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WATER RESERVOIRS PROJECT - ARMENIA

Environmental and Social Impact Assessment for the Astghadzor Reservoir Construction Project

BIODIVERSITY ACTION PLAN

Rev03

March 2026

Prepared for:

***European Bank for
Reconstruction and
Development***

and

***Water Committee under the
Ministry of Territorial
Administration and
Infrastructure of the Republic
of Armenia***

 **ATMS
Solutions**
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Consultancy Services Contract № 2023.009567

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**European Bank for Reconstruction and Development
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of the Republic of Armenia**

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Document Preparation and Issue:

Version	Status	Prepared by	Reviewed by	Issued by	Date of issue
Rev01	1st draft of the BAP for the Astghadzor Reservoir Construction Project	A.Artov	M. Gachechiladze-Bozhesku		26.01.2026
Rev02	2nd draft of the BAP for the Astghadzor Reservoir Construction Project	A.Artov	M. Gachechiladze-Bozhesku		20.02.2026
Rev03	Final draft of the BAP for the Astghadzor Reservoir Construction Project	A.Artov	M. Gachechiladze-Bozhesku	A. Ter-Torosyan	09.03.2026

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This Biodiversity Action Plan (BAP) has been developed as part of the Environmental and Social Impact Assessment (ESIA) for the Astghadzor Reservoir Construction Project (hereinafter 'the Project'). The assessment is based on information drawn from multiple sources, including the detailed design documentation, reports from field investigations, meeting records, relevant publications, various databases, and data collected directly by the ESIA team.

Verifying all sources with complete certainty is extremely challenging; therefore, validation has been undertaken primarily through careful review and logical assessment of the available information. Every effort has been made to ensure that all information used in the ESIA has been accurately presented.

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List of Abbreviations

BAP	- Biodiversity Action Plan
BMP	- Biodiversity Management Plan
BOMP	- Biodiversity Offset Management Plan
CH	- Critical Habitat
CJSC	- Close Joint Stock Company
EAAA	- Ecologically Appropriate Area of Analysis
EBRD	- European Bank for Reconstruction and Development
EIA	- Environmental Impact Assessment
ESAP	- Environmental and Social Action Plan
ESIA	- Environmental and Social Impact Assessment
ESHS	- Environmental, Social, Health, and Safety
ESMP	- Environmental and Social Management Plan
ESMS	- Environmental and Social Management System
ESP	- Environmental and Social Policy
EU	- European Union
E&S	- Environmental and Social
GIP	- Good International Practice
ME	- Ministry of Environment
MTAI	- Ministry of Territorial Administration and Infrastructure
NG	- Net Gain
NNL	- No Net Loss
OHS	- Occupational Health and Safety
OHSMP	- Occupational Health and Safety Management Plan
GA	- Government of Armenia
PAP	- Project Affected Person
PBF	- Priority Biodiversity Features
PIU	- Project Implementation Unit
PPE	- Personal Protective Equipment
PR	- Performance Requirement
RA	- Republic of Armenia
SDA	- Spoil Disposal Area
SDMP	- Spoil Disposal Management Plan
SPA	- Spoil Disposal Area
SPMP	- Spill Prevention and Management Plan
SSESMP	- Site-Specific Environmental and Social Management and Monitoring Plan
WCRA	- RA Water Committee
WMP	- Waste Management Plan

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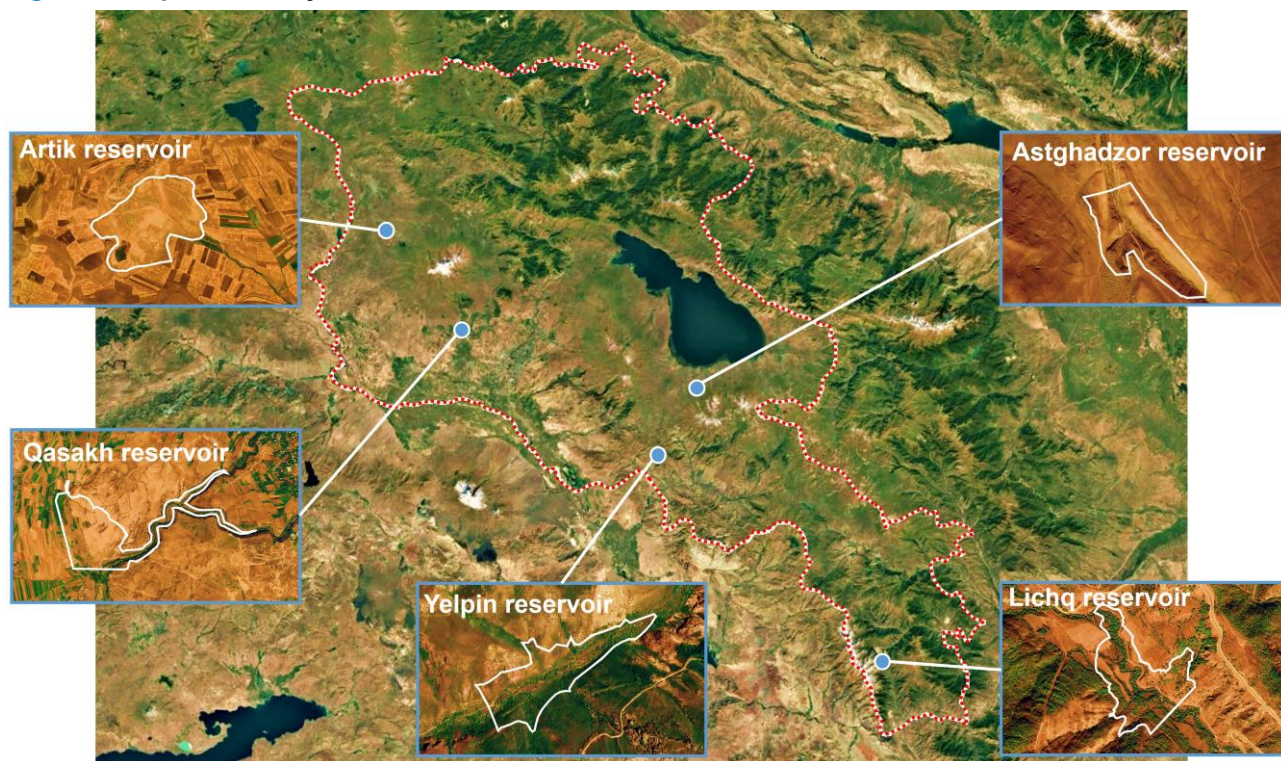
1. Introduction

The Government of the Republic of Armenia ('RA') plans to construct 17 reservoirs within the EU support initiative 'Recovery, resilience and reform: post 2020 Eastern Partnership priorities' to the Government of Armenia ('GA') to enhance the water and food security level in the country. The European Bank for Reconstruction and Development ('EBRD' or the 'Bank') is considering provision of a loan to the GA to finance the construction of five water reservoirs in different regions (Marzes) of Armenia:

- Kassakh reservoir in Aragatsotn Marz¹,
- Lichk reservoir in Syunik Marz,
- Yelpin reservoir in Vayots Dzor Marz,
- Artik reservoir in Shirak Marz,
- Astghadzor reservoirs in Gegharkunik Marz.

