or passengers – Damage to pedestrians, other drivers and passengers, property	– Trained and licensed drivers – Speed limits – Daily safety checklist	– Vehicles and equipment operated by authorized personnel – No traffic accidents	Owner/ Operator of vehicle: Contractor, Supervision

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
		– Liability to contractor and project	– Passengers only in seats designed for persons (safety belts, etc.), no standing or riding in back of trucks or on equipment – No giving rides to public – No vehicle/equipment movements off construction zones and roads unless authorized by site supervisor	– No injuries to drivers or passengers, no damage to property	Consultant, GSE
6.3	All construction works	Damage to vegetation, land surface, property outside construction zone boundaries	– Implement relevant elements of Land Management and Erosion Control Plan: – Implement relevant elements of Occupational Health and Safety Plan – Control dust from soil/spoil piles by covering or vegetating, from roads by dampening – Control noise by maintaining equipment and vehicles, training workers	– All work within construction zone boundaries – Minimal damages, compensation per RAP – Work completed safety	Contractor Supervision Consultant (OHS)
6.4	Stakeholder engagement	– Uninformed stakeholders – Distrust of GSE – Increased vandalism	Implement Stakeholder Engagement Plan: – Notify local authorities and National forestry Agency of ongoing maintenance and repair operations – Implement Grievance Redress Mechanism: receive and respond to comments and complaints	– Informed stakeholders – Public support	GSE (manage throughout, implement during operation) Contractor (day-to-day)
6.5	Hazardous and nonhazardous waste and materials management	– Spills and contamination of soil and surface water – Extra cost due to wastage	Implement materials and wastes management procedures: – Minimize use of hazardous materials, using nonhazardous substitutes wherever possible – Store hazardous materials (including fuels) in secure area over impermeable surface	– Minimal spills and contamination, rapid and proper cleanup as needed – Proper and safe waste management, including third-party management	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– Material Data Safety Sheets to be kept at all locations where hazardous materials are stored or used – Allow only authorized and trained personnel to work with hazardous materials – Segregate used materials/wastes in categories to maximize ability to restore, reuse, recycle and minimize disposal – Dispose wastes in licensed disposal area or hire licensed hauler to take wastes to a licensed area (verified by contractor) – For hazardous wastes taken away by hauler, verify hauler's license and verify that final disposal/recycling location is properly permitted		
6.6	Vehicle and equipment fueling and maintenance	– Spills and contaminated soil or water – Fire	– Vehicle and equipment fueling and maintenance only over impermeable surfaces. Use drip trays needed when not over paved surface. – Fire extinguisher with proper chemicals in all vehicles/equipment and at all fueling locations – Spill cleanup kits at all locations where fuel and hazardous chemicals are stored – Vehicles maintained per manufacturers' recommendations: mufflers, safety equipment, engine and fuel burning (no black smoke), etc.	– No contamination from incidents involving fueling – Vehicles maintained as required	Contractor
6.7	All activities within 50m of perennial and seasonal streams and other surface water	– Spills of fuel or other materials into water – Damage to streams and water bodies – Erosion into streams and water bodies	Implement procedure for working in or near surface water: – No construction zones within 50m of flowing water or ephemeral drainageway – No fueling within 50m of surface water or ephemeral drainageway	– No water contamination – Minimal damage to streams and drainageways	Contractor

