

Dariali Hydropower Plant Project

***IMPACT OF DARIALI HPP ON KAZBEGI NATIONAL
PARK
TRADITIONAL USE ZONE***



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1. Legal Framework of the Kazbegi National Park

Kazbegi National Park is located in the historical gorge on the northern slopes of the Caucasus range. The territory of Kazbegi Protected Areas is fragmented, with a total area of 8707 hectares. All of the Kazbegi National Park is mountainous. Administration of Kazbegi National Park includes the following territories: Kazbegi National Park-8686.6 ha, Nature Monument of Sakhznari Cliff Columns-335,7ha, Nature Monument of the Abano Mineral Lake-0,04 and Nature Monument of the Truso Travertines-4,2 ha (<http://www.apa.gov.ge/index.php?site-id=39&page=4&id=1>). According to Relevant Regulations Establishing Kazbegi National Park Order # 53 of the Minister of Natural Resources of Georgia December 6, 2011, Tbilisi On Approval of Temporary Regulation Procedure of Functioning of Some Protected Territories and Temporary Regulation Procedure of Functioning of Kazbegi National Park the following circumstances should be underlined:

Article 4. Location and Total Area of Kazbegi National Park

1. Kazbegi National Park is located on the territory of Kazbegi municipality, Central Caucasian Ridge, In the ravines of the rivers – Tergi, Snos Tskali, Aragvi, Khdes Tskali and is represented on the territory in the form of quite scattered groups.
2. The territory of Kazbegi National Park covers the territory, defined by the Article 6 of the Law of Georgia “On the Status of Protected Territories”, with total area of 8707 ha.

Article 5. Zoning of Kazbegi National Park

For the purpose of implementation of the basic environmental goals, with consideration of the Article 5 of the Law of Georgia “On the System of Protected Territories”, the following zones are allocated on the territory of Kazbegi National Park:

- a) Zone of strict environmental protection;
- b) Visitors’ zone;
- c) Zone of traditional use.

Article 6. The Area, Boundaries of Strict Environmental Protection of the National Park and Permitted Activities

1. Total area of strict environmental protection zone of Kazbegi National Park makes the territory of 3407 ha, which includes blocks 1, 2 (with the exception of the 5th district), 3, 4 (with the exception of the 11th district), 12, 13, 15, 16, 19, 20, 31, 43, 46, 47, 48, 50, 51, 53, 55, 56.
2. All activities are prohibited in the strict environmental protection zone of Kazbegi National Park with the exception of:
 - a) Non-manipulation scientific researches and monitoring;
 - b) Educational Activities;
 - c) Limited movement with auto-, motor-vehicles and aircrafts for the purpose of implementation of official activities in the case of natural disaster, emergency situation and restoration activities.

Article 7. The Area, Boundaries of Visitors’ Zone of the National Park, Permitted Activities

1. The area of visitors’ zone of the National Park makes 2311 ha and includes 11th district of the 4th block and blocks 7, 8, 9, 17, 21, 22, 23, 24, 25, 37, 39, 40, 52, 54.
2. All activities are prohibited in the visitors’ zone of Kazbegi National Park with the exception of:
 - a) Conservation, maintenance, restoration and monitoring of ecosystems existing on the territory and wildlife and wild plants spread within its boundaries;

- b) Protection, restoration and monitoring of hydrological system and forest ecosystem of the territory;
- c) Non-manipulation scientific researches and monitoring;
- d) Educational Activities;
- e) Collection of limited amount of materials for herbarium and collection of invertebrates for the purpose of educational and scientific activities;
- f) Implementation of restoration activities;
- g) Limited movement with auto-, motor-vehicles and aircrafts for the purpose of implementation of official activities in the case of natural disaster, catastrophe, emergency situation and restoration activities;
- h) Implementation of cadastre activities;
- i) Recording of natural resources;
- k) Visitors' controlled and regulated access;
- l) Creation and arrangement of infrastructure required for protection and ecotourism;
- m) Movement by horse on foot, in special cases – movement by vehicle on roads;
- n) Arrangement of tracks and maintenance of the existing roads and tracks;
- o) Cleaning of forest from blockages and cutting and removal of over-dry trees dried in groups by social cuts in 20m zone along the roads and tracks for the purpose of protection against fire;
- p) Transit cattle crossing and pasturing of visitors' and patrol horses.

