

# **Dariali Hydropower Plant Construction and Operation Project**

## **Biodiversity Action Plan Terrestrial Biodiversity**



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## 1. Introduction

### 1.1 Dariali Hydropower Project

#### 1.1.1 Project Description

The Project comprises the development, construction and operation of Dariali HPP. It will be a run-of-the-river power plant located at the elevation of 1,729 m on the Tergi river in Kazbegi district, north-eastern Georgia. Dariali HPP will lie near the town of Stepantsminda around 1.2km from the Georgian – Russian border, 160 km north of the capital city of Tbilisi. The installed capacity will be 108 MW and expected electricity output 510 GWh (implied load of 54%). The Project comprises a 13-metre weir/dam with settling basin, 2 km diversion pipe, 5 km underground headrace tunnel, underground powerhouse with three turbines, 36 MW each, and 1.6 km tailrace tunnel. In particular, infrastructure object will be located on the right slope of the river Tergi on 8 km length distance of the existing riv. Kuro and riv. Khdistskali. Low level dam construction is considered at the adjacent territory of Stepantsminda – 172 m a.s.l. Arrangement of power unit is planned 1.2 km away from State Border Check-point of Dariali – 1340-1360 m a.s.l. of the river. Below in the Table 1 is provided Darial HPP general project data.

**Table 1.** Darial HPP general project data

<b>Characteristics</b>	<b>Dimension Unit</b>	<b>Value</b>
Headrace level	m	1725
Tailrace level	m	1345
HPP calculating water flow	m <sup>3</sup> /sc	33.0
Calculating pressure (net)	m	370-380
HPP installed capacity	MW	108.0
50% of production	million kW/hour	510.0

HPP placement territory is 160 km away from Tbilisi, capital of Georgia. Georgia-Russian connecting motor way runs along the whole parameter of the project territory. According to design decision HPP is a diversion type without regulation, working on gravity. HPP facility includes: water intake, sedimentation diversion channel, tunnel entrance portal with spillway, diversion pipeline, surge shaft, underground pressure tunnel, dam underground building and open substation. Dariali HPP will be connected to power network via Dariali 110 kW power transmission line which connects Georgia and Russia power network (Stepantsminda–Vladikavkaz). Additionally, construction of new 220 or 500 kV transmission line construction is under consideration. The construction of the transmission line is a separate project and will be undertaken in accordance with the national permitting requirements (this includes requirement to develop a standalone ESIA). The development of the transmission line is not included as part of the activities financed by The European Bank for Reconstruction and Development (EBRD), FMO and the Green for Growth Fund, Southeast Europe. However, as this will be an associated facility, high level comment has been made to the extent possible in accordance with EBRD requirements (ESP, 2008). Dariali HPP project scheme is given on the Map 1 provided below.



**Map 1.** The scheme of the Dariali HPP Project

Dark red line – diversion tunnels, Light blue line – diversion pipeline, Black polygon – headwork's, Brown polygon – sedimentation basin, Orange line-flushing gallery and water spillway channel, Magenta hatched polygon – sites extracted from NP (#015, #016, #246), Green dashed line – border of the Kazbegi National park.

## **2. Purpose and Scope of the Dariali Hydropower BAP**

### **2.1 Goal and Objectives of the BAP**

The goal of the Dariali HPP BAP is to achieve no net biodiversity loss as a result of the Project by ensuring that the biodiversity is protected and enhanced where possible. The BAP has been developed in consultation with the biodiversity experts and confirms that appropriate measures are in place to be successfully implemented.

The Dariali HPP BAP is needed to ensure that the Project complies with international environmental requirements and best practice, including European Bank for Reconstruction and Development (EBRD) Environmental and Social Policy (2008), and the Equator Principles.

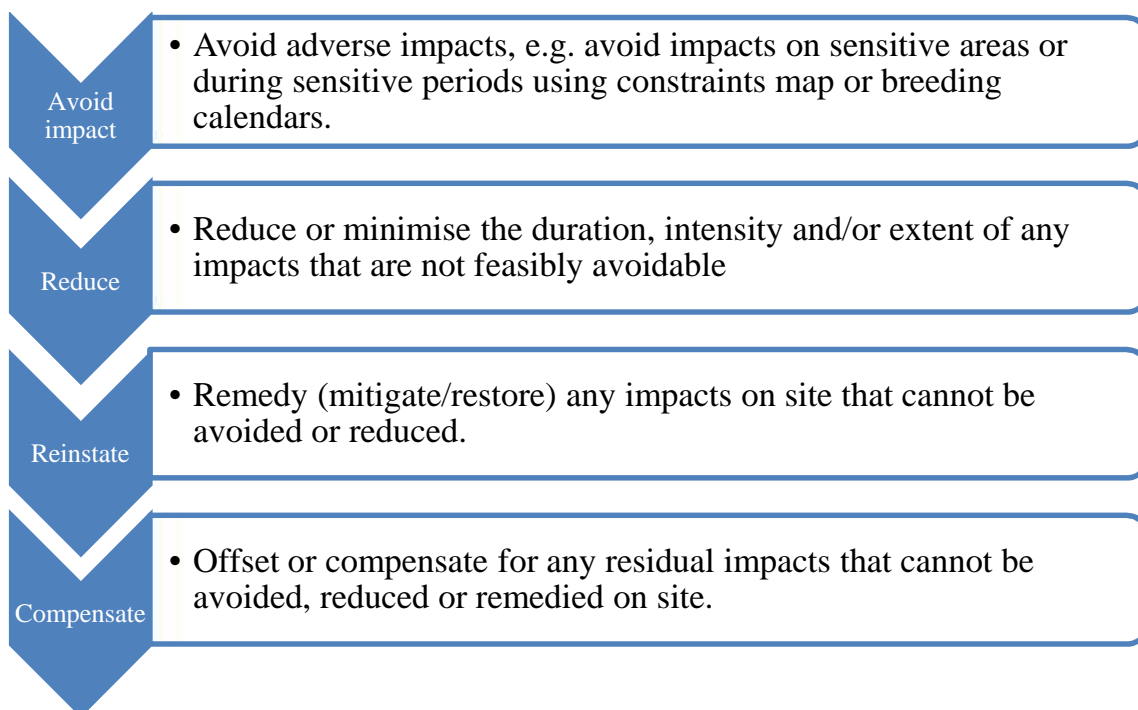
Georgia is a non-EU country but is a potential EU candidate country. Georgia's relations with the European Union are shaped via the EU Association Agreement. Consequently, Dariali HPP BAP has to take in due consideration commitments undertaken by Georgia in the framework of the Georgia-EU AA Action Plan and timing of its implementation.

The objectives of the Dariali HPP Project BAP is to:

- Establish a monitoring and evaluation program for biodiversity allowing for the success of the BAP interventions to be assessed;
- Introduce/ Implement the actions required by applicable docs (ESIA, ESAP);
- Monitoring/assess results of these actions;
- Identify inconsistencies, unexpected or significant residual impacts; and
- Develop/implement actions to improve situation and to close the related revealed gaps.

This BAP includes both long-term biodiversity conservation actions and on-site mitigation measures linked to the construction and operation activities of the Project. The biodiversity baseline, conservation actions and mitigation in this BAP supplement the information in the Dariali HPP ESIA, ESMP. Additional conservation opportunities/actions have been identified during the BAP process, following a comprehensive desktop review and results of Supplementary Reports (Dariali Hydropower Plant Project, Expert Advice on Terrestrial Biodiversity Conservation, Land Take and Compensation Report; Impact of Dariali HPP on Kazbegi National Park Traditional Use Zone).

The conservation objectives and actions in this BAP have been developed to ensure the systematic implementation of the mitigation hierarchy i.e. avoid, reduce (minimise), remedy (restore) and offset. The concept of the mitigation hierarchy is outlined in **Figure 1**. This will allow for the careful management of risk and the best possible outcomes for the project and local communities, without compromising the health, function and integrity of the ecological system. In addition to the actions linked to the mitigation hierarchy, this BAP includes Additional Conservation Actions (ACA), which are actions to enhance the biodiversity of the Study Area, irrespective of the developments taking place there.



## Figure 1. Mitigation hierarchy

The conservation actions have been established with the aim of achieving ‘no net loss’ or ‘a net gain’ to biodiversity in accordance with EBRD PR6. PR requires evidence that the mitigation hierarchy has been applied, that avoidance is prioritized, and that offsets are measurable and only applied as a last resort where residual impacts are unavoidable (PR 6 - *protect and conserve biodiversity; avoid, minimize and mitigate impacts on biodiversity and offset significant residual impacts, where appropriate, with the aim of achieving no net loss or a net gain of biodiversity*).

## 2.2 Study Area

Construction of the Dariali HPP is being implemented near Stepantsminda (Administrative center of Kazbegi Municipality), on the section between riv. Tergi, Stepantsminda borough and Georgian state border. Target territory of this plant covers the valley of riv. Tergi, - the right bank of the river Kurostskali at its inflow into the river Tergi and adjacent territory. A map of the construction region is shown in the Figure2.

Project Implementation Territories are located in Kazbegi District, which is situated in the north of the main watershed for the Central Greater Caucasus Mountains, in the valley of the Tergi River (42°48'N; 44°39'E) near the Russian border. The elevations of these mountains range between ~1,210 and 5,033 m (highest peak is Mt. Mkinvartsveri, or Kazbegi) with a mean elevation of 2850 m. The geology of Kazbegi District mainly contains the Palaeozoic shale of sediment rocks and Jurassic limestone and marl rocks. A great role in its geology is also played by igneous rocks. Soils of this area consist of Jurassic rocks, Palaeozoic and older granites, along with younger lava and moraine deposits. The main soils in the region are mountain-meadow. About 50 soil types have been described on the territory of Georgia and the following specific soil types are found at subalpine zones: 1) mountain-forest brown skeleton soils of middle and small depth; 2) mountain-forest light brown skeleton soils of middle and small depth; and 3) degraded forest and secondary meadow soils.

The main river of the district is Tergi with its right tributaries Snotskali (Gudushauris Aragvi), Esikomi, Armkhi, Arkhadoni, Bidara, Desikomidoni and Brolistskali (Khdistskali) and left tributaries Amali, Tifidoni, Chkheri, Chkhati, Suatisi, Mniastskali, Kesia, Resistskali, Kabakhi, Jimaristskali and Devdaraki. Three rivers are originated from glaciers on Mt. Mkinvartsveri: R. Chkheri – Ortsveri; R. Khdistskali – Kibishi; R. Devdaraki - Devdaraki. The climate of the Kazbegi district is conditioned by the rugged topography, vicinity of glaciers and high altitude. Along with the vertical zonality the air temperature and precipitation vary. The average annual temperature is 4.9 °C. January is the coldest month with an average temperature of –5.2 °C and the lowest temperature is –30 °C. The maximum average temperature of the warmest months (July and August) is about 14.4 °C (the highest temperature is 30 °C). The annual precipitation is 1,000-1,200 mm. During a year, one maximum precipitation is in May-June (100-200 mm) and one minimum in January (50-60 mm). Stable snow cover persists for 5–7 months from November to May and reaches its maximum depth (115–120 cm) in March. Fog is frequent in this zone (135 foggy days per year), especially in the summer. Winds of the mountain-gorge type prevail.

The following vegetation zones are represented in the region: middle-mountain (1,200–1,500 m a.s.l.), upper- mountain (1,500–1,750 m a.s.l.), subalpine (1,750–2,500 m a.s.l.), alpine (2,500–3,000 m a.s.l.), subnival (3,000–3,600 m a.s.l.), and nival (above 3600 m a.s.l.). Alpine rivers and the herbaceous vegetation in the Dariali Gorge is at the altitude up to 1200-1700 meters and subalpine birch forest (*Betula litwinowii*) is mainly represented on Mountains near this gorge by founded only on north-facing slopes till 2,550 m and subalpine shrubbery located on higher elevations 2,100-2,900 m with *Rhododendron caucasicum*, *Vaccinium myrtillus*, *Empetrum*

*caucasicum*, etc.. The secondary shrubbery and subalpine meadows are located in degraded birch forest areas on the same north slopes. The southern slopes of the rocky ridges are held by pine (*Pinus kochiana*) forest habitat. The rocky scrubs are mainly represented by juniper (*Juniper communis* var. *depressa*, *J. sabina*).

The Project is considered Category A under the EBRD respective policies. The Project includes the Dariali HPP and its associated infrastructure and corporate structures. The Study Area for this BAP is the Project site and the terrestrial Project's Area of Influence (the aquatic aspects are subject to another report).



**Figure 2.** Map of the Project Construction Region

### **3. Legal, Regulatory, Planning and Third Party Requirements**

#### **3.1 Legal and Regulatory Requirements**

This chapter describes the national and international legal framework of the Dariali HPP Project, including standards and policies applicable to the Project Biodiversity Action Plan.

##### **3.1.1 International Legislation and Policy**

The following international laws/agreements and conventions applicable to this Project related to nature conservation and biodiversity, have been ratified by Georgia:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1975; universal);
- Convention on Biological Diversity (CBD 1992; universal);
- European Union Habitats Directives (1992; regional);
- Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat--Ramsar Convention (1975; universal);



- Convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention; 1972; universal);
- United Nations Framework Convention on Climate Change (UNFCCC 1994; universal) and (Kyoto Protocol adopted 1997; universal);
- Convention on the conservation of European Wildlife and natural Habitats (the Bern Convention 1979);
- European Landscape Convention 2000;
- Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention, 1979);
- Agreement on the Conservation of Bats in Europe (EUROBATS) (1995);
- Agreement on the Conservation of African-Eurasian Migratory Water birds (1991).

### 3.1.2 European Union (EU) Legislation and Policy

Georgia is a non-EU country but is a potential EU candidate country. Georgia's relations with the European Union are shaped via the EU Association Agreement.

The Environmental Acquis comprises approximately 300 legal instruments, mostly in the form of Directives. The Acquis covers environmental protection, polluting and other activities, production processes, procedures and procedural rights as well as products. The key EU environmental directives making up the Acquis that are considered to be applicable to the Dariali HPP BAP are listed in Table 2 and are shown alongside the directly equivalent transposed Georgian legislation.

**Table 2.** EU Legislation Applicable to the Project

<b>EU Legislation</b>	<b>Georgian Legislation</b>
Council Directive 85/337/EEC (amended by 97/11/EC) on Environmental Impact Assessment (EIA)	Regulation on Environmental Impact Assessment was approved by the Order No. 59 of the Minister of Environment Law on Ecological Examination 2007 Law on Service of Environmental Protection 2007 Law on Environmental Impact Permit 2007 other laws, by-laws, statutory acts and regulations
Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (Natura 2000) – The Habitats Directive	Law on Protection of Environment (1996, amend 2000, 2003, 2007) Law on Wildlife (1997, amend. 2001, 2003, 2004)
Council Directive 78/659/EEC on the quality of fresh waters needing protection or improvement in order to support fish life	Law on System of Protected Areas (1996, amend.2003, 2004, 2005, 2006, 2007)
Council Directive 79/409/EEC on conservation of wild birds	Law on Red List and Red Book of Georgia 2006 Law on Status of Protected Areas, 2007 Biodiversity Protection Strategy and Action Plan, 2014 Red List, 2006 other laws, by-laws, statutory acts and regulations Georgia is a party to Convention on

	International Trade in Endangered Species (CITES), Ramsar and CBD.
Council Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy" or, in short, the EU Water Framework Directive	Law on Water 1997 Law on Environment Protection 1996 Law on Public Health 2007 Standard acts of the Ministry of Environment Protection and Natural Resources

### 3.1.3 National Legislative and Policy Framework

In Georgia, The Ministry of Environment and Natural Resources Protection (MoENRP) is responsible for regulating the natural environment. The MoEENRP participates in the development environmental state policy and implements all policies designed for the protection and conservation of the environment and for the sustainable use and management of Georgia's natural resources. This includes controlling activities that have a potential adverse impact on the environment and natural resources and issuing environmental licenses and permits.

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

Establishing and updating a National Biodiversity Strategy and Action Plan (2005) is an obligation under the Convention on Biological Diversity, which aims to protect biodiversity, to ensure the sustainable use of biological resources and habitat, and to enable fair access to benefits of biodiversity. 2<sup>nd</sup> National Biodiversity Strategy and Action Plan was adopted by the Government of Georgia in 2014 (decree 343, 14.05.2014). The Plan puts forward a set of national policies and plans to meet Georgia's responsibilities under the Convention, as well as providing a framework to coordinate priority conservation activities and to share information on biodiversity and key threats on the natural environment. The NBSAP sets strategic goals, national targets,, objectives and actions. The strategic goals of the NBSAP are the following:

**Strategic Goal A:** Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society;

**Strategic Goal B:** Reduce the direct pressures on biodiversity and promote sustainable use;

**Strategic Goal C:** Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity;

**Strategic Goal D:** Enhance the benefits to all from biodiversity and ecosystem services;

**Strategic Goal E:** Enhance implementation through participatory planning, knowledge management and capacity building.

The Project has considered these strategic goals and will help achieve this goals. Georgian environmental legislation is based on existing international concepts and criteria. The key pieces of legislation regarding biodiversity are:

- Law of Georgia on Protection of the Environment (Framework Law);
- Law of the General Rules for the Protection of Wild Plants and Animals;
- Law of Georgia on Protected Areas;
- Law of Georgia on Wildlife;
- Law of Georgia on Red List and Red Book;
- Forest Code of Georgia.

The **Law of Georgia on Protection of the Environment** regulates legal relationship between the bodies of the state authority and physical persons/legal entities in the scope of environmental protection and consumption of natural resources on all Georgian territory including its territorial waters, airspace, continental shelf and special economic zones.

The law concerns environmental education, environmental management, economic sanctions, licensing, standards, environmental impact assessment and related issues. The law considers various aspects of ecosystem protection, protected areas, global and regional environmental management, protection of the ozone layer, biodiversity and the Black Sea, as well as discussing international cooperation aspects.

The main goals of the law are promotion of biological diversity, conservation of the country-specific, rare, endemic and endangered species of flora and fauna, marine environmental protection and provision of ecological balance. Law defines "*biological diversity conservation principle*", meaning that an activity should not lead to irreversible degradation of biodiversity.

The **Law of the General Rules for the Protection of Wild Plants and Animals** defines general rules for wildlife and plant protection:

- To maintain self-reproduction of wild plant and animal resources and biodiversity conservation, their extraction from the environment is strictly limited and is a subject to licensing;
- Any activities that could damage wildlife, plants, habitats, reproduction areas and migration routes are prohibited;
- Endangered wild animals and plants are registered in the "Red List" and "Red Data Book" of Georgia; and
- Any kind of activity regarding wild animals and plants, registered in the "Red List" and "Red Data Book" of Georgia are prohibited, including: hunting, trade, catching, cutting, mowing, except in special cases, which decreases the plants and animals number, deteriorates their habitats and living conditions.