Table 8.1.1. Environmental and Social Management Plan

No.	Activities	Potential adverse impact	Mitigation measures/Best management practice	Target outcome of mitigation	Responsible Body
			– Vehicle/equipment crossings of drainageways or small streams only at designated locations – Apply gravel or otherwise prepare surface at places of frequent crossings to minimize damage to streambed – Minimize crossings during wet weather – Repair rutting and other damage to stream banks and streambeds immediately when works are completed in that area (grade, revegetate)		
6.8	Responding to emergencies	– Worker injury or death – Community member injury or death – Excess damage to property or people	Implement emergency preparedness and response procedures, which is to include: – Appoint emergency response team – Train workers in their responsibilities in case of emergencies and in responding – Identify possible emergencies and possible consequences (fire, accidents, injuries or deaths, earthquake or weather event, civil unrest, spills) – Develop and use checklists to verify readiness for emergencies – Place and maintain emergency response equipment (fire extinguishers, first aid kits, radios/communication devices, etc.) – Conduct investigations/reviews to identify causes and avoidance measures following emergencies, including accidents	– Emergencies avoided – Emergency equipment in place and ready if needed – Quick and effective responses to emergencies	Contractor and Supervision Consultant
6.9	Protect undiscovered cultural heritage	– Damage or destruction of artifacts or archaeological remains	Implement chance find procedure: – Stop work upon discovery – Notify Employer – Resume work when authorized by Employer – Train workers and supervisors in procedure	– Qualified personnel make judgments about possible finds – Cultural heritage protected	Contractor

Table 8.1.2. Monitoring Program

Activity	What *(Is the parameter to be monitored?)*	Where *(Is the parameter to be monitored?)*	How *(Is the parameter to be monitored?)*	When *(Define the frequency / or continuous?)*	Why *(Is the parameter being monitored?)*	Who *(Is responsible for monitoring?)*
All construction works	Technical progress and implementation of mitigation measures, compliance with Georgia E&S law, World Bank ESF, and C-ESMP	All areas	– Observations during normal activities – Inspections – Monthly reports and incident reports	Continuous or as necessary	Verify implementation of mitigation measures	Supervision Consultant
			E&S monitoring audit	Annually during construction	Verify implementation of C-ESMP	Third-party consultant appointed by GSE
	Working conditions Biodiversity management and erosion control	All active work areas	Observations	During daily rounds (continuous)	Verify implementation of OHS Plan	Contractor safety manager
			Inspections	At least weekly		GSE
		Active and recent tree cutting areas, active sites on steep slopes, active construction sites	Observations	During daily rounds	Verify relevant aspects of C-ESMP are being implemented	Contractor E&S manager and/or specialist(s)
			Inspections	At least weekly		
		New construction sites	Inspections	Before construction begins	Verify supervisors are aware of requirements, protected species are marked, etc.	
	Working conditions (equipment, tools, etc.) and workers (PPE)	All active work areas	Observations	During daily rounds (continuous)	– Verify safety of working conditions and workers – Provide guidance to supervisors and workers	Safety Officers
			Inspections	At least weekly		Contractor safety manager
	Worker and supervisor safety training	All active work areas	Records checks & interviews	Daily or as needed before beginning new work	Ensure workers are trained to work safely	Supervisor

Table 8.1.2. Monitoring Program

Activity	What *(Is the parameter to be monitored?)*	Where *(Is the parameter to be monitored?)*	How *(Is the parameter to be monitored?)*	When *(Define the frequency / or continuous?)*	Why *(Is the parameter being monitored?)*	Who *(Is responsible for monitoring?)*
				Spot checks (at least once every site monthly)		Contractor safety manager
Progress reports/meeting	Technical progress and status of C-ESMP implementation: – Safety – Biodiversity survey and restoration activities – Erosion control & site stabilization – Site restoration – Grieveance management	Active sites	– Interviews with contractor E&S & technical staff – Review monthly contractor and Supervision Consultant E&S reports – Review worker & stakeholder grievance registers – Site visits	Monthly	Verify technical progress and E&S protection	– Mandatory attendees: – Contractor E&S personnel – Supervision Consultant – GSE
Drivers and vehicle safety	Driver qualifications	Office	– Verify valid driver's license and operator's permit as required – Check with traffic police if needed – Skills test as needed	– Before allowed to vehicles/equipment – Annually	Trained drivers	Contractor PM & safety manager
	Mobile plant/vehicle safety (horns, backup alarms, lights, tires, safety belts, fire extinguisher, cleanup kit, first aid kit, etc.)	All mobile plant in use	Inspect and complete checklist	Daily before first use	Minimize traffic accidents, protect workers and other drivers/pedestrians	Driver/operator
			Review checklists and vehicles	Spot checks: at least monthly for each vehicle		Contractor safety manager
Marking boundaries of work areas	Boundary is clearly marked	All active work areas	Observations and photographs	– The day before work is to begin – At least once during each stage of construction works	- Limit areas of impacts - Verify no off-site damage	Contractor supervisors & E&S personnel

