Biodiversity Action Plan for the Operation Phase of the 184 MW Shuakhevi Hydropower Project, Republic of Adjara, Georgia.

Shuakhavi Hydropower

Final Report

09 September 2021

Project No.: 0416400

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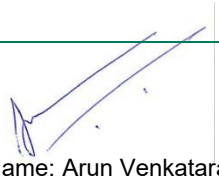

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Acronyms and Abbreviations

Name	Description
ACSR	Aluminium Conductor Steel-Reinforced
AEWA	African-Eurasian Waterbird Agreement
AFF	Association for Fauna and Flora
AGL	Adjaristsqali Georgia LLC
BAP	Biodiversity Action Plan
CH	Critical Habitat
CEPF	Critical Ecosystem Partnership Fund
DMU	Discrete Management Unit
EBRD	European Bank for Reconstruction and Development
ECM	Environmental Compliance Manager
EPC	Engineering, Procurement, and Construction
ESP	Environment and Social Policy
EU	European Union
GoG	Government of Georgia
IFC	International Finance Corporation
ha	Hectares
HPP	Hydropower Project
HSE	Health, Safety and Environment
IBA	Important Bird Area
kV	Kilovolt
KBA	Key Biodiversity Area
LFMS	Low Flow Mitigation Strategy
MW	Megawatt
msl	Mean Sea Level
OHL	Overhead Line
OMMMP	Operation Mitigation, Management and Monitoring Plan
PS	Performance Standard
PR	Performance Requirement
RBMP	River Basin Management Plan
WFD	EU Water Framework Directive

1. BACKGROUND

1.1 Scope of Operational Phase Bap

A Biodiversity Action Plan (BAP) is a plan which includes a set of actions that lead to the conservation or enhancement of biodiversity for a specific site or project.

The scope of Shuakhavi Hydropower Operational Phase BAP is required to ensure that the Project:-

- Implements the mitigation, compensation and biodiversity offsetting measures within the Adjaristsqali Hydropower ESIA (Mott Mac Donald,2012b,c, 2013a, 2016);
- Complies with AGL's Environmental and Social Policy (AGL,2012);
- Complies with national legislation/policy requirements of Georgia; and
- Complies with international environmental requirements and best practice, including European Bank for Reconstruction and Development (EBRD) Performance Requirement 6, Asian Development Bank (ADB) Safeguard Requirement 1: Environment, International Finance Corporation (IFC) Performance Standard 6 (PS-6) and Equator Principles.

The BAP for the operational phase will guide BAP implementation from the end of the construction phase across the rest of the project life cycle.

1.2 Project Description

1.2.1 Shuakhevi Hydro Electric Project (from EIA and BAP)

The total installed capacity of the Project is 184 MW. The project has two dams with reservoirs on the Adjaristsqali and Skhalta Rivers and one weir on the Chirukhistsqali River. River water will be diverted through tunnels from the abstraction points on the Skhalta and Chirukhistsqali Rivers into the Didachara reservoir on the Adjaristsqali River. From here it will be sent through a headrace tunnel to the Shuakhevi HPP. A small-capacity HPP (9MW) has been constructed at Skhalta, utilizing the water being transferred from the Chirukhistsqali River, while the main power unit (Shuakhevi HPP) is constructed on the right bank of the Adjaristsqali River near Shuakhevi village and the confluence of the Adjaristsqali and Chirukhistsqali Rivers.

The generated electricity will be primarily sold on the energy markets of Turkey or other countries and supplied to the Georgian energy system during the winter. The Project is a peaking plant designed to operate at maximum capacity during the periods of high electricity demand, when there are high prices in Turkey (electricity prices vary depending on the time of day). As there are two small reservoirs to enable daily storage of water the scheme will operate to full capacity at chosen times of the day to meet peak demand.

1.2.2 35 KV Transmission line (from ESIA New Metal Georgia)

The project implementation is in the Adjara region, in the territories of the Shuakhevi and Khulo municipalities. Construction involves part of the valley of the river Skhalta – from the village of Tsablana to the bridge of the Furtio on the Adjaristskali River and part of the Adjaristskali valley, to the dam of the Shuakhevi hydro power plant.

The Skhalta-Shuakhevi 35 kV overhead transmission line (OHL) is a 24 km long, single conductor with a 24 fibre Optical Ground Wire (OPGW). The OHL has been built under the framework of the Adjaristsqali Hydro Power Cascades to allow Skhalta power evacuation into the Georgian 220 kV transmission network. The line extends across the Shuakhevi and Khulo Municipalities of Adjara Autonomous Region of Georgia.

The OHL has been constructed with 35 kV class steel towers on appropriate foundations and 110 kV class steel towers in difficult geographic locations to maintain electrical clearances. The OHL has 133 towers. The OHL uses ACSR conductors of adequate capacity insulated with composite ceramic insulators to carry generated power on a continuous basis. An optical ground wire with 24 fibres with accessories was strung to ensure telecommunication and protection of the line. Trees in the tower location were cleared and those in the servitude area were trimmed to maintain clearances between the tree top and the OHL. Around 38 ha of forest was trimmed and 0.23 hectares cleared out of 96 ha land required for the project. The forest clearing was optimised and executed with necessary approvals and mitigation measures. Out of 5000 affected trees, 7% were cut down and others trimmed to maintain adequate clearances with focus on the forest ecosystems. A major section of the line follows the Adjaristskali River and its tributaries, the Skhlata River and the Chirukistsqali River. The line was built under the framework of the Adjaristsqali Hydro Power Cascades (Shuakhevi with capacity 178 MW and Skhalta with capacity of 9 MW) and allows Skhalta power evacuation into the Georgian 220 kV transmission network. Surplus power will be exported to Turkey or other countries that are connected to the transmission network after meeting the requirements to eliminate energy deficit in Georgian network during winter- time.

1.2.3 Study Area/DMU for Ecological Baseline and Biodiversity Action Plan

The Project is within the territory of the Autonomous Republic Adjara, which is located in the south-west part of Georgia, on the Black Sea coast. Five administrative units (municipalities) are included in Adjara, namely: Kobuleti, Keda, Shuakhevi, Khulo and Khelvachauri. The Project infrastructure is located in the municipalities of Khulo and Shuakhevi.

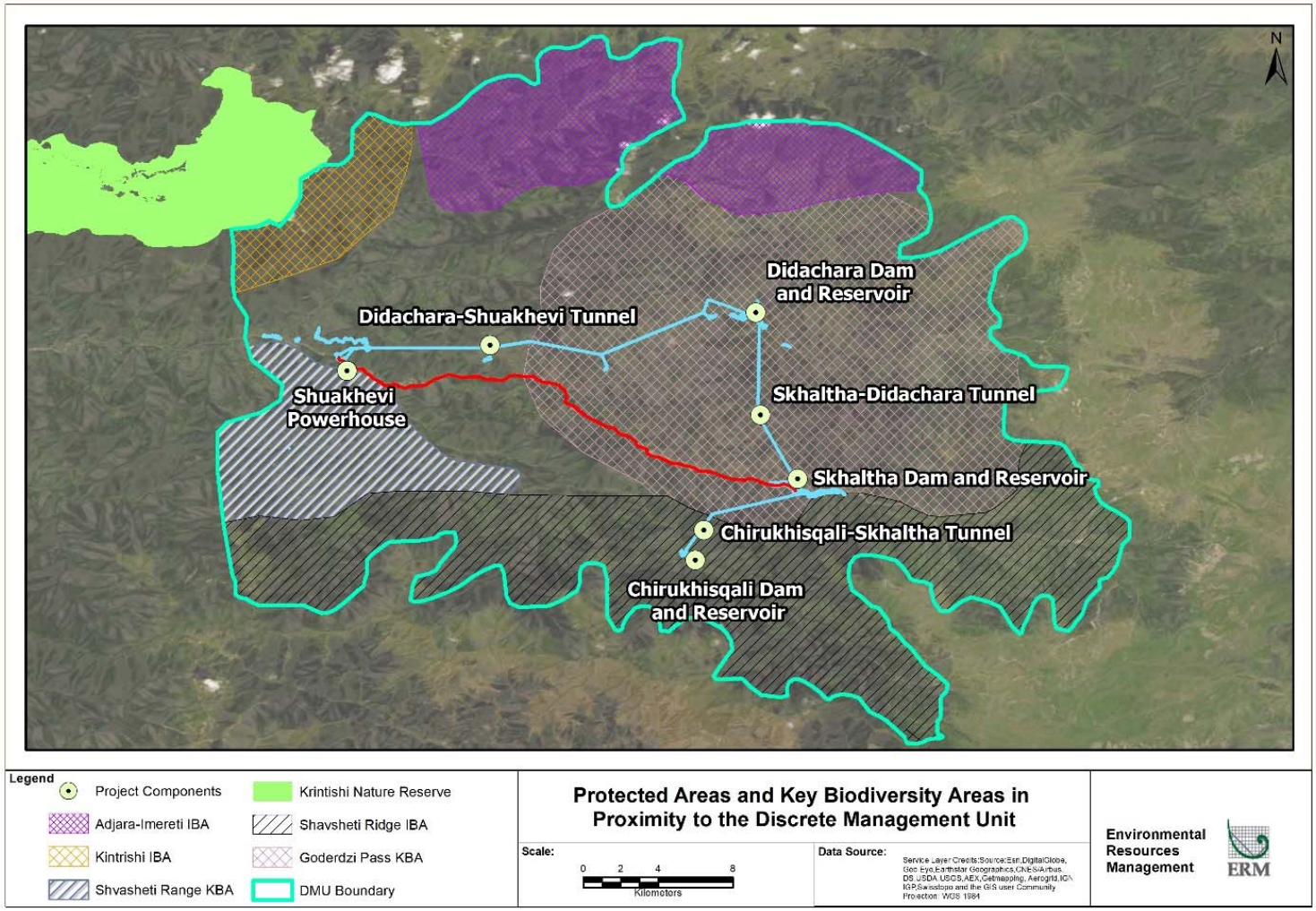
The BAP for the upper part of the Adjaristsqali River Basin (upstream of Dandalo Bridge), excludes the sub-alpine and alpine zones and includes:

- Coastal mountainous hills in Adjara Coastal District: deciduous mixed forest (400-1100 msl) and beech forest (800/1100-1300/1600 msl)
- Lower gorges in Adjara Inner Mountainous District: oak forest (300-800 msl) and mixed coniferous deciduous forest (800-1500 msl)
- Mid mountains in Adjara Inner Mountainous District: coniferous forests (900/1500-2100 msl)

The BAP Study Area is considered to represent a Discreet Management Unit (DMU), in line with IFC Guidance Note 6 (IFC, 2012b).

The BAP Study Area (832.64 km^2 or 83,264 ha) is shown in *Error! Reference source not found.* along with the project components and nature conservation areas within and near the Study Area.

Figure 1-1 Study Area/DMU for Ecological Baseline and Biodiversity Action Plan



Source: ERM (2020)

1.3 Ecological Landscape

An **ecoregion** (**ecological region**) is an ecologically and geographically defined area that is smaller than a bioregion, which in turn is smaller than an ecozone. An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterize that region. Ecoregions are areas within which there is spatial coincidence in characteristics of geographical phenomena associated with differences in the quality, health, and integrity of ecosystems (Olson and Dinerstein 1998).

A biodiversity hotspot is a biogeographic region that is both a significant reservoir of biodiversity and is threatened with destruction. The term biodiversity hotspot specifically refers to 25 biologically rich areas around the world that have lost at least 70 percent of their original habitat (Myers *et al* 2000)

Caucasus Ecoregion

The Caucasus is one of the world's biologically richest yet most threatened areas. The forests, high mountain ecosystems and arid landscapes contain more than twice the animal diversity found in adjacent regions of Europe and Asia. The Caucasus area covers territory in Georgia, Armenia, Azerbaijan, Russia, Turkey and Iran. Within this region, The Critical Ecosystem Partnership Fund (CEPF)[1] is interested in supporting initiatives in 5 target conservation corridors: Greater Caucasus, Caspian, West Lesser Caucasus, East Lesser Caucasus and Hyrcan. The project site is located in Caucasus Ecoregion as depicted in ***Figure 1-2***

Figure 1-2 Caucasus Ecoregion

Source: WWF (2006) An Ecoregional Conservation Plan for the Caucasus (http://caucasus-naturefund.org/wp-content/uploads/2012/10/Caucasus-Ecoregion.jpg) *Caucasus-Global Biodiversity Hotspot*

[1]CEPF is a joint initiative of l'Agence Française de Développement, Conservation International, the European Union, the Global Environment Facility, the Government of Japan, the MacArthur Foundation and the World Bank.

The Caucasus hotspot, historically interpreted as the isthmus between the Black and Caspian seas, covers a total area of 580,000 km^2, including the nations of Armenia, Azerbaijan and Georgia, the North Caucasus portion of the Russian Federation, north-eastern Turkey and part of north-western Iran.

One of the most biologically rich regions on Earth, the Caucasus is among the planet's 25 most diverse and endangered hotspots.

The Caucasus is one of WWF's Global 200 Ecoregions, identified as globally outstanding for biodiversity. The Caucasus has also been named a large herbivore hotspot by WWF's Large Herbivore Initiative. Eleven species of large herbivores, as well as five large carnivores, are found over a relatively small area. The 2002 IUCN Red List identifies 50 species of globally threatened animals and one plant in the Caucasus. Among the IUCN species, 18 have restricted ranges or are endemics. The Caucasus Mountains harbour a wealth of highly sought-after medicinal and decorative plants, as well as unique relic and endemic plant communities.

Located at a biological crossroads, species from Central and Northern Europe, Central Asia, the Middle East and North Africa mingle here with endemics found nowhere else. High levels of landscape diversity in the Caucasus are largely the result of temporal-spatial variability in the region. The unique geology and terrain, consisting of three major mountain chains separated by valleys and plains, permit a variety of different microclimate, soil and
vegetation conditions, resulting in a broad range of landscapes and unusually high levels of species diversity for the Temperate Zone. Climatic conditions are very diverse, with precipitation ranging from more than 4,000 mm per year in the south-western Caucasus to less than 200 mm a year in deserts in the eastern Caucasus.

More than 6,500 species of vascular plants are found in the Caucasus. A quarter of these plants are found nowhere else on Earth - the highest level of endemism in the temperate world. At least 153 mammals inhabit the Caucasus; one-fifth of these are endemic to the region. As many as 400 species of birds are found in the Caucasus, four of which are endemic to this hotspot. The coasts of the Black and Caspian seas are important stop over sites for millions of migrating birds, which fly over the isthmus each spring and autumn between their summer and winter homes. Twenty-two of the 77 reptiles in the Caucasus are endemic to the region. Fourteen species of amphibians are found in the region, of which four are endemic. More than 200 species of fish are found in the rivers and seas of the region, more than a third of which are found nowhere else (Nugzar and Kandaurov 2006).

1.3.1 Centres for Endemism: The Colchic Region

The Colchis (Colchida, Kolkheti) is a part of West Georgia, situated between 41° to 45°N and 40° to 46°E. The Colchic Wetlands and Forests are on the Tentative List of World Heritage as per a proposal submitted by Georgia in 2007[2]. The Colhic Wetlands and Forest ecosystems were given a status of international importance under the Ramsar Convention in 1997[3].

The political and administrative perimeter of the Colchis corresponds with its natural borders (Kikvidze & Ohsava, 2001) [4]. From a botanical-geographical point of view, Colchis belongs to the Eastern Euxinian or Colchian Phytogeographic Province. This region from West Georgia slightly expands to Russia, in the territory of north-western part of the Caucasus (Tuapse-Novorosiysk) and to Turkey,

[2] https://whc.unesco.org/en/tentativelists/5223/

[3] https://whc.unesco.org/en/tentativelists/5223/

4 Kikvidze Z., Ohsava M., 2001. Richness of Colchic vegetation: comparison between refugia of south-western and East Asia. BMC Ecology, 116: 1-10.

within the north-eastern part of Anatolia (Albov, 1896 [5] ; Maleev, 1940 [6] ; Kolakowsky, 1961 [7] ; Manjavidze, 1967 [8] ; Kharadze, Gagnidze, 1970 [9] ; Gagnidze, 1974 [10] , 1999 [11] , 2002 [12]). Therefore, Colchis comprises an area, forming so called the Colchic Triangle"(Walter, 1968 [13] ; Kikvidze & Ohsawa, 2001 [14]). The central place of the most humid area is in the South Colchis within West Georgia's two provinces, Adjara and Guria. This is a narrow strip of coastal lowland between the estuaries of the rivers Tchorokhi and Rioni with considerably humid and warm-temperate climate. Within this region a maximum precipitation of 4500 mm occurs at Mt. Mtirala in Adjara. This is a record for the Caucasus Isthmus.

1.3.2 Proximity of Protected Areas to Area of Influence

There are several nature conservation areas within or near the Study Area: Kintrishi Nature Reserve and Important Bird and Biodiversity Area (IBA) and Key Biodiversity Area (KBA), and the Shavsheti Ridge IBA/KBA and Adjara-Imereti Ridge IBA/KBA. Brief descriptions of these sites are provided below.

1.3.2.1 Kintrishi State Nature Reserve

The Kintrishi State Nature Reserve (IUCN category Ia) was established in 1959 to protect relict forests (Chestnut and Beech communities with evergreen understorey) and Colchic flora and fauna. The nature reserve has an area of 10,703 ha plus a protected landscape of 3,190 ha around it, and is located adjacent to the BAP Study Area. Areas that meet the criteria of the IUCN's Protected Area Management Category Ia are likely to qualify as critical habitat (IFC, 2012b).

The Goderdzi Emerald Site

The Emerald Network is an ecological network made up of Areas of Special Conservation Interest Sites. Its implementation was launched by the Council of Europe as part of its work under the Bern Convention, with the adoption of Recommendation No. 16 (1989) of the Standing Committee to the Bern Convention. Countries assess their natural resources and identify species and habitats to be protected according to the relevant resolutions of the Bern Convention. The sites are initially proposed by individual countries to the Bern Convention's Secretariat for evaluation for ecological sufficiency. Those meeting criteria are classified as 'officially nominated Candidate Emerald sites' and endorsed by the Standing Committee of the Convention to the Convention on the Conservation of European Wildlife and Natural Habitats, before ultimately being re-classified as "officially adopted Emerald sites". Georgia joined the Bern Convention in 2009 and the establishment of the Emerald Network became an obligation under the EU-Georgia Association Agreement which was signed in 2014.

(5) Albov N., 1896. Essay of vegetation of Colchic. In: Zemlevedenie, I: 49-74 (in Russian).

(6) Maleev V.P., 1940. The vegetation of the Black Sea coastal countries in the Euxinean Province of Mediterranean region, its origin and connection. Trudy Botanicheskogo Instituta Akademii Nauk SSSR, Ser.-Geobotanica,

(7) Kolakowsky A.A., 1961. The flora and vegetation of Colchis. MOIP, otd. Bot, 10, XVIII, MGU, Moskva (in Russian).

(8) Mandjavidze D.V., 1967. A review of historical development of flora and vegetations of Ajaria in connection of geological past of Caucasus. In: Trudy Batumskogo Botan. Sada; Flora and Vegetation of Adjaria, 14:16-21 (in Russian).

(9) Kharadze A.L., Gagnidze R.I., 1970. Review of hemixerophilic endemic elements in the flora of the Novorossiysk sub-province of Caucasus. Not. Syst. Geogr. Inst. Bot. Tbilisi, 28: 56-82 (in Russian).

(10) Gagnidze R.I., 1974. Botanical and geographical analysis of the florocoenotic complex of tall herbaceous vegetation of the Caucasus. Metsniereba, Tbilisi (in Russian).

(11) Gagnidze R.I., 1999. Arealogical review of Colchic evergreen broad-leaved mesophyllous dendroflora species. In: Klötzli F., Walther G.-R. (Eds.): Conference of recent shifts in vegetation boundaries of deciduous forests, Forests especially due to general Global warming. Birkhäuser Verlag, Basel-Boston-Berlin. 199-216.

(12) Gagnidze R.I. et al, 2002. Endemic genera of the Caucasian flora. Feddes Repectorium, 113, 7-8: 616-630.

(13) Walter H., 1968. Die Vegetation der Erde. V.I. Progress, Moskva (translation in Russian).

(14) Kikvidze Z., Ohsava M., 2001. Richness of Colchic vegetation: comparison between refugia of south-western and East Asia. BMC Ecology, 116: 1-10.

The Goderdzi site (GE0000026) was part of a larger group of initial sites shortlisted as proposed Candidate Emerald Sites in November 2014[15], during the Project construction phase. It is also listed as a site proposed for evaluation by the Standing Committee in a NACRES/MoEPA paper on the development of the Emerald Network in Georgia, published in December 2018[16]. However, the site had not been progressed to 'officially nominated Candidate Emerald site' status between November 2014 and December 2019[17]. Lists of officially nominated Candidate (and officially adopted) Emerald sites are published annually following the annual meeting of the Standing Committee; Goderdzi has not been included in any published list and is not included in the latest list of officially nominated Candidate Emerald sites published in December 2019[18]. The site is therefore not considered further in this BAP.

1.3.3 Brief Summary of Habitats and IFC Classification of Natural, Modified and Critical Habitats.

Habitats as reported in Construction Phase BAP are presented in ***Table 1-1.*** The Construction Phase BAP assessed all natural forest in the DMU as Critical Habitat because of the presence of Greek Strawberry Tree (*Arbutus andrachne*), Milk-vetch (*Astragulus sommieri)* (Georgian endangered), *Symphytum grandiflorum* (Georgia endemic/restricted range), and Caucasian Salamander (*Mertensiella caucasica*) (restricted-range species). The Project will affect 23.65 ha of this natural/Critical Habitat forest but it is unlikely there will be any measurable impacts on the species that trigger Critical Habitats (see Section 4.4).

Table 1-1 Main Habitats within Study Area

Type	IFC Category	Conservation value	Area (ha)	Proportion of the Study Area (%)
Mixed deciduous forest	Natural/ Critical	Medium	613.89	0.74
Oriental beech forest	Natural/ Critical	Medium	1,358.70	1.63
Deciduous forest dominated by oak and/or hornbeam	Natural/ Critical	High	4,186.50	5.03
Mixed deciduous and coniferous forest	Natural/ Critical	Medium	12,083.44	14.51
Coniferous forest with spruce and fir, Caucasian pine forest, and degraded coniferous forest	Natural/ Modified	Medium	41,769.22	50.17
Walnut plantation	Modified	Low	8.68	0.01
Scrub with *Rhododendron ponticum, Prunus laurocerasus, Ilex colchica* and *Euonymus europaea*	Natural/Modified	Medium	545.05	0.65
Grassland	Modified	Low	7,417.57	8.91
Agricultural land (arable land and pastures)	Modified	Negligible	11,825.19	14.20

[15] the Standard Data Form for the site indicates that is was proposed in November 2014.

[16] https://www.researchgate.net/publication/329566712_Emerald_Network-Questions_and_Answers [Accessed 18.11.2020]

[17] Note Goderdzi is erroneously listed as a Candidate Emerald Site on the Emerald Network Viewer (http://emerald.eea.europa.eu/) [Accessed 18.11.2020]

[18] https://rm.coe.int/updated-list-of-officially-nominated-candidate-emerald-sites-december-/168098ef50 [Accessed 18.11.2020]

Type	IFC Category	Conservation value	Area (ha)	Proportion of the Study Area (%)
Rivers and streams (high confidence)	Natural	High	393.01	0.47
River bed, roads and bare rock (low confidence)	Modified	Medium/Low	1,210.65	1.45
Lakes	Natural	High	5.11	0.01
Roads (mud and paved roads)	Modified	Negligible	1,067.89	1.28
Human settlements	Modified	Negligible	764.76	0.92

2. CONSERVATION PRIORITIES

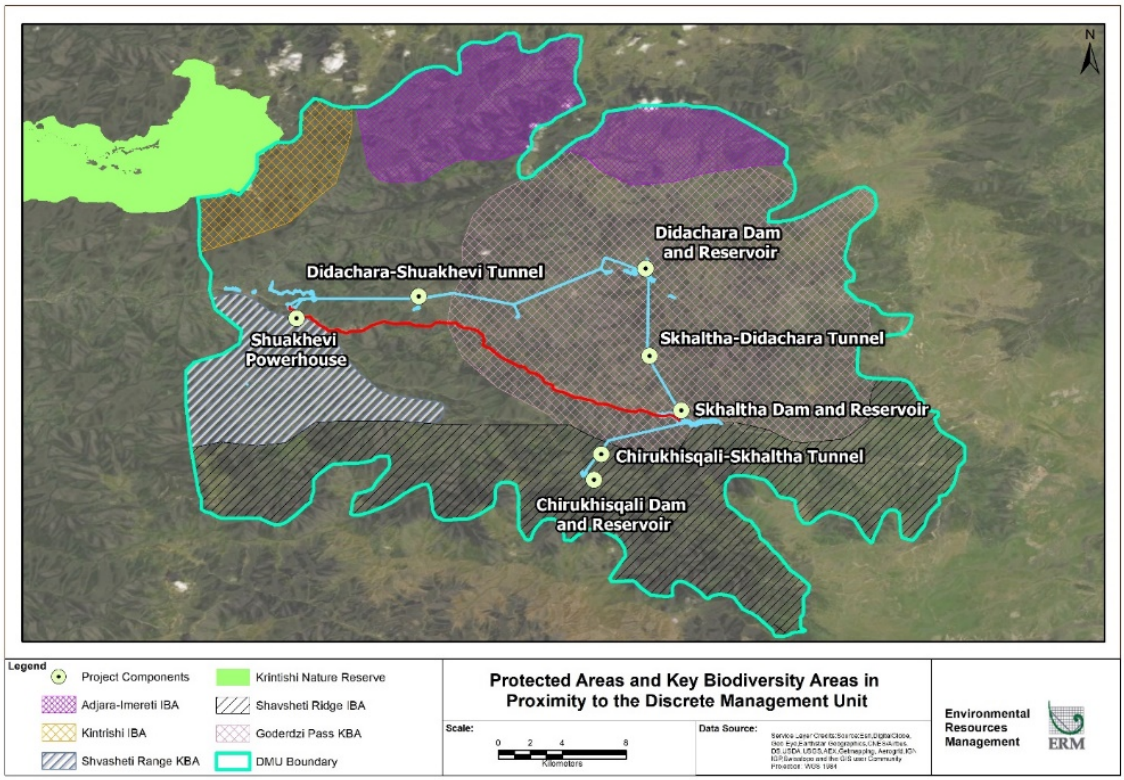
2.1 IUCN Red-List

The IUCN Red-List Categories and Criteria is intended to be an easily and widely understood system for classifying species at high risk of global extinction. The general aim of the system is to provide an explicit, objective framework for the classification of the broadest range of species according to their extinction risk. However, while the Red-List may focus attention on those taxa at the highest risk, it is not the sole means of setting priorities for conservation measures for their protection.

2.1.1 Proximity of Key Biodiversity Areas to Study Area/DMU

To provide a context for the discussion on the relevance of the project to Key Biodiversity Areas ***Figure 2-1*** provides the location of important project components in proximity to the Key Biodiversity Areas.

Figure 2-1 Proximity of Key Biodiversity Areas to Project Components



2.1.1.1 Kintrishi State Nature Reserve, Important Bird Area and Key Biodiversity Area

Kintrishi IBA overlaps with the nature reserve but is slightly larger (15,725 ha) (Birdlife International, 2012a). An area of 2,957.13 ha of the IBA overlaps with the BAP Study Area. The IBA is protected for important habitats (broad-leaved deciduous forests, alpine/subalpine/boreal grasslands, rocky areas and wetlands) and bird species, notably the Caucasian Grouse (*Tetrao mlokosiewiczi*), listed as near threatened/decreasing on the IUCN Red List (v 2017.1.3), and Caspian Snowcock (*Tetraogallus caspius*), listed as least concern/decreasing on the IUCN Red- List (v 2017.1.3) (Birdlife International 2019a)

The Kintrishi IBA site supports at least two of the 10 species in Europe that are restricted (when breeding) to the Eurasian high-montane biome. Other notable species that do not meet IBA criteria and are present in the Kintrishi IBA include: Lesser Kestrel (*Falco naumanni*), Bearded Vulture

(*Gypaetus barbatus*), Golden Eagle (*Aquila chrysaetos*) and Peregrine Falcon (*Falco peregrinus*); all these species are listed as being of least concern on the IUCN Red- List (v 2017.1).

2.1.1.2 Adjara-Imereti Ridge Important Bird and Biodiversity Area and Key Biodiversity Area

The IBA is located within the Study Area but not within the physical footprint of the scheme. The Adjara-Imereti Ridge IBA is very large (173,279 ha) and is designated for the following trigger species: Caucasian Grouse *(Lyrurus mlokosiewiczi*), Caspian Snow Cock (*Tetraogallus caspius*) Eastern Imperial eagle (*Aquila heliaca*), listed as vulnerable on the IUCN Red List (v 2017.1), Corncrake (*Crex crex*) and Great Snipe (*Gallinago media*) (Birdlife International 2019b) .

The KBA was assessed in 2004 and appeared on public domain KBA portals[19], consequent to project financing being agreed and the preparation of the CBAP (Mott MacDonald 2016).

2.1.1.3 Shavsehti Range (2) Key Biodiversity Area

The total area is 19,312 ha. This KBA overlaps with the 35 KV transmission line and the Shuakhevi power house.

This site has been identified as a Key Biodiversity Area based on the presence of:

- Significant populations of globally threatened species.
- Significant populations of endemic species known only to be found in a limited area.

This includes the Black Sea Viper (*Vipera pontica*) which is restricted to the Pontic Black Sea region of Turkey but could also be found in adjacent Georgia.

The KBA was assessed in 2004 and appeared on public domain KBA portals, consequent to project financing being agreed [20]

2.1.1.4 Shavsheti Ridge Important Bird Area and Key Biodiversity Area

This IBA overlaps with the Chirukhisqali Weir and the Chirukhisqali-Skhalta Tunnel. The IBA trigger species are Caucasian Grouse (20 breeding pairs recorded in the period 2000-2002) and Caspian Snow cock. An area of 2,878.26 ha of this IBA overlaps with the BAP Study Area (Birdlife International 2019c).

The KBA was assessed in 2004. At the time the project was funded the boundary of this site overlapped with the study area but not the project footprint as reported in the CBAP [ref to CBAP]. However, since financing, the boundary of this site has been extended to the west and now overlaps with the Chiruki dam / reservoir and Chiruki – Skhalta tunnel[21].

2.1.1.5 Goderdzi Pass KBA

The total area is 30,632 ha. The Didachara and Skhalta Dams and the Chirukhisqali-Skhalta and Skhalta-Didachara Tunnels are located in this KBA. The KBA is triggered due to

- Significant populations of globally threatened species.
- Significant populations of endemic species known only to be found in a limited area. One species is the Caucasian Salamander (*Mertensiella caucasica*)

[19] http://www.keybiodiversityareas.org/site/factsheet/18572

[20] http://www.keybiodiversityareas.org/site/factsheet/46693

[21] http://www.keybiodiversityareas.org/site/factsheet/18573

The KBA was assessed in 2004 and appeared on public domain KBA portals, consequent to project financing being agreed[22]

2.2 Georgian Red-List

Georgian flora is one of the richest among countries with moderate climates and has 4,130 vascular plant species, including around 900 species (approximately 21%) that are either Caucasian or Georgian endemics. In addition, 17 endemic genera are present in Georgia and Caucasus. About 2,000 species of Georgian flora have direct economic value; utilized as timber, firewood, food (fruit, hazel nut), forage and animal food or used in medicine, painting and volatile oil extraction. Many local variations of domestic crops as well as their wild relatives (especially wheats and legumes) are distributed in Georgia.

In terms of the country's fauna, 16,054 species have been described, 758 of which are chordates. Amongst the Caucasian endemics there are 19 mammals, three birds, 15 reptiles and three amphibians, whilst the Georgian endemics are represented by only one species; the Adjarian Lizard (*Darevskia mixta*).

In 2003 the Parliament of Georgia adopted the Law on Red- List and Red Book which gives the legal definitions of Red- List and Red Book (relevant recommendations and methodological issues) of endangered species of Georgia. The Red -List structure was also legally defined, as well as the relevant procedures for including species in the Red- List, procedures for revising, and updating of it. The Law also regulates issues related to planning and financial matters connected with the protection, taking of, rehabilitation and conservation of endangered species.

2.3 Conservation Priorities as Lender Requirements

2.3.1 IFC Performance Standard 6

The IFC Performance Standard (PS6) (IFC, 2012a) and Guidance Note 6 (IFC, 2012b) have been used on the Project as the international standard for good practice. In accordance with IFC PS6, habitats are divided into modified, natural and Critical Habitats.

Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.

Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

The client will not significantly convert or degrade natural habitats, unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project on modified habitat;
- Consultation has established the views of stakeholders, including Affected Communities, with respect to the extent of conversion and degradation; and
- Any conversion or degradation is mitigated according to the mitigation hierarchy.

In areas of natural habitat, mitigation measures will be designed to **achieve no net loss of biodiversity** where feasible. Appropriate actions include:

[22] http://www.keybiodiversityareas.org/site/factsheet/46685

- Avoiding impacts on biodiversity through the identification and protection of set-asides
- Implementing measures to minimize habitat fragmentation, such as biological corridors;
- Restoring habitats during operations and/or after operations; and
- Implementing biodiversity offsets.

Critical Habitats can be either modified or natural habitats supporting high biodiversity value, including:

- habitat of significant importance to critically endangered and/or endangered species (IUCN Red List)
- habitat of significant importance to endemic and/or restricted-range species
- habitat supporting globally significant concentrations of migratory species and/or congregatory species
- highly threatened and/or unique ecosystems
- areas associated with key evolutionary processes

In areas of Critical Habitat, the client will not implement any project activities unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical;
- The project does not lead to measurable adverse impacts on those biodiversity values for which the Critical Habitat was designated, and on the ecological processes supporting those biodiversity values;
- The project does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time; and
- A robust, appropriately designed, and long-term biodiversity monitoring and evaluation program is integrated into the client's management program.

In such cases where a client is able to meet the requirements defined above, the project's mitigation strategy will be described in a Biodiversity Action Plan and will be designed to **achieve net gains of those biodiversity values** for which the Critical Habitat was designated.

In instances where biodiversity offsets are proposed as part of the mitigation strategy, the client must demonstrate through an assessment that the project's significant residual impacts on biodiversity will be adequately mitigated to meet the requirements listed above.

A BAP is required for all projects located in Critical Habitat (IFC, 2012a) and is recommended for projects that have the potential to significantly impact natural habitat (IFC, 2012b). The CBAP has highlighted the potential presence of Critical Habitats within the study area of the Project (Mott MacDonald, 2013a).

2.3.2 European Bank for Reconstruction and Development's (EBRD)

EBRD's Environmental and Social Policy (ESP, 2014) commits the Bank to "be precautionary in its approach to the protection, conservation, management and sustainable use of living natural resources and will require relevant projects to include measures to safeguard and, where feasible, enhance ecosystems and the biodiversity they support." To help implement these commitments at the project level, the ESP includes Performance Requirement (PR) 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. The EBRD's PR6: Biodiversity Conservation and Sustainable Management of Living Natural Resources recognise the importance of maintaining core ecological functions of ecosystems and the biodiversity they support. PR6 also recognises that

(i) the livelihood of indigenous peoples and affected communities whose access to, or use of, biodiversity or living natural resources may be affected by project activities, and

(ii) they may have a positive role in biodiversity conservation and sustainable management of living natural resources. The EBRD believes that the objective of biodiversity conservation and sustainable management of living resources must be balanced with the potential for utilising the multiple economic, social and cultural values of biodiversity and living natural resources in an optimised manner.

EBRD identifies priority biodiversity features as detailed in ***Table 2-1.***

Table 2-1 Features that may meet Criteria for Priority Biodiversity Features

Priority biodiversity features as per EBRD PR6 (2014), paragraph 12	Examples
Threatened habitats	Habitats considered under pressure by national, regional or international assessments. These include natural and priority habitats identified under the EU Habitats Directive (Annexe I).
Vulnerable species	Species listed by the International Union for Conservation of Nature (IUCN) or any other national/regional lists (such as national Red Lists) as Vulnerable (VU) or equivalent. These include animal and plant species of community interest identified under the EU Habitats Directive (Annexe II).
Significant biodiversity features identified by a broad set of stakeholders or governments	Key Biodiversity Areas and Important Bird and Biodiversity Areas; nationally and internationally important species or sites for conservation of biodiversity; many areas meeting natural habitat definitions of other international financial institutions.
Ecological structure and functions needed to maintain the viability of priority biodiversity features	Where essential for priority biodiversity features, riparian zones and rivers, dispersal or migration corridors, hydrological regimes, seasonal refuges or food sources, keystone or habitat-forming species.

Source: European Bank for Reconstruction and Development's (EBRD) Environmental and Social Policy (ESP, 2014

Criteria for Critical Habitat (EBRD, 2016)

Areas identified as Critical Habitat hold the highest tier of irreplaceable (existing in few places) and vulnerable (at high risk of being lost) biodiversity features. The criteria used by the EBRD's PR6 to define Critical Habitat build on and are closely aligned with those used by the International Finance Corporation Performance Standard 6 (IFC PS6). PR6 also explicitly includes ecological functions that are vital for maintaining the viability of Critical Habitat features. Identification of such functions will vary between features and locations, so the involvement of credible external experts with relevant ecological experience is highly recommended. (Refer ***Table 2-2***)

Table 2-2 Features that may meet Criteria for Critical Habitat and Relationship with Criteria for Priority Biodiversity Features

Critical Habitat as per EBRD PR6 (2014), paragraph 14	Definition/examples	Priority biodiversity features as per EBRD PR6 (2014), paragraph 12
(i) Highly threatened or unique ecosystems	Ecosystems that are at risk of significantly decreasing in area or quality; have a small spatial extent; and/or contain concentrations of biome-restricted species. For example: ■ Ecosystems listed as, or meeting criteria for, Endangered or Critically Endangered by the IUCN Red List of Ecosystems ■ Areas recognised as priorities in official regional or national plans, such as National Biodiversity Strategy and Action Plans ■ Areas determined to be of high priority/significance based on systematic conservation planning carried out by government bodies, recognised academic institutions and/or other relevant qualified organisations (including internationally-recognised NGOs).	(i) Threatened habitats
(ii) Habitats of significant importance to endangered or critically endangered species	Areas supporting species at high risk of extinction (Critically Endangered or Endangered) on the IUCN Red List of Threatened species (or equivalent national/regional systems). For example: ■ Alliance for Zero Extinction sites ■ Animal and plant species of community interest in need of strict protection as listed in EU Habitats Directive (Annexe IV).	(ii) Vulnerable species
(iii) Habitats of significant importance to endemic or geographically restricted species	Areas holding a significant proportion of the global range or population of species qualifying as restricted-range under Birdlife or IUCN criteria. For example: ■ Alliance for Zero Extinction sites ■ Global-level Key Biodiversity Areas and Important Bird and Biodiversity Areas identified for restricted-range species.	(iii) Significant biodiversity features identified by a broad set of stakeholders or governments (such as Key Biodiversity Areas or Important Bird Areas)
(iv) Habitats supporting globally significant (concentrations of) migratory or congregatory species	Areas that support a significant proportion of a species' population, where that species cyclically and predictably moves from one geographical area to another (including within the same ecosystem), or areas that support large groups of a species' population that gather on a cyclical or otherwise regular and/or predictable basis. For example: ■ Global-level Key Biodiversity Areas and Important Bird and Biodiversity Areas identified for congregatory species	

	■ Wetlands of International Importance designated under criteria 5 or 6 of the Ramsar Convention.	
(v) Areas associated with key evolutionary processes	Areas with landscape features that might be associated with particular evolutionary processes or populations of species that are especially distinct and may be of special conservation concern given their distinct evolutionary history. For example: ■ Isolated lakes or mountaintops ■ Populations of species listed as priorities by the Edge of Existence programme.	
(vi) Ecological functions that are vital to maintaining the viability of biodiversity features described (as Critical Habitat features)	Ecological functions without which critical biodiversity features could not persist. For example: ■ Where essential for critical biodiversity features, riparian zones and rivers, dispersal or migration corridors, hydrological regimes, seasonal refuges or food sources, keystone or habitat-forming species.	(iv) Ecological structure and functions needed to maintain the viability of priority biodiversity features

Source: European Bank for Reconstruction and Development's (EBRD) Environmental and Social Policy (ESP, 2014

2.4 Protected, Threatened and Endemic Plant Species Within The Study Area

The region, including the BAP Study Area, is well known as being of significant botanical interest with high floristic diversity and refugia for genetic diversity of domestic cultivars. The BAP Study Area supports three species that are listed as endangered on the red list of Georgia.

Greek Strawberry (*Arbutus andrachne*) (Endangered in Georgia) is only known from one location in Adjara, 5 km west of Shuakhevi.

Milk-vetch *(Astragalus sommieri)*, a species listed as Endangered on the Georgia Red List and rare in Adjara, has been recorded near Zamleti village.

Hop-hornbeam *(Ostrya carpinifolia)* (Endangered in Georgia) has been recorded near Zamleti, near Nenia, at the confluence of the Diditzkali and Skhalta rivers, near Purtio Bridge and at the confluence of the Skhalta and Adjaristsqali rivers and also at Didachara, Sanalia and Skhalta sites. This species is rare in Georgia and in Adjara it is present in the Shuakhevi and Khulo municipalities.

The following two Georgia endemic species Dwarf Comphrey (*Symphytum grandiflorum*) and Caucasian Chamomille (*Tripleurospermum szovitsii*) are present in the Study Area.

Sumac *(Rhus coriaria)* is listed as vulnerable on the IUCN red list (v 2017.1.3) is relatively common in the BAP Study Area and is known in the wider area. This species is planted and even invasive in Georgia and is native in Tajikistan and Uzbekistan only.

Swida koenigii is listed as vulnerable on the Caucasus Endemic Plant List and is thought to be a Colchic endemic, but is not listed on the Georgia Red List.

Twenty three endemic species have been recorded in the BAP Study Area, including Colchic, Caucasian, Georgia and Adjara-Lazetian species as detailed in ***Table 2-3***.

Table 2-3 Protected, Threatened and Endemic Plant Species within the Study Area

Latin name	Common name	Endemic	Georgia Red Data Book	Caucasus Endemic Plant List	IUCN Red List (v 2017.1)
Juglans regia	Walnut	-	VU	-	NT
Ostrya carpinifolia	Hop-hornbeam	-	EN	-	-
Ulmus glabra	Elm	-	VU	-	-
Taxus baccata	Yew	-	VU	-	LC
Arbutus andrachne	Greek Strawberry Tree	-	EN	-	-
Astragalus sommieri	Adjara-Lazetian		EN	-	-
Cornus sanguinea ssp. *australis (Swida koenigii)*	Dog Wood	Colchic	-	VU	-
Ranunculus ampelophyllus		Colchic	-	-	-
Cirsium imereticum	Imeretian Thistle	Colchic	-	LC	-
Symphytum	Dwarf	Georgia	-	-	-
Tripleurospermum	Caucasian	Georgia	-	-	-
Hedera colchica	Ivy	Colchic	-	-	-
Digitalis ferruginea ssp. *ischkinii)*	Foxglove	Caucasian	-	-	-
Helleborus caucasicus	Helleborine	Caucasian	-	-	-
Tilia rubra ssp. *ısica)*	Caucasian	Caucasian	-	-	-
Campanula cordifoilia	Caucasian	-		-	-
Lotus caucasiscus	Caucasian	-		-	-
Quercus petraea ssp. *dschorochensis)*	Sessile Oak	Adjara-Lazetian	-	-	-
Origanum (*Amaracus) rotundifolium*)	Round-Leaved Oregano)	Adjara-Lazetian	-	-	-
Linaria adzharica		Adjara-Lazetian	-	-	-
Ficus carica (F. colchica)	Common Fig	Colchic	-	-	LC
Rhamnus imeretina		Colchic	-	-	-
Rubus caucasicus		Caucasian	-	-	-

Latin name	Common name	Endemic	Georgia Red Data Book	Caucasus Endemic Plant List	IUCN Red List (v 2017.1)
Euphorbia pontica		Colchic	-	-	-
Asplenium woronowii		Colchic	-	-	-
Hypericum adzharicum		Adjara-Lazetian	-	-	-
Cyclamen adzharicum (C. coum ssp. *caucasicum, C. vernum)*	Cyclamen	Adjara-Lazetian	-	-	-
Anthemis woronowii		Colchic	-	-	-

Source: BAP Construction Stage.

2.5 Protected, Threatened and Endemic Bird Species Within Study Area

The eastern coast of the Black Sea, and in particular the Batumi area, is one of the most important bottlenecks for raptor migration during autumn in the Eurasian-African migration system (Verhelst et al., 2011). The migration bottleneck is narrow near Batumi as migrants are funnelled between the Black Sea and the Lesser Caucasus mountains. South of Batumi, the autumn migrants continue their journey along the Black Sea coast or follow the Chorokhi valley. However, the BAP Study Area is in a mountainous area is further than 30 km from Batumi bottleneck.

A total of 135 species have been reported within the Study Area. Of these, the protected, threatened and notable species are:

- One Caucasus endemic species, *Tetrao mlokosiewiczi* (Caucasian Grouse), which has been recorded in Kintrishi IBA and Shavsheti Ridge IBA;
- 44 species are listed on two relevant international conventions (28 species on the Convention on the Conservation of Migratory Species of Wild Animals and 16 species on the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (also known as AEWA or African-Eurasian Waterbird Agreement));
- Two species are globally threatened: Eastern Imperial Eagle (*Aquila heliaca*) – vulnerable and Egyptian Vulture- endangered;
- Nine species are nationally threatened and are classified as vulnerable to critically endangered on the Red- List of Georgia e.g. Lesser Kestrel - critically endangered, Golden Eagle - vulnerable, and Long Legged Buzzard - Vulnerable.

Threatened and protected species are listed in ***Table 2-3***

Table 2-4 Threatened and Protected Bird Species Recorded Recently in the BAP Study Area.

IOU Scientific Name	IOU English Name	Georgia Red List	IUCN Red List (v 2017.1)	CMS	AEWA	Annexe 1 Birds Directive	Present in BAP Study Area	Proposed Trans-mission Line Corridor
Aegolius funereus	Boreal Owl	VU	LC	X	-	X	X	-
Aquila chrysaetos	Golden Eagle	VU	LC	X	-	X	X	X

Aquila heliaca	Eastern Imperial Eagle	VU	VU	X	-	X	-	X
Buteo rufinus	Long-legged Buzzard	VU	LC	X	-	X	X	X
Ciconia nigra	Black Stork	VU	LC	X	X	X	-	X
Falco naumanni	Lesser Kestrel	CR	LC	X	-	X	-	X
Gyps fulvus	Griffon Vulture	VU	LC	X	-	X	-	X
Tetrao mlokosiewiczi	Caucasian Grouse	VU	NT	-	-	-	X	X
Neophron percnopterus	Egyptian Vulture	VU	EN	X	-	X	X	X

Source: BAP Construction Stage.

2.6 Protected, Threatened and Endemic Herpetofauna Species Within The Study Area

Fifteen species of reptiles were enumerated from the study area. Of these, four are near threatened or vulnerable

Derjugin's Lizard (*Darevskia derjugini*) and Transcaucasian Long-nosed Viper (*Vipera transcaucasiana*) are listed as near-threatened on the IUCN Red List.

Caucasian Salamander (*Mertensiella caucasica*) is listed as vulnerable on the IUCN Red List and the Red List of Georgia. The Caucasian Toad (*Bufo verrucosissimus*) is listed as near-threatened on the IUCN Red List.

Threatened and protected species are listed in ***Table 2-5***

Table 2-5 Protected, Threatened and Endemic Herpetofauna Species Recorded in the BAP Study Area

Latin name	Common name	Georgia Red List status	IUCN Red List (v 2017.1)	Caucasus Endemic Species	Habitats Directive (Annexe II and/or IV)
Lacerta agilis	Sand lizard	-	LC	-	IV
Darevskia derjugini	Derjugin's lizard	-	NT	-	-
Darevskia parvula	Red-bellied lizard	-	LC	X	-
Vipera transcaucasiana	Transcaucasian long-nosed viper	-	NT	-	-
Anguis colchica	Colchic slow worm	-	-	X	-
Coronella austriaca	Smooth snake	-	NE	-	IV

Natrix megalocephala	Colchic water snake	-	VU	X	-
Natrix tessellata	Tessellated water-snake	-	LC	-	IV
Mertensiella caucasica	Caucasian salamander	VU	VU	-	-
Bufo verrucosissimus	Caucasian toad	-	NT	X	-

Source: BAP Construction Stage.

2.7 Protected, Threatened and Endemic Mammals Species Within The Study Area

Notable species that are protected under Georgian and international legislation and conventions from the BAP study are;

Eurasian Lynx (*Lynx lynx*)- critically endangered in Georgia and Annexe II and IV species (EU Habitat Directive);

Brown Bear (*Ursus arctos*)- endangered in Georgia and Annexe II and IV species (EU Habitat Directive);

Grey Wolf (*Canis lupus*)– Annexe II and IV species (EU Habitat Directive);

Wild Cat (*Felis silvestris*)– Annexe IV species (EU Habitat Directive);

Northern Chamois (*Rupicapra rupicapra*)– endangered in Georgia;

Caucasian Squirrel (*Sciurus anomalus*) - vulnerable in Georgia, Annexe IV species (EU Habitat Directive);

Long-clawed Mole Vole (*Prometheomys schaposchnikowi*)– vulnerable in Georgia;

Grey Dwarf Hamster (*Cricetulus migratorius*)– vulnerable in Georgia

The mammal species from BAP Study area which are protected under Georgian and international legislation and conventions are listed in ***Table 2-6.***

Table 2-6 Protected, Threatened, Caucasus Endemic and/or Habitat Directive Listed Mammal Species Known or Likely to Occur within the Study Area

Latin name	Common name	Georgia Red List status	IUCN Red List (v 2017.1)	Caucasus Endemic species	EU Habitats Directive (Annexe II and/or IV)
Bats					
Eptesicus serotinus	Serotine Bat	-	-	-	IV
Hypsugo (Pipistrellus) savii	Savi's Pipistrelle	-	-	-	IV
Myotis blythii	Lesser Mouse-eared Bat	-	LC	-	II, IV
Myotis emarginatus	Geoffroy's Bat	-	-	-	II, IV
Myotis mystacinus	Whiskered Bat	-	-	-	IV
Myotis nattereri	Natterer's Bat	-	-	-	IV
Nyctalus leisleri	Lesser Noctule Bat	-	-	-	IV
Nyctalus noctula	Common Noctule	-	-	-	IV
Pipistrellus nathusii	Nathusius's Pipistrelle	-	-	-	IV
Pipistrellus pipistrellus	Common Pipistrelle	-	-	-	IV
Pipistrellus pygmaeus	Soprano Pipistrelle	-	-	-	IV
Plecotus auritus	Brown Big-eared Bat	-	-	-	IV
Rhinolophus hipposideros	Lesser Horseshoe Bat	-	-	-	II, IV
Other mammals					
Apodemus (Sylvaemus) ponticus	Black Sea Field Mouse	-	-	X	-
Chionomys gud	Caucasian Snow Vole	-	-	X	-
Chionomys roberti	Robert's Snow Vole	-	-	X	-
Cricetulus migratorius	Grey Dwarf Hamster	VU	-		-
Canis lupus	Grey Wolf	-	LC	-	II, IV
Felis silvestris	Wild Cat	-	LC	-	IV
Lynx lynx	Eurasian Lynx	CR	LC	-	II, IV
Microtus (Terricola) daghestanicus	Daghestan Pine Vole	-	-	X	-

Latin name	Common name	Georgia Red List status	IUCN Red List (v 2017.1)	Caucasus Endemic species	EU Habitats Directive (Annexe II and/or IV)
Prometheomys schaposchnikowi	Long-clawed Mole Vole	VU	NT	X	-
Rupicapra rupicapra	Northern Chamois	EN	-	-	-
Sciurus anomalus	Caucasian Squirrel	VU	LC	-	IV
Sorex raddei	Radde's Shrew	-	-	X	-
Sorex satunini	Caucasian Shrew	-	-	X	-
Sylvaemus fulvipectus	Steppe Mouse	-	-	X	-
Sylvaemus uralensis	Little Mouse	-	-	X	-
Talpa caucasica	Caucasian Mole	-	-	X	-

Source: BAP Construction Stage.