The **Law of Georgia on Protected Areas** gives a definition of protected areas (including national parks, reserves, State Preserves and multiple use areas) and sets frameworks of activities, permitted in those areas. Eligible activities are determined according to the area designation, territory legislation, specific provisions and protected area management plans, as well as in accordance with the requirements of international agreements and conventions signed by Georgia. It defines limits of the natural resource use within national parks and other protected areas. Generally, following activities are prohibited in the protected areas:

- To damage or modify natural ecosystems;
- To destroy natural resources due to use or other purposes;
- To seize, damage or disturb natural ecosystems and species;
- To pollute the environment;
- To introduce and multiply alien and exotic species of living organisms;
- To import into the territory explosive or poisonous materials.

The **Law of Georgia on Wildlife** provides protection and restoration of the wildlife and its habitats, conservation of species diversity and genetic resources, sustainability and creating conditions for sustainable development, taking into account interests of future generations; legislative provision of the state regulation, regarding animal protection and animal wildlife use.

The **Law of Georgia on Red List and Red Book (2003)** regulates the Red List of Georgia and Red Book of Georgia, in relation to endangered species protection and their use, with the

exception of issues related to aspects of international trade in endangered animals and plants. There are 137 species protected under the Laws in Georgia. Together with species protected by international conventions, the number increases to 200. Most of these are listed in the International Red List (Red Data List of IUCN), Red List of Georgia and in the Conventions' appendices.

The **Forest Code of Georgia (1999)** regulations relate to functions and use of forest, including protection, management of water catchment basin, wood production, etc. It allows for private ownership of forest and commercial woodcutting. According to the law, the Forest Department of Georgia does not undertake commercial woodcutting itself, but controls and manages these operations by granting this function to private enterprises. However, the Forest Department carries responsibility for maintenance woodcutting and forest management. According to the Code, the Ministry of Environment Protection and Natural Resources delegated to the Department a right to issue woodcutting licenses. The Forest Code sets categories of protected forests, including those regulating soil and catchment basins, riparian and sub-alpine forest zones, floristic species of the Red List, etc. The Forest Code is a framework law and requires execution of detailed regulations.

At present Georgia has no **Fisheries Law**. Recently the Ministry of Agriculture (MoA) started to prepare a new law on fisheries for Georgia. Governmental approval of this law is expected to take place in coming years, after which a number of regulations under the law will still need to be produced.

In addition to these, the **Law of Georgia on Environmental Impact Permit (2007)** gives a complete list of activities subject to ecological examination (Article 4, Chapter II) and defines environmental examination through the EIA process as an obligatory step for obtaining authorization for implementation of the planned development. This includes development of a hydroelectric power station with 2 MW or higher installed capacity. The legislation sets out the legal basis for issuance of environmental permits, including implementation of an ecological examination, public consultations and community involvement in the processes. According to the Law, the environmental permit is the key procedure for implementation of an activity on the territory of Georgia. The permit takes ecological, social and economic interests of the public and the state into consideration in order to protect human health and natural and cultural assets and heritage.

## **3.2 Third Party Requirements**

The project related Lender Policies and Standards are given in section below.

### **3.2.1 European Bank for Reconstruction and Development (EBRD) Standards**

Under the EBRD Environmental and Social Policy (ESP) (EBRD, 2008), projects are categorized as A / B / C / FI, based on environmental and social criteria to: (i) reflect the level of potential environmental and social impacts and issues associated with the proposed Project; and (ii) determine the nature and level of environmental and social investigations, information disclosure and stakeholder engagement required for each project, taking into account the nature, location, sensitivity and scale of the Project, and the nature and magnitude of its possible environmental and social impacts and issues.

The categorization of each project depends on the nature and extent of any actual or potential adverse environmental or social impacts, as determined by the specifics of its design, operation and location. EBRD lists the criteria by which a project is classified as a Category A project. This

includes projects which involve large dams and other impoundments designed for the holding back or permanent storage of water and the construction of high-voltage overhead electrical power lines, both of which are features of this Project and consequently it is classified as Category A.

EBRD has adopted a comprehensive set of specific Performance Requirements (“PRs”) that projects are expected to meet, covering a range of key areas of environmental and social impacts and other issues and actions involved in the project development and operation. The policies applied to the project is set out in an Environmental and Social Action Plan (ESAP) that has been included as part of the Environmental and Social Impact Assessment and in the project loan documentation. Furthermore, EBRD is committed to promoting EU environmental standards as well as the European Principles for the Environment (EPE), which are reflected in the PRs.

The PR6 “Biodiversity Conservation and Sustainable Management of Living Natural Resource” is the relevant requirement for this BAP. PR6 applies to projects in all types of habitats, irrespective of whether they have been disturbed or degraded previously, or whether or not they are protected or subject to management plans.

The objectives of PR6 are:

- to protect and conserve biodiversity;
- to avoid, minimize and mitigate impacts on biodiversity and offset significant residual impacts, where appropriate, with the aim of achieving no net loss or a net gain of biodiversity;
- to promote the sustainable management and use of natural resources;
- to provide for fair and equitable sharing of the benefits from project development and arising out of the utilization of genetic resources;
- to strengthen companies’ license to operate, reputation and competitive advantage through best practice management of biodiversity as a business risk and opportunity;
- to foster the development of pro-biodiversity business that offers alternative livelihoods in place of unsustainable exploitation of the natural environment.

## **4. Biodiversity Baseline**

### **4.1 General Approach and Methodology**

#### **4.1.1 Desktop Study**

A detailed desk-based review of available information from the following source documents was undertaken:

- Dariali Hydropower Plant ESIA;
- Dariali Hydropower Plant Project, Expert Advice on Terrestrial Biodiversity Conservation, Land Take and Compensation Report;
- Impact of Dariali HPP on Kazbegi National Park Traditional Use Zone;
- International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species (<http://www.iucnredlist.org>);
- The Red List of Georgia ([http://chm.moe.gov.ge/index.php?page=red\\_list&lng=en\\_#](http://chm.moe.gov.ge/index.php?page=red_list&lng=en_#));
- Fauna and Flora International (FFI) conservation programmes- Georgian carnivore conservation ([www.fauna-flora.org](http://www.fauna-flora.org));
- Birdlife International Data Zone (<http://www.birdlife.org/datazone/home>).

Information on the following nature conservation areas (existing or proposed) within or near the Study Area has also been collected and reviewed:

- Nationally protected areas in Georgia:
  - Strict Nature Reserves;
  - National Parks;
  - Managed Nature Reserves;
  - Natural Monuments;
  - Protected Landscapes; and
  - Multiple Use Area.

## **4.1.2 Field Surveys**

### **4.1.2.1 Overview**

A field survey was carried out in 2010-2011 by Gamma and Stucky Caucasus. Particularly, Ecological surveys of areas of specific interest and areas sensitive to potential disturbance within the Study Area were undertaken between July and September 2010-2011 (Gamma, 2010, 2011) and included:

- Flora and vegetation surveys;
- Birds surveys;
- Mammal surveys (including bats);
- Reptile and amphibian surveys;

The following additional surveys were carried out in 2013, 2014:

- Impact of Dariali HPP on Kazbegi National Park Traditional Use Zone;
- Dariali Hydropower Plant Project, Expert Advice on Terrestrial Biodiversity Conservation, Land Take and Compensation Report;
- Botanical and habitat surveys and as part of the Ksani-Stepantsminda Interconnection 500 kV (Kazbegi transmission line) routing study.

A routing study has been undertaken to inform the new 500 kV transmission line which is to be developed as a separate project, but reference to it here has been included because it is associated with the Dariali HPP Project. The proposed electricity transmission line is 112 km long, but only the western most ~16 km fall within the Tergi basin. As mentioned previously in this document, the Transmission Line works are not part of this BAP or construction program, but may be considered in full at a different time.

A brief summary of the methodology for each ecological feature is provided below. A full description of the methodologies and results of these surveys can be found in the Dariali HPP ESIA, respective Supplementary Reports (Expert Advice on Terrestrial Biodiversity Conservation, Land Take and Compensation Report; Impact of Dariali HPP on Kazbegi National Park Traditional Use Zone) and Ksani-Stepantsminda Interconnection 500 kV (Kazbegi Transmission Line) Routing Study (GSE, 2014).

### **4.1.2.2 Vegetation and Floristic Surveys**

Description of the habitats and an inventory of the floristic diversity within the areas of the Project were undertaken in July-August 2010-2011 (Gamma, 2010,2011). This included the identification of plant species listed in the Red Data List of Georgia. Lists of protected, threatened, rare and endemic plant species, plant communities and habitats were recorded by qualified botanists for the Dariali HPP Project impact zone in the context of Expert Advice on Terrestrial Biodiversity Conservation, Land Take and Compensation Report (August September

2013) and Impact of Dariali HPP on Kazbegi National Park Traditional Use Zone Report (May 2013) as well as during the walkover for the electricity transmission line undertaken in July-August 2014. In addition, a botanical surveys of the construction sites on the Dariali HPP Project impact area was undertaken in July, October 2014 to inform the BAP.

During the floral surveys habitat classification was prepared in 2013 for the areas under the footprint of the Project and for the entire route corridor (1 km wide) of the associated electricity transmission line project. The habitat areas to be affected by the Project have been assessed and Project of impacts have been identified on sensitive habitats.

#### 4.1.2.2.1 Methodological Approach

During the detailed Botanical Survey vegetation occurrence/coverage was assessed according to Drude's 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%; Cop<sup>3</sup> (coptosal) – an abundant species, frequency of occurrence/coverage 70-90%; Cop<sup>2</sup> – a species is represented by numerous individuals, frequency of occurrence/coverage 50-70%; Cop<sup>1</sup> – frequency of occurrence/coverage 50-70%; Sp<sup>3</sup> (sporsal) – frequency of occurrence/coverage about 30%; Sp<sup>2</sup> (sporsal) – frequency of occurrence/coverage about 20%; Sp<sup>1</sup> (sporsal) – frequency of occurrence/coverage about 10%; Sol (solitarie) – scanty individuals, frequency of occurrence/coverage about to 10%; Un (unicum) – a single individual.

#### 4.1.2.3 Terrestrial Fauna Survey

Lists of protected, fauna species, and habitats were recorded by qualified zoologists/ornitologists for the Dariali HPP Project impact zone in the following documents: Expert Advice on Terrestrial Biodiversity Conservation, Land Take and Compensation Report (August September 2013) and Impact of Dariali HPP on Kazbegi National Park Traditional Use Zone Report (May 2013) as well as during the monitoring visits of the electricity transmission line corridor and nearby territory in July-August 2014. Besides a zoological/ornitological surveys of the Dariali HPP Project impact area was undertaken in July, October 2014 to obtain information for the BAP.

The general principle for species selection for the analysis is that construction, operation and maintenance of the Dariali Hydropower Plant should not lead to the harm to animals that occur in Georgia, especially, to the endangered species, in this regard each species, considered in the report, had more or less strong arguments for the inclusion in the list for consideration. Thus, all species, included in the list for consideration in this report, are reviewed as the species that could be impacted by the Project.

#### 4.1.2.3.1 Methodological Approach

**Birds:** For the impact assessment only breeding bird species are of interest. Migrating species and occasional visitors have enough space to avoid negative effect of the construction and operation of the hydropower plant, if any. Number of birds breeding within the study area (impact area, sites extracted from National park and sites devoted to compensation) is quite limited.

**Methods of observation.** Direct visual observations from high located watching points and land-based survey with using binoculars (magnitude up to 12x). All records should be documented with details of observation (dates, time, location of watching site, weather conditions, number of observed individuals and flocks, age, if possible, of observed birds, distance from observers,

directions and height of flight, etc.). Especially attention should be paid to find nests of large birds of prey, which are nesting in proximity of the construction sites.

**Methods:** a) The methods of "point transects", generally used for counts of all bird species during the breeding seasons on large territories (Svensson, 1974, 1979; International Bird Census Committee, 1969; Holmberg, 1979); b) The specific survey methods are recommended for local Georgian conditions in order to find the Caucasian Black Grouse and Caucasian Snowcock (Kutubidze, 1974).

**Mammals: Methods of observation.** For **Small Mammals** - Registration of signs of activity within the corridor of the Project area - combination of the various methods: burrow count on transects, registration of footprints and droppings, visual counts during survey on foot etc. For **Large mammals** - Registration of signs of activity within the Study area (footprints, droppings, direct visual counts from high watching points) should be done in a combination of various methods of census of large mammals - tracking on transects, direct visual counts from high watching points, ground counting by team on foot, as well as indirect methods, e.g. dung counting (Krebs, Ch., 2006; Sutherland, W., 2006; Thompson, W., White, G., Gowan, Ch., 1998).

**Reptile & Amphibians. Methods of observation.** Foot-survey along the banks of the river Tergi and its tributaries within the impact zone and on sites of the Kazbegi National Park (extracted and compensation sites); direct visual observations and count of the adult animals.

## 4.2 Protected and Nature Conservation Areas

There are several nature conservation areas within or adjacent to the Study Area. Kazbegi National Park (KNP) 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>). Further information and an assessment of the likely impacts are provided in the Sensitive Habitat chapter below.

### 4.2.1 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.

#### **4.2.2 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.

#### 4.2.3 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 m<sup>2</sup> at the beginning of the pipeline route immediately below the weir/dam;
2. Plot No 16 with an area of 17,322 m<sup>2</sup> which is one km away from the weir/dam site;
3. Plot 246 with an area of 37,637 m<sup>2</sup> 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.

### 4.3 Habitats

#### 4.3.1 Overview

A detailed description of the habitats in the study area is provided in the Flora and Vegetation Report Dariali HPP ESIA (2011), Expert Advice on Terrestrial Biodiversity Conservation, Land Take and Compensation Report (August-September 2013) and Impact of Dariali HPP on Kazbegi National Park Traditional Use Zone Report (May 2013). A summary of the main habitats within the Project Study Area is provided below.

Vegetation is mainly represented by habitats of subalpine birch forest and alpine meadows. In the Dariali Gorge at the altitude up to 1200-1700 meters the southern slopes of the rocky ridges are held by pine (*Pinus kochiana*) forest habitat. The rocky scrubs are mainly represented by juniper (*Juniper depressa*, *J. Sabina*).

The vegetation in Kazbegi District is represented by the following habitats (sensitive habitats are marked with asterisk [\*]):

1. 3220 Alpine rivers and the herbaceous vegetation along their banks
2. 4060 Alpine and boreal heaths
3. 50GE1 mountain xerophytic scrubs
4. 50GE3 Tragacanthic scrub

5. 61GE01 Sub-alpine high herbaceous vegetation
6. 61GE02 Sub-alpine meadows
7. 6150 Siliceous alpine and boreal grasslands
8. 62GE04 Vegetation of urban and rural areas
9. 62GE05 Vegetation of pastures
10. 70GE02\* Low grass marshes
11. 8110 Siliceous scree of the montane to snow levels
12. 8220 Siliceous rocky slopes with chasmophytic vegetation
13. 8310\* Caves
14. 8340\* Rock and true glaciers
15. 91PK-GE Caucasian Pine forest (*Pinus kochiana*)
16. 9BF-GE\* Subalpine birch krummholz (*Betula litwinowii*)

The Project Corridor is covered with subalpine and alpine meadows. The subalpine meadows are represented by the following sub-types of habitat (Code 61GE02-01):

1. Grass meadows (Bromopsieto) with the dominant species: *Bromopsis variegata*, *Agrostis tenuis*, *A. planifolia*. This community holds both dry and moist habitats. Appropriate species of the community are *Trifolium ambiguum*, *Lotus caucasicus*, *Alchemilla sericata*, etc. It is distributed up to the altitude of 2700 meters a.s.l. It is used for mowing.
2. *Agrostieta* meadows with the dominant species – *Agrostis tenuis*, *A. planifolia*. This community holds moist river banks.
3. *Festuca ovina* meadows which hold the southern slope. Characteristic species are: *Koeleria albovii*, *Bromopsis riparia*, *Agrostis tenuis*, *Carex buschiorum*, *Pulsatilla violacea*, *Thymus collinus*.
4. Fescue-grass (*Festuca varia*) contains many grass and herbaceous species and represents the grass forbs community.

**The sub-types of alpine meadow habitats (Code 6150-01):**

- Festuceta ovinae
- Festuceta supinae
- Nardeta strictae
- Festuceta supinae + *Carex meinshauseniana*
- Kobresieta humilis

**6150-02. Alpine snowbed (Code 6150-02)**

Alpine snowbeds can be found in plain places between large stone sand moraines at the upper border of the alpine zone, where snow melt is late and vegetation is late. It consists of the following grasses: *Poa alpina*, *Phleum alpinum*, *Festuca supina*, etc. and herbaceous species: *Campanula biebersteiniana*, *Carum caucasicum*, *Veronica gentianoides*, *Gnaphalium supinum*, *Pedicularis crassirostris*, *P. armena*, *Poa alpina*, *Taraxacum stevenii*, *Sibbaldi asemiglabra*, etc.

**4.3.2 Main Habitats and Plant Communities**

The main habitats on the Project schemes a of the Study Area are briefly presented below, that includes the main habitats characteristics along with the conservation value.

The detailed botanical studies and habitat assessments were carried out in the river Tergi canyon within the borders of the Project Corridor. The expected negative impact on the botanical receptors caused by construction and operation of the Dariali HPP in the Project Corridor and adjacent areas has been revealed. The plant communities and species of various conservation value spread in the project impacted area have been identified (attributed to the Red List,

endemic, rare). The detailed descriptions of phytocoenosis developed in the Project Corridor are given below.

During the Botanical Survey vegetation occurrence/coverage was assessed according to Drude's 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%; Cop<sup>3</sup> (coptosal) – an abundant species, frequency of occurrence/coverage 70-90%; Cop<sup>2</sup> – a species is represented by numerous individuals, frequency of occurrence/coverage 50-70%; Cop<sup>1</sup> – frequency of occurrence/coverage 50-70%; Sp<sup>3</sup> (sporsal) – frequency of occurrence/coverage about 30%; Sp<sup>2</sup> (sporsal) – frequency of occurrence/coverage about 20%; Sp<sup>1</sup> (sporsal) – frequency of occurrence/coverage about 10%; Sol (solitarie) – scanty individuals, frequency of occurrence/coverage about to 10%; Un (unicum) – a single individual.

**Site N1.** GPS coordinates N42°66'72.3''/E 44°64'54.7'', 1725 m a.s.l. Exposition northwest, slope inclination 5-35°. The right bank of the river Kurostskali at its inflow into the river Tergi. The designed place for construction of watershed facilities. Weathered detritus, erosive relief. The following species of plants are growing sparsely: *Oxytropis cyanea*, *Cerastium* sp., *Festuca varia*, *Moehringia trinervia*, *Pyrethrum* sp., *Tussilago farfara*, *Taraxacum officinale*, *Trifolium spadiceum*, *Artemisia absinthium*, *Senecio sosnovskyi*. Sparse are sea-buckthorn (*Hippophae rhamnoides*) species. The habitat of low conservation value. (This site was located in the zone of traditional use of Kazbegi National Park, which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 1 on the Map: Cadastre Dariali Energy).