Article 8. The Area, Boundaries of Traditional Use Zone of the National Park, Permitted Activities and Use of Resources

1. Total area of traditional use zone of Kazbegi National Park makes the territory of 2990 ha, which includes the 5th district of the block #2 and blocks 5, 6, 10, 11, 14, 18, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 38, 41, 42, 44, 45, 49, 57, 58.

2. All activities are prohibited in the traditional use zone of Kazbegi National Park with the exception of:

- a) Protection, maintenance, restoration and monitoring of ecosystems existing on the territory and wildlife and wild plants spread within its boundaries;
- b) Protection, maintenance and restoration of forest ecosystems;
- c) Non-manipulation scientific researches and monitoring;
- d) Educational Activities;
- e) Collection of limited amount of materials for herbarium and collection of invertebrates for the purpose of educational and scientific activities;
- f) Creation and arrangement of protective, tourist and recreational infrastructure;
- g) Arrangement of permanent and temporary sapling farms and arrangement of animal enclosures for the purpose of wildlife restoration;
- h) Limited movement with auto-, motor-vehicles and aircrafts on the territory of traditional use zone for the purpose of implementation of official activities in the case of natural disaster, catastrophe, emergency situation and restoration activities;
- i) Implementation of cadastre activities;
- k) Recording of natural resources;
- l) Movement on roads with vehicles;
- m) Visitors' presence and movement;
- n) Maintenance of roads and maintenance and arrangement of tracks;
- o) For personal use by the population of the adjacent settlements, according to the procedure, established by Georgian legislation – use of non-wood forest resources, use of products of wood plants of the forest, use of secondary wood materials, grafting of wood plants of wild fruit species, pasturing (areas, not covered with forest), arrangement of bee gardens, where the number of hives shall not exceed 300, collection of mushrooms and fruit and berries, in the case specified by sub-paragraphs “a”, “b”, “c” and “e” of the Article 271 of the “Rule of Forest Use” approved

by the Resolution # 242 dated August 20, 2010 of the Government of Georgia - forest use for special purposes and other activities, permitted by Georgian legislation.

2. The Kazbegi National Park and High Mountain Ecosystem

KNP is located on the north slope of Main Caucasian ridge, in the basin of the river Tergi (in Khevi) in Kazbegi District; the lower mark of its territory is at the height of 1400 m above sea level and the upper – in the range of 3300- 4100 m. The present KNP is fragmented, as it came into existence from starting with two protected areas that were extended by forested patches of land in 1976 and was again extended with individual pieces of land in 1987. The main purpose of establishment of Kazbegi National Park is to protect high mountainous ecosystems of the region.

Its relief is complex, mountainous and very rugged. Kazbegi National Park as well as the whole gorge are constructed with basalt formations such as quartzite, carbonaceous clay shales of the lower Lias age and argillaceous sediments of the lower Toarcian age, where there are many diabase layer-veins. The so-called lava pillows are part of the region's geology. In Dariali gorge, and even to the south, everywhere, where the Tergi River has cut its way through the canyons, the slopes of the gorge are the perfect examples of the local geology. It is easy to see the basalt sections and lava layers in the cliffs.

Vegetation cover of Kazbegi National Park is quite diverse. It is enclosed in the very part of the Kazbegi floristic zone of the Greater Caucasus, which is distinguished by richness of endemic species. 1347 species of plants can be found in this floristic zone, 26% out of them are endemic. The alpine, subalpine, xerophyte and plants of other ecological communities can be found here.

The territory includes high mountain paleoglacial-denudational alpine landscapes with grasslands and rhododendron thickets, high mountain volcanic subnival landscapes, high mountain denudational and paleoglacial sub-alpine landscapes with combination of meadows, shrubs and open, upper-mountain erozional-denudational, partially paleoglacial landscapes with birch and pine and hornbeam-oak forests.