The locations of the Project reservoirs are shown in **Figure 1**.

Figure 1. Map of the Project reservoirs



The EBRD has categorized this greenfield project as 'A' in line with its Environmental and Social Policy ('ESP') (2019) because it may cause significant environmental and social impacts. This means that a comprehensive Environmental and Social Impact Assessment ('ESIA') report and associated documents must be elaborated, followed by their public disclosure for a minimum period of 120 days.

One of the reservoirs listed above is planned for construction within the administrative boundaries of Astghadzor and Zolaqar rural settlements in the RA Gegharkunik Marz. The Astghadzor Reservoir is designed in the middle reaches of the Astghadzor River, to ensure sustainable irrigation

¹"Marz" means "Region" in Armenian

of 740 ha of agricultural land in the settlements of Astghadzor, Zolaqar, Vaghashen, and part of Martuni.

The Bank has engaged the Consultant² to update the national Environmental Impact Assessment ('EIA') report for the Astghadzor Reservoir Construction Project into the ESIA in accordance with the EBRD ESP and to prepare the associated Environmental and Social (E&S) documentation, including this Biodiversity Action Plan ('BAP') proportionate to the Project's specific impacts, benefits, and opportunities.

2. Need, Purpose and Structure of the BAP

Armenia is a key contributor to biodiversity within the South Caucasus, one of the world's recognised biodiversity hotspots. Despite its relatively small size, Armenia hosts an exceptional variety of ecosystems and habitats, including semi-deserts, mountain steppes, broadleaf and mixed forests, riverine and wetland systems, subalpine and alpine meadows, and high-mountain rocky ecosystems. This habitat diversity supports high species richness and numerous endemic and rare species.

Located at the junction of Europe, Asia, and the Middle East, Armenia also functions as an ecological corridor, facilitating species movement and maintaining genetic exchange across the region. These characteristics give Armenia an important ecological role at both national and transboundary levels.

As presented in the ESIA, the Astghadzor Reservoir Construction Project will be implemented in an area of high biodiversity where valued habitats and species were identified. The CHA has revealed biodiversity values assessed as PBFs and CHs that will be adversely affected by the Project; some habitats will be lost. According the EBRD PR6, this requires mitigation and, as a last resort, offsetting. This requirement underpins the need for a Biodiversity Action Plan (BAP).

Purpose of the BAP is development of mitigation measures in accordance with the mitigation hierarchy and design a biodiversity offset strategy to address the project's significant residual impacts on biodiversity.

The BAP provides a biodiversity summary from the ESIA including a description of legal framework for biodiversity conservation, outline of the Project and findings on biodiversity values and impacts on them. In accordance with to the EBRD PR6, a set of mitigation measures is designed in the form of Biodiversity Management Plan (BMP) comprising objectives, specific actions, timelines, assigned responsibilities, and monitoring indicators. Just after, remained residual impacts on some PBFs and CHs are assessed. Finally, the BAP designs an offsetting strategy to achieve no net loss/net gains of priority biodiversity features (PBFs) and critical habitats (CHs).

The BAP has been informed by the Project's biodiversity baseline, national EIA and ESIA reports, and has been developed with input from a range of stakeholders, including Ministry of Environment (ME), biodiversity experts, available national level reports as well as documents prepared by the international organization specialised in the biodiversity studies. The BAP will need to be updated if changes to the Project design occur and prior to the commissioning of the reservoir. Any update of the BAP should be agreed with the EBRD and "no objection" should be obtained from the Water Committee of the Republic of Armenia (WCRA).

²A consortium consisting of ATMS Solutions Ltd. (Armenia) and Ecoline International Ltd. (Bulgaria)

3. Legal and Regulatory Framework for Biodiversity

3.1 National Requirements

According to the **RA Law on Environmental Impact Assessment and Expert Examination (2014, revised in 2023)**³, there are two types of documents, which are subject to environmental impact assessment and expert examination. These documents are:

- (i) Framework Document - a policy, strategy, concept, scheme of utilization of natural resources, program, master plan, urban development document, which are likely to affect the environment; and
- (ii) (ii) Design Document - technical report, feasibility study and construction-engineering design of intended activity.

The Law establishes the general legal and organizational principles for conducting the mandatory EIA of various types of activities and concept documents of sectoral development. According to Article 12 of the Law, the types of activities, which should undergo EIA are divided into "A" and "B" categories depending on their expected environmental impact.

As per Article 12 the Law, the reservoirs or artificial lakes with 500,000 m³ and more capacities are subject of national EIA and State expert examination. The roles and powers of parties engaged in EIA and expert examination processes are set out in Chapter 2 of the Law. The procedure for public notification and public discussions is outlined in the **RA Government Decree №1325-N** dated 19.11.2014⁴.

The **RA Law on flora (1999)**⁵ and **RA Law on fauna (2000)**⁶ outline Armenia's policies for the conservation, protection, use, regeneration and management of natural populations of plants and animals as well as the impact of human activities on biodiversity. These laws are aimed at the sustainable preservation and use of flora/fauna and the conservation of biodiversity. The laws also contain provisions for assessing and monitoring flora and fauna, especially rare and threatened species. The RA Government Decree №71-N and №72-N on approval of the **RA Red Book of animals**⁷ and **RA Red Book of plants**⁸ respectively define the biology of threatened (rare, threatened, endangered, vulnerable) species of flora and fauna as well as their quantity, habitats and variety.

The **Law of Fauna** was materially updated in 2022 to introduce the new concepts in order to complete Armenia's commitments under the 2018 Partnership Agreement with the EU⁹ and align with the EU legislation. The amendments included such notions as fauna monitoring, definition of invasive species, use of fauna for health, protection and industrial purposes, Important Bird Areas (as areas of special environmental interest established for conservation of birds (outside of specially protected nature areas or included therein), serving for nesting, wintering or rest, and others.

RA Government Decree №781-N "On the order of protection of flora of the Republic of Armenia and its use for the purpose of reproduction in natural conditions (2014)"¹⁰ defines the measures for

³<https://www.arlis.am/documentview.aspx?docid=178468>

⁴<https://www.arlis.am/documentview.aspx?docid=188071>

⁵<https://www.arlis.am/documentview.aspx?docid=120784>

⁶<https://www.arlis.am/documentview.aspx?docid=120790>

⁷<https://www.arlis.am/DocumentView.aspx?DocID=56347>

⁸<https://www.arlis.am/DocumentView.aspx?DocID=56348>

⁹Comprehensive and enhanced Partnership Agreement between the European Union and the European Atomic Energy Community and their Member States, of the one part, and the Republic of Armenia, of the other part ([https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22018A0126\(01\)](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22018A0126(01))).

¹⁰<https://www.arlis.am/documentview.aspx?docid=91830>

the protection, including translocation, of plants threatened with extinction as a result of economic activity.

The **RA Law on special protected natural areas (2006)**¹¹ regulates special protected areas of RA and eco-systems that have environmental, economic, social, scientific, educational, historical, cultural, healthcare and recreational value. It also outlines the legal basis for state policies regarding sustainable development, restoration, protection, reproduction and use of natural features and complexes. The Law defines four categories of protected areas in Armenia: (i) State Reserves; (ii) National Parks; (iii) Sanctuaries; and (iv) Nature Monuments. The list of the nature monuments is approved by the **RA Government Decree №967-N** dated 14.08.2008¹².