**Site 1.** Erosive relief



**Site 1.** *Oxytropis cyanea*



**Site 1.** *Taraxacum officinale*

**Site N2.** GPS coordinates N42°66'88.0''/E 44°64'57.8'', 1572 m a.s.l. Exposition northwest, slope -5-10°. Grass forbs meadow-pasture (degraded). The habitat is of low conservation value. (This site located in the zone of traditional use of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 1 on the Map: Cadastre Dariali Energy).

Alchemilla sp.-Cop<sup>3</sup>  
 Carum carvi- Cop<sup>2</sup>  
 Trifolium ambiguum- Cop<sup>1</sup>  
 Taraxacum officinale-Sp<sup>3</sup>  
 Plantago lanceolata- Sp<sup>2</sup>  
 Agrostis planifolia- Sp<sup>2</sup>  
 Minuartia sp.- Sp<sup>1</sup>  
 Cirsium caucasicum-Sol  
 Juniperus depressa-Unic



**Site 2.** *Taraxacum officinale*



**Site 2.** *Cirsium caucasicum*



**Site 2.** Grass forbs meadow-pasture (degraded)

**Site N3.** GPS coordinates N42°67'04.2''/E 44°64'76.5'', 1702 m a.s.l. Represented with the same type of vegetation – the degraded pasture with stripes of sea-buckthorn (*Hippophae rhamnoides*), barberry (*Berberis* sp.), sweet briar (*Rosa canina*) scrub, goat willow, (*Salix caprea*) in ravines. The height of sea-buckthorn attains to 2.5 m, of barberry – 1,5 m, briar – 2 m, goat willow – 4-6 m. This is the habitat of low conservation value. (This site located in the zone of traditional use of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 1 on the Map: Cadastre Dariali Energy).



**Site 3.** Degraded pasture with scrubs



**Site 3.** *Rosa canina*



**Site 3.** *Berberis vulgaris*



**Site 3.** Sea-buckthorn (*Hippophae rhamnoides*)



**Site 3.** Goat willow (*Salix caprea*)



**Site 3.** Pasture

**Site N4.** GPS coordinates N42°40'29.9"/E 44°38'55.1", 1725 m a.s.l. southwest exposition. Slope inclination- 20-25°. This territory is occupied with sea-buckthorn (*Hippophae rhamnoides*) shrubbery. The coverage of vegetation is 60%. The sea-buckthorn height attains to 2 m., the herbaceous vegetation is represented by the following species: *Galium album*, *Artemisia absinthium*, *Cirsium caucasicum*, *Urtica dioica*. The habitat is of low conservation value. (This site located in the zone of traditional use of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 1 on the Map: Cadastre Dariali Energy).



**Site 4.** Sea-buckthorn shrubbery (*Hippopha rhamnoides*)



**Site 4.** Sea-buckthorn shrubbery (*Hippopha rhamnoides*)



**Site 4.** Sea-buckthorn shrubbery (*Hippopha rhamnoides*)

**Site N5.** GPS coordinates N42°40'21.6"/E 44°39'00.0", 1740 m a.s.l., southwest exposition. Slope inclination - 5°. This site represents the grass forbs meadow degraded from grazing. The habitat is of low conservation value. (This site located in the zone of traditional use of Kazbegi National Park, which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 1 on the Map: Cadastre Dariali Energy). The vegetation coverage is 80%, phytocenosis height – 5 cm. Below is provided species cover-abundance by Drude scale:

Festuca varia-Cop<sup>3</sup>  
 Plantago lanceolata- Cop<sup>3</sup>  
 Cirsium caucasicum-Cop<sup>2</sup>  
 Cerastium arvense-Cop<sup>1</sup>  
 Oxytropis cyanea-Cop<sup>2</sup>  
 Euphorbia iberica-Sparsus  
 Taraxacum officinale-Cop<sup>1</sup>  
 Potentilla sp.-Sparsus  
 Macrotomia echioides-Sol

Around the described plot is developed shrubbery of sea-buckthorn, barberry, juniper (*Hippopha rhamnoides*, *Berberis vulgaris*, *Juniperus depressa*).



**Site 5.** Overgrazed grass forbs degraded meadow with the sea-buckthorn shrubbery in the background



**Site 5.** Overgrazed grass forbs degraded meadow with shrubbery of the sea-buckthorn, barberry and juniper in the foreground



**Site 5.** Overgrazed grass forbs degraded meadow with the shrubbery of sea-buckthorn, barberry and juniper in the foreground



**Site 5.** Juniper *Juniperus depressa*



**Site 5.** Penstock site

**Site N6.** GPS coordinates N42°67'18.3''/E 44°64'80.3'', 1705 m a.s.l. Exposition – west, slope inclination -10-15°. Sea-buckthorn (*Hippopha rhamnoides*) shrubbery with admixed barberry (*Berberis vulgaris*), sweet briar (*Rosa canina*), blackberry and juniper (*Juniperus depressa*). The juniper height is 0.5 m. The habitat is of medium conservation value.





**Site 6.** Juniper (*Juniperus depressa*)



**Site 6.** Sea-buckthorn shrubbery (*Hippopha rhamnoides*)

**Site N7.** GPS coordinates N42°67'78.9"/E 44°64'75.0", 1674 m a.s.l. Exposition – west. Slope inclination - 20-25°. In the degraded grass forbs meadow the sea-buckthorn scrub is growing in kind of islets (like the previous site). The habitat is of medium conservation value.



**Site 7.** Sea-buckthorn scrubberies in degraded grass forb meadow



**Site 7.** Sea-buckthorn shrubbery (*Hippopha rhamnoides*)

**Site N8.** GPS coordinates N42°68'04.7"/E 44°64'69.5", 1663 m a.s.l. Sparse juniper shrubbery (*Juniperus depressa*). Slope inclination - 0°. Juniper height attains to – 0.5 m. With admixed young sea-buckthorn (*Hippopha rhamnoides*) growth. The habitat is of medium conservation value. (This site is located in the zone of traditional use of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the Map: Cadastre Dariali Energy).



**Site 8.** Juniper shrubbery (*Juniperus depressa*)



**Site 8.** Juniper shrubbery (*Juniperus depressa*)

**Site N9.** GPS coordinates N42°68'16.6"/E 44°64'68.4", 1662 m a.s.l. Sea-buckthorn shrubbery with admixed goat willow. Exposition – northwest. Slope inclination -5°. Sea-buckthorn height – 2.5m, goat willow height -4-5m. Isolated species of birch (*Betula litwinowii*) with the height 5m. On the adjacent bank *Cirsium* sp., *Artemisia absinthium*, *Echinops sphaerocephalus* are growing. The habitat is of medium conservation value. (This site located in the zone of traditional use of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the Map: Cadastre Dariali Energy).



**Site 9.** Sea-buckthorn shrubbery with admixed goat willow and birch



**Site 9.** Sea-buckthorn shrubbery with admixed goat willow and birch



**Site 9.** *Echinops sphaerocephalus*

**Site N10.** GPS coordinates N42°68'42.4''/E 44°64'46.7'', 1621m a.s.l. Juniper shrubbery (*Juniperus sabina*). Exposition - southwest, slope 10-15°. Juniper height from 40-50 cm to -1 meter. With admix sweet briar (*Rosa canina*), sea-buckthorn (*Hippopha rhamnoides*), rock-red currant (*Ribes biebersteinii*). The habitat is of medium conservation value. (This site located in the zone of traditional use of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the Map: Cadastre Dariali Energy).



**Site 10.** Juniper (*Juniperus sabina*)



**Site 10.** Juniper (*Juniperus sabina*)

**Site N11.** GPS coordinates N42°40'15.5''/E 44°39'03.7'', 1757 m a.s.l. Northwest exposition. Slope inclination-5-15°. The habitat is of medium conservation value. This site is represented with overgrazed grass forbs meadow. Coverage of vegetation-90%. Phytocenosis height – 40 cm. Below is provided species cover-abundance by Drude scale. Symbols of Drude's scale indicate frequency of occurrence/coverage of a species. (This site located in the zone of traditional use of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the Map: Cadastre Dariali Energy).

Festuca varia-Cop<sup>3</sup>  
 Alchemilla caucasica-Cop<sup>3</sup>  
 Carum meifolium-Cop<sup>3</sup>  
 Taraxacum officinale-Cop<sup>1</sup>  
 Plantago saxatilis- Cop<sup>1</sup>  
 Potentilla crantzii-Cop<sup>2</sup>  
 Gentiana nivalis-Sparsus  
 Polygala alpicola-Sparsus  
 Pulsatilla violacea-Sparsus  
 Thymus sp.-Sparsus  
 Trifolium ambiguum-Cop<sup>2</sup>  
 Oxytropis cyanea-Sparsus  
 Coronilla balansae-Cop<sup>2</sup>  
 Euphorbia iberica -Sparsus  
 Ranunculus oreophyllus-Cop<sup>1</sup>  
 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*.



Site 11. Grass forbs meadow



Site 11. Grass forbs meadow



Site 11. *Pulsatilla violacea*



Site 11. *Primula algida*



Site 11. *Pulsatilla violacea*



Site 11. *Pulsatilla violacea*

**Site N12.** GPS coordinates N42<sup>0</sup>40'32.4''/E 44<sup>0</sup>38'55.7'', 1724 m a.s.l. Southwest exposition. Slope inclination-5-20<sup>0</sup>.The habitat of medium conservation value. On this site is developed overgrazed grass forbs degraded meadow. Coverage of vegetation is 90%. Phytocenosis height – 5 cm. Below is provided species cover-abundance by Drude scale. (This site located in the zone of traditional use of Kazbegi National Park which was excluded from the Kazbegi protected territory before the beginning of construction of Dariali hydropower plant, Fig. N 2 on the Map: Caaastre Dariali Energy).

Festuca ovina-Cop<sup>3</sup>  
 Plantago saxatilis- Cop<sup>2</sup>  
 Potentilla crantzii-Sparsus  
 Pulsatilla violacea-Sparsus  
 Cerastium arvense-Sparsus  
 Androsace barbata-Sol  
 Linaria meyeri-Sol

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



**Site 12.** *Juniperus depressa*



**Site 12.** *Androsace barbata*



**Site 12.** *Berberis vulgaris*



**Site 12.** *Linaria meyeri*



**Site 12.** *Berberis vulgaris*



**Site 12.** *Androsace barbulata*



**Site 12.** *Pulsatilla violacea* aspect



**Site 12.** *Pulsatilla violacea* aspect

**Site N13.** GPS coordinates N42<sup>0</sup>40'25.0''/E 44<sup>0</sup>38'53.8'', 1719 m a.s.l. The northwest exposition, Slope inclination -10-15<sup>0</sup>. The habitat of low conservation value. The territory is represented by sea-buckthorn shrubbery with admixed goat willow (*Salix caprea*), juniper (*Juniperus depressa*) and barberry (*Berberis vulgaris*). The sea-buckthorn height is 2.5 m, the goat willow height is 3 m, barberry height – 1.5 m, juniper – 1 m. Coverage of vegetation is 50%. (This site located in the zone of traditional use of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the Map: Cadastre Dariali Energy).



**Site 13.** Sea-buckthorn shrubbery with admixed goat willow, juniper and barberry



**Site 13.** Sea-buckthorn shrubbery with admixed goat willow, juniper and barberry



**Site 13.** Sea-buckthorn shrubbery with admixed goat willow, juniper and barberry

**Site N14.** Kazbegi District. Slope inclination-30°. Southern exposition, foliated detritus.

*Festuca varia*+*Thymus nummularius*

Total coverage 90%. 3 layers: I – 40 cm, 20%. II – 25 cm, 45%. III – 10 cm, 60%. Aspect –pink *Thymus nummularius*, yellow *Leontodon hispidus* and blue *Campanula collina* flowers in the greyish-green background. Topologically associated with *Festuca varia*+*Alopecurus glacialis*. The habitat is of medium conservation value. (This site located in the zone of traditional use of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).

*Festuca varia*- Cop<sup>2</sup>

*Thymus nummularius*- Cop<sup>2</sup>

*Agrostis planifolia*- Sp<sup>3</sup>

*Zerna variegata*- Sp<sup>2</sup>

*Festuca rubra*- Sp<sup>2</sup>

*Helictotrichon asiaticus*- Sp<sup>1</sup>

*Anthoxanthum odoratum*- Sp<sup>1</sup>

*Campanula collina*- Sp<sup>2</sup>

*Vicia purpurea*- Sp<sup>1</sup>

*Poa caucasica*- Sp<sup>1</sup>

Leontodon hispidus- Sp<sup>1</sup>  
 Ranunculus oreophilus- Sp<sup>1</sup>  
 Euphrasia ambliodonta- Sp<sup>1</sup>  
 Centaurea fischeri- Sol  
 Polygonum carneum- Sol  
 Alopecurus glacialis- Sol  
 Silene ruprechtii- Sol  
 Trifolium ambiguum- Sol  
 Carex meinshauseniana- Sol  
 Luzula spicata- Sol  
 Alchemilla pycnotricha-Sol  
 Gentiana caucasica- Sol  
 Poa alpina - Sol  
 Alectorolophus minor- Sol  
 Sedum involucreatum- Sol  
 Campanula aucheri- Sol  
 Sparsely moss.

**Site N15.** GPS coordinates N42<sup>0</sup>68'45.9''/E 44<sup>0</sup>64'47.2'', 1612 m a.s.l. Exposition – southwest. Slope inclination - 70-80<sup>0</sup>. Rock complex. *Juniperus sabina*, *Juniperus depressa*, with admixed *Spiraea hypericifolia*. Herbaceous plants are represented by: *Minuartia brotheriana*, *Saxifraga cartilaginea*, *Sedum caucasicum*, *Sempervivum caucasicum*, *Asplenium septentrionale*, *Saxifraga juniperifolia*. The habitat is of high conservation value.



Site 15. Rock complex with *Juniperus sabina*



Site 15. Rock complex with *Juniperus depressa*



Site 15. *Minuartia brotheriana*



Site 15. *Sempervivum caucasicum*





**Site 15.** Limewort



**Site 15.** *Saxifraga cartilaginea*



**Site 15.** *Saxifraga juniperifolia*

**Site N16.** GPS coordinates N42°68'45.9''/E 44°64'47.2'', 1612 m a.s.l. Meadowsweet (*Spiraea hypericifolia*) on the rock. Slope inclination -70-80-90°, exposition – southwest. With admixed *Ephedra procera*. Herbaceous vegetation is represented by chasmophytes: *Minuartia brotheriana*, *Saxifraga juniperifolia*, *Draba brioides*. The habitat is of high conservation value.



**Site 16.** Meadowsweet (*Spiraea hypericifolia*)



**Site 16.** *Ephedra procera*

**Site N17.** GPS coordinates N42°68'57.4''/E 44°64'34.1'', 1585m a.s.l. On the rock (slope inclination - 80-90°) are developed juniper shrubbery with admixed meadowsweet - *Spiraea hypericifolia*, *Ephedra procera*. Below, on the right bank terrace of the river are developed sea-buckthorn shrubbery. Iberian Aster (*Aster ibericus*) flowers in autumn. The habitat is of medium conservation value.



**Site 17.** “Rock legs”



**Site 17.** Sea-buckthorn shrubbery



**Site 17.** *Aster ibericus*



**Site 17.** *Ephedra procera*



**Site 17.** *Saxifraga juniperifolia*

**Site N18.** GPS coordinates N42<sup>0</sup>72'88.0''/E 44<sup>0</sup>62'93.1'', 1400 m a.s.l. Exposition – west, slope inclination-30-35<sup>0</sup>. The height of herblayer is -40 cm. The grass forbs meadow Festucetum-mixtoherbosa. The habitat is of low conservation value. (This site located in the zone of traditional use of Kazbegi National Park, which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the Map: Cadastre Dariali Energy).

*Festuca varia*-Cop<sup>2</sup>

*Phleum alpinum*- Cop<sup>2</sup>

*Agrostis planifolia*- Cop<sup>1</sup>

Potentilla cranzii- Sp<sup>3</sup>  
 Galium verum- Sp<sup>3</sup>  
 Thymus sp.- Sp<sup>2</sup>  
 Coronilla varia- Sp<sup>2</sup>  
 Achillea millefolium- Sp<sup>2</sup>  
 Artemisia absinthium-Sp<sup>1</sup>  
 Salvia verticillata- Sp<sup>1</sup>  
 Hypericum perforatum- Sp<sup>2</sup>  
 Thalictrum alpinum-Sol  
 Plantago lanceolata-Sol  
 Echium vulgare-Sol



**Site 18.** Grass forbs meadow Festucetum-mixtoherbosa



**Site 18.** Grass forbs meadow Festucetum-mixtoherbosa



**Site 18.** Grass forbs meadow Festucetum-mixtoherbosa



**Site 18.** Dariali. Tunnel portal vicinity

**Site N19.** Dariali. Rock complex. The same place. Rock inclination – 70-90°C. Exposition – west. Pine (*Pinus kochiana*), juniper (*Juniperus depressa*) sparsely grow on the rock. From herbaceous plants are represented the following species: *Parietaria judaica*, *Anthemis marschalliana* subsp. *marschalliana*, *Saxifraga cartilaginea*, *Saxifraga juniperifolia*, *Asplenium septentrionale*. The habitat is of medium conservation value. (This site located in the zone of traditional use of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 3 on the Map: Cadastre Dariali Energy).



**Site 19.** Rock complex



**Site 19.** *Parietaria judaica*



**Site 19.** *Parietaria judaica*



**Site 19.** *Juniperus depressa*



**Site 19.** *Juniperus depressa*



**Site 19.** *Saxifraga juniperifolia*



**Site 19.** *Saxifraga juniperifolia*

**Site N20.** Such rock-forest complexes are represented in Dariali Gorge, along the right bank of the river Tergi to Gveleti Bridge. GPS coordinates from Gveleti bridge: N42<sup>0</sup>70'99.8''/E 44<sup>0</sup>62'76.2'', 1421 m a.s.l. The habitat is of medium conservation value.



**Site 20.** *Saxifraga cartilaginea*



**Site 20.** *Anthemis marschalliana* subsp. *marschalliana*



**Site 20.** *Asplenium septentrionale*

**Site 21.** Kazbegi District, southeast exposition. Slope inclination - 15°, inclined relief, undulating subrelief.

*Festuca varia*+*Agrostis planifolia*

Total coverage 98%. 2 layers: I-45 cm, 25%, II-30 cm, 85%. The aspect – pink *Polygonum carneum* flowers in the greyish-green background. Topologically associated with bentgrass community developed on the prominent forms of the relief. The habitat is of low conservation value. (This site located in the zone of traditional use of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 3 on the Map: Cadastre Dariali Energy).