The flora is typified by high mountain grassland communities of the High Caucasus, interspersed with highly fragmented birch-ash forests patches along lower slopes, side-hills and micro-watersheds and a juniper-rhododendron belt forming the tree line above 2000 m elevation. The forests of Kazbegi National Park are located on the steep slopes. 105 species of wood plants can be found here, though mainly there are Litvinov's birch (*Betula litwinovi*), Caucasian pine (*Pinus kochiana*), junipers (*Juniperus* - 3 species), Sea-buckthorn (*Hippophae rhamnoides*). It is remarkable that in Georgia there is a very rare large grove of Sea-buckthorn nearby the settlement of Stepantsminda, and the Caucasian rhododendron (*Rhododendron caucasicum*), oriental beech and high-mountain oak are widespread in the vast areas. Existence of diverse vegetation indicates to richness in fauna.

Prominent fauna of the region includes Caucasian Tur (*Capra cylindricornis*), chamois (*Rubicapra rubicapra*), brown bear (*Ursus arctos*) and wolf (*Canis lupus*). The avifauna is richly represented with several species endemic to the area, including Caucasian Snowcock (*Tetraogallus caucasicus*), but it also holds breeding populations of vulture species (Bearded Vulture (*Gypaetus barbatus*) and Griffon Vulture (*Gyps fulvus*). Numerous plant and animal species reported from the region are listed in Georgia's Red Data Book (RDB does not have legal status due to Georgian Red List, 2006). Out of Georgian "Red List" plant species only Radde's (black) birch (*Betula raddeana*) is encountered on the mentioned area. From fauna Georgia's Red List species can be found here: East Caucasian tur (*Capra cylindricornis*), chamois (*Rupicapra rupicapra*), wolf (*Canis lupus*), Pine Marten (*Martes martes*), Brown bear, lynx, *et al.* Birds of prey can be found in the National Park, which are also included in the Red List of

Georgia, such as the Golden eagle (*Aquila chrysaetos*), griffon vulture (*Gyps fulvus*) and Bearded vulture (*Gypaetus barbatus*).

Historical monuments, such as the fourteenth century Sameba temple, tenth century Garbani church, Sioni three-parted basilica, Akhaltsikhe basilica and seventeenth century Sno castle are very interesting for the visitors as well. Religious traditions and habits of the local people that is a mix of Christian and Pagan habits attract the visitors.

Kazbegi has quite rich tourist potential: breath-taking nature, biodiversity, historical-cultural monuments, local traditions and habits. In the near future the improvement of the infrastructure of Kazbegi National Park is being planned, which will actively promote the development of tourism in this region.

3. The Dariali Hydropower Plant (HPP) on Tergi River in Kazbegi

On May 19, 2011 the government of Georgia and company Dariali Energy signed an agreement on construction of a new Dariali Hydro Power Plant (DHPP) in Georgian highlands of Kazbegi, Mtskheta-Mtianeti Region, on the river Tergi. Gamma Ltd (Scientific Research Firm) and Stucky Caucasus Ltd have prepared an Environmental Impact Assessment (EIA) of the DHPP project, including assessments of environmental and social impact and recommended mitigating measures for anticipated negative impacts.

The HPP is being constructed at a site within the KNP, north of Stepantsminda town, the administrative centre of the area. As such, construction is not allowed in a protected area. 20 ha of protected area have been taken out of the KNP and as a compensation measure 339 ha of land have been added. This was confirmed in a letter from MENR (Ministry of Energy and Natural Resources of Georgia) of 27 June 2012.

4. National Park Land Affected by Dariali Hydropower Project

Three small area of land were removed from the KNP for the DHPP totaling 8,737 ha or 8.8 ha (not 20 ha) belongs to the **Area within the Boundaries of Traditional Use Zone of the Kazbegi National Park**. They are:

1. Plot No 15 with an area of 32,778 m² at the beginning of the pipeline route immediately below the weir/dam;
2. Plot No 16 with an area of 17,322 m² which is one km away from the weir/dam site;
3. Plot 246 with an area of 37,637 m² is at the downstream end of the project.