The **RA Forest Code (2005)**¹³ regulates the sustainable management of forests: guarding, preserving, rehabilitation, afforestation and rational use of forests and forest lands in Armenia as well as forest inventory, monitoring and control.

The **RA Water Code (2002)**¹⁴ provides the legal basis for the protection of water resources, the provision of water for people and economic sectors through effective management of water resources and ensuring the protection of water resources for future generations. The Water Code includes the following: responsibilities of state/local authorities and public, development of the national water policy and national water program, water cadastre and monitoring system, public access to relevant information, water use and water system use permitting systems, trans-boundary water resources use, water quality standards, safe operation of hydraulic facilities, protection of water resources and state supervision. The quality of surface water in Armenia is monitored as per the principles of EU Water Framework Directive adopted by the **RA Government Decree №75-N** dated 27.01.2011¹⁵.

Article 1 of the Water Code defines, among other things:

- 'Water protection zone' as an area designated to prevent the pollution and depletion of water resources, and to maintain a favourable water regime; such areas are not subject to privatization or confiscation.
- 'Protected sanitary zone of water ecosystems' as an area designated to protect water resources used for drinking, healthcare, domestic services, medical facilities, resorts, and other health-related purposes.

3.2 Ratified International Agreements

Republic of Armenia is a signatory/party to several international agreements related to biodiversity (**Table 1**).

Table 1. List of ratified by the RA international agreements applicable for the project

International agreements (convention or protocol)	Description
Convention on Wetlands of International Importance - (Ramsar 1971)	The Ramsar Convention is an intergovernmental treaty aiming to maintain the ecological character and plan the sustainable use of Wetlands of International Importance. The Convention entered into force in Armenia in 1993.

¹¹<https://www.arlis.am/documentview.aspx?docid=140513>

¹²<https://www.arlis.am/documentview.aspx?docid=157090>

¹³<https://www.arlis.am/DocumentView.aspx?docid=121312>

¹⁴<https://www.arlis.am/DocumentView.aspx?docid=148955>

¹⁵<https://www.arlis.am/documentview.aspx?docid=200962>

International agreements (convention or protocol)	Description
The Convention on the Conservation of Migratory Species of Wild Animals (1979) (Bonn Convention)	The objective of the Bonn Convention, which was adopted in 1979, is to ensure the conservation of land, marine and air migratory species over the whole of their area of distribution. Armenia is a State party since 2011
Convention on International Trade in Endangered Species (CITES) (1973)	This convention is designed to ensure that international trade in animals and plants does not threaten their survival in the wild. Armenia joined this convention in 2008.
Convention on the Conservation of European Wildlife and Natural Habitats, Bern (1979)	The Bern Convention is a binding international legal instrument in the field of nature conservation, covering most of the natural heritage of the European continent and extending to some States of Africa. Ratified by Armenia in 2008.
The Convention on Biological Diversity (1992)	The three main objectives of the Convention are: the conservation of biological diversity; the sustainable use of the components of biological diversity; and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. Signed by Armenia in 1993.
UN Convention to Combat Desertification, Paris (1994)	This Convention is the sole legally binding international agreement linking environment and development to sustainable land management. The Convention addresses specifically the arid, semi-arid and dry sub-humid areas, known as the drylands, where some of the most vulnerable ecosystems and peoples can be found. Ratified by Armenia in 1997.
Convention on Environmental Impact Assessment in a Transboundary Context, Espoo Convention (1991)	The Convention sets out the obligations of the Parties to carry out an environmental impact assessment of certain activities at an early stage of planning. Before permitting an industrial project, the country to decide on the project ("country of origin") must notify any countries which could be affected by the transboundary impacts of a project located in another country ("affected parties"). The affected party and the public in the affected area must be able to express their views and comments about the proposed project. This is a separate procedure which is additional to any relevant national permitting process. The permitting state must take these comments into account in its final decision and communicate it to the affected country and the public. The projects subject to consultations under the Convention are those listed in Appendix I including 'large dams and reservoirs'. Ratified by Armenia in 1997.

3.3 EBRD Requirements

The main requirements of the EBRD for its own activities are formulated in the Bank's ESP (2019), while the requirements for the E&S aspects of the Client-borrower's activities are set out in the RRs. The ESP sets E&S requirements for the EBRD clients' activities to achieve sustainable results, with the *PR1: Assessment and Management of Environmental and Social Risks and Impacts* being the umbrella PR for the other requirements. The one relevant regarding Biodiversity is the *PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources* which

determines the requirements for the conservation of biological and landscape diversity in the development area. PR 6 requires the borrower to characterise the state of biodiversity, identifying sensitive species and habitats, and developing measures to avoid / reduce impacts. PR 6 defines criteria for critical habitat screening and requires developing a BAP where significant adverse impacts on biodiversity are expected.

3.4 Good International Practice (GIP) Guidelines

Specific E&S requirements applicable to the Project are set out in the EBRD's Sub sectoral Environmental and Social Guidelines: Building and Construction Activities (2010)¹⁶. They elaborate on typical E&S risks related to construction, operation, maintenance and decommissioning of facilities.

The following biodiversity guidelines were used for the BAP development:

- EBRD's Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (Guidance Note PR6, EBRD, 2022)¹⁷,
- Hardner, J., R.E. Gullison, S. Anstee, M. Meyer. 2015. Good Practices for Biodiversity Inclusive Impact Assessment and Management Planning. Prepared for the Multilateral Financing Institutions Biodiversity Working Group¹⁸,
- Biodiversity Offsets: a User Guide. World Bank Group. October, 2016¹⁹,
- A Cross-sector Guide for Implementing the Mitigation Hierarchy. Prepared by The Biodiversity Consultancy. Cross-sector Biodiversity Initiative, 2015²⁰,
- Edgar, P., Foster, J. and Baker, J. (2010). Reptile Habitat Management Handbook. Amphibian and Reptile Conservation, Bournemouth²¹.

3.5 Applicable EU Directives

- Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora²²,
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds²³.

4. Project Description

The planned Astghadzor Reservoir will be located within the administrative boundaries of the Astghadzor and Zolaqar rural settlements. It is designed to be constructed on the Astghadzor River, at an elevation of 2,100-2,160 meters above sea level (masl). The reservoir will provide irrigation for approximately 740 ha of agricultural land in the settlements of Astghadzor, Zolaqar, Vaghashen, and part of Martuni in the Gegharkunik Marz (**Figure 2**).