*Festuca varia*-Cop<sup>2</sup>

*Agrostis planifolia*- Cop<sup>2</sup>

*Zerna variegata*-Sp<sup>3</sup>

*Festuca rubra*- Sp<sup>3</sup>

*Helictotrichon asiaticus*- Sp<sup>1</sup>

*Polygonum carneum*- Sp<sup>3</sup>

Campanula collina- Sp<sup>1</sup>  
 Anthoxanthum odoratum- Sp<sup>1</sup>  
 Potentilla crantzii- Sp<sup>2</sup>  
 Myosotis alpestris- Sp<sup>1</sup>  
 Poa alpina- Sp<sup>1</sup>  
 Trifolium ambiguum- Sp<sup>1</sup>  
 Euphrasia ambliodonta- Sp<sup>1</sup>  
 Deschampsia flexuosa- Sp<sup>1</sup>  
 Centaurea fischeri- Sol  
 Betonica grandiflora- Sol  
 Cerastium purpurascens- Sol  
 Silene ruprechtii- Sol  
 Leontodon hispidus- Sol  
 Carex meinshauseniana- Sol  
 Carex huetiana- Sol  
 Luzula multiflora- Sol  
 Pimpinella rhodanta- Sol  
 Veronica gentianoides- Sol  
 Luzula spicata- Sol  
 Campanula aucheri- Sol  
 Tragopogon reticulatus- Sol  
 Knautia involucrata- Sol  
 Carum caucasicum- Sol  
 Alectorolophus minor- Sol  
 Bryum pallescens- Sp<sup>1</sup> (by small groups)

Most widely from the meadows in this ravine is represented the bentgrass community, among them the leading role has *Festuca varia*+*Carex meinshauseniana*.

#### 4.3.3 Sensitive Habitats of the Project Corridor

Based on the detailed botanical studies of the Dariali HPP Project Corridor the identification and detailed description of sensitive areas has become possible. Therefore, based on the field studies in the Project Corridor the following medium and high-sensitive areas have been revealed.

##### High conservation value habitats:

**Site N15.** GPS coordinates N42°68'45.9"/E 44°64'47.2'', 1612 m a.s.l. Exposition – southwest. Slope inclination - 70-80°. Rock complex. *Juniperus sabina*, *Juniperus depressa*, with admixed *Spiraea hypericifolia*. Herbaceous plants are represented by the following species: *Minuartia brotheriana*, *Saxifraga cartilaginea*, *Sedum caucasicum*, *Sempervivum caucasicum*, *Asplenium septentrionale*, *Saxifraga juniperifolia*.

**Site N16.** GPS coordinates N42°68'45.9"/E 44°64'47.2'', 1612 m a.s.l. Meadowsweet shrubbery (*Spiraea hypericifolia*) on the rock. Slope inclination-70-80-90°, exposition – southwest. With admixed *Ephedra procera*. Herbaceous plants are represented by chasmophytes: *Minuartia brotheriana*, *Saxifraga juniperifolia*, *Draba brioides*.

##### Medium conservation value habitats:

**Site N6.** GPS coordinates N42°67'18.3"/E 44°64'80.3'', 1705 m a.s.l. Exposition – west, slope inclination-10-15°. Sea-buckthorn shrubbery (*Hippopha rhamnoides*) with admixed barberry (*Berberis vulgaris*), sweet briar (*Rosa canina*), blackberry and juniper (*Juniperus depressa*). The juniper height is 0.5 m.

**Site N7.** GPS coordinates N42°67'78.9''/E 44°64'75.0'', 1674 m a.s.l. Exposition – west. Slope inclination- 20-25°. In the degraded grass forbs meadow the sea-buckthorn scrub is growing in kind of islets (like the previous site).

**Site N8.** GPS coordinates N42°68'04.7''/E 44°64'69.5'', 1663 m a.s.l. Sparse juniper (*Juniperus depressa*). Slope inclination - 0°. Juniper height attains to – 0.5 m. Some spots of young sea-buckthorn (*Hippopha rhamnoides*). (This site located in the traditional use zone of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).

**Site N9.** GPS coordinates N42°68'16.6''/E 44°64'68.4'', 1662 m a.s.l. Sea-buckthorn shrubbery with admixed goat willow. Exposition – northwest. Slope inclination-5°. Sea-buckthorn height – 2.5 m, goat willow height -4-5 m. Isolated species of birch (*Betula litwinowii*) with the height 5 m. On the adjacent bank *Cirsium* sp., *Artemisia absinthium*, *Echinops sphaerocephalus* are growing. (This site located in the traditional use zone of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).

**Site N10.** GPS coordinates N42°68'42.4''/E 44°64'46.7'', 1621 m a.s.l. Juniper shrubbery (*Juniperus sabina*). Exposition - southwest, slope inclination 10-15°. Juniper height from 40-50 cm to -1 meter. With admixed sweet briar (*Rosa canina*), sea-buckthorn (*Hippopha rhamnoides*), rock-red currant (*Ribes biebersteinii*). (This site located in the traditional use zone of Kazbegi National Park, which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).

**Site N11.** GPS coordinates N42°40'15.5''/E 44°39'03.7'', 1757 m a.s.l. Northwest exposition. Slope inclination -5-15°. This site is represented with the overgrazed grass forbs degraded meadow. Vegetation coverage – 90%. Phytocenosis height – 40 cm. The detailed description of the site provides species cover-abundance by Drude scale in this section. There are sparse shrubbery amongst stones, where we can observe the following species: barberry (*Berberis vulgaris*), juniper(*Juniperus depressa*), *Asplenium trichomanes*, *Thalictrum buschianum* (Caucasian endemic). (This site located in the traditional use zone of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).

**Site N12.** GPS coordinates N42°40'32.4''/E 44°38'55.7'', 1724 m a.s.l. Southwest exposition Slope inclination-5-20°. On this site is developed the overgrazed grass forbs degraded meadow. The coverage is 90%. Phytocenosis height – 5 cm. On this site are sparsely growing scrubs of barberry (*Berberis vulgaris*), juniper(*Juniperus depressa*). (This site located in the Traditional Use Zone of Kazbegi National Park, which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).

**Site N14.** Kazbegi District. Slope inclination 30°. Southern exposition, foliated detritus. *Festuca varia*+*Thymus nummularius*. Total coverage 90%. 3 layers: I – 40 cm, 20%. II – 25 cm, 45%. III – 10 cm, 60%. Aspect –pink *Thymus nummularius*, yellow *Leontodon hispidus* and blue *Campanula collina* flowers in the greyish-green background. Topologically associated with *Festuca varia*+*Alopecurus glacialis*. (This site located in the Traditional Use Zone of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).

**Site N17.** GPS coordinates N42°68'57.4''/E 44°64'34.1'', 1585 m a.s.l. On the rock (slope - 80-90°) are developed juniper shrubbery with admixed meadowsweet - *Spiraea hypericifolia*, *Ephedra procera*. Below, on the right bank terrace of the river are developed sea-buckthorn shrubbery. Iberian Aster (*Aster ibericus*) flowers in autumn.

**Site N19.** Dariali. Rock complex. The same place. Rock inclination– 70-90°C. Exposition – west. Pine (*Pinus kochiana*), juniper (*Juniperus depressa*) sparsely grow on the rock. Out of herbaceous plants are represented the following species: *Parietaria judaica*, *Anthemis marschalliana* subsp. *marschalliana*, *Saxifraga cartilaginea*, *Saxifraga juniperifolia*, *Asplenium septentrionale*. (This site located in the traditional use zone of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 3 on the map).

**Site N20.** Such rock-forest complexes are represented in Dariali Gorge, along the right bank of the river Tergi to Gveleti Bridge. GPS coordinates from Gveleti bridge: N42°70'99.8''/E 44°62'76.2'', 1421 m a.s.l. The habitat is of medium conservation value.

#### 4.4 Rare and Endemic Floral Species of the Project Corridor

The region, including the Study Area, is well known as being of significant botanical interest with high floristic diversity. Hence, detailed floristic surveys were undertaken as part of the ESIA in 2010-2011 (Gamma, 2010-2011). Additional botanical surveys were carried out in August-September 2013 in order to address the key data gap existing in ESIA of Dariali HPP Project from the Biodiversity standpoint and July-October 2014 to support the Dariali HPP BAP.

Ten plant species are considered as endemic, endangered been recorded in the Study Area. The species protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1975; universal), Bern convention or Georgian Red List are not growing in the Project Corridor. Below is given the list and status of rare, endemic and endangered species recorded in the Dariali HPP Project Area:

1. *Anthemis marschalliana* subsp. *marschalliana* – a Caucasian endemic. It can be observed on the Project Corridor, site N19 (this site was located in the area of Traditional Use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N3 on the map) and on Project Corridor, site 20.
2. *Saxifraga juniperifolia* – the plant having the interesting disjunctive area as Caucasus-Bulgaria-Northeast Anatolia. It can be found on the Project Corridor, site N15, site N16, site N19 (this site was located in the area of Traditional Use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N3 on the map).
3. *Minuartia brotheriana* – the endemic of Central Caucasus. May be found on the Project Corridor, Site 15, Site 16.
4. *Sempervivum caucasicum* – the Caucasian endemic. Is found on the Project Corridor, site 15.
5. *Cirsium caucasicum* – the Caucasus- Asia Minor (Caucasian sub-endemic). Is found on the Project Corridor, site 2 (this site was located in the area of Traditional Use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N1 on the map), the on the Project corridor, site 4 (this site was located in the area of traditional use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N1 on the map); on the Project Corridor, site 5 (this site



was located in the area of Traditional Use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N1 on the map.)

6. *Aster ibericus* – Caucasus-Eastern Anatolia (Caucasian subendemic). Is found on the Project Corridor, site 17.
7. *Ranunculus oreophilus* – the Crimean-Caucasian endemic. Is found on the Project Corridor, site 14 (this site was located in the area of Traditional Use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N2 on the map).
8. *Linaria meyeri* – the endemic of the Greater Caucasus (Central and Eastern Caucasus). Is found on the Project Corridor, site 12 (this site was located in the area of traditional use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N2 on the map);
9. *Pulsatilla violacea* - a Caucasian endemic. Is found on the Project Corridor, site 11 (this site was located in the Traditional Use Zone of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N2 on the map); on the Project Corridor, site 12 (this site was located in the Traditional Use Zone of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N2 on the map);
10. *Thalictrum buschianum* – a Caucasian endemic. Is found on the Project corridor, Site N11 (this site was located in the Traditional Use Zone of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N2 on the map).



**Site 20.** *Anthemis marschalliana* subsp. *marschalliana*



**Site 15.** *Saxifraga juniperifolia*



Site 15. *Minuartia brotheriana*



Site 2. *Cirsium caucasicum*



Site 17. *Aster ibericus*



Site 12. *Linaria meyeri*



Site 12. *Pulsatilla violacea* aspect

#### 4.5 Birds

At least of 148 bird species were recorded in the region of the Project area:

- 24 bird species are classified as year-round residents;
- 38 are migratory summer breeders.

About 108 species are recorded (regularly or irregularly) during seasonal migrations in spring and autumn, from which at least:

- 26 species are also recorded in study area during breeding season as breeders, and
- 82 species were recorded only during passage.

Winter avifauna is presented of year-round resident bird species and more than up to ten species winter visitors or occasional visitors. About ten bird species are rare irregular in small numbers visitors to study area or occasional elements (vagrants)

**Table 3.** Bird species occurring within the work area

The occurrence of the species confirmed by: DO – direct observations, IA – Impact Area Dariali Pass; OA – other areas of Kazbegi municipality;

Status of presence: YR-R – year-round resident, SB – summer breeder, PM – passage migrant

International conservation status: Extinct (EX); Extinct in the Wild (EW); Critically Endangered (CR); Endangered (EN); Near Threatened (NT); Conservation Dependent (CD); Least Concern (LC)

	Latin name	English name	Status of presence	International conservation status	IA	OA
1	<i>Accipiter nisus</i>	Eurasian Sparrowhawk	SB	LC		DO
2	<i>Gypaetus barbatus</i>	Bearded Vulture	YR-R	NT		DO
3	<i>Gyps fulvus</i>	Eurasian Griffon	YR-R	LC		DO
4	<i>Falco peregrinus</i>	Peregrine Falcon	SB, PM	LC		DO
5	<i>Falco tinnunculus</i>	Common Kestrel	SB, PM	LC		DO
6	<i>Tetraogallus caucasicus</i>	Caucasian Snow Cock	YR-R	LC		DO
7	<i>Tetrao mlokosiewiczzi</i>	Caucasian Black Grouse	YR-R	NT		DO
8	<i>Charadrius dubius</i>	Little Ringed Plover	SB, PM	LC	DO	DO
9	<i>Actitis hypoleucos</i>	Common Sandpiper	SB, PM	LC	DO	DO
10	<i>Hirundo rustica</i>	Barn Swallow	SB, PM	LC	DO	DO
11	<i>Ptyonoprogne rupestris</i>	Crag Martin	SB, PM	LC	DO	DO
12	<i>Anthus spinoletta</i>	Water Pipit	SB	LC	DO	DO
13	<i>Motacilla alba</i>	White Wagtail	SB, PM	LC	DO	DO
14	<i>Motacilla cinerea</i>	Grey Wagtail	SB	LC	DO	DO
15	<i>Lanius collurio</i>	Red-backed Shrike	SB, PM	LC	DO	DO
16	<i>Sylvia atricapilla</i>	Blackcap	SB, PM	LC	DO	DO
17	<i>Phylloscopus collybita</i>	Common Chiffchaff	SB	LC		DO
18	<i>Saxicola rubetra</i>	Whinchat	SB, PM	LC	DO	DO
19	<i>Oenanthe oenanthe</i>	Northern Wheatear	SB, PM	LC	DO	DO
20	<i>Phoenicurus ochruros</i>	Black Redstart	SB	LC	DO	DO
21	<i>Phoenicurus erythrogaster</i>	Gueldenstaedt's Redstart	YR-R	LC		DO
22	<i>Turdus merula</i>	Eurasian Blackbird	YR-R	LC	DO	DO
23	<i>Parus major</i>	Great Tit	YR-R	LC	DO	DO
24	<i>Troglodytes troglodytes</i>	Winter Wren	YR-R	LC	DO	DO
25	<i>Carpodacus rubicilla</i>	Caucasian Great Rosefinch	YR-R	LC		DO
26	<i>Emberiza cia</i>	Rock Bunting	SB	LC		DO
27	<i>Carduelis carduelis</i>	European Goldfinch	SB, PM	LC	DO	DO

28	Montifringilla nivalis	White-winged Snowfinch	YR-R	LC		DO
29	Pyrrhocorax pyrrhocorax	Red-billed Chough	YR-R	LC		DO
30	Pyrrhocorax graculus	Yellow-billed Chough	YR-R	LC		DO
31	Corvus corax	Common Raven	YR-R	LC		DO
		Number of species observed	16			

#### 4.5.1 Breeding Bird Species

The breeding avifauna of Impact area (bottom of the Dariali Pass and close vicinities of the town Stepantsminda) consist of about 16 common and abundant forest passerines and ravine waders:

- Little Ringed Plover (*Charadrius dubius*),
- Common Sandpiper (*Actitis hypoleucos*)
- Barn Swallow (*Hirundo rustica*)
- Eurasian Crag Martin (*Ptyonoprogne rupestris*)
- Water Pipit (*Anthus spinoletta*)
- White Wagtail (*Motacilla alba*)
- Grey Wagtail (*Motacilla cinerea*)
- Common Shrike (*Lanius collurio*)
- Blackcap (*Sylvia atricapilla*)
- Whinchat (*Saxicola rubetra*)
- Northern Wheatear (*Oenanthe oenanthe*)
- Black Redstart (*Phoenicurus ochruros*)
- Common Blackbird (*Turdus merula*)
- Great Tit (*Parus major*)
- Winter Wren (*Troglodytes troglodytes*), and
- European Goldfinch (*Carduelis carduelis*)

13 species were observed during field surveys in the summer and autumn of 2013 and in 2010-2012-th years. Three species: Great Tit, Winter Wren, and European Goldfinch were recorded earlier. No one of recorded there bird species is protected by law.

About 12 bird species are nesting on secondary meadows and on rocks above its:

- Eurasian Sparrowhawk (*Accipiter nisus*)
- Bearded Vulture (*Gypaetus barbatus*)
- Common Kestrel (*Falco tinnunculus*)
- Eurasian Crag Martin (*Ptyonoprogne rupestris*)
- Water Pipit (*Anthus spinoletta*)
- Caucasian Chiffchaff (*Phylloscopus collybita lorenzii*)
- Whinchat (*Saxicola rubetra*)
- Northern Wheatear (*Oenanthe oenanthe*)
- Black Redstart (*Phoenicurus ochruros*)
- Winter Wren (*Troglodytes troglodytes*)
- Rock Bunting (*Emberiza cia*)
- European Goldfinch (*Carduelis carduelis*)

The Bearded Vulture, which is listed in the National red data list, can be considered as breeder in the territory of the impact area only conventionally. The nest of this bird is situated on the high rock close to the tailrace tunnel (200-250 m above the road). An adult bird with one younger was observed during the site visits in May of 2013. That is clear evidence that construction works have no adverse impact on this bird. Other bird species are not protected by law.

Based on all available data and taking into account the viewpoint of bird conservation, it can be concluded that breeding avifauna of the impact zone can be classified as poor by breeding species and is presented in general by common, widely distributed and numerous bird species.

#### 4.5.2 Bird Migration Routes Across the Project Area

The general fly-way within the project area is going through the Dariali Pass, over the Project area. It follows the valleys of the rivers Aragvi, Baidara and Tergi. Spring (second decade of March – first decade of May). General direction of the migration is from the South to the North. There are using all suitable valleys of the rivers and the coast of the Black Sea. One can see four waves of the birds' migration on the territory of Georgia in the spring - from the beginning of March till the middle of March, in second half of March, from the first week of April till the third week of April, from the end of April till the second week of May.

Arrivals of the migrant birds, which are nesting in Georgia, continue from 5-10 May to 20-25 May, with peak between 10 and 20 May. The most important factors of intensification of spring migration are the meteorological conditions on the plains of the North Caucasus and the existence in Transcaucasia.

Autumn (September – end of October). General direction of the migration is from the North to the South. The birds' flocks cross the Main Caucasus Ridge through the passes in the gorges of the main rivers and go down to the intermountain plains. They do not follow to the bends of these riverbeds. The main part of the birds flies along the coastline of the Black Sea and above the sea. Birds gather in large flocks in the autumn migrants appear even at the beginning of August. The autumn passage ends at the turn of November.