Plots 2 and 3 are on the right bank of the Tergi River downstream of Stepantsminda town. The land along with some private land is required to build the first section of the water delivery system (a buried pipeline) for the DHPP. The two pieces of KNP land are taken from a small fragment area of KNP which is itself surrounded by private land. The two areas do have Sea-buckthorn groves. Plot 3 is at the downstream area and is required for construction activity; it will be used in operations for the switchyard and transformers. The land is immediately alongside the main road to the border and is between the road and mountainside.

The Ministry of Environment Protection is indicating that 20 ha had been excluded from the KNP, but this presumably covers the corridor of land required for the tunnel. The surface KNP land along and above the tunnel alignment is unaffected by the project.

5. Dariali Hydropower Plant Approval Process

An Environmental Impact Assessment (EIA) was undertaken for the Dariali project in 2011 and contains the information necessary to obtain an Environmental Permit under Georgian Law on Environmental Permits, 2008 and the Regulation on Environmental Impact Assessment, 2009. The EIA was undertaken by the Georgian firms Gamma Ltd and Stucky Caucasus and presented as a 238 page report⁴. Public Consultation was carried out with a final meeting that took place on 8th November 2011 in the Kazbegi Municipality, Stepantsminda.

The EIA was considered by Ministry of Environment Protection and the MoEP permit (entitled the Environmental Expertise Conclusion on the Project) was granted on 28 November 2011. Subsequently, the Ministry of Economy approved the Building Permit for Construction of Dariali on 30th November 2011. Building work commenced immediately on the tunnel work component of the project. MoEP (Ministry of Environment Protection of Georgia) is responsible for monitoring Dariali Project and ensuring that mitigation recommendations in the EIA are followed.

6. Main Project Impacts and Mitigation

There will be construction impacts at the weir where a 150m temporary access road is required and drilling at three downstream sites. Correct disposal of drilling materials is one of the major issues in environmental management.

The great majority of the workforce for construction activities is employed locally. The camp for the non-local workforce and for offices is 8.5 km away from Stepantsminda town in the downstream area and social impacts will be minimal. Impact on habitat for flora and fauna will be small and mostly short term. There will be a need to upgrade power lines in the Tergi valley. Upgrading will be restricted to the existing power line corridor and will have no additional environmental impact or on biodiversity conservation in the area.

Once construction is finished, there is little visual impact from the project as most of the project components, including the powerhouse, are underground. There will only be need for land for the project sub-station and control room. There will be no impact on biodiversity and landscape on the gorge slopes that belong to the KNP, because the headrace tunnel will be underground, and there will be no interruptions in the hillside hydrology or movement of animals. The latter can still move freely to the river water for drinking. The main potential long term impacts resulting from the project relate to reduced water in the 7 km section of the Tergi River between weir intake and the powerhouse with visual landscape impacts and loss of aquatic habitat. There is trout in the river and the DHPP weir will impede fish movement. There will be cumulative impacts especially on fish movements from the other projects both existing and proposed in the Tergi River system (The Larsi project is 100m downstream of DHPP and an old Tergi River downstream HPP in Russia over the border also poses obstacles to any long distance fish movements). DHHP will use a diversion weir that will allow flood events through the main gorge during peak flow season and which are responsible for the existing river landscape. Trout will form local populations and the main trout populations will still inhabit upstream parts of Tergi River.

7. Natural Monuments as Compensation Areas

Three territories have been added to the National Park as compensation areas for the land lost at Dariali and for the potential loss of the land at Stepantsminda KNP forest area (due to Rooms Hotel Plans). The three areas were confirmed as protected areas under the Law No 5853 on the Status of Protected Areas which was approved on 16th March 2012. Before these area were general government land and APA had no ownership, nor any protection tasks for them. In February 2012 APA obtained the ownership of the areas. The National Parks office in

Stepantsminda was ordered to patrol these three new areas pursuant to the new law in March 2012. These areas were already designated as natural monuments and had protected status as general Government-owned land. They are now registered to APA and represent important additions to the KNP project area.

Two of the added territories - the Truso Travertines (4.2 ha) and the Abano Mineral Lake (0.04 ha) are located in open grazing areas at a height of about 2000m. The two features are within 500m of each other. They can best be protected and managed by consolidating the features and incorporating a contiguous section of the Truso Valley section in the new KNP project area. The third territory, the Sakhazinari Cliff columns (331.46 ha), is a mountainous area, with cliff columns of peculiar beauty and are recognized as critical habitat for vultures.