¹⁶<https://www.ebrd.com/downloads/policies/environmental/construction/buidling.pdf>

¹⁷<https://www.ebrd.com/who-we-are/our-values/environmental-and-social-policy/implementation.html>

¹⁸<https://publications.iadb.org/publications/english/document/Good-Practices-for-Biodiversity-Inclusive-Impact-Assessment-and-Management-Planning.pdf>

¹⁹<https://documents1.worldbank.org/curated/en/344901481176051661/pdf/110820-WP-BiodiversityOffsetsUserGuideFinalWebRevised-PUBLIC.pdf>

²⁰<https://www.icmm.com/en-gb/guidance/environmental-stewardship/2015/implementing-mitigation-hierarchy>

²¹<https://dnu7gk7p9afoo.cloudfront.net/Files/37.-edgar-p.-foster-j.-and-baker-j.-2010.-reptile-habitat-management-handbook.amphibian-and-reptile-conservation-bournemouth.pdf>

²²<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A01992L0043-20250714>

²³<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02009L0147-20190626>

The reservoir footprint (surface area of the water horizon at the FSL) is 9.13 ha, the footprint of the dam's northern part that is not flooded is about 1.45 ha (i.e. the full footprint area is 10.58 ha). Area of the buffer zone including the footprint area is 42.011 ha, of the buffer zone alone – 31.431 ha.

The reservoir will have a storage capacity of 1.55 mln. m³.

The reservoir hydraulic unit consists of:

1. Dam,
2. Spillway,
3. Construction (diversion) outlet,
4. Irrigation main outlet and two irrigation pipelines
5. Emergency spillway.

The dam body is planned to be constructed using locally available materials, with pebble-gravel shells. A central loam core is envisaged as an anti-filtration measure. The dam crest level has been determined for both scenarios: Full Supply Level (FSL) and Maximum Water Level (MWL) and the higher of the two was selected.

Figure 2. Location of the Astghadzor Reservoir site and the surrounding rural settlements



The main technical characteristics of the dam are as follows:

- Dam height - from channel bed upstream - 27.9 m, from channel bed downstream - 43.85 m,
- Inclination of the upstream slope - 1:3.5,
- Inclination of the downstream slope - 1:2.5,
- Crest width - 10.0 m,
- Dam length - 260 m.

Pebble-gravel, gravel-sand, and rock materials required for the construction of the earth dam can be sourced from the reservoir area and the riverbed up to 1 km downstream of the dam axis. Additionally, 100,000 m³ of loam required for the core and other construction needs will be procured from licensed suppliers.

All facilities required for the reservoir construction, except of the sandy loam borrow pit, are situated within the Construction site (42.011 ha area permanently allocated for the Project needs). These facilities include construction camp, pebble-gravel and loam borrow pits and topsoil temporary storage area. Therefore, no temporary land use will be needed from the Project needs.

5. Biodiversity Values

Biodiversity values for this Project are defined as the species and habitats that qualify as Priority Biodiversity Features (PBFs) and Critical Habitats (CHs).

The Critical Habitats Assessment (CHA) against the EBRD PR6 has revealed four habitats (according the EUNIS habitat classification used by the Bern Convention) and 35 species: 33 bird species, one reptile species and one invertebrate species identified as PBFs and three species: one mammal species, one reptile species and one amphibia triggering CH (see [Table 2](#)).

In line with the EBRD Guidance Note on PR6 and Declaration on the European Principles for the Environment, the EBRD has adopted the country-sensitive approach for countries that are part of the European Neighbourhood Policy, which involves tailoring the application of the criteria and conditions for identifying PBFs and CHs to the needs of a specific country. This means that the requirements of the EU Directives would not be automatically applicable to the analysis below.

Table 2. CHA Findings: Summary Table of PBFs and CHs identified in the footprint area as per EBRD PR6 ²⁴

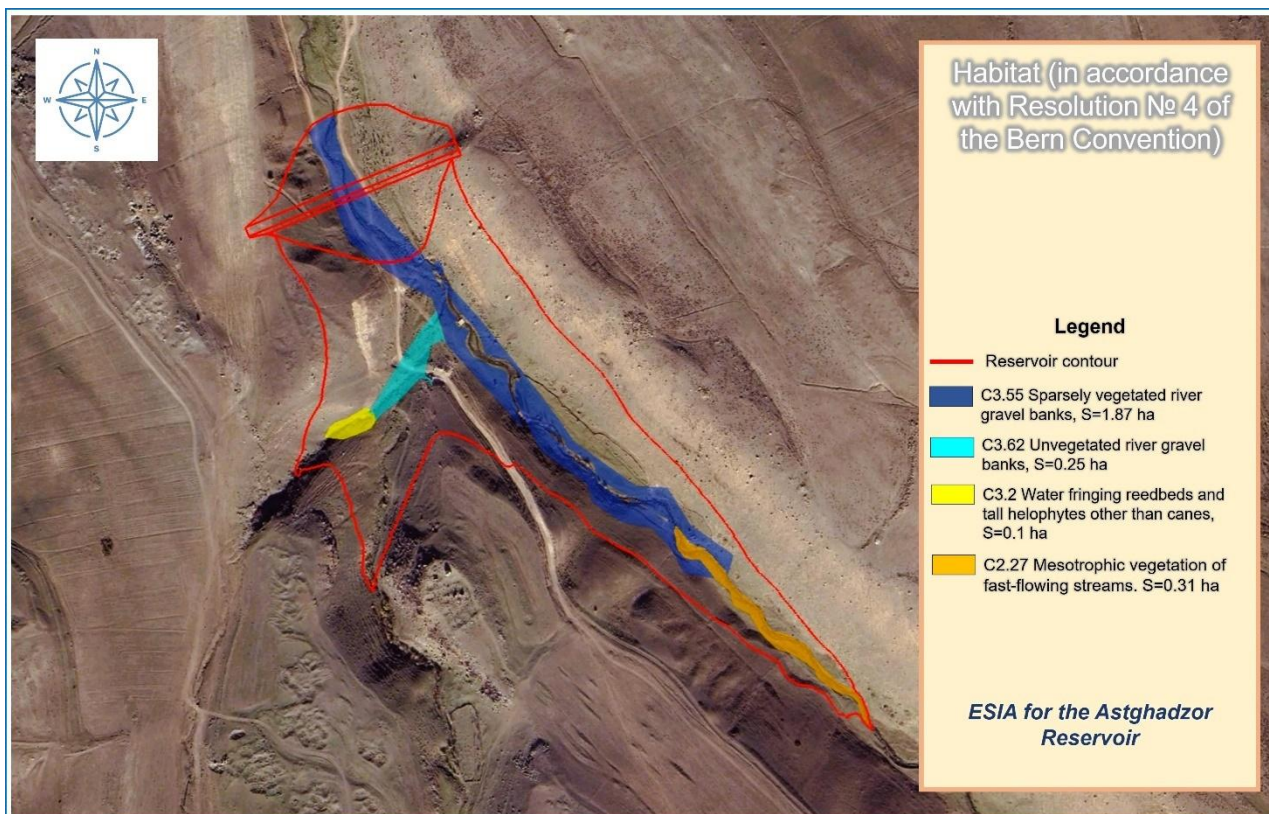
No	Criterion	Features (Habitats/species)
PBFs as per EBRD PR6 (§12)		
i	12.i.a EAAA ²⁵ is habitat type listed in Resolution 4 of the Bern Convention	Habitats (x4 - according the Bern Convention) C2.27 Mesotrophic vegetation of fast-flowing streams (0.31 ha), C3.2 (3.21) Water fringing reedbeds and tall helophytes other than canes (0.1 ha) C3.55 Sparsely vegetated river gravel banks (1.87 ha), C3.62 Unvegetated river gravel banks (0.25 ha)
ii	12.ii.a EAAA for species and their habitats listed in Annex II of the Habitats Directive, Annex I of the Birds Directive, or Resolution 6 of the Bern Convention	Birds (x29) <i>Egretta garzetta</i> (LC) <i>Ciconia nigra</i> (LC) <i>Tadorna ferruginea</i> (LC) <i>Milvus migrans</i> (LC) <i>Circus cyaneus</i> (LC) <i>Circus pygargus</i> (LC) <i>Circus macrourus</i> (NT) <i>Circus aeruginosus</i> (LC) <i>Pernis apivorus</i> (LC) <i>Gypaetus barbatus</i> (NT)

²⁴In case a species would trigger several criteria in the PBF and CH, it is listed in this table only once as the highest conservation concern, which is CH.