Table 8.1.2. Monitoring Program

Activity	What *(Is the parameter to be monitored?)*	Where *(Is the parameter to be monitored?)*	How *(Is the parameter to be monitored?)*	When *(Define the frequency / or continuous?)*	Why *(Is the parameter being monitored?)*	Who *(Is responsible for monitoring?)*
Air quality	– Visible dust – Dust coating leaves on nearby vegetation	Unpaved roads & other construction areas	Observations	Continuous during daily rounds	Determine need for damping roads to suppress dust	All contractor managers, supervisors, E&S personnel,
	Black smoke from vehicles, equipment, other engines	All areas			Determine need to remove engine from service until repaired	
Flora and fauna surveys (design team and preconstruction surveys)	– Boundary of vegetation control zone marked – Flora species of concern logged, photographed, marked, and mapped – Mature trees with hibernating/nesting bats/birds logged, photographed, & marked – Trees to be cut marked	Selected areas being surveyed, while surveys are ongoing	– Visits to ongoing surveys – Spot checks of specimen marking after surveys – Debriefs by survey team(s)	- Visits and spot checks: one site daily - Debriefs: daily verbal or email/written	Verify surveys are identifying species of concern, mature trees, natural habitat	Contractor E&S manager & specialists
Land clearing activities (roads, towers, substation, & construction areas)	Compliance with Land Management and Erosion Control Plan, including: – Boundary marking before construction begins – Working within boundaries – Topsoil storage and spoil storage – Drainage control to prevent erosion	All areas being cleared	– Visits/inspections – Reports from supervisors to E&S manager	– Before clearing – Daily during clearing – After clearing and before construction	– Limit extent of clearing – Verify topsoil salvaged – Verify drainage controlled and erosion avoided –	– Contractor E&S personnel – Contractor PM (spot checks)
		All areas under construction	Inspections	At least weekly	Verify implementation of LC&EC Plan	Contractor E&S personnel

Table 8.1.2. Monitoring Program

Activity	What *(Is the parameter to be monitored?)*	Where *(Is the parameter to be monitored?)*	How *(Is the parameter to be monitored?)*	When *(Define the frequency / or continuous?)*	Why *(Is the parameter being monitored?)*	Who *(Is responsible for monitoring?)*
	Condition of land/vegetation at boundary		Observations and photography	Before clearing begins	Allow verification of working within boundaries	Contractor E&S personnel
	Site restoration	Construction sites	Inspections	When construction ends at that site	To verify restoration	Contractor E&S personnel
Excavations and cuts	Areas of excavations marked, edges of excavations marked (tape, rock barriers, etc.)	Foundation locations, cuts on steep slopes	Before ground broken,	Before excavations	Limit area of disturbance	Contractor E&S personnel
	Works are within boundaries	Tower locations, substation location	Observation, photographs	Daily during works	Limit area of disturbance	Contractor E&S personnel & supervisors
	Soil salvaged and stored separately from subsoil/spoil	All excavations	Observations and photographs	At least once during works at each site	Topsoil conserved and protected from erosion	Contractor E&S personnel
	Workers received relevant training	Work sites and records	Interviews, records review	Prior to work at excavation sites	Verify workers can work safely	Contractor safety manager
	Barriers (tape, rocks, etc.) placed to prevent falls	Perimeter of excavations >1m deep	Observation	When excavation is complete	Protect workers against falls	Supervisor
				Spot checks		Contractor E&S personnel
Vegetation cutting	Implementation of Flora and Fauna Survey Plan – Boundary of vegetation control zone marked	Areas where trees and shrubs are to be cut	Observation	Immediately prior to cutting/clearing	Verify species and specimens of concerns are identified	Contractor E&S manager