#### 4.6 Mammals

Within the study area are known ranges of distribution of 35 terrestrial mammal species. Among these 35 mammalian species 25 are known from published issues (Bukhnikashvili 2004, Shidlovsky 1976, . . ., 2013, Janashvili A., 1963). 20 species are recorded in results of authors field surveys in 2001-2013<sup>th</sup> years, and eight of them are fixed first time for the administrative district. Totally, two species are named in locals interview, (wolf and Caucasian tur and confirmed by scientific publications and direct observation. There are not large areas of the key-habitats of the endangered mammals within the Construction. Parts of populations or some individuals of the protected by law species can be affected during construction and operation of the Dariali HPP, as well as, in results of vehicle accidents within the construction zone (the feeding strategy of some medium-sized carnivore species, picking up dead animals from the road, leads in increased mortality).

It should be noted that the Project area lies within the ranges of distribution of some species, which are of community interest. There are some species and species attractive for tourists. Among them are nine mammals, of middle and large size, which are listed in the Table 4.

**Table 4.** Some mammal species occurring within the work area

The occurrence of the species confirmed by: DO – direct observations, C – Museum, P – Published issues;

Locals interview; IA – Impact Area Darial Pass.

International conservation status: Extinct (EX); Extinct in the Wild (EW); Critically Endangered (CR); Endangered (EN); Near Threatened (NT); Conservation Dependent (CD); Least Concern (LC)

	<b>Latin name</b>	<b>English name</b>	<b>Status of presence</b>	<b>International conservation status</b>	<b>IA</b>	<b>OA</b>
1	<i>Canis lupus</i>	Wolf	Resident- is reported by locals for Sakhizari compensation site, footprints of wolf seen at the village Juta in 2010	LC	NO	DO
2	<i>Vulpes vulpes</i>	Fox	Resident-- presence is confirmed by direct observations and footprints within the impact area (at the workers camp) and on compensation sites (Abano Lake and Sakhizari).	LC	DO	DO
3	<i>Meles meles</i>	Badger	Resident- Tracks found at the village Juta in 2010. This species is not reported in scientific publications for the study area	LC	no	DO
4	<i>Martes foina</i>	Stone Marten	Resident- presence is confirmed by direct observations and footprints within the impact area, (at the workers camp) and on compensation sites (Abano Lake and Sakhizari).	LC	DO	DO
5	<i>Capra cylindricornis</i>	East-Caucasian tur	Resident-- presence is known from published issues and from interview with local	NT	DO	no
6	<i>Rupicapra rupicapra</i>	Chamois	Resident-t presence is known from published issues and from interview with	LC	LI	no

			local			
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Presence of five species is confirmed via direct observations and by tracks. Information on other four species is obtained during interview of locals. Two most common species - fox (*Vulpes vulpes*) and stone marten (*Martes foina*) are dwelling everywhere. Their presence is confirmed by direct observations and footprints within the impact area (at the workers camp) and on compensation sites (Abano Lake and Sakhizari). Outside the study area, marten is observed at the village of Ukhati (1988), Devdoraki glacier (2003, 2010), and in the Truso gorge (2010). Presence of the most attractive mammals: East-Caucasian tur (*Capra cylindricornis*) and chamois (*Rupicapra rupicapra*) are known from published issues and from interview with locals.

## 4.7 Reptiles and Amphibians

### 4.7.1 Reptiles

54 species of reptiles were ever recorded for Georgia (Bakradze & Chkhikvadze, 1992; Tarkhnishvili et al., 2002). The major part of reptile species is restricted in their distribution in the south-eastern part of Georgia, and cannot be affected by the construction. The Dinnik's Viper is only species of reptilian found in the study area, which is listed in the National Red Data list. Harm to snake population in the Dariali Pass will be insignificant in case of implementation of proper mitigation measures.

**Table 5.** Reptilian species occurring within the work area

The occurrence of the species confirmed by: DO – direct observations, C – Museum, P – Published issues, LI – Locals interview; IA – Impact Area Darial Pass; OA – other areas of Kazbegi municipality.

International conservation status: Extinct (EX); Extinct in the Wild (EW); Critically Endangered (CR); Endangered (EN); Near Threatened (NT); Vulnerable (VU); Conservation Dependent (CD); Least Concern (LC).

	Latin name	English name	Status of presence	International conservation status	IA	OA
1	<i>Darevskia caucasica</i>	Caucasian Rock Lizard	resident	LC	DO	DO
2	<i>Darevskia daghestanica</i>	Daghestanian Rock Lizard	resident	LC		P
3	<i>Darevskia derjugini</i>	Artvin Lizard,	presumed	LC	P	P
4	<i>Darevskia rudis</i>	Spiny-Tailed Lizard	resident	LC	P	P
5	<i>Lacerta strigata</i>	Caspian Green Lizard	resident	LC	P	P
6	<i>Coronella austriaca</i>	Smooth Snake	resident	LC	P	DO
7	<i>Natrix natrix</i>	Ring Snake	resident	LC	DO	
8	<i>Vipera dinniki</i>	Dinnik's Viper	presumed	VU	P	P

### 4.7.2 Amphibians

Five species of amphibians are noted for the Project area.

Among amphibians that are or can be found within the Construction area, two species Long-legged Wood Frog and Northern Banded Newt are regional endemic of the Caucasus and northern part of Anatolia. No one of recorded there amphibian species is protected by law. All amphibian species are in need of stagnant, or of very slowly current, freshwater bodies for reproduction. So, nonegative impacts are expected for amphibians. Change of water flow can provide them newplaces for reproduction.

**Table 6.** Amphibian species occurring within the work area

The occurrence of the species confirmed by: DO – direct observations, C – Museum, P – Published issues; LI –Locals interview;

Occurring within the - IA – Impact Area Darial Pass; OA – other areas of Kazbegi municipality.

International conservation status: Extinct (EX); Extinct in the Wild (EW); Critically Endangered (CR); Endangered (EN); Near Threatened (NT); Vulnerable (VU); Conservation Dependent (CD); Least Concern (LC).

	Latin name	English name	International conservation status	IA	OA
1	Ommatotriton ophryticus	Northern Banded Newt	NT		P ?
2	Triturus karelinii	Southern Crested Newt	LC		P ?
3	Bufo viridis	Green Toad	LC	DO	
4	Pelophylax ridibundus	Eurasian Marsh Frog	LC	DO	
5	Rana macrocnemis	Long-legged Wood Frog	LC	DO	DO

#### 4.8 Invertebrates

Thousands of invertebrates species occurs in Georgia and most of them are very poorly studied (Foster-Turley P., Gokhelashvili R., 2009). Invertebrates, and in particular insects, a new group, which is included in the EIA process in last decades. Nine invertebrate species, occurring in Georgia, are listed as threatened - Critically Endangered, Endangered or Vulnerable in the 2008 IUCN Red Data Book. 43 species of invertebrates are listed in the Georgian National Red Datalist (2006). Conservation status of the most of other species can be characterized as DD (Data deficient), except narrow-ranged forms, which are a priori threatened. There is only fragmentary bibliography on spatial distribution of most of them in the region under consideration. In Georgia, we have not State Register of fauna, as an officially accepted document for the use in the EIA. Such document is prepared only for Adjara - the Register of the Fauna of Adjara (Bukhnikashvili A., ed., 2011). That is obstacle to consider the wholly spectrum of invertebrates in this report.

Valery Petrov, entomologist of Georgian State Museum, carried two field surveys in the lower part of the impact area, river Khdistskali (Kistinka) mouth and tailrace tunnel construction site, in 14-20 May 2013 and in 4-8 June 2013. He had counted about 40 species of Butterflies (Lepidoptera), four bumblebees (Apoidea, Bombini) and one bee species (Apoidea, Halictodae), one species of Neuroptera, four beetles (Coleoptera), one Cicada (Cicadoidea) and two mollusks.



About 135 species of bees and bumblebee (Apoidea) and up to 105 species of beetles (Coleoptera) are noted in the scientific publications as found in the Kazbegi municipality. Four species of the insects fixed on the study area are listed in the National Red Data list of Georgia. It is expected that invertebrate species hardly could be affected by the construction of the Dariali HPP on a population level or on a species level, because of very limited area of habitat destroying in results of construction. There are not large areas of the key-habitats of the endangered invertebrates within the Project area. It seems that the Project cannot be considered as one which will have significant adverse impact on these species. That's why we do not describe here invertebrate species occurring within the area of interests.

## **5. Sensitive Habitat Assessment for Project Area and Compensation Sites**

### **5.1 Overview**

Botanical and Zoological surveys have been carried in order to address the key data gap existing in ESIA of Dariali HPP Project from the Biodiversity standpoint that is provided in the "Expert Advice on Terrestrial Biodiversity Conservation, Land Take and Compensation Report" that includes two Annexes: I. Survey and comparative analysis of flora and vegetation of Dariali Hydropower Plant Project Corridor and compensation sites (carried out by Botanists: Dr Mariam Kimeridze and Mr David Chelidze) and II. Survey and comparative analysis of fauna of Dariali Hydropower Plant Project Corridor and compensation sites (carried out by Zoologists: Dr Alexander Bukhnikashvili, Dr Teimuraz Kokosadze and Mrs Marine Gioshvili).

Three small areas of land were removed from the Kazbegi National Park for the Dariali HPP construction totaling 8,737 ha that belonged to the area within the Boundaries of Traditional Use Zone of the KNP. Three territories have been added to the Protected Areas as compensation areas for the land lost at Dariali due to HPP: Nature Monument of Sakhznari Cliff Columns-335,7ha, Nature Monument of the Abano Mineral Lake-0,04 ha and Nature Monument of the Truso Travertines-4,2 ha. For additional information with regard to impact of Dariali HPP construction on KNP please see the report prepared by Dr Mariam Kimeridze "Impact of Dariali HPP on Kazbegi National Park Traditional USE Zone" dated 31.05.2013.

The detailed botanical and zoological studies were carried out in the river Tergi gorge within the borders of the Project Corridor and Compensation Sites. The expected negative impact on the botanical and zoological receptors caused by construction and operation of the Dariali HPP in the Project Corridor and adjacent areas has been revealed. The plant communities and floral and faunal species of various conservation value spread in the project impacted area and compensation sites have been identified. Comparative analysis has been carried out for Dariali HPP Project Corridor that includes three small areas of land which were removed from the Kazbegi National Park and compensation areas from the Biodiversity standpoint.

Based on the detailed botanical and zoological studies of the compensation sites (Natural Monument of Abano Mineral Lake, Natural Monument of Truso Travertines, Natural Monument of Sakhznari Cliffs) the identification and detailed description of sensitive areas has become possible. As a result of extensive Biodiversity surveys we can conclude, that those sites of Dariali Hydropower Plant which were located in the Traditional Use Zone of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, represent the sites of much lower conservation value as compared with the Compensation Sites, in the context of sensitive habitats and communities and populations of rare and endangered species. Granting the status of Natural Monuments to the Abano Mineral Lake, Truso Travertines and Sakhznari Cliffs to balance exclusion of the sites which were located in the Traditional Use Zone of Kazbegi National Park, is more than a sufficient compensation from the qualitative and quantitative context.

## 5.1.1 Habitats of Compensation Sites

### 5.1.1.1 Sensitive Habitats of Compensation Sites

#### High compensation value habitats:

##### Natural Monument of Abano Mineral Lake

**Site N3.** Trusso Canyon. On rocks adjacent to the Abano Lake are growing: *Alchemilla* sp., *Androsace villosa*, *Saxifraga exarata*, *Artemisia splendens*, *Veronica gentianoides*, *Thalictrum alpinum*, *Polygala alpicola*, *Potentilla crantzii*, *Minuartia oreina*, *Sempervivum caucasicum*, *Allium* sp. In caves is growing *Cystopteris fragilis*.

**Site N5<sup>a</sup>.** Trusso, Suatisistskali Canyon. West exposition, slope inclination 30°. ~2600 m a.s.l., Microrelief is stepwise. *Festuca varia*+*Festuca ovina*. Aspect – greyish-green. 2 layers: I-60 cm, 40%, II-32 cm, 50%, III – 15 cm, 7-%. Total coverage 98%. Borders with rhododendron+variegated fescue, matgrass+alpine snowbed elements, alpine snowbed, sedge-variegated fescue (*Carex buschiorum*), Caricetum (*Carex tristis*).

##### Natural Monument of Trusso Travertines

**Site N6.** Trusso Travertines. GPS coordinates N42°58'35.1''/E 44°42'57.1'', 2134 m a.s.l., exposition – north, northwest, slope -5-10°, height – 60-70 cm. On travertine sometimes we can see *Betula litwinowii*, *Salix kazbekensis* grown up by islets. All around travertines are developed variegated fescue- *Festucetum variae*, with sparsely admixture willows (*Salix kazbekensis*) and birches (*Betula litwinowii*).

**Site N7.** Kazbegi District. Right terrace of Trusso Canyon, village Ketrisa vicinity (between Ketrisa and Kasara jaws). ~2100 m a.s.l., plaining, alluvial-proluvial blanket. *Caricetum inflatae purum*. Coverage 75%. 1 layer – 45 cm. Topologically associated with *Carex inflata*+*Carex panacea*, *Carex inflata*+*Heleocharis pauciflorum* meadowed marsh. Association substrate is silted due to seasonal floods.

**Site N8.** Kazbegi District. Right terrace of Trusso Canyon, village Ketrisa vicinity (between Ketrisa and Kasara jaws). ~2100 m a.s.l., plaining (with slight sloping), alluvial-proluvial blanket. Compared with the previous site this site has the elevated relief, near the outlet of groundwater spring. *Carex inflata*+*Carex panacea*. Coverage 85%, Layer 1 – 45 cm. Topologically associated with *Caricetum inflatae purum*, the meadowed marsh. It seems that running water conditions are necessary for *Carex panacea*.

**Site N11.** Kazbegi District. Left terrace of Trusso Canyon, village Ketrisa vicinity (between Ketrisa and Kasara jaws). The young alluvial substratum. ~2100 m a.s.l.. The bottom is covered with salts from the springs of narzan type. *Triglochinetum palustrae purum*. Coverage 80%. 2 layers: I-40 cm, 25%; II-10 cm (mainly formed by the *Triglochin palustris* leaf mass ), 70%.

**Site N13.** Kazbegi District. Left terrace of Trusso Canyon. ~2100 m a.s.l.. plaining. Between Ketrisa and Kasara jaws. *Triglochin palustris*+*Juncus bufonius*. Coverage 85%. 2 layers: I-45 cm, 35%, II – 8 cm, 60%. Topologically associated with *Triglochinetum purum*, *Blysmus compressus*+*Drapanocladus aduncus*, *Blysmetum compressae purum*. This association ecologically and structurally is similar to *Triglochinetum purum*, but here the surface water thickness is small and salts are more accumulated. Among *Triglochinetum* the most widespread is *Triglochinetum palustrae purum*.

**Site N14.** Kazbegi District. Left terrace of Trusso Canyon. ~2100 m a.s.l. plaining. Between village Ketrisa and Kasara jaws. *Triglochin palustris*+*Drapanocladus aduncus*. Coverage 98%. 3

layers: I – 40 cm, 10%; II- 10 cm, 45%, III – mosslayer 65%. Topologically associated with *Triglochin purum*, *Triglochin palustris*+*Juncus bufonius*, *Blysmus compressus*+*Drapanocladus aduncus*. Throughout the area of associations described on the left terrace of Trusso are observed the outlets of mineral springs which feed those associations.

**Site N15.** Kazbegi District, Trusso Canyon. East exposition, slope inclination 30°. Mezorelief is slightly concave-straight, microrelief is slightly undulating. ~2200 m a.s.l. Festuca varia+ grass forbs meadow domination. Aspect – greenish-greyish. 3 layers are not clearly expressed. I – 45-60 cm, 30%, II-30 cm, 55%, III – 20 cm, 65%. Coverage 98%. It borders the rocky outcrops and grass forbs meadow. The habitat is of high conservation value.

#### **Natural Monument of Sakhznari Cliffs**

**Site N16.** Sakhznari. The northern slope of the mountain peak Kabarjina. The place Sakhznari is near the river Sioni. GPS coordinates N42°57'58.9"/E 44°56'40.5", 2379 m a.s.l. At the rock bottom is developed the grass forbs meadow - *Festucetum variae* with admixed rhododendron (*Rhododendron caucasicum*) and birch (*Betula litwinowii*) and also *Daphne glomerata*. Slope inclination – 10-25°. Here and there are observed the fragments of plants of alpine snowbed.

**Site N17.** Located on detritus. Slope inclination 30-35°. Exposition – north. Sparsely are growing *Senecio sosnowskyi*, *Oxyria elatior*, *Scrophularia* sp., *Pyrethrum* sp., *Minuartia brotheriana*, *Astragalus kazbekii*.

**Site N20.** Sakhznari Cliffs. 2450-2500 m a.s.l. slope inclination – 70-90°. Exposition – north, northwest, northeast. Sparsely are growing the joint plants (chasmophytes). Here and there are observed single rhododendrons (*Rhododendron caucasicum*).

**Site N21.** Sakhznari. South and southeast exposition. ~2200 m a.s.l. Microrelief is undulating stepwise. Here and there are small stones. Festuca varia+Alchemilla sericata. Aspect – greyish-greenish. 3 layers: I-60 cm, 35%; II – 25 cm, 55%; III – 10 cm, 65%. Canopy – 98%. Borders with *Carex buschiorum*+*Festuca varia*, *Festucetum vaiae*, canyon, rocky outcrops.

**Site N22.** Sakhznari. West and southwest exposition, slope inclination 35°. ~2400 a.s.l. Microrelief slightly stepwise. Festuca varia+Alchemilla sericata. Aspect – greyish-green, 3 layers: I – 55 cm, 35%; II – 30 cm, 50%; III – 10 cm, 55%. Coverage 98%. Topologically associated with *Festuca varia*+*Carex buschiorum*.

**Site N23.** Sakhznari. West exposition, slope inclination 38°, ~2300 m a.s.l. Microrelief stepwise, here and there are observed stones (in a very small amount). Grass- variegated fescues. Aspect – greenish-greyish, 3 layers: I -65 cm, 45%, II-35 cm, 85%; III-16 cm, 35%. Canopy 97%. from one side it borders with rocks, topologically associated with the following groups: *Carex meinshauseniana*+*Festuca varia*, *Festuca varia*+*Carex meinshauseniana*, *Festuca varia*+*Carex meinshauseniana*+*Alchemilla sericata*.