²⁵EAAA - ecologically appropriate area of analysis

No	Criterion	Features (Habitats/species)
iii		<i>Gyps fulvus</i> (LC) <i>Neophron percnopterus</i> (EN) <i>Aquila chrysaetos</i> (LC) <i>Aquila nipalensis</i> (EN) <i>Aquila heliaca</i> (VU) <i>Clanga pomarina</i> (LC) <i>Hieraaetus pennatus</i> (LC) <i>Tachyspiza brevipes</i> (LC) <i>Buteo rufinus</i> (LC) <i>Falco naumanni</i> (LC) <i>Falco peregrinus</i> (LC) <i>Crex crex</i> (LC) <i>Grus grus</i> (LC) <i>Anthropoides virgo</i> (LC) <i>Coracias garrulus</i> (LC) <i>Lanius collurio</i> (LC) <i>Lanius minor</i> (LC) <i>Emberiza hortulana</i> (LC)
	12.ii.d EAAA for regularly occurring nationally or regionally listed EN or CR species	<u>Birds (×2, already triggering cr. 12 ii.a)</u> <i>Neophron percnopterus</i> (EN) <i>Aquila nipalensis</i> (EN)
	12.ii.e EAAA for regularly occurring range-restricted species	<u>Birds (×1)</u> <i>Phylloscopus sindianus</i> (LC) <u>Reptilia (×1)</u> <i>Vipera (Pelias) eriwanensis</i> <u>Insects (×1)</u> <i>Carabus cribratus</i>
	12.iii Significant biodiversity features identified by a broad set of stakeholders or governments	<u>Birds (×3, listed in the Red Book of RA as Vulnerable)</u> <i>Larus armenicus</i> <i>Motacilla citreola</i> <i>Rhodopechys sanguineus</i>
CHs as per EBRD PR6 (§14)		
ii	14.ii.a EAAA for species and their habitats listed in Annex IV of the Habitats Directive	<u>Mammals (×1)</u> <i>Canis lupus</i> (LC) <u>Reptiles (×1)</u> <i>Natrix tessellata</i> <u>Amphibians (×1)</u> <i>Bufo viridis</i>

The habitats map of PBFs triggering the EBRD PR6 Criterion 12 i.a is presented on [Figure 3](#).

Figure 3. Map of the habitats in the Project footprint area listed in Resolution 4 of the Bern Convention

Aquatic life

As described in the ESIA, survey reports from about 10-12 years ago indicated the presence of Sevan sturgeon and Trout species in the Astghadzor river, though only in very small numbers near Astghadzor village, located downstream of the proposed reservoir site. However, a more recent survey conducted under the EIA in April 2024 recorded no fish species in the sections of the Astghadzor River and its tributaries that fall within the planned reservoir construction zone.

Based on these findings, it can be concluded that no fish species migrate upstream to the river section where the reservoir site located. However, such rare fish species as Trout can migrate potentially to the river section near Astghadzor village (downstream of the reservoir site). Accordingly, it remains crucial to determine and maintain an appropriate ecological flow from the reservoir. This flow should be sufficient to support any breeding migrations of fish that enter the river from Lake Sevan up to the areas adjacent to Astghadzor village. The required flow rate has been calculated and recommended in the national EIA, which received a positive environmental expert examination conclusion from the Ministry of Environment in 2024. To ensure that the calculated and approved environmental flow supports fish migrations (if any), annual monitoring of these migrations is proposed downstream of the reservoir site (refer to the mitigation measures section of the ESIA and below, in this BAP).

There are no other available hydrobiological data about the Astghadzor river. Since the river does not dry up during the year, occurrence of aquatic and amphibious species may be expected there. A focused river aquatic biota field survey is thus included in the BAP as a preventive mitigation measure (see mitigation measures section).

6. Summary of Potential Impacts

As presented in the ESIA, the Project will be implemented in the rich biodiversity area where valued (priority) habitats and species were identified.

The impacts of the Project on biodiversity will occur during both construction and operation/maintenance. The construction phase involves the dam building and reservoir filling. The methodology of impact assessment, including the identification of impact characteristics and significance matrix are detailed in Section 5 of the ESIA. As different species and their groups respond differently to different impacts, their sensitivity as receptors was considered during assessment.

Impacts on aquatic biota are not considered because there are no available data on the biota. Impact assessment will be done following the completion of the focused field survey under the BAP implementation (see the mitigation measures section).

The following potential impacts on biodiversity (including PBFs and CHs) could result from the Project activities during:

1. Construction phase:

- Destruction (loss) of habitats (by vegetation clearance, excavation, top-soil removal and transportation, reservoir filling),
- Flora species loss (by vegetation clearance, including trees cutting, excavation, top-soil removal and its transportation, reservoir filling),
- Disturbance of fauna species by noise, vibration and light pollution (construction machinery, traffic, lighting at the construction site),
- Destruction of sedentary animals' habitats and risk of their death (as a result of excavation, top-soil removal and its transportation, reservoir filling),
- Loss of foraging habitats for medium and large mammals (as a result of excavation, top-soil removal and its transportation, reservoir filling),
- Loss of breeding and foraging habitats for birds (as a result of excavation, top-soil removal and its transportation, reservoir filling),
- Loss of breeding, foraging and wintering habitats for invertebrates and risk of their death in overwintering stages (as a result of vegetation clearance, excavation, removal of top-soil and its transportation, reservoir filling),
- Impact on protected areas and internationally designated areas.

2. Operation and maintenance phase:

- Emergence of new habitats (water, riparian),
- Increased access to the area.

Negative impacts could occur mainly at the construction phase; they are caused by the dam building and flooding of the reservoir footprint area.

Some positive impacts on biodiversity occur during the operational phase; they are connected with the emergence of new habitats where large water surface area and coastal vegetation would attract some species of animals.

The assessment is completed for each predicted impact at the construction and operation phases and per each group of biodiversity receptors, which were combined based on their ecological characteristics; in some cases, impacts on individual species are assessed where possible.