8. Conclusions on Impact on Biodiversity Conservation and on the Overall Objectives of Protected Areas Development Programme

The particular Kazbegi high altitude biodiversity that is of most interest for protection under the future limits of the KNP is at the higher elevations above the building and operation areas of the DHPP. Therefore this project has no negative impact on the particular biodiversity, nor on the foreseen biodiversity and habitat conservation, under the future KNP as will be developed through the Support Programme for Protected Areas.

Conclusions on Impacts of Hydro Power Plant Investment Projects on the Kazbegi National Park Traditional Use Zone and the foreseen KNP Project

Dariali HPP has no/negligible impact on the KNP Project Area with loss of only small fragments of land. This is concluded as well in Mission Report on Impact of Dariali HPP and rooms hotel Plans on the Kazbegi National Park (Transboundary Joint Secretariat for the Southern Caucasus. BMZ, kfw, REC Caucasus. November 2012. 54 p).

Compensation Areas

- The Truso Valley Travertines and Abano mineral lake features would benefit as would the whole valley from an extension of the KNP and designation as traditional use area.
- The Sakhazinari Cliffs are a valuable bird habitat and landscape addition to the KNP.

Overall

- Biodiversity conservation objectives and Kazbegi National Park development and objectives of the Support Programme for Protected Areas investments are not at risk due to DHHP construction and operation.

9. Results of the Detailed Ecological Survey For the Assessment of Impact of DHHP on KNP Traditional Use Zone

For the assessment of impact of DHHP on **KNP Traditional Use Zone**, all relevant documents were reviewed, in addition on-site ecological assessments have been carried out in order to reveal any negative impact of the Dariali project construction and operation activities in the context of flora and vegetation and fauna receptors with participation of the expert in Botany: David Chelidze and expert in Zoology; Alexander Bukhnikashvili.

9.1 Botanical survey

Detailed floristic and syntaxonomical surveys were undertaken on 23-24 May 2013 at a number of sites along the Dariali HPP impact area, which were identified as particularly sensitive to HPP construction and operational activities in the context of assessment of the Dariali HPP impact on Kazbegi National Park Support Zone. A key objective of the floristic and phytocociological research was to identify and collect quantitative data on plant communities and species of high conservation value that occur in the impact area or in close vicinity of the project construction

and operational activities. These territories include the former sites of **Kazbegi National Park Support Zone that were transferred to Dariali Energy by the Government of Georgia.**

Methodology: An internationally recognized standard methodology has been used in assessments of the botanically important and sensitive sites. Sample plots to study important syntaxonomical units in the project impact area in sensitive sites were determined by selective sampling. This involved subjective selection of the sampling plots identified to be representative of a community type or containing a special feature such as species of high conservation value. Cover-abundance of the vegetation was assessed by the Drude scale. Symbols of Drude's scale indicate frequency of occurrence/coverage of a species. The symbols are as follows: Soc (socialis) – the dominant species, frequency of occurrence/coverage exceeds 90%; Cop³ (coptosal) – an abundant species, frequency of occurrence/coverage 70-90%; Cop² – a species is represented by numerous individuals, frequency of occurrence/coverage 50-70%; Cop¹ – frequency of occurrence/coverage 50-70%; Sp³ (sporsal) – frequency of occurrence/coverage about 30%; Sp² (sporsal) – frequency of occurrence/coverage about 20%; Sp¹ (sporsal) – frequency of occurrence/coverage about 10%; Sol (solitarie) – scanty individuals, frequency of occurrence/coverage about to 10%; Un (unicum) – a single individual.