2.8 Protected, Threatened and Endemic Fish Species In The Study Area

Thirteen species were recorded during the 2014 fish surveys, including the following species of conservation importance: Brown Trout (*Salmo labrax fario)*, Colchic Nase (*Chondrostoma colchicum*), Colchic Khramulya (*Capoeta sieboldii*), Transcaucasian loach (*Cobitis satunini*) and Caucasian Goby (*Ponticola constructor*) (Association Flora and Fauna, 2014a, 2014b). During the 2015 surveys, nine species were recorded, including the following species of conservation importance: Brown Trout, Colchic Nase and Colchic Khramulya (Association Flora and Fauna, 2015a, 2015b).

During the 2016 fish surveys, ten species were recorded, including the following species of conservation importance: Freshwater Trout, Colchic Nase, Caucasian Goby (Association of Flora and Fauna, 2016a; 2016b).

The fish monitoring carried out by NEKTON (2018) from 2014 to 2018 recorded the following Colchic endemic species Colchic Minow (*Alburnoides fasciatus*), Anatolian Khramulya (*Capoeta tinca*), Colchic Khramulya (*Capoeta sieboldii*), Colchic Nase (*Chondrostoma colchicum*) and site (*Luciobarbus escherichii*) (***Table 2-7***).

From the above the following species were considered of national importance due to their national threatened status and them being Colchic endemics.

Freshwater Trout (Salmo labrax fario)

This is a Georgia vulnerable and IUCN least concern species (v 2017.1). This is the freshwater resident ecoform of the Black Sea salmon.

Trout is distributed mainly throughout the tributaries of the Adjaristskali River. They are relatively more frequent in the Skhalta River above the mouth of the river) in the year's cold period of November to April.

During the warmer parts of the year, trout are concentrated in the middle and upper reaches of the tributaries of the Adjaristskali River. During cold periods, they were observed in the upper reaches, as well as in the lower reaches though at a much lower frequency.

Spawning sites are located in upstream areas of tributaries, streams and in mouths of rivers. In tributaries and streams, natural barriers (waterfalls, rapids, high inclines etc.) confine some species only capable of crossing natural barriers. As an example, in the Akakreta River, at a village above Merisi (located above Ortamele) only trout are present because of the existence of rapids.

Colchic Minnow (Alburnoides fasciatus)

A widespread distributed species, this was observed right through the Adjaristskali River along its entire length and its tributaries.

Anatolian Khramulya (Capoeta tinca)

They are found, in Georgia, only in the Choroki River's basin. In the Adjaristskali River, the species was observed close to the village Didachara but not seen upstream. The species was observed in tributaries (mainly in downstream reaches of Akavreta, Chvanistskali, Chirukhistskali, Skhalta, Ghorjomistskali. Below the village of Nenia, the species was observed together with Colchic Khramulya. Their spawning periods and locations are similar and hybrid forms exist. Hybrid forms are mostly found downstream of the town of Keda.

Colchic Khramulya (Capoeta sieboldii)

This is a Colchic endemic and least concern on the IUCN Red List (v 2017.1). The species is endemic to the rivers on the eastern coast of the Black Sea.
The species is distributed in the Adjaristkali River close to the village Nenia and was not observed upstream of Nenia. The species was mostly observed downstream of Makhuntseti. The species was also observed in the Akavreta, Chiruxistkali and Chvanistkali Rivers.

Colchic Nase (Chondrostoma colchicum)

This is a Colchic endemic and least concern on the IUCN Red List (v 2017.1).
The species was widely distributed and observed in the Adjaristskali River as well as in its tributaries. In the tributaries the species was usually seen in the middle and lower reaches. In the upper reaches the species was seen during the spawning period.

Colchic Barbel (Luciobarbus escherichii)

The species was observed along the Adjarastqali, Chirukhisqali and Skhalta Rivers

Table 2-7 Protected, Threatened and Endemic Fish Species in the Study Area

Latin Name	Common name	IUCN red list ((v2017.1)	Georgia red list	Range	EU Habitats Directive Annexe IV
Salmo labrax fario	Freshwater Trout	Least concern	Vulnerable	Pontic endemic	-
Alburnoides fasciatus	Colchic Minnow	Least concern	-	Colchic endemic	
Capoeta tinca	Anatolian Khramulya	Least concern	-	Colchic endemic	

Latin Name	Common name	IUCN red list ((v2017.1)	Georgia red list	Range	EU Habitats Directive Annexe IV
Capoeta sieboldii	Colchic Khramulya	Least concern	-	Colchic endemic	-
Chondrostoma colchicum	Colchic Nase	Least concern	-	Colchic endemic	-
Luciobarbus escherichii	Colchic Barbel	Least concern	-	Colchic endemic	

2.9 Critical Habitat Assessment

2.9.1 Critically Endangered and/or Endangered Species at Global and/or National level, and EU Habitats Directive Annexe IV species

The IFC Performance Standard (PS6) (IFC, 2012a) and Guidance Note 6 (IFC, 2012b) have been used to inform whether the Project impacts Critical Habitat as the international standard for best practice.

Table 2-8 provides the quantitative thresholds used for assessing whether a project location falls within Critical Habitats.

Table 2-8 Quantitative Thresholds for Critical Habitat Assessment

Criteria	Tier 1	Tier 2
Criteria 1: Critically Endangered(CR)/Endangered (EN) Species	Habitat required to sustain ≥ 10 percent of the global population of an IUCN Red-listed CR or EN species where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species. Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.	Habitat that supports the regular occurrence of a single individual of an IUCN Red-listed CR species and/or habitat containing regionally-important concentrations of an IUCN Red-listed EN species where that habitat could be considered a discrete management unit for that species. Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. As appropriate, habitat containing nationally/regionally-important concentrations of an EN, CR or equivalent national/regional listing.
Criterion 2: Endemic and Restricted-range Species	Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species.	Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment.
Criterion 3: Migratory and Congregatory Species	Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species' life-cycle where that habitat could be considered a discrete management unit for that species.	Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species' life-cycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment. For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance.

Criteria	Tier 1	Tier 2
		For species with large but clumped distributions, a provisional threshold is set at ≥5 percent of the global population for both terrestrial and marine species. Source sites that contribute ≥ 1 percent of the global population of recruits.
Criterion 4: Highly Threatened and/or Unique Ecosystems	No Tiered system is prescribed that are at risk of significantly decreasing in area or quality; with a small spatial extent; and/or containing unique assemblages of species including assemblages or concentrations of biome-restricted species. Highly threatened or unique ecosystems are defined by a combination of factors which may include long term trend, rarity, ecological condition, and threat	
Criterion 5: Key Evolutionary Processes	The criteria is defined by: Isolated areas (e.g., islands, mountaintops, lakes) are associated with populations that are phylogenetically distinct. Areas of high endemism often contain flora and/or fauna with unique evolutionary histories (note overlap with Criterion 2, endemic and restricted-range species). Landscapes with high spatial heterogeneity are a driving force in speciation as species are naturally selected on their ability to adapt and diversify. Environmental gradients, also known as ecotones, produce transitional habitat which has been associated with the process of speciation and high species and genetic diversity. Edaphic interfaces are specific juxtapositions of soil types (e.g., serpentine outcrops, limestone and gypsum deposits), which have led to the formation of unique plant	

Criteria	Tier 1	Tier 2
	communities characterized by both rarity and endemism. Connectivity between habitats (e.g., biological corridors) ensures species migration and gene flow, which is especially important in fragmented habitats and for the conservation of metapopulations. This also includes biological corridors across altitudinal and climatic gradients and from “crest to coast.” Sites of demonstrated importance to climate change adaptation for either species or ecosystems are also included within this criterion.	

The construction phase BAP assessed all potential Critical Habitat triggers species from BAP Study Area against the quantitative thresholds provided in ***Table 2-8.*** The results for their assessment against IFC criteria are provided in ***Table 2-9***

Table 2-9 Potential Critical Habitat Trigger Species and their Assessment against IFC Criteria 1 and EU Habitats Directive Annexe IV.

Latin name	Common Name	IUCN Red List (v2017.1)	Georgia Red List	EU Habitats Directive Annexe IV Species	Rationale for Assessment
Ostrya carpinifolia	Hop-hornbeam	Least Concern	**Endangered**	No	Hop-hornbeam has a wide global distribution and is found in Transcaucasia (including Georgia), southwest Asia (including Turkey), south-east, southern and central Europe, and Russia. In Georgia, hop-hornbeam is scarce and has been recorded in Abkhazia, Racha-Lechkhumi, Samegrelo, Imereti, Guria, Kartli, Meskheti. Species was observed in the study area. Tier 1 threshold for Critical Habitat is not triggered by this species. It is considered that the habitats in the Adjaristsqali basin DMU do not support nationally or regionally important concentrations of this endangered species. **Therefore, this species does not meet the Tier 2 threshold for Critical Habitat in the DMU.**
Arbutus andrachne	Greek Strawberry Tree	Not Evaluated	**Endangered**	No	This species is only known from one location in Adjara, which is 5 km to the west of Shuakhevi, on the right side of the Adjaristsqali River, and next to the village of Gornakhul. It usually occurs in Oak (*Q.petraea* ssp. *dschorochensis*) and Pine (*Pinus kochiana*) woodland. In Georgia, this species is rare and is found in Abkhazia and Adjara. Tier 1 threshold for Critical Habitat is not triggered by this species. It is considered that the habitats in the DMU support a nationally important population ('concentration') of this endangered species in Georgia. **Therefore, this species meets the Tier 2 threshold for Critical Habitat in the DMU.**
Astragalus sommieri	Milk-vetch	Not Evaluated	**Endangered**	No	A small and isolated patch of this species was recorded in 2012 on a cliff next to the main Khulo road, near the village of Zamleti and close to the confluence of Adjaristsqali and Skhalta Rivers. This species is found on dry, stony slopes in the middle mountain belt of Trans-caucasus. It is a rare species in Georgia, where it has been recorded in Adjara only. *Astragalus sommieri* is an endemic species to

Latin name	Common Name	IUCN Red List (v2017.1)	Georgia Red List	EU Habitats Directive Annexe IV Species	Rationale for Assessment
					the Adjara-Lazetian area, with a distribution in Adjara (Georgia) and north-east Turkey. In Georgia, this species is only known from the Shuakhevi area in Adjara. Tier 1 threshold for Critical Habitat is not triggered by this species. It is considered that the habitats in the DMU support a nationally important population ('concentration'), which is probably the only population of this endangered species in Georgia. **Therefore, this species meets the Tier 2 threshold for Critical Habitat in the DMU.**
Neophron percnopterus	Egyptian Vulture	**Endangered**	Vulnerable	No	This species was recorded in breeding surveys. This species is known to breed to the east of the DMU. Globally, this species occupies a large range, with European population (migratory and breeding, including in the Caucasus) showing a severe long-term decline (>50%) in the last 42 years. **This species do not meet the Tier 1 or Tier 2 thresholds for Critical Habitat in the DMU.**
Falco naumanni	Lesser Kestrel	Least Concern	**Critically Endangered**	No	This is a migratory raptor species, which breeds in Georgia and is of least concern globally. According to published literature, breeding of Lesser Kestrel has not been recorded in the Adjaristsqali river basin. It is considered that the habitats in the DMU do not support nationally important concentrations of this critically endangered species in Georgia. **Therefore, this species does not meet the Tier 1 or Tier 2 thresholds for Critical Habitat in the DMU.**
Lynx lynx	Eurasian Lynx	Least Concern	**Critically Endangered**	**Yes**	Eurasian Lynx has a wide range and is listed as of least concern globally. The action plan for the conservation of Eurasian lynx in Europe does not include the Caucasus and Georgia. Lynx is found in a range of habitats including thick scrub woodland and barren, rocky areas above the tree line but primarily in forested areas with good ungulate populations and which provide enough cover for hunting. Its home range can vary between 100 and 1000 km^2 for males, depending on prey abundance and density. **Tier 1 threshold for Critical Habitat is not triggered by this species.** It is considered that the habitats in the DMU do not support nationally important

Latin name	Common Name	IUCN Red List (v2017.1)	Georgia Red List	EU Habitats Directive Annexe IV Species	Rationale for Assessment
					concentrations of this critically endangered and Annexe IV species in Georgia species, because sub-alpine scrub and rocky habitats above tree line, which Lynx prefer, are outside the DMU, forest types in the DMU are widespread in Georgia and sporadic records Lynx is confirmed in the DMU. However the species has been recorded during the biodiversity monitoring.
Ursus arctos	Brown Bear	Least Concern	**Endangered**	**Yes**	Brown Bear has a wide range and is listed as of least concern globally, although there has been a decline in Europe, Asia and North America. Brown bears are found mostly in mountain forests with minimal human disturbance. Their present distribution extends over most of Adjara except coastal areas. The species has been recorded in the baseline surveys and the biodiversity monitoring. Tier 1 threshold for Critical Habitat is not triggered by this species. It is considered that the habitats in the DMU do not support nationally important concentrations of this endangered species and Annexe IV in Georgia species as the DMU includes 2.45% of the Brown Bear range. The DMU forested area (72.08%, 600.12 km^2) represents 1.76% of brown bear range. The forest types within DMU are wide spread across Georgia and the presence of the species is sporadic. **Therefore, this species does not meet the Tier 2 threshold for Critical Habitat in the DMU.**
Canis lupus	Grey Wolf	Least Concern	-	**Yes**	Grey Wolf is known in Adjara from literature and interviews with local people. It has also been recorded in the Study Area recently. Across their worldwide range, wolf density ranges from one per 12 km^2 to one per 120 km^2. Grey wolf feeds mainly on large ungulates but they will also eat smaller prey, livestock, carrior and garbage. The species has been observed during the baseline surveys and the biodiversity monitoring. Tier 1 threshold for Critical Habitat is not triggered by this species. It is considered that the habitats in the DMU do not support nationally important concentrations of this Annexe IV species because of the wide spread distribution and sporadic records in DMU. **Therefore, this species does not meet the Tier 2 threshold for Critical Habitat in the DMU**.

Latin name	Common Name	IUCN Red List (v2017.1)	Georgia Red List	EU Habitats Directive Annexe IV Species	Rationale for Assessment
Felis silvestris	Wild cat	Least Concern	-	**Yes**	Wild Cat is found in a variety of habitats, including scrub grassland to dry and mixed forest and their home ranges vary from between 1 and 10 km^2 in forest habitat. The species has been observed during the baseline surveys and the biodiversity monitoring Tier 1 threshold for Critical Habitat is not triggered by this species. It is considered that the habitats in the DMU do not support nationally important concentrations of this Annexe IV species because of the wide spread distribution and sporadic presence of species. **Therefore, this species does not meet the Tier 2 threshold for Critical Habitat in the DMU**.
Rupicapra rupicapra caucasica	Northern Chamois	Least Concern	**Endangered**	No	Northern Chamois is widely distributed (listed as of least concern globally) but the Caucasus subspecies (*R. rupicapra* ssp*. caucasica*) is declining and becoming fragmented. It occurs to the north of the Adjaristsqali River, east of Keda. The species was not observed during baseline surveys and community consultations. Northern Chamois inhabits steep, rocky areas in the mountains, and feed on grasses, herbs, leaves of trees, buds, shoots and fungi. Females and young occur in flocks of five to thirty animals, while adult males remain solitary. It is important to note that the sub-alpine and alpine zones (geobotanical districts) are not included in the Study Area and therefore the likelihood of Northern Chamois occurring in the Study Area is very low because of different habitat requirements. Tier 1 threshold for Critical Habitat is not triggered by this species. It is considered that the habitats in the DMU do not support nationally important concentrations of this endangered species in Georgia because of absence of habitat overlap with study area and unreliable secondary records. **Therefore, this species does not meet the Tier 2 threshold for Critical Habitat in the DMU.**
Lutra lutra	Eurasian Otter	Near Threatened	Vulnerable	**Yes**	Eurasian Otter is rare in Georgia and in Adjara due to a low food supply and conflict with commercial fisheries. Baseline survey confirms its presence in the study area. Otters have decreased in Georgia and the minimum population size is approximately 400 individuals. The species has been observed during the baseline surveys and the biodiversity monitoring

Latin name	Common Name	IUCN Red List (v2017.1)	Georgia Red List	EU Habitats Directive Annexe IV Species	Rationale for Assessment
					Tier 1 threshold for Critical Habitat is not triggered by this species. It is considered that the river habitats in the DMU do not support nationally important concentrations of this Annexe IV species because the confirmed records are very sporadic. **Therefore, this species does not meet the Tier 2 threshold for critical habitat in the DMU.**
Sciurus anomalus	Caucasian Squirrel	Least Concern	Vulnerable	**Yes**	The species is recorded in baseline surveys. CaucasianS predominantly lives in mixed and deciduous forests, although it also occurs in coniferous forests and rocky outcrops. The species has been observed during the baseline surveys and the biodiversity monitoring Tier 1 threshold for Critical Habitat is not triggered by this species. It is considered that the habitats in the DMU do not support nationally important concentrations of this Annexe IV species because presence of Caucasian squirrel is sporadic in DMU, its forest habitats is widespread. **Therefore, this species does not meet the Tier 2 threshold for Critical Habitat in the DMU.**
Microbats	Microchiroptera	Various	Vulnerable – 4 species only	**Yes**	Bat passes were surveyed within the study area for Common pipistrelle (*Pipistrellus pipistrellus*) and Lesser Noctule Bat (*Nyctalus leisleri*). Microbat species were observed during the baseline surveys and the biodiversity monitoring Tier 1 threshold for Critical Habitat is not triggered by microbat species. It is considered that the habitats in the DMU do not support nationally important concentrations of Microbats (Annexe IV species) because the forest types in the DMU which are largely the habitat of Microbats are widespread in Georgia. **Therefore, microbats do not meet the Tier 2 threshold for Critical Habitat in the DMU**.
Lacerta agilis	Sand Lizard	Least Concern	-	**Yes**	Sand Lizard's habitat is wide ranging and includes meadows, grassland, shrubland, hedgerows and open woodland. It prefers habitat mosaics that allow for basking. The species have been reported in the baseline surveys. Tier 1 threshold for Critical Habitat is not triggered by this species. The species has been observed during the baseline surveys and the biodiversity monitoring

Latin name	Common Name	IUCN Red List (v2017.1)	Georgia Red List	EU Habitats Directive Annexe IV Species	Rationale for Assessment
					It is considered that the habitats in the DMU do not support nationally important concentrations of this Annexe IV species as the Sand lizard has a relatively wide distribution in Georgia and are sporadically present in DMU.
Coronella austriaca	Smooth Snake	Not Evaluated	-	**Yes**	The species is recorded in baseline surveys and sufficient suitable habitats are available. It prefers dry and sunny areas, clearings and forest margins. The species has been observed during the baseline surveys and the biodiversity monitoring. Tier 1 threshold for Critical Habitat is not triggered by this species. It is considered that the habitats in the DMU do not support nationally important concentrations of this Annexe IV species as it is widely distributed in Georgia. **Therefore, this species does not meet the Tier 2 threshold for Critical Habitat in the DMU.**
Natrix tessellata	Tessellated Water Snake	Least Concern	-	**Yes**	The species is recorded in baseline surveys. Tessellated water-snake is an aquatic species associated with rivers, coasts, streams, lakes, ponds and the surrounding terrestrial habitat. It prefers natural, unmodified wetland habitats. The species was not observed during the biodiversity monitoring **Tier 1 threshold for Critical Habitat is not triggered by this species**. It is considered that the habitats in the DMU do not support nationally important concentrations of this Annexe IV species as its presence is sporadic in DMU and it is widely distributed in Georgia. **Therefore, this species does not meet the Tier 2 threshold for Critical Habitat in the DMU.**

From ***Table 2-9*** the following species meet the thresholds for Critical Habitat triggers for Criteria 1 (Tier 1 and 2: Critically Endangered and Endangered Species) and the rationale for their assessment is provided in ***Table 2-9***

1. Greek Strawberry Tree (*Arbutus andrachne*)

2. Milk-vetch (*Astragalus sommieri*)

2.9.2 Endemic and/or restricted-range species

2.9.2.1 Floral Species

The following species meet the Critical Habitat Criteria 2 (Tier 1 and 2: Endemic/Range Restricted) and their assessment against IFC criteria is provided below

Dwarf comphrey (Symphytum grandiflorum)

Recorded from the DMU and is endemic to Georgia. This species occurs in forest habitat and damp ravines, and is relatively frequent/abundant in the Study Area

Caucasian chamomile (Tripleurospermum szovitsii)

Recorded from the DMU, endemic to Georgia. This species occurs on dry rocky slopes (mainly southern aspect), and is rare in the Study Area

The two species mentioned above are not on the Red-List of Georgia and are not restricted to the DMU or Adjara Province. They have not been evaluated by the IUCN Red-List. Tier 1 threshold for Critical Habitat is not triggered by these species. Using a precautionary and conservative approach, the DMU may support between 1% and 95% of the global populations of these species. Hence, may meet the Tier 2 threshold for Critical Habitat in the DMU.

2.9.2.2 Faunal Species

Caucasian Salamander (Mertensiella caucasica)

Caucasian Salamander is listed as vulnerable on the IUCN Red-List (v 2017.1.3) because its area of occupancy is less than 2,000 km^2, its distribution is severely fragmented and confined to small streams free of fish, and there is continuing decline in the extent and quality of its habitat in Turkey and Georgia. The species is undergoing a rapid reduction across its range. The current distribution includes the north-east part of Anatolia in Turkey and south-west Georgia including Adjara. Caucasian salamander is a habitat specialist, found mainly in Oriental Beech Forest (*Fagus orientalis*), Coniferous Forest (*Abies nordmanniana* and *Picea orientalis*), Box Forest (*Buxus* sp.), in Mediterranean Shrub Forest, Mixed Forests, the sub-alpine belt and in alpine meadows. The species tends to avoid large streams and lives mainly in small streams with stony substrate.

Tier 1 threshold for Critical Habitat is not triggered by this species. This species meets the Tier 2 threshold for Critical Habitat in the DMU as it represents 41.63% of the global distribution of the species.

2.9.3 Migratory and/or Congregatory species

The eastern coast of the Black Sea, and in particular the Batumi area, is one of the most important bottlenecks for raptor migration (especially during autumn) in the Eurasian-African migration system. Species that move through bottleneck sites where significant numbers of individuals of a species pass

over a concentrated period of time are classified as congregatory species. Migratory bird surveys have identified that these species avoid the DMU.

It is concluded that the DMU does not include habitat supporting globally significant concentrations of migratory and/or congregatory species and therefore it does not meet the Critical Habitat Criteria 3 Tier 1 or Tier 2 sub-criteria

2.9.4 Legally Protected and Internationally Recognised Areas

Kintrishi Nature Reserve (IUCN category Ia) is a legally protected area that is adjacent to the DMU. Protected areas corresponding to IUCN categories I and II are classified as Critical Habitat. However, the Project is not 'located within a legally protected area' as specified in IFC PS6 and Guidance Note 6. The DMU (832.64 km^2/ 83,264.16 ha) overlaps partly with the three IBAs (which are also Key Biodiversity Areas), the Kintrishi and Shavseti Ridge IBAs and the Goderdzi Pass KBA (Refer Table 2-10)

The land required for the Project (as well as the study area) also overlaps with the Svasheti Range (2) and Goderdzi Pass KBA (Section 2.1.1).

The only two named species are the Caucasian Salamander for Goderdzi Pass, and Black Sea Viper for Shavsheti Range (2).

The Caucasian Salamander was assessed against Critical Habitat Criteria 1 and 2, and was assessed as a Critical Habitat candidate species. The species was surveyed throughout its occurrence in the DMU and the population is being presently not being impacted (see **Annexe B**). The Black Sea Viper has not been recorded in the study area.

Also as mentioned earlier these KBAs were assessed and included in the KBA network in 2004 with details available on public domain portals, subsequent to project funding.

Paragraph GN95 in IFC (2012a) mentions that with respect to mitigation, clients are expected to comply with requirements for natural or critical habitat, depending on the qualifying biodiversity values present in the legally protected (including areas officially proposed for protection) or internationally recognized area. Given that the monitoring of the Caucasian Salamander has a clear objective to understand potential impacts and mitigate these, GN95 is addressed.

Furthermore it is also considered that the requirements in Paragraph 20 of the IFC PS6 (IFC, 2012a)[23] or Paragraph 19[24] of the EBRD PR6 are not applicable to the Project given the above rationale.

[23] In circumstances where a proposed project is located within a legally protected area1 or an internationally recognized area, the client will meet the requirements of paragraphs 13 through 19 (concerning natural or Critical Habitat) of this Performance Standard, as applicable. In addition, the client will:

- Demonstrate that the proposed development in such areas is legally permitted;
- Act in a manner consistent with any government recognized management plans for such areas;
- Consult protected area sponsors and managers, Affected Communities ,Indigenous Peoples and other stakeholders on the proposed project, as appropriate; and
- Implement additional programs, as appropriate, to promote and enhance the conservation aims and effective management of the area.

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[24] Where the project occurs within or has the potential to adversely affect an area that is protected through legal or other effective means, and/or is internationally recognised, or proposed for such status by national governments, the client must identify and assess potential project-related impacts and apply the mitigation hierarchy so that impacts from the project will not compromise the integrity, conservation objectives and/or biodiversity importance of such an area

Table 2-10 Legally Protected and Key Biodiversity Areas Overlapping with the DMU or in Close Proximity

Protected Area	Status	Total Area	Area Overlapping with DMU
Kintrishi Nature Reserve	Legally protected area (IUCN category Ia)	10,703 ha (plus 3190 ha of protected landscape)	0 ha (adjacent to DMU)
Kintrishi IBA/KBA	Internationally recognised area	15,725 ha	2,957.13 ha
Adjara-Imereti Ridge IBA/KBA	Internationally recognised area	173,279 ha	0 ha (within 1km from DMU)
Shavsheti Ridge IBA/KBA Shavsheti Range (2) KBA	Internationally recognised area Internationally recognised area	38,253 ha 19,312 ha	2,878.26 ha 4,828 ha
Goderdzi Pass KBA	Internationally recognised area	30,632 ha	15,181 ha

Source: BAP Construction Phase

2.10 Summary of The Critical Habitat Assessment And Implications For The Project

Table 1-1 summarizes the results of the Critical Habitat assessment carried out in the last section.

Table 2-11 Summary of Critical Habitat Features (IFC PS6) Triggered

Critical Habitat Feature	Critical Habitat Triggered (Criteria/Tier)
Habitat of significant importance to critically endangered and/or endangered species (IUCN Red List)	Greek strawberry tree (*Arbutus andrachne*): Criteria 1 Tier 2e. Milk-vetch species (*Astragalus sommieri*): Criteria 1 Tier 2e.
Habitat of significant importance to endemic and/or restricted-range species	Caucasian salamander (*Mertensiella caucasica*): Criteria 2 Tier 2 Dwarf comphrey (*Symphytum grandiflorum*) Criteria 2 Tier 2 Caucasian chamomile (*Tripleurospermum szovitsii*) Criteria 2 Tier 2
Habitat supporting globally significant concentrations of migratory species and/or congregatory species	Not triggered
Highly threatened and/or unique ecosystems	Not triggered
Areas associated with key evolutionary processes	Not triggered

With respect to any implications for the project, the following conclusions can be draw,

- All natural forest in the DMU was classified as Critical Habitat because of the presence of Greek Strawberry tree (*Arbutus andrachne*), and Milk-vetch (*Astragalus sommieri*) (Georgian endangered), Dwarf comphrey (*Symphytum grandiflorum*) and Caucasian chamomile (*Tripleurospermum szovitsii*) (restricted-range) and Caucasian salamander (*Mertensiella caucasica*) (restricted-range).
- The Project affected 23. ha of this Critical Habitat forest but it is unlikely there was any measurable impacts on the species that trigger Critical Habitat (see *Error! Reference source not found.*). This is because Critical Habitat trigger species were either not present in the land required for the Project or the proposed mitigation resulted in no measurable adverse impact at the Project scale.

For the Greek Strawberry Tree (*Arbutus andrachne*) the project does not have any measurable adverse direct impacts on the area where this species occurs or on the ecological processes supporting this species (including local climatic regime and soil chemistry/nutrient cycling) as it was not recorded within the land required for the Project.

The results of monitoring of the Greek Strawberry where it occurs is provided in ***Section 3.1.5***

For Milk-vetch (*Astragalus sommieri*) the project has only affected a very small area of this habitat i.e. 0.42% of the river bed, roads and bare rock in the DMU (it was not possible to map the bare rock separately). It is important to note that it is very unlikely that this species is present in other locations near the Project, because the species has been subjected to monitoring in the past. The Project has not had any measurable adverse direct impacts in the area where this species occurs or on the ecological processes supporting this species (including local climatic regime and soil chemistry/nutrient cycling). The results of monitoring of the Milk-vetch where it occurs is provided in ***Section 3.1.5***

Symphytum grandiflorum is presently found in only two project areas, 300 m downstream of Skhalta Dam and downstream of Chirukhistsqali weir.

Tripleurospermum szovitsii is presently found close to the Chirukhistsqali weir.

The results of monitoring of these 2 species where they occur are provided in ***Section 3.1.5***

For the Caucasian Salamander (*Mertensiella caucasica*) there are confirmed records within and adjacent to the DMU. The habitats preferred by this species (Oriental beech forest, coniferous forest, mixed coniferous/deciduous forests) occupy 66.31% of the DMU. However, the total area of these habitats affected by the Project is 3.34 ha or 0.03% of the DMU. Total area of all forest habitats affected by the Project is 23.65 ha or 0.87% of the DMU. Caucasian salamander occurs mainly in small streams (it avoids large streams), usually less than 1-1.5 min width and about 20-30 cm in depth in spring (Kaya et al., 2009).

The results of monitoring of the Caucasian Salamander where it occurs is provided in ***Section 3.1.5.***

Even though it is maintained in the Construction phase BAP that the project will not affect any of the small streams of this type, the precautionary principle is followed due to subtle hydrological impacts on these streams (especially downstream of dams and weirs).

3. IMPACTS ON BIODIVERSITY RECEPTORS DURING THE OPERATION PHASE AND ACTION PLAN FOR MITIGATION AND MANAGEMENT

This section provides a summary of impacts relevant for the biodiversity priorities listed above and those mentioned below:

- Were Experienced in the construction phase for which monitoring is long term and will extend into the operation phase.
- Are expected to be experienced in the operation phase with specific mitigation for addressing these impacts
- Were experienced during the operation phase of the 35 KV transmission line with specific mitigation for addressing these impacts

Mitigation actions complied with the mitigation hierarchy as defined in IFC PS6 and pertain to actions that avoid, minimize (reduce), rehabilitate/restore (remedy) and compensate (offset) impacts of biodiversity receptors. There is a fourth type of action, described in PS6 as an additional action (GN34) that should consider identifying additional opportunities to enhance habitat and protect and conserve biodiversity as part of their operations. While net gains of biodiversity are a requirement in Critical Habitat, clients should also endeavour to implement additional measures in modified and natural habitats. For example, in modified habitat, the restoration of relevant biodiversity values or other habitat enhancement measures, such as the removal of invasive species scan be implemented. For natural habitats, an example might be the development of strategic frameworks with other companies and/or with the government through the design of joint mitigation measures.

The category of mitigation actions i.e. avoid, reduce, remedy and compensate are **bold faced** in the mitigation action tables below.

3.1 Impacts Experienced During The Construction Phase And Mitigation Implemented

The impacts experienced only during the construction phase:

1. Noise and light disturbance from construction activities affecting birds and mammals;
2. Dust deposition around working areas affecting adjacent habitats;
3. Localised changes in hydrological conditions and increased risk of localised pollution events due to use of construction vehicles affecting adjacent habitats and subsequent local effects on ground-nesting bird species and mammals;
4. Localised changes in air quality resulting from construction activities and increased vehicle movements through the area;
5. Reductions in water quality in the river system resulting from potential release of contaminants into the river as well as localised water quality issues due to discharges from construction facilities;
6. Sediment release into the river system resulting from the depositing of construction and tunnelling waste into the river;
7. Water abstraction for construction activities

Impacts experienced in the construction phase and likely to continue in the operation phase:

8. Compaction of soils and habitat degradation resulting from an increase in off-road vehicle movements which is likely to effect the condition of habitats;
9. Permanent habitat loss by land take for project components and inundation by reservoir
10. Temporary habitat loss resulting from the extraction of aggregates for the construction of the tunnels, dams and roads, spoil disposal, site compounds, and construction access roads;
11. Degradation of habitats for construction activities, including local felling of trees for timber, increased disturbance for construction workers.

12. Hunting of local wild mammals and birds, and fishing from the construction work force;
13. Accidental introduction and dispersal of invasive species from construction activities, which could have a long-term and irreversible effect on the local biodiversity.
14. Noise from operation of turbine, any maintenance activities and from maintenance workers and vehicles and lights from project installations.

The impacts described for 1 to 7 are short term and the specific mitigation proposed for the construction phase will not extend into the operation phase. These mitigation actions will not need to be managed or monitored in the operation phase.

The impacts described for 8 to 14, even though restricted to the construction phase will need continued monitoring and management in the operation phase. The relevant mitigation actions proposed in the BAP for each of these impacts are discussed below. For ease of cross referencing the Action reference numbers form the construction phase BAP are retained in this document.

3.1.1 Permanent Degradation and Loss of Habitats for Construction Activities

Terrestrial Habitats

Restoration of natural habitats, with the exception of rivers and streams, are confined to the following natural or Critical Habitats converted or degraded by construction as indicated in ***Table 3-1***.

Table 3-1 Vegetation Types and Habitat Features Impacted by Construction

Habitat TypeV ***VeVegetation Type/Habitat Feature***	**IFC Category**	**Conservation value**	**Area affected by Project (ha)**	**Proportion of this habitat affected within DMU (%)**
Mixed deciduous forest	Natural/ Critical	Medium	3.94	0.64
Deciduous forest dominated by oak an/or hornbeam	Natural/ Critical	High	15.85	0.38
Mixed deciduous and coniferous forest	Natural/ Critical	Medium	3.86	0.03
Walnut plantation	Modified	Low	3.41	45.17
Scrub with *Rhododendron ponticum*, *Prunus laurocerasus*, *Ilex colchica* and *Euonymus europaea*	Natural/ Modified	Medium	3.17	0.58
Grassland	Modified	Low	15.89	0.21

Habitat TypeV *VeVegetation Type/Habitat Feature*	**IFC Category**	**Conservation value**	**Area affected by Project (ha)**	**Proportion of this habitat affected within DMU (%)**
Agricultural land(arable land and pastures)	Modified	Negligible	10.46	0.09
Rivers and streams (high confidence)	Natural	High	15.21	3.65
River bed, roads and bare rock (low confidence)	Natural/ Modified	Medium/Low	0.62	0.05
Roads (mud and paved roads)	Modified	Negligible	2.08	0.19
Human settlements	Modified	Negligible	0.92	0.12

At present there are 7 species on the Georgia Red-List found in the study area (***Table 3-2***).

Table 3-2 Georgia Red-list Species Found in Study Area

Species Latin name	**Species Common name**	**Georgia Red Data Book**	**IUCN Red List** (v 2017-3)
Juglans regia	Walnut	VU	NT
Ostrya carpinifolia	Horn hornbeam	EN	-
Ulmus glabra	Elm	VU	-
Taxus baccata	Yew	VU	LC
Arbutus andrachne	Greek Strawberry	EN	-
Astragalus sommieri		EN	-
Cornus sanguinea ssp. australis (Swida koenigii)	Dog wood	VU	-

The Law of the General Rules for the Protection of Wild Plants and Animals (1994) and the Law of Georgia on Wildlife (1996) includes provisions for the 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. Lates updated in Georgian legislation requires monetary compensation for red-list species felled during construction activities.

In compliance to IFC PS6, the loss of 23.65 ha of natural habitat lost due to construction of the Shuakhevi cascade is to be restored.

In addition 0.3 ha lost due to the 35 KV transmission line construction is also to be restored.

The Social and Environment Supplementary Assessment (2016) for the 35 KV transmission line estimates that 0.3 ha of natural habitat loss will occur due to the construction of the transmission line. In addition there is a likely loss of some natural habitat due to trimming of trees to prevent branches touching the transmission line. While trimming is unlikely to constitute loss of natural habitat, old growth forest such Mixed Deciduous Forests dominated by Oak and Hornbeam may be somewhat impacted especially if natural tree growth is very slow.

The transmission line alignment and tower pads were superimposed on a Google Earth Imagery (2020).

The likely loss of habitat due to tower pad construction was estimated at 0.09 ha

While most of the alignment did follow river valleys and did not overlap with natural habitat, a length of 1130 m did overlap with natural habitat. From pre-construction surveys, it was determined that this habitat was dominated by Mixed Deciduous Forests dominated by Oak and Hornbeam.

The Right of Way on each side of the transmission line is 20 m and therefore it is likely that 40 m will need to be trimmed on both sides of transmission line. This results in an overlap of 4.2 ha with natural habitat. We assume that only 5 % of trees will be old growth forest and will reach a height that will need trimming. This provides an impacted area of 0.21 ha.

The area estimated to be impacted by natural habitat loss and trimming is approximately 0.3 ha.

Therefore the total area of forest to be restored is 23. 95 ha. To ensure net gains, restoration of a larger area of these forest types is required.

An adaptation of the habitat hectares method as per Parkes et al (2003) was used.

The Habitat Hectares enables us to identify the amount of habitat of the same ecological vegetation class (EVC) type that would be required to replace the habitat lost to the project. However most metrics recognise that replacement of habitat is subject to a number of risks and that a simple 1:1 ratio may not be suitable to achieve effective compensation for habitat loss. Guidance on the Habitats Directive 92/43/EEC, in relation to compensation ratios states (European Commission January 2007), areas of habitat types within the project area have been determined based on habitat condition scores. These scores are used to set a baseline condition of the impact site against a habitat condition benchmark (set at a value of 1). The Habitat Hectare model relies on scores to define ‘vegetation quality’, being the degree to which the current vegetation differs from a ‘benchmark’ representing characteristics of a mature and apparently long-undisturbed stand of the same vegetation community. Essentially, this method attempts to assess how ‘natural’ a site is by comparing it to the same vegetation type in the absence of major ecosystem changes that have occurred (Parkes et al 2003).

Table 3.3 outlines the habitat class condition scores applied. These scores have been derived based on the definitions contained in IFC PS6 for “natural” and “modified” habitats and the definition of “degradation” of habitats (IFC, 2012a). The scores have been derived to reflect the relative difference between a condition category and the benchmark, which in effect is a proxy for the ‘restorability’ of that habitat.

Table 3-3 Habitat condition scores (A)

Condition	Definition	Value
Benchmark	Benchmark habitats in a mature condition with only native origin vegetation, a diversity of species of a mature or senescent state; and no sign of human disturbance (such as the presence of waste, vegetation removal).	>0.75 - 1
Natural	Natural condition is defined as habitat largely of native origin, and/or where human activity has not essentially modified the primary ecological functions and species composition. Some disturbance is likely present such as vegetation removal, waste and minor introduction of invasive species.	>0.5- 0.75
Modified	Modified condition habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition	>0.25-0.5
Degraded	Degraded condition is defined as significant conversion or degradation of the habitat such as the elimination or severe diminution of the integrity of a habitat caused by a major and/or long-term change in land or water use; or (ii) a modification that substantially minimizes the habitat's ability to maintain viable populations of its native species	0-0.25

Here the following calculations were carried out where the offset period for temperate forest habitats are recommended as 30 years. Literature was reviewed for determining the period in which the vegetation types impacted could be restored to a stage where intervention was not deemed necessary for their continued perpetuation. This varied greatly across soft-woods (Spruces and Pines) and hard-woods (Oak and European Hornbeam) and therefore the mean period to allow natural perpetuation and thereby offset period, was assigned 30 years.

1. Calculation of Baseline Habitat Hectares: Candidate Offset Habitat Condition Score (A1) x Area of Habitat Type (B1) = Candidate Offset Habitat Hectares (W)

2. Calculation of Habitat Hectare Gains: Candidate Offset Habitat Condition Score (A1) + Candidate Offset Habitat Condition Score (Gain) (C1)] x Area of Habitat Type (B1) = Candidate Offset Habitat Hectares Gain (X)

3. Calculation of Habitat Hectares: Candidate Offset Habitat Hectares Gain (X) – Candidate Offset Baseline Habitat Hectares (W) = Candidate Offset Habitat Hectares (Y)

The habitat condition (A1) and offset gain (C1) scores for habitats is provided below

The offset gain scores have been derived based on the likely relative periods to achieve ecological restoration and the available Offset Gain Period. These have been adapted from Parkes et al (2003) to reflect likelihood of faster restoration in temperate forests.

In the case of Natural Habitat, a gain score of 0.003 (0.3%) is estimated to be achieved in 1 year; and 0.03(3 %) increase by 10 and 0.3 (30 %) increase by 30 years.

In the case of Modified Habitat, a gain score of 0.004 (0.4%) is estimated to be achieved in 1 year; and 0.04(4 %) increase by 10 and 0.4 (40 %) increase by 30 years.

These gain scores are outlined in ***Table .***

ERM has considered the potential rate for failure of plantings; impacts from natural effects and lost biodiversity value during the time of management to define these values.

The estimates of gain may vary in practice and require monitoring to determine if the estimation are accurate. Where significant variations occur in estimated value increases, additional management or increases in offset areas managed will need to be applied.

Table 3-4 Offset gain score (C1)

Existing Site Condition	Base Condition Value	Gain 1 year	Gain 10 years	Gain 30 years
Natural	0.8	0.003	0.03	0.3
Modified	0.5	0.004	0.04	0.4
Degraded	0.25	0.005	0.05	0.5

Based on the above calculations:

For the Shuakhevi cascade a gain score of 0.3 (30 %) is suggested if the offset is in Deciduous forest dominated by Oak and/ or hornbeam as natural habitats and the impacted habitat is in natural condition with habitat condition of 0.8. The categorization of natural habitat is guided by the Construction Phase BAP (Mot MacDonald, 2016) which considers this vegetation type of high conservation value.

A gain score of 0.4 (40 %) is suggested if the offset is in either Mixed Deciduous Forests or Mixed Deciduous Forests with Conifers as modified habitats and the impacted habitat is in modified condition with habitat condition 0.6. The categorization of modified habitat is guided by the Construction Phase BAP (Mot MacDonald, 2016) which considers these vegetation types of medium conservation value.

An offset discount is applied assuming that all vegetation cleared for project components will be in modified or natural condition. This discount assumes that Mixed Deciduous Mixed Deciduous Forests or Mixed Deciduous Forests with Conifers (Modified Habitat) and Deciduous forest dominated by Oak and/ or Hornbeam (Natural Habitat) will be restored with habitat conditions of 0.6 and 0.8 for Modified and Natural Habitats respectively.

The discount assumes that all vegetation cleared will be rehabilitated and attain a gain of 0.4 (40 %) for modified habitat and 0.3 (30%) for natural habitat in the 30 year offset period

Table 3.5 provides the discounted offset areas.

Table 3-5 Discounts for Offset

Vegetation Type	Area Cleared (B) ha (includes cascade and TL)	Habitat Condition (A1)	Gains (C1)	Discounted Offset (A1XB)-(BxC1) ha
Mixed deciduous forest	3.94	0.6	0.4	0.79
Mixed deciduous and coniferous forest	3.86	0.6	0.4	0.78
Deciduous forest dominated by Oak and/ or hornbeam	16.15	0.8	0.3	7.93
Total	23.95			9.49

The total area available for an offset is 30 ha (10 ha in modified habitat and 20 ha in natural habitat) in accordance to available land in the Project Area as well as discussions with government agencies that included the Wildlife Agency of Adajara. The offset habitat hectares is derived in ***Table 3.6***

Table 3-6 Habitat Hectares of Offset

Habitat Type Condition	Condition Score(A1)	Offset Gain Score (C1) 30 years	Habitat Type Area (B1)	Habitat Hectare Offset Area (W)	Habitat Hectare Gain Value (X)	Habitat Hectare Candidate Offset Value (Y)
Natural	0.8	0.3	20	16	22	6
Modified	0.6	0.4	`10	6	10	4
Total			30	22	32	10

The offset habitat hectares value exceeds the discounted value by 0.51 ha (10-9.49) and therefore net gains is achieved

Therefore, considering a total of 23.65 and 0.3 ha will be impacted as a consequence of the Shuakhevi cascade and 35 KV transmission line construction, 30 ha will need to be restored to achieve net gains.

The targets and the present status of restoration are summarized in ***Table 3.7.***

Table 3-7 Impacted and Offset Areas for Shuakhevi Cascade and 35 KV Transmission Line

Habitat Type	Habitat Type	Area Impacted (ha)	Habitat Hectares Offset Value	Total Area to be Restored (ha)	Present Status of Restoration (ha)	Remaining Area to be restored (ha)
Modified	**Mixed deciduous forest**	3.94	4	10	4.25 - Iakobidzeebi Village in Khulo municipality and Vashlovani Village, in Shuakhevi Municipality	1.65
	Mixed deciduous and coniferous forest	3.86			4.1 -Zamleti Village in Khulo municipality, Didsavardia Village and Jabnidzeebi village in Shuakhevi Municipality	
Natural	**Deciduous forest dominated by Oak and/ or hornbeam**	16.15	6	20	9.8 is already planted in the Village Tsablana in Khulo municipality and Nigazeuli Village in Shuakhevi Municipality) 9.5 ha restoration is in progress and will be completed in spring 2021, based on the contract with Wildlife Agency of the Ministry of Environmental Protection And Agriculture	0.7
	Grand Total	23.95	10	30	27.85	2.15

The remaining restoration will be carried out in Spring, 2021 and Autumn 2021. The areas for planting are identified.

Action B 2.1: Net gains through replanting of red listed species and species specific to habitats degraded or lost as a result of the Project.

Mitigation hierarchy	Avoid	Reduce	**Remedy**	**Offset**	Additional Actions

Timescale: Planting commences once site is agreed with the GOG and a replanting/ strategy is developed. 5 years of maintenance which includes removal of saplings that do not survive and invasive species management.
Monitoring to be carried out and responsibilities for monitoring as per Section 4.
Agency responsible for implementation: ECM and Botanist.

As mentioned in Section 2.9.1 and 2.9.2 there are other Georgian Red-Listed Plants and those endemic to the Adjara Region present in the DMU. Both direct construction impacts as well as long range more subtle impacts from the project in the construction and operation phase could cause declines in individuals or stands and these declines will have to be monitored and mitigation carried out should declines be noticed.

Action B 2.3: Protect the populations of Georgia threatened and Endemic plant species in the Study Area					
Mitigation hierarchy	Avoid	Reduce	Remedy	Offset	**Additional Actions**
Timescale: Agree and start implementing protection measures in 2017; 10 years of annual monitoring to be carried out and responsibilities for monitoring as per Section 4. Agency responsible for implementation: ECM and Botanist.					

Aquatic Habitats

Inundation by reservoirs will cover approximately 39.1 ha (Mott MacDonald (2012b).. This will include the following lengths of river reaches which are natural habitat.

- Didachara Reservoir: 2.44 km
- Skhalta Reservoir: 3.27km
- Chirukhisqali Reservoir: 0.47 km

The inundation will convert lotic habitats to lacustrine habitats thereby impacting species whose life histories require lotic habitats

The sampling of fish abundance from 2014-2019 upstream of the Didachara, Chirukhisqali and Skhalta Dams provides the following results. The full results are in **Annexe B.**

1.*Salmo trutta* (Brown Trout) -overall trend does not change across all upstream sites
2.*Luciobarbus escherichii*-overall decreases from abundances in 2014 downstream of the Didachara dam but no change in Chirukhisqali and not recorded upstream in Skhalta
3. *Alburnoides fasciatu*s, *Oxynoemacheilus angorae* and *Luciobarbus escherichii* initially found upstream of the Didachara dam in 2014 disappeared in subsequent years.

The monitoring upstream of Didachara dam gives some idea of what species composition was like in the inundated section of the rivers in 2013 prior to construction of the dam. While the declines observed are unlikely completely attributed to the project, if they are, these species are likely to continue to decline. The monitoring in the operation phase will indicate consistent declines likely attributed to the project.

However as while we observe there no overall decline of Brown Trout upstream, of all dams, we are unaware whether the inundation had any impacts on the species in the inundated reach. However this sub-species of trout is also known to live in lakes and reservoirs (Ortlepp and Murle, 2003) and it is likely that impacts to populations within the inundated reach, may recover quickly through colonization by individuals further upstream. Any residual impacts to Brown Trout will be compensated through the fish stocking programme which should also be implemented upstream of all dams.

For the 4 other species we assume that loss of natural habitat, from lotic to lacustrine habitat, does occur and these species are consequently impacted. IFC PS 6 (2019) recommends that in areas of natural habitat, mitigation measures will be designed to achieve no net loss of biodiversity where feasible. Appropriate actions include:

- Avoiding impacts on biodiversity through the identification and protection of set-asides;
- Implementing measures to minimize habitat fragmentation, such as biological corridors;

- Restoring habitats during operations and/or after operations; and
- Implementing biodiversity offsets.

It is very challenging and thereby not feasible, to restore natural aquatic habitats to original conditions through a biodiversity offset.

However as discussed below in ***Section 3.1.6*** some additional actions will be taken to compensate declines in species abundance in sites immediately downstream of the Didachara. These actions will also compensate for loss of lotic habitat by inundation.