Table 3. Assessment of impacts on the identified biodiversity features (PBFs and CHs)

Code	Receptor	Key impacts identification	Impact significance
C2.27	Mesotrophic vegetation of fast-flowing streams	Habitat loss (0.31 ha)	Significant
C3.21	Water fringing reedbeds and tall helophytes other than canes	Habitat loss (0.1 ha)	Significant
C3.55	Sparsely vegetated river gravel banks	Habitat loss (1.87 ha)	Significant
C3.62	Unvegetated river gravel banks	Habitat loss (0.25 ha)	Significant
Sedentary animals Reptilians: Dice Snake Amphibians: Variable toad/ green toad		Destruction of animals' habitats and risk of their death; but the flooded area will increase the periphery of the coastline and thus increase the habitat of the species	Moderate
Sedentary animals Reptilians: Armenian steppe viper		Loss of animals' habitats, including the buffer zone	Significant (should be confirmed)
Large terrestrial mammals and associated habitats: Grey Wolf		Loss of foraging habitats (should be confirmed)	Low
Birds Corn crane 1-2 pairs Red-backed Shrike 2-3 pairs Ortolan Bunting 2-3 pairs		Loss of breeding habitats Lost habitats – about 10 ha totally ²⁶ (the species' ranges overlap)	Significant
Birds: Long-legged Buzzard		Loss (minor) of foraging area	Low
Insects: Ground beetle <i>Carabus cribratus</i> .		Destruction of habitats, increased mortality of individuals due to vegetation clearance, excavation works, flooding reservoir	Significant

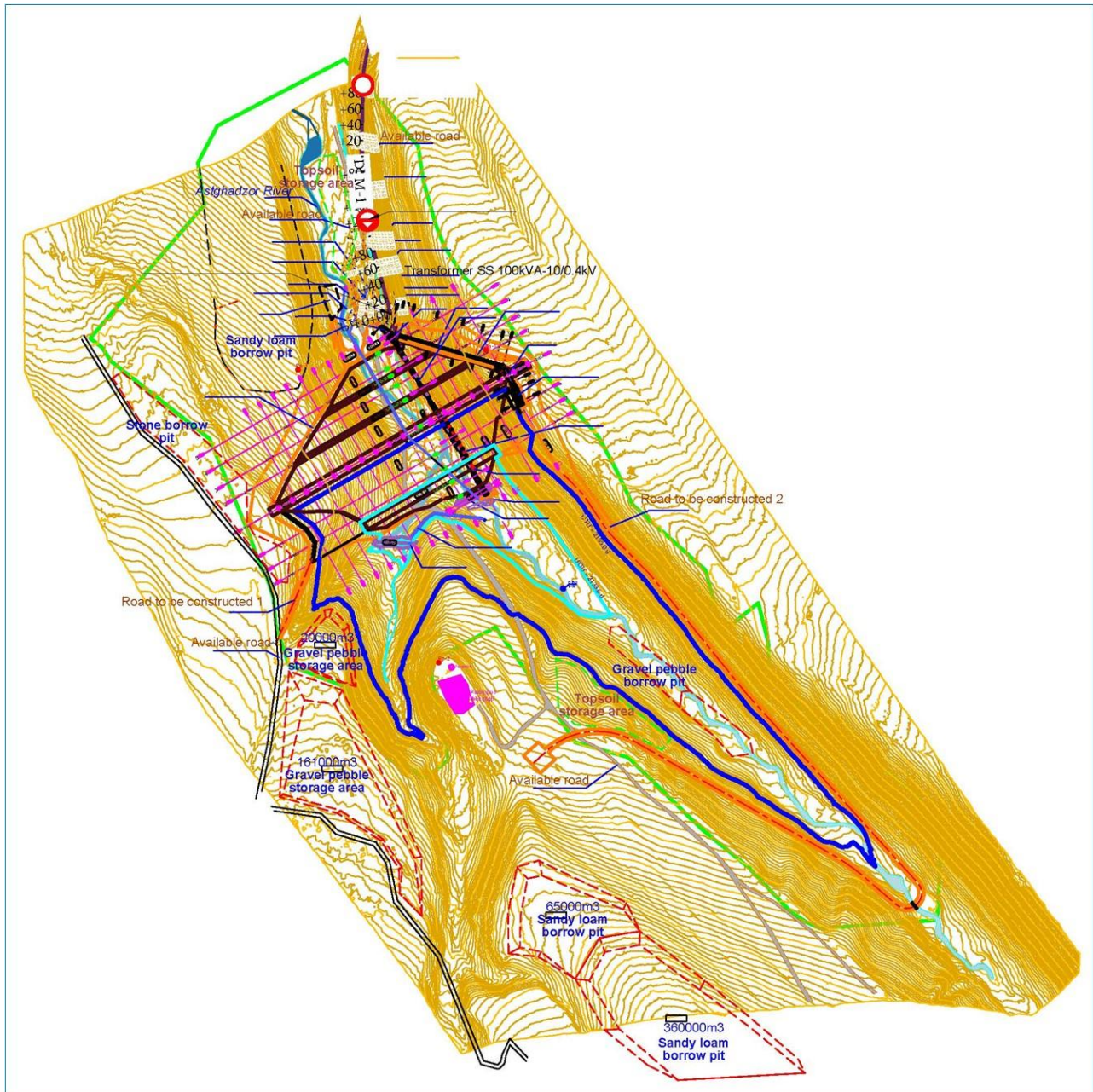
In addition to the habitats lost within the reservoir and dam footprint area, some habitats will be destroyed in the buffer zone and beyond due to the planned location of borrow pits, storage areas and roads that will be constructed (**Figure 4**). At present, there are no data on the types and area of the habitats that will be destroyed due to these auxiliary structures. Accordingly, the survey to identify habitats and their areas should be carried out at the pre-construction phase and appropriate mitigation measures developed (this is included in the BMP, see below).

As per the ESIA, pebble-gravel, gravel-sand, and rock materials required for the construction of the earth dam can be sourced not only from the reservoir area, but also from the riverbed up to 1 km downstream of the dam axis. If so, this will additionally affect about 900 m riverbed and destroy, mainly, habitat *C3.55 Sparsely vegetated river gravel banks* (PBF). As this extraction activity is

²⁶This area is calculated basing on the corn crane territory that is the largest one (territories of the other two bird species are less and may overlap with the corn crane one). The size of the territory for the corn crane is linked to the male's calling site, often defined as a 200- to 250-meter radius, which includes the nest and brood-rearing areas. Accordingly, the circle area with 250-meter radius covers about 20 ha. But the habitat mapping revealed that only about 10 ha of the suitable habitats inside the footprint area may be potentially occupied by the two pairs of corn crane.

considered as possible, but not confirmed, it is necessary to clarify whether the riverbed will be affected beyond the footprint area and to what extent; following this, during the pre-construction phase, a relevant survey should be carried out and mitigation measures developed (this is included in the BMP, see below).

Figure 4. Master plan of the construction site



Source: ESIA for the Astghadzor Reservoir Construction Project, 2025

Potential impacts on protected areas and internationally designated areas

As described in the ESIA, the planned Astghadzor Reservoir site does not fall within any protected areas (the nearest is the "Sevan" National Park, the border of which is 5 km away). No significant impacts of the reservoir on the National Park are expected; however, a potential impact may arise from a reduction in water discharge, as the Lake Sevan ecosystem is sensitive to water shortages. To prevent a reduction in water discharge, an appropriate environmental flow should be maintained from the reservoir. The required flow rate has been calculated and recommended by the national

EIA. Accordingly, no additional mitigation measures are proposed; monitoring of the environmental flow will be implemented.