Plot No.1. GPS coordinates N42°40'15.5''/E 44°39'03.7'', 1757m asl; Northern-Western exposure; Slope inclination 5-15°. Medium conservation value habitat. The territory is represented by overgrazed grass forbs degraded meadow and is not under direct impact of the Project construction activities. Coverage of vegetation-90%. Phytocoenosis height-40cm. Below is provided species cover-abundance by Drude scale. Symbols of Drude's scale indicate frequency of occurrence/coverage of a species:

Festuca varia-Cop³
Alchemilla caucasica-Cop³
Carum meifolium-Cop³
Taraxacum officinale-Cop¹
Plantago saxatilis- Cop¹
Potentilla crantzii-Cop²
Gentiana nivalis-Sparsus
Polygala alpicola-Sparsus
Pulsatilla violacea-Sparsus (endemic of Caucasus)
Thymus sp.-Sparsus
Trifolium ambiguum-Cop²
Oxytropis cyanea-Sparsus
Coronilla balansae-Cop²
Euphorbia iberica -Sparsus
Ranunculus oreophyllus-Cop¹
Festuca ovina-Sparsus
Cerastium arvense-Sparsus
Androsace barbata-Sol
Galium album-Sol
Primula algida-Sol
Veronica gentianoides-Sol
Mosslayer is developed.

The site is represented by the sparse shrubbery among the stones with the following species: barberry (*Berberis vulgaris*), juniper (*Juniperus depressa*), *Asplenium trichomanes*, *Thalictrum buschianum* (endemic of Caucasus).



Plot No.1. Grass forbs meadow



Plot No.1. Grass forbs meadow



Plot No.1. *Pulsatilla violacea*



Plot No.1. *Primula algida*



Plot No.1. *Pulsatilla violacea*



Plot No.1. *Pulsatilla violacea*

Plot No.2. GPS coordinates N42⁰40'32.4''/E 44⁰38'55.7'', 1724 m asl; Southern -Western exposure; Slope inclination 5-20⁰. Medium conservation value habitat. The territory is represented by overgrazed grass forbs degraded meadow and is under direct impact of the Project construction activities. Coverage of vegetation-90%. Phytocoenosis height-5cm. Below is provided species cover-abundance by Drude scale:

Festuca ovina-Cop³
Plantago saxatilis- Cop²
Potentilla crantzii-Sparsus
Pulsatilla violacea-Sparsus (endemic of Caucasus)
Cerastium arvense-Sparsus
Androsace barbata-Sol
Linaria meyeri-Sol (endemic of Caucasus)

The site is represented by the sparse shrubbery with the following species: barberry (*Berberis vulgaris*), juniper (*Juniperus depressa*), etc.



Plot No.2. *Juniperus depressa*



Plot No.2. *Androsace barbata*



Plot No.2. *Berberis vulgaris*



Plot No.2. *Linaria meyeri*



Plot No.2. *Berberis vulgaris*



Plot No.2. *Androsace barbulata*



Plot No.2. Aspect of *Pulsatilla violacea*



Plot No.2. Aspect of *Pulsatilla violacea*

Plot No.3. GPS coordinates N42⁰40'29.9''/E 44⁰38'55.1'', 1725 m asl; Southern -Western exposure; Slope inclination 20-25⁰. Low conservation value habitat. The territory is represented by sea-buckthorn shrubbery and is under direct impact of the Project construction activities. Coverage of vegetation-60%. height of shrublayer-2m. From herbaceous species are spread the

following plants in herblayer: *Galium album*, *Artemisia absinthium*, *Cirsium caucasicum*, *Urtica dioica*.



Plot No.3. Sea-buckthorn shrubbery



Plot No.3. Sea-buckthorn shrubbery



Plot No.3. Sea-buckthorn shrubbery

Plot No.4. GPS coordinates N42⁰40'25.0''/E 44⁰38'53.8'', 1719 m asl; Northern-Western exposure; Slope inclination 10-15⁰. Low conservation value habitat. The territory is represented by sea-buckthorn shrubbery with admixed goat willow (*Salix caprea*), juniper (*Juniperus depressa*) barberry (*Berberis vulgaris*). The site is under direct impact of the Project construction

activities. Coverage of vegetation-50%. height of sea-buckthorn-2,5m, goal willow-3m , barberry-1,5m, juniper-1m.