**Site N24.** Sakhznari. West exposition, slope inclination 40°, ~2300 m a.s.l. Microrelief stepwise. Festuca varia+Calamagrostis arundinacea. Aspect – greyish-green, 3 layers: I-70 cm, 40%; II-35 cm, 70%; III- 15 cm, 35%. Coverage 100%. Topologically is associated with *Carex meinshauseniana*+*Festuca varia*, *Festuca varia*+*Carex meinshauseniana*, *Festuca varia*+*Carex meinshauseniana*+*Alchemilla sericata*. Grass-variagated fescues.

#### **Medium conservation value habitats:**

#### **Natural Monument of Abano Mineral Lake**

**Site N4.** Trusso Canyon. The village Abano vicinity, southwest exposition, ~2500 m a.s.l., undulating relief, stepwise subrelief. Dry, stone soil. Slope inclination 35°. Festuca varia+Carex meinshauseniana. The greyish-green aspect. 2 layers: I – 60 cm, 45%, II-20 cm, 90%. Total coverage – 100%. The layers are not clearly expressed. Topologically is associated with Carex meinshauseniana+Thymus-+Festuca, Carex meinshauseniana+Festuca varia.

**Site N 5.** Trusso Canyon, Zekagori vicinity. Southwest exposition. Slope inclination 30°. ~2400 m a.s.l., Microrelief is slightly stepwise, undulating, sometimes with schist with the diameter 5-25 cm. Festuca varia+Carex bushiorum. The aspect – Cephalaria and Scabiosa flowers in the greyish-green background. 3 layers: I- 70 cm, 15%, II – 32 cm, 50%, III – 13 cm, 60%. Borders with Caricetum (Carex bushiorum), Carex bushiorum+grasses, forbs-grass and grass-forbs meadows.

### **Natural Monument of Trusso Travertines**

**Site N9.** Kazbegi District. Right terrace of Trusso Canyon, village Ketrisa vicinity (between Ketrisa and Kasara jaws). ~2100 m a.s.l. Elevated relief at the marsh surface. Coverage 85%. 2 layers: I-35 cm, 95%, II-15 cm, 60%. Topologically is associated with Caricetum inflatae purum, meadowed marsh, Carex inflata+Blysmus compressus – this association floristically and structurally is similar to Carex inflata+ Heleocharis pauciflora.

**Site N9<sup>a</sup>.** Kazbegi District. Right terrace of Trusso Canyon, village Ketrisa vicinity (between Ketrisa and Kasara jaws). ~2100 m a.s.l. Elevated relief at the marsh bank strip. Coverage 95%. 2 layers: I-15 cm, 40%, II-5 cm. Mosslayer - 65%. The association involves nonlayered plants as well. Topologically connected with Carex inflata+ Heleocharis pauciflora, Caricetum inflatae purum. Blysmus compressus+ Cratoneuron commutatum var. falcatum ,in the described marsh the major place is held by Caricetum inflatae purum, then in the periphery of the marsh - Blysmus compressus+Cratoneuron commutatum var. falcatum, also Blysmetum compressae purum, then - Carex inflata+ Heleocharis pauciflora an on the smallest spots - Carex inflata+Carex panacea.

**Site N10.** Kazbegi District. Right terrace of Trusso Canyon, village Ketrisa vicinity (between Ketrisa and Kasara jaws). ~2100 m a.s.l., The young alluvial substratum – silty, with seasonal floods. The habitat is of medium conservation value. Equisetetum palustrae purum. Coverage 80%. Layer 1-30 cm. Topologically associated with Blysmetum compressae purum and Potamogetonetum (formed by Potamogeton pectinatus) where this species of horsetail gradually penetrates along with sedimentation.

**Site N12.** Kazbegi District. Left terrace of Trusso Canyon, village Ketrisa vicinity (between Ketrisa and Kasara). ~2100 m a.s.l.. With feeding of narzan type spring water. The substrate is very mobile. The water attains the mosslayer. Blysmus compressus+Drapanocladus aduncus. Canopy 100%. 2 layers: I-20 cm, 50%; II- mosslayer 70%. Topologically associated with Triglochinetum palustrae purum, Blysmetum compressae purum, Triglochin palustris+Juncus bufonius. The latter association is represented on small sections in Triglochineta complex. As it seems Blysmus compressus+Drapanocladus aduncus will substitute Triglochinetum palustrae purum. Blysmetums on this Trusso terrace are represented rather broadly.

**Site N14<sup>a</sup>.** In the vicinity of the village Ketrisa (Trusso Canyon) in addition to the above described marshes there is also one wetland – near Kasara jaws (in the bottom side of the canyon, towards the village Ketrisa). In this wetland are spread 1. Heleocharidetum pauciflorae purum. Coverage 75%. Floristically poor. There are also Blysmus compressus, Triglochin palustris and etc., 2. Blysmus compressus+Cratoneuron commutatum, 3. Blysmetum compressae purum, 4. Carex dacica+Cratoneuron commutatum, 5. Caricetum dacicae purum. The latter

associations are floristically very poor. Among them on a larger area are spread: *Heleocharidetum pauciflorae purum*, *Blysmetum compressae purum*, *Blysmetum cratoneurosum commutatum*; other associations are less spread.

#### **Natural Monument of Sakhznari Cliffs**

**Site N18.** The grass forbs meadow is developed on detritus and partially on turf with admixed rhododendron and juniper. Slope inclination– 35-40°, exposition – north, coverage– 20-30%.

**Site N19.** Sparse rhododendron scrubs below the caves. Slope inclination– 35-40°, exposition – north, coverage – 30-40%.

#### **5.1.1.2 Conclusions in the Context of Sensitive Habitat Assessment for Project Area and Compensation Sites**

Thus, in Dariali Hydropower Plant Project Corridor are represented 2 high conservation value (HCV) habitats and 11 medium conservation value (MCV) habitats, where 7 sites of medium conservation value were located in the zone of Traditional Use of the Kazbegi National Park which were excluded from the Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant. As it is known, for compensation to it the Abano Mineral Lake, Trusso Travertines and Sakhznari Cliffs were given the status of Natural Monument. On the above-mentioned compensation sites are represented 16 habitats of high conservation value and 11 habitats of medium conservation value. Hence, as a result of the comparative analysis of the Project Corridor and Compensation Sites we can conclude that in the context of sensitive habitats and communities as well as rare species populations the Compensation Sites represent the habitats of much higher conservation value.

#### **5.1.1.3 Rare and Endemic Species of the Project Corridor and Compensation Areas**

Noteworthy is that in the Project Corridor and Compensation Sites there are some rare, endemic, endangered and species as well as the species protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1975; universal). The species protected under Bern convention are not growing in the Project Corridor and Compensation Sites.

Below is given the list and status of rare, endemic and endangered species protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES):

1. *Anthemis marschalliana* subsp. *marschalliana* – a Caucasian endemic. It can be observed on the Project Corridor, site N19 (this site was located in the area of Traditional Use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N3 on the map) and on Project Corridor, site 20.
2. *Saxifraga juniperifolia* – the plant having the interesting disjunctive area as Caucasus-Bulgaria-Northeast Anatolia. It can be found on the Project Corridor, site N15, site N16, site N19 (this site was located in the area of Traditional Use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N3 on the map).
3. *Minuartia brotheriana* – the endemic of Central Caucasus. May be found on the Project Corridor, Site 15, Site 16; on the Compensation Area – site 17, site 20.
4. *Sempervivum caucasicum* – the Caucasian endemic. Is found on the Project Corridor, site 15; on the Compensation Area – site 3.
5. *Salix kazbekensis* - the Caucasian endemic. Is found on the Compensation Area , site 6.
6. *Draba bryoides* – the Caucasian endemic. Is found on the Compensation Area , site 20.
7. *Astragalus kazbekii* - the Caucasian endemic. Is found on the Compensation Area , site 17.

8. *Senecio sosnowskyi* - - the Caucasian endemic. Is found on the Compensation area , site 17.
9. *Cirsium caucasicum* – the Caucasus- Asia Minor (Caucasian subendemic). Is found on the Project Corridor, site 2 (this site was located in the area of Traditional Use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N1 on the map), the on the Project corridor, site 4 (this site was located in the area of traditional use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N1 on the map); on the Project Corridor, site 5 (this site was located in the area of Traditional Use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N1 on the map.)
10. *Aster ibericus* – Caucasus-Eastern Anatolia (Caucasian subendemic). Is found on the Project Corridor, site 17.
11. *Ranunculus oreophilus* – the Crimean-Caucasian endemic. Is found on the Project Corridor, site 14 (this site was located in the area of Traditional Use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N2 on the map); on the Compensation Area, Site 5, Site 9, Site 15, Site 22, Site 24.
12. *Linaria meyeri* – the endemic of the Greater Caucasus (Central and Eastern Caucasus). Is found on the Project Corridor, site 12 (this site was located in the area of traditional use of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N2 on the map);
13. *Vicia grossheimii* – a Caucasian endemic. Is found on the Compensation Area, Site 4, Site 5<sup>a</sup>, Site 15, Site 22, Site 24.
14. *Lotus caucasicus* - a Caucasian endemic. Is found on the Compensation Area, Site 5, Site 15, Site 24.
15. *Scabiosa bipinnata* – Caucasus-Eastern Anatolia (subendemic). Is found on the Compensation Area , site 5.
16. *Psephellus dealbatus* - Caucasus-Asia Minor (Northeast) (subendemic). Is found on the Compensation Area, Site 5, Site 21.
17. *Campanula sarmatica* – an endemic of Central and Eastern Caucasus. Is found on the Compensation Area, site 5.
18. *Peucedanum pschavicum* – an endemic of the Greater Caucasus. Is found on the Compensation Area, Site 21.
19. *Pulsatilla violacea* - a Caucasian endemic. Is found on the Project Corridor, site 11 (this site was located in the Traditional Use Zone of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N2 on the map); on the Project Corridor, site 12 (this site was located in the Traditional Use Zone of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N2 on the map);
20. *Fritillaria lutea* – an endemic of Caucasus-Asia Minor (Northeast Anatolia). Is found on the Compensation Area, Site 15, Site 22.
21. *Scabiosa caucasica* – Caucasus – Anatolia (subendemic). Is found on the Compensation Area, Site 15, Site 23.
22. *Medicago glutinosa* – a Greater Caucasus endemic. Is found on the Compensation Area, Site 21.
23. *Primula luteola* – a Greater Caucasus endemic. Is found on the Compensation Area, Site 22.
24. *Sedum involucreatum* – a Caucasian endemic. Is found on the Compensation Area, Site N5A, Site 22, Site 24.
25. *Carex buschiorum* – a Crimean-Caucasian endemic. Is found on Compensation Area, Site N5<sup>a</sup>, Site 15, Site N22, Site N23, Site N24.

26. *Rosa boissieri* – Caucasus-Northeast Anatolia (subendemic). Is found on the Compensation Area, Site 23.
27. *Thalictrum buschianum* – a Caucasian endemic. Is found on the Project corridor, Site N11 (this site was located in the Traditional Use Zone of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, figure N2 on the map);
28. *Orchis purpurea subsp. caucasica* (= *Orchis caucasica*)- a species protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1975; universal). Is found on the Compensation Area, Site 5.
29. *Dactylorhiza urvilleana* (= *Orchis triphylla*)- a species protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1975; universal). Is found on the Compensation Area, Site 24.

#### **5.1.1.4 Conclusions in the Context of Rare and Endemic Species of the Project Corridor and Compensation Areas**

Thus, on the Project Corridor and Compensation Territories (Natural Monument of Abano Mineral Lake, Natural Monument of Trusso Travertines, Natural Monument of Sakhiznari Cliffs) total 29 rare species are growing. Out of them 10 species are found on the Project Corridor from which 7 species are growing on the sites which were located in the Traditional Use Zone of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant. On the Compensation Sites are growing 22 rare and endemic species, and out of the list of above-mentioned rare plants 3 rare species grow both on the Project Corridor and Compensation Sites.

Consequently, we can conclude, that those sites of Dariali Hydropower Plant which were located in the Traditional Use Zone of Kazbegi National Park and excluded from Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant, represent the sites of much lower conservation value as compared with the Compensation Sites, in the context of sensitive habitats and communities and populations of rare and endangered species. Granting the status of natural monuments to the Abano Mineral Lake, Trusso Travertines and Sakhiznari Cliffs to balance exclusion of the sites which were located in the Traditional Use Zone of Kazbegi National Park, is more than a sufficient compensation from the qualitative and quantitative context.

## **6. Priorities for Biodiversity Conservation**

### **6.1 Selection criteria**

Based on the literature review and the extensive field surveys carried out in 2010, 2011 and 2013, 2014, a description of the biodiversity baseline for the Study Area is presented in Chapter 4 of this document. The information on the biodiversity of the Study Area is quite comprehensive is considered to be sufficient to inform the BAP.

A BAP needs to focus on species and habitats that need special management rather than dealing with all the biodiversity in the Study Area. As part of the Dariali HPP Project BAP, the priorities for biodiversity conservation have been selected based on:

- The global, national and/or regional conservation importance of some species and habitats in the Study Area – this category includes rare, restricted-range and threatened species in Kazbegi District/Georgia or globally (IUCN Red List), as well as the habitats where these species occur;
- The sensitive habitat trigger species, habitats and legally protected areas that are affected by the project;

- The protection status of some areas within the Study Area – this category includes nature conservation areas which are protected in Georgia or internationally; and
- The predicted impacts of the Dariali HPP Project onto the above features – protected areas and features of high conservation importance which are not affected by the Project do not have to be dealt with in this BAP, although some additional conservation (biodiversity enhancement) actions are included in this document.

## 6.2 Priorities

### 6.2.1 Habitats

The following habitat types of high and medium conservation value have been selected as priorities for conservation in this BAP within the Dariali HPP Project impact zone:

#### High conservation value habitats

- **Site N15.** GPS coordinates N42°68'45.9"/E 44°64'47.2", 1612 m a.s.l. Exposition – southwest. Slope inclination - 70-80°. Rock complex. *Juniperus sabina*, *Juniperus depressa*, with admixed *Spiraea hypericifolia*. Herbaceous plants are represented by the following species: *Minuartia brotheriana*, *Saxifraga cartilaginea*, *Sedum caucasicum*, *Sempervivum caucasicum*, *Asplenium septentionale*, *Saxifraga juniperifolia*.
- **Site N16.** GPS coordinates N42°68'45.9"/E 44°64'47.2", 1612 m a.s.l. Meadowsweet shrubbery (*Spiraea hypericifolia*) on the rock. Slope inclination-70-80-90°, exposition – southwest. With admixed *Ephedra procera*. Herbaceous plants are represented by chasmophytes: *Minuartia brotheriana*, *Saxifraga juniperifolia*, *Draba brioides*.

#### Medium conservation value habitats

- **Site N6.** GPS coordinates N42°67'18.3"/E 44°64'80.3", 1705 m a.s.l. Exposition – west, slope inclination-10-15°. Sea-buckthorn shrubbery (*Hippopha rhamnoides*) with admixed barberry (*Berberis vulgaris*), sweet briar (*Rosa canina*), blackberry and juniper (*Juniperus depressa*). The juniper height is 0.5 m.
- **Site N7.** GPS coordinates N42°67'78.9"/E 44°64'75.0", 1674 m a.s.l. Exposition – west. Slope inclination- 20-25°. In the degraded grass forbs meadow the sea-buckthorn scrub is growing in kind of islets (like the previous site).
- **Site N8.** GPS coordinates N42°68'04.7"/E 44°64'69.5", 1663 m a.s.l. Sparse juniper (*Juniperus depressa*). Slope inclination - 0°. Juniper height attains to – 0.5 m. Some spots of young sea-buckthorn (*Hippopha rhamnoides*). (This site located in the traditional use zone of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).
- **Site N9.** GPS coordinates N42°68'16.6"/E 44°64'68.4", 1662 m a.s.l. Sea-buckthorn shrubbery with admixed goat willow. Exposition – northwest. Slope inclination-5°. Sea-buckthorn height – 2.5 m, goat willow height -4-5 m. Isolated species of birch (*Betula litwinowii*) with the height 5 m. On the adjacent bank *Cirsium* sp., *Artemisia absinthium*, *Echinops sphaerocephalus* are growing. (This site located in the traditional use zone of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).
- **Site N10.** GPS coordinates N42°68'42.4"/E 44°64'46.7", 1621 m a.s.l. Juniper shrubbery (*Juniperus sabina*). Exposition - southwest, slope inclination 10-15°. Juniper height from 40-50 cm to -1 meter. With admixed sweet briar (*Rosa canina*), sea-buckthorn (*Hippopha rhamnoides*), rock-red currant (*Ribes biebersteinii*). (This site located in the traditional use zone of Kazbegi National Park, which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).



- **Site N11.** GPS coordinates N42°40'15.5''/E 44°39'03.7'', 1757 m a.s.l. Northwest exposition. Slope inclination -5-15°. This site is represented with the overgrazed grass forbs degraded meadow. Vegetation coverage – 90%. Phytocenosis height – 40 cm. The detailed description of the site provides species cover-abundance by Drude scale in this section. There are sparse shrubbery amongst stones, where we can observe the following species: barberry (*Berberis vulgaris*), juniper(*Juniperus depressa*), *Asplenium trichomanes*, *Thalictrum buschianum* (Caucasian endemic). (This site located in the traditional use zone of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).
- **Site N12.** GPS coordinates N42°40'32.4''/E 44°38'55.7'', 1724 m a.s.l. Southwest exposition Slope inclination-5-20°. On this site is developed the overgrazed grass forbs degraded meadow. The coverage is 90%. Phytocenosis height – 5 cm. On this site are sparsely growing scrubs of barberry (*Berberis vulgaris*), juniper(*Juniperus depressa*). (This site located in the Traditional Use Zone of Kazbegi National Park, which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).
- **Site N14.** Kazbegi District. Slope inclination 30°. Southern exposition, foliated detritus. Festuca varia+Thymus nummularius. Total coverage 90%. 3 layers: I – 40 cm, 20%. II – 25 cm, 45%. III – 10 cm, 60%. Aspect –pink *Thymus nummularius*, yellow *Leontodon hispidus* and blue *Campanula collina* flowers in the greyish-green background. Topologically associated with *Festuca varia*+*Alopecurus glacialis*. (This site located in the Traditional Use Zone of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 2 on the map).
- **Site N17.** GPS coordinates N42°68'57.4''/E 44°64'34.1'', 1585 m a.s.l. On the rock (slope - 80-90°) are developed juniper shrubbery with admixed meadowsweet - *Spiraea hypericifolia*, *Ephedra procera*. Below, on the right bank terrace of the river are developed sea-buckthorn shrubbery. Iberian Aster (*Aster ibericus*) flowers in autumn.
- **Site N19.** Dariali. Rock complex. The same place. Rock inclination– 70-90°C. Exposition – west. Pine (*Pinus kochiana*), juniper (*Juniperus depressa*) sparsely grow on the rock. Out of herbaceous plants are represented the following species: *Parietaria judaica*, *Anthemis marschalliana* subsp. *marschalliana*, *Saxifraga cartilaginea*, *Saxifraga juniperifolia*, *Asplenium septentrionale*. (This site located in the traditional use zone of Kazbegi National Park which was excluded from the Kazbegi Protected Territory before the beginning of construction of Dariali Hydropower Plant, Fig. N 3 on the map).
- **Site N20.** GPS coordinates from Gveleti bridge:N42°70'99.8''/E 44°62'76.2'', 1421 m a.s.l. Such rock-forest complexes are represented in Dariali Gorge, along the right bank of the river Tergi to Gveleti Bridge.