The reservoir area is located outside KBA/IBA sites (see the ESIA report) - the border of the nearest site "Lake Sevan and Environs" is about 1.5 km north with Astghadzor village located between the Project and the KBA/IBA. The borders of this AZE site "Lake Sevan and Environs" coincide with the KBA/IBA site, i.e. the reservoir area is also located outside the AZE site.

The potential impact on the KBA/IBA site area is limited to the loss of foraging habitats for some far-ranging bird species, particularly birds of prey. However, the Project area does not appear to play a critical role in their foraging, as existing observations indicated that these species use it opportunistically rather than intensively (described in the ESIA report), while there is abundant alternative foraging habitat. Therefore, this impact is considered negligible. No impacts are expected on the Armenian whiskered bat (*Myotis Hajastanicus*), the qualifying AZE species of Lake Sevan and Environs. No bats have been observed during the surveys. The reservoir may provide additional suitable foraging habitat for this species.

According to the ESIA, the Astghadzor reservoir area is located inside the Candidate Emerald Site Sevan (AM 0000002). The Candidate Emerald site already encompasses a significant portion of disturbed areas around Lake Sevan, including settlements, agricultural lands and other modified habitats. The reservoir will create an additional plot of the artificially altered land, contributing to the fragmentation of the Candidate Emerald Site. But from a quantitative point of view, this contribution (added impact) is insignificant (0.0003% of the Candidate Emerald Site area)²⁷.

7. Mitigation: Biodiversity Management Plan

According to the EBRD PR6, the mitigation hierarchy should be applied, where impact avoidance is the first choice. If avoidance is not possible, adverse impacts have to be minimised or mitigated. And, as a measure of last choice, offsetting may be applied, if significant residual impacts remain after all previous efforts.

Mitigation measures were developed in the ESIA in terms of the priority features groups. In the current BAP, developed measures are presented in the framework of the BMP with monitoring targets (indicators), timeframe and responsible parties.

Mitigation measures related to capacity improvement of the priority species habitats, capture and relocation of animals are included in the offset measures (see the Offsetting strategy, BAP2). Additional studies are included in the BMP to identify habitats that will be destroyed due to the reservoir construction activities within the buffer zone (but beyond the reservoir and dam footprint area) and outside of it, as well as to assess the significance of the project site for aquatic biocenosis.

This BAP forms part of the tender documentation for the Project. All mitigation contained in this BAP at the pre-construction and construction phase will be included in the Terms of Reference and contract of the Construction Contractor and cascaded into contracts of relevant subcontractors as appropriate. Hiring professional zoologists will be required to implement surveys and relocation of animals.

²⁷According to the ESIA, as a reaction to the immediate challenges identified by the Ministry of Environment, the Emerald Network database was completely revised and optimized by the World Bank under the European Union for Environment (EU4Environment) Action Program. The proposed revised borders of the Candidate Emerald Site Sevan exclude the reservoir site; but this revision was not approved yet.

Project Lenders will be kept updated on BAP implementation progress via regular E&S Monitoring Reports (by independent external monitoring consultants).

All mitigation contained in this BAP at the operation and maintenance phase will be included in the Client's operation plan.

The matrix of the mitigation measures, that is the BMP, is presented in [Table 4](#).

Table 4. Mitigation measures: Biodiversity Management Plan

Measures, actions	Timeframe	Responsible	Indicator
BMP1 (avoidance measures)			
Objective: Avoid mortality of burrow animals due to construction works and flooding			
<i>Pre-construction phase</i>			
A1. Survey the area to map inhabited burrows of badger and other burrowing mammals; if the burrows may be affected by the pre-construction/construction works, provide relocation by species-specific methods	Prior to the commencement of any pre-construction preparations	Mammologist (with support of the Client or the construction contractor)	
Actions			
1. Survey the footprint areas to identify inhabited burrows (and map their locations), species and estimate quantity of animals	First year, best time - February to April, October to November (for badger)	Mammologist	Report, maps
2. If relocation is needed: survey the areas adjacent to the buffer zone with suitable habitats to where the animals can be relocated in order to estimate their species-specific capacity	First year		Report, maps
3. Develop relocation protocol	Second year		Developed relocation protocol
4. Provide relocation	Second year		Identified/Safely relocated and settled animals
5. Monitoring of the animals in the new locations	For two years after		Monitoring report, percent of settled animals
<i>Construction phase</i>			
A2. Before filling the reservoir, check the mapped residential burrows of badger and other animals; if they remain, capture them and relocate to the safe habitats.	Before filling the reservoir, from March - to October	Construction contractor, overall responsibility	
1. Examine potentially flooded area based on the prepared map of the burrow locations (see A1.1) to identify yet inhabited burrows and animals	March-September	Mammologist	Identified /relocated animals
2. If any animals remained: capture and relocate them according to the earlier developed protocol (see A1.3)	For two years after		Monitoring report, percent

Measures, actions	Timeframe	Responsible	Indicator
3. Monitor the relocated animals at the new locations			of settled animals
BMP2 (reduction measures)			
Objective: decrease direct impacts of the construction works, operation and employee on fauna			
<i>Pre-construction phase</i>			
R1. Develop the Worker Code of Conduct for employees of the construction company to prevent poaching and 'Procedures' to prevent harm to animals during construction works'	During the bulding preparation	Construction contractor, overall responsibility	Developed and approved documents
Actions:			
1. Develop the Worker Code of Conduct for employees focusing on prevention of poaching and protection of animals during building	During the construction preparation	Construction contractor, mammologist, herpetologist	Developed documents
2. Develop 'Procedures' to prevent harm to animals during construction works' focusing on impact from excavating and blasting			
3. Approve the documents by the construction contractor order	Each new staff worker; all personnel - two times a year	Construction contractor, Supervision Engineer	Approved documents Trained personnel and subcontractors
4. Train personnel and subcontractors on the documents' application			
<i>Construction phase</i>			
R2. Prevent any harm to animals and poaching during construction by applying the developed documents (see R1)	During construction works	Construction contractor - overall responsibility; Water Committee - supervision	Absence of cases of harm to animals, cases of poaching
Actions:			
1. Apply the Procedures during construction works including, among others:	During construction works	Supervision Engineer, Zoologist	Number of discovered animals, Number of saved and relocated animals
- Start construction works from one edge of the dam area, this approach will allow the remaining animals to leave,			
- Start vegetation clearance and construction works after the breeding season - not earlier than August (i.e. avoid these between March – July to avoid impacts to breeding animals) or confirm absence of breeding animals through an expert survey; this will prevent/reduce mortality of animals including offspring,			
- Strictly respect the limited project footprint areas, speed limitations,			
- qualified and experienced zoologist is to be engaged to supervise the excavation works	During construction works	Supervision Engineer	Number of poaching cases
- should any animals be found, procedures on capture and relocation must be followed,			
2. Apply and monitor compliance with the Worker Code of Conduct of employee to prevent poaching during construction.			
R3. Develop the Worker Code of Conduct for employees of the reservoir operator to prevent	At the finishing construction works	Water Committee	Developed documents