Plot No.4. Sea-buckthorn shrubbery with admixed goat willow, juniper, barberry



Plot No.4. Sea-buckthorn shrubbery with admixed goat willow, juniper, barberry



Plot No.4. Sea-buckthorn shrubbery with admixed goat willow, juniper, barberry

Plot No.5. GPS coordinates N42°40'21.6''/E 44°39'00.0'', 1740 m asl; Southern-Western exposure; Slope inclination 5°. Low conservation value habitat. The territory is represented by overgrazed grass forbs degraded meadow. The site is under direct impact of the Project construction activities. Coverage of vegetation-80%. Phytocoenosis height-5cm. Below is provided species cover-abundance by Drude scale:

Festuca varia-Cop³
Plantago lanceolata- Cop³
Cirsium caucasicum-Cop²
Cerastium arvense-Cop¹
Oxytropis cyanea-Cop²
Euphorbia iberica-Sparsus
Taraxacum officinale-Cop¹
Potentilla sp.-Sparsus
Macrotomia echioides-Sol

Around the plot described the site is represented by the shrubbery with the following species: sea-buckthorn (*Hippophae rhamnoides*), barberry (*Berberis vulgaris*), juniper (*Juniperus depressa*).



Plot No.5. Overgrazed grass forbs degraded meadow, in the foreground– shrubbery with sea-buckthorn, barberry and juniper



Plot No.5. Overgrazed grass forbs degraded meadow, in the foreground– shrubbery with sea-buckthorn, barberry and juniper



Plot No.5. Overgrazed grass forbs degraded meadow, in the foreground– shrubbery with sea-buckthorn, barberry and juniper



Plot No.5. *Juniperus depressa*



Penstock site

Construction and Operation phases negative impact and relevant mitigation measures. As a result of detailed Botanical assessment 2 high conservation value species populations on project areas have been revealed (endemics of Caucasus *Pulsatilla violacea* and *Linaria meyeri*), as well as assessment of negative impact of construction and operation phases on flora and vegetation for

the project areas are identified and adequate conservation/reinstatement measures are elaborated for the implementation; Relevant Biorestoration specification plan that includes Rare species conservation plan should be prepared and Biodiversity monitoring/ management plan for the botanical component is already included in Dariali HPP ESIA. Baseline description/ information will serve as basis against which the rate and character of complex ecological reinstatement (vegetation cover reinstatement) of project post-construction areas can be monitored and Biodiversity (Botanical component) monitoring should be carried out.

After the identification of endemic, rare and endangered plant species populations in project impact zone, relevant mitigation measures are being elaborated in order to undertake necessary steps to ensure protection, conservation and sustainable development of endangered populations, which are directly impacted by the project construction activities.

To ensure species conservation the following selected methodologies are translocation of live plants to conservation centers and plant propagation from seeds collected in the wild. As the translocation of plants is always associated with high risk, seed propagation should be used as well in order to increase chances of success and propagate enough seedlings for consequent reintroduction.

Plants translocated from their wild habitat and grown from seeds will form living collections at the proposed conservation centers. Once the construction of the project is finished, translocated plants and those grown from seeds should be reintroduced, in their wild habitat or in relevant adjacent habitats in order to restore the wild populations existing prior to project clearance.

9.2 Zoological Survey

On 23-24 May 2013, a zoological survey of the protected territory at the foot of the Mountain Kuro was organized that is part of Kazbegi Protected Area (National Park Traditional Use Zone). It is located on the eastern slope of the mountain Kuro and covers secondary meadows, bushes of the sea-buckthorn, dog-rose, barberry and other species and detritus. It is crossed by three deep gorges formed by the temporal currents and situated between a high steep escarp opposite the river Kuro and the village Tsdo.

The protective measures needed for strictly protected areas are not being implemented on the site under consideration. The secondary meadow is overgrazed by the sheep and cattle, and as a result, the bushes and detritus are in a better state, while the state of the meadow cannot stand any critics. However, it also should be mentioned that grazing intensity varies with the highest press during taking the sheep to the high-mountainous pastures. The press of grazing of cattle is average or low, although the number of rodent burrows in the meadow are significantly reduced.

Methodology: Cattle and medium sized mammals were registered according to their traces along 1-5 km routes and transects and visually during the day and at night. Otter was registered by its traces and burrows along eth water reservoir, along 1-5 km routes, transects and by other vital signs as well as with immediate observations. The species of the mammals were registered approximately with the visual and other methods, as it was impossible to catch them.