Table 8.1.2. Monitoring Program

Activity	What *(Is the parameter to be monitored?)*	Where *(Is the parameter to be monitored?)*	How *(Is the parameter to be monitored?)*	When *(Define the frequency / or continuous?)*	Why *(Is the parameter being monitored?)*	Who *(Is responsible for monitoring?)*
	– Flora species of concern logged, photographed, & marked – Mature trees with bats/birds logged, photographed, & marked – Trees to be cut marked					
Tree and shrub plantings	2+ trees and shrubs of same species planted per tree/shrub of conservation concern cut/removed	In 20m strip between 54.5m vegetation control zone and edge of 74.5m corridor	Observation and photography	During spring following cutting	Verify plantings	Botanist appointed by contractor
	Survival of 2+ plantings per tree/shrub cut			Prior to demobilization	Verify success to allow final payment	
				Annually for 5 years after planting	Verify success or identify need for replanting	Botanist appointed by GSE
Bat box placement	2+ bat boxes placed per mature tree with hollows supporting bat hibernating, roosting, nesting	Within 50m of tree that was cut	Observation	Within one month of tree cutting	Verify placement	Contractor-appointed biodiversity expert
				One year after original placement	Verify in place	
Land restoration	Implementation of Land Management and Erosion Control Plan – Grading to stable contours as needed – Placement of topsoil on bare ground – Planting native species (seeds or plants)	All areas where land was disturbed	Observation and photography	Within one month of end of activities at that site	Identify need for repairs or verify restoration	Contractor E&S personnel

Table 8.1.2. Monitoring Program

Activity	What *(Is the parameter to be monitored?)*	Where *(Is the parameter to be monitored?)*	How *(Is the parameter to be monitored?)*	When *(Define the frequency / or continuous?)*	Why *(Is the parameter being monitored?)*	Who *(Is responsible for monitoring?)*
	Establishment of self-sustaining vegetation cover	All restored areas except slopes not capable of supporting vegetation cover	Observation & photography	Each month until vegetation cover determined to be self-sustaining and one year after that	Verify vegetation is established & determine if further action or repairs needed	Botanist appointed by contractor (and GSE as necessary after construction ends)
Identify need for bird diverters on line	Migration of raptors and waterbirds across transmission line corridor	Main river valleys	Observations (monitoring plan to be developed under 2.12 in Table 8.1.1)	Autumn migration season (as recommended by expert) for two seasons	Identify if bird diverters are needed to avoid collisions	GSE (by appointment of a consultant)
Noise generation	Noise levels	Workplaces	Noise meters, per Noise Management Plan	Monthly at typical work sites	Verify noise is within standard or identify need for mitigation	Contractor E&S personnel
		Off-site locations		Within 24 hours of request or noise complaint by worker or external party		
EMF generation	EMF levels	At location of complaint within 100m of centerline or of substation	EMF meter	Within 24 hours of request or complaint by worker or external party	Verify EMF is within standard or identify need for mitigation	GSE
Blasting	Slope slippage (landslide potential)	Within 200m of blasts	Observation	Same work shift as blast	Determine risk of landslide and need for corrective action	Personnel assigned by blast master
	Pre-blast condition	Buildings within 100m of blast	Inspection and photography	Prior to blast	Allow determination of blast damage	Personnel assigned by blast master & PM
	Post-blast condition: cracks, settling, flyrock damage, etc.		Inspection and photography	Same work shift as blast	Identify blast damage	
	Blasting contractor compliance with legal requirements for transport, storage, use	Magazine and blasting sites	Inspection	Monthly	Verify compliance, ensure safety	Contrctor E&S manager