Long term monitoring of abundance of fish species will continue right through the operation phase and adaptive management will be considered, should any significant declines of abundance of any of the species recorded in the project area occur. While re-stocking of Brown Trout as required by the Ministry of Environmental Protection and Agriculture is planned, declines of any of the other species will also be compensated, by possible restocking.

Furthermore, as discussed in ***Section 3.2***, any impacts of reduced flows and peaking will be identified immediately after commissioning and adaptive management, in consultation with qualified ichthyologists, will be considered.

3.1.2 Management of Alien Invasive Species

Non-native (alien) invasive species (AIS) are the second greatest threat to global biodiversity after habitat destruction. The likelihood of invasion by alien species is higher in habitats that are altered and disturbed, for example during construction. Invasive species have the following traits:

- Fast growth
- Rapid reproduction
- High dispersal ability
- Ability to alter growth form to suit current conditions
- Tolerance of a wide range of environmental conditions
- Ability to live off of a wide range of food types
- Association with humans

The only AIS recorded on the Project sites that are recognised as being invasive in Georgia are *Ambrosia artemisiifolia* (Ragweed) and *Robinia pseudacacia* (Black Locust) (Kikodze et al., 2009). However, these species are not recognised as being among 100 of the world's worst invasive alien species (Lowe et al., 2000; Weber, 2003).

The monitoring of invasive species (2013-2019) has provided the following results.

In August, 2019 invasion either through the occurrence of single plants or clumped distributions were observed in:

1. Khichauri Contractors storage area (*Ambrosia artemisiifolia*)
2. Akhaldaba-2 - Spoil Disposal Area (*Ambrosia artemisiifolia)*
3. Shuakhevi high pressure headrace tunnel adit area (*Robinia pseudoacacia*)
4. Shuakhevi, Spoil Disposal Area 7 (*Robinia pseudoacacia*)
5. Chanchkhalo road and adit (*Ambrosia artemisiifolia*)
6. Nigazeuli Spoil Disposal Area 4B (*Ambrosia artemisiifolia*)
7. Vashlovani Spoil Disposal Area 4 (*Robinia pseudoacacia* and *Ambrosia artemisiifolia)*
8. Paqsadzeebi Camp Site (*Ambrosia artemisiifolia*)

In August 2019 large scale invasion was observed in:

1. Saburkhevi Spoil Disposal Area 6 (*Ambrosia artemisiifolia*).
2. Paksadzeebi Spoil Disposal Area (*Ambrosia artemisiifolia*)
3. Shuakhevi, Poverhouse Site (*Robinia pseudoacacia*)
4. Nigazeuli Spoil Disposal Area 4A (*Ambrosia artemisiifolia*).
5. Didachara Spoil Disposal Area 3 (*Robinia pseudoacacia* and *Ambrosia artemisiifolia*)

In September 2019, sites were cleared of invasive species.

This is borne out by the observation that by September, 2020 invasion was only observed in the these sites.

1. Shuakhevi, Powerhouse Site (Robinia pseudoacacia and Ambrosia artemisiifolia)
2. Saburkhevi Spoil Disposal Area 6 (Ambrosia artemisiifolia)
3. Didachara Spoil Disposal Area 3 (Ambrosia artemisiifolia).

It also may be added that all sites where widespread invasion was noticed were surrounded by natural habitat with invasions of the 2 species. Given this and that there are other natural factors that influence the spread of invasive species, it is difficult to assess whether proliferation has been caused by project impacts alone.

However several actions were suggested during the construction phase for the prevention of proliferation of invasive species.

Implementing measures to prevent the accidental introductions of invasive species are required under the IFC PS6 (IFC, 2012a) and EBRD PR6 (EBRD, 2008). IFC PS6 (IFC, 2012a) includes the following requirements with regard to AIS:

- Must not intentionally introduce AIS unless this is in accordance with existing regulatory framework
- Must not deliberately introduce AIS irrespective of regulatory framework
- Introduction of AIS (e.g. in planting) must be subject to a risk assessment
- Implement measures to avoid accidental introduction or spreading of alien species (see below)
- Consider the implementation of measures to eradicate AIS from natural habitats over which client has management control

The efficacy of these actions will be monitored during the operation phase to ensure that any proliferation does not impact indigenous plant communities.

A key requirement of the monitoring is to ensure that while invasion of single plants or clumps of plants is noted in some areas, none of these areas are subject to large scale proliferation of invasive species.

It further may be noted that in some areas, there is proliferation of invasive species outside the impacted sites, which could be due to natural causes. If invasive species proliferate into impacted sites due to such natural proliferation, control of invasive species is challenging and beyond the control of AGL

The monitoring will also ensure that impacted areas which are presently not subject to proliferation of species or do not have proliferation of invasive species in surrounding areas, do not experience proliferation as a possible consequence of project impacts.

Action B 1.7 : Prevent the spread of alien invasive species during construction of the Project in areas were proliferation can be attributed to the project and not through natural causes.					
Mitigation hierarchy	Avoid	**Reduce**	Remedy	Offset	Additional Actions
Timescale: Monitoring to be carried out and responsibilities for monitoring as per Section 4. Agency responsible for implementation : ECM and Botanist.					

3.1.3 Temporary Habitat Loss during Construction

Restoration of any natural habitats that are affected temporarily by construction are being implemented from the end of construction. On small un-forested areas, it is expected that the vegetation will gradually establish on its own on the reinstated top soils (after a number of years) as most plants will regenerate from the seed bank.

The following protocols are being implemented for reinstatement of top soils.

Soils have been reinstated at all temporary construction sites that include 2 construction camps while reinstating is in progress at 2 additional camps.

The following action as relevant for the operation phase is proposed.

Action B 1.5: Habitat/soil removal and reinstatement plant (HRRP) implemented by following clear and best practice guidance to minimise adverse impacts					
Mitigation hierarchy	Avoid	Reduce	**Remedy**	Offset	Additional Actions
Timescale: Implementation during and at the end of construction. Monitoring to be carried out and responsibilities for monitoring as per Section 4. Agency responsible for implementation : EPC contractor					

3.1.4 Construction Phase Impacts and their Monitoring for Priority Species and their Habitats.

Among fauna of conservation significance likely across the study area, the impact on these terrestrial fauna can be summarised as follows:

- The Caucasian Salamander occurs in the forest habitats at higher elevations associated along the Chirukhistsqali as established by the biodiversity monitoring , but during construction was not found to be impacted by habitat loss and degradation associated with the access roads and construction working areas (**See Section 3.1.5 and Annexe B**)

- While bird diversity is high, few bird species of conservation value occur within the project footprint. Long-legged Buzzard is likely to forage across the project during migration periods and could have been negatively impacted due to potential additional hunting and minor loss of habitats which are likely to be used for foraging. The species was recorded during the biodiversity monitoring and was recorded across all monitoring years (**Annexe B**).

- A pair of Egyptian vultures (*Neophron percnopterus*) was recorded on a cliff near the village of Kortokhi south-east from Didachara (GPS location N 41.648460 E 42.378370) only during the breeding season in 2013. The species was not observed nesting across the future monitoring years but it is known whether this was related to construction (**Annexe B**).

- Little owl (*Athene noctua*) breeding in the surrounding forest habitats may have experienced negative impacts due to loss and fragmentation of the forest habitats associated with access roads, construction working areas, loss of nesting sites and noise disturbance. Little Owl is of medium conservation value (due to its status in the Georgian Red Data Book). The species was not recorded during the biodiversity monitoring.

- The Caucasian Grouse, which is of medium conservation value, was recorded in the study area, however, this species tends to forage and breed at much higher elevations. The species was however not recorded during the long term monitoring.

- Wildcat, Wild Boar, Jackal, Lynx and Brown Bear all occur within the study area. The most significant construction impacts to these species were risks from hunting, temporary habitat loss and disturbance. While jackal did increase at Didachara all other species did not show any consistent increase of decrease (**Annexe B**).

- Eleven bat species were recorded within the study, and these were likely to be impacted during construction from tree removal for access roads, noise and light disturbance, and temporary severance of commuting routes. No known bat roosts occur within the study area although it is likely that some minor tree roosts were disturbed and lost. No changes were observed in both bat abundance and species richness within the Order Chiroptera during the monitoring years (**Annexe B**)**.**

- Eurasian Otters are of high conservation value and the impact during construction had the potential to be a significant due to disturbance, sediment release into the rivers, habitat loss, noise disturbance and construction activities in the river acting as an ecological barrier. Indirect evidence such a tracks, scat etc were monitored since 2016. In 2016, 2017 and 2018, 14, 13 and 14 sites had indirect evidence of otters indicating that the species has not declined across the monitoring years (**Annexe B**).

The efficacy of the following actions suggested in the construction phase will need to be monitored in the operation phase across the following taxa

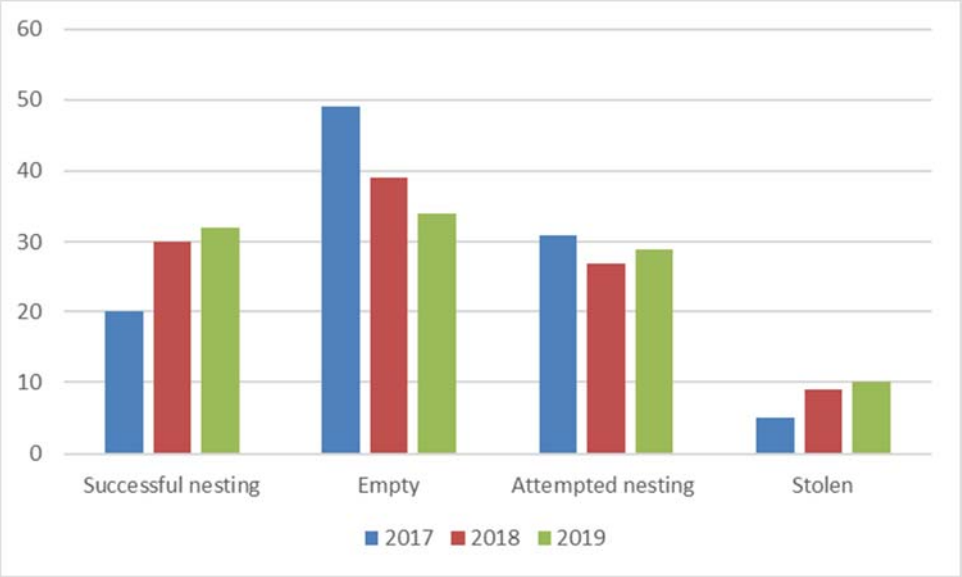
Birds

23.65 ha of forest habitat, highly suitable habitat for nesting birds, was lost under the Project. Compensatory forest planting commenced as explained under Action B 2.1. In addition, to compensate for this loss of habitat for breeding birds, bird boxes were installed. Up to 100 bird boxes were installed on trees in the Study Area, especially near the Project sites.

AGL provided financial/logistical support to a specialist consultancy to install the bird boxes in 2016. The boxes were monitored and maintained by the same organisation for five years. The same consultancy was been appointed to ensure that appropriate sites and specifications for bird boxes are identified.

Figure 3-1 provides the results obtained from monitoring bird boxes. It is to be noted that the percentage of successful nest boxes increased across 2017, 2018, and 2019, the number of empty boxes decreased while attempted nesting varied. The monitoring has only been carried out for 2 years and needs to continue long term to assess the efficacy of this mitigation action.

Figure 3-1 Results of Monitoring of Bird Next Boxes



The bird boxes targeted passerine species, Red-starts, Tits, Little (*Athene noctua*) and Boreal owl (*Aegolius funereus;* Annexe 1 EBDRD) and Rose Chaffinch (*Carpodacus erythrinus*, Bern Convention Appendix II).

Action E 2.1: Provide artificial nesting opportunities for priority bird species through 100 bird boxes installed in the Study Area by 2017					
Mitigation hierarchy	Avoid	Reduce	Remedy	**Offset**	Additional Actions
Timescale: Monitoring to be carried out and responsibilities for monitoring as per Section 4. Agency responsible for implementation : ECM and Ornithologist.					

In addition to artificial enhancements such as bird boxes there was also a need to continue to monitor long terms impacts on breeding and resident bird abundance and diversity from the project moving from the construction phase into the operation phase. For this the following action is suggested.

From the biodiversity monitoring it was found that there was not significant decline of species richness and abundance across all impacted sites within the bird orders Accipitriformes, Piciformes and Passeriformes (**Annexe B).**

Action E 2.2 : Annual bird surveys across the operational phase

Mitigation hierarchy	Avoid	Reduce	Remedy	Offset	**Additional Actions**
Timescale: Monitoring to be carried out and responsibilities for monitoring as per Section 4. Indicators, locations and schedules for monitoring provided in Section 4. Agency responsible for implementation: ECM and Ornithologist.					

All operation staff will be required to follow company rules and Code of Conduct. To ensure the national legislation prohibiting hunting and poaching of protected bird species is not breached, additional measures are being, implemented to protect birds within the Project area and surroundings. All are under an obligation not to undertake poaching or hunting throughout the whole area of the development. Information on illegal hunting and poaching, will continue to be provided to workers during induction, toolbox talks and regular HSE meetings. Warning signs regarding the illegal hunting are being installed near all construction and camp sites

Action E 1.3 : No hunting or poaching of birds by AGL in the Project area and surroundings during operation

Mitigation hierarchy	Avoid	Reduce	Remedy	Offset	**Additional Actions**
Timescale: Monitoring to be carried out and responsibilities for monitoring as per Section 4. Indicators, locations and schedules for monitoring provided in Section 4. Agency responsible for implementation: AGL security					

Mammals and Reptiles

All 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 are being implemented to protect the mammals and reptiles within the Project area and surroundings. All are under an obligation not to undertake poaching or hunting throughout the whole area of the development. Information on illegal hunting and poaching will continue to be provided to workers during induction, toolbox talks and regular HSE meetings. Warning signs regarding the illegal hunting are being installed near all construction and camp sites

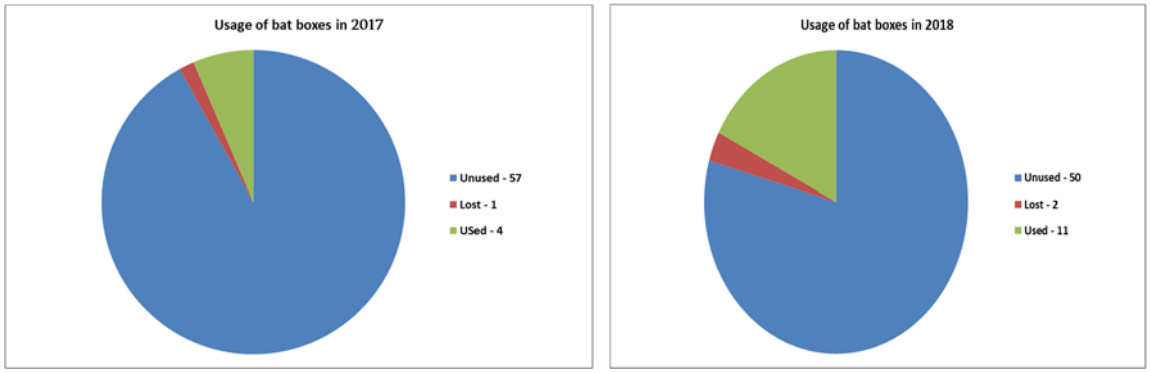
Action D 1.4: No hunting or poaching by AGL in the Project area and surroundings during operation

Mitigation hierarchy	**Avoid**	Reduce	Remedy	Offset	Additional Actions
Timescale: Monitoring to be carried out and responsibilities for monitoring as per Section 4. Indicators, locations and schedules for monitoring provided in Section 4. Agency responsible for implementation: AGL security					

To offset for the loss of suitable roosting sites for bats, AGL provided financial/logistical support to a specialist consultancy which installed 100 bat boxes near the project areas. The boxes are being monitored annually and maintained by the same organisation for five years well into the operation phase.

Figure 3-2 indicates the usage of bat boxes in 2017 and 2018

Figure 3-2 Results of Monitoring of Bat Boxes



In 2017 6.4 % of the bat boxes were used as compared to 2018 when 17.4 % were used. This represents a significant increase and demonstrates good utility of this mitigation action.

Action D 2.1: Provide artificial nesting opportunities for priority bat species **Target: Install up to 100 bat boxes**					
Mitigation hierarchy	Avoid	Reduce	Remedy	**Offset**	Additional Actions
Timescale: Monitoring to be carried out and responsibilities for monitoring as per Section 4. Indicators, locations and schedules for monitoring provided in Section 4. Agency responsible for implementation: ECM and Chiropteran expert.					

Action D2.1 will continue during the operation phase to assess long-term efficacy of mitigation.

Owing to the high conservation importance of threatened mammals and reptiles and their continuous decline, further research is necessary to understand their distribution and ecology in the study area and determine whether past impacts from construction prevail during the operation phase or are unique for the operation phase.

This research focusses on temporal and spatial trends on distribution, breeding, and population size of species which are protected or threatened. The research involves the use of camera traps and live traps for small mammals, to collect reliable information. The camera and live traps are being installed and checked by the specialists undertaking the monitoring. The statistical trend analysis of these survey results are summarized above and provided in **Annexe B.**

Action D 2.2: Research to evaluate spatial and temporal trends of mammal and reptile species					
Mitigation hierarchy	Avoid	Reduce	Remedy	Offset	**Additional Actions**
Timescale: Right through operation phase. Monitoring to be carried out and responsibilities for monitoring as per Section 4. Indicators, locations and schedules for monitoring provided in Section 4. Agency responsible for implementation: ECM and Mammal /Herpetologist experts					

Raising awareness of the local population on the importance of protected and threatened mammal and reptile species is being undertaken through ecology activities in schools (including field trips), workshops, videos, posters and leaflets. This is important as widespread hunting and trapping for sport and food does take place in the study area and its surroundings and due to AGL's stewardship of the area, steps should be taken to prevent decline on threatened and protected species. AGL has provided financial and/or

logistical support to some of the activities described above. AGL has established two information centres in Khulo and Shuakhevi (since April 2014), where local people can find leaflets, posters, photos and videos relevant to the Project and the biodiversity in the study area. This action commenced in the construction phase and will continue at periodic intervals through the operation phase.

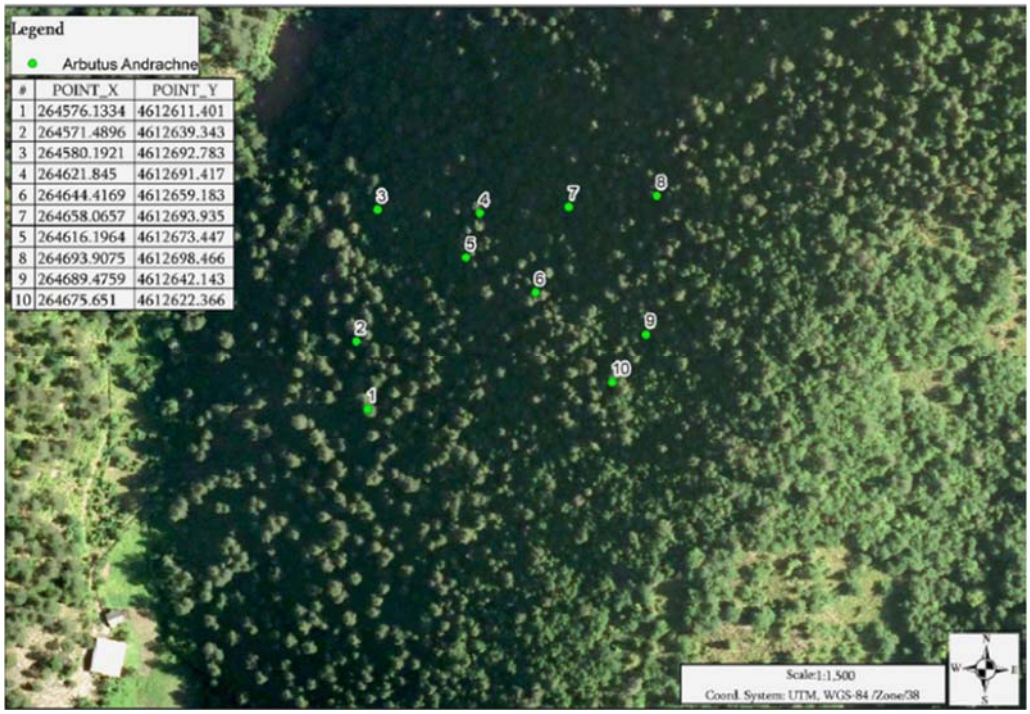
Action D 2.3: Local communities to be aware of the importance of wild and threatened mammals and reptiles in the study area and the relevant wildlife laws					
Mitigation hierarchy	Avoid	Reduce	Remedy	Offset	**Additional Actions**
Timescale: Right through operation phase. Monitoring to be carried out and responsibilities for monitoring as per Section 4. Indicators, locations and schedules for monitoring provided in Section 4. Agency responsible for implementation: ECM, and local Conservation NGOs with some support from the social team					

3.1.5 Residual Impacts on Critical Habitat Trigger Species from Monitoring of Biodiversity in Construction Phase

Although the Project is unlikely to affect the species, Milk-vetch *Astragalus sommieri* and Greek Strawberry tree *Arbutus andrachne* for the years 2017-2019, no reduction in stems of these species were observed and the habitats within the plots maintained species diversity and cover.

The location of the species are provided in *Error! Reference source not found.*

Figure 3-3 Location of *Arbutus andrachne*



The trends in numbers across the monitoring years is provided in *Error! Reference source not found.* .

Table 3-8 Trends in Numbers of Arbutus andrachne across monitoring years

Plot Number	2017	2018	2019
1.	1	1	1
2.	1	1	1
3.	1	1	1
4.	4	4	4
5.	5	5	5
6.	4	4	4
7.	4	4	5
8.	4	3	3
9.	1	1	2
10.	1	1	1
Total	26	25	27

There appears to be a small increase in numbers of the species across 2017-2019

Milk-vetch species (*Astragalus sommieri*)

The location of the species is provided in *Error! Reference source not found.*.

Figure 3-4 Locations of *Astragalus sommierii*

Error! Reference source not found. provides the trends in the number of stems of the species in the monitoring years 2017-2019

Table 3-9 Trends in Numbers of *Astragalus sommierii* across Monitoring Years

Plot Number	2017	2018	2019
1.	35	30	39
2.	15	14	16
3.	38	36	39
4.	12	12	16
5.	10	10	10
6.	3	1	2
7.	1	1	2
8.	6	6	6
9.	1	1	1
10.	1	1	3
Total	122	112	134

There appears to be an increase in numbers of the species across 2017-2019.

Dwarf Comphrey (*Symphytum grandiflorum*)

At the Chirukhistsqali weir its habitat was restricted in 2013-2014 and through monitoring in April 2020 it was found confined to only specific sections of the river where the forest is adjacent to the right bank of the Chirukhistskali and where impacts of construction are not observed and is maintained in an almost intact conditiomn.

The species is no longer found in Sanalia and Saburkhevi, because habitat in these sites have been completely modified as a result of the construction of the Chirukhisqali weir. .

The area on which the *Symphytum grandiflorum* population was lost due to the construction of the Chirukhistskali Dam is 0.09 ha (see **Annexe B**)

Caucasian Chamomille *(Tripleurospermum szovitsii)*

Monitoring in April and July 2020 showed that there was no severe impact on this species during construction. This is because this species grows along the road on the dry-rocky slope of the right bank of the river, where no damaging impacts of construction are observed.

To compensate for the loss of the Dwarf Comphrey and achieve net gains, it is recommended that 20 % additional area over the areas formerly occupied by and lost due to construction, be restored in an alternate site with an appropriate number of seedlings brought in from other areas where it grows. A cultivation plan is presently being prepared for this alternate site and will be implemented in spring 2021.

Caucasian Salamader (*Mertensiella caucasica*)

The total number of Caucasian salamanders observed across the monitoring years 2013-2018 indicated that there were no increasing or decreasing trends in the abundance of Caucasian salamanders (See **Annexe B).**

3.1.6 Residual Impacts to other Species from Monitoring of Biodiversity in Construction Phase

This section describes residual impacts to the biodiversity receptors prevailing subsequent to the implementation of the mitigation hierarchy. Mitigation is also proposed to address these residual impacts.

3.1.6.1 Forest Habitats.

The extent of forest habitats permanently lost for the construction of project components and inundation by the reservoir is 23.95ha. Due to the presence of 2 Georgian Red-List Endangered plant species, 2 restricted-range endemic plant species and the restricted range Caucasian salamander, these forest habitats are considered Critical Habitat.

At present the existing or proposed plans for compensation involves 30 ha which achieves net gains.

3.1.6.2 Terrestrial Species

From an analysis of the biodiversity monitoring carried out during the construction phase (**Annexe B**), some impacts were detected for some taxa. These taxa were the species of the order Piciformes, the aquatic dependent White-throated Dipper and certain mammal species. *Error! Reference source not found.* provides the taxa, locations where impacts were observed and proposed mitigation. As none of the species within these taxa were Critical Habitat trigger species, the objective of the mitigation was to obtain no net loss.

Aquatic Species

Fish

Declines of some species were noticed in sites, downstream of the Didachara Dam along the Adjaratqali River.

There were no declines observed upstream of the Didachara Dam

Declines of some species were observed downstream of the Chirukhisqali River. However as a control sites close by also had similar declines these declines were likely a consequence of natural population cycling and not project related impacts. Furthermore the sampling location along the Chirukhisqali River is 2 km upstream of its confluence with the Adjarastqali River and it is unlikely to have been impacted by any construction activity.

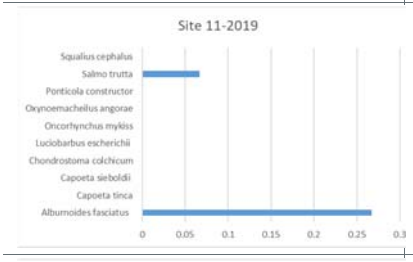
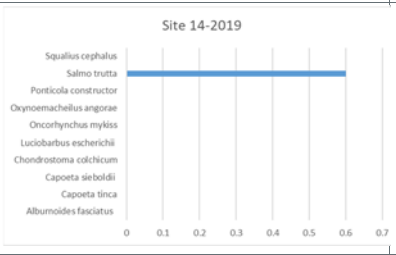
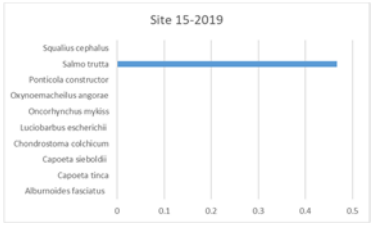
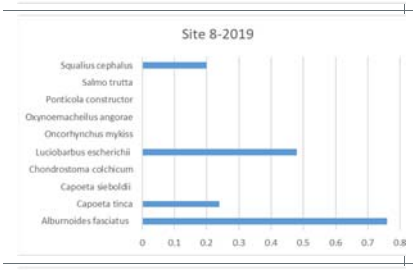
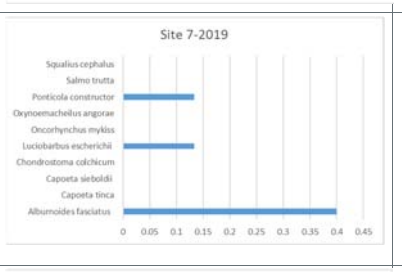
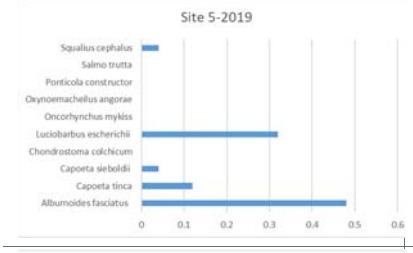
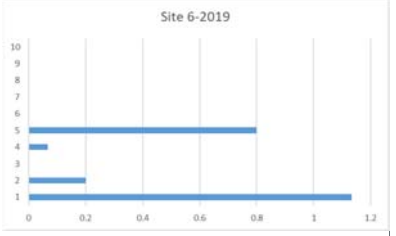
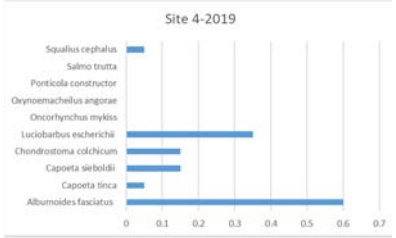
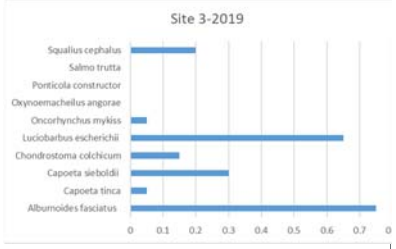
It may be added that the Brown Trout (*Salmo trutta*) is rarely found in downstream reaches of the Adjarastqali River and is much more common in the upstream reaches of Chirukhisqali and Skhalta Rivers and the tributaries of the Adjarastqali River. It was also found upstream of the Didachara dam. There is no apparent and consistent decrease in the CPEG of this species caught across the years.

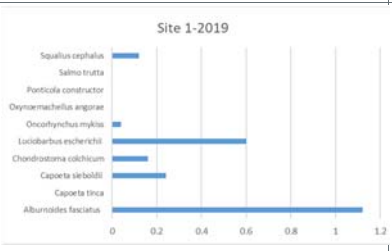
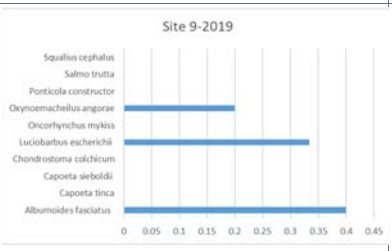
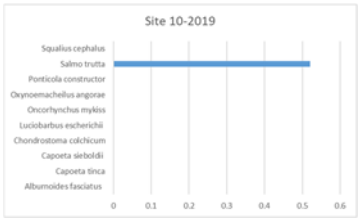
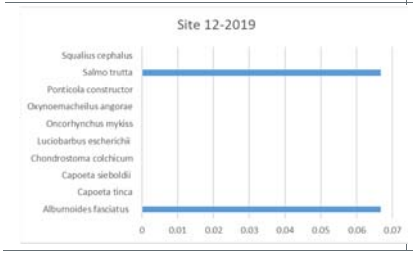
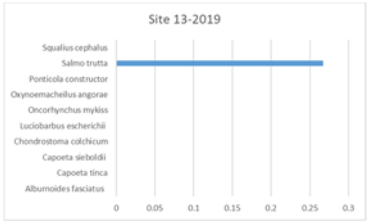
While declines were observed across species, several of these species also recovered in subsequent years. Furthermore declines of the same species were observed in the control sites. Given these observations, it is premature to conclude that these declines are irreversible and a consequence of project impacts.

For further details of the statistical trend analysis, please see **Annexe B.**

As impacts in the operation phase are likely to be complex and subtle it is suggested that a baseline is established prior to commencement of operations to compare future abundances of observed fish species. The baseline was from the 2019 sampling. The baseline is provided in ***Table 3.10.***

Table 3-10 2019 Baseline CPEG for Impacted and Control Sites of the 3 Rivers

Impacted Sampling Locations (Arranged Upstream to Downstream (All sites downstream of Didachara Dam)	Control Sampling Locations (Tributaries) (Arranged Upstream to Downstream)	Control Sites (Upstream)
Adjarastqali River		
		
		
		
		
		

Impacted Sampling Locations (Arranged Upstream to Downstream (All sites downstream of Didachara Dam)	Control Sampling Locations (Tributaries) (Arranged Upstream to Downstream)	Control Sites (Upstream)
		
Chirukhisqali River		
		
Skhalta River		
		

Actions that are likely to achieve no net loss for fish species impacted are provided in ***Table 3.11.***

Table 3-11 Residual Impacts Observed for Specific Taxa and Proposed Mitigation

Taxa	Species/Order	Impacts Observed	Recommended Additional Mitigation
Birds	Egyptian Vulture	The disappearance of the nesting Egyptian vultures southeast of Didachara	Support for the protection of at least 1 nest of Egyptian vultures from disturbance due to anthropogenic and development of activity in collaboration with wildlife agencies/NGOs.
	Species of the order Piciformes	Decline of abundances of Piciformes in Shuakhevi-Akhaldaba area	Planting of nesting tree species in forest restoration sites and continued monitoring across years to assess success of nesting
	White-throated Dipper	Declines of abundance possibly due to noise and vibration caused by construction activity	Recovery of numbers will be only be possible if habitat structure is not significantly altered during the operation phase. This will be facilitated if the Low

Taxa	Species/Order	Impacts Observed	Recommended Additional Mitigation
		upstream of the Shuakhevi powerhouse (the impact site transect is upstream of the site) and downstream of the Didachara dam Water quality deterioration could also be responsible for declines in abundance downstream of the Didachara dam	Flow Mitigation strategy is fully implemented. Any breeding sites identified on rocky cliffs and bridges should be protected from any human disturbance.
Mammals	Eurasian lynx	Eurasian Lynx not recorded in 2017 and 2018 in Chirukhisqali and Akhalabad-Shuakhevi but recorded in 2019	Continued monitoring to ensure that there are no significant and consistent declines 1. .
	Eurasian Badger	Eurasian Badger declines from 2014 and not seen from 2016 in Skhalta	
	Wild Boar	Wild Boar abundance decreases in Didachara	
	European Hare	European Hare abundance decreases in Akhalabad-Shuakhevi	
Fish	Several species	Declines of species abundance noticed immediately downstream of Didachara Dam	1. Identification of external stressors of water quality e.g. effluent of untreated waste, unregulated sand and gravel mining, construction activity 2. Identification of hotspots of unsustainable fishing practices e.g. locations where unsustainable gear used, fishing during spawning season 3. Development of community awareness programmes for reducing stressors involving law enforcement and local communities 4. Implementation of community awareness programmes

3.2 Anticipated impacts for the operation phase and mitigation proposed.

During operational activities of the Project the potential effects could include:

- Reduction in river flows along the Adjaristsqali to 10% of the average annual flows which is likely to have a direct effect on fish populations and indirect effect on bird and mammal species dependent on the river habitats;
- Peaking flows from Shuakhvi Power House
- The dams and weirs acting as ecological barriers preventing the movement of fish along the Adjaristsqali.
- Changes in water quality in the main river system, especially during low flows;
- Permanent habitat loss resulting from the project infrastructure, notably access roads, dams, weirs, powerhouses and substations;
- Permanent habitat loss from inundation due to the creations of 2 reservoirs;
- Degradation of habitats resulting from the 'dead zone' around each of the reservoirs; and,
- Sediment release and change in water quality during the flushing of the dam system

3.2.1 Reduction in River Flows along the Adjaristsqali to 10% of the Average Annual Flows

The purpose of the Low Flow Mitigation Strategy (LFMS) is to set out a strategy to mitigate the potential impacts caused by reduced flows downstream of the dams and weirs that form part of the Shuakhevi Hydropower Project. This is achieved by outlining the expected impacts that the scheme will create and the potential mitigation measures available. The report then focusses on each river, detailing its characteristics, hydrology and ecology. This understanding is used to assess specific impacts for each river which in turn informs recommendations for the specific, robust mitigation measures which will be required to achieve no net loss through impacts on biodiversity. The approach is informed by the precautionary principle at all times; i.e. in the absence of a complete understanding of potential impacts, a reasonable worst case is assumed with effects subject to a monitoring programme.

The operating regime for the Project is provided in *Error! Reference source not found.*

Table 3-12 Proposed Operating Regime

	Chirukhistsqali	Skhalta	Didachara
Environmental flow (m^3/s)	0.477	0.578	0.715
Maximum intake (m^3/s)	10.6	25	48.88
Flushing flow (m^3/s)	5 to 10	17	25
Frequency of flushing (/yr)	2	2	2

In December 2016 a team surveyed each of the rivers below the impoundment sites to assess the likely hydro-geomorphological changes to each river following commissioning. Photographs and observations of each section were made, with particular attention to the stretches between the impoundment and the first significant tributaries. The survey team comprised senior engineering, environmental and ecologists. The team estimated flow rates on the day and then visualised this in comparison to the proposed downstream flow regime, i.e. environmental flow, spilling/flood flows, ground water flow and flushing flows. The survey assessed how the river will behave under the new regime and what habitat will be provided, observing:

- Channel shape and depth
- River morphologies
- Sources of sediment
- Likely obstacles
- Additional flow from tributaries and ground water

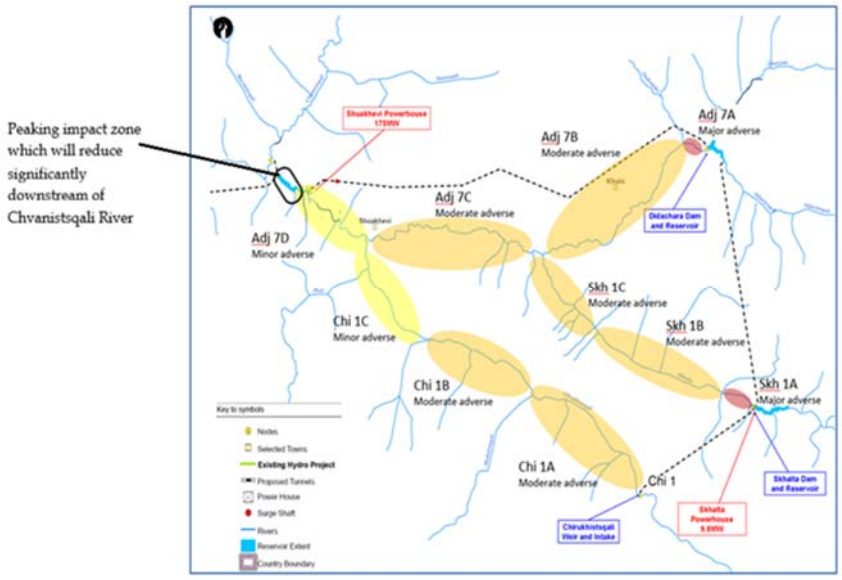
The survey focused on the stretch of river within approximately 5 km of the dams and weirs as these will be the reaches most affected by the new flow regime. The information gained through these surveys has been combined with existing knowledge from the ESIA and subsequent fish surveys to define robust mitigation measures for the project.

Each river was divided into sections based on the quantum of environmental flow anticipated through release from the dam and tributary inflow.

Impact significances were assessed based on sensitivity of receptors e.g. presence of spawning sites and magnitude of impacts correlated with % of flow anticipated compared to baseline flows.

Based on the delineation of river stretches and the assessment of impact significance an assessment of impacts was possible for all 3 rivers (***Figure 3-5***).

Figure 3-5 Map Showing the Anticipated Environmental Impact of the New Flow Regime



Surveys indicated the presence of fish species that migrate locally (e.g. Freshwater Trout) in the Chirukhistsqali River at the elevation of the weir. In order to mitigate the risk of fragmenting breeding populations, a fish pass has been incorporated into the weir structure.

The minimum standards to achieve no net loss through residual impacts, the impacts experienced by each river and the proposed mitigation are provided below.

Chirukhistsqali River

Minimum standard

- Channel downstream of the fish pass must maintain full hydraulic connectivity
- Species abundance and diversity will not be reduced
- No net loss of fish diversity and abundance

Specific impacts to be mitigated

Hydrogeological

- Risk of braiding and river splitting into multiple channels
- Risk of a single large boulder blocking the path of the river
- Occasional wider, flatter reaches over fine gravel where the river could have low depth

Ecological

- Reduction in suitable riverine habitats and decline of macro-invertebrate diversity
- Alteration in the bankside vegetation and associated shelter for some fish species
- Risk of fish mortality during downstream migration as result of entrainment in intake structure
- Impacts on reach Chi 1 A&B classified as 'moderate adverse'
- A barrier effect to tributaries (if water level and velocity are not sufficient for individuals to move upstream)

The mitigation actions proposed are the following

Action F 1.1: Reduction of impacts from decreased environmental flows in the Chirukhistsqali River

- Gradual reduction of the downstream flow rate at commissioning, starting at 30% of the mean annual flow
- Monitoring changes in hydro geomorphology during commissioning and operation
- Monitor, document and report external factors likely to affect the fish population in Chirukhistsqali River. Monitoring and reporting of the external factors are described below

  - Natural origin (mud flow, exceptional flood or drought):

    The operation team carries out automated monitoring of flow and constant visual inspection of sediment levels in the rivers. Any high water caused by excess rainfall leading to flooding and/or exceedance of the Full Reservoir Level (FRL) of the dams/weirs will need operational action governed by established operational emergency procedures to address safety issues to project facilities and local communities. Similarly drought conditions resulting in low water at the powerhouses will need operational action such as shutdowns. These events will all be recorded in detail in operations reports and can be referenced to understand any impacts to fish populations. Similarly the cause for any unnatural sediment levels, such as mud flows, will be investigated and the cause ascertained and included in operation reports for further reference.

  - Anthropic origin (waste / wastewater discharged into the river, poaching, construction or operation of other HPPs with lower standards…)

    The sampling protocols for fish and macro-invertebrate require entry of data into specific data sheets. These sheets will be modified for monitoring personnel to record poaching activities and their nature e.g. off season fishing, illegal practices used, solid/wastewater dumping and discharge and their origins e.g. GPS location, source village/town, nature e.g. type of solid waste, type of wastewater such as sewage, agricultural run-off. This will allow future analysis to determine if any changes in fish species abundance or diversity can be related to these events.
    It is also anticipated that the through the newspaper and government notifications any HPP projects planned in the basin will come to the notice of the operation team as this could have implications for operations if located upstream of any of the weirs through changes in flow or sediment load. Projects located downstream of the power house will also need to be considered. Consultations should be carried out with concerned government agencies to understand practices planned with respect to flow, waste and sediment management during construction and operation and any issues likely to impact fish diversity and abundance, flagged to the ECM.

- Implementation of minor channel modification where required
- Successful operation of the fish pass (sustained by regular maintenance and demonstrated by monitoring):
  - Empty and clean the fish pass from accumulated sediments and debris. As the fish pass is visited on a routine on a monthly basis by weir maintenance personnel, they will be instructed to also provide a report with photos on the condition of the fish pass with respect to accumulation of waste, sediment or vegetation. These reports will be reviewed by the ECM and if necessary a site visit will be carried out and the fish pass cleaned.
  - The fish camera should be relocated to the exit portal into the reservoir and video footage reviewed to assess whether better clarity occurs and species identification as well as number of fish entering the fish pass is possible (see *Table 4-15* for analysis of video footage) .
  - The automated monitoring will be supplemented by visual monitoring carried out during the migratory season (see *Table 4-15* for visual monitoring protocol).
- Fish and macro-invertebrate monitoring: Robust indicators and thresholds for fish and macro-invertebrates monitoring have been defined in ***Table 3.10*** (for fish) and ***Annex B*** for macro-invertebrates) so that the eventual impacts of Shuakhevi scheme can be assessed independently from the identified external factors. The indicators are essentially the abundance of each fish species and % EPT for macro-invertebrates prior to commissioning in 2019, in various reaches of the rivers. These comprise a baseline which can be compared with, for future monitoring during the operation phase.
- Stocking fish upstream of the dam if required

Mitigation Hierarchy	Avoid	**Reduce**	Remedy	Offset	Additional Actions
Timescale: Minimum quarterly in first year after commissioning, or after restoration works, and monthly thereafter) and after major events e.g. spill from dam, sediment flushing release. If concerns are raised then frequency should increase accordingly Monitoring to be carried out and responsibilities for monitoring as per Section 4. Indicators, locations and schedules for monitoring provided in Section 4. Agency responsible for implementation: ECM, Fluvial geomorphologist and Ichthyologist. .					

Skhalta River

Minimum Standard

- No fish pass so complete hydraulic connectivity to the dam beyond the closest tributary is not considered necessary to achieve the minimum standards.
- No reduction in species abundance and diversity
- Fish access to the ecologically important flows and habitat provided by the downstream tributaries
- Maintenance of the quality of aquatic habitat in the reach below the dam
- No net loss of fish diversity and abundance

Specific impacts to be mitigated

Hydrogeological

- Wider, flatter reaches over fine gravel where the river could have low depth
- Higher risk of spreading and splitting risk of reduced flows preventing fish movement to valuable habitat provided by tributaries
- Risk of sediment build-up due to lower flows

Ecological

- Loss of spawning habitat for various Cyprinid species within reservoir area
- Reduction in flow and subsequent alteration/loss of riverine habitats downstream of the dam, reduction in macro-invertebrate diversity.
- A barrier effect to tributaries (if water level and velocity are not sufficient for individuals to move upstream)
- Alteration of the riparian vegetation and elimination of some slower backwater flood areas which shield some species from predation as well as providing important resting areas
- Increase in limnophilic species
- Risk of fish mortality during downstream migration as result of entrainment into intake structure
- Barrier to further upstream migration

The mitigation actions proposed are the following

Action F1.2: Reduction of impacts from decreased environmental flows in the Skhalta River

- Monitoring of changes in hydro geomorphology during commissioning and operation

- Monitor, document and report external factors likely to affect the fish population in the Skhalta River. Monitoring and reporting of the external factors are described below

  - Natural origin (mud flow, exceptional flood or drought):

    The operation team carries out automated monitoring of flow and constant visual inspection of sediment levels in the rivers. Any high water caused by excess rainfall leading to flooding and/or exceedance of the Full Reservoir Level (FRL) of the dams/weirs will need operational action governed by established operational emergency procedures to address safety issues to project facilities and local communities. Similarly drought conditions resulting in low water at the powerhouses will need operational action such as shutdowns. These events will all be recorded in detail in operation reports and can be referenced to understand any impacts to fish populations. Similarly the cause for any unnatural sediment levels, such a mud flows, will be investigated and the cause ascertained and included in operation reports for further reference.

  - Anthropic origin (waste / wastewater discharged into the river, poaching, construction or operation of other HPPs with lower standard)

    The sampling protocols for fish and macro-invertebrate require entry of data into specific data sheets. These sheets will be modified for monitoring personnel to record poaching activities and their nature e.g. off season fishing, illegal practices used, solid/wastewater dumping and discharge and their origins e.g. GPS location, source village/town, nature e.g. type of solid waste, type of wastewater such as sewage, agricultural run-off. This will allow future analysis to determine if any changes in fish species abundance or diversity can be related to these events.

    It is also anticipated that the through the newspaper and government notifications any HPP projects planned in the basin will come to the notice of the operation team as this could have implications for operations if located upstream of any of the weirs through changes in flow or sediment load. Projects located downstream of the power house will also need to be considered. Consultations should be carried out with concerned government agencies to understand practices planned with respect to flow, waste and sediment management during construction and operation and any issues likely to impact fish diversity and abundance, flagged to the ECM.

- Fish and macro-invertebrate monitoring: Robust indicators and thresholds for fish and macro-invertebrates monitoring have been defined in ***Table 3.10*** (for fish) and ***Annex B*** for macro-invertebrates) so that the eventual impacts of Shuakhevi scheme can be assessed independently from the identified external factors. The indicators are essentially the abundance of each fish species and % EPT for macro-invertebrates prior to commissioning in 2019, in various reaches of the rivers. These comprise a baseline which can be compared with, for future monitoring during the operation phase.

- Stocking fish upstream of the dam (in accordance with the Environmental Permit and the fish stocking plan with additional stocking if identified as necessary through the fish monitoring programme)
- Ensuring the beneficial flows from, and access to downstream tributaries are maintained

Mitigation Hierarchy	Avoid	**Reduce**	Remedy	Offset	Additional Actions

Timescale: Minimum quarterly in first year after commissioning, or after restoration works, and after major events e.g. spill from dam, sediment flushing release. If concerns are raised then frequency should increase accordingly Monitoring to be carried out and responsibilities for monitoring as per Section 4. Indicators, locations and schedules for monitoring provided in Section 4.
Agency responsible for implementation: ECM, Fluvial geomorphologist and Ichthyologist.

Adjaristsqali River

Minimum standard

- No fish pass so complete hydraulic connectivity to the dam beyond the closest tributary is not considered necessary to achieve the minimum standards
- Flows should allow fish to move up and down the main river to avoid isolating populations in the tributaries
- Maintenance of access to the flows and habitat provided by the downstream tributaries
- No net loss of fish diversity and abundance

Hydrogeological

- Wider, flatter reaches over fine gravel where the river could have low depth
- Risk of spreading and splitting
- Risk of reduced flows preventing fish movement to alternative habitat provided by tributaries
- Risk of sediment build-up due to lower flows

Ecological

- Loss of riverine habitat from a reduction in flow downstream
- The dam acting as an obstruction to fish movement and the loss of aquatic habitats
- Loss of important feeding habitat
- A barrier effect to tributaries (if water level and velocity are not sufficient for individuals to move upstream)

The mitigation actions proposed are the following

Action F1.3: Reduction of impacts from decreased environmental flows in the Adjaristsqali River

- Monitoring changes in hydro geomorphology during commissioning and operation
- Monitor, document and report external factors likely to affect the fish population in Adjaristsqali River. Monitoring and reporting of the external factors are described below
  - Natural origin (mud flow, exceptional flood or drought):

    The operation team carries out automated monitoring of flow and constant visual inspection of sediment levels in the rivers. Any high water caused by excess rainfall leading to flooding and/or exceedance of the Full Reservoir Level (FRL) of the dams/weirs will need operational action governed by established operational emergency procedures to address safety issues to project facilities and local communities. Similarly drought conditions resulting in low water at the powerhouses will need operational action such as

shutdowns. These events will all be recorded in detail in operation reports and can be referenced to understand any impacts to fish populations. Similarly the cause for any unnatural sediment levels, such as mud flows, will be investigated and the cause ascertained and included in operation reports for further reference.

- Anthropic origin (waste / wastewater discharged into the river, poaching, construction or operation of other HPPs with lower standard)

  The sampling protocols for fish and macro-invertebrate require entry of data into specific data sheets. These sheets will be modified for monitoring personnel to record poaching activities and their nature e.g. off season fishing, illegal practices used, solid/wastewater dumping and discharge and their origins e.g. GPS location, source village/town, nature e.g. type of solid waste, type of wastewater such as sewage, agricultural run-off. This will allow future analysis to determine if any changes in fish species abundance or diversity can be related to these events.

  It is also anticipated that the through the newspaper and government notifications any HPP projects planned in the basin will come to the notice of the operation team as this could have implications for operations if located upstream of any of the weirs through changes in flow or sediment load. Projects located downstream of the power house will also need to be considered. Consultations should be carried out with concerned government agencies to understand practices planned with respect to flow, waste and sediment management during construction and operation and any issues likely to impact fish diversity and abundance, flagged to the ECM.