## 6.2.2 Species

The species listed below have been identified as priorities for conservation as part of this BAP. None of these species are restricted to the Study Area; they are known or likely to occur in other parts of Kazbegi District and Georgia.

### 6.2.2.1 Plant Species of Conservation Importance in Kazbegi District, Georgia and Caucasus

The following plant species of conservation importance in Kazbegi District, Georgia and Caucasus occur within the Study Area and are priority species in this BAP:

- *Anthemis marschalliana* subsp. *marschalliana* – a Caucasian endemic;
- *Saxifraga juniperifolia* – the plant having the interesting disjunctive area as Caucasus-Bulgaria-Northeast Anatolia;
- *Minuartia brotheriana* – the endemic of Central Caucasus;
- *Sempervivum caucasicum* – the Caucasian endemic;
- *Cirsium caucasicum* – the Caucasus- Asia Minor (Caucasian sub-endemic);
- *Aster ibericus* – Caucasus-Eastern Anatolia (Caucasian sub-endemic);
- *Ranunculus oreophilus* – the Crimean-Caucasian endemic;
- *Linaria meyeri* – the endemic of the Greater Caucasus (Central and Eastern Caucasus);
- *Pulsatilla violacea* - a Caucasian endemic;
- *Thalictrum buschianum* – a Caucasian endemic.

#### 6.2.2.2 Animal Species Endemics to Caucasus within the Project Area

Within the Impact Area of the project, one can find among mammals – endemic to Caucasus species:

- Caucasian Mole (*Talpacaucasica*)
- Robert's Snow Vole (*Chionomys roberti*)
- Caucasian Snow Vole (*Chionomys gud*)
- East Caucasian Tur (*Capra cylindricornis*).

Bird species:

- Caucasian Grouse (*Tetrao mlokosiewiczi*)
- Caucasian Snow Cock (*Tetraogallus caucasicus*) and one endemic subspecies
- Caucasian Chiffchaff (*Phylloscopus collybita lorenzii*).

Among reptiles there are one regional endemic of the Middle East that is found only in the Caucasus and the northern part of the Asia Minor:

- Georgian or Spiny-Tailed Lizard (*Darevskia rudis*).

Three species are regional endemic found exclusively in the Caucasus:

- the Caucasian Rock Lizard (*Darevskia caucasica*),
- Daghestanian Rock Lizard (*Darevskia daghestanica*), and
- Derjugin's Lizard (*Darevskia derjugini*).
- One reptilian species the Dinnik's Viper (*Vipera dinniki*) is strictly endemic to the Great Caucasus mountain chain.

Among the amphibian species one can see two regional endemic species of the Middle East are found only in the Caucasus and the northern part of the Asia Minor:

- Northern Banded Newt (*Ommatotriton ophryticus*) and
- Caucasian Wood Frog (*Rana macrocnemis*). Certainly, such species deserve an especial attention from the conservation point of view. As it is shown above no one of the endemic species will be negatively affected during construction and operation of the Dariali HPP.

#### 6.2.2.3. Red Data List Animal Species of Georgia within the Project Area

**Table 8.** Animal species, included in the Red Data List of Georgia (2006), which are occurring within the impact area of the Project

NRDL categories: VU – Vulnerable, EN – Endangered; CR – Critical Endangered; Type of occurrence: H – home range of the species lies within the area; YR-R – year-roundresident (for birds); V – the species is a visitor within the area, M – species migrating across the area, ? - occurrence of the species is doubtful.

The occurrence of the species isconfirmed by: DO – the direct observations or tracks, C – Museum, P – Published issues;, LI – Locals interview; Areas: IA – Impact Area Dariali Pass; OA – other areas of Kazbegi municipality

	Latin name	English name	National Status	IA	Type of occurrence
<b>Mammals</b>					
1	<i>Sicista kazbegica</i>	Kazbegi Birch Mouse	VU		H
2	<i>Prometheomys schaposchnikovi</i>	Long-Clawed Mole-Vole	VU		H
3	<i>Cricetulus migratorius</i>	Grey Hamster	VU		H
4	<i>Capra cylindricornis</i>	East Caucasian Tur	VU	DO	H
5	<i>Rupicapra rupicapra</i>	Chamois	EN	LI	H
6	<i>Lynx lynx</i> <sup>1</sup>	Lynx	CR	P	
7	<i>Ursus arctos arctos</i>	Brown bear	CR	P	
8	<i>Lutra lutra</i>	Otter	CR	P	
1	<b>Birds</b>				
6	<i>Buteo rufinus</i>	Long-legged Buzzard	VU		M - Regular migrant
7	<i>Buteo lagopus</i>	Rough-legged Buzzard	VU		M - Regular migrant
8	<i>Aquila heliaca</i>	Imperial Eagle	VU		M - Regular migrant
9	<i>Aquila clanga</i>	Greater Spotted Eagle	VU		M - Rere migrant
10	<i>Aquila chrysaetos</i>	Golden Eagle	VU		V - seasonal verticalmovements
11	<i>Neophron percnopterus</i>	Egyptian Vulture	VU		V - Rare visitor
12	<i>Gypaetus barbatus</i>	Bearded Vulture	VU	DO	YR-R - Nest observed
13	<i>Aegypius</i>	Cinereous	EN		V Rare visitor

<sup>1</sup>Mentioning of the lynx, Brown bear and Otter with reference of the Project impact area is based only on published literature materials, by the interview with locals lynx was seen last in 1960, and Brown bear and Otter in 1975, Since no survey expedition could confirm Presence of those species in the region, let alone the territories, within the range of the Project impact area, and it was expected, as habitats of those species year by year had been undergoing of big anthropogenic load and had changed substantially. For these reasons, no mitigation measures is envisaged in reference of those species.

	Latin name	English name	National Status	IA	Type of occurrence
	monachus	Vulture			
14	Gyps fulvus	Eurasian Griffon	VU		YR-R
15	Falco cherrug	Sacker	CR		M - Regular migrant
16	Falco vespertinus	Red-footed Falcon	EN		M - Regular migrant
17	Falco naumanni	Lesser Kestrel	CR		M - Regular migrant
18	Accipiter brevipes	Levant Sparrow hawk	VU		M - Regular migrant
19	Carpodacus rubicilla	Great Rosefinch	VU		YR-R - Above 2500 masl
20	Phoenicurus erythrogastrus	Guldenstadt's Redstart	VU		YR-R- Above 2500 masl
21	Tetrao mlokosiewiczzi	Caucasian Black Grouse	VU		YR-R
22	Grus grus	Common Crane	EN	DO	M - Regular migrant
<b>Reptiles</b>					
23	Vipera dinniki	Dinnik's viper Caucasus subalpine viper	VU	DO	H
<b>Invertebrates</b>					
<b>Insects</b>					
24	Callimorpha dominula	Tiger Moth	VU	DO	H
25	Parnassius apollo	Apollo	VU	P	H
26	Polyommatus daphnis	Meleager's Blue	VU	DO	H
27	Bombus alpigenus (= B. wurflenii)	Alpine bumble bee	VU	DO	H
28	Onychogomphus assimilis	Dark Pincertail	VU	P	H
				13=8DO+3L +2P	18H; 9M; 5V.

## 7. BAP Actions

### 7.1 Overview

This chapter sets out all the proposed actions structured from the perspective of biodiversity conservation.

Conservation objectives and actions have been developed for each priority biodiversity feature or groups of features to ensure the systematic implementation of the mitigation hierarchy i.e. avoid, reduce (minimise), remedy (restore) and offset. The concept of the mitigation hierarchy is outlined in **Figure 1**. This will allow for the careful management of risk and the best possible

outcomes for the Project and local communities, without compromising the health, function and integrity of the ecological system. In addition to the actions linked to the mitigation hierarchy, this BAP includes Additional Conservation Actions (ACA), which are actions to enhance the biodiversity of the Study Area, irrespective of the development taking place there.

The conservation actions have been established with the aim of achieving “no net loss” and “net gain” to biodiversity in accordance with EBRD PR6. EBRD PR6 requires evidence that the mitigation hierarchy has been applied, that avoidance is prioritized, and that offsets are measurable and only applied as a last resort where residual impacts are unavoidable.

The conservation objectives and actions have been identified and developed based on:

- The legal, policy, regulatory and third party requirements;
- The international and national standards, guidance and best practice (e.g. EBRD, 2008); and
- The other biodiversity conservation initiatives in the wider area (UNDP/GEF, WWF).

The Dariali HPP Project BAP is composed of four sub-plans, and each sub-plan comprises one or several conservation objectives. A number of actions have been identified to achieve each objective. Under each sub-plan, the objectives and actions relevant to impact avoidance and reduction are presented first as they have high priority. The objectives and actions which involve further monitoring and research, biodiversity enhancement come after the impact mitigation actions. The order of the actions generally follows the mitigation hierarchy (**Figure 1**), but this is not always possible as one action can be relevant to more than one category in the mitigation hierarchy.

## **7.2 Action Plan for Sensitive Habitats and Rare Plant Species**

### **7.2.1 Action Plan Objectives and Actions**

**Objective A1: Protect the natural habitats and the populations of rare and endangered plant species during construction and operation of the Project**

**Action A1.1: Inform construction staff on the importance of natural habitats and rare and endangered plant species**

All construction staff will be informed about the areas supporting natural and sensitive habitats, as well as protected, threatened and endemic species.

**Action A1.2: Mapping and delineation of sensitive areas that will be considered “no-go zones” for construction traffic**

The sensitive areas maps will be used to manage the construction impacts of the Project, avoid or minimise adverse impacts on the valuable habitats and locations supporting protected and threatened species. The maps will be also used to compare the habitat areas before and after construction on each site.

**Action A1.3: Avoid or minimise loss/degradation of natural habitats during Project operation phase**

The locations for spoil deposits, quarrying areas, laydown areas and other associated facilities have been selected based on the minimum likely ecological and environmental impacts.

In order to avoid or minimise habitat loss and degradation measures to avoid or minimise habitat degradation and loss will include the following actions:

- Minimise land requirements for above ground permanent facilities;
- Minimise the width of an access road during operation as far as possible;
- Minimise the impact on project territories, avoiding the use of heavy equipment such as bulldozers, especially on steep slopes, water and wetland crossings, and forested areas during operation phase.

Particular attention will be given to avoid or minimise impacts on the habitat areas known to support protected, threatened or endemic plant species. The sensitive habitats restoration have to be for each Project site in order to achieve “no net loss” or “a net gain” to biodiversity in accordance with EBRD PR6.

#### **Action A1.4: Prepare and implement a habitat/soil removal and reinstatement plan**

Reinstatement Management Plan has been elaborated by DE, in April 2015 which includes habitat removal, soil and erosion management and habitat restoration. The Plan sets out the minimum requirements for such activities, and details how reinstatement activities should be carried out. The reinstatement plan includes 5 years post construction monitoring, along with remediation actions if unsuccessful. The Plan will be updated to address the comments provided by EBRD. The following aspects and measures will be added/included as a minimum in the Plan:

##### *Soil reinstatement and habitat restoration/biorestoration*

Soils will be reinstated after construction in the temporary sites (workforce accommodation camps, storage yards, access roads). Soil reinstatement will be carried out to ensure the topsoil is returned to the surface in line with international standards and best practice. Following top soil reinstatement, erosion control measures will be implemented on steep slopes. This may take the form of either the use of a nursery crop or the use of biodegradable erosion control geotextile blankets. Post-project restoration of any damaged natural habitats will be implemented to ensure no net loss in long-term.

On small unforested areas, it is expected that the vegetation will gradually establish on its own on the reinstated top soils as most plants will regenerate from the seed bank in the top soil. However, approximately natural woodland areas that are likely to be affected by the Project temporarily will be replanted immediately after construction to prevent soil erosion. Additionally, forestry offset programme will be implemented for compensation of GHGs associated with the Project over its lifecycle through a carbon sink in the Project’s catchment area. Only native species will be used in any planting taking place on or off site.

The overall objectives of bio-restoration are to:

- Restore the ecological characteristics and in particular the variety and distribution pattern of plant species; and
- Achieve sufficient vegetation cover to reduce erosion through restoration of the local plant community.

Bio-restoration of the Project area and temporary facilities will be undertaken to meet the following requirements:

- Non-agricultural areas - the long-term cover shall be the native flora. The biorestoration strategy is based on supplementing the seed bank of species remaining in the preserved topsoil with equivalent materials (seeds, bulbs, and plants) re-planted

after removal from project areas before construction disturbance and/or from suppliers.

- 100% of tree and shrub species planted reflecting original vegetation composition in terms of both major species and roughly equivalent proportion.
- 100% of trees and shrubs replaced upon death of trees and shrubs.

Bio-restoration of permanent facilities (i.e. in project areas with permanent surface development) will not be possible and these areas will be subject to landscaping. The Pre-Construction Survey provided Site-specific data that will be used to develop specific Methods Statements for biore restoration activities. These Method Statements will include the following information, as necessary:

- Plant/tree specification;
- Methodology for planting;
- Aftercare.

Restoration of non-agricultural land will be undertaken taking three types of plant community into consideration as follows:

- Habitats;
- Interim species; and
- Species specific, including rare species.

In non-agricultural areas the long-term cover shall be the native flora. The biore restoration strategy is based on supplementing the seed bank of species remaining in the preserved topsoil with equivalent materials (seeds, bulbs, and plants) from suppliers and/or re-planted after removal from project areas before construction disturbance.

In non-agricultural areas the following biore restoration objective has been set:

“A minimum of 70% cover of ground vegetation to be established within one year of planting. ‘Established’ means showing an initial healthy growth that would be expected for the particular species. Where the original cover is less than 70% the requirement shall be 70% of the original cover.”

It may also be necessary to plant grass seed on highly erodible slopes, or alpine species where the land is unsuited to grass.

The underlying premise is that achievement of the above objective will minimize surface erosion and provide a sustainable, self-generating plant community under most conditions.

Rates of vegetation growth depend on soil, slope and climatic conditions. The re-growth target will be reduced to 50% ground cover (or <50% of the original cover where original cover <70%) in the first year and 70% in the second year in the following circumstances:

- Less than 50% of average rainfall is received in the first year of biore restoration;
- Natural flooding occurs during the first year of biore restoration;
- The slope is greater than or equal to 25%.

In instances where trees and shrubs are grown in nurseries for re-planting, the survival rate objective is 75%. All failed trees will be replaced and further corrective action such as watering, application of fertilizer etc. will be taken as necessary to meet the stated biore restoration requirements. Original percentage cover will be estimated from the Pre-Construction Survey record of the route, or in case of doubt, by reference to adjacent undisturbed areas.

The objective will be to re-establish vegetation cover consistent with the following features:

- The species originally found in each route section or project area;
- Other species (for example, fast growth types) which are suited to the local environment and indigenous to the region;
- An ecologically compatible mixture of those two groups.

Bio-restoration will be undertaken to achieve the following composition of vegetative cover, following reinstatement:

- The species originally found in each route section or project area (with the species in their original proportions, taking into account the expected growth rates of individual species); or
- Other species (for example, fast growth types) which are suited to the local environment and indigenous to the region; or
- An ecologically compatible mixture of those two groups.

DE will be responsible for the choice of plant species and form of materials for each project area; the choice will be based on the objectives (detailed above), and DE Pre-construction Survey records.

Where rapid growth is necessary for erosion control or other reasons, the species selected for initial planting will have the following properties:

- Dense, fibrous horizontal root structure close to the surface;
- Dense uniform ground cover, particularly during the season of the most intense rainfalls;
- Resistant to damage by high-velocity run-off;
- Resistant to damage from trampling by people and animals;
- Not persistent – will allow the original species to re-colonize the area;
- If possible, not clumpy or tussocky as this may lead to concentration of run-off between the plants.

The species selected for long-term growth shall reflect the variety and distribution pattern of the pre-construction flora. As far as possible the vegetation replanted on the Project area will reflect the original species composition. To the extent practical, and as provided in ESIA that imposes some constraints on planting procedures.

In order to ensure habitat continuity across the Project area, and to minimize landscape impacts, DE will retain, whenever possible, mature trees and regenerating trees on the Project corridor. This was defined during the Pre-Construction Survey. Precise details of the numbers and species of trees to be planted at each site along the Project area has to be provided by DE, which will be supplemented by the information presented in the Pre-construction Survey.

The data generated from the Pre-construction Survey will be used to supplement an assessment of the quantities of each species required for replanting. After completion of the Pre-construction Survey a detailed categorization of habitats along the Project area was undertaken and specific reinstatement measures for each category will be described in updated Reinstatement Plan Prepared by DE in April 2015.

#### **Action A1.5: Long-term monitoring of reinstated habitats and translocated plants**

The reinstated habitats and any translocated plants will be monitored annually for 5 years to ensure successful establishment. Scientists from the respective scientific institutions and



Consultings contracted by DE will undertake the post-construction monitoring of the reinstated habitats and any translocated plants within the Project corridor. A report will be prepared after each monitoring visit and recommendations on any remediation measures required will be provided, should the habitats not recover satisfactorily.

**Action A1.6: Long-term monitoring of high and medium conservation value habitats with particular attention to the areas removed from the Kazbegi National Park**

DE will conduct semiannual monitoring in order to reassess habitats identified in earlier reports, with particular attention to the areas removed from the Kazbegi National Park and to high and medium conservation value habitats identified in the previous surveys.

**Action A1.7: Possible monitoring to further document conservation value of compensation areas in Kazbegi National Park**

DE will consult Agency of Protected Areas to determine if they believe that any further survey of these areas could be valuable to further document the conservation value and/or to verify there has been no change since the original surveys of compensation areas in Kazbegi National Park.

**Objective A2: Replant affected forest and enhance forest habitat within the Study Area**

**Action A2.1: Forest habitat creation and enhancement within the Study Area**

Reinstatement of any forest habitat affected temporarily during construction will be undertaken. Habitat creation is an important component in mitigation of the overall impacts of the Project on biodiversity.

**Action in Addition to Terrestrial BAP A2.1: Pilot programme to deliver a carbon neutral and sustainable hydropower project in Georgia in the context of Forest Offset programme**

The planning effort of this Project is being funded by EBRD, thus all activities supported by the project has to be separated from Terrestrial BAP. It is recommended that efforts to be coordinated since they can be complementary in nature and there may be synergies between the two projects at planning and implementation stages.