Table 8.1.2. Monitoring Program

Activity	What *(Is the parameter to be monitored?)*	Where *(Is the parameter to be monitored?)*	How *(Is the parameter to be monitored?)*	When *(Define the frequency / or continuous?)*	Why *(Is the parameter being monitored?)*	Who *(Is responsible for monitoring?)*
Ensuring adequate Hygiene	Sanitation, water, etc.	Kitchens, break areas, toilets, accommodations	Inspections			
	Toilets & potable water	Work locations	Observations	Daily during rounds	Verify sanitation	Safety Officers and/or E&S specialists, supervisors, managers
			Inspections	At least weekly		Contractor E&S specialist and/ or safety officer
Worker grievance resolution	Worker grievance register	Work sites and records office	Review of register	Weekly	Verify grievances are being recorded and resolved	Contractor HR manager and PM
	Grievance handling and resolution		Interviews of managers responsible for resolution and with complaining workers	Before monthly progress meeting	Verify grievances are being addressed properly	Contractor HR manager, supervisors
External stakeholder grievance resolution	Stakeholder grievance register	Records office	Review of register	Weekly	Verify grievances are being recorded and resolved	Contractor HR manager and PM
	Grievance handling and resolution	Community	Interviews of selected stakeholders who submitted grievances and with persons responsible for addressing	Before monthly progress meetings	Verify grievances are being addressed properly	Contractor E&S manager, social specialist
Stakeholder engagement	Worker behavior in communities	Community	Reviews of grievance log Interviews with community leaders	Quarterly	Determine need for training/dismissals/ etc.	Contrctor HR manager, PM, social specialists
	Community satisfaction with project	Community	Reviews of grievance log Interviews with community leaders and local residents	Quarterly	Identify community issues	Social specialist, CLO

Table 8.1.2. Monitoring Program

Activity	What *(Is the parameter to be monitored?)*	Where *(Is the parameter to be monitored?)*	How *(Is the parameter to be monitored?)*	When *(Define the frequency / or continuous?)*	Why *(Is the parameter being monitored?)*	Who *(Is responsible for monitoring?)*
Resettlement and compensation	Compliance with RAP	As specified in RAP				
Erosion control, land stability	Effectiveness of erosion control and land restoration	Tower locations	Observations during routine maintenance patrols	Semi-annually during operation	Identify need for further land stabilization and erosion control	Maintenance patrols

9. Public Consutlaiton and Stakeholder Engagement

The stakeholders of any infrastructure project are many and varied. They include most importantly the local people who may be affected by the project and also include local authorities in whose jurisdiction a project will be developed; national authorities who implement and enforce laws governing environmental, social issues, and energy; nongovernmental organizations (NGOs), members of the scientific community with expertise in the issues, and any other interested parties.

Stakeholder engagement is an integral part of a project development and implementation and should begin as early in project development as possible and continue through the project's full life cycle. GSE began planning for the Jvari-Tskaltubo transmission line and substation in 2016 and the Feasibility Study was conducted in 2016-2017. From 2017, GSE and its ESIA team started informal engagement with local authorities and local communities to collect information about the project and learn about people's concerns.

GSE prepared a Stakeholder Engagement Plan (SEP) which outlines how stakeholder engagement will be practiced throughout the project cycle and describes methods to be used in this process. SEP describes responsibilities of GSE and contractors in stakeholder engagement. Actions included in SEP target project-affected persons (those whose property and user rights to land may be influenced, those who reside along the transmission line corridor and whose lives may change positively or negatively as a result of power line construction and operation), as well as at other interested parties (ministries and other Governmental agencies, NGOs, business and workers' organizations, press and media, general public, tourists, jobseekers, academic institutions, etc.). SEP outlines special considerations that will be given to ensure outreach to and engagement of disadvantaged and vulnerable groups. SEP activities include establishment and management of a project-wide grievance redress mechanism (GRM), public meetings, trainings and workshops, media and social media communication, disclosure of written materials, municipal information desks, involvement of project community liaison officers at the municipal level, as well as a survey among affected persons to gauge satisfaction with the quality of citizen engagement and share additional concerns.