- Implementing minor channel modification where required
- Fish and macro-invertebrate monitoring: Robust indicators and thresholds for fish and macro-invertebrates monitoring have been defined in ***Table 3.10*** (for fish) and ***Annex B*** for macro-invertebrates) so that the eventual impacts of Shuakhevi scheme can be assessed independently from the identified external factors. The indicators are essentially the abundance of each fish species and % EPT for macro-invertebrates prior to commissioning in 2019, in various reaches of the rivers. These comprise a baseline which can be compared with, for future monitoring during the operation phase.
- Stocking fish upstream of the dam (in accordance with the Environmental Permit and the fish stocking plan, with additional stocking if identified as necessary through the fish monitoring programme)
- Maintaining flow inputs from, and access to habitats in the Diakonidze River

Mitigation Hierarchy	Avoid	**Reduce**	Remedy	Offset	Additional Actions
Timescale: Minimum quarterly in first year after commissioning, or after restoration works,) and after major events e.g. spill from dam, sediment flushing release. If concerns are raised then frequency should increase accordingly Monitoring to be carried out and responsibilities for monitoring as per Section 4. Indicators, locations and schedules for monitoring provided in Section 4. Agency responsible for implementation: ECM, Fluvial geomorphologist and Ichthyologist					

3.2.2 Impacts of Peaking Flows Downstream of the Shuakhevi Powerhouse Tailrace.

As a consequence of peaking, rapid water level fluctuations and wetting & drying of banks increases susceptibility to bank erosion and seepage erosion (piping) processes.

Increase in shear stress during flow changes increases erosion and bed incision. The latter consequences could change habitat downstream of the tail-race of peaking projects.

By releasing large quantities of flows within the span of a few hours, peaking projects create daily fluctuations between flood and drought that can strand, wash away or disrupt fish breeding grounds and aquatic biota. However as temperate, montane rivers and streams typically have seasonal fluctuations in water levels due to rapid transitions from high to low waters, fish are likely adapted to these changes and thereby risks of stranding or washing away are likely lower. The risks of habitat change are more relevant.

Peaking impact zone which will reduce significantly downstream of Chvanistsqali River

The impacts of peaking are likely attenuated by the Chvanistsqali River which is a major tributary joining the Adjarastqali River downstream of the tail- race.

Any change in fish species abundance and diversity as a consequence habitat change caused by peaking will be indicated by monitoring at Site 6 just downstream of the power- house. Any long-range impacts will be indicated by Sites 4 and 5. Species diversity and abundance at these sites can be compared to those at Sites 8 and 11 which are upstream of the tail race and suitable controls.

Any changes in macro-invertebrate community structure will be indicated by monitoring at Site A7 with long- range impacts indicated by Sites A8-A10. These can be compared to Sites A4-6 that are upstream of the tail- race as suitable controls.

(See Action F1.3 for construction phase monitoring of fish and macro-invertebrates).

As a part of the post commissioning monitoring it has been suggested that the reach of Adjaristsqali River downstream of the powerhouse will be heavily modified from changes in riverbed morphology, channel type, sediment composition and hydrological regime. This is due to increased water discharge which can be up to 10 times larger than non-peaking flows from the powerhouse (during operational phase 40 m3/s of water will be flushed permanently or by several peaks most days).

For determining magnitude of hydraulic impact on aquatic ecology it is proposed to conduct hydromorphological, hydrological and sediment monitoring jointly with fish (according to fish expert report there are 4 fish species living in this area) and macroinvertebrates monitoring. The results will be compared with pre-commissioning conditions (conducted by BREC in November 2019). This will indicate any changes as a consequence of peaking.

Based on any observed changes to species composition and abundance appropriate mitigation could be designed in consultation with ichthyologists which could include “softening” the peaking process or at the maximum, compensatory offsets.

3.2.3 Ecological Barriers Preventing the Movement of Fish along the Adjaristsqali.

As mentioned in **Section 3.2.1,** the only fish pass is on the weir on the Chirukhistsqali River. The fish pass is to ensure the passage of freshwater trout, which is the only local migratory species.

A Larinier baffle fish pass is used here. The head pond level at Chirukhistsqali is 6 m higher than the downstream bed level, and the fish are only able to climb 1.5 m in height at a time. Four flights of fish pass channels are therefore separated by the upper, middle and lower resting pools. The fish pass has baffles on the base of the channel to cause currents that dissipate energy in the flow and reduce the flow velocity to allow the fish to swim up them. The resting pools are incorporated to provide the fish with an opportunity to recuperate before swimming up the next flight of fish pass. The head pond water level will vary depending on flow in the river. Therefore gates are provided at two different levels to make sure flows can pass into the fish pass regardless of head pond water level. These gates will automatically adjust to release the required environmental flow when flows in the river allow (i.e. in all but very low flow conditions).

Some of the challenges in ensuring fish pass integrity are

Lack of attraction of the fish pass resulting from a poor position of the fish pass or insufficient flow at the entrance in relation to the flow discharge into the river.

Frequent clogging up or obstruction of the fish passage facility, resulting from inadequate protection against debris, or too exposed a position, or quite simply inadequate maintenance on the part of the operator.

Malfunctioning of parts which regulate the flow discharge and the drops between pools such as the 2 gates releasing flows into the fish pass

Mitigation actions for proper functioning of the fish pass should ensure adequate attraction flows and unobstructed passage of fish and would require regular maintenance checks and action to ensure that

- Baffles and resting pools are free of debris to ensure unobstructed passage of fish
- All moving parts such as gates are working and free of obstruction
- Adequate attraction flows enter the fish pass on considering the target species traveling up the fish pass (in this case freshwater trout).
- Any river connectivity obstruction to the fish pass will need to removed and then monitored as part of the site inspections and maintenance procedure. This will be especially important following floods events and sediment flushing.

Action F2.1: Ensure proper functioning of fish pass by maintenance checks and remedial action to ensure that desired numbers of fish are migrating upstream.

Mitigation hierarchy	Avoid	**Reduce**	Remedy	Offset	Additional Actions

Timescale: Monitoring right through operation phase.
Monitoring to be carried out and responsibilities for monitoring as per Section 4. Indicators, locations and schedules for monitoring provided in Section 4.
See Action F1.1 regarding the monitoring of the fish pass during migrations
Agency responsible for implementation: ECM and Ichthyologist

3.2.4 Changes in Water Quality in the Main River System, Especially During Low Flows and Flushing Events

Due to lower flows downstream of the dams, there is likely deposition of sediment and changes to meso-habitats. This could result in changes to benthos, which provide important nutritional resources to fish species. Changes in habitats could also impact spawning of fish spawning in the main river and any tributaries where excessive deposits may occur. A sedimentation management plan has been developed which monitors water quality in lieu of changes in sedimentation pattern caused by low flow conditions with emphasis on the provision of flushing flows to remove excessive sedimentation during the operation phase.

Action F3.2 : Implementation of sediment management plan and monitoring its implementation and consequent water quality

Mitigation hierarchy	Avoid	**Reduce**	Remedy	Offset	Additional Actions

Timescale: Implementation of sedimentation management plan through operation phase.
Monitoring to be carried out and responsibilities for monitoring as per Section 4. Indicators, locations and schedules for monitoring provided in Section 4.
Agency responsible for implementation: COO and ECM

3.2.5 Impacts from the operations of the 35 KV transmission line and mitigation proposed.

The total right of way (RoW) of the transmission line is 40 m width and 22 km long, with the total area of 96 ha. Of this 40% is forest and the maximum extent being cut is 38 ha. Presently 133 towers with average foot print of 5 m x 5 m and construction area of 7 m x 7 m and a total area of tower polygons of 50 m^2 are being erected, It was identified that 5,000 tree will be affected by the Project, out of which 10% are being cut from the bottom to stretch lines between foundations and to arrange 3 m clearance between towers. Others are being trimmed to preserve safety distances from wires. Among trees being cut there are the following species: Alder (*Alnus serrulata*), Pine (*Pinus sp.*), Georgian Oak (*Quercus iberica*), Fir-tree (*Abies sp*) and Hornbeam (*Carpinus betulus*). None of these are however Georgian Red Listed Trees.

The ESIA for the 35 kV transmission line indicated that birds may be adversely affected through electrocution and collisions with the new structures (New Metal Georgia, 2016). The following species of conservation significance are likely to be at risk from the collision risk (*Error! Reference source not found.*)

Table 3-13 Birds of Conservation Significance Recorded or Reported from Study Area at Risk from Transmission Line

Latin name	Common Name	IUCN Red List (v 2017.1.3)	Georgia Red List	EU Birds Directive Annexe I
Resident				
Aquila heliaca	Eastern Imperial Eagle	**Vulnerable**	**Vulnerable**	**Yes**
Aegolius funereus	Boreal Owl	Least concern	**Vulnerable**	**Yes**
Tetrao mlokosiewiczi	Caucasian Grouse	Near threatened	**Vulnerable**	-
Aquila chrysaetos	Golden Eagle	Least concern	**Vulnerable**	**Yes**
Gyps fulvus	Griffon Vulture	Least concern	**Vulnerable**	**Yes**
Buteo rufinus	Long-Legged Buzzard	Least concern	**Vulnerable**	**Yes**
Northern Breeder Migratory				
Neophron percnopterus	Egyptian Vulture	**Endangered**	**Vulnerable**	**Yes**
Passage Migrant				
Falco naumanni	Lesser Kestrel	Least concern	**Critically Endangered**	**Yes**
Ciconia nigra	Black Stork	Least concern	**Vulnerable**	**Yes**

Due to their lower flights, the Boreal owl and the Caucasian Grouse are less likely to be at risk from electrocution from the transmission line, though the Boreal Owl may nest in hollows in posts.

It is important that the powerlines, masts and towers of the 35 kV transmission line are designed in such a way that they do not lead to bird mortality. In accordance with internationally accepted best practice for avoiding and reducing impacts on birds, the following measures will be implemented for the 35 kV line:

- Bird deflector devices installed on conductors to minimise bird electrocution and collision if the threshold of collisions/electrocutions is crossed after one year monitoring. In the event that more project-specific and detailed bird data becomes available, it would be possible to limit the sections where bird deflectors are needed.
- The transmission line pole and insulator design follow the CMS Guidelines for ‘avian-safe’ lines (Prinsen et al, 2012), African-Eurasian Waterbird Agreement (AEWA) Guidelines, Birdlife International

Position Statement on birds and power lines recommendations and suggested practices (Birdlife International, 2013) and Avian Power Line Interaction Committee suggested practice (APLIC, 2006).

- Monthly monitoring will be carried out in the first year after construction along the transmission line routes to check for evidence of bird deaths due to electrocution and collisions. If evidence is found of bird deaths resulting from electrocution or collision then appropriate mitigation measures will be put in place; this may mean replacing the type or location of bird deflector devices or insulating towers if carcass of birds are found at the base of towers (see below).

Action E1.4: Avoid or minimise bird collision and electrocution through adoption of design using international best practices.

Mitigation hierarchy	Avoid	**Reduce**	Remedy	Offset	Additional Actions
Timescale: First year of operation of transmission line Monitoring of mortality to be carried out and responsibilities for monitoring as per Section 4. Indicators, locations and schedules for monitoring provided in Section 4. Agency responsible for implementation: ECM and Ornithologist					

4. MONITORING AND ADAPTIVE MANAGEMENT

The section provides specific guidance to monitor the achievement of no net loss through residual impacts on biodiversity values for mitigation proposed for the various impacts. For each of the mitigation proposed, guidance is provided on the following.

- Monitoring locations
- Monitoring protocols
- Indicators to be used in measuring for no net loss or net gains being achieved
- Measurement of no net loss or net gains
- Monitoring schedule, and;
- Thresholds for implementing adaptive management and suggested actions

For some mitigation actions, the above methods are common and are discussed accordingly.

Agencies responsible for the implementing monitoring and suggesting adaptive management and AGL staff accountable are discussed

4.1 Impacts Experienced During The Construction Phase And Continuing Into The Operation Phase With Mitigation Proposed

4.1.1 Temporary Impacts Experienced during Construction

Table 4-1 Action B 1.5

Action B 1.5: Habitat/soil removal and reinstatement plan (HRRP) implemented by following clear and best practice guidance to minimise adverse impacts
Indicators to be used: The main objective of this action is to ensure regeneration of near natural habitat in areas where vegetation clearance has occurred due to construction. Shortly after soil reinstatement, one can expect the herb layer to regenerate and based on soil and water conditions, shrubs and trees at later stages. To ensure that regeneration is close to natural conditions the following parameters will be measured. 1. % of area targeted for reinstatement covered by regenerating vegetation (herbs, shrubs and trees) 2. Enumeration of list of species within target areas
Monitoring Protocol
Location: All areas targeted for rehabilitation
Method: Since it is unlikely that seedlings of woody plants (shrubs and trees species) on the targeted rehabilitation areas will appear for 2 first years, because only herbaceous plants were sown here (and not woody plant seeds), the monitoring in the first 2 years is limited to these actions : 1. % of area covered by regenerating vegetation (herbs, shrubs and trees) as confirmed through visual/tape measurements of regenerated area. 2. Enumeration of list of species within target areas. 3. For monitoring of invasive species see ***Section 3.12***. Method: Randomized squares for enumerating frequency of species regenerating. While a minimum of 10 random squares (1X1 m) will be selected for each of the targeted areas, the actual number will vary according to the size of the rehabilitated area and its topography.

For each square initially all herb species will be enumerated but later when shrubs and trees regenerate these will be enumerated too.

Shannon Weaver's index will be calculated after 2-3 years from rehabilitation, that is, when forest habitat restoration begins and we can compare it with control sites in forest habitats.

Measurement of no net loss: % of area covered with vegetation, species richness of herbs and after 2-3 years, Shannon Weaver's Index for each target area will be computed and compared with data from control sites in forest habitats. No net loss will be considered to be achieved if both parameters are close to those for control sites.

Thresholds for implementing adaptive management and suggested actions: If it is found that there is no appreciable increase in the above parameters or these values remain constant over time, adaptive management will be considered.
A botanist's advice will be sought to identify the reasons (e.g. pest infestation or lack of soil fertility) and remedial action will be taken prior to continued monitoring. It is advisable that remedial action should align to best practices and not be detrimental to ecological processes.

Monitoring Schedule:

- Once a year in June/July for first 4 years
- Once every 2 years in June/July for next 6 years

Agencies responsible for monitoring: A competent botanical team. Reporting after every monitoring session providing results of monitoring, progress towards no net loss through residual impacts and suggested adaptive action

AGL staff accountable: ECM and ERM

4.1.2 Permanent Degradation and Loss of Habitats for Construction Activities

Table 4-2 Action B 2.1

Action B 2.1: Net gains through replanting of Red- Listed species and species specific to habitats degraded or lost as a result of the Project.

Indicators

The main objective of this action is to ensure that net gains of habitats where forest degradation has occurred due to construction.

For plots restored by AGL

1. For the Georgian red-list species annual survivorship and height increment of all replanted stems will need to be monitored on a long term basis

For payment to Government of Georgia for restoration

Disbursement of tranches of financial contribution will be linked to demonstrated success across the following milestones
1. Identification of target areas for planting of Red- List species
2. Annual reports provided by GoG (Wildlife Agency of Adjara). While it is desirable that these reports provide details on the status of reforestation in terms of survivorship and annual growth of planted species, with government agencies such as the Wildlife Agency of Adjara such details are unlikely to be provided in the report which will be much more focussed on the area and species planted.

Table 4-3 *Action B 2.3*

Action B 2.3: Protect the populations of Georgia threatened and endemic plant species in the study area
Indicators: Survivorship of stems of all threatened and endemic species
Monitoring Protocol
Location: All locations of these protected and endemic species
Method: All stems of these species will be monitored on a long term basis.
Measurement of no net loss: Number of threatened and endemic species do not decline beyond unviable population sizes (as determined by a botanist)
Thresholds for implementing adaptive management and suggested actions: If numbers of these species fall below a minimum viable population size (as per a botanists opinion) replanting of sapling of these species will need to be considered.
Monitoring Schedule: Annually every September till botanists consider stands of threatened and endemic species viable and likely to persist over the long term.
Agencies responsible for monitoring: A competent botanical team. Reporting after every monitoring session providing results and suggested adaptive action.
AGL staff accountable: ECM and ERM

Table 4-4 Action B 1.7

Action B 1.7: Prevent the spread of alien invasive species during construction of the Project
Indicator: Percentage area of natural habitat covered with invasive species
Monitoring Protocol
Location: All locations of presence of either patches or stems of *Ambrosia artemisiifolia* and *Robinia pseudacacia*.
Method: As *Ambrosia artemisiifolia* is a shrub and *Robinia pseudacacia* a tree, GPS will be used to identify and record locations of patches of the former and stems of the latter. These patches and stems should be revisited periodically to assess any expansion of area of patches or addition of new stems.
Measurement of nest gains: Not relevant here except to measure any annual loss of natural habitat
Thresholds for implementing adaptive management and suggested actions: If significant proliferation of either species is noticed in areas with clumped or isolated proliferation, areas have fresh proliferation and loss of natural habitat observed in habitat that does not have existing proliferation, a botanist's advice will be sought for appropriate control of the species. Control should ensure that natural ecological processes are not disrupted.
Monitoring Schedule: Annually every July till it is established that large scale proliferation does not occur for 5 years
Agencies responsible for monitoring: A competent botanical team. Reporting after every monitoring session providing results and suggested adaptive action
AGL staff accountable: ECM and ERM

4.1.3 Construction Impacts to Priority Species and their Habitats

Birds

Table 4-5 *Action E 2.1*

Action E 2.1: Provide artificial nesting opportunities for priority bird species **Target: 100 bird boxes to be installed in the Study Area by 2017**
Indicators: 1. % of nest boxes used. 2. % of nest boxes raising successful hatchling
Monitoring Protocol
Location: All nest boxes
Method: Visually inspecting nest boxes
Measurement of no net loss: % of nest boxes raising successful hatchlings
Thresholds for implementing adaptive management and suggested actions: If % of nest boxes used for success of raising nestling is low an ornithologist's opinion must be sought on the design and placement of nest boxes
Monitoring Schedule: Annually every July till successful nesting crosses a reasonable percentage (3-40 %) and is maintained for 3 years.
Agencies responsible for monitoring: A competent ornithology team. Reporting after every monitoring session providing results and suggested adaptive action.
AGL staff accountable: ECM and ERM

Table 4-6 Action E 2.2

Action E 2.2: Annual bird surveys across the operational phase
Indicators: Abundance and species richness of birds when compared to control sites
Monitoring Protocol
Location*:* 4 sampling sites around areas under building activities and operational process. Sampling sites should be areas within 2 km radius circle around all key hydro power plant features, such as dams, powerhouses and entrances to the tunnel. For aquatic dependent birds, transects along the 3 river courses
Methods: 10 sampling plots should be selected in each sampling site. Sampling plots should be circular plots of 50 m in radius, positioned so that they represent a whole array of habitats at the sampling site. Sampling plots should be marked with colour marks on the stones and trees and GPS locations recorded. Two enumerators should arrive at the plot, measure the 50 m radius with laser range finder and after 10 minutes of silent waiting start recording all vocalisations, birds species and their numbers. Every observation is recorded only after consensus between counters. After 10 minutes of observation counters should move to the next plot. Binoculars and/or spotting scopes should be used For aquatic dependent birds, transects surveys should be carried out a constant speed allowing proper identification
Measurement of no net loss: No significant spatial or temporal changes of species richness and abundance from control site. For aquatic dependent species no changes in encounter rates across monitoring years
Thresholds for implementing adaptive management and suggested actions: The reason for any significant changes from control sites should be analysed by an ornithologist and the plausible causes identified. Attempts should be made to minimize or remove these causes.
Monitoring Schedule: Annually every April to May for breeding birds and water birds and aquatic dependent birds in July till there is no change from baseline values, as measured from species richness and abundance for at least 3 years.
Agencies responsible for monitoring: A competent ornithology team. Reporting after every monitoring session providing results and suggested adaptive action.
AGL staff accountable: ECM and ERM

Table 4-7 Action E 2.3

Action E 2.3: No hunting or poaching or birds by AGL in the Project area and surroundings during operation
Indicators: Registers to record all incidences of hunting and poaching or birds with details on species afflicted, date, methods used, names of hunters/poachers
Location: Through entire study area
Method: Surveillance and intelligence provides data on all incidences of hunting poaching
Measurement of no net loss: No significant spatial or temporal changes of species richness and abundance from baseline values
Thresholds for implementing adaptive management and suggested actions: If sudden spurts of hunting poaching noticed significantly over baseline levels, the existing anti- hunting/ poaching strategies need to be strengthened which could call for additional surveillance
Monitoring Schedule: Continuous
Agencies responsible for monitoring: AGL security staff with registers updated when incidences occur
AGL staff accountable: ECM and ERM

4.1.3.1 Mammals and Reptiles

Table 4-8 Action D 1.4

Action D 1.4: No hunting or poaching of mammals and reptiles by AGL in the Project area and surroundings during operation
Indicators: Registers to record all incidences of hunting and poaching of mammals (and reptiles if relevant) with details on species afflicted, date, methods used, names of hunters/poachers
Location: Through entire study area
Method: Surveillance and intelligence provides data on all incidences of hunting poaching
Measurement of no net loss: No significant spatial or temporal changes of species richness and abundance from baseline values
Thresholds for implementing adaptive management and suggested actions: If sudden spurts of hunting poaching noticed significantly over baseline levels, the existing hunting/ poaching strategies need to be strengthened which could call for additional surveillance
Monitoring Schedule: Continuous
Agencies responsible for monitoring: AGL security staff with registers updated when incidences occur
AGL staff accountable: ECM and ERM

Table 4-9 Action D 2.1

Action D 2.1: Provide artificial nesting opportunities for priority bat species **Target: 100 bat boxes to be installed in the Study Area by 2017**
Indicators: 1. % of nest boxes used. 2. % of nest boxes raising successful young
Monitoring Protocol
Location: All nest boxes
Method: Visually inspecting nest boxes

Measurement of no net loss: % of nest boxes raising successful young

Thresholds for implementing adaptive management and suggested actions: If % of nest boxes used or success of raising young are low a bat expert's opinion must be sought on the design and placement of nest boxes

Monitoring Schedule: Annually every July till successful usage of nest boxes crosses a reasonable percentage (30-40 %) and is maintained for 3 years.

Agencies responsible for monitoring: A competent bat expert. Reporting after every monitoring session providing results and suggested adaptive action.

AGL staff accountable: **ECM and ERM**

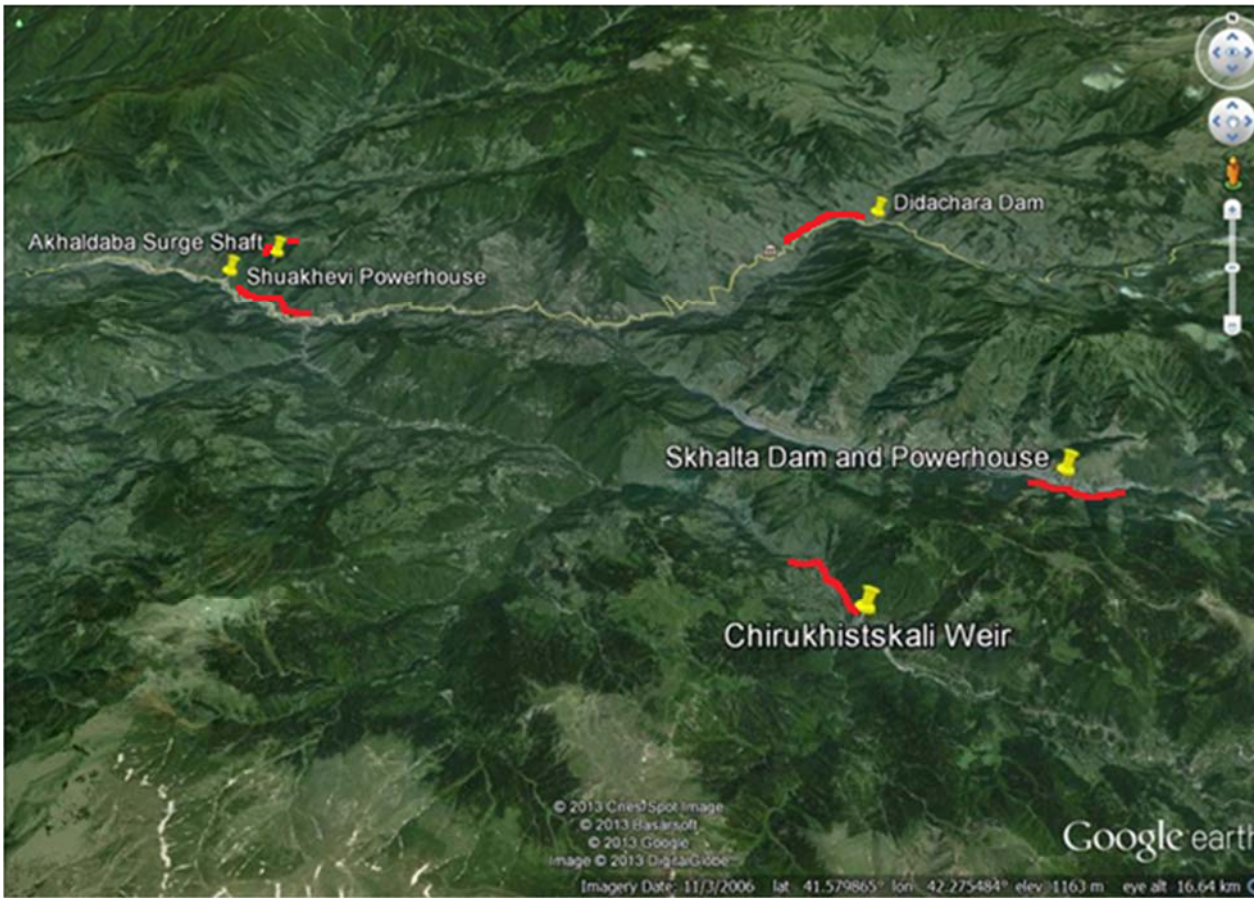
Table 4-10 Action D 2.2

Action D 2.2: Research to evaluate spatial and temporal trends of mammal and reptile species

Indicators:
Large Mammals: Abundance
Small Mammals: Abundance
Reptiles: Abundance and species presence/absence
Otters: Indirect evidence

Monitoring Protocol

Locations:
Large Mammals: 4 sampling sites around areas under building activities and operational process. Sampling sites should be areas within 2 km radius circle around all key hydro power plant features, such as dams, powerhouses and entrances to the tunnel.
Small Mammals: As above. For otters monitoring of signs of indirect evidence
Herpetofauna: As per map provided



Methods: Large mammals: 25 camera traps in each of the designated sites Small mammals: Non flying small mammals: Life trap lines: In each site, 50 life traps placed 5 m apart Chiroptera: Continuous observations along the routes and transects, in forests, alleys, separate trees, underground sites and buildings as well as in coastal zones. Observations will be conducted through ultrasonic detectors Pettersson D240 and Pettersson D240x, and by netting with special nets for bats. Field surveys will start in the evening through 1:00 am or 2:00 am. Individuals caught by netting will be identified directly in the field and then released. Also by observing numerous individuals of a species with a small area a colony may be present (breeding, male or wintering colonies). If a colony is found it shall be recorded on a GPS and its approximate size estimated. Otters: Periodic monitoring of indirect evidence at established locations where otters are known to occur.
Measurement of no net loss: Assessment of spatial and temporal trends of abundance for large and small mammals, abundance and presence/absence for herpetofauna and trends in frequency of signs of indirect evidence for otters across monitoring years
Thresholds for implementing adaptive management and suggested actions: The reason for any significant changes across years should be analysed by large/small mammal experts/herpetologists and the plausible causes identified. Attempts should be made to minimize or remove these causes
Monitoring Schedule: Large Mammals: Year round till baseline values of species richness and abundance is maintained for 3 years Small mammals: June-July each year for 10 years. For otters August and September each year till baseline values of species richness and abundance is maintained for 3 years Herpetofauna: July each year till baseline values of species richness and abundance is maintained for 3 years
Agencies responsible for monitoring: A competent large/small mammal expert/herpetologist team. Reporting after every monitoring session providing results and suggested adaptive action.
AGL staff accountable: ECM and ERM

4.1.4 Construction Impacts to Critical Habitat Trigger Species

Milk-Vetch (*Astragalus sommieri*) and Greek Strawberry tree (*Arbutus andracine*), Dwarf comphrey (*Symphytum grandiflorum*) and Caucasian chamomile (*Tripleurospermum szovitsii*) will be continued to be monitored and adaptively managed as per the guidance provided in **Action B2.3.**

For the Caucasian salamander the following monitoring and adaptive management is proposed.

Table 4-11 Action D 2.2

Action D 2.2: Research to evaluate spatial and temporal trends for the Caucasian salamander
Indicator: Abundance
Monitoring Protocol
Location: All identified streams and pond known to provide habitat for the species
Method: Intensive visual surveys of all known habitats.
Measurement of net gains: There was no decline in the abundance
Thresholds for implementing adaptive management and suggested actions: If declines are below thresholds for minimum viable size, reintroductions from other sites may be considered under the guidance of an expert and in compliance to the IUCN guidelines for re-introductions[25].
Monitoring schedule: Annually in August/September till baseline values of species richness and abundance is maintained for 3 years
Agencies responsible for monitoring: A competent herpetologist. Reporting after every monitoring session, providing results and suggested adaptive action.
AGL staff accountable: ECM and ERM

[25] IUCN/SSC (2013). Guidelines for Reintroductions and Other Conservation Translocations. Version 1.0. Gland, Switzerland: IUCN Species Survival Commission, viiii + 57 pp

4.2 Impacts experienced in the operation phase and mitigation proposed.

Reduction in river flows along the Adjaristsqali to 10% of the average annual flows.

Mitigation of impacts for each of the 3 rivers is based on the Low Flow Management Strategy (LFMS) and are provided below.

Table 4-12 Action F 1.1 Reduction of impacts from decreased environmental flows in the Chirukhistsqali River

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
Gradual reduction of the downstream flow rate at commissioning, starting at 30% of the mean annual flow	Breaks in hydraulic connectivity	Below all dams/weirs	Qualified fluvial geomorphologist with experience of hydropower will be on site observing the river to check for breaks in hydraulic connectivity.	No break in connectivity	Flow rate will be held at 30% as long as required for any permits or contracting arrangements to be finalised and modification made. If the fluvial geomorphologist is satisfied that functional connectivity has been achieved at the 30% flow, then flow will be reduced to 20% of the annual average flow. Again a survey will be undertaken to ensure hydraulic connectivity is maintained and a	At commissioning	AGL with qualified fluvial geomorphologist	ECM and ERM

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
					contractor will be instructed to address any issues arising before the flow can be further reduced. The process will be repeated again at the final 10% flow.			
Monitoring changes in hydro geomorphology during commissioning and operation	No braiding of river, obstacles blocking river course and river spreading in wider, shallower areas blocking fish movement		Qualified fluvial geomorphologist with experience in hydropower will be on site. Tasks would be involve: ■ Site inspections at critical reaches at regular intervals (minimum quarterly in first year after commissioning, or after restoration works, and monthly thereafter) and after major events e.g. spill from dam, sediment	No break in connectivity	Fluvial geomorphologist will suggest minor channel modifications where required	Minimum quarterly in first year after commissioning, or after restoration works, and monthly thereafter and after major events e.g. spill from dam, sediment flushing release. If concerns are raised then frequency should increase accordingly	AGL with qualified fluvial geomorphologist and Ichthyologist	ECM and ERM

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
			flushing release. If concerns are raised then frequency should increase accordingly. ■ Site inspections to include a set of photographs taken at each target site replicated at each inspection visit to allow comparison over time. ■ Sediment samples continuing preconstruction monitoring programme (sites and frequency) to allow comparison over time against baseline. ■ Bed samples (size) continuation of preconstruction monitoring ■ Water quality continuation of preconstruction monitoring					

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
			■ Analyse release flow figures from operations team but also take ad hoc velocity measurements in the critical reaches to check conditions in low flow conditions. ■ The fluvial geomorphologist will collaborate with an ichthyologist whose tasks include ■ Monitoring of physical aquatic habitats ■ Identification of the presence of sensitive habitats and distribution and assess changes ■ Monitoring fish pass efficiency ■ Liaison with experts' teams responsible for					

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
			undertaking fish and macroinvertebrate surveys					
Implementation of minor channel modification where required	No braiding of river, obstacles blocking river course and river spreading in wider, shallower areas blocking fish movement	In any of the river sections	Qualified fluvial geomorphologist with experience in hydropower will be on site observing the river to check for breaks in hydraulic connectivity	No break in connectivity	Fluvial geomorphologist will suggest minor channel modifications where required	Commissioning and operations	AGL with qualified fluvial geomorphologist	ECM and ERM
Successful operation of the fish pass (sustained by regular maintenance and demonstrated by monitoring)	See monitoring of fish pass below							
Fish and macro-invertebrate monitoring	Measures of abundance (catch/effort) of the following species of conservation	Up and downstream of the dam	Fish Electro-fishing if permits are provided by GoG. If not	Abundances of the 6 species do not decline significantly below the	Review of flow provided, river connectivity and fish pass efficiency by competent ichthyologist.	Fish 4 times a year for at least 3 years January-March; April-June; July-	A competent ichthyologist team. Reporting after every monitoring session, providing	ECM, and ERM

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
	significance. Six species in **Section 2.8.** Abundance and diversity of macro-invertebrates		■ Cast net (weight 7 kg, with hole distances of 20 mm) <u>Macro-invertebrates</u> Hand nets (mesh size 0,5 mm, net metal frame dimensions: width 30 cm and length 40 cm). The frame is attached to the handle with supporting triangular structure of 25 cm long. The net enables sampling along the edges of river, as well as the relatively deeper points (40-90 cm).	thresholds defined in action F1.1 and F1.2	Remedial action recommended	September; October-December. Second week of the first month of the quarter Fish monitoring on all stations, using the robust indicators and thresholds defined in F1.1 and F1.2, should separate data into juveniles and adult fish to track recruitment for key species (i.e. *Salmo trutta*, *Capoeta sieboldii* and *Chondrostoma colchicum* and to measure the effectiveness of the fish pass <u>Macro-invertebrate</u> Summer- autumn each year following commissioning, and may continue at a reduced frequency	results and suggested adaptive action.	

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
						post-impoundment, till % EPT remains constant for at least 3 years.		
Stocking fish upstream of the dam if required in accordance to the fish stocking plan	Freshwater trout • Size, weight, age, growth and the growth rate, sex ratio, type of food consumed)	In reservoirs and in the tributaries (in the section upstream the confluence area)	Fish catching will be performed using a cast net (weighing 7 kg, mesh size 20 mm) and different forms of fishing rods (and/or using natural, man-made lures and baits). Several sections for fish capture will be selected. The section lengths will vary from 100 to 500 meters and will depend on the landscape. Catch-release principle will be kept to. A few samples will be kept for lab analysis (when appropriate).	Trout abundances return to close to baseline values	If numbers are declining further fish stocking will be considered	As above	A competent ichthyologist team. Reporting after every monitoring session, providing results and suggested adaptive action.	ECM and ERM

Table 4-13 Action F 1.2: Reduction of impacts from decreased environmental flows in the Skhalta River

Mitigation	Indicators	Location	Methods	Measurement of nonet loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
Monitoring of changes in hydro geomorphology during commissioning and operation	No braiding of river, obstacles blocking river course and river spreading in wider, shallower areas blocking fish movement	In any of the river sections	Qualified fluvial geomorphologist with experience in hydropower will be on site. Tasks would involve ■ Site inspections at critical reaches at regular intervals (minimum quarterly in first year after commissioning, or after restoration works, and monthly thereafter) and after major events e.g. spill from dam, sediment flushing release. If concerns are raised then frequency should increase accordingly. ■ Site inspections to include a set of photographs taken at each target site replicated at each	No break in connectivity	Fluvial geomorphologist will suggest minor channel modifications where required	Minimum quarterly in first year after commissioning, or after restoration works, and monthly thereafter and after major events e.g. spill from dam, sediment flushing release. If concerns are raised then frequency should increase accordingly	AGL with qualified fluvial geomorphologist	ECM and ERM

Mitigation	Indicators	Location	Methods	Measurement of nonet loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
			inspection visit to allow comparison over time. ■ Sediment samples continuing preconstruction monitoring programme (sites and frequency) to allow comparison over time against baseline. ■ Bed samples (size) continuation of preconstruction monitoring ■ Water quality continuation of preconstruction monitoring ■ Analyse release flow figures from operations team but also take ad hoc velocity measurements in the critical reaches to check conditions in low flow conditions.					

Mitigation	Indicators	Location	Methods	Measurement of nonet loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
			■ The fluvial geomorphologist will collaborate with an ichthyologist whose tasks include ■ Monitoring of physical aquatic habitats ■ Identification of the presence of sensitive habitats and distribution and assess changes ■ Monitoring fish pass efficiency ■ Liaison with experts' teams responsible for undertaking fish and macroinvertebrate surveys					
Implementation of minor channel modification	No braiding of river, obstacles blocking river course and river spreading in wider, shallower areas blocking fish movement	In any of the river sections	Qualified fluvial geomorphologist with experience in hydropower will be on site observing the river to check for breaks in hydraulic connectivity	No break in connectivity	Fluvial geomorphologist will suggest minor channel modifications where required	Commissioning and operations	AGL with qualified fluvial geomorphologist	ECM and ERM

Fish and macro-invertebrate monitoring	Measures of abundance (catch/effort) of the following species of 6conservation significant species in **Section 2.8.**	Up and downstream of the dam	Fish Electro-fishing if permits are provided by GoG. If not ■ Cast net (weight=7 kg, with hole distances of 20mm) ■ Fishing rods Macro-invertebrates Hand nets (mesh size 0.5 mm, net metal frame dimensions: width 30 cm and length 40 cm). The frame is attached to the handle with supporting triangular structure 25 cm long. The net enables sampling along the edges of river, as well as the relatively deeper points (40-90 cm).	Indicators for the 6 species, do not decline significantly below threshold values	Review of flow provided, river connectivity and fish pass efficiency by competent ichthyologist. Remedial action recommended	Fish 4 times of a year for at least 3years January-March; April-June; July-September; October-December , using the robust indicators and thresholds defined in F1.1 and F1.2, Second week of the first month of the quarter Macro-invertebrate Summer- autumn each year for the first 2 years following commissioning, and may continue at a reduced frequency post-impoundment, till % EPT remains constant for at least 3 years.	A competent ichthyologist team. Reporting after every monitoring session, providing results and suggested adaptive action.	ECM and ERM

Mitigation	Indicators	Location	Methods	Measurement of nonet loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
Stocking fish upstream of the dam (in accordance with the Environmental Permit and the fish stocking plan with additional stocking if identified as necessary through the fish monitoring programme)	Freshwater trout • Size, weight, age, growth and the growth rate, sex ratio, type of food consumed)	In reservoirs and in the tributaries (in the section upstream the confluence area)	Fish catching will be performed using a cast net (weighing 7 kg., mesh size 20 mm) and different forms of fishing rods (and/or using natural, man-made lures and baits). Several sections for fish capture will be selected. The section lengths will vary from 100 to 500 meters depending on the landscape. Catch-release principle will be kept to. A few samples will be kept for lab analysis (when appropriate).	Trout abundances return to close to baseline values	If numbers are declining further fish stocking will be considered	As above	A competent ichthyologist team. Reporting after every monitoring session, providing results and suggested adaptive action.	ECM and ERM
Ensuring the beneficial flows from, and access to downstream tributaries are maintained	River connectivity upstream and downstream of tributary confluences are maintained	At confluences of all tributaries	Ensuring that river flow to tributaries are unobstructed upstream of the confluence and flows from the tributaries freely flow downstream of the confluence	Environmental flows to and from the tributaries are unhindered	If obstruction occurs to tributary or from tributary, minor channel modification to be considered.	During commissioning and operation	Fluvial geomorphologist	ECM and ERM

Table 4-14 Action F 1.3: Reduction of impacts from decreased environmental flows and peaking (Shuakhevi Powerhouse) in the Adjaristsqali River

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
Monitoring changes in hydro geomorphology during commissioning and operation	No braiding of river, obstacles blocking river course and river spreading in wider, shallower areas blocking fish movement	In any of the river sections	Qualified fluvial geomorphologist with experience in hydropower will be on site. Tasks would involve ■ Site inspections at critical reaches at regular intervals (minimum quarterly in first year after commissioning, or after restoration works, and monthly thereafter) and after major events e.g. spill from dam, sediment flushing release. If concerns are raised then frequency should increase accordingly.	No break in connectivity	Fluvial geomorphologist will suggest minor channel modifications where required	Minimum quarterly in first year after commissioning, or after restoration works, and monthly thereafter) and after major events e.g. spill from dam, sediment flushing release. If concerns are raised then frequency should increase accordingly	Fluvial geomorphologist	ECM and ERM

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
			■ Site inspections to include a set of photographs taken at each target site replicated at each inspection visit to allow comparison over time. ■ Sediment samples continuing preconstruction monitoring programme (sites and frequency) to allow comparison over time against baseline. ■ Bed samples (size) continuation of preconstruction monitoring ■ Water quality continuation of preconstruction monitoring ■ Analyse release flow figures from operations team but also take ad hoc velocity					

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
			measurements in the critical reaches to check conditions in low flow conditions. ■ The fluvial geomorphologist will collaborate with an ichthyologist whose tasks include ■ Monitoring of physical aquatic habitats ■ Identification of the presence of sensitive habitats and distribution and assess changes ■ Monitoring fish pass efficiency ■ Liaison with experts' teams responsible for undertaking fish and macroinvertebrate surveys					

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
Implementing minor channel modification where required	No braiding of river, obstacles blocking river course and river spreading in wider, shallower areas blocking fish movement	In any of the river sections	Qualified fluvial geomorphologist with experience in hydropower will be on site observing the river to check for breaks in hydraulic connectivity	No break in connectivity	Fluvial geomorphologist will suggest minor channel modifications where required	Commissioning and operations	Fluvial geomorphologist	ECM and ERM
Fish and macro-invertebrate monitoring	Measures of abundance (catch/effort) of the following species of 6 conservation significant species in **Section 2.8.** Abundance and diversity of macro-invertebrates	Up and downstream of the dam	Fish Electro-fishing if permits are provided by GoG. If not ■ Cast net (weight=7 kg, with hole distances of 20 mm) Macro-invertebrates Hand nets (mesh size 0.5 mm, net metal frame dimensions: width 30 cm and length 40 cm). The frame is	Indicators for the 6 species, do not decline significantly below thresholds	Review of flow provided, river connectivity and fish pass efficiency by competent ichthyologist. Remedial action recommended	Fish 4 times of a year for at least 3years January-March; April-June; July-September; October-December,, using the robust indicators and thresholds defined in F1.1 and F1.2,.	A competent ichthyologist team. Reporting after every monitoring session, providing results and suggested adaptive action.	ECM and ERM

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
			attached to the handle with supporting triangular structure of 25 cm long. The net enables sampling along the edges of river, as well as the relatively deeper points (40-90 cm).			Second week of the first month of the quarter Macro-invertebrate Summer- autumn each year for the first 2 years following commissioning, and may continue at a reduced frequency post-impoundment, till % EPT remains constant for at least 3 years		

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
Stocking fish upstream of the dam (in accordance with the Environmental Permit and the fish stocking plan, with additional stocking if identified as necessary through the fish monitoring programme)	Measures of abundance (catch/effort) of the following species of 6 conservation significant species in **Section 2.8.** Abundance and diversity of macro-invertebrates	In reservoirs and in the tributaries (in the section upstream the confluence area)	Fish Electro-fishing if permits are provided by GoG. If not ■ Cast net (weight 7 kg, with mesh size of 20 mm) ■ Fishing rods Macro-invertebrates Hand nets (mesh size 0,5 mm, net metal frame dimensions: width 30 cm and length 40 cm). The frame is attached to the handle with supporting triangular structure of 25 cm long. The net enables sampling as in the edges of river, as well as relatively deeper points (40-90 cm).	Indicators of the 6 species, does not decline significantly below thresholds	Review of flow provided, river connectivity and fish pass efficiency by competent ichthyologist. Remedial action recommended	Fish 4 times of a year for at least 3years January-March; April-June; July-September; October-November, using the robust indicators and thresholds defined in F1.1 and F1.2, Second week of the first month of the quarter Macro-invertebrate summer- autumn each year for the first 2 years following commissioning, and may continue at a reduced frequency post-	A competent ichthyologist team. Reporting after every monitoring session, providing results and suggested adaptive action.	ECM and ERM

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
						impoundment, till % EPT remains constant for at least 3 years		
Maintaining flow inputs from, and access to habitats in, the Diakonidze River	River connectivity upstream and downstream of confluences with Diakonidze River are maintained	At confluences of Diakonidze River	Ensuring that river flow to tributaries are unobstructed upstream of the confluence and flows from the Diakonidze River freely flow downstream of the confluence	Environmental flows to and from the Diakonidze River are unhindered	If obstruction occurs to or from Diakonidze River, minor channel modification to be considered.	During commissioning and operation	Fluvial geomorphologist	ECM and ERM
Monitoring impacts of peaking flows	Fish abundance and diversity	Downstream of the Shuakhevi powerhouse	Hydromorphological, hydrological and sediment monitoring jointly with fish	The results will be compared with pre-commissioning	Softening of peaking flows based on advise of ichthyologist	After commissioning	Fluvial geomorphologist and ichthyologist and macro-	ECM and ERM

Mitigation	Indicators	Location	Methods	Measurement of no net loss through residual impacts	Thresholds for implementing adaptive management and suggested actions	Monitoring Schedule	Agencies responsible for monitoring	AGL staff accountable
		till the Chvanistsqali River	monitoring (according to fish expert report there are 4 fish species living in this area) and macroinvertebrates monitoring.	conditions (conducted by BREC in November 2019).			invertebrate specialist.	

Table 4-15 Action F 2.1

Action F 2.1: Ensure proper functioning of fish pass by maintenance checks and remedial action to ensure that desired numbers of fish are migrating upstream.

Indicators:

- Entrances, exits, baffles and resting pools are clear of obstructions
- Number of juveniles found upstream of the dam expressed as a proportion of adults found
- Gates are working smoothly
- Number of fish ascending and descending through the fish pass, fish species and length
- Any river connectivity obstruction to the fish pass will need to removed and then monitored as part of the site inspections and maintenance procedure. This will be especially important following floods events and sediment flushing.
- Robust indicators defined in action F1.1
- Presence or absence of external factors influencing the proper functioning of the fish pass

Monitoring protocol:

Location: Chirukhistsqali weir

Method:

- Regular inspection of fish pass for obstructions during migratory seasons for known migratory species
- cleaning of the fish pass to remove sediment and debris., when required
- Based on initial results from the Biotactic BRAVO Generation 2 fish pass monitoring system due to water turbidity it has been difficult to identify species using the fish pass. The monitoring system will be moved to the exit portal of the fish pass to improve the quality of footage and complemented with visual monitoring and tracking of yellow marked fish

Measurement of no net loss through residual impacts:
No indicator(s) exceed the thresholds (see action F1.1), across 3 years of operation.
An ichthyologist's opinion will also need to sought if a viable populations of each native species is maintained fin the river.

Thresholds for implementing adaptive management and suggested actions: If indicator(s) exceed the thresholds (see actions F1.1) an ichthyologist's opinion needs to be sought about adaptive action such as review and changes in attractant flows, further channel modification needed or minor and feasible alterations of fish pass design.

Monitoring Schedule:

- Maintenance checks to be carried out regularly during the migratory seasons for known migratory species as described in **Section 3.2.1 Action F1.1**.
- Review of fish pass using the Biotactic BRAVO Generation 2 fish pass monitoring system relocated to the exit portal of the fish pass during the migratory seasons. It is recommended that the video footage be reviewed daily during the spawning period identified below and continued for an additional 7 days after visual monitoring ceases, if only clarity in the water allows proper analysis of video footage. The number of fish recorded and if possible, the species recorded, should be entered into appropriate data sheet formats.
- Visual fish pass monitoring[26] will be carried out during the spawning period of trout, the timing of which will be specified additionally, taking into account the weather conditions of the year. .Preliminary, monitoring is planned for the first 10 days of October 2021.Fifteen to twenty days before the survey, the visual monitoring team will alert AGL about the visit and the need to clean and flush the fish pass from accumulated sediments and foreign objects. Clearing must be completed at least 5 days before field work begins. During this survey period, the company should stop any work in the riverbed, up- and downstream the weir which could disturb fish. .During the survey direct visual observations in the fish pass will be conducted, as well as with the help of a mobile underwater video camera on an elongated monopod. The

[26] According to the AGL consultant ichthyologist, Archil Guchmanidze, visual monitoring to assess fish pass efficacy is used for all hydro-projects in Georgia and provides a useful indication of proper fish pass functioning.

observation will be carried out mainly at dawn and twilight hours, the exact time and duration will be adjusted depending on the results obtained, weather conditions, illumination, etc. Adequate personnel will be involved in the monitoring to avoid observation fatigue due to the long hours spent monitoring.

- In addition permanent markings on migrating fish will be used. These will be beads sewn with a special needle with Kevlar thread under the dorsal fin of the adult fish (larger than 15 cm).Fish caught along the entire river section downstream of the weir will be transported in a water can directly downstream of the weir and kept in a special padded cage to be released soon after. This will increase the concentration of fish during the migration through fish pass into the reservoir. All fish caught below the dam will be marked with red marks. Similarly all fish caught in the upper reaches of the river (upstream of the Sanalia HPP intake) will be concentrated downstream of the weir. All these will be marked with yellow beads

Agencies responsible for monitoring:
Maintenance checks carried out by AGL operations team and results recorded in maintenance register.
A competent ichthyologist team. Reporting after every monitoring session, providing results and suggested adaptive action.

AGL staff accountable; ECM and ERM

Table 4-16 Action F 3.2

Action F 3.2: Implementation of sediment management plan and monitoring its implementation and consequent water quality

Indicators:
1. Reservoir siltation monitoring
2. Monitoring of the area adjacent to the reservoir (banks of reservoirs, main river and tributary banks)
3. Riverbed deformations monitoring

Monitoring Protocol

Location: Banks of reservoirs, main river and tributary banks

Methods:
1. Reservoir siltation: Bathymetric and topographic survey of the reservoir (area corresponding to maximum water level conditions) (scale 1:1000)
2. Monitoring of the area adjacent to the reservoir (guided by the modelling of siltation through provision of risk prone areas):
   - Visual observation
   - Instrumental monitoring, if deemed advisable (using reference points, boreholes, piezometers and/or vibrometers).
   - Indication of sensitive locations on the map
3. Riverbed deformations: Topographic survey of river bed and floodplain (scale 1:2000) 1 km downstream and 1 km upstream (from maximum water level). Data analysis in Arc View GIS software.