The birds were observed by the transect strip method. In addition, the nests and sites of concentration of legally protected and rare bird species were identified, and will be considered as the important sites for the species. The number of birds will be evaluated by using of different standard methods. Reptiles and amphibians were fixed by routing, in shelters and water reservoirs. The sites with a great number of animals inhabited or with species diversity will be marked as the key ones.

Materials: Out of large mammals, only cattle were registered. Out of small mammals, only 3 vole burrows were registered in the meadow and beyond the concerned area, near the river Kuroskhevi (the burrows may be of two species only (Daghestanian vole (*Terricola daghestanica*) or common vole (*Microtus arvalis*)). Smell of Gueldenstaedt's shrew (*Crocidura gueldenstaedtii*) was fixed at two places, which is so strong that is felt quite easily, particularly in the propagation period.

Out of birds, the Red-billed Chough (*Pyrhocorax pyrrhocorax*), Red-backed Shrike (*Lanius collurio*), blackbird (*Turdus merula*), Water Pipit (*Anthus spinoletta*), Black Redstart (*Phoenicurus ochruros*), White-winged Snowfinch (*Montifringilla nivalis*), Crag Martin (*Ptyonoprogne rupestris*), Alpine Swift (*Apus melba*), Common cuckoo (*Cuculus canorus*) were registered.

No reptiles or amphibians were registered.

In addition to the above-listed species, in the immediate vicinity of the area of our interest, in particular, in Stepantsminda (mostly in the environs of the settled areas), Gveleti and Dariali gorges, there live such mammals as Caucasian shrew (*Sorex satunini*) and Caucasian pygmy shrew (*Sorex volnuchini*) (they are less likely to be found in the settled areas), white-toothed shrew (*Crocidura leucodon*) (it is likely to be found here), grey hamster (*Cricetulus migratorius*), Caucasian Snow Vole (*Chionomys gud*), pygmy wood mouse (*Sylvaemus uralensis*), Caucasian wood mouse (*Sylvaemus fulvipectus*) (They are likely to be found here) (Bukhnikashvili, 2004). The following bird species are found here: Griffon Vulture (*Gyps fulvus*), Bearded Vulture (*Gypaetus barbatus*), Golden eagle (*Aquila chrysaetus*), raven (*Corvus corax*), crow (*Corvus cornix*), Common Kestrel (*Falco tinnunculus*). Out of reptiles, the one typical to semi-arid landscape are found here: Caucasian meadow viper (*Vipera lotievi*), and out of amphibians, green toad (*Bufo viridis*) is likely to appear in the given area.

The species on the Red List of Georgia found in the area of our interest is only grey hamster (in least quantities). Despite the fact of the named area not fixed anywhere, it is known that Russian researchers worked here in the 1980s (Yasni, 1990) and they generalized the data immediately from this area for other similar sites of the river Tergi upper reaches.

Out of endemic species, the area of interest may include Caucasian pygmy shrew, Daghestanian and Gudaurian voles. The latter can be found over the detritus and cliffy formations in relatively humid locations, as well as Caucasian meadow viper.

Sensitive sites and hazards: The sensitive sites, due to the small size of the RoW, are impossible to identify. Laying operations of the pipeline will be accompanied by:

- The increased noise and vibration, plants will be covered with dust having its influence on the feeding base of the vertebrates and invertebrates and their reproduction (Yablokov, Ostroumov, 1985);
- Increased disturbance for the birds nesting near the access roads and grey hamster.

Proposed mitigation measures to be implemented:

- The measures in order to reduce dust formation during the works are necessary;
- The measures in order to reduce the noise and vibration during the works are necessary;
- Domestic and construction waste must not be accumulated on open landfills or disposed in the water;
- Spillage of oil products and other conterminous substances on water and ground shall be prohibited;

- Pits, trenches and other must be protected to prevent fall of animals. For large species – sharp-colored ribbon, for small animals – any flat material – tin, polyethylene and etc. Long boards or logs must be launched into trenches and pits, so that small animals could get out. Trenches must be inspected before filling them with soil;
- Grey hamster shall be removed from the disturbed sites and shall be reproduced at the laboratory or in a half-free state, to return to their original sites after the construction is complete.

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