Preparation of SEP was a participatory process too. Consultations conducted in preparation of SEP included the following:

- Primary engagement and initial informal meetings with communities (late 2017 and early 2018);
- Community meetings towards SEP preparation (late 2018 and early 2019);
- Communication with government agencies (throughout 2018); and
- Communication with local NGOs (late 2018).

Consultations conducted during preparation of the Resettlement Policy Framework are documented and annexed to RPF.

9.1. *Consultation on the ESIA report*

Present chapter describes consultation process in the course of developing ESIA report and detailed records on the consultations undertaken in the process of its preparation are provided in Annex 6 of the present report.

In the inception phase of ESIA, the team held series of meetings various units in GSE, representatives of relevant Governmental agencies, NGOs, and scientific community. The primary purpose of these meetings was to acquire information, however, meetings also served for disseminating information about the project.

Initial consultations with local population and representatives of local authorities during feasibility study, sourcing of baseline data and undertaking initial routing of the transmission line were held in 2017.

The first draft ESIA report was prepared in accordance with the national legislation in force in the period of ESIA preparation and submission to the Ministry of Environment Protection and Agriculture in December 2017[5]. Information on the disclosure of that first draft ESIA report and meetings scheduled for discussing it with stakeholders was posted in newspapers, on the information boards at city halls of the municipalities and on municipality websites. Hard copies of the ESIA report was made available in the municipal buildings, at GSE office in Tbilisi, and on the internet.

Public consultation meetings were held in each municipality crossed by the transmission line on 19-21 February 2018.

At the public meetings in the municipalities, GSE and its ESIA consultant team presented information about the intended infrastructure, its potential impacts and expected benefits; received comments and entertained questions from the audience. Main types of questions/comments received through the consultation process included those about the actual need for Jvari-Tskaltubo transmission line and purpose of its construction, alignment of its corridor, proximity of the intended power line to the protected areas, and possible health impacts from power line operation. There were many questions regarding the benefits that villagers might receive. GSE and its ESIA consultant team informed about expected employment opportunities for local residents during construction of the transmission line. It was also explained that strengthening of the high-voltage transmission network would improve efficiency of the whole system and enhance the reliability of the countrywide energy system. In addition, indirect benefits were described, such as increased potential for industrial development of the regions and providing transmission capacity to evacuate power from hydropower plants that are being built and that may be built in the future.

[5] As noted in Chapter 2, the relevant law at the time was Article 6 of the Law of Georgia on Environmental Impact Permit, which got replaced with the Environmental Assessment Code.

Local population expressed concerns regarding safety of the new transmission line for human health and wellbeing. The project team responded that the line will be built and operated in full compliance with existing regulations. It was also noted that expected impacts of power line operation on the public health and safety were fully considered during ESIA and respected in aligning the power line corridor.

Several questions were raised about restrictions that will apply in the buffer zone, including restrictions on land use. The restrictions on houses and auxiliary buildings in the 74.5-meter buffer zone were discussed in detail. It was pointed out that the preferred alternative would not require physical relocation from the buffer zone, however, this may be confirmed once the detailed design of the power line is produced. The ESIA team pointed out that agricultural activities under the line will not be restricted during its operation, since the land will remain in cultivation for crops, grass, or cattle grazing, but that restrictions would prevent keeping high-growing fruit trees (with over four meters height) within 20 meters from the line.