Achieving no net loss through residual impacts: Not relevant here

Thresholds for implementing adaptive management and suggested actions: As per F1.1, F1.2 and F1.*3*

Monitoring Schedule:
1. Year 1 after commissioning to Year 10
2. Year 1 after commissioning to Year 10. After spring flood (June) and in case of emergency events
3. Year 1 after commissioning to Year 10. After spring flood (June)
4. Year 1 after commissioning to Year 10. After spring flood (June)

Agencies responsible for monitoring: Fluvial geomorphologist

AGL staff accountable: ECM and ERM

4.3 Impacts from the operations of the 35 kv transmission line and mitigation proposed.

Table 4-17 Action E 1.4:

Action E 1.4: Avoid or minimise bird collision and electrocution through adoption of design using international best practices
Indicators: Mortality through electrocution of species of conservation significance as listed in Table 3.6
Monitoring Protocol
Location: 100 m on either side of transmission line
Methods: Surveys for evidence of bird deaths (carcasses) due to electrocution and collisions. Focus should be in the base of tower to identify electrocution incidents as compared to collision incidents that happen further away from the base.
Achieving no net loss through residual impacts: Mortality of species through collision and electrocution do not exceed 2 incidences per year per species.
Thresholds for implementing adaptive management and suggested actions: If this threshold is crossed then appropriate remediation measures will be put in place; this will mean installing bird deflector devices at sections of the transmission line which are deemed as high risk to birds from collision/electrocution.
Monitoring schedule: Monthly monitoring along entire transmission line for 1st year of operation
Agencies responsible for monitoring: Competent monitoring team of ornithologists.
AGL staff accountable: ECM and ERM

4.4 Impacts From Operations On Critical Habitats

Given that all natural forests within the projects AoI have been classified Critical Habitat, it is essential that all mitigation actions, including offsets, should collectively result net gains to these habitats.

Table 4-18 demonstrates how specific mitigation actions within the BAP achieve net gain to Critical Habitats when Critical Habitats are impacted or net loss when Critical Habitat trigger species are not impacted .

Table 4-18 Contribution of Mitigation Action in Achieving Net Gains or Net Loss

Action S.No.	Action	Impacts Addressed	Mitigation Hierarchy Type	Achieving Net Gains
Habitats				
B 2.1	Net gains through planting of red listed species and restoration of vegetation features and habitat types. This will be achieved through planting of Red-List species and other species specific to habitats converted or degraded. AGL will be responsible for planting 19 ha and will financially support	Loss of Critical Habitats/ natural habitats due to construction of project components and inundation by reservoir	**Compensation/ Offset**	Endangered trees and surrounding habitat types are restored to areas over and above that lost to construction of project components and inundation by reservoir (28 ha versus 24.57 ha) and monitored during operation phase to ensure habitat extent and quality achieves net gains

Action S.No.	Action	Impacts Addressed	Mitigation Hierarchy Type	Achieving Net Gains
	the GoG in the restoration of 9 ha			
B 2.3	Protect the populations of Georgia threatened and endemic plant species in the study area (includes *Astragalus sommieri* and *Arbutus andrachne*)	Long range and indirect impacts during operation phase	**Additional Actions**	Continued monitoring of plots of threatened and endangered species and adaptive management if abundance of the species or habitat quality decreases. Note; As these species are not impacted by the project no net loss should be ensured.
D2.2	Monitoring to evaluate spatial and temporal trends in abundance for the Caucasian Salamander	Changes in hydrological regimes impacting salamander habitat.	**Additional Actions**	If declines are below thresholds for minimum viable size, reintroductions from other sites may be considered under the guidance of an expert and in compliance to the IUCN guidelines for re-introductions. Note; As this species is not impacted by the project no net loss should be ensured.

5. CLOSURE REPORT

The closure table in **Annexe A** clearly identifies whether the Project had been compliant with the commitments in the Construction BAP, confirms which construction actions are closed (i.e. not transferred to the Operational Phase BAP), and which remain open and are transferred to the Operational Phase BAP.

It also provides regulatory or lender framework requirements (e.g. IFC and EBRD) and presents progress against these. This assessment provides a useful assessment of progress against these requirements and identifies any gaps that need to be addressed prior to project commissioning

6. OPERATION PHASE MITIGATION, MONITORING AND MANAGEMENT PLAN

The operation phase mitigation, monitoring and management plan ***(***internal document***)*** serves as a ready to use format for AGL to monitor the performance of all actions relevant for the operation phase.

As discussed above, these actions could be:

1. Actions suggested for the construction phase that require monitoring or management in the operation phase.
2. Actions commencing in the operation phase and requiring monitoring through a part of the whole of the monitoring phase.

For each action the following parameters are specified.

Date Action Commencing in Operation Phase:

- For construction phase actions these would be the date on which the actions move into the operation phase. In most cases this would be the commencement of monitoring but in several cases (such as mammal, reptile and birds surveys), action had already commenced in the construction phase and require continued monitoring in the operation phase.
- For operation phase actions these would be the date from which the action is implemented (usually from the date of commissioning the project component) and monitoring ensues.

Date Action Ending in Operation Phase

In all cases these are the dates by which both implementation of actions and its monitoring are completed.

Action Implementing Agency

For construction actions, these differ from the agency implementing the actions in the operation phase. For example while the EPC contractor may implement the actions in the construction phase, the specialist consultancy agency responsible for monitoring the action, may take over during the operation phase.

Monitoring Protocols

The parameters indicators, location, summary of methods, measurement of no net loss through residual impacts, adaptive management (AM) thresholds and adaptive management actions are self-explanatory.

Monitoring and AM Implementing Agency

This could be the same as the “Action Implementing Agency” if the action requires only monitoring during the operation phase. This could vary if the action requires one agency for implementation and another for monitoring and adaptive management.

AGL Staff Accountable

This would be focal person in AGL responsible for the performance of both implementing and monitoring the action.

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APPENDIX A STATUS OF ACTIONS IN THE CONSTRUCTION: CLOSED OR TRANSFERRED/CONTINUED IN THE OPERATION PHASE

Table A.1 Status of Actions from Construction Phase

Action	Phase	Target and Purpose	Status
Terrestrial Habitats			
B1.1 Inform construction staff on the importance of natural forest habitats and notable plant species	Pre-Construction	All construction and operation staff to be aware of the importance of forest habitats and notable plant species within the Study Area	Completed
B1.2: Prepare habitat maps for project sites using high resolution satellite imagery and ground trothing	Pre-Construction	Obtain high resolution satellite images for all Project sites and prepare habitat maps before construction and prepare habitat maps	Completed
B1.3: Avoid or minimise loss/degradation of natural habitat during Project construction	Construction	No net loss through residual impacts or significant degradation of natural habitat within the Study Area as a result of construction activities	Completed
B1.4: Undertake pre-construction surveys and mitigation to minimise impacts on natural habitats and protected/threatened and endemic plants **Actions B1.5 –B2.3 in Table 0.2**	Pre-construction	Targeted botanic surveys before construction to identify and map the habitats and locations of protected/threatened and endemic plant species on each Project site	Completed
River Habitats			
C1.1: Inform construction staff on the importance of river habitats and associated species	Construction	All construction to be aware of the importance of river habitats and associated species within the Study Area	Completed
C1.2: Avoid or minimise loss/degradation/pollution of river habitat during Project construction	Construction	No degradation of river habitat owing to construction activities	Completed
C1.3 Install fish passes and release environmental flows on the rivers affected by dams and weirs	Construction	Fish pass constructed and environment flows to be released in operation phase	Completed and future action for operation
C1.4 Inform fish farmers about opening of dam gates	Operation	To be implemented during operations	Completed and future action for operation

Action	Phase	Target and Purpose	Status
Terrestrial Habitats			
C1.5 Assess impacts of environmental flows based on data collection by river sections	Operation	To be implemented as per Action F1.1-3	Future action for operation
C1.6 Implement monitoring of river habitat and biota during construction and operation	Construction and operation	To be implemented in monitoring of aquatic biota and habitat in F1.1-3	Future action for operation
C1.7 Establish the requirement for fish capture and release programme and implement this programme if required	Operation	To be implemented in monitoring of aquatic biota and habitat in F1.1-3	Future action for operation
C1.8 In-channel habitat modification	Operation	To be implemented as per Action F1.1-3	Future action for operation
C2.1 Provide support for the implementation of the Chorokhi-Adjaristsqali River Basin Management Plan	Construction and operation	This is an additional conservation action and is not needed to mitigate the project's impacts. AGL attended a meeting in April 2015 but no clear actions were established. Implementation depends on actions from third parties. AGL to provide monitoring data if required by the Government. There has been no progress as of September 2016.	A potential role for AGL will be examined when any third part approaches AGL for its participation and a plan developed hence against any TOR provided.
C2.2 Raise awareness of the local communities on the importance of protected amphibian, fish and otter species	Construction	To reduce stressors of aquatic biodiversity	Not completed
Terrestrial Species			
Mammals			
D1.1: Ensure construction staff are aware of the importance of protected mammals and reptiles, and the national legislation	Construction	All construction and operation staff to be aware of the importance of wild and threatened mammals and reptiles in the Study Area	Completed
D 1.2: Minimise the time excavations are left open and provide protection	Construction	No wild mammal or reptile injuries/deaths owing to excavations	Completed
D 1.3: Minimise habitat loss/damage and off-road vehicle movement	Construction	Construction and vehicle movement will be avoided in sensitive habitats and key areas for priority species	Completed

Action	Phase	Target and Purpose	Status
Terrestrial Habitats			
D1.4: Active control of hunting and poaching ban	Construction	No hunting or poaching by AGL or Contractor staff in the Project area and surroundings during construction and operation	To be continued in operation phase.
D1.5: Minimise noise and artificial lighting at night during construction	Construction	No disturbance to mammal species through noise or light pollution	Completed
D1.6: Undertake pre-construction surveys for bats	Pre-construction	Targeted bat surveys to identify bat activity and roost locations, and inform mitigation measures for the same	Completed
D2.1 Install up to 100 bat boxes in each scheme ECM	Construction	Offset habitat loss of bat species	Completed
D 2.2 Support existing research projects and conservation programmes	Construction and operation	As possible additional conservation action for loss of natural habitat	Batumi Botanical Gardens was provided funds of US$100,000 by AGL for research and conservation
D2.3 Raise awareness in the local communities on the importance of protected mammals and the relevant national law	Construction	Several awareness workshops conducted	Completed
Birds			
E1.1: Schedule vegetation clearance outside breeding season for priority species where possible or undertake pre-construction surveys and define appropriate mitigation	Construction /Pre-construction	Avoid vegetation clearance in the breeding season for priority species; where this is not possible, pre-construction surveys for breeding birds will be undertaken and mitigation defined if priority species are affected	Completed
E1.2: Implement noise reduction measures to reduce impacts on breeding or migrating birds during construction	Construction	Measures to reduce noise levels and artificial lighting to be implemented during construction	Completed
E1.3: Implement ban on bird hunting and raise awareness E1.4 Avoid or minimise bird collision and electrocution with transmission lines	Construction	No bird hunting by AGL or Contractor staff within the Study Area during construction and Operation	To be continued in the operation phase

Action	Phase	Target and Purpose	Status
Terrestrial Habitats			
Actions 2.1-2.2 in Table 0.2			

Table A.2 Actions Continued from Construction Phase or Specific for the Operation Phase

Action Number	Action	Start Date	End Date	GOG/Lender requirements to be satisfied	Comments on present status and when closure likely
Action B 1.5	Habitat/soil removal and reinstatement plant (HRRP) implemented by following clear and best practice guidance to minimise adverse impacts	SDA re-cultivation plans are presently approved by the MoE. All SDAs are reinstated. Camp site reinstatement plans are approved. Chirukhistqali and Skhalta has been completed. Didachara and Khicahuri camp will be completed in September 2021.	April 2020	Requirement of GoG approved ESMP	Ongoing
B1.6	Long-term monitoring of reinstated habitats	Long-term monitoring carried out as a part of B1.5			
B1.7	Prevent the spread of alien invasive species during construction of the Project	April 2017	Continuous till no proliferation occurs	Nil	Ongoing
Action B 2.1	Net gains of natural habitat as a result of the Project through replanting of red listed species that results in net gains and habitat types. This is to address the loss of 24.57 ha of natural/critical habitat converted or degraded due to construction. For this 19 ha will be restored by AGL and another 9 ha by the GoG (Wildlife Agency of Adjara).	April 2015	Spring 20201	Replanting of Georgian Red list species requirement of GOG	Ongoing

Action Number	Action	Start Date	End Date	GOG/Lender requirements to be satisfied	Comments on present status and when closure likely
B 2.2	Provide support for reforestation scheme to improve forest habitats	Merged with B 2.1			
B2.3:	Protect the populations of Georgia threatened and endemic plant species in the study area (includes *Astragalus sommieri* and *Arbutus andrachne*)	April 2019	10 years	Needed for satisfying GOG Law of the General Rules for the Protection of Wild Plants and Animals (1994) and the Law of Georgia on Wildlife (1996) which include provisions for the protection and restoration of the wildlife and their habitats. Satisfies IFC PS 6 GN17- "In natural and Critical Habitats clients should consider project-related impacts across the potentially affected landscape".	Monitoring of *Astragalus sommieri* and *Arbutus andrachne* ongoing to understand any long term and indirect impacts. Monitoring of Dwarf comphrey (*Symphytum grandiflorum*) and Caucasian chamomile (*Tripleurospermum szovitsii*) ongoing to commence in April 2020
Action E 2.1	Provide artificial nesting opportunities for priority bird species Target: 100 bird boxes to be installed in the Study Area	Commenced in 2017	10 years	Will address loss of nesting habitat for several species of birds e..g Passerine species, red-starts, tits, some of the smaller owls such as the Boreal owl (*Aegolius funereus*) and the rose chaffinch (*Carpodacus erythrinus*). The latter are Annexe 1 species as per the EU Birds Directive and Appendix 2 species in the Bern Convention respectively.	Continued from construction phase 105 nest boxes have been installed so this has been completed and monitoring ongoing.
Action E 2.2	Annual bird surveys across the operational phase	Commenced in 2013	10 years	Needed for satisfying GOG Law of the General Rules for the Protection of Wild Plants	Continued from construction phase. An intensive monitoring programme is ongoing for breeding birds within the

Action Number	Action	Start Date	End Date	GOG/Lender requirements to be satisfied	Comments on present status and when closure likely
				and Animals (1994) and the Law of Georgia on Wildlife (1996) that include provisions for the protection and restoration of the wildlife and their habitats. Satisfies IFC PS 6 GN17- “In natural and Critical Habitats clients should consider project-related impacts across the potentially affected landscape”.	wider area of the project. Four reports per year are prepared by the NGO PSOVI.
Action E 2.3	No hunting or poaching of birds by AGL in the Project area and surroundings during operation	Already commenced	Continuous	Needed for satisfying GOG Law of the General Rules for the Protection of Wild Plants and Animals (1994) and the Law of Georgia on Wildlife (1996) which include provisions for the protection and restoration of the wildlife and their habitats habitats. Satisfies IFC PS 6 GN17- “In natural and Critical Habitats clients should consider project-related impacts across the potentially affected landscape”.	Ongoing as warning signs regarding the illegal hunting are installed near all construction and camp sites and local government agencies also monitor illegal hunting in the project area and there have been no breaches reported so far.
Action D 1.4	No hunting or poaching of mammals and reptiles by AGL in the Project area and surroundings during operation	Already commenced	Continuous	Needed for satisfying GOG Law of the General Rules for the Protection of Wild Plants and Animals (1994) and the Law of Georgia on Wildlife (1996) which include provisions for the protection	Ongoing as warning signs regarding the illegal hunting are installed near all construction and camp sites and local government agencies also monitor illegal hunting in the project area and there have been no breaches reported so far.

Action Number	Action	Start Date	End Date	GOG/Lender requirements to be satisfied	Comments on present status and when closure likely
				and restoration of the wildlife and their habitats. Satisfies IFC PS 6 GN17- "In natural and Critical Habitats clients should consider project-related impacts across the potentially affected landscape".	
Action D 2.1	Provide artificial nesting opportunities for priority bat species Target: 100 bat boxes to be installed in the Study Area	Commenced in 2017	10 years	Several bat species are Annexe II and IV in the EU Habitat Directive and impacts need to be addressed.	Continued from construction phase 63 bat boxes were installed and are being monitored. 100 bat boxes will be installed by commissioning.
Action D 2.2:	Research to evaluate spatial and temporal trends of mammal and herpetofaunal species This includes the Caucasian salamander.	Commenced in 2013	10 years	General Rules for the Protection of Wild Plants and Animals (1994) and the Law of Georgia on Wildlife (1996) that include provisions for the protection and restoration of the wildlife and their habitats. Satisfies IFC PS 6 GN17-"In natural and Critical Habitats clients should consider project-related impacts across the potentially affected landscape". The Caucasian salamander is a Critical Habitat candidate and it needs to be clearly established whether populations in the study area are being impacted and mitigation action is necessary.	Continued from construction phase An intensive monitoring programme is ongoing for large and small mammals using 25 camera traps and a number of live traps over an area up to 3 km from project. Six interim reports per year and annual reports are prepared by the NGO PSOVI.

Action Number	Action	Start Date	End Date	GOG/Lender requirements to be satisfied	Comments on present status and when closure likely
Action D2.3	Local communities to be aware of the importance of wild and threatened mammals and reptiles in the study area and the relevant wildlife laws	Already commenced	Continuous	Satisfies IFC PS 6 GN17- "In natural and Critical Habitats clients should consider project-related impacts across the potentially affected landscape".	Ongoing as information provided to local communities at AGL Information Centres in Shuakhevi, Skhalta and Khulo (since April 2014). In 2015, presentations were given in five villages (three in Shuakhevi and two in Khulo) on the importance of biodiversity in local area.
Action F 1.1:	Reduction of impacts from decreased environmental flows in the Chirukhistsqali River				
	Gradual reduction of the downstream flow rate at commissioning, starting at 30% of the mean annual flow	From commissioning	Right through operation phase	Ensuring no net loss through residual impacts on aquatic habitats as per IFC PS6 important for fish of conservation importance Freshwater trout (*Salmo labrax fario*) Colchic khramulya (*Capoeta sieboldii*) Colchic nase (*Chondrostoma colchicum*)	At commissioning only. Competent fluvial geomorphologist in place prior to commissioning
	Monitoring changes in hydro geomorphology during commissioning and operation	From commissioning	Right through operation phase	Ensuring no net loss through residual impacts on aquatic habitats important for fish of conservation importance Freshwater trout (*Salmo labrax fario*) Colchic khramulya (*Capoeta sieboldii*) Colchic nase (*Chondrostoma colchicum*)	During commissioning and operations only. Competent fluvial geomorphologist in place prior to commissioning

Action Number	Action	Start Date	End Date	GOG/Lender requirements to be satisfied	Comments on present status and when closure likely
	Successful operation of the fish pass (sustained by regular maintenance and demonstrated by monitoring)	From commissioning	For 3 years of operation phase	Ensure that habitats are not fragmented for freshwater trout and other migratory species thereby achieving no net loss.	The fish pass has been constructed and the fish pass monitoring system has been procured and will be installed shortly. Monitoring will need to commence on commissioning and during the first migratory season.
	Fish and macro-invertebrate monitoring	Already commenced in 2014	10 years	Requirement of Ministry of Environment GoG and to ensure that no net loss through residual impacts as per IFC PS6 is being achieved.	Ongoing as monitoring of fish is being undertaken more intensively than mentioned in the BAP (4 times per year x 15 sites including control sites), as required by the Ministry of Environment. As recommended by Mott MacDonald, AFF has included the 2012/2013 sites in their surveys in August 2016, along with additional fish monitoring sites on the tributaries and downstream/upstream of dams. Macro-invertebrate surveys have been undertaken twice per year since 2012 but in 2016 there was one survey in November only.
	Stocking fish upstream of the dam if required in accordance to the fish stocking plan	Spring 2021 AGL will rent already established fish farm in summer 2019 and activity for producing fish will start in Autu 2019. Fish , stoking was conduct in 2021	Right through operation phase	Fish stocking of the the rivers affected by the Project is required under the environmental licence issued by the Government of Georgia and it is also a key compensation measure to achieve the no net loss through residual impacts on biodiversity. The environmental licence requires that stocking is carried out using 10,000 juvenile	This is a new action added in the Shuakhevi BAP in October 2016. It begins after commissioning and is monitored right through the construction phase.

Action Number	Action	Start Date	End Date	GOG/Lender requirements to be satisfied	Comments on present status and when closure likely
				freshwater trout.	
Action F 1.2:	Reduction of impacts from decreased environmental flows in the Skhalta River				
	Monitoring of changes in hydro geomorphology during commissioning and operation	From commissioning	Right through operation phase	Ensuring no net loss through residual impacts on aquatic habitats important for fish of conservation importance Freshwater trout (*Salmo labrax fario*) Colchic khramulya (*Capoeta sieboldii*) Colchic nase (*Chondrostoma colchicum*)	During commissioning and operations only. Competent fluvial geomorphologist in place prior to commissioning
	Implementation of minor channel modification where required	From commissioning	Right through operation phase	Ensuring no net loss through residual impacts on aquatic habitats important for fish of conservation importance Freshwater trout (*Salmo labrax fario*) Colchic khramulya (*Capoeta sieboldii*) Colchic nase (*Chondrostoma colchicum*)	During commissioning and operations only. Competent fluvial geomorphologist in place prior to commissioning
	Fish and macro-invertebrate monitoring	Already commenced from 2014	For 10 years	Requirement of Ministry of Environment GoG and to ensure that no net loss through residual impacts as per IFC PS6 is being achieved.	Ongoing as monitoring of fish is being undertaken more intensively than mentioned in the BAP (4 times per year x 15 sites including control sites), as required by the Ministry of Environment. As recommended by Mott MacDonald, AFF has included the 2012/2013 sites in their surveys in August 2016, along with additional fish monitoring sites on the tributaries and downstream/upstream of dams.

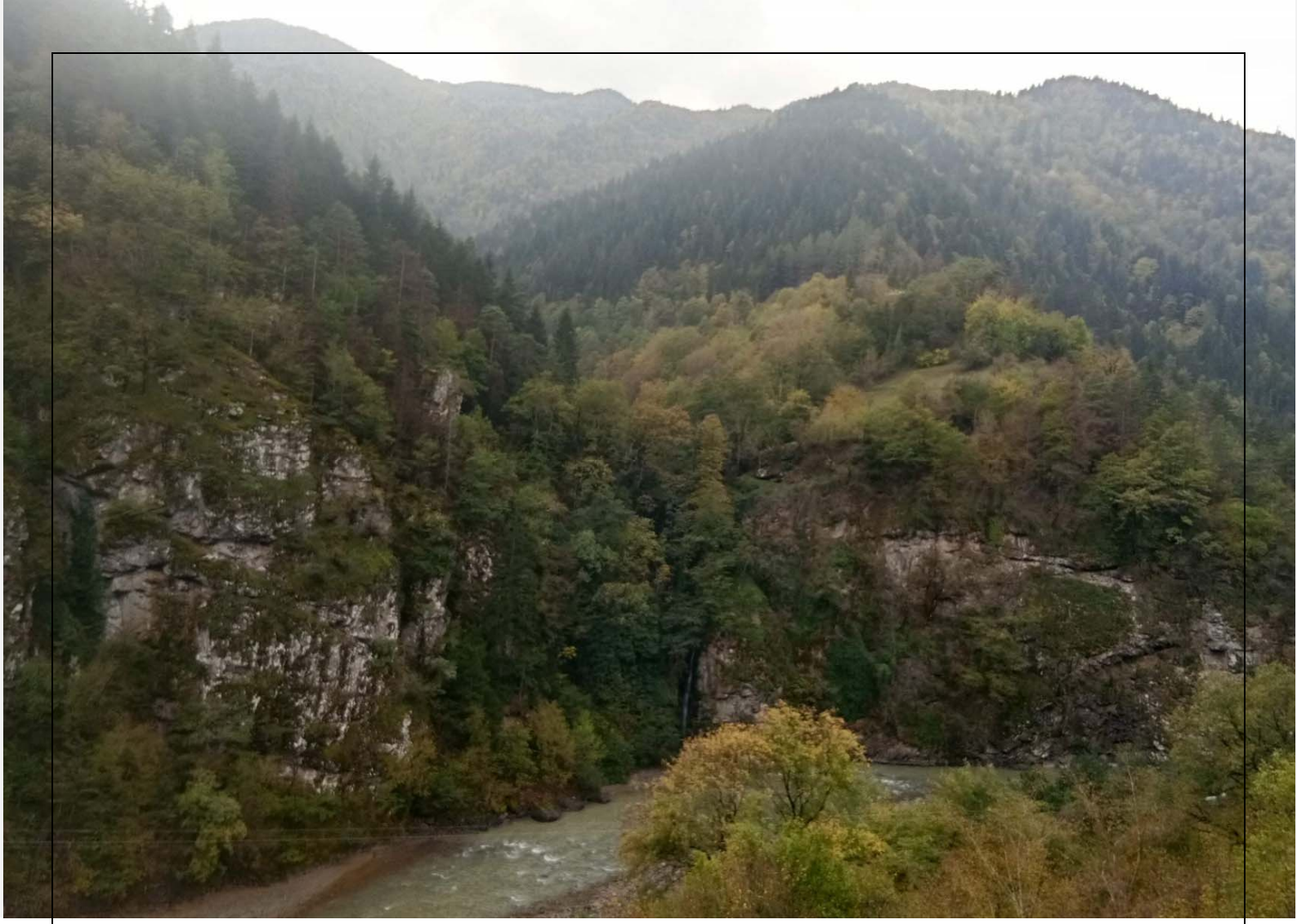
Action Number	Action	Start Date	End Date	GOG/Lender requirements to be satisfied	Comments on present status and when closure likely
					Macro-invertebrate surveys have been undertaken twice per year since 2012 but in 2016 there was one survey in November only. .
	Stocking fish upstream of the dam if required in accordance to the fish stocking plan	Spring 2021 AGL will rent already established fish farm in summer 2019 and activity for producing fish will start in Autumn 2020. Stocking has been conducted in spring 2021.	Right through operation phase	Fish stocking of the rivers affected by the Project is required under the environmental licence issued by the Government of Georgia and it is also a key compensation measure to achieve the no through no net loss residual impacts of biodiversity. The environmental licence requires that stocking is carried out using 10,000 juvenile freshwater trout	This is a new action added in the Shuakhevi BAP in October 2016. It begins after commissioning and is monitored right through the operation phase Monitoring locations for post operation monitoring need to be finalized from guidance in the statistical trend analysis of fish abundance data. Additional sites are presently being discussed with AGL
	Ensuring the beneficial flows from, and access to downstream tributaries are maintained	From commissioning	Right through operation phase	Ensuring no net loss through residual impacts as per IFC PS6, for migratory fish species, by providing access to and from spawning sites.	During commissioning and operations only. Competent fluvial geomorphologist in place prior to commissioning
Action F 1.3:	Reduction of impacts from decreased environmental flows in the Adjaristsqali River	From commissioning	Right through operation phase		

Action Number	Action	Start Date	End Date	GOG/Lender requirements to be satisfied	Comments on present status and when closure likely
	Monitoring of changes in hydro geomorphology during commissioning and operation	From commissioning	Right through operation phase	Ensuring no net loss through residual impacts on aquatic habitats important for fish of conservation importance Freshwater trout (*Salmo labrax fario*) Colchic khramulya (*Capoeta sieboldii*) Colchic nase (*Chondrostoma colchicum*)	During commissioning and operations only. Competent fluvial geomorphologist in place prior to commissioning
	Implementation of minor channel modification where required	From commissioning	Right through operation phase	Ensuring no net loss through residual impacts on aquatic habitats important for fish of conservation importance Freshwater trout (*Salmo labrax fario*) Colchic khramulya (*Capoeta sieboldii*) Colchic nase (*Chondrostoma colchicum*)	During commissioning and operations only. Competent fluvial geomorphologist in place prior to commissioning
	Fish and macro-invertebrate monitoring	Already commenced in 2014	10 years		Ongoing as monitoring of fish (4 times per year x 15 sites including control sites), as required by the Ministry of Environment. As recommended by Mott MacDonald, AFF has included the 2012/2013 sites in their surveys in August 2016, along with additional fish monitoring sites on the tributaries and downstream/upstream of dams. Macro-invertebrate surveys have been undertaken twice per year since 2012 but in 2016 there was one survey in November only.

Action Number	Action	Start Date	End Date	GOG/Lender requirements to be satisfied	Comments on present status and when closure likely
	Stocking fish upstream of the dam if required in accordance to the fish stocking plan	Autumn 2020 AGL will rent already established fish farm in summer 2019 and activity for producing fish will start in Autumn 2019. Possibly, stoking will conduct during first year of operation in 2020.	Right through operation phase	Requirement of Ministry of Environment GoG and to ensure that no net loss through residual impacts as per IFC PS6 is being achieved.	This is a new action added in the Shuakhevi BAP in October 2016. It begins after commissioning and is monitored right through the operation phase
	Maintaining flow inputs from, and access to habitats in the Diakonidze River	From commissioning	Right through operation phase	Ensuring no net loss through residual impacts as per IFC PS6, for migratory fish species, by providing access to and from spawning sites in the Diakonidze River	During commissioning and operations only. Competent fluvial geomorphologist in place prior to commissioning
Action F3.2	Implementation of sediment management plan and monitoring its implementation and consequent water quality	From commissioning	Right through operation	Ensuring no net loss through residual impacts on aquatic habitats as per IFC PS6 important for fish of conservation importance Freshwater trout (*Salmo labrax fario*) Colchic khramulya (*Capoeta sieboldii*) Colchic nase (*Chondrostoma colchicum*)	The LFMS identifies risk areas to be confirmed/ updated by the geomorphology walkovers after flushing events and floods during spring and autumn.
Action E1.4	Avoid or minimise bird collision and electrocution through adoption of design using international best practices	From commissioning of transmission line	Continuous	CMS Guidelines for 'avian-safe' lines (Prinsen et al, 2012), African-Eurasian Waterbird Agreement (AEWA) Guidelines, Birdlife International Position Statement on birds and power lines recommendations and suggested practices (Birdlife International, 2013) and Avian Power Line Interaction	To be installed subsequent to one year monitoring results. If mortality exceeds 2 incidents per year, bird deflectors will be installed in sections prone to collisions.

Action Number	Action	Start Date	End Date	GOG/Lender requirements to be satisfied	Comments on present status and when closure likely
				Committee suggested practice (APLIC, 2006).	

APPENDIX B STATISTICAL TREND ANALYSIS OF BIODIVERSITY MONITORING DATA



Annexe B: Statistical Trend Analysis of Biodiversity Monitoring Data

2013-2019

9 September 2021

Project No.: 0515864

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Document details	The details entered below are automatically shown on the cover and the main page footer. PLEASE NOTE: This table must NOT be removed from this document.
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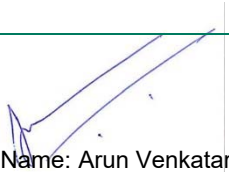
Signature Page

09th Sep 2021

Annexe B: Annexe B: Statistical Trend Analysis of Biodiversity Monitoring Data

2013-2019



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1. INTRODUCTION

ERM submitted a proposal to AGL LLC Georgia (AGL) on 28th May 2019 to carry out a statistical trend analysis of construction phase biodiversity monitoring data for birds, fish, endemic plants, herpetofauna, invertebrates, large mammals, macro-invertebrates and small mammals obtained during the period 2013-2019. The following are the objectives of the study:

1. Review of all the reports submitted by NGO and check for any deviations in the year, locations and frequency of sampling
2. Carry out initial trend analysis across all sampling locations across the years
3. Undertake a separate analysis for control sites and impacted site and compare any trends between the control and impacted sites
4. Use the trend analysis to assess residual impacts, at the end of the construction phase and suggest additional mitigation actions to address any residual impacts

The sampling sites including controls, the indices of abundance and biodiversity used and the method for carrying out the statistical trend analysis are described below specific for each taxa.

The indices used include

- In general species richness is the total number of species occurring in a sampling site
- Abundance within a species is the total number of individuals of a particular species occurring in a sampling site. For fish instead of abundance Catch per Unit Effort Gear was used and is explained in the relevant section.
- Species richness within an order is the total number of species occurring in that order.
- Abundance within an order is the total number species occurring within that order

2. RESULTS

2.1 Birds

2.1.1 Sampling Areas

The bird monitoring is to establish whether any impacts are occurring in the following impact areas. Any changes in bird species richness and abundance will be assessed against the control site, Chvana. As Chvana is the only site not impacted by construction activities, it can be considered the only control site.

Table 2.1 provides the names and coordinates of all sampling sites for terrestrial birds. ***Annex A*** provides the maps of these locations.

1. Chirukhisqali Weir
2. Skhalta dam and powerhouse
3. Didachara dam
4. Akhaldaba surge shaft and Shuakhevi powerhouse
5. Chvana (Control Site)

For aquatic dependent birds the following areas were sampled using line transects. Line transects either sampled impact or control sites. The locations of both line transects are provided in ***Annex B.***

1. Chirukhisqali River (impact and control transects)
2. Skhaltha River (impact transect)

3. Adjarastqali River downstream of Didachara Dam Site (impact transect)
4. Adjarastqali River upstream of Shuakhevi powerhouse (impact transect)
5. Chvana (control transect)

In 2013 the survey was carried out during June as a part of the pre- construction surveys. In other years sampling was carried out in April (breeding birds) and May (breeding and water birds)

Table 2-1 Sampling Locations for Birds

Sampling Site	Sampling Locations
Chirukhisqali Weir	Chirukhi 1: Location N 41.54105 E 42.32189 Chirukhi 2: Location N 41.54470 E 42.31445 Chirukhi 3: Location N 41.54580E 42.30824 Chirukhi 4: Location N 41.53809 E 42.31881 . Chirukhi 5: LocationN 41.54203 E 42.32338 Chirukhi 6: LocationN 41.54376 E 42.33171 Chirukhi 7: LocationN 41.54700 E 42.32042 Chirukhi 8: LocationN 41.55010 E 42.31957

Sampling Site	Sampling Locations
Skhaltha	Skhalta 1: Location N 41.57608 E 42.36238 Skhalta 2: LocationN 41.58349 E 42.36968 . Skhalta 3: LocationN 41.56945 E 42.37168 Skhalta 4: LocationN 41.56588 E 42.37511 Skhalta 5: LocationN 41.56757 E 42.36832 Skhalta 6: LocationN 41.57432 E 42.38442 Skhalta 7: LocationN 41.57439 E 42.38086 Skhalta 8: LocationN 41.57827 E 42.36296 Skhalta 9: LocationN 41.58115 E 42.36800 Skhalta 10: LocationN 41.58151 E 42.36346

Sampling Site	Sampling Locations
Didachara	Didachara 1: Location:N 41.65580 E 42.35442 Didachara 2: Location:N 41.65553 E 42.35096 Didachara 3: Location:N 41.65113 E 42.34990 Didachara 4: Location:N 41.65175 E 42.33788 Didachara 5: Location:N 41.64845 E 42.34241 Didachara 6: Location:N 41.65803 E 42.35416 Didachara 7: Location:N 41.65559 E 42.35877 Didachara 8: Location: N 41.65511 E 42.36159 Didachara 9: Location:N 41.66426 E 42.35404 Didachara 10: Location:N 41.65802 E 42.34736

Sampling Site	Sampling Locations
Akhaldaba - Shuakhevi	Akhaldaba 1: Location:N 41.64463 E 42.14991 Akhaldaba 2: Location:N 41.64480 E 42.15559 Akhaldaba 3: LocationN 41.64307 E 42.16711 Akhaldabai 4: LocationN 41.64307 E 42.16711 Akhaldaba 5: Location:N 41.64710 E 42.14485 Suakhevi 6: Location:N 41.63306 E 42.14766 Suakhevi 7: Location:N 41.63456 E 42.15432 Suakhevi 8: Location:N 41.62936 E 42.15308 Suakhevi 9: Location:N 41.63796 E 42.15644 Suakhevi 10: LocationN 41.63834 E 42.14682
Control-Chvana	Chvana 1: Location E 41.65340 N 42.13290 Chvana 2: Location E 41.66100 N 42.14112 Chvana 3: Location E 41.66952 N 42.15029

Given the large number of species, which renders species specific analysis unwieldy, analysis was carried out by grouping species into the following bird orders;

Accipitriformes: An order of birds that includes most of the diurnal birds of prey, including hawks, eagles, and vultures, but not falcons

Piciformes: Nine families of largely arboreal birds make up the order Piciformes, the best-known of them being the Picidae, which includes the woodpeckers and close relatives.

Passeriformes: This order includes more than half of all bird species. Sometimes known as perching birds or – less accurately – as songbirds, passerines are distinguished from other orders of birds by the arrangement of their toes (three pointing forward and one back), which facilitates perching.

It is assumed that species within an order share similar life history characteristics than those from other orders and impacts from the project on life histories are likely to be similar within an order than across orders.

2.1.2 Results

2.1.2.1 Terrestrial Birds

Table 2-1 provides the trends of abundance and species richness across the 4 impacted and one control site. Both the species richness and abundance represent means of values obtained from the April and May sampling sessions for all years from 2014-2019.

Trends observed were the increase of both abundance and species richness within the order Accipitiformes in Chirukhi and Shuakhevi-Akhaldaba. There were no such changes in the control site, Chvana.

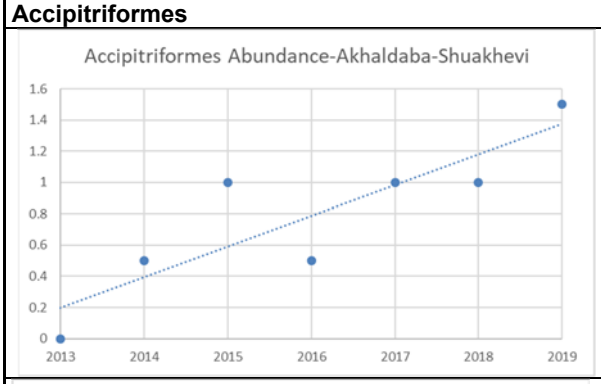
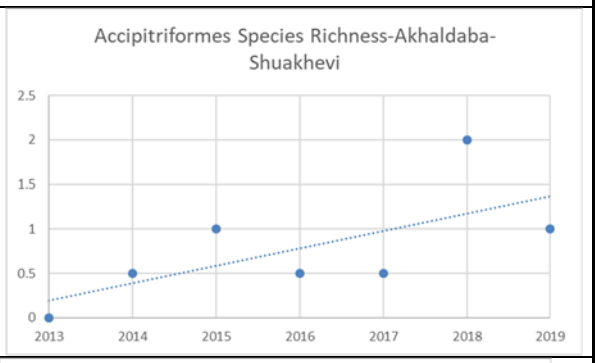
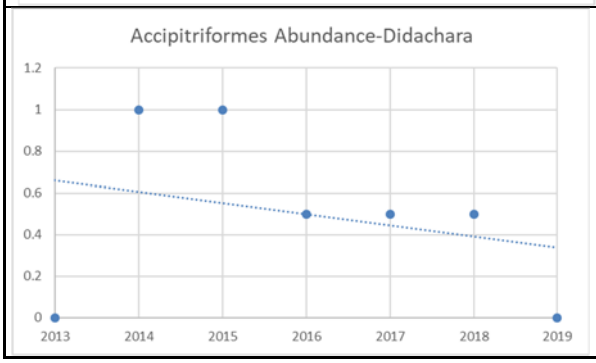
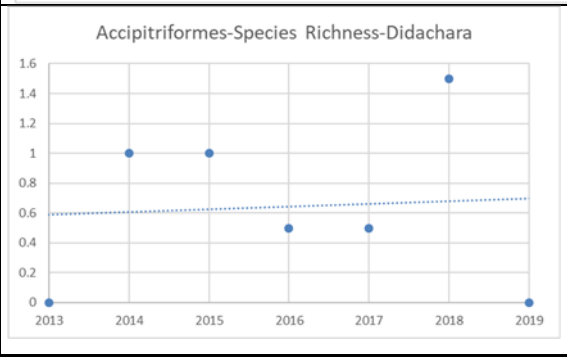
The Short-toed Snake Eagle (*Circaetus gallicus*) which was not earlier recorded in Chirukhi was observed here in 2018. The Booted Eagle was also observed in 2018 and 2019. We also observed an increase in the abundance of this order in Shuakhevi-Akhaldaba due to an increase in the latter species and Steppe Buzzards (*Buteo buteo vulpinus*).

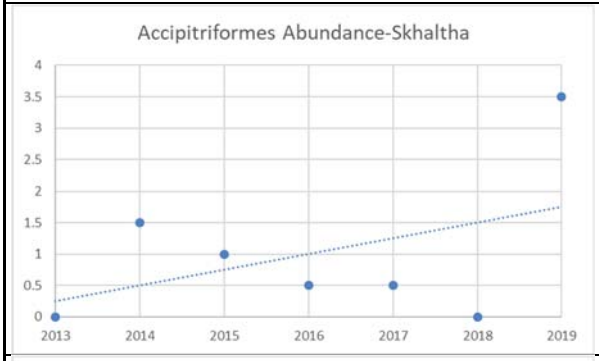
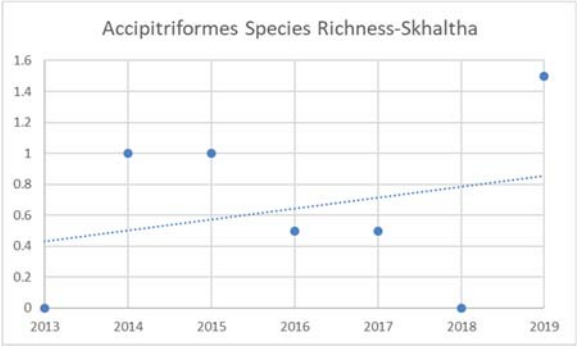
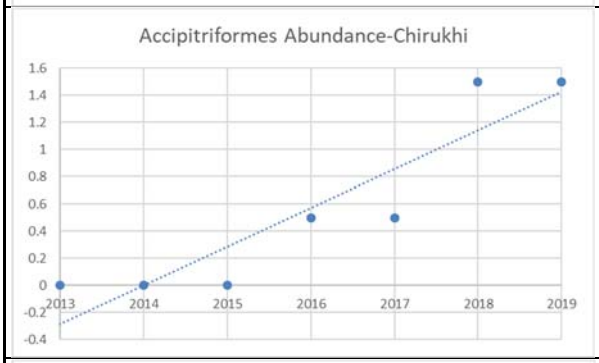
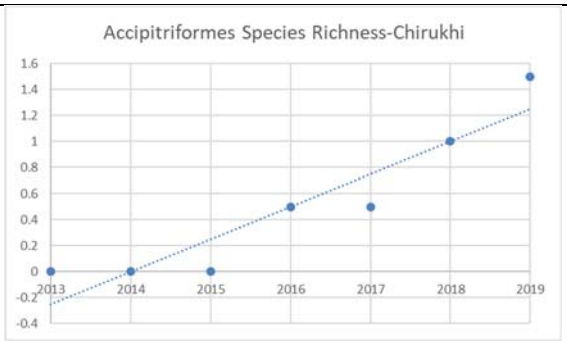
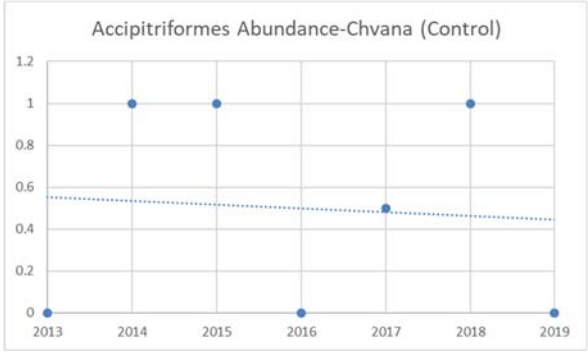
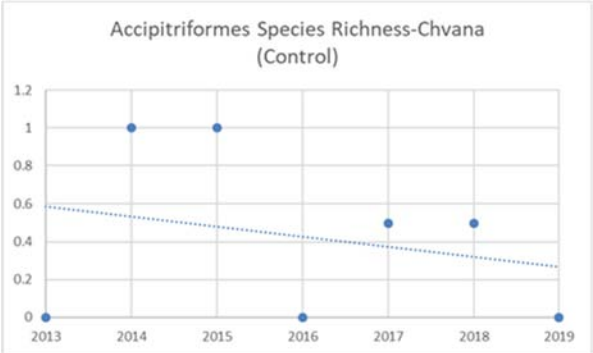
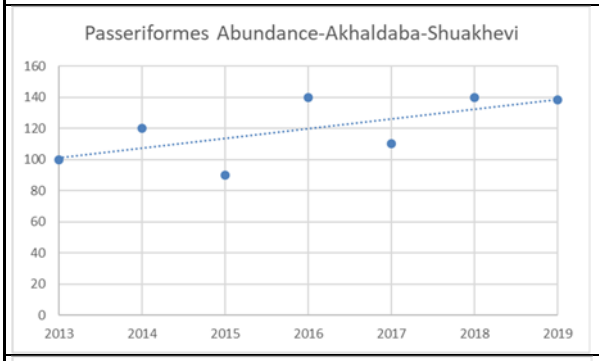
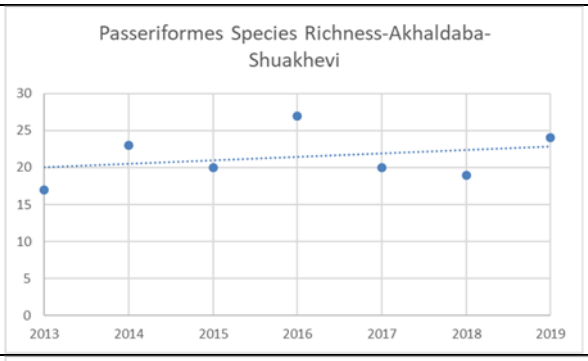
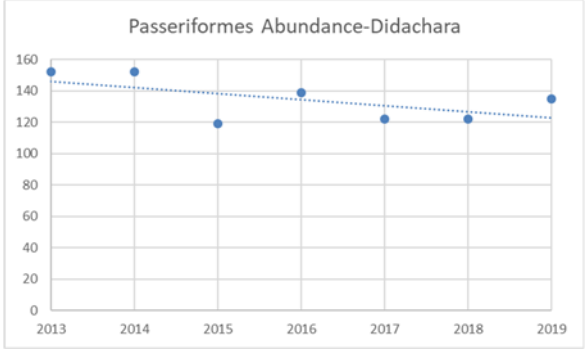
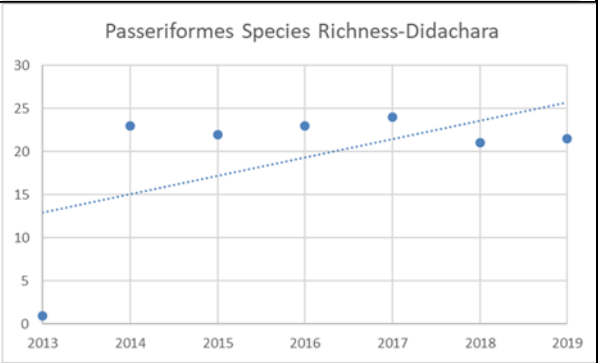
There was also a significant decrease (R^2= 0.82, $p<0.05$ in the abundance of Piciformes order in Didachara (4 to 2).

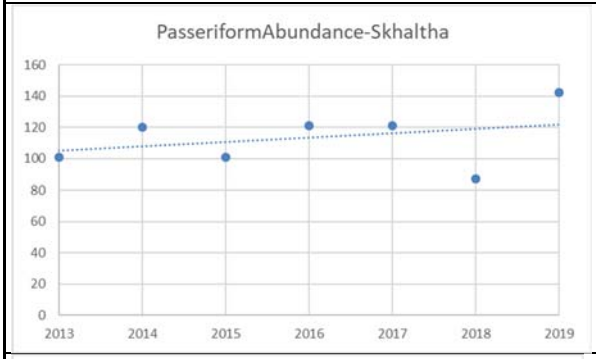
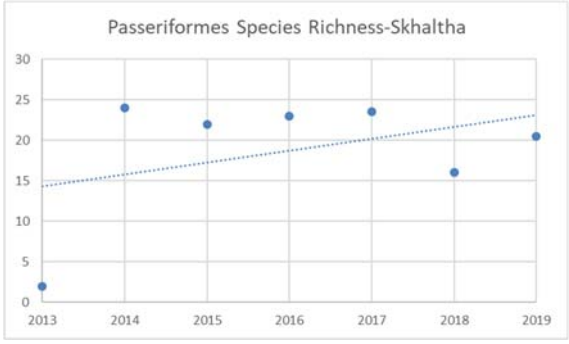
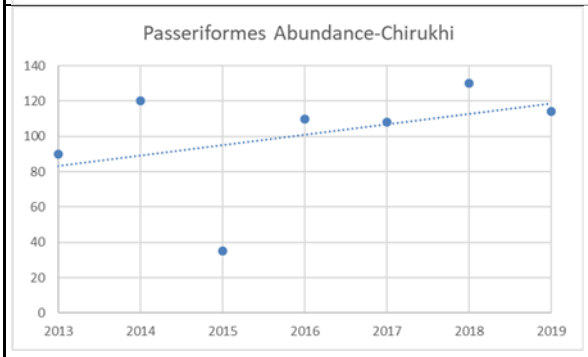
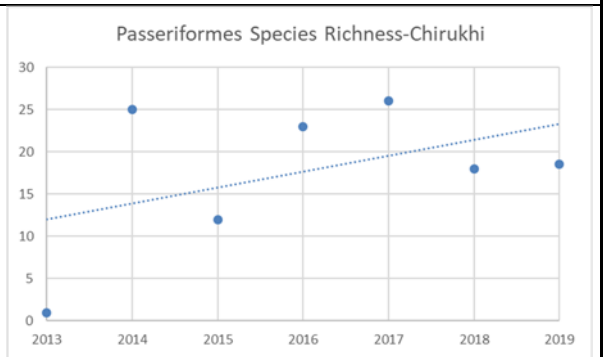
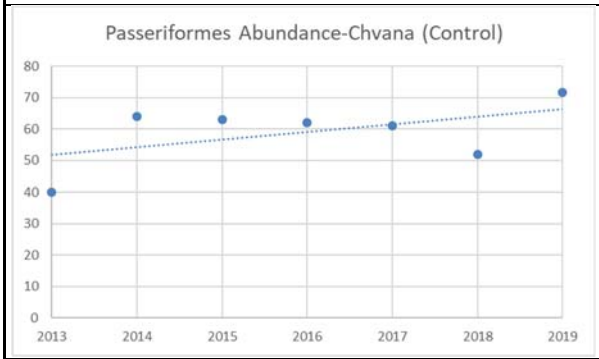
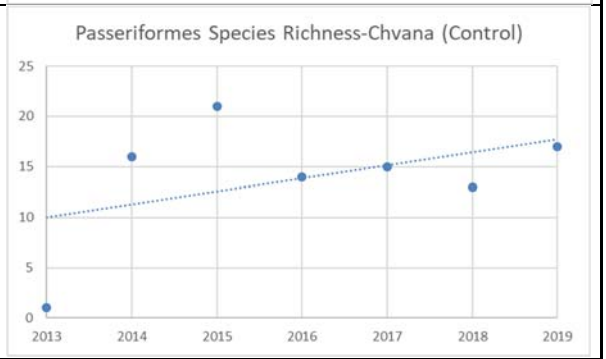
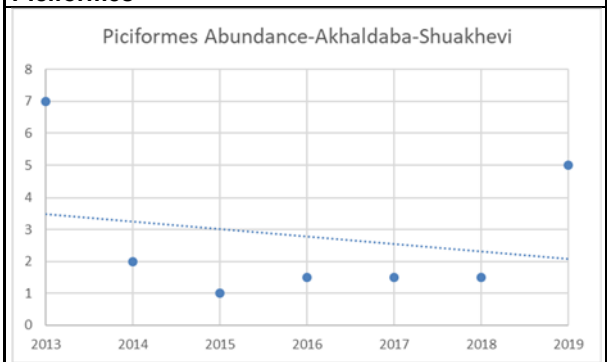
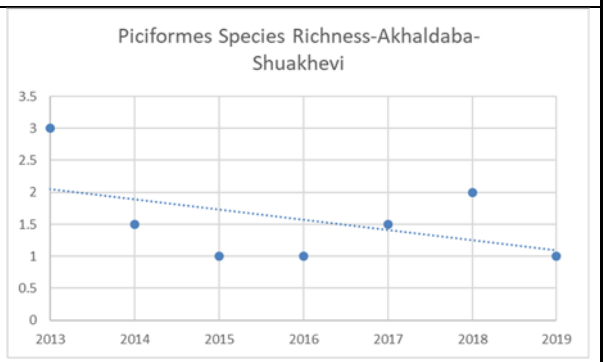
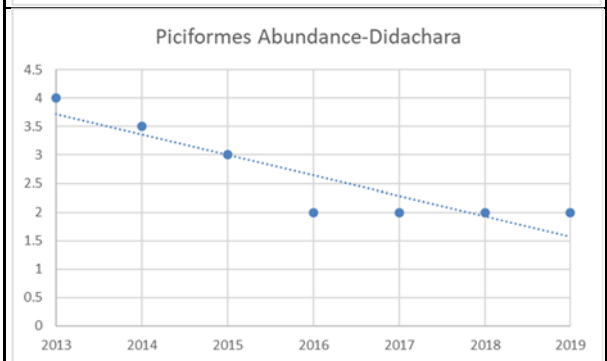
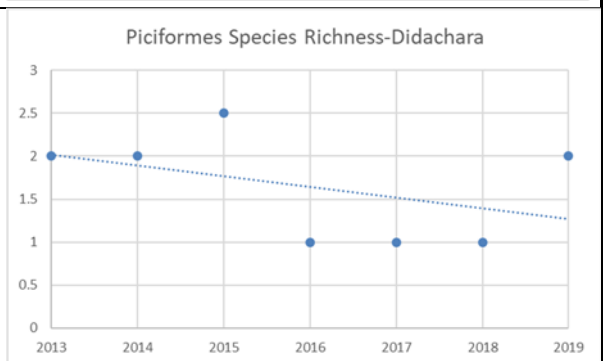
A pair of Egyptian vultures (*Neophron percnopterus*) was recorded on a cliff near the village of Kortokhi south-east from Didachara (GPS location N 41.648460 E 42.378370) only during the breeding season in 2013. This species is listed as Endangered on the IUCN Red List and Vulnerable on the Georgia Red List. The location is given in the map of the Didachara sampling locations in ***Annex A.*** The species was not observed nesting across the future monitoring years.