Below is provided context of forest offset programme that has to be implemented by DE as the habitat creation is an important component in offsetting the overall impacts of the Project on biodiversity.

EBRD initiated a discussion with DE on the opportunity to include a reforestation component into the hydropower project: Dariali Energy has committed to cover on a voluntary basis the expenses associated with the implementation of such a component, with the following targets:

- The localised compensation of GHGs associated with the Project over its lifecycle (construction and operation), through a carbon sink (capture of carbon in vegetation) in the Project's catchment area;
- The restoration and enhancement of biodiversity in an area that has been highly deforested in the past;
- The restoration of soils and erosion control through the selection of areas to be reforested also in view of climate change adaptation and building resilience; and
- The creation of local jobs and socioeconomic opportunities associated with both timber and non-timber forest products.

The proposed pilot program is designed to meet the objectives of EBRD's Environmental and Social Policy (2014), Energy Sector Strategy (2013), Strategy for Georgia (2013) and of the Sustainable Energy Initiative & The Sustainable Resource Initiative.

### 7.3 Action Plan for Protected and Threatened Terrestrial Mammal and Reptile Species

#### 7.3.1 Current Status

- Kazbegi Birch Mouse ( *Sicista kazbegica* ) listed as Vulnerable in the red list of Georgia Home range of the species lies within the area Visitor.
- Long-Clawed Mole-Vole ( *Prometheomys Schaposchnikovi* ) - listed as Vulnerable in the red list of Georgia.
- Grey Hamster ( *Cricetulus migratorius* ) listed as Vulnerable in the red list of Georgia Home range of the species lies within the area.
- East Caucasian Tur ( *Capra cylindricornis* ) listed as Vulnerable in the red list of Georgia Occurrence within the project area is confirmed by Direct observations,
- Chamois ( *Rupicapra rupicapra* ) listed as endangered in the red list of Georgia. Home range of the species lies within the project area
- Dinnik's viper Caucasus subalpine viper ( *Vipera dinniki* ) listed as Vulnerable in the red list of Georgia Occurrence within the project area is confirmed by Direct observations.
- Lynx - *Lynx lynx*<sup>2</sup> listed as Vulnerable in the red list of Georgia Occurrence within the project area is not confirmed by Direct observations.
- Brown bear - *Ursus arctos arctos* listed as Vulnerable in the red list of Georgia Occurrence within the project area is not confirmed by Direct observations.
- Otter - *Lutra lutra* - is in the red list of Georgia Occurrence within the project area is not confirmed by Direct observations.

#### 7.3.2 Current Factors affecting the Protected and Threatened Mammals and Reptiles

The protected terrestrial mammals listed above are affected by forest habitat loss, degradation and fragmentation, which are caused by illegal tree felling and developments.

There is a strong hunting culture in Georgia and the large mammals are threatened as a result of this. Especially this concerns to the East Caucasian Tur.

#### 7.3.3 Current Actions in Georgia

Fauna and Flora International (FFI) has worked on the conservation of carnivores in Georgia since 2004 ([www.fauna-flora.org](http://www.fauna-flora.org)). FFI and the Centre for Biodiversity Conservation and Research (NACRES) are working on the Georgian Carnivore Conservation Project (EU funded) and are addressing the threats on carnivorous mammals by improving law enforcement,

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<sup>2</sup>Mentioning of the lynx, Brown bear and Otter with reference of the Project impact area is based only on published literature materials, by the interview with locals lynx was seen last in 1960, and Brown bear and Otter in 1975, Since no survey expedition could confirm Presence of those species in the region, let alone the territories, within the range of the Project impact area, and it was expected, as habitats of those species year by year had been undergoing of big anthropogenic load and had changed substantially. For these reasons, no mitigation measures is envisaged in reference of those species.

biological monitoring and raising awareness. With the exception of large carnivores, there are no specific conservation actions for the other species outside the protected areas.

### 7.3.4 Action Plan Objectives and Actions

#### **Action B.1: Active control of hunting and poaching ban, mitigation status- avoidance**

All construction and operation staff will be required to follow company rules and code of conduct. To ensure the national legislation prohibiting hunting and poaching of protected species is not breached; additional measures will be implemented to protect the mammals and reptiles within the Project area and surroundings. All staff of construction and service organizations will be under an obligation not to undertake poaching or hunting throughout the whole area of the development.

A key responsibility of the DE Environmental Manager and Construction Contractor Environmental Officer shall be enforcement of the hunting ban and raising awareness about the conservation importance of mammals and the national law protecting them (see Action B1.1). Any member of staff (DE or Contractor) found in violation of the hunting ban will be subject to company disciplinary action, in addition to the fine under the national law.

### 7.4 Action Plan for Protected and Threatened Bird Species

#### 7.4.1 Current Status

The following species of national conservation importance are present in the Study Area:

##### **Regular migrants**

- Long-legged Buzzard (*Buteo rufinus*)-listed as vulnerable in the red list of Georgia (RLG)
- Rough-legged Buzzard (*Buteo lagopus*)-Vulnerable by RLG
- Imperial Eagle (*Aquila heliaca*) - Vulnerable by RLG
- Common Crane (*Grus grus*)- Endangered by RLG, occurrence confirmed by direct observation
- Sacker (*Falco cherrug*) - Critically endangered by RLG
- Red-footed Falcon (*Falco vespertinus*) Endangered by RLG
- Lesser Kestrel (*Falco naumanni*) Critically endangered by RLG
- Levant Sparrow hawk (*Accipiter brevipes*) Vulnerable by RLG

##### **Rere migrant**

- Greater Spotted Eagle (*Aquila clanga*) Vulnerable by RLG
- Golden Eagle (*Aquila chrysaetos*) Vulnerable by RLG - seasonal vertical movements

##### **Rare visitors**

- Egyptian Vulture (*Neophron percnopterus*) Vulnerable by RLG
- Cinereous Vulture (*Aegypius monachus*) Endangered by RLG

##### **Year round visitors**

- Bearded Vulture (*Gypaetus barbatus*) Vulnerable by RLG. occurrence confirmed by direct observation Nest observed
- Eurasian Griffon (*Gyps fulvus*) Vulnerable by RLG
- Great Rosefinch (*Carpodacus rubicilla*) Vulnerable by RLG Above 2500 masl
- Guldenstadt's Redstart (*Phoenicurus erythrogastus*)Vulnerable by RLG Above 2500 masl

- Caucasian Black Grouse (*Tetrao mlokosiewiczi*) Vulnerable by RLG

#### 7.4.2 Current Factors Affecting the Birds of Conservation Concern in the Study Area

The factors affecting the raptor species include hunting, habitat loss/degradation, fragmentation and climate change.

Wildfowl species are affected by hunting, degradation and decrease of the areas of wetland habitats, water abstraction and pollution of the freshwater.

#### 7.4.3 Current Actions

There have been surveys and monitoring programmes for the raptor species in other regions of Georgia, but there have been no concrete conservation actions for these species in the Study Area.

#### 7.4.4 Action Plan Objectives and Actions

##### Objective C1: Protect bird species during operation phase

**Table 10.** Vulnerable bird species under the special attention within the project area

Species	Period
Bearded Vulture ( <i>Gypaetus barbatus</i> ) Nest observed	February-March
Eurasian Griffon ( <i>Gyps fulvus</i> )	March – July
Great Rosefinch ( <i>Carpodacus rubicilla</i> )	June-July
Guldenstadt's Redstart ( <i>Phoenicurus erythrogastrus</i> )	March-June
Caucasian Black Grouse ( <i>Tetrao mlokosiewiczi</i> )	April- July

##### Action C1.1.: Implement ban on bird hunting and raise awareness

All construction and operation staff will be required to follow company rules and code of conduct. Any staff member breaching the bird and mammal hunting ban will be subject to disciplinary action by DE.

##### Objective C2: Provide compensation and increase understanding of priority bird species in the Study Area

##### Action C2.1: Provide artificial nesting opportunities for priority bird species

Reforestation activities and compensatory forest planting will be undertaken, to mitigate forest habitat loss due to construction, which is highly suitable habitat for nesting birds, as explained under Action A2.1. In addition, to compensate for this loss of habitat for breeding birds, bird boxes will be installed.

## 8. BAP Implementation, Monitoring and Reporting

### 8.1 Implementation of the Dariali HPP BAP

The Section 7 present what actions will be implemented. Additional information on the implementation and coordination of the BAP is provided in this section.

Before the start of construction, DE has committed for implementing the BAP and the associated ecological mitigation and monitoring measures as outlined in the Dariali HPP EMP.

DE commits to ensure an effective implementation of the protection and enhancement of biodiversity during construction of the Project. The responsibilities of the respective staff of DE include but are not limited to:

- To inform, explain and where necessary enforce the biodiversity legislation, policies and lender requirements associated with the Project.
- To undertake patrols across the Project area and oversee and provide guidance on activities which may affect the biodiversity features within the Project area.
- To undertake and arrange for the clear demarcation and signage which may prohibit entry to ecologically sensitive areas.
- To provide advice to contractors regarding the ecological sensitivities within the Project area, and if necessary supervise contractors to ensure that they adhere to environmental requirements to avoid or minimise disturbance to habitats, flora and fauna.

DE respective staff persons are responsible for the implementation of the BAP and the measures in the EMP.

## **8.2 Monitoring & Assessment**

### **8.2.1 Overview**

One of the most important factor for a successful implementation of the BAP is a continuous monitoring of its actions and assessment of their efficiency in meeting the BAP objectives. These monitoring activities need to be implemented during construction, post construction and operation phases of the Project. This section deals with the monitoring and evaluation of the BAP actions.

### **8.2.2 Operation Phase Monitoring**

The BAP includes a 5 year post-construction monitoring of the following receptors:

Water - water quality/depth and flow;

Aquatic Environment, its' biota - otters and reinstated or created habitat and abiota<sup>3</sup>;

Terrestrial Environment- reinstated or created habitats.

Additional monitoring will be to check for evidence of bird collision and electrocution following the construction of the new power lines.

### **8.2.3 Reporting**

The reporting requirements during construction are detailed in the Dariali HPP EMSM (Environmental Management System Manual) and EMP (and Ecological Management Plan).

The Contractors will have internal reporting responsibilities, which will include reporting the daily site inspections in the site diary; using the inspection checklist to report weekly site inspections; and prepare monthly HSE reports to DE.

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<sup>3</sup>Non-living factors which are present in and affect the characteristics of a given ecosystem.

DE will be responsible for the following reporting HSE requirements: non-compliance incidents, corrective actions, weekly inspection reports and checklists, and three Quarterly audits. DE will also report externally on the compliance with the ecological mitigation and the BAP implementation to the financing parties and regulatory bodies.

Annual post-construction monitoring reports and reports on the BAP implementation will be prepared. If evidence suggests a decline in the ecological conditions relating to the construction and operational activities of the Project then intervention and further measures will be identified and implemented.

## **9. Biodiversity Monitoring and Evaluation Program**

### **9.1 Aim and Objectives**

As mentioned above, the Project is unlikely to have any significant residual adverse impacts on the trigger features of sensitive habitat and therefore no biodiversity offsets are required. Nevertheless, EBRD PR6 requires that for projects located in sensitive habitat (irrespective of impacts), a Biodiversity Monitoring and Evaluation Programme (BMEP) is prepared and integrated into the client's management programme.

The BMEP outlined in this section covers the whole of the Study Area rather than Project sites only. The BMEP will be fully integrated into the Project's ESMP.

The aim of this BMEP is to monitor the nature, extent, quality and spacial configuration of the habitats in the Tergi River Basin (TRB) in relation to Project impacts and human activities. It is well recognized that habitat loss, destruction and fragmentation are the main cause of biodiversity loss. Given that the nature, extent and configuration of the habitats reflect the level of biodiversity they support, the proposed monitoring in this BMEP will provide a rapid and cost-effective way of detecting any significant changes in the biodiversity of the Study Area. It is impossible to measure all biodiversity aspects on a site. Any monitoring programme should focus on key biodiversity elements and source of threats for these elements. This BMEP will focus on monitoring trends rather than measuring biodiversity values. To distinguish between Project-related impacts and changes caused by human activities, a number of socio-economic factors will be also included in this monitoring.

The objectives of this BMEP are to:

- Mapping and delineation of sensitive areas that will be considered “no-go zones” for construction traffic;
- Undertake long-term monitoring to detect any significant changes in the nature, extent, quality and configuration of the habitats;
- Analyze data and identify the reasons for any significant changes in consultation with specialists, local communities and other stakeholders; and
- Develop and implement measures to mitigate for any significant changes, in consultation with specialists, local communities and other stakeholders.

### **9.2 Monitoring Indicators**

Biodiversity monitoring indicators need to be realistic, simple, sensitive to anthropogenic impacts, dynamic (responsive to ongoing changes), meaningful, and cost-effective to monitor. The monitoring as part of this BMEP will be undertaken at several levels: landscape, ecosystem, and species/population.

### 9.2.1 Landscape Level

- Change in the extent of each type of natural habitat
- Change in the spatial arrangement of habitats (habitat horizontal structure or patterns)

The nature and spatial arrangement of habitats and plant communities (vegetation patterns or vegetation horizontal structure) are important as they influence many ecological processes, such as the movement of matter and energy and the spread and extent of disturbance. The term 'landscape structure' is used to describe the composition and spatial configuration of vegetation patches within an area. Landscape structure is quantified by the means of landscape indices (metrics) e.g. patch richness, patch density, edge density, patch shape complexity, patch connectivity and fragmentation.

As there is a close relationship between landscape structure and biodiversity, landscape structure indices can be used to assess/predict biodiversity at ecosystem and species levels. In addition, landscape structure influences the factors and processes (e.g. competition, dispersal ability and environmental conditions) that determine plant diversity and distribution.

### 9.2.2 Ecosystem Level

The indicator to be monitored at this level will be the change in habitat quality or health. Monitoring methodology is provided below.

### 9.2.3 Species/Population Level

The focus should be on undertaking population studies on large carnivores, reptiles amphibians and fishes as the area is known to support a number of protected and threatened species, in particular:

- Fox
- Badger
- Stone Marten
- East-Caucasian tur
- Chamois
- Long legged Wood Frog
- Kazbeg Birch Mouse
- Long-Clawed Mole-Vole
- Dinnik's Viper
- Caucasian Rock Lizard everywhere,
- Daghestanian Rock Lizard
- Common Crane
- Bearded Vulture

## 9.3 Monitoring Methodology

### 9.3.1 Habitat Ground Truthing

Habitat type will be recorded in the field using a simple habitat classification that mostly used. Based on the preliminary habitat classification undertaken for the Dariali HPP Project ( Expert Advice on Terrestrial Biodiversity Conservation, Land Take and Compensation Report) for some parts of the Study Area, these are the habitat types known to occur there:

Sensitive habitats are marked with asterisk [\*]:

- 3220 Alpine rivers and the herbaceous vegetation along their banks
- 4060 Alpine and boreal heaths
- 50GE1 mountain xerophytic scrubs
- 50GE3 Tragacanthic scrub
- 61GE01 Sub-alpine high herbaceous vegetation
- 61GE02 Sub-alpine meadows
- 6150 Siliceous alpine and boreal grasslands
- 62GE04 Vegetation of urban and rural areas
- 62GE05 Vegetation of pastures
- 70GE02\* Low grass marshes
- 8110 Siliceous scree of the montane to snow levels
- 8220 Siliceous rocky slopes with chasmophytic vegetation
- 8310\* Caves
- 8340\* Rock and true glaciers
- 91PK-GE Caucasian Pine forest (*Pinus kochiana*)
- 9BF-GE\* Subalpine birch krummholz (*Betula litwinowii*)

### 9.3.2 Habitat Quality

The monitoring of habitat quality will need to be undertaken by specialists as this requires some botanical skills. At the very least the dominant plant species will be recorded at each sample site, along with species listed on the IUCN, Georgia red lists, and endemic species (Any non-native and invasive species will be also recorded). The relative abundance of the plant species and the substrate will be recorded in each area. Relative abundance, for example using the DAFOR scale (D=dominant, A=abundant, F=frequent, O=occasional, R=rare), is less time consuming than recording the percentage cover.

Plant species will be identified in the field or subsequently using detailed photographs or samples collected in the field.

The following habitat condition (health or quality) information will be recorded on standard recording forms (to be developed) for each monitoring site:

- Habitat boundaries and extent: habitat types and their boundaries will be confirmed or defined in the field using the preliminary habitat classification prepared by interpretation of satellite imagery. The actual habitat areas will be calculated in GIS after field surveys;
- Habitat structure: e.g. water depth and width, bank height and slope, vegetation cover and height, vegetation layers in woodland, percentage of bare soil or open water;
- Vegetation: record dominant plant species in each habitat;
- Protected, threatened, endemic, rare and other notable species: presence or potential presence and relative abundance (DAFOR);
- Non-native invasive species and undesirable native species: species name and relative abundance (DAFOR) to be recorded;
- Environmental disturbance: e.g. artificial barriers, pollution, overgrazing, timber extraction, trampling, drainage, burning, fishing;
- Management recommendations: e.g. reducing grazing level, reducing fishing pressure, invasive species control.

### 9.3.3 Monitoring of Populations Size for Threatened Species of Mammals and Reptiles



Given the difficulty of sighting the threatened mammals in the wild, secondary indicators such as field signs will have to be used. Additionally, live traps (for small mammals) should be considered in the monitoring (see chapter: Methods of observation and counts of animals for details).

For reptiles, the use of artificial refugia is highly recommended as this method will collect more objective data on the population size, demographics and species distribution.

#### **9.4 Monitoring Timescale and Reporting**

New high-resolution satellite imagery will be obtained every two years and will be interpreted to produce a habitat classification and map. DE will obtain the new satellite imagery in 2014 and will sponsor the preparation of the baseline habitat classification/map and analysis. After this, the field ground truthing for habitats and monitoring of habitat condition will start in 2014 and will be repeated every year (the same year with the satellite imagery) until 2019.

One interim report will be prepared two years to include all sets of data, analysis, conclusions and recommendations for management interventions. A final report including a more detailed analysis of trends will be prepared in 2019.

#### **9.5 Evaluation**

This monitoring will be periodically evaluated to determine its effectiveness and meeting of the objectives, and identify any necessary remediation.

The findings of the above monitoring program will be evaluated every year and the outcomes will be used to adapt the management and ongoing mitigation measures. The evaluation will be undertaken by the respective specialists/experts from academic institutions in Georgia.

Management interventions will need to be identified when there is a negative trend in the areas of natural habitat and/or the connectivity of the habitats. The threshold for interventions will be when the area of any natural habitat has decreased by more than 5%. The outcome of the evaluation and any management interventions required will be fed to the relevant managers and land owners.