Multiple questions pertained involuntary resettlement and compensation for it: who would be compensated, for what, when, and how much. GSE and ESIA consultant team explained the main principles of the RPF, including the fact that there will be a very detailed census of landowners and property that could be affected, and more detailed Resettlement and Compensation Action Plans (RACPs) will be developed to guide the entire process. It was emphasized that compensation for affected properties will be calculated in accordance with very clear rules included in the RPF and RACPs, which are based on the national legislation of Georgia as well as the requirements of the World Bank. It was also noted that compensation will be based on the replacement cost, which is considered as good practice worldwide. Finally, it was mentioned that vulnerable households will receive additional support, and that special support will be provided for legalization of properties within the corridor if that is needed.

First draft ESIA report was substantially upgraded to meet the requirements of the World Bank's new ESF. This draft was disclosed through the same social media as the first draft on 11 March 2019. Second round of stakeholder consultation was advertised and held in Tsalenjikha municipality on 15 March 2019 with participation of representatives from all project-affected municipalities. Discussion topics were quite similar to those raised during first round of consultations, the main item being involuntary resettlement, easement arrangements, and compensation. Clarifications were provided to the extent possible at the stage of general design. It was highlighted that exact locations of towers and, therefore, exact needs for land take/easement will be known once the contractor is on board and develops detailed design of the transmission line.

9.2. *Stakeholder Engagement during Project Implementation*

Engagement will continue through the life of the project. SEP provides details of the program that will be used to present information to stakeholders and to receive information and opinions from stakeholders. In summary, there will be:

Public / community meetings;

Mass/social media communication;

Distribution of information materials;

Grievance redress mechanism;

Project tours for media, civil society, and local representatives;

Information desks at each municipality;

Citizen perceptions surveys;

Trainings and workshops to raise awareness on key topics of interest such as EMF, impacts on land and compensations, code of conduct for project staff, grievance redress mechanism, or other topics of interest to citizens.

Also, GSE has assigned part of the corporate website to this project which will be used for publicizing important project-related documents and information on its progress in Georgian and English languages. The website will also explain the mechanism by which external stakeholders (that is, anyone) can submit complaints or comments on the project and be assured they will be addressed promptly. It will provide an electronic comment form and provide details of a person who may be contacted.

9.3. *Grievance Redress Mechanism*

GSE will establish and maintain a functional Grievance Resolution Mechanism (GRM). The GRM addresses grievances in an efficient, timely and cost-effective manner, that arise in the Project, either due to actions by GSE or the contractor/sub-contractors employed by GSE, from affected communities and external stakeholders. A separate mechanism is developed to address worker grievances. GSE is responsible for managing the GRM, but many of the grievances on the Project will likely relate to the actions of the Contractor and so will need to be resolved by the Contractor. GSE with the support of the Supervision Consultant will administer the GRM process deciding whether they or the Contractor is responsible and determining the best course of action to resolve the grievance. The Supervision Consultant will support GSE to monitor grievance resolution being undertaken by the contractor.

The project GRM deals with the issues of land and other assets acquisition (e.g. amount of compensation, suitability of residual land plots, loss of access roads, etc.) as well as the losses and damages caused by construction works, and any direct or indirect environmental and social impacts. Therefore, the grievance redress mechanism has to be in place by the time GSE starts preparation of RAP, ESIA and shall function until the completion of all construction activities and beyond until the defect liability period ends. PAPs and other potential complainants should be fully informed of the GRM, its functions, procedures, timelines and contact persons both verbally and through booklets and information brochures during consultations meetings and other stakeholder engagement activities.

GSE will implement an effective GRM, with the objective of helping third parties to avoid resorting to the judicial system as far as possible. GSE's GRM includes three successive tiers of extra-judicial grievance review and resolution: (i) the first tier is the Grievance Resolution Committee (GRC) at the Municipal level; (ii) the second tier is the GRM Focal Person at GSE headquarters at the national level; and finally, (iii) the third tier is the Grievance Redress Commission (GRC) comprising of senior GSE management at GSE headquarters. Complainants can seek redress from the judicial system at any time. The step-by-step process does not deter them from approaching the courts. All grievance related correspondence will be documented, and the grievance resolution process will be systematically tracked.

The Project GRM is described in detail in the SEP.

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