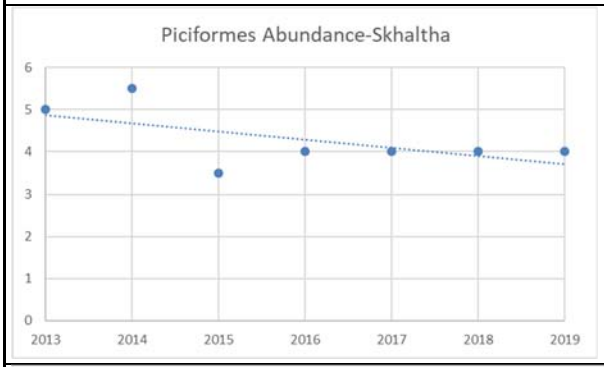
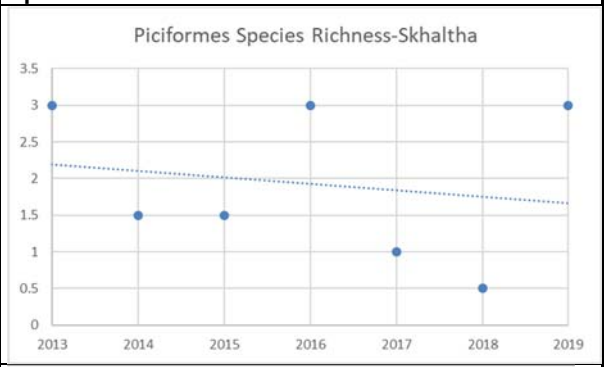
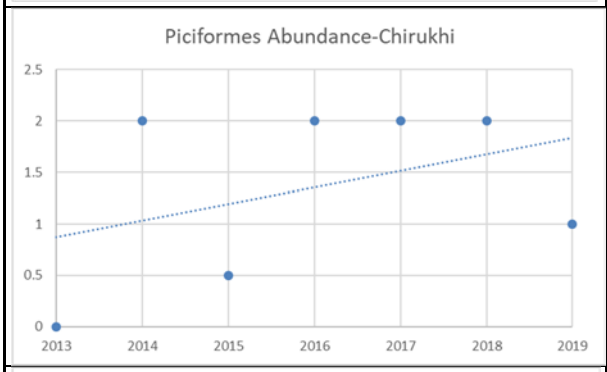
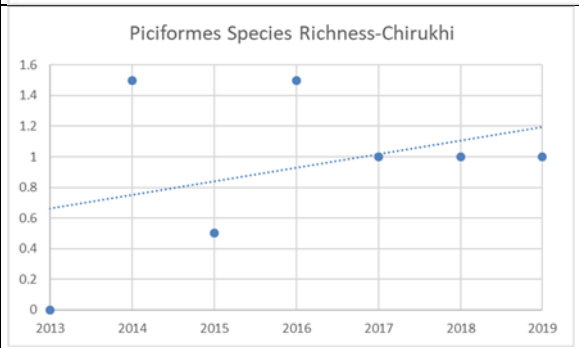
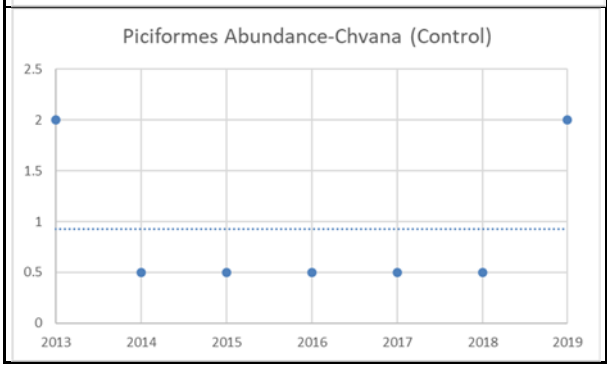
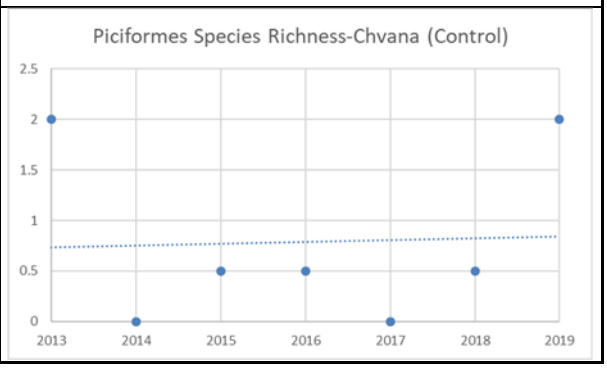
It is also to be noted that there was a single sighting of Common Quail (*Coturnix coturnix*) in Shuakhevi-Akhaldaba in 2018 May.

Table 2-2 Trends in Bird Species Richness and Abundance across Impacted and Control Sites

Abundance	**Species Richness**
Accipitriformes	
	
	

Abundance	Species Richness
	
	
	
Passeriformes	
	
	

Abundance	Species Richness
	
	
	
PIciformes	
	
	

Abundance	Species Richness
	
	
	

2.1.2.2 *Aquatic Dependent Birds*

Aquatic dependent birds were monitored along 2 km long transects close to 4 construction sites, up and downstream of the Adjarastqali (Didachara and Shuakhevi), Chirukhisqali and Skhalta Rivers and at the control sites at Chvana and upstream of the Chirukhisqali Dam. The encounter rates of 4 species were calculated from the following formula.

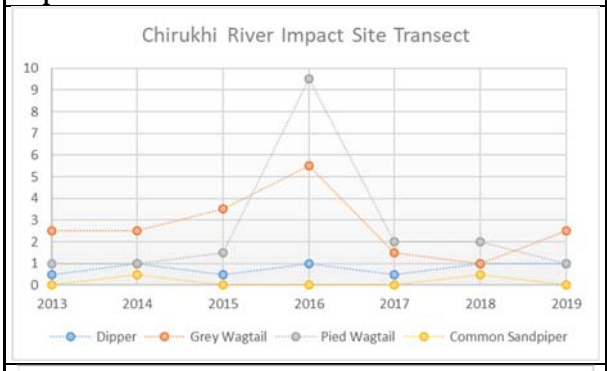
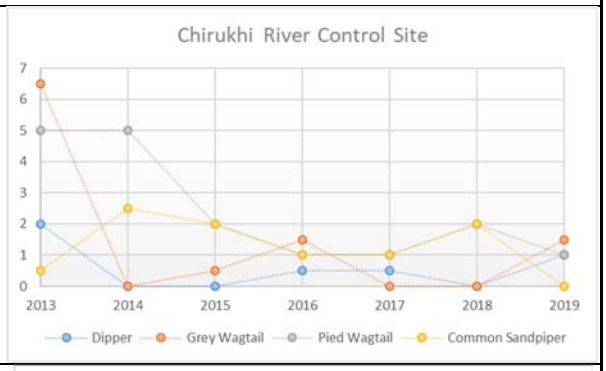
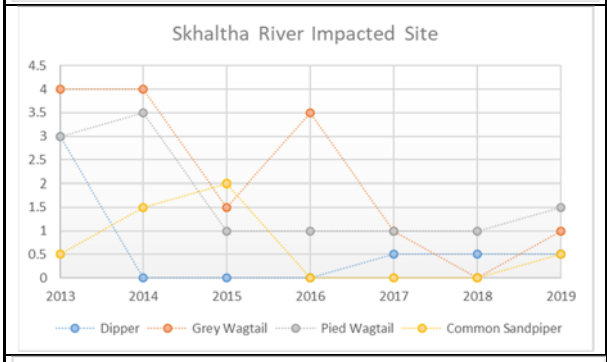
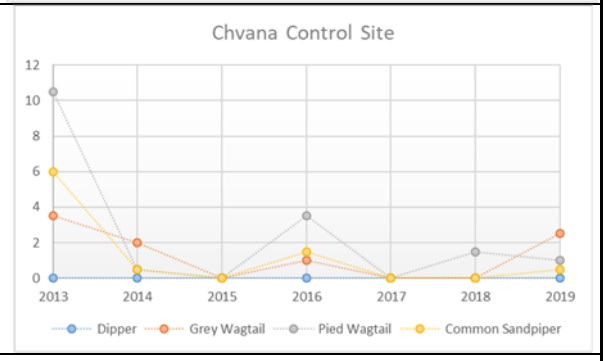
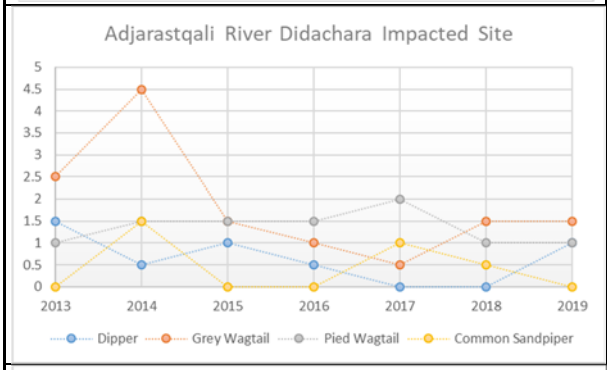
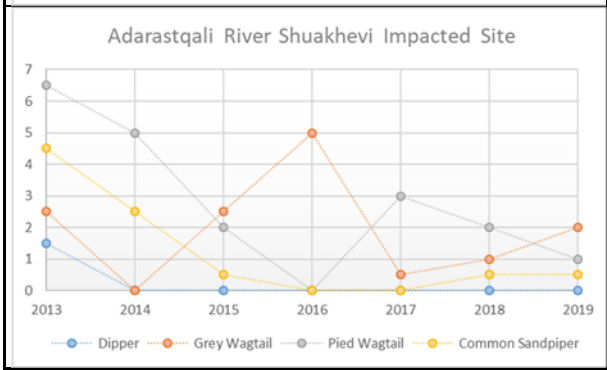
$$F_d = \frac{N}{L}$$

Where F_d - is the encounter rate.

N – is the number of species individuals recorded the transect,
L – is the length of the transect in km.

For the different sites the encounter rates of the 4 aquatic dependent species are provided for each sampling location in ***Table 2-3*** below.

Table 2-3 Comparison of Aquatic Dependent Bird Densities across Impacted and Control Site Transects

Impacted Site	Control Sites
	
	
	
	

Among the 4 monitored aquatic dependent species, White-throated Dipper (*Cinclus cinclus*), Common Sandpiper (*Actitis hypoleucos*), Pied Wagtail (*Motacilla alba*) and Grey Wagtail (*Motacilla cinerea*), the White-throated Dipper declined along the Adjarastqali River at Shuakhevi. Abundance decreased from 3 individuals in 2013 to no individuals from 2014 in Shuakhevi. However this decrease was not significant (R^2=0.38, p>0.05). It may be noted that there were no records of the species in the control site Chvana.

Construction was completed in March 2017 in both Shuakhevi and Didachara. It is therefore likely that the impacts of construction continued into the longer term and no recovery was observed once construction was completed.

This species occupies fast-flowing, clear-water rocky streams and rivers with riffles and exposed rocks, and with abundant invertebrate prey. It also uses shallow watercourses in broadleaf woodland, in semi-natural forest and on open moorland and glacial lakes. It requires rocky cliffs or artificial sites, such as bridges, for breeding.

The status and abundance of this species is strongly reflected by the water quality and habitat structure of rivers. Pollution that adversely affects aquatic prey also has an impact on dippers[1].

In southern Europe and elsewhere, hydro-electric and irrigation schemes are thought to be causing declines by reducing flow rates in watercourses. In addition habitat degradation, water abstraction and water impoundment are also threats in parts of its range[2]

For the 3 other species there was variation across the years. This trend of variation across years was also observed across the 2 control site transects.

Little Ringed Plover (*Charadrius dubius*) and Green Sandpiper (*Tringa ochropus*) have been recorded in the study area since 2014, but were not included in the analysis due to insufficient data.

2.1.3 Impacts and Recommended Additional Mitigation

Table 2-4 Summary of Observed Impacts and Recommended Additional Mitigation

Impacted Site	Impacted Receptor	Predicted Impact (ESIA 2013)	Mitigation (ESIA 2013)	Observed Impact	Recommended Additional Mitigation
All impacted sites	Notable terrestrial bird species	Habitat loss, light and noise disturbance, hunting, creation of open water habitats	Hunting ban and enforcement measures, minimise habitat loss and reinstatement where possible, provision of safe artificial nest sites, staff awareness	The disappearance of the nesting Egyptian vultures southeast of Didachara	Support for the protection of at least 1 nest of Egyptian vultures from disturbance due to anthropogenic and development of activity in collaboration with wildlife agencies/NGOs.
	General bird assemblages			Decline of abundances of Piciformes in Shuakhevi-Akhaldaba	Planting of nesting tree species in forest restoration sites and continued monitoring across years to assess success of nesting

[1] https://www.iucnredlist.org/species/22708156/131946814#threats

[2] Ormerod, S., Tyler, S. and Christie, D.A. 2015. White-throated Dipper (Cinclus cinclus). In: del Hoyo, J., Elliott, A., Sargatal, J., Christie, D.A. and de Juana, E. (eds), Handbook of the Birds of the World Alive, Lynx Edicions, Barcelona.

Impacted Site	Impacted Receptor	Predicted Impact (ESIA 2013)	Mitigation (ESIA 2013)	Observed Impact	Recommended Additional Mitigation
Chirukhi and Skhalta Rivers	Aquatic dependent birds	Habitat loss, light and noise disturbance, , creation of open water habitats such as reservoirs, deterioration of water quality through construction activity, soil run-off, solid and aqueous waste disposal	None proposed	No impacts observed	None recommended.

Impacted Site	Impacted Receptor	Predicted Impact (ESIA 2013)	Mitigation (ESIA 2013)	Observed Impact	Recommended Additional Mitigation
Adjarastqali,	White-throated Dipper	Habitat loss, light and noise disturbance, , creation of open water habitats such as reservoirs, deterioration of water quality through construction activity, soil run-off, solid and aqueous waste disposal	None proposed	Declines of abundance possibly due to noise and vibration caused by construction activity upstream of the Shuakhevi powerhouse (the impact site transect is upstream of the site) and downstream of the Didachara dam (the impact site transect is downstream of the site). Water quality deterioration could also be responsible for declines in abundance downstream of the Didachara dam, (though from **Section 2.6**, there are no major changes in macro-invertebrate species composition). In the operation phase, lowered flows and changes in habitat structure could cause declines	Recovery of numbers will be only be possible if habitat structure is not significantly altered during the operation phase. This will be facilitated if the Low Flow Mitigation strategy is fully implemented. Any breeding sites identified on rocky cliffs and bridges should be protected from any human disturbance.

2.2 Endangered and Endemic Flora Species

2.2.1 Sampling Area

Table 2-5 provides the location of the plots for monitoring the endemic species *Arbutus andrachne* and *Astragalus sommieri.*

Arbutus andrachne (Endangered in Georgia) is only known from one location in Adjara, 5 km west of Shuakhevi (Z. Manvelidze, pers. comm.) and the species is rare in Georgia (Melia et al., 2012[3];

[3] Melia, N., Gabedava, L., Barblishvili, T., Jgenti., L (2012). Reproductive biology studies towards the conservation of two rare species of Colchic flora, Arbutus andrachne and Osmanthus decorus. Turk. J.Bot., 36: 55-62

Eristavi et al., 2013[4]). Surveys undertaken in August 2013 for this species found that it was present on a small area (1.62 ha) approximately 700 m from the nearest project component (spoil deposit area) (see ***Figure 2.1).***

A small patch of *Astragalus sommieri*, a species listed as Endangered on the Georgia Red List and rare in Adjara, has been recorded near Zamleti village (Mott MacDonald, 2013). It is understood that this area is part of a known and small population of this species, which is the only population of this species in Georgia (Manvelidze et al., 2009)[5] (see ***Figure 2.1).***

The following two Georgia endemic species are also present in the Study Area and they have been assessed against Critical Habitat Criteria 2 Tier 2. The DMU may support between 1 and 95% of the global population of these species.

- *Symphytum grandiflorum*: recorded in 2013 at the Sanalia site (Mta-Bari, 2013) and in 2014 present in low abundance (<5% cover) at 300m downstream of Shuakhevi dam and Skhalta dam, and at Saburkhevi spoil area (Mta Bari 2014a)[6]. This species occurs in forest habitat and damp ravines, and is relatively frequent/abundant in the Study Area (Z. Manvelidze, pers. comm.)
- *Tripleurospermum szovitsii*: recorded in 2014, 300m downstream of the Didachara dam[4] and also in low abundance downstream of Chirukhistsqali weir (Mta-bari 2014b)[7]. This species occurs on dry rocky slopes (mainly southern aspect), and is rare in the Study Area (Z. Manvelidze, pers. comm.)

Table 2.6 provides the location of the plots for monitoring the restricted range species *Symphytum grandiflorum*: and *Tripleurospermum szovitsii* in April and May 2020.

[4] Eristavi, M., Shulkina, T., Sikhuralidze, S., Asieshvili, L. (2013).Rare, Endangered and Vulnerable Plants ofthe Republic of Georgia. http://www.mobot.org/MOBOT/Research/georgia.

[5] Manvelidze, Z., Eminagaoglu, O., Memiadze, N., Kharazishvili, D. (2009). Conservation of endemic plant species of Georgian-Turkish transboundary area.Critical Ecosystem Partnership Fund, WWF and Mta-Bari Association for Sustainable Development and Environment Protection, Batumi.

[6] Mta-Bari (2014a). Botanical Research at the Adjaristsqali Hydropower Cascade Project (October). Mta- Bari.

[7] Mta-Bari (2014b). Botanical Research at the Adjaristsqali Hydropower Cascade Project (July). Mta-Bari.

Figure 2.1 Locations of *Arbutus andrachne* and *Astragalus sommieri* with Respect to Project Components

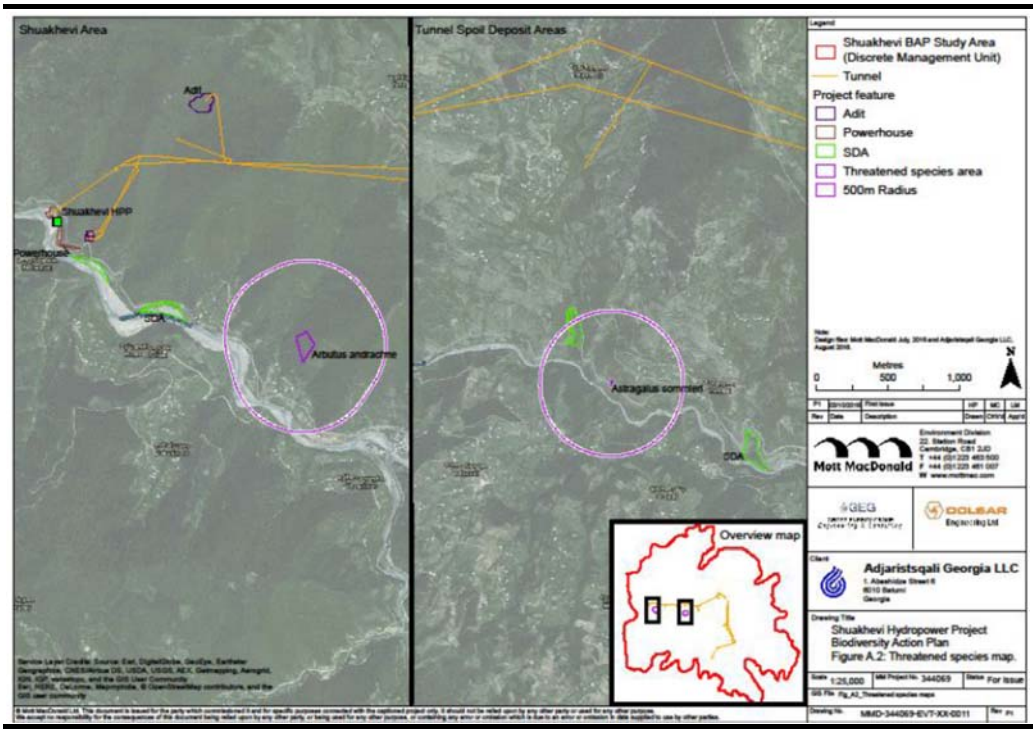


Table 2-5 Location of Plots for Endangered Species

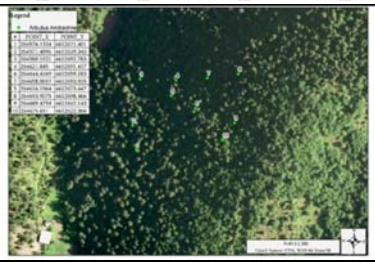
Species	Map of Plot Locations
Arbutus andrachne	
Astragalus sommieri	

Table 2.6 Location of Plots for Restricted Range Species

Species	Map of Plot Locations
Symphytum grandiflorum 1. 300 m downstream of Skhaltha dam 2. 300 m downstream of Chirukhisqali weir	 
Tripleurospermum szowitzii 1. 300 m downstream of Chirukhisqali weir	

Sampling plots (***Table 2-5 and Table 2.6***) with populations of the target species were used to provide consistent and comparable data on the structural change of the vegetation components of those communities where *Arbutus andrachne* and *Astragalus sommieri* and *Symphytum grandiflorum* and *Tripleurospermum szowitzii* occur.

During the survey GPS coordinates for all sampling plots were collected. In the sampling plots were of the number of individuals of trees and semi-shrubs, total cover of plots and species richness of the

plots (Conklin & Meinzholt, 2004[8]; Bonham, 2013[9]) were enumerated. Coverage of in the sampled plots were estimated according the Braun-blanquet scale (Braun-Blanquet, 1965[10]) which is convertible into percentage values of species cover (Peet & Roberts, 2013[11]).

2.2.2 Results

The results show abundance of *Arbutus andrachne* remained more or less constant in the surveyed plots across the monitoring years of 2017- 2019.

Table 2-6 Trends in Numbers of *Arbutus andrachne* across Monitoring Years

Plot Number	2017	2018	2019
1.	1	1	1
2.	1	1	1
3.	1	1	1
4.	4	4	4
5.	5	5	5
6.	4	4	4
7.	4	4	5
8.	4	3	3
9.	1	1	2
10.	1	1	1
Total	26	25	27

There appears to be an increase in abundance of *Astragalus sommierii* across 2017-2019

Table 2-7 Trends in Numbers of *Astragalus sommierii* across Monitoring Years

Plot Number	2017	2018	2019
1.	35	30	39
2.	15	14	16
3.	38	36	39
4.	12	12	16
5.	10	10	10
6.	3	1	2
7.	1	1	2
8.	6	6	6
9.	1	1	1
10.	1	1	3
Total	122	112	134

In addition significant growth was observed in plot cover and species richness within the plots indicating the health of the habitat these 2 species were found in.

[8] Conklin, A.R., & Meinzholt, R. 2004. Field Sampling: Principles and Practices in Environmental Analysis. ISBN: 0824754719. Marcel Dekker, Ink. New York & Basel.376 pp.

[9] Bonham, Ch. D., 2013. Measurements for Terrestrial Vegetation. ISBN: 0470972580. A John Wiley & Sons, Ltd. 260 pp.

[10] Braun-Blanquet, J., Fuller G.D., Conard H.Sh., Blanquet J.B. 1965. Plant Sociology: The Study of Plant Communities. Authorized English Translation of Pflanzensoziologie by J. Braun-Blanquet. Transl., rev. and Ed. by George D. Fuller and Henry S. Conard. Hafner Pub.

[11] Peet, R.K. and Roberts, D.W., 2013. Classification of Natural and Semi - natural Vegetation. Vegetation Ecology, Second Edition, pp.28-70.

For *Symphytum grandiflorum* and *Tripleurospermum szowitzii* the results of the monitoring in April and May 2019 are shown in ***Table 2.8***.

Table 2-8 Numbers of *Symphytum grandiflorum* and *Tripleurospermum szowitzii* in 2020

Species	Plot	Numbers Observed	Map of Survey Plot
Symphytum grandiflorum	300 m downstream of Skhaltha Dam	386 individuals (two generations grow together, present in the flowering phase at the time of observation)	
	300 m downstream of Chirukhisqali weir	Within a surveyed plot, the area occupied by the species is 1500 m^2. The species however could not be counted. Individuals in the population are randomly arranged in small groups (two generations grow together and are in the flowering phase at the time of observation).	
Tripleurospermum szowitzii	300 m downstream of Chirukhisqali Weir	Within a surveyed plot, the area occupied by the species is 2200 m^2. (300 X 5 m on the mouth of the river). Unable to be counted, Individuals in the population are equally distributed throughout the area. They are in the flowering	

		stage during the observation period.	

Symphytum grandiflorum in April and May 2020 remains in only two areas:

- 300 m downstream of Skhalta Dam
- Downstream of Chirukhistsqali weir.

300 m downstream of Skhalta Dam, habitat was limited in 2013-2014 and in April and May 2020, it was restricted to a section of the river in a moist forest adjacent to the left bank of the Skhaltistskali. Here the impact of construction processes was not observed and the habitat is maintained in an almost intact condition.

300 m downstream of the Chirukhistsqali weir habitat was limited in 2013-2014 and in April and May 2020 was restricted to a section of the river in a moist forest mouth adjacent to the right bank of the Chirukhistskali. Here the impact of construction processes was not observed and habitat is maintained in an almost intact condition.

It should however be noted that this species is no longer found in Sanalia and Saburkhevi, because these sites have been completely modified as a consequence of the construction of the Chirukhisqlai Weir. Around 0.09 ha of habitat of the species was lost due to the constuction.

Tripleurospermum szovitsii in April and May 2020 remains downstream of the Chirukhistsqali weir on a dry slope along the roadside near the right bank of the Chirukhistskali. However, an estimated half of the population of 2013-2014 remains. In this section there was no impact during the construction period.

2.2.3 Impacts and Recommended Additional Mitigation

Table 2-9 Summary of Impacts and Recommended Additional Mitigation

Impacted Site	Impacted Receptor	Predicted Impact	Mitigation (ESIA 2013)	Observed Impact	Recommended Additional Mitigation
Plots as shown in ***Table 2.5***	*Arbutus andrachne* and *Astragalus sommieri.*	As the plots are far removed from the construction areas there will be no direct impact from construction. The only likely impacts will be the displacement of grazing livestock as a consequence of construction activity and land take for the project.	Monitoring of populations of species as being carried out now.	None observed	Continued monitoring of populations of species as being carried out now.
Plots as shown in **Table 2.6**	*Symphytum grandiflorum* and *Tripleurospermum szowitzii*	Habitat conversion and degradation from construction.	Habitat conversion and degradation from construction	Complete loss of habitat in Sanalia and Saburkhevi as a consequence of the construction of the Chirukisqali Weir.	To compensate for the loss of the *Symphytum grandiflorum* and achieve net gains, it is recommended that 20 % additional area over the areas formerly occupied by and lost due to construction, be restored in an alternate site with an appropriate number of seedlings brought in from other areas where it grows. A cultivation plan is presently being prepared for this alternate site

2.3 Fish

2.3.1 Sampling Area

Catch per Gear Effort (CPGE) was calculated by dividing catch for each species for each sampling site by the total number of casts of nets for each site. The number of casts varied across sites but was the same for each site across the sampling years.

The analysis was carried out for each of the three rivers, Adjarastqali, Chirukhisqali and Skhalta.

Where possible CPGE was calculated for the following reaches within each of the above rivers.

1. Downstream

2. Upstream

3. Control (undisturbed reaches of the river but could also coincide with upstream reaches or tributary reaches).

Fish were sampled in February, April, August and October from 2014-2019.

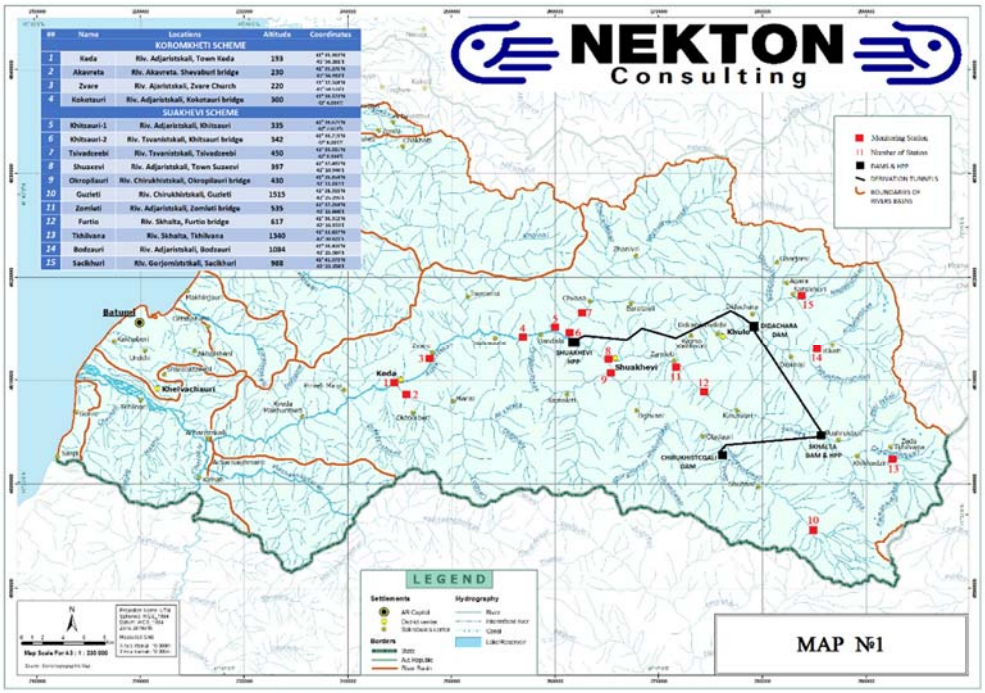
The sampling sites within each river is provided in

Table 2.10 and the map of all sampling locations is provided in ***Figure 2.2***

Table 2.10 Sampling Locations in Reaches of Each River

River	Reach	Sampling Sites
Adjarastqali	Downstream	1-6,8,11
	Upstream and Control	14
	Tributary and control	7,15
Chirukhisqali	Downstream	9
	Upstream and Control	10
Skhalta	Downstream	12
	Upstream and Control	13

Figure 2.2 Map of all Sampling Locations for Fish

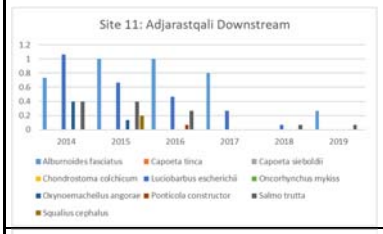
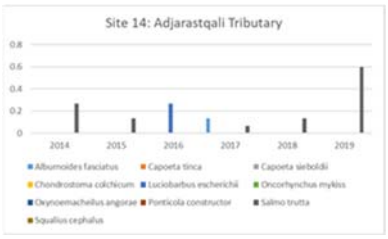
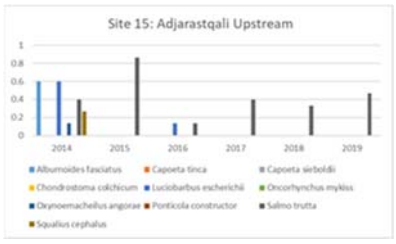
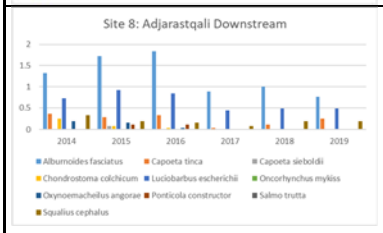
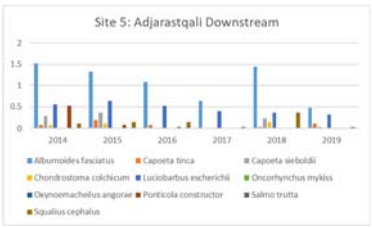
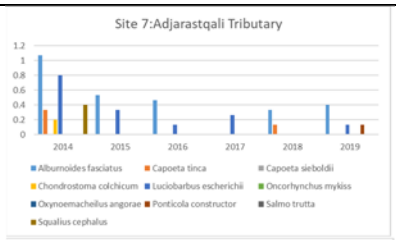
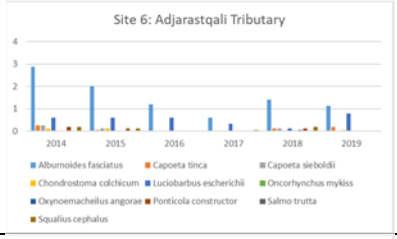
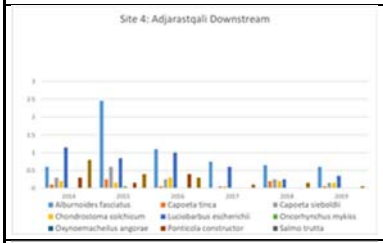
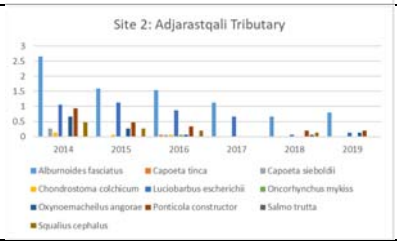
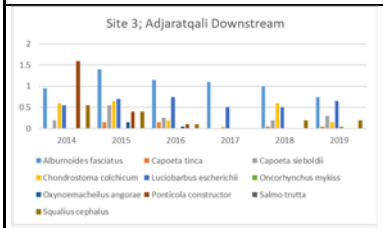
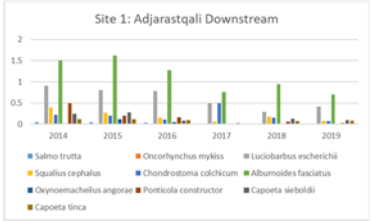


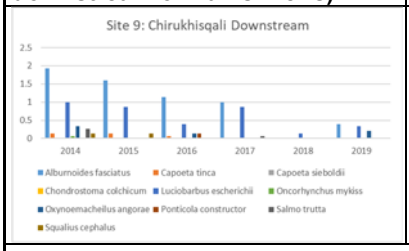
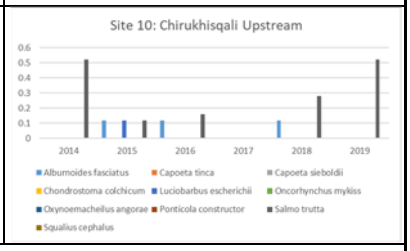
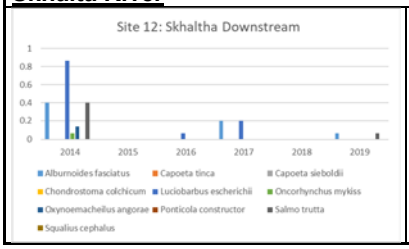
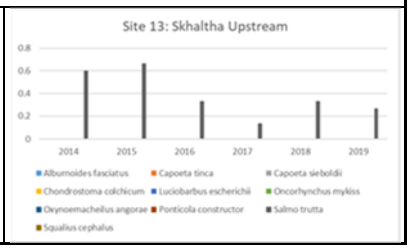
2.3.2 Results

Table 2-11 provides trends in CPEG for different impacted reaches of each of the 3 rivers. These parameters are also provided for control sites for the Adjarastqali (upstream of Didachara dam and tributaries), Chirukhisqali River (upstream of Chirukhisqali Weir) and Skhalta River (upstream of Skhalta dam). CPEG was averaged across the 4 seasons of sampling in each year (February, April, August and October).

While bar charts were plotted, scatter plots and trend lines were also used to explore any significant trends of declines. Due to large number of data points across all species, bar charts are provided for easier interpretation.

Table 2.11 CPEG for Impacted and Control Sites of the 3 Rivers

Impacted Sampling Locations (Arranged Upstream to Downstream (All sites downstream of Dams/Weirs)	Control Sampling Locations (Tributaries) (Arranged Upstream to Downstream)	Control Sites (Upstream of Dams/Weirs)
Adjarastqali River		
		
 	 	
		
 		
Chirukhisqali River		

Impacted Sampling Locations (Arranged Upstream to Downstream (All sites downstream of Dams/Weirs)	Control Sampling Locations (Tributaries) (Arranged Upstream to Downstream)	Control Sites (Upstream of Dams/Weirs)
		
Skhalta River		
		

Declines of CPEG for *Alburnoides fasciatus*, *Luciobarbus escherichii* and *Oxynoemacheilus angorae* were observed at Site 11, downstream of the Didachara Dam, though *Alburnoides fasciatus* did recover in 2018 and 2019. Only the decline of *Luciobarbus escherichii was found significant* (R^2=0.95, p<0.05)

Alburnoides fasciatus, Oxynoemacheilus angorae and Luciobarbus escherichii initially found upstream of the Didachara dam between 2014-2016 at Site 15, disappeared in subsequent years.

The decline of one species, *Alburnoides fasciatus,* in Site 9 which is downstream in the Chirukhisqalli River was significant (R^2=0.87,p<0.05) The closest control site is Site 7, the Tsvanistsqali River, a tributary of the Adjarastqali River. A decline of CPEG for *Luciobarbus escherichii*, was also observed here, though this decline was not significant (R^2 =0.46,p<0.05), so it is likely that these declines were a consequence of natural population cycling and not project related impacts. Furthermore the sampling location along the Chirukhisqali River is 2 km upstream of its confluence with the Adjarastqali River and far downstream of the Chirukhisqali Weir and it is unlikely to have been impacted by any construction activity.

It may also be noted that both *Luciobarbus escherichii* and *Alburnoides fasciatus* did decline downstream of the Skhalta Dam. *Luciobarbus escherichii* initially detected at relatively high abundance in 2014, was not observed in 2015, increased in 2016 and 2017 and was absent in 2018 and 2019. *Luciobarbus escherichii* showed similar trends, relatively high abundance in 2014 and fluctuating lower abundances till 2019. While there is no comparable species data from the control site (upstream of the Skhalta), which is upstream and cold, this variation in abundance probably indicates natural population cycling across the years and not the influence of project impacts.

It may be added that the Brown Trout (*Salmo trutta*) is rarely found in downstream reaches of the Adjarastqali River and is much more common in the upstream reaches of Chirukhisqali and Skhalta Rivers and the tributaries of the Adjarastqali River. It was also found upstream of the Didachara dam. There is no apparent and consistent decrease in the CPEG of this species caught across the years.

While declines were observed across species, several of these species also recovered in subsequent years. Furthermore declines of the same species were observed in the control sites. Given these observations, it is premature to conclude that these declines are irreversible and a consequence of project impacts.

2.3.3 Impacts and Recommended Additional Mitigation

Table 2-10 Summary of Observed Impacts and Recommended Additional Mitigation

Impact Site	Predicted Impact (ESIA 2013)	Mitigation (ESIA 2013)	Observed Impact	Recommended Additional Mitigation
Adjarastqali , Chirukhisqali and Skhalta Rivers	Soil run off from construction activities increasing sediment, aqueous and solid waste disposal, underwater noise and vibrations from construction activities , overfishing by worker force	Controlling soil run off, no aqueous and solid waste disposal in river and ban on fishing by construction workers	Declines of species such as *Alburnoides fasciatus*, and *Luciobarbus escherichii* in impacted sites, though these species were also observed to decline in a few control sites.	1. Continued monitoring in the operation phase specifically those reaches made more vulnerable due to lowered flows and sediment management 2. Adaptive management as described in the LFMS where declines are noticed as consistent. 3. Additional actions to compensate for declines ▪ Identification of external stressors of water quality e.g. effluent of untreated waste, unregulated sand and gravel mining, construction activity ▪ Identification of hotspots of unsustainable fishing practices e.g. locations where unsustainable gear used, fishing during spawning season ▪ Development of community awareness programmes for reducing stressors involving law enforcement and local communities ▪ Implementation of community awareness programmes

2.4 Herpetofauna

2.4.1 Sampling Areas

The map of the sampling locations is provided in ***Annex C*** and the coordinates of the locations in ***Table 2-11.***

Table 2-11 Sampling Locations for Herpetofauna

Sampling Location	Site Location
Chirukhistskali Valley,	Site 1: N 41.54031 E 42.31898
Skhalta Dam and Powerhouse	Site 11. N 41.56416 E 42.37213 Site 13. N 41.58136 E 42.36463
Didachara dam	Site 14. N 41.65759 E 42.35025
Shuakhevi Powerhouse	Site 10. N 41.63887 E 42.15300

Herpetofauna were sampled in May each year

2.4.2 Results

Table 2-12 provides data on the presence of 16 reptile and amphibian species monitored since 2013. The total number of species and the number of Caucasian Salamander observed across the monitoring years 2013-2019 are provided in ***Table 2-13.*** From this data it is evident that there are no increasing or decreasing trends in either total number of species recorded or the abundance of Caucasian Salamanders.

Table 2-12 Total Number of Herpetofauna Species Recorded in the Monitoring Years 2013-2019

Year	Total Number of Species Recorded	Total Number of Observations of Caucasian Salamander
2013	23	1
2014	29	2
2015	26	1
2016	24	1
2017	16	1
2018	24	2
2019	39	2

Table 2-13 Presence of Monitored Herpetofauna Species across Monitoring Years

English Name	Latin Name			20	13				20	14				20	15				20	16				20	17			
		Chirukhi	Skhalta	Didachara	Axaldaba	Shuakhevi	Chirukhi	Skhalta	Didachara	Axaldaba	Shuakhevi	Chirukhi	Skhalta	Didachara	Axaldaba	Shuakhevi	Chirukhi	Skhalta	Didachara	Axaldaba	Shuakhevi	Chirukhi	Skhalta	Didachara	Axaldaba	Shuakhevi	Chirukhi	Skhalta
Caucasian Salamander	*Mertensiella caucasica*		x				x	x					x					x					x				x	x
Caucasian Toad	*Bufo verrucosissimus*	x	x				x	x			x		x			x		x		x			x			x		x
Green Toad	*Bufotes viridis*		x			x	x	x					x					x						x			x	x
Oriental Treefrog	*Hyla orientalis*		x				x						x		x			x										x
Lake Frog	*Pelophylax ridibundus*	x	x	x		x	x	x	x		x	x	x	x		x	x	x	x	x	x		x	x		x			x
Asia Minor Frog	*Rana macrocnemis*		x					x				x	x					x					x						x
Colchic Slow Worm	*Anguis colchicus*	x		x					x		x		x	x		x	x	x	x										
Red-Bellied Lizard	*Darevskia parvula*	x	x	x		x	x	x	x		x	x	x	x		x	x	x			x	x	x	x		x	x		x
Artvin Lizard	*Darevskia derjugini*	x			x		x		x	x		x				x	x					x	x		x		x	x
Sand Lizard	*Lacerta agilis*			x										x	x				x										
Ring Snake	*Natrix natrix*		x			x	x	x					x					x								x			
Dice Snake	*Natrix tesselata*			x					x		x			x					x		x								
Sand Viper	*Vipera transcaucasiana*						x										x												
Dahl's Whip Snake	*Platyceps najadum*						x																						
Banded Racer	*Hemorrhois ravergieri*															x													
Smooth Snake	*Coronella austriaca*						x										x										x		
Total		**5**	**8**	**5**	**1**	**4**	**11**	**7**	**5**	**1**	**5**	**4**	**9**	**5**	**2**	**6**	**6**	**9**	**4**	**2**	**3**	**2**	**6**	**3**	**1**	**4**	**4**	

2.4.3 Impacts and Recommended Additional Mitigation

Table 2-14 Summary of Impacts and Recommended Additional Mitigation

Impact Site	Predicted Impact (ESIA 2013)	Mitigation (ESIA 2013)	Observed Impact	Recommended Additional Mitigation
All sites	Clark's lizard and Caucasus Viper-Habitat loss, accidental killing and injury	Minimise area of habitat loss, pre-construction checks in sensitive areas/suitable habitats, relocation of animals if found, staff awareness	None observed	None recommended
	Caucasian salamander-Habitat loss, accidental killing and injury, degradation of habitats		None observed	None recommended

2.5 Terrestrial Invertebrates

The sampling locations are provided in ***Annex D.***

Omophron limbatum was recorded in the same sites as in previous years, and for the first time in a middle of Adjaristskhali basin, near Shuakhevi (Site 9).

Chlaenius and *Bembidion* species were abundant in pitfall traps as in previous years. The most abundant species was *Chlaenius coerulesus* which was present and abundant in almost in all locations.

There were therefore no decreasing trends of any of these species across the monitoring years. The observation of *Omophron limbatum* in the middle of the Adjaristskhali basin, near Shuakhevi does not suggest an increasing trend of the species but could be a chance find related to survey effort.

There are no recommended additional mitigation actions for invertebrates as there are no impacted observed.

2.6 Mammals

2.6.1 Sampling Areas

The large mammal monitoring is to establish whether any impacts are occurring in the following impact areas.

1. Chirukhistsqali Weir,
2. Skhalta Dam and Powerhouse,
3. Didachara Dam,
4. Akhaldaba Surge Shaft,
5. Shuakhevi Powerhouse,
6. River Adjaristskali (Otter),

Table 2-15 provides the locations of all sampling sites for the above areas. ***Annex E*** provides the maps of these locations.

Camera traps were placed at these locations in 2013 and monitored continuously through 2019

Table 2-15 Sampling Locations for Mammals

Impact Area	Location
Chirukhistsqali Weir,	Chirukhi 1: Location: 274413.52 m E / 4603405.15 m N Chirukhi 2: Location: 275851.23 m E / 4600427.01 m N Chirukhi 3: Location: 277438.66 m E / 4602605.24 m N Chirukhi 4: Location: 276143.19 m E / 4604336.86 m N
Skhalta dam and Powerhouse	Skhalta 1: Location: 281162.59 m E / 4605051.58 m N Skhalta 2: Location: 281621.54 m E / 4605927.85 m N Skhalta 3: Location: 279596.81 m E / 4606141.92 m N Skhalta 4 : Location: 279576.15 m E / 4606720.42 m N
Didachara Dam,	Didachara 1: Location: 281470.32 m E / 4613824.90 m N Didachara 2: Location: 279087.93 m E / 4612009.34 m N Didachara 3 : Location: 279219.02 m E / 4612657.38 m N Didachara 4: Location: 278584.18 m E / 4614014.08 m N Didachara 5 : Location: 279074.31 m E / 4614592.02 m N Didachara 6 : Location; 279549.78 m E / 4615281.25 m N
Akhaldaba Surge Shaft,	Akhaldaba 1: Location: 264228.38 m E / 4613873.34 m N Akhaldaba 2 : Location: 264103.37 m E / 4614034.96 m N Akhaldaba 3 : Location: 263538.76 m E / 4614031.31 m N Akhaldaba 4 : Location: 263146.59 m E / 4614192.42 m N Akhaldaba 5 : Location: 262561.61 m E / 4614487.77 m N
Shuakhevi Powerhouse	Shuakhevi 1 : Location: 263099.78 m E / 4613658.55 m N Shuakhevi 2 : Location: 262074.28 m E / 4612614.22 m N Shuakhevi 3 : Location: 262238.46 m E / 4613545.19 m N Shuakhevi 4 : Location: 261522.95 m E / 4613511.58 m N

In August 2017, the otter habitats were surveyed along the River Acharistskali and its tributaries. Locations of potential dens is provided in ***Table 2-16*** below.

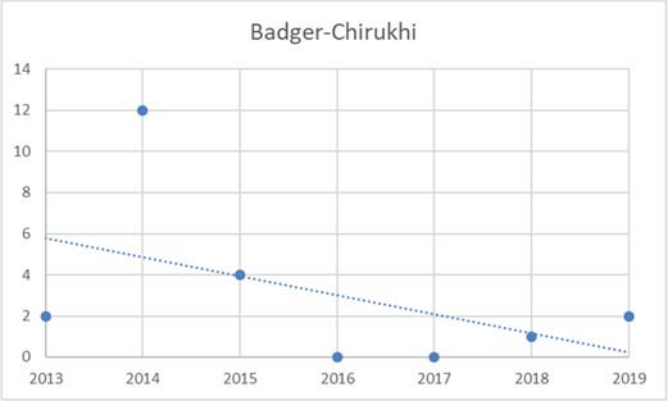
Table 2-16 Locations of Otter Sampling Locations

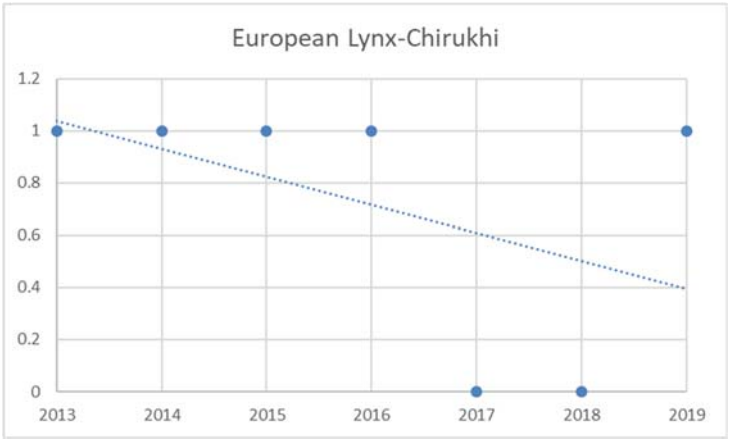
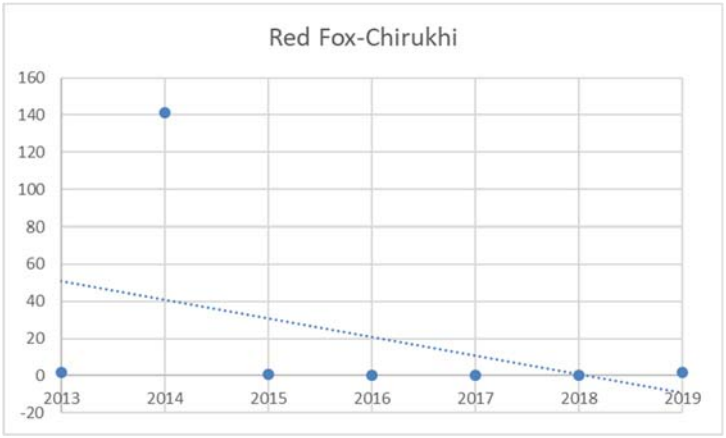
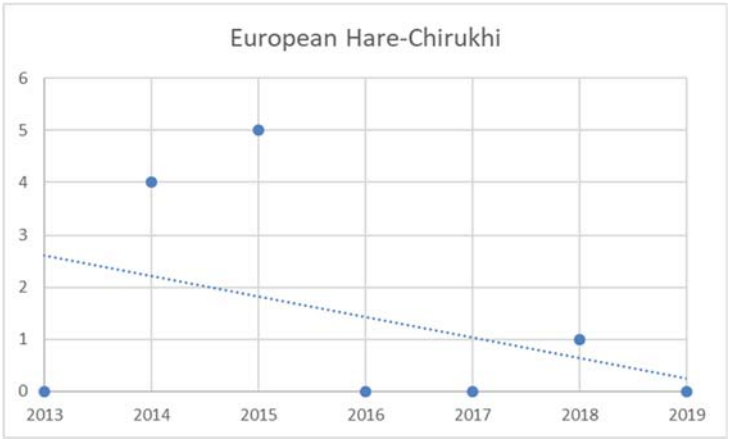
Location	Coordinates
River Chirukhisqali	271778.00 m E/ 4606639.00 m N
River Chirukhisqali	270526.00 m E/ 4607390.00 m N
River Chirukhisqali	269652.00 m E/ 4607797.00 m N
River Chirukhisqali	266633.00 m E/ 4608620.00 m N
River Skhalta	279227.00 m E/ 4606531.00 m N
River Skhalta	278178.00 m E / 4606695.00 m N
River Skhalta	273422.00 m E / 4609469.00 m N
River Adjarastsqali	277725.00 m E / 4614974.00 m N
River Adjarastsqali	277318.00 m E / 4614065.00 m N
River Adjarastsqali	276839.00 m E / 4613217.00 m N
River Adjarastsqali	270984.00 m E / 4611713.00 m N
River Adjarastsqali	270133.00 m E / 4612245.00 m N
River Adjarastsqali	266757.00 m E / 4612105.00 m N

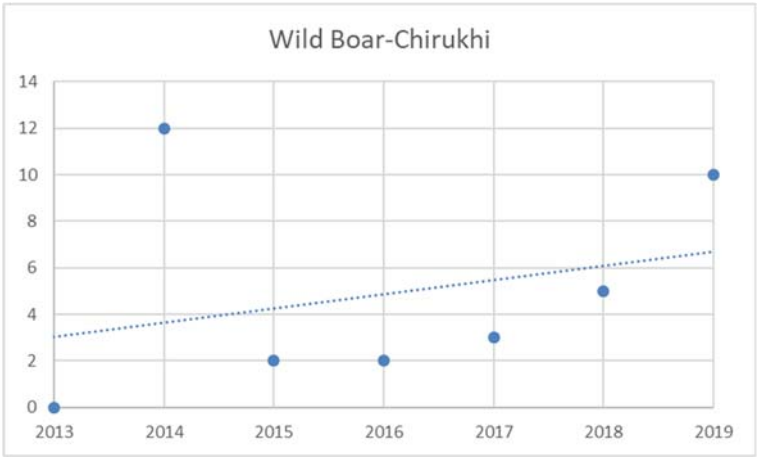
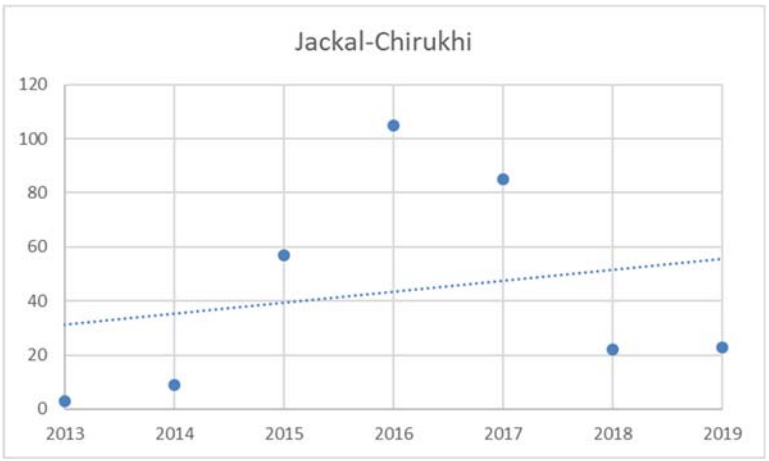
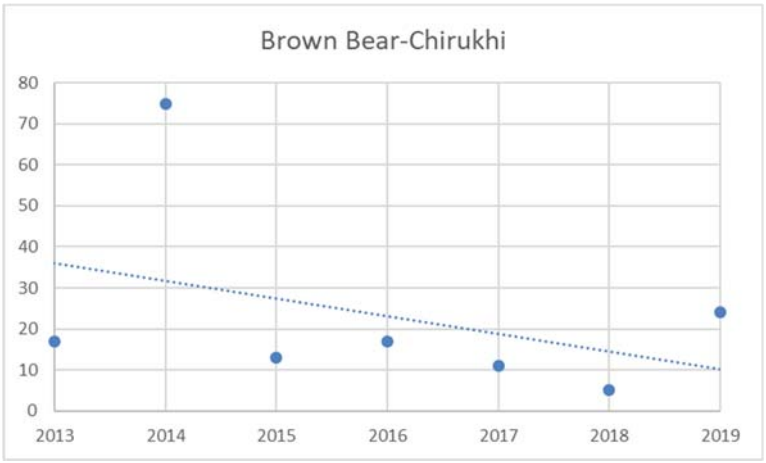
2.6.2 Results

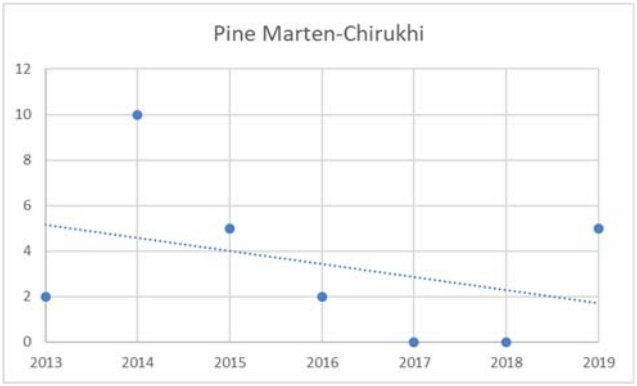
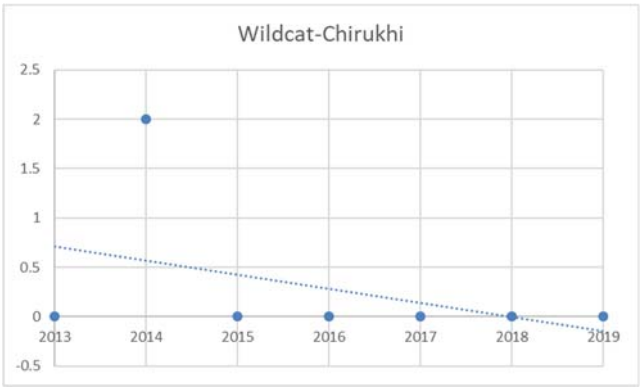
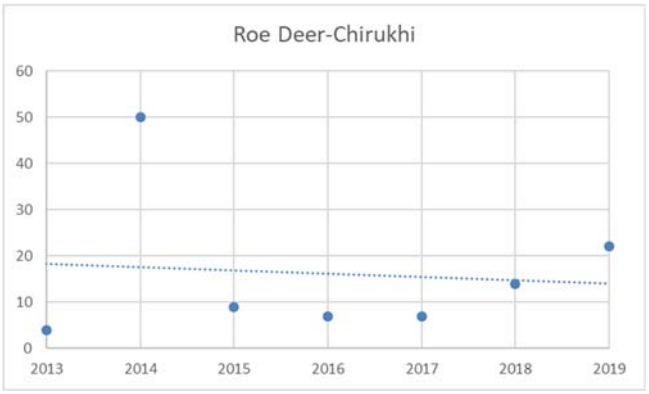
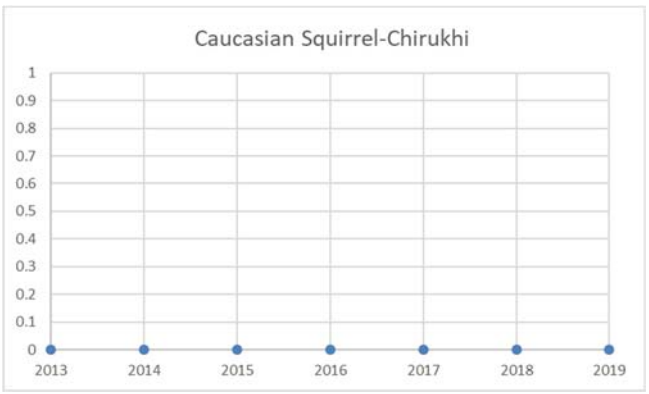
2.6.2.1 Chirukhisqali Weir

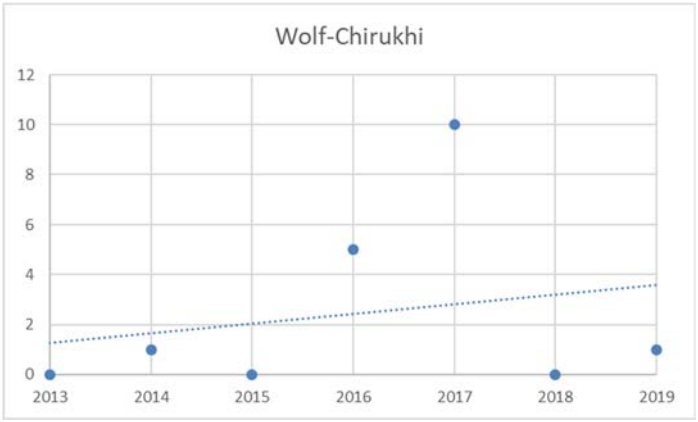
Table 2-17 Abundance of Large Mammals Across Sampling Sites in Adjarastqali, Chirukhisqali and Skhalta Project Locations.

Mammal	Comment	Trend (Y axis-Abundance (number of camera trap photos of a given species; camera traps were continuously deployed throughout the year and there was no variation in sampling effort for within a site)
Eurasian Badger (*Meles meles*)	No trend observed (R^2=0.23, P>0.05)	

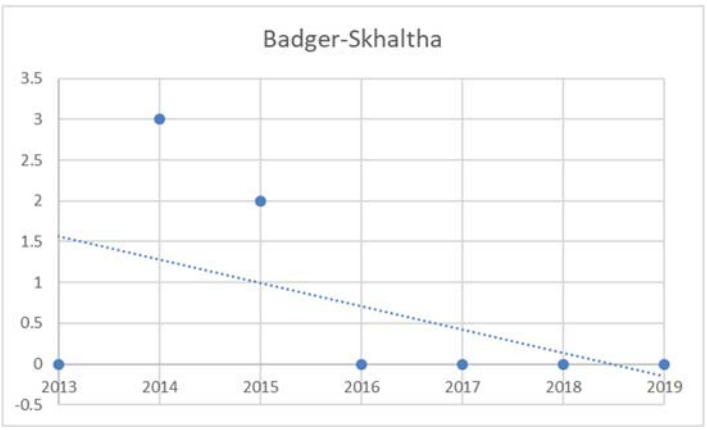
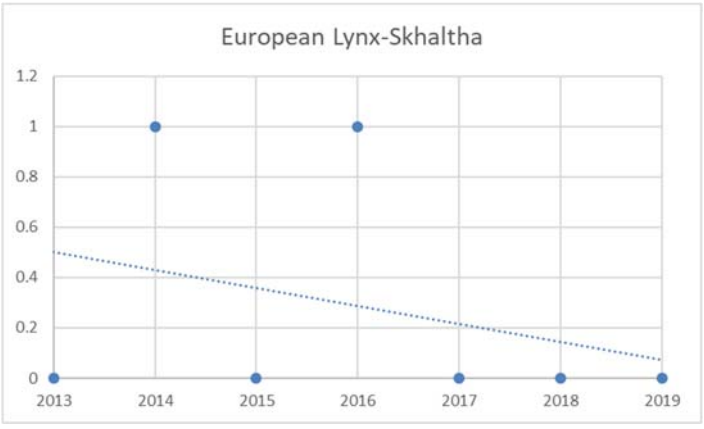
Eurasian Lynx (*Lynx lynx*)	Species not observed in 2017 and 2018 (R^2=0.22, p>0.05)	
Red Fox (*Vulpes vulpes*)	Species recorded only once in 2014 and not earlier or later	
Eurasian Hare (*Lepus europaeus*)	No trend observed (R^2=0.16, p>0.05)	

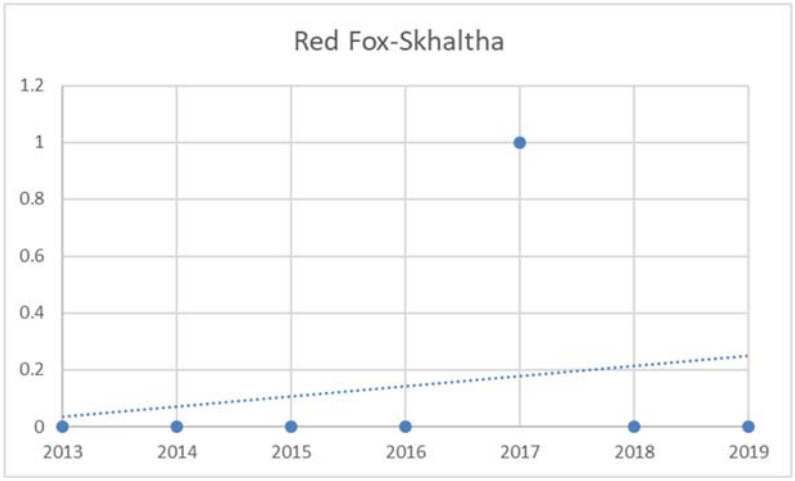
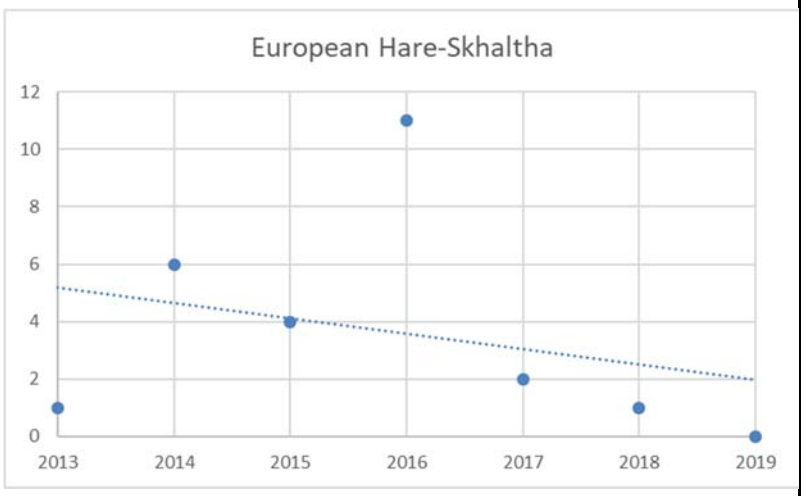
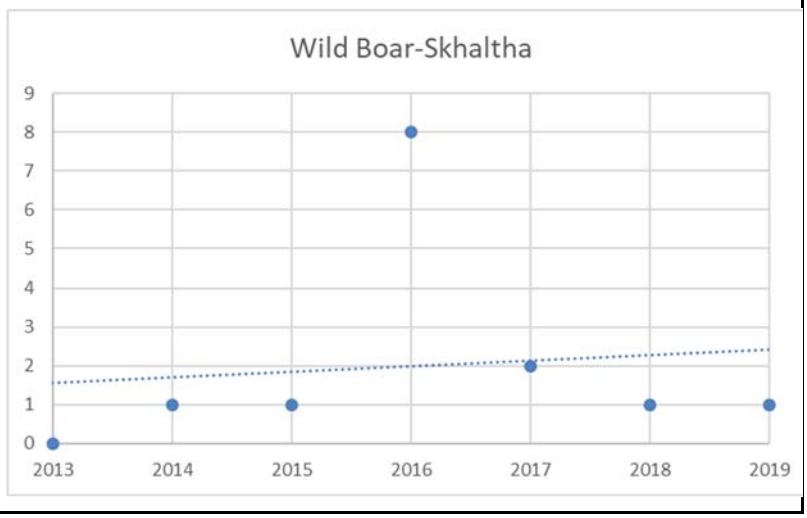
Wild Boar (*Sus scrofa*)	No trend observed (R^2=0.08, p>0.05)	
Golden Jackal (*Canis aureus*)	No trend observed (R^2=0.05, p>0.05)	
Brown Bear (*Ursus arctos*)	No trend observed (R^2=0.15,p>0.05)	

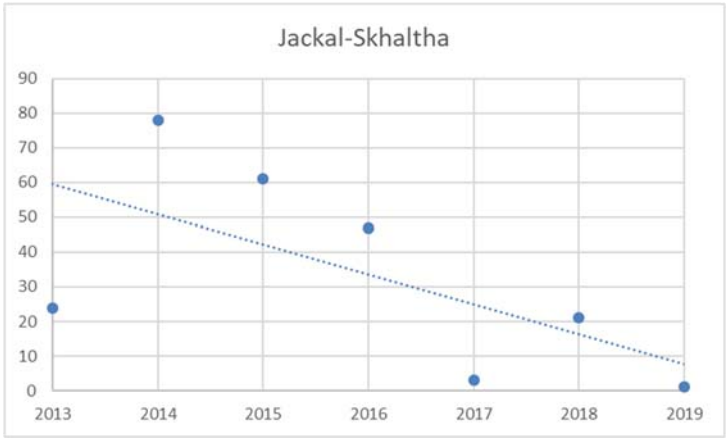
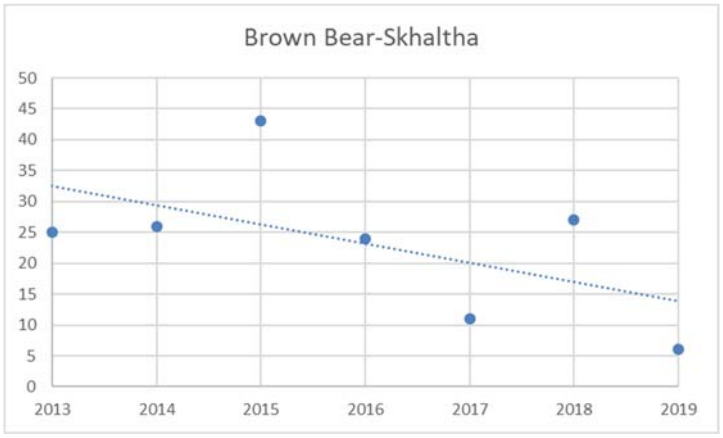
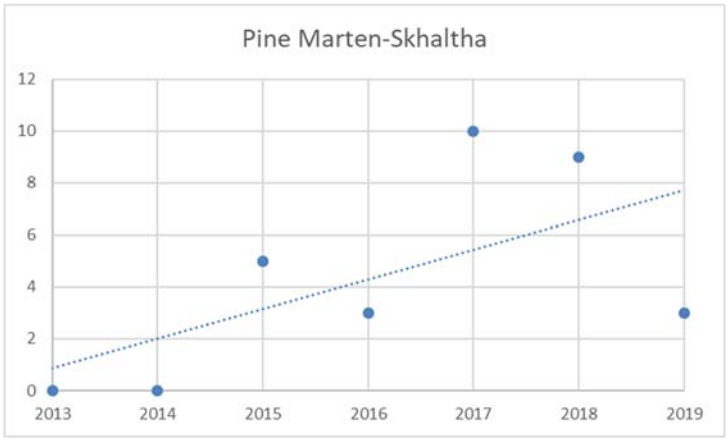
European Pine Marten (*Martes martes*)	No trend observed (R^2=0.12, p>0.05)	
Wild Cat (*Felis silvestris*)	Species recorded only once in 2014 and not earlier or later	
European Roe Deer (*Capreolus capreolus*)	No trend observed (R^2=0.01, p>0.05)	
Caucasian Squirrel (*Sciurus anomalus*)	Species not seen in this site	

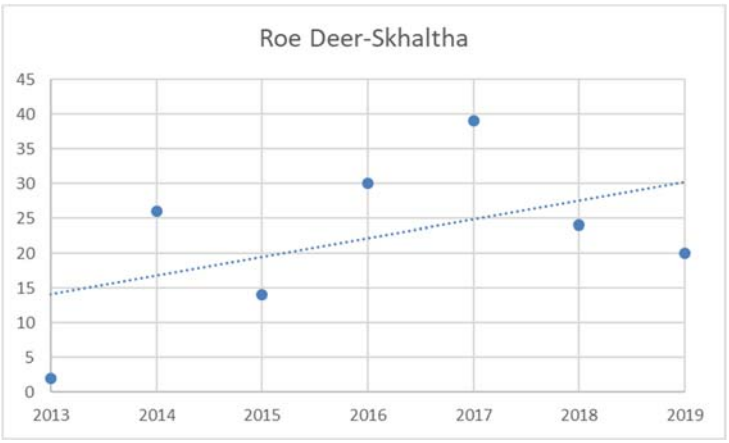
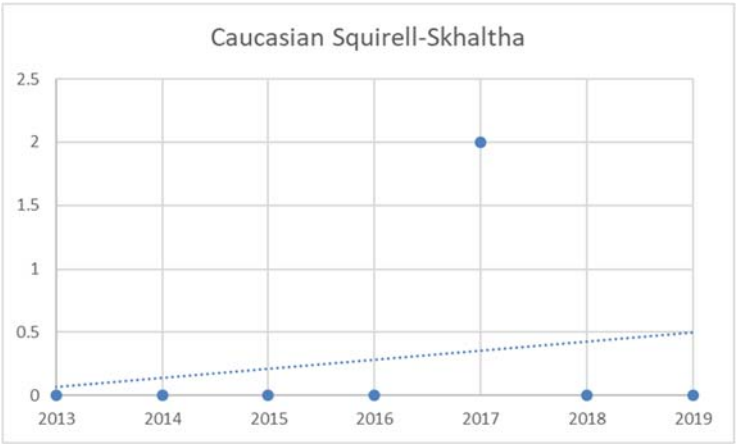
Grey Wolf (*Canis lupus*)	No trend observed (R^2=0.05, p>0.05)	

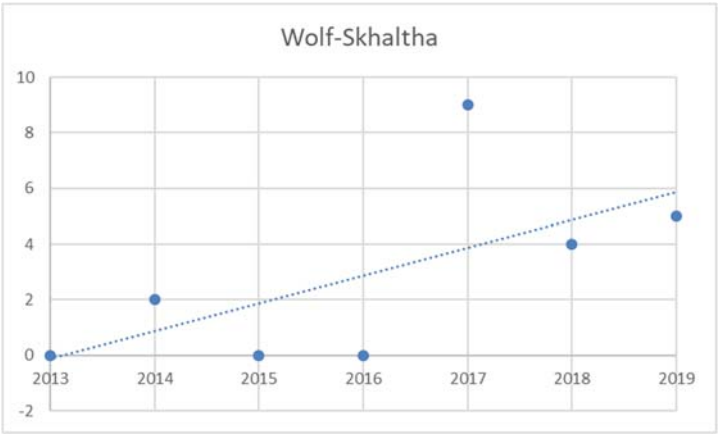
2.6.2.2 Skhalta

Mammal	Comment	Trend
Eurasian Badger (*Meles meles*)	Species declines from 2014 and not seen from 2016 (R^2=0.24, p>0.05)	
Eurasian Lynx (*Lynx lynx*)	No trend observed (R^2=0.1, p>0.05)	

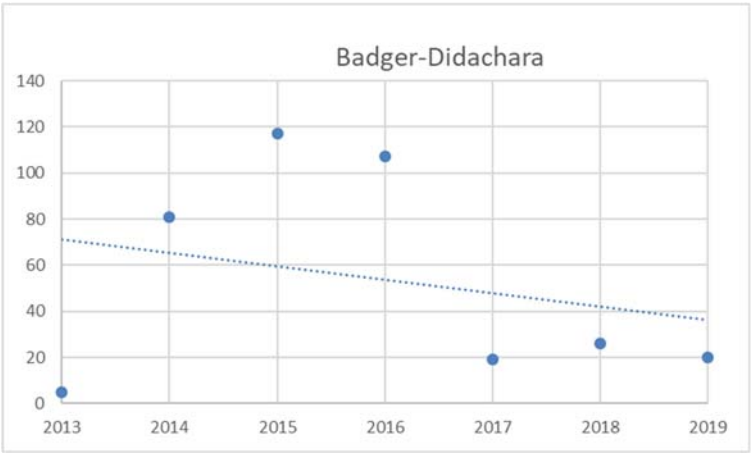
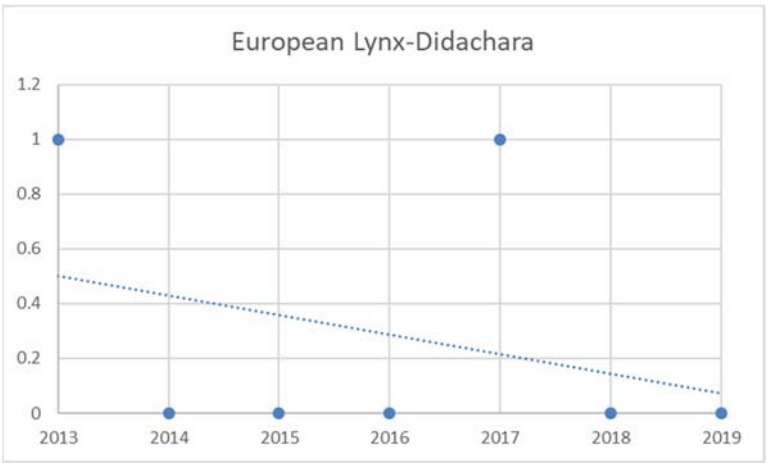
Red Fox (*Vulpes vulpes*)	Species recorded only once in 2018 and not earlier or later	
Eurasian Hare (*Lepus europaeus*)	No trend observed (R^2=0.09, p>0.05)	
Wild Boar (*Sus scrofa*)	No trend observed (R^2=0.01, p>0.05)	

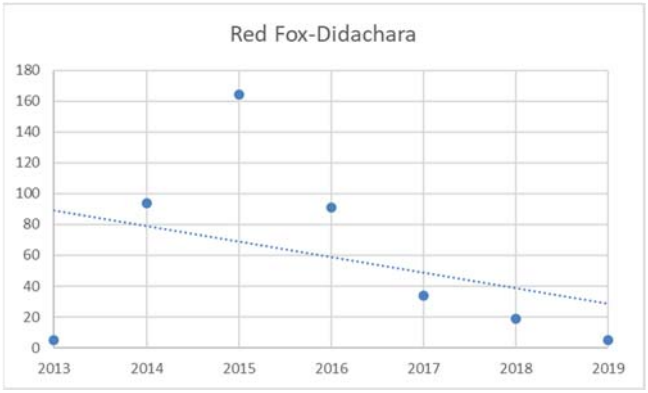
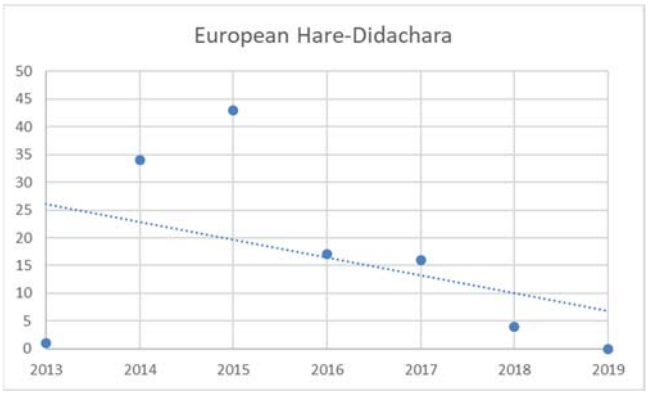
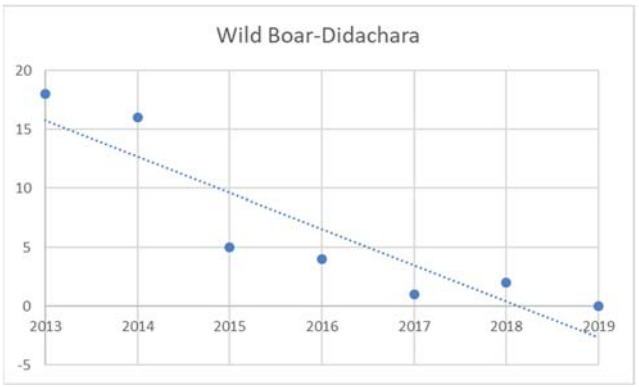
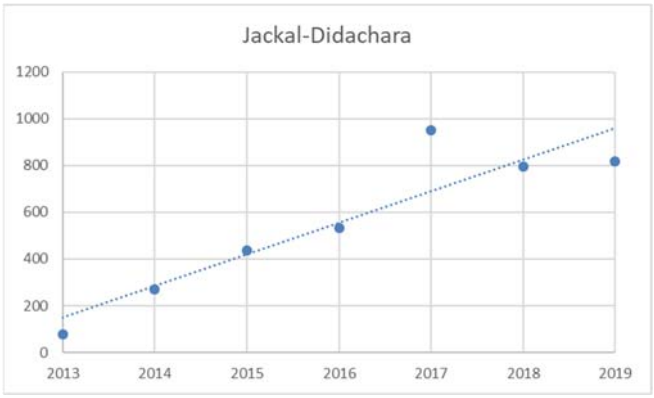
Golden Jackal (*Canis aureus*)	Decreasing trend observed but not significant (R^2=0.40, p>0.05)	
Brown Bear (*Ursus arctos*)	No trend observed (R^2=0.13, p>0.05)	
European Pine Marten (*Martes martes*)	No trend observed (R^2=0.38, p>0.05)	

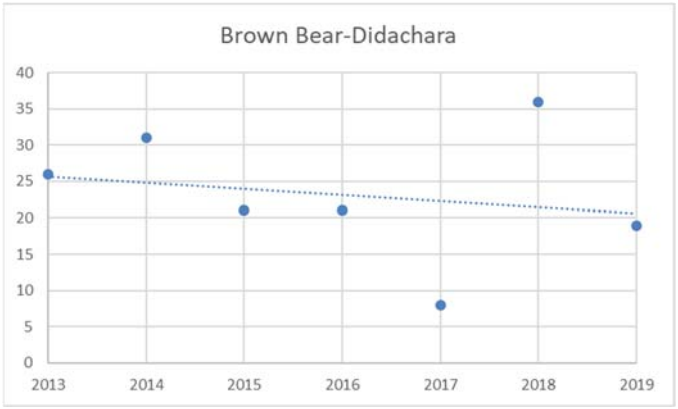
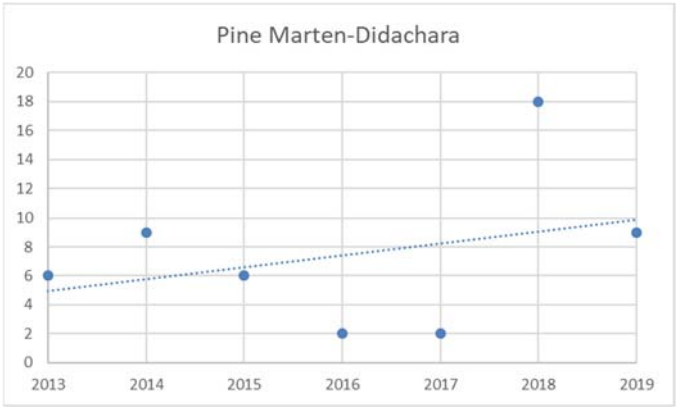
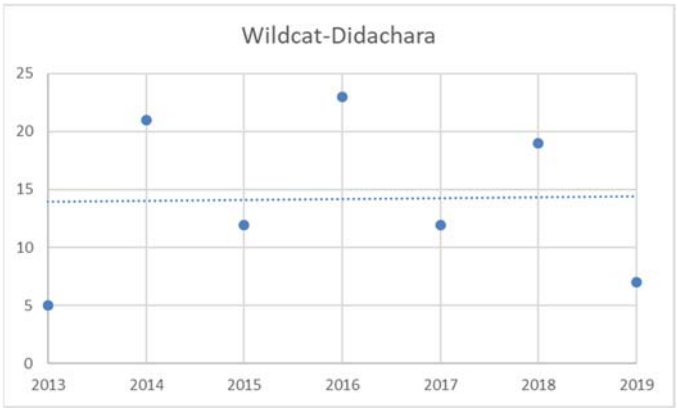
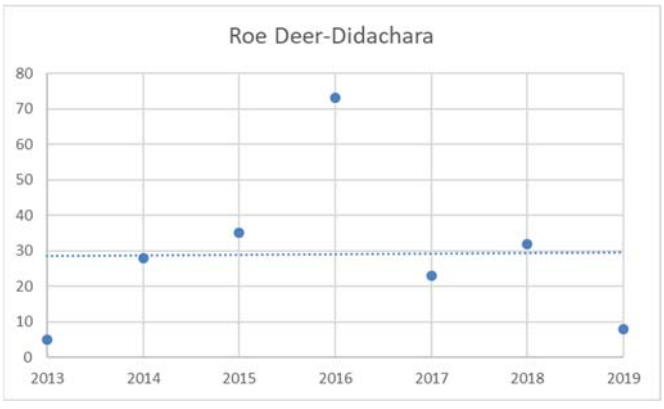
Wild Cat (*Felis silvestris*)	Species recorded only once in 2018 and 2019.	
European Roe Deer (*Capreolus capreolus*)	No trend observed (R^2=0.24, p>0.05)	
Caucasian Squirrel (*Sciurus anomalus*)	Species seen only in 2017 and not earlier or later.	

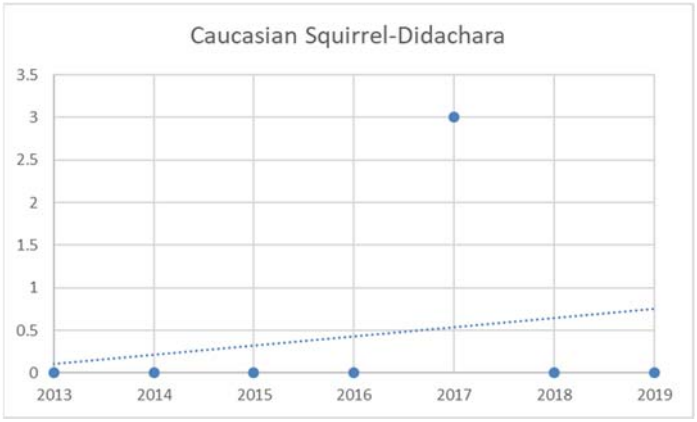
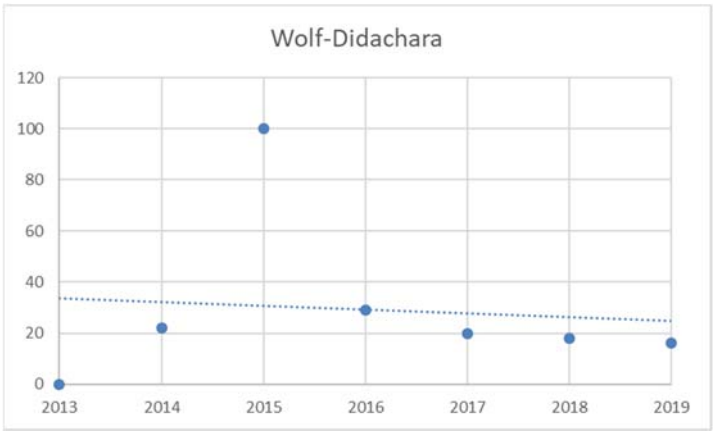
Grey Wolf (*Canis lupus*)	No trend observed (R^2=0.41, p>0.05)	

2.6.2.3 Didachara

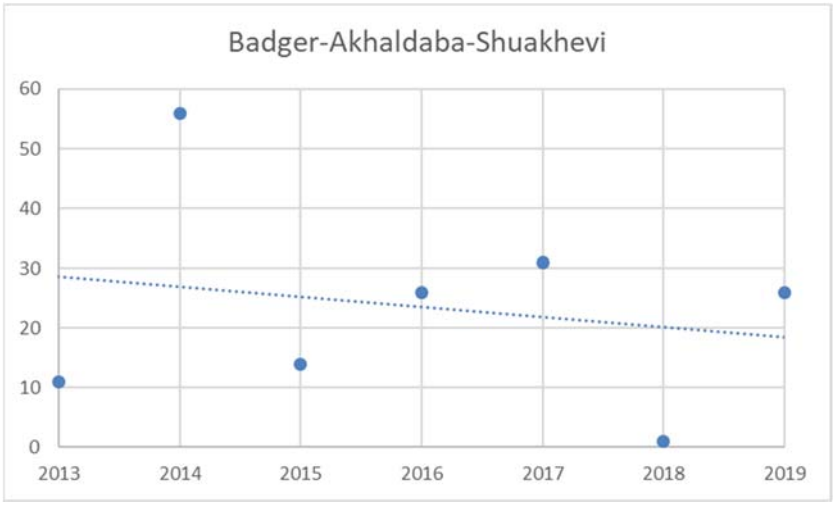
Mammal	Comment	Trend
Eurasian Badger (*Meles meles*)	No trend observed (R^2=0.07, p>0.05)	
Eurasian Lynx (*Lynx lynx*)	Species seen only once in 2013 and then in 2017.	

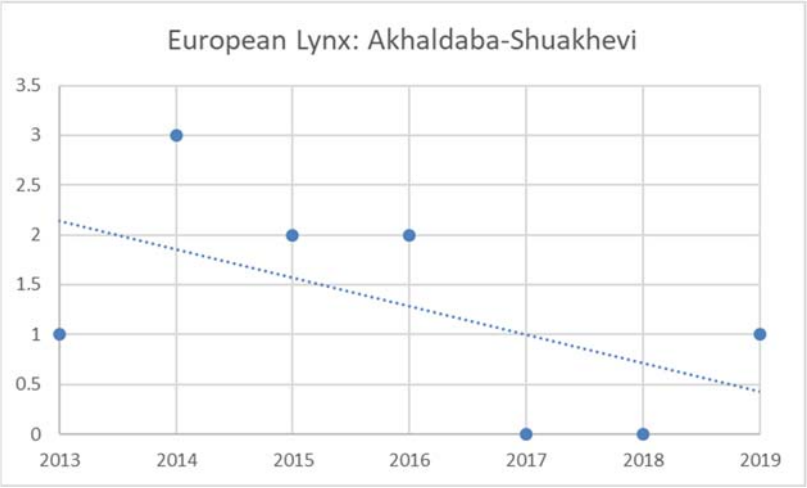
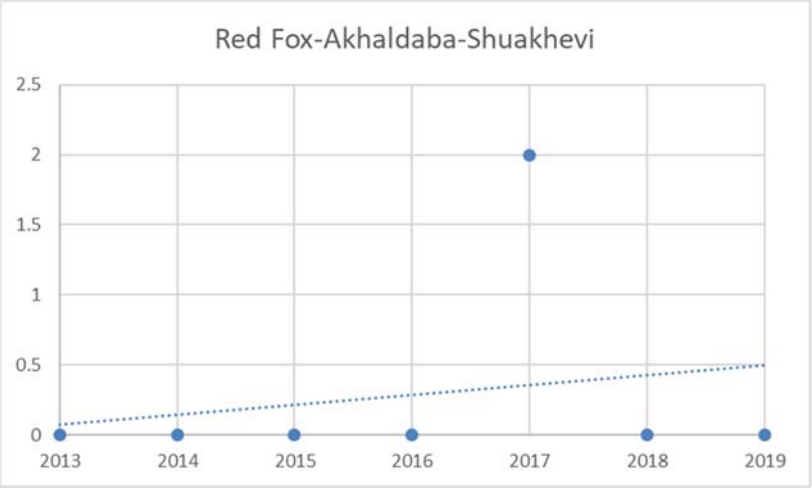
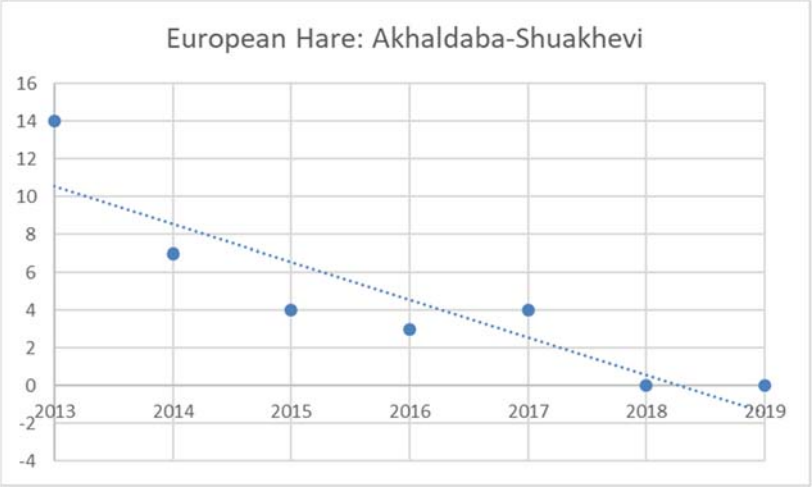
Red Fox (*Vulpes vulpes*)	No trend observed (R^2=0.13, p>0.05)	
Eurasian Hare (*Lepus europaeus*)	No trend observed (R^2=0.17, p>0.05)	
Wild Boar (*Sus scrofa*)	Decreasing trend observed (R^2=0.82, p<0.05)	
Golden Jackal (*Canis aureus*)	Increasing trend observed (R^2=0.84, p<0.05)	

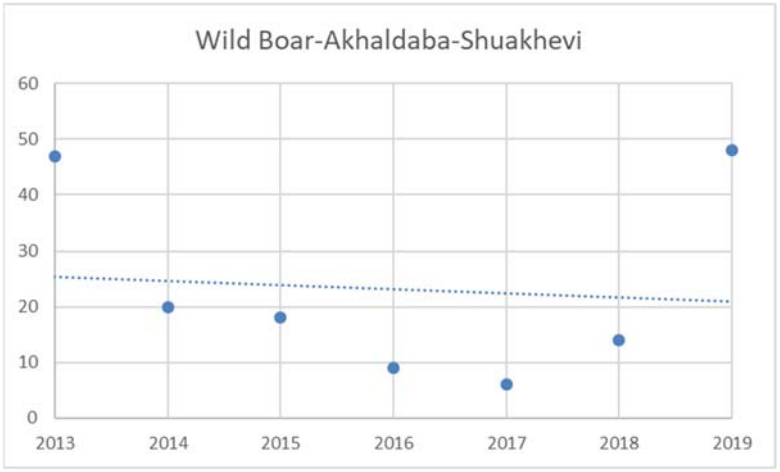
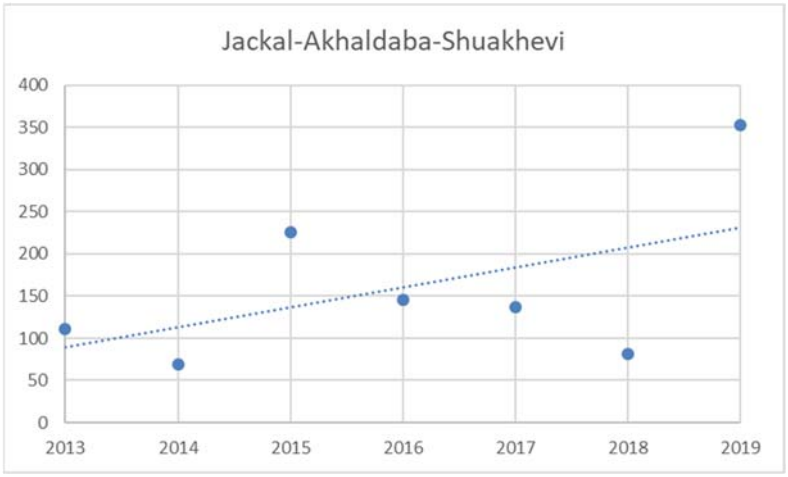
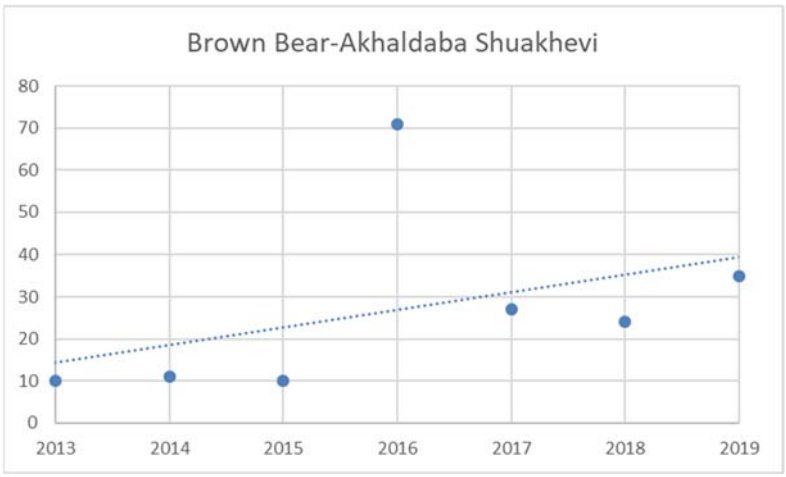
Brown Bear (*Ursus arctos*)	No trend observed (R^2=0.04, p>0.05)	
European Pine Marten (*Martes martes*)	No trend observed (R^2=0.11, p>0.05)	
Wild Cat (*Felis silvestris*)	No trend observed (R^2=0.00, p>0.05)	
European Roe Deer (*Capreolus capreolus*)	No trend observed (R^2=0.0, p>0.05)	

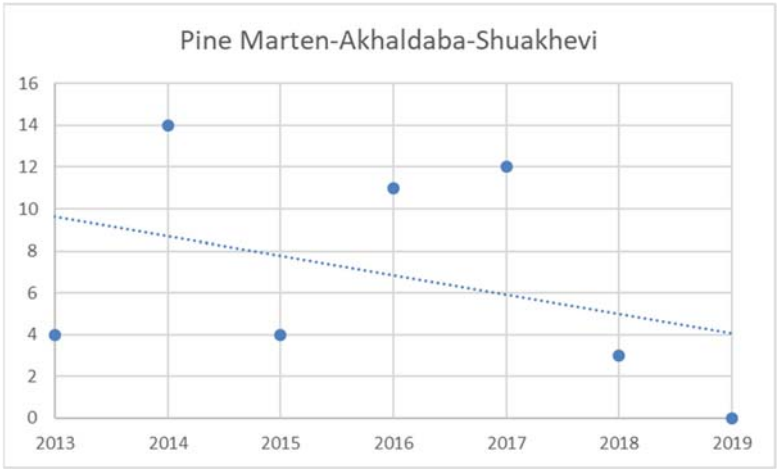
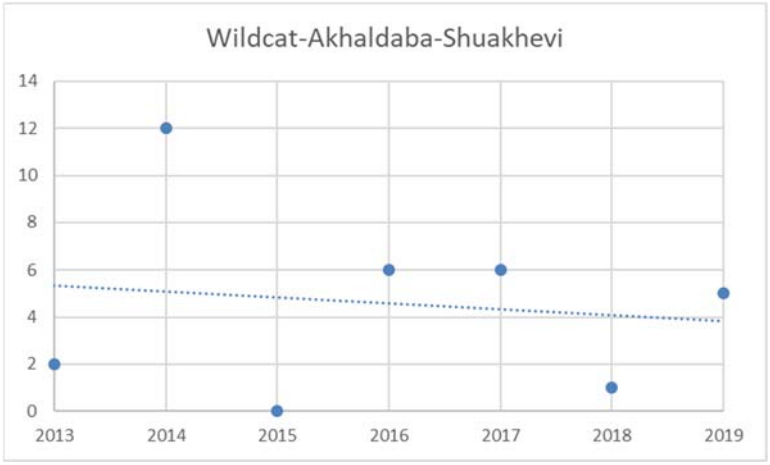
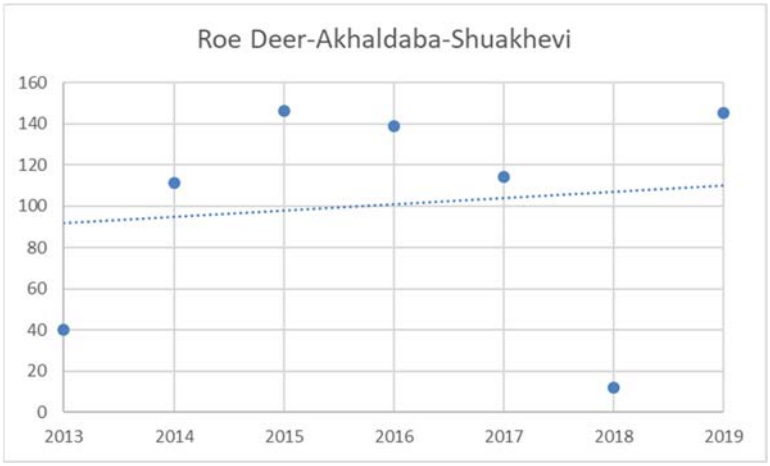
Caucasian Squirrel (*Sciurus anomalus*)	Species seen only in 2017 and not earlier or later.	
Grey Wolf (*Canis lupus*)	No trend observed (R^2=0.01, p>0.05)	

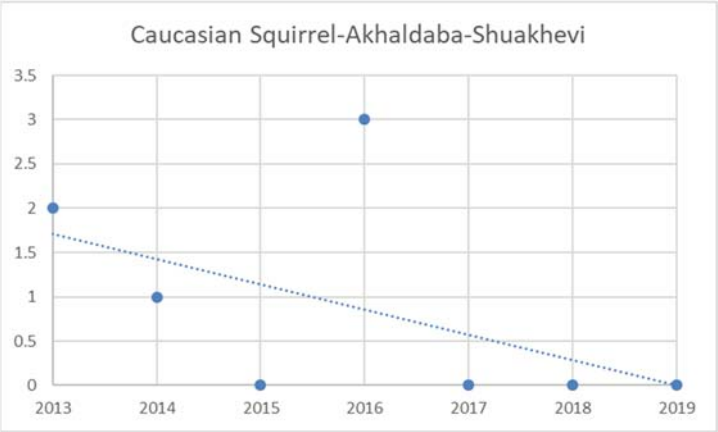
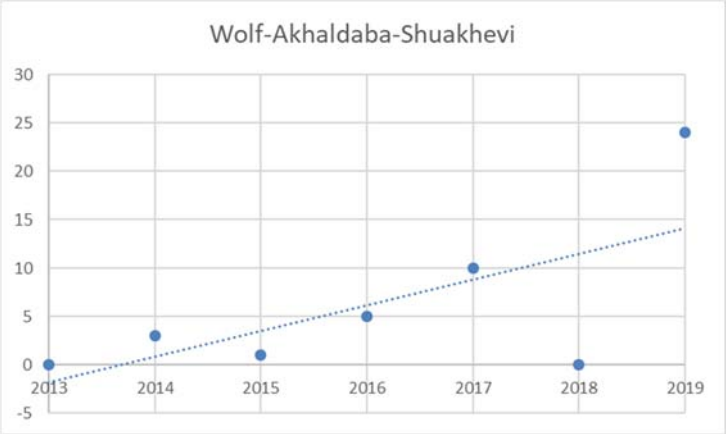
2.6.2.4 Akhalabad-Shuakevi

Mammal	Comment	Trend
Eurasian Badger (*Meles meles*)	No trend observed (R^2=0.04, p>0.05)	

Eurasian Lynx (*Lynx lynx*)	No trend observed (R^2=0.31, p>0.05)	
Red Fox (*Vulpes vulpes*)	Species recorded only once in 2017 and not earlier or later	
Eurasian Hare (*Lepus europaeus*)	Decreasing trend observed (R^2=0.80, p<0.05)	

Wild Boar (*Sus scrofa*)	No trend observed (R^2=0.01, p>0.05)	
Golden Jackal (*Canis aureus*)	No trend observed (R^2=0.27, p>0.05)	
Brown Bear (*Ursus arctos*)	No trend observed (R^2=0.17, p>0.05)	

European Pine Marten (*Martes martes*)	No trend observed (R^2=0.14, p>0.05)	
Wild Cat (*Felis silvestris*)	No trend observed (R^2=0.02, p>0.05)	
European Roe Deer (*Capreolus capreolus*)	No trend observed (R^2=0.02, p>0.05)	

Caucasian Squirrel (*Sciurus anomalus*)	No trend observed (R^2=026, p>0.05)	
Grey Wolf (*Canis lupus*)	No trend observed (R^2=0.45, p>0.05)	

2.6.2.5 Otters

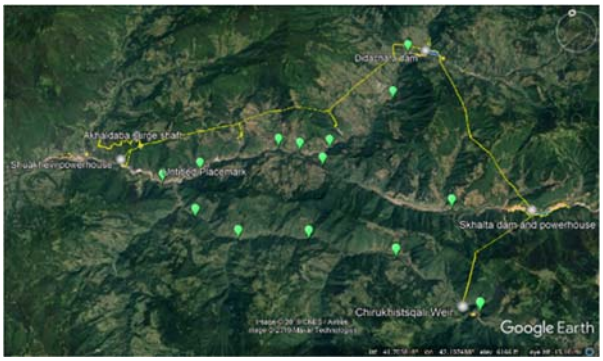
Indirect evidence of European Otters (*Lutra lutra*) such a tracks, scat etc were monitored since 2016. In 2016, 2017, 2018 and 2019, 14, 13, 14 and 13 sites had indirect evidence of otters indicating that the species has not declined across the monitoring years.

Box 2.1 provides the location of the indirect evidence of otters from 2016-2019

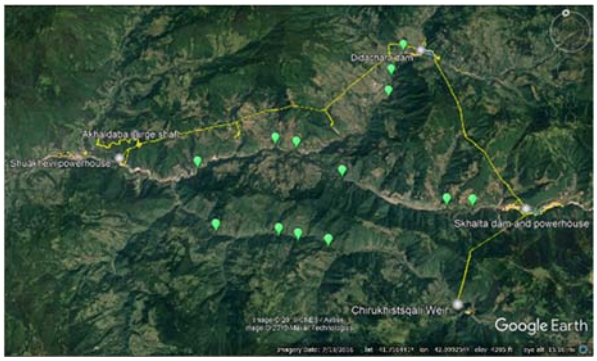
Box 2.1 Locations for Indirect Evidences of Eurasian Otters-2016-2019

2019

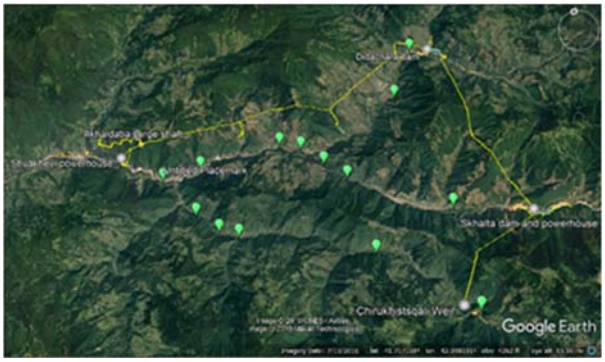
2018



2017



2016



2.6.3 Impacts and Recommended Mitigation

Table 2-18 Summary of Observed Impacts and Recommended Mitigation

Impact Site	Predicted Impact (ESIA 2013)	Mitigation (ESIA 2013)	Observed Impact	Recommended and Additional Mitigation	
Chirukhistsqali Weir,	Brown Bear- Habitat loss, noise disturbance, hunting Eurasian Lynx- Habitat loss, noise disturbance, hunting Caucasian squirrel- Habitat loss, noise disturbance, hunting Golden jackal- Habitat loss, noise disturbance, hunting	Eurasian Otter- Minimum working areas, sediment control and Brown Bear- Avoidance of natural habitat loss, hunting ban, good working practices, Eurasian lynx- Avoidance of natural habitat loss, hunting ban, good working practices,	Eurasian lynx not recorded in 2017 and 2018 but was recorded in 2019	Eurasian lynx- Continued monitoring to ensure that there are no significant and consistent declines .	
Skhalta Dam and Powerhouse,			Badger declines from 2014 and not seen from 2016	Badger- Continued monitoring to ensure that there are no significant and consistent declines	
Didachara Dam,			Wild boar abundance significantly decreases. Jackal abundance significantly increases	Wild boar- Continued monitoring to ensure that there are no significant and consistent declines	

Impact Site	Predicted Impact (ESIA 2013)	Mitigation (ESIA 2013)	Observed Impact	Recommended and Additional Mitigation	
Akhalabad-Shuakhevi	Wild boar-Habitat loss, noise disturbance, hunting	Caucasian squirrel-Avoidance of natural habitat loss, hunting ban, good working practices, habitat instatement Golden jackal-Avoidance of natural habitat loss, hunting ban, good working practices, habitat instatement Wild Boar-Avoidance of natural habitat loss, hunting ban, good working practices, habitat instatement	European hare abundance significantly decreases	European hare-Continued monitoring to ensure that there are no significant and consistent declines	

2.7 Aquatic Macro-invertebrates

2.7.1 Sampling Areas

The parameter used for the analysis was the % of observations of individuals of Ephemoptera, Plecoptera and Tricoptera among individuals of all macro-invertebrate orders (% EPT)

The % EPT estimates water quality by the relative abundance of three major orders of stream insects that have low tolerance to water pollution.

The analysis was carried out for each of the three rivers, Adjarastqali, Chirukhisqali and Skhalta.

% EPT was calculated for the following reaches within each of the above rivers.

1. Downstream

2. Upstream

3. Control (undisturbed reaches of the river but could also coincide with upstream reaches or tributary reaches)

Table 2.19 provides all the reaches within the 3 rivers. ***Figure 2.3*** provides maps of sampling locations in all 3 rivers.

Sampling was carried out in November for 2013 and 2014 and May, August and November for 2015-2019

Table 2-19 Sampling Locations within Reaches in each River for Macro-invertebrates

River	Reach	Sampling Sites
Adjarastqali	Downstream	A.2: Adjaristcali_ A.3:. Ajaristskali Confluence with Uchkhotskali A. 7: Achristskali hoteli Khichauri A.8: Acgharistskali A.9: Acharistskali_ A.10 : Ajarisstkali at Dandalo Bridge
	Upstream	A.1: Didachara
	Tributary	UM1: Chambistskali G.1: Confluence with Ghorjomistskali H1: Hewa River
	Control	A.4: Adjaratskali Confluence with Skalta A.5: Adjaristskali Confluence with Skalta-100m A.6 : Adjaratskali Bridge H.1: Khabelashvilebi River UK 1: Uchkhostskali_ UK 2: Uchkhostskali_
Chirukhisqali	Downstream	-
	Upstream	-
	Tributary	CR.1: Chirukitskali
	Control	CR.2: Chirukhistskali confluence with Modolistskali CR.3: Chirukhistskali Bridge
Skhalta	Downstream	S.2: Skalta S.3: Skalta S.4 : Skalta

River	Reach	Sampling Sites
	Upstream	S.1: Skalta
	Tributary	-
	Control	-

Figure 2.3 Sampling Locations on Adjarastqali River and Tributaries

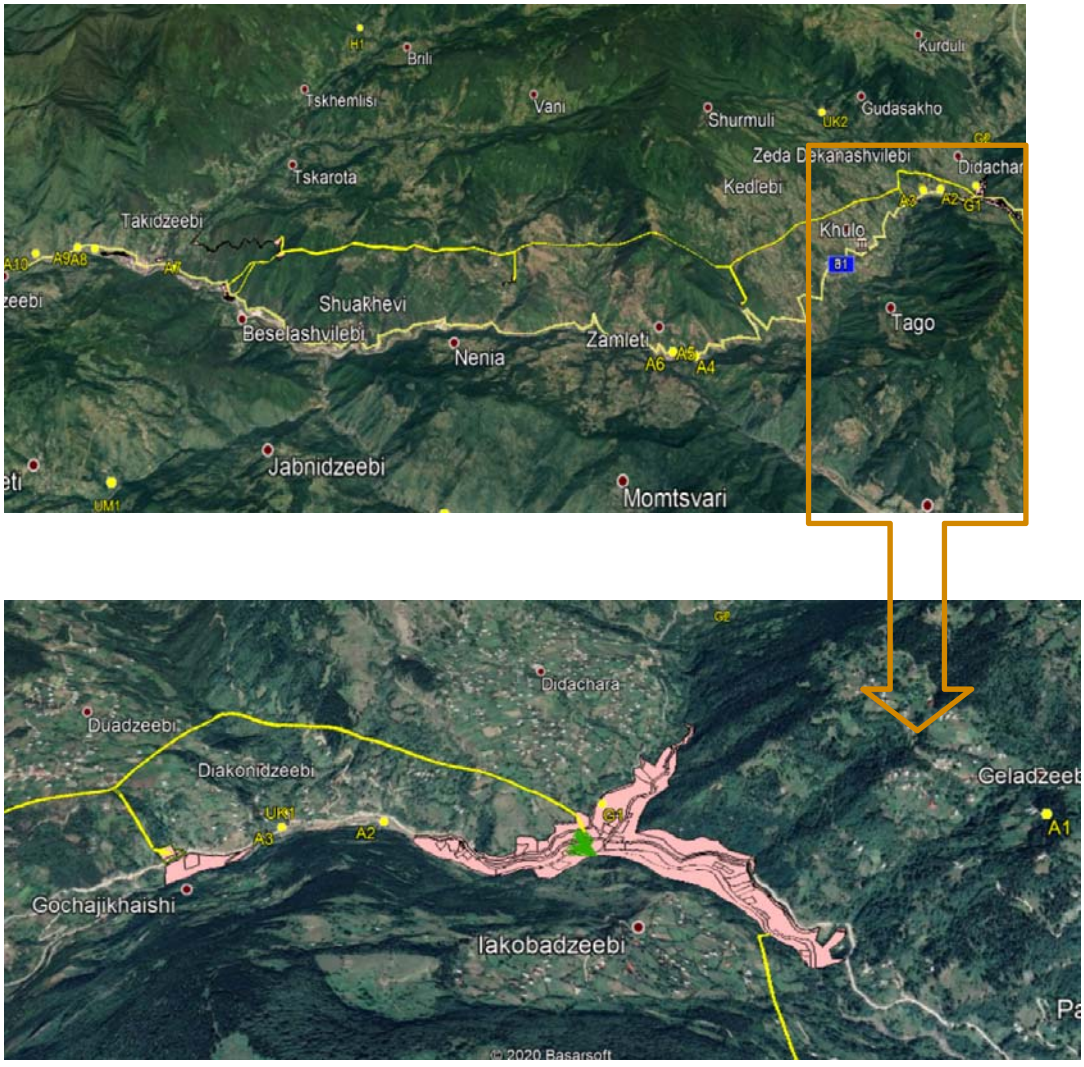


Figure 2.4 Sampling Locations on Chirukhisqali River

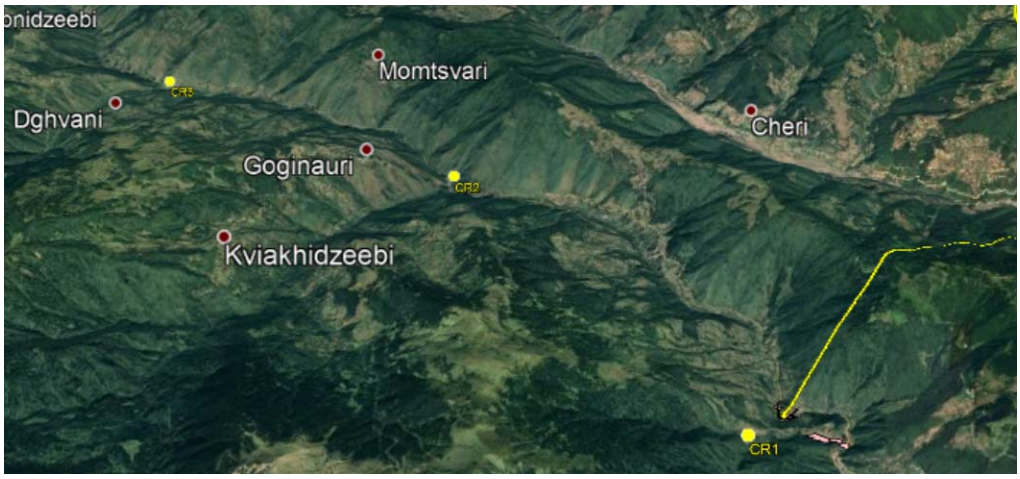
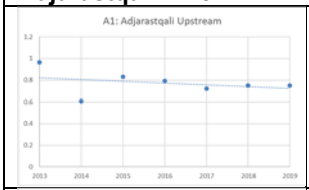
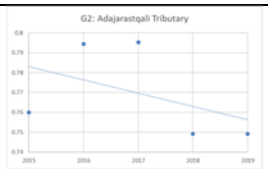
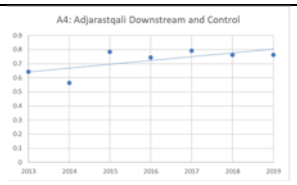
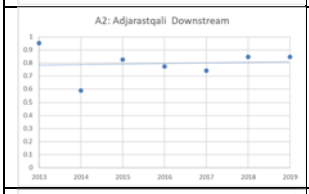
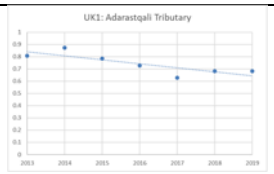
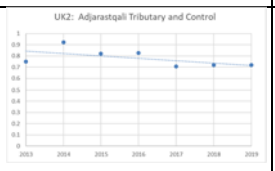
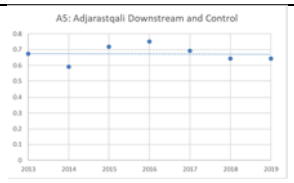
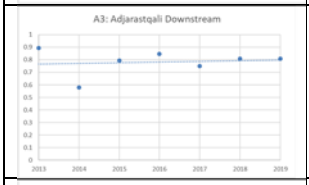
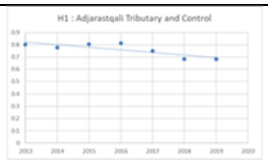
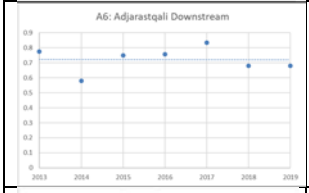
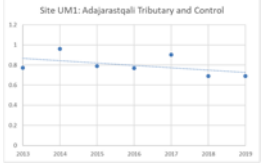
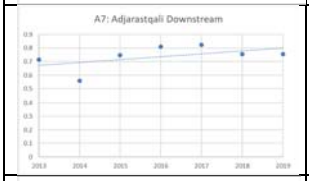
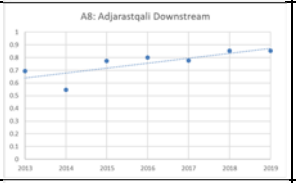
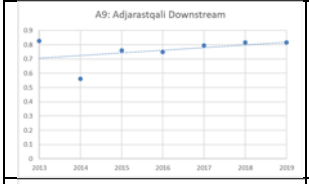
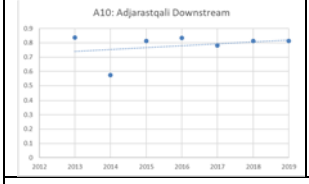


Figure 2.5 Sampling Locations on Skhalta River

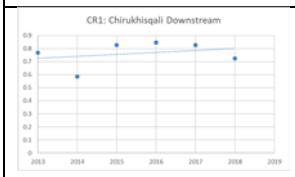
2.7.2 Results

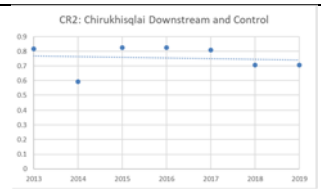
Box 2.1 provides the % EPT for varying stretches of the 3 Rivers. % EPT was calculated by first calculating for each of the sampling months within a given year and then averaging across all months within the year. In all cases the mean % EPT remains > 60 % for every year. There are no significant declines in % EPT for any of the sampling locations across the monitoring years.

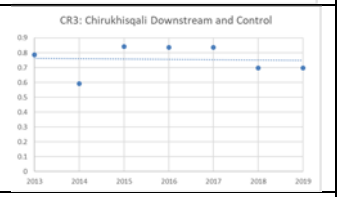
Box 2.1 % EPT Across Sampling Sites

Impacted Sites on Main Stem Arranged Upstream of Dams to Downstream Reaches	Impacted Tributaries Arranged Upstream of Dams to Downstream	Control Sites on Tributaries	Control Sites on Main Stem Arranged Upstream of Dams to Downstream Reaches
Adjarastqali River			
			
			
			
			
			
			
			
			

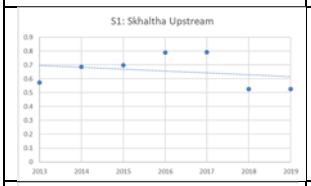
Chirukhisqali River

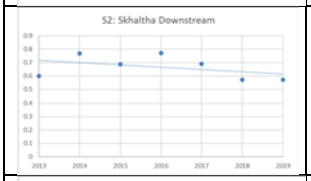


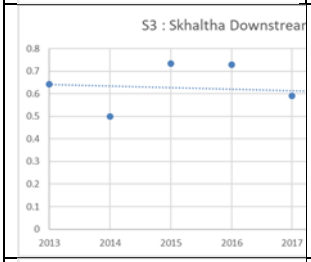


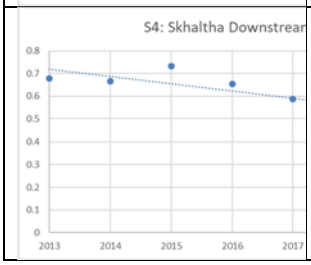


Skhaltha River









2.7.3 Impacts and Recommended Additional Mitigation

Table 2-20 Summary of Impacts and Recommended Additional Mitigation

Impact Site	Predicted Impact (ESIA 2013)	Mitigation (ESIA 2013)	Observed Impact	Recommended Additional Mitigation
All rivers	Soil run off from construction activities increasing sediment load and resulting in bed modification, aqueous and solid waste disposal, underwater noise and vibrations from construction activities, overfishing by worker force	Controlling soil run off and no aqueous and solid waste disposal in river	None observed	None recommended

2.8 Small Mammals

2.8.1 Sampling Areas

provides the location of all sampling sites while **Figure 2.3** provides the map of all sampling locations.

Table 2-21 Sampling Locations for Small Mammals

Sampling Locations	Easting	Northing
Chirukhi	276160.85 m E	4602018.11 m N
Makhalakidzeebi	277105.69 m E	4602133.85 m N
Tsablana 2, memorial	280158.71 m E	4606516.21 m N
Phushurkauli-Vernrbi bridge	286285.87 m E	4604197.57 m N
Tsablana 1, bridge	280252.46 m E	4606233.60 m N
Akho	256562.13 m E	4615368.63 m N
Akhaldaba 4	261284.13 m E	4614407.59 m N
Akhaldaba 3, traps	263541.08 m E	4614041.13 m N
Akhaldaba 3, net	263121.06 m E	4614270.08 m N
Akhaldaba 2	262710.85 m E	4613597.44 m N
Akhaldaba 1	263858.12 m E	4614424.58 m N
Didadjara 1	279875.12 m E	4614788.01 m N
Dioknisi	281875.45 m E	4612735.53 m N
Didadjara 2	279535.45 m E	4615400.93 m N

Sampling was carried out in July and October from 2014 to 2019 and only in October in 2013.

Data has been averaged across the 2 sampling sessions in July and October. Given the proximity of the 2 sampling sites for Shuakhevi and Akhaldaba, we have pooled abundance and species richness data across these sites for each sampling session.

Figure 2.6 Map of Sampling Locations for Small Mammals

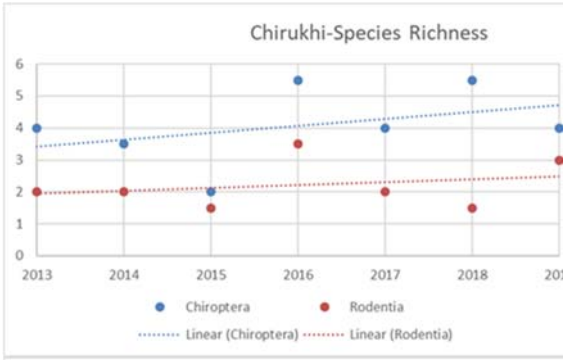
2.8.2 Results

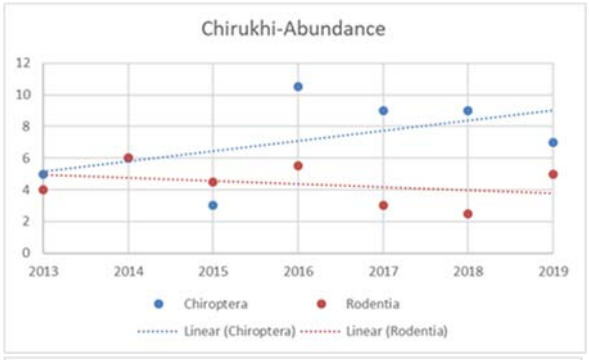
Recording of Chiroptera was carried out through continuous observations along routes and transects, in forests, alleys, separate trees, underground sites and buildings as well as in coastal zones. Acoustic sampling was carried out through ultrasonic detectors Pettersson D240 and Pettersson D240x, and by netting with special nets for bats.

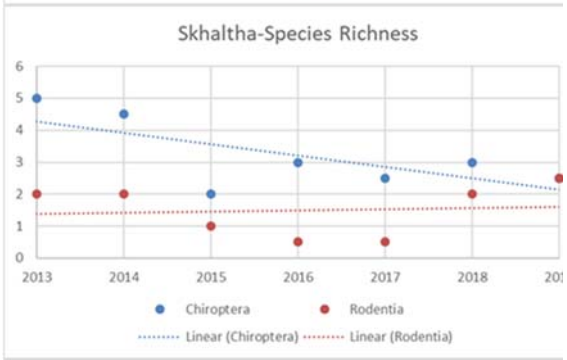
Field surveys started in the evening till 1:00am or 2:00am. Individuals caught by netting were identified directly in the field and then released. Also presence of large number of individuals at any one location as a colony, were recorded and its approximate size estimated

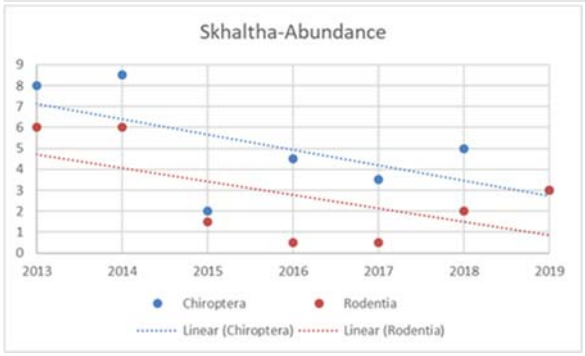
From ***Box 2.2*** we can observe that while there are no significant changes for species richness and abundance in the Chiroptera order, there is some decrease in both species richness and abundance in the Rodentia order for Didachara. We however observe no significant changes in species richness and abundance in the control site. The absence of changes in Chiroptera is note-worthy as with the exception of one species (*Rhinolophus ferumequinum*) all the other species are in Annexe II and IV in the EDRB Habitat Directive.

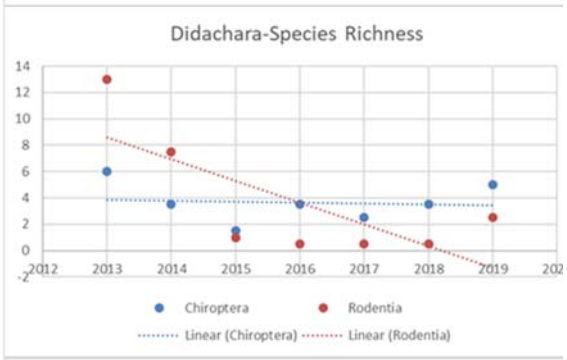
Box 2.2 Species Richness and Abundance for Chiroptera and Rodentia Across Sampling Sites

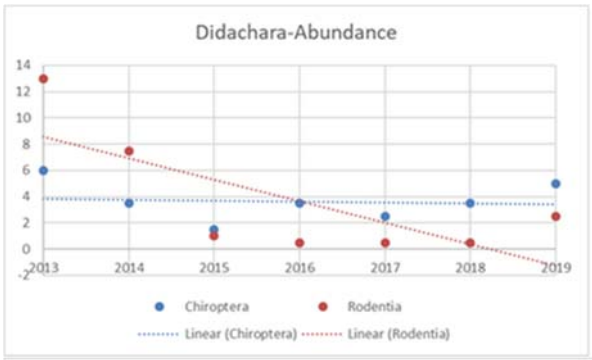


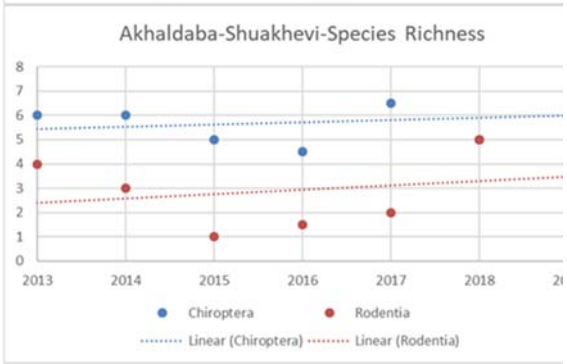


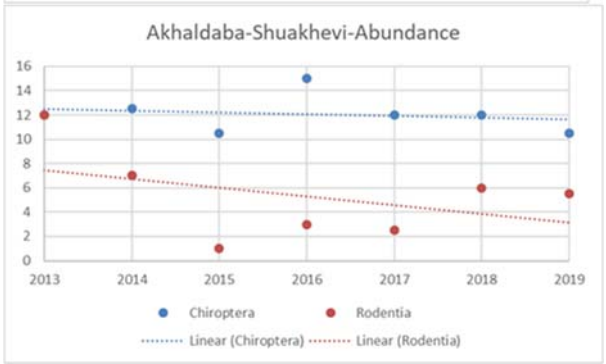


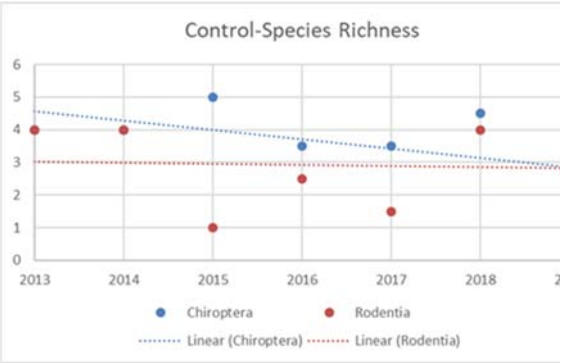


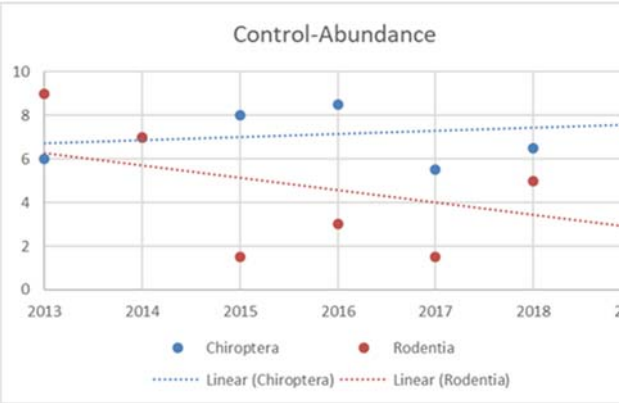












2.8.3 Impacts and Recommended Additional Mitigation

Table 2-22 Summary of Impacts and Recommended Additional Mitigation

Impact Site	Predicted Impact (ESIA 2013)	Mitigation (ESIA 2013)	Observed Impact	Recommended Additional Mitigation
All sites	Chiroptera Habitat loss, light and noise disturbance.	Avoidance of natural habitat loss, habitat instatement	None observed	None recommended
Didachara	None predicted	None suggested	Decline in species richness and abundance	As increases and declines of rodent populations are likely a consequence of natural population cycling no additional mitigation is recommended

3. ACHIEVING NO LET LOSS FROM RECOMMENDED ADDITIONAL ACTIONS

The above trend analysis has identified species specific or taxa specific impacts guiding the recommendation of specific actions to restore degraded habitats or effect population recovery. Here it may be added that no Critical Habitat candidate species have been observed to be impacted and therefore net gains is not necessary.

Table 3-1 summarizes the actions required t achieve net loss to these impacted species, taxa or habitats.

These actions are over and above the mitigation prescribed in the ESIA (2013) and represent additional actions to address observed residual impacts ascertained from the biodiversity monitoring

Table 3-1 Summary of Actions to Achieve Net Loss

Species/Taxa/Habitats Impacted	Likely Impacts	Actions to Achieve Net Gains
Birds	Egyptian Vulture	Support for the protection of at least one nest of Egyptian vultures from disturbance due to anthropogenic and development of activity in collaboration with wildlife agencies/NGOs.
	Species of the order Piciformes	Planting of nesting tree species in forest restoration sites and continued monitoring across years to assess success of nesting
	White-throated Dipper	Recovery of numbers will be only be possible if river habitat structure is not significantly altered during the operation phase. This will be facilitated if the Low Flow Mitigation strategy is fully implemented. Any breeding sites identified on rocky cliffs and bridges should be protected from any human disturbance.
Mammals-Eurasian Lynx, Wild Boar, European Hare, Eurasian Badger	Construction activity at all sites	Continued monitoring to ensure no future and consistent declines of abundance

Species/Taxa/Habitats Impacted	Likely Impacts	Actions to Achieve Net Gains
Fish	Construction activity downstream of Didachara dam and inundation by reservoir	1.Continued monitoring in the operation phase specifically those reaches made more vulnerable due to lowered flows and sediment management 2.Adaptive management as described in the LFMS where declines are noticed as consistent. 3.Additional actions to compensate for declines •Identification of external stressors of water quality e.g. effluent of untreated waste, unregulated sand and gravel mining, construction activity •Identification of hotspots of unsustainable fishing practices e.g. locations where unsustainable gear used, fishing during spawning season •Development of community awareness programmes for reducing stressors involving law enforcement and local communities •Implementation of community awareness programmes

APPENDIX A SAMPLING LOCATIONS FOR ALL TERRESTRIAL BIRD SPECIES

Figure A-1 Sampling Locations at Chirukhisqali Weir

Figure A-2 Sampling Locations at Skhalta dam and Powerhouse

Figure A-3 Sampling Locations at Didachara dam

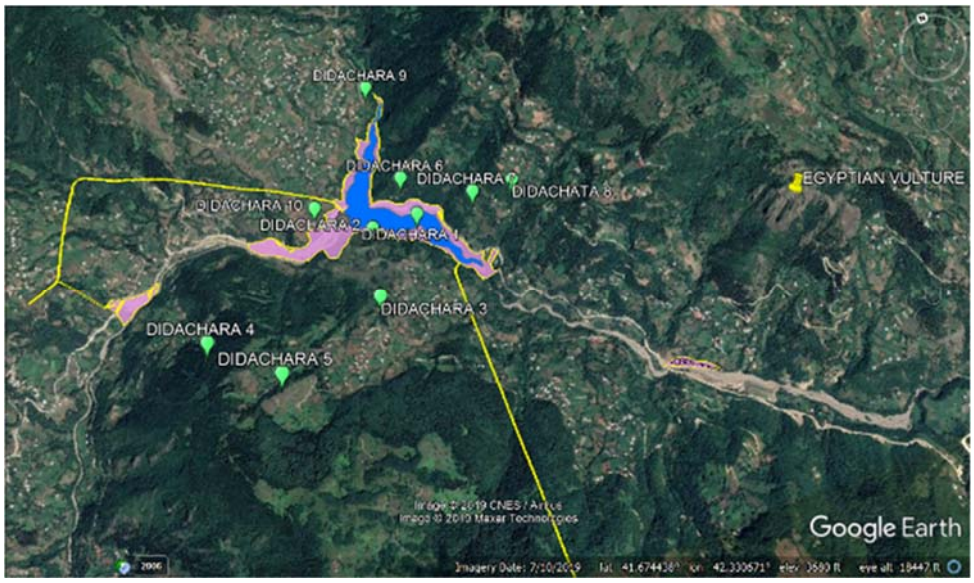


Figure A-4 Sampling Locations at Akhaldaba surge shaft

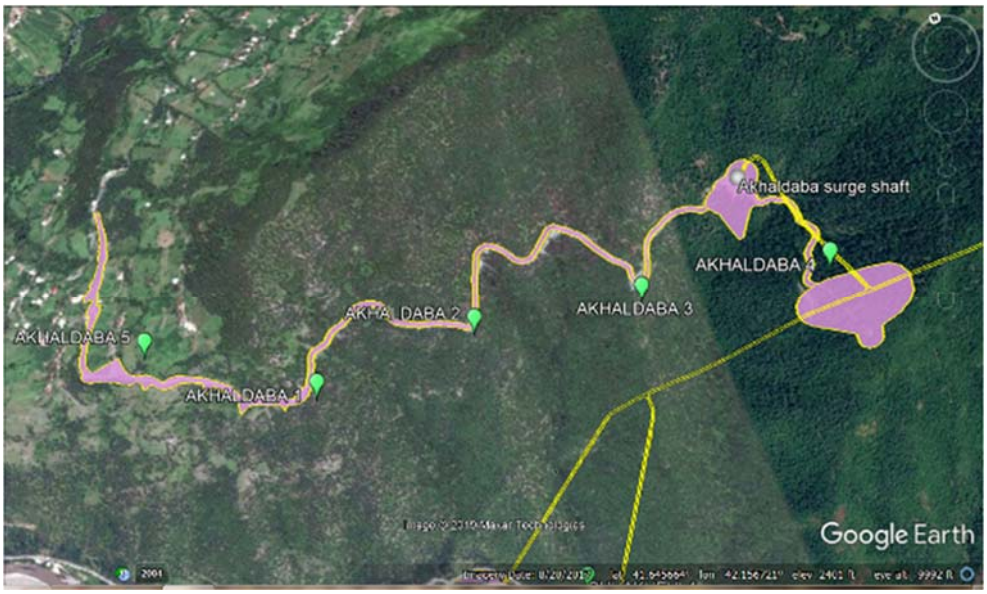
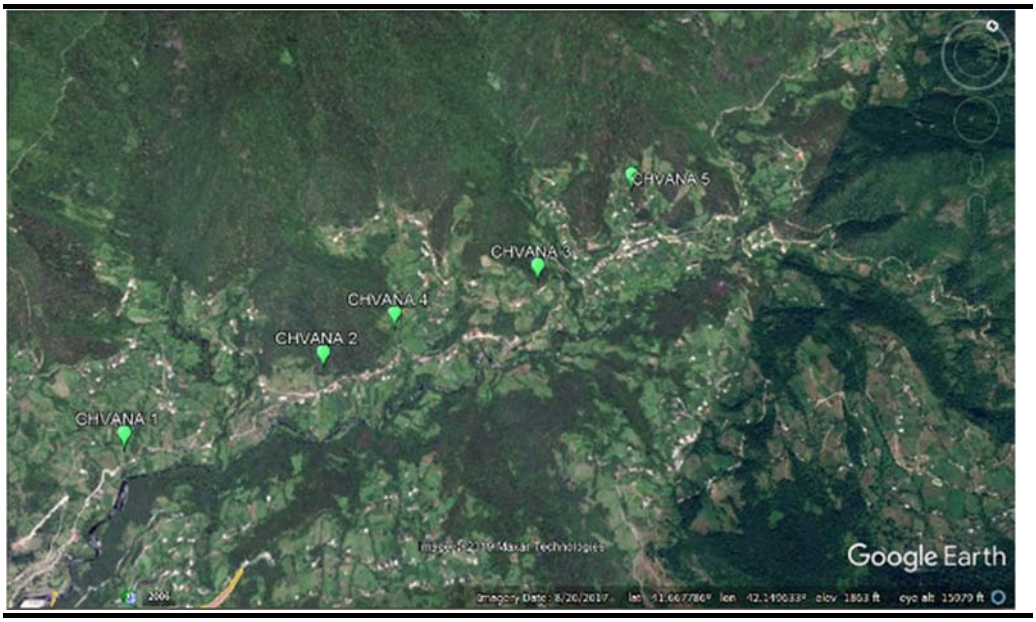


Figure A-5 Sampling Locations at Shuakhevi Powerhouse

Figure A-6 Sampling Locations at Chvana, Control Site



APPENDIX B SAMPLING LOCATIONS FOR AQUATIC DEPENDENT BIRD SPECIES

Figure B- 1 Sampling Locations for Aquatic Dependent Birds Along the Chirukhisqali River

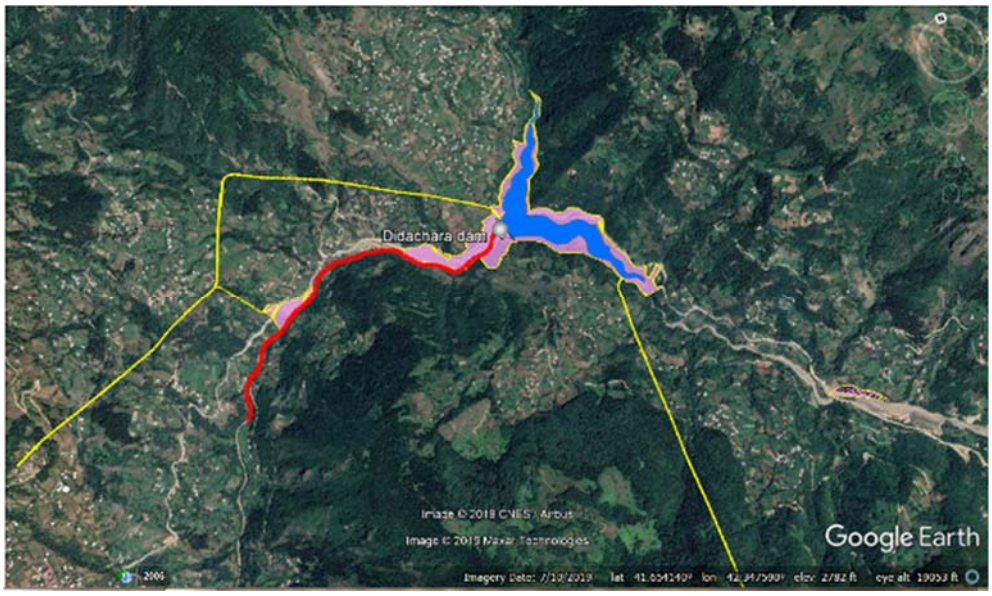
Impact site monitoring transect

Control site monitoring transect

Figure B- 2 Sampling Locations for Aquatic Dependent Birds along Skhalta River

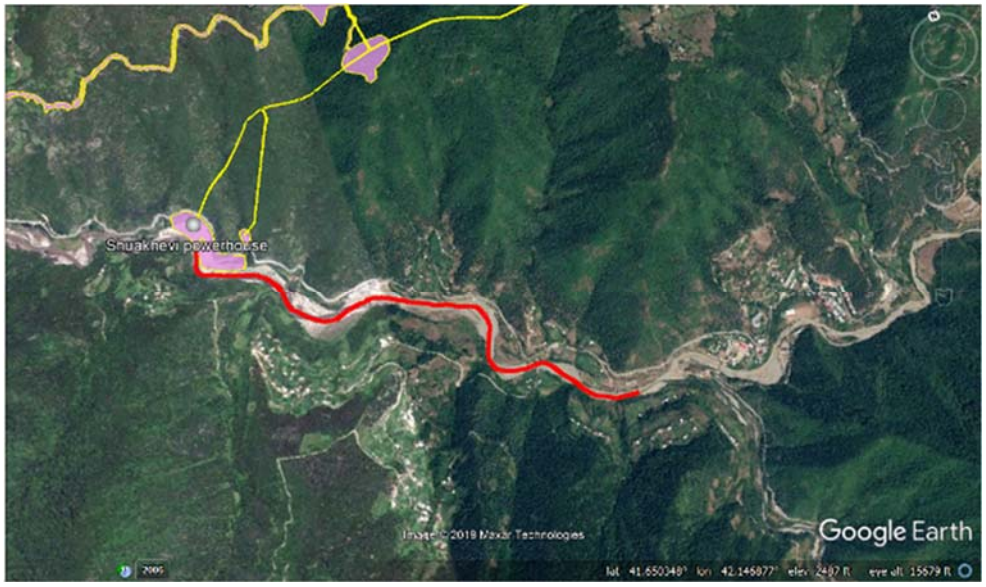
Impact site monitoring transect

Figure B- 3 Sampling Locations for Aquatic Dependent Birds along the Adjarastqali River at Didachara



Impact site monitoring transect

Figure B-4 Sampling Locations for Aquatic Dependent Birds along the Adjarastqali River at Shuakhevi



Impact site monitoring transect

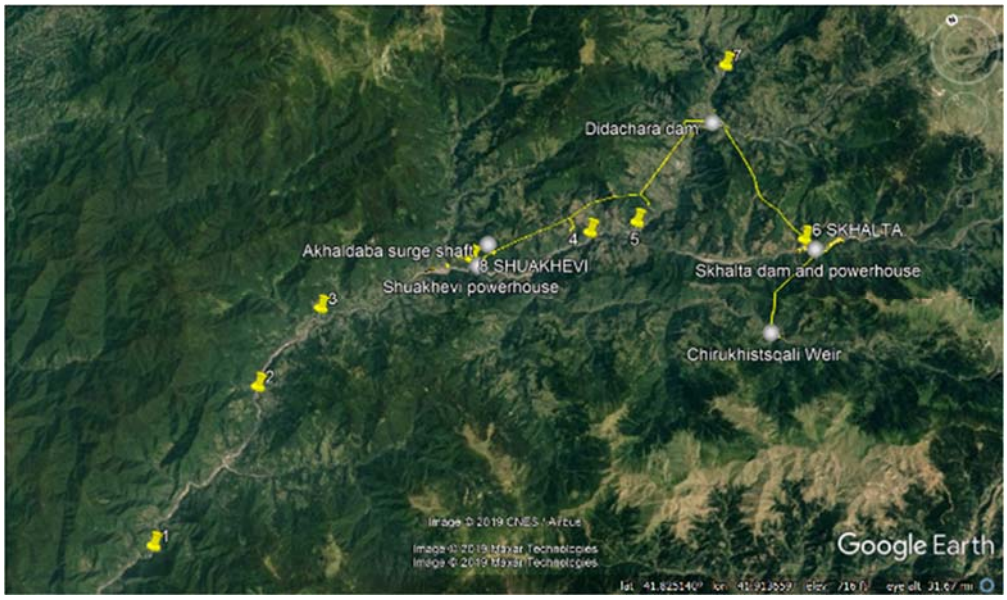
Figure B-5 Sampling Locations for Aquatic Dependent Birds at the Chvana Control Site

APPENDIX C SAMPLING LOCATIONS FOR HERPETOFAUNA SPECIES

Figure C-1 Sampling Locations for Herpetofauna Species

APPENDIX D SAMPLING LOCATIONS FOR INVERTEBRATE SPECIES

Figure D-1 Sampling Locations for Invertebrate Species



APPENDIX E SAMPLING LOCATIONS FOR LARGE MAMMAL SPECIES

Figure E-1 Sampling Locations for Large Mammals at the Chirukhisqali Weir

Figure E-2 Sampling Locations for Large Mammals at the Skhalta Dam and Powerhouse

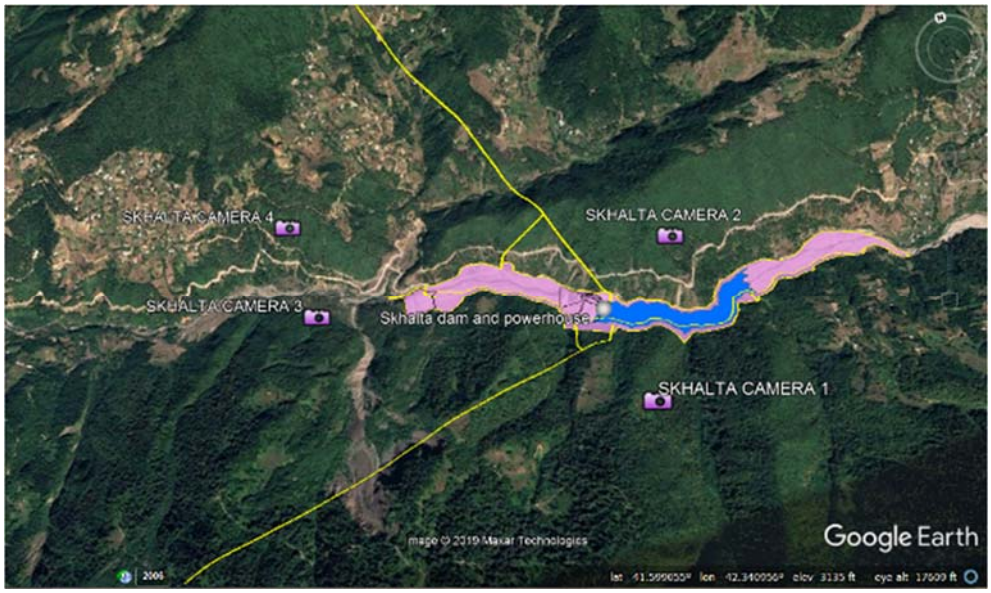


Figure E-3 Sampling Locations for Large Mammals at the Didachara Dam and Reservoir

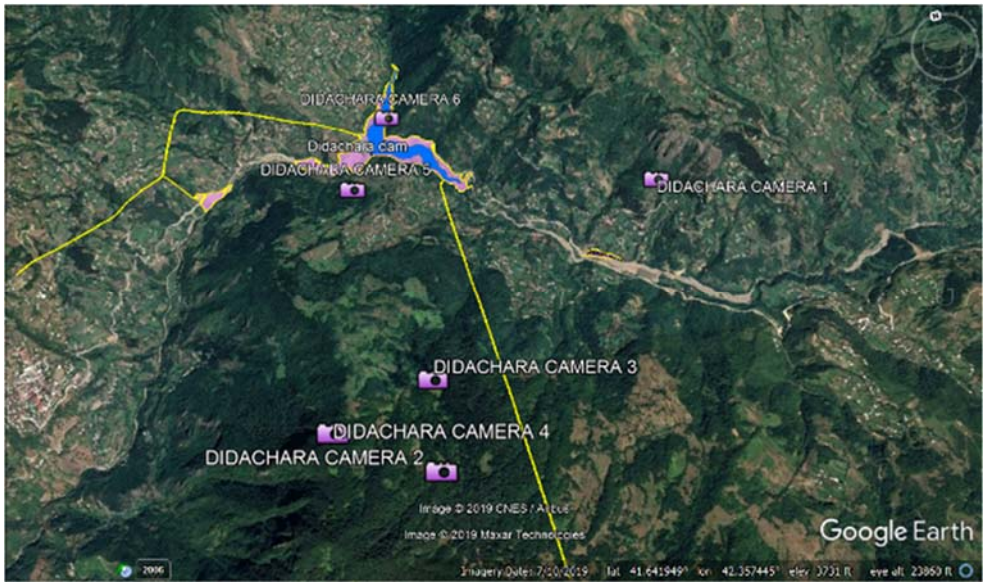


Figure E-4 Sampling Locations for Large Mammals at the Akhaldaba Surge Shaft

Figure E-5 Sampling Locations for Large Mammals at the Shuakhevi Powerhouse

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