Measures, actions	Timeframe	Responsible	Indicator
poaching and 'Procedures to observe, treat and save encountered animals during operations'			
Actions: 1. Develop the Worker Code of Conduct for employees focusing on prevention of poaching and saving animals during operation 2. Develop the 'Procedures to observe, treat and save encountered animals during operations' 3. Approve the documents 4. Educate and train hired personnel on the documents' application	At the operation preparation phase Just after personnel hired, further – two times a year	JRAR CJSC - reservoirs operator - responsible person, mammologist, herpetologist Supervision person	Developed documents Approved documents Trained personnel
<i>Operation and maintenance phase</i>			
R4. Prevent poaching and save animals during the operations of the reservoir hydraulic structure	During operation	JRAR CJSC - reservoirs operator	Absence of cases of harm to animals, cases of poaching
Actions: 1. Observe animals in the reservoir, riverbanks and buffer zone 2. If observed animal is at risk or harmed, implement animal saving actions according to the developed protocol (see R3), contact a responsible person/zoologist 3. Apply and monitor compliance of the reservoir's operator with the Worker Code of Conduct to prevent poaching	During operation	JRAR CJSC - reservoirs operator Supervision person, if any	Number / specioes of animals discovered at risk or harmed, number of saved animals cases of poaching
BMP3: Additional surveys			
<i>Pre-construction phase</i>			
S1. Additionally survey aquatic ecosystem in the Project area and downstream, to identify aquatic species (if any) and estimate potential impact of the Project on these species. If the species identified and impact is assessed as moderate or significant, to develop appropriate mitigation measures and, if needed, offset project	From March to June	The Client - overall responsibility Aquatic biologist	Report, maps
S2. Survey the footprint and buffer areas to confirm/rule out the presence of the living den of Gray Wolf; if a den is found, take measures to scare away animals from the areas	After the breeding season (after end-June)	The Client - overall responsibility, zoologist	Report, maps; if the den is found, uninhabited den
S3. Carry out a survey to identify habitats that may be potentially destroyed by the construction objects and activities in the buffer zone and beyond; develop appropriate mitigation measures for habitats restoration and/or offset project.	In spring - summer	The Client - overall responsibility, geobotanist	Report, maps, addendums to the offsetting strategy
<i>Operation and maintenance phase</i>			
S4. Annual monitoring of fish migration from Sevan to the Astghadzor River on a section of the river between Lake Sevan and Astghadzor village (its southern border), estimating hydrological parameters of the	November - December, June-July	JRAR CJSC - reservoirs operator –	Reports, corrected design (if needed)

Measures, actions	Timeframe	Responsible	Indicator
environmental flow at this section of the river (this is also envisaged by the ESIA mitigation measures – see Table 8.15 of the ESIA report). In case of insufficiency of the environmental flow, it will be recalculated and ensured.		overall responsibility, hydrologist, ichtiologist,	

8. Residual impact

The residual impact, remaining impact after the implementation of the mitigation measures is assessed as follows:

Minor or negligible residual impact: considered as negligible or minor/acceptable residual impacts for which additional measures are not necessary,

Moderate or major residual impact: unacceptable unless they can be offset by other positive impacts of the project.

In case of moderate or major residual impacts on 1) PBFs, additional measures will be designed to achieve "no net loss" and on 2) CHs net gain is required (through offsets as per EBRD PR6 definitions).

The final significance of the residual potential impacts after avoidance and reduction measures is presented in [Table 5](#).

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Table 5. Assessment of residual impacts

	Receptor	Key impacts identification	Impact significance	Mitigation measures	Residual impact	Offset needed
C2.27	Mesotrophic vegetation of fast-flowing streams	Habitat loss (0.31 ha)	Significant	No	Significant	Yes (no net loss)
C3.21	Water fringing reedbeds and tall helophytes other than canes	Habitat loss (0.1 ha)	Significant	No	Significant	Yes (no net loss)
C3.55	Sparsely vegetated river gravel banks	Habitat loss (1.87 ha)	Significant	No	Significant	Yes (no net loss)
C3.62	Unvegetated river gravel banks	Habitat loss (0.25 ha)	Significant	No	Significant	Yes (no net loss)
<i>Sedentary animals</i> Reptilians: Dice Snake Amphibians: Variable toad/ green toad		Destruction of animals' habitats and risk of their death; but the flooded area will increase the periphery of the coastline and thus, will increase the habitat of the species	Moderate	R1-R4	Minor	No
<i>Sedentary animals</i> Reptilians: Armenian steppe viper		Loss of animals' habitats, including the buffer zone (should be confirmed)	Significant	R1-R4	Moderate (should be confirmed)	Yes (no net loss)
Large terrestrial mammals and associated habitats: Grey Wolf		Loss (minor) of foraging habitats (should be confirmed)	Low	S2	Minor	No
Birds Corn crane 1-2 pairs Red-backed Shrike 2-3 pairs Ortolan Bunting 2-3 pairs		Loss of breeding habitats Lost habitats – about 10 ha totally (the species' ranges overlap)	Significant	R1-R4	Moderate	Yes (no net loss)
Birds: Long-legged Buzzard		Loss (minor) of foraging area	Low	R1-R4	Minor	No
Insects: Ground beetle <i>Carabus cribratus</i>		Destruction of habitats, increased mortality of individuals due to vegetation clearance, excavation works, flooding reservoir	Significant	R1-R4	Moderate	Yes (no net loss)

9. Offsetting strategy

The technical rationale of how the project's mitigation strategy (offset) will achieve a net gain (NG) or no net loss (NNL), as required by EBRD PR 6, is presented in this section.

The offsetting strategy aims to achieve NNL or NG on biodiversity values (habitats - ecosystems) based on the "biodiversity conservation" approach ("averted loss"). The Project will fully destroy valuable habitats (ecosystems) within the boundaries of the dam and reservoir footprints and, partly, in the buffer zone, due to construction works and flooding. At the same time, similar habitats are situated in surrounding areas. These similar habitats will be conserved to avoid their changes/destruction in the future (due to such potential threats as building activities, overgrazing, agricultural usage, hunting, and other).

Furthermore, offset is needed to provide species habitats for animals who will lose their habitats due to construction of the reservoir (see [Table 5](#)). Conserved habitats (ecosystems) will be used for relocation of animals and, where needed, for improvement/construction of the species local habitats to increase the habitats capacities. Accordingly, the second offsetting approach – habitat improvement/restoration, will be applied in relation to the species habitats while, at the same time, contributing to restoration of the habitats/ecosystems.

Additionally, the restoration approach will be applied to restore habitats similar to the existing riverine habitats along shoreline of the new reservoir.

It is proposed to base the offsetting strategy on such pillars as stakeholders' involvement and capacity building, adaptive monitoring and law enforcement, adapted for the offsetting measures.

9.1 Loss and gain analysis and calculations

After the implementation of mitigation measures, the key residual impacts are:

Lost habitats (ecosystems):

- C3.21 Water fringing reedbeds and tall helophytes other than canes (0.1 ha),
- C2.27 Mesotrophic vegetation of fast-flowing streams (0.31 ha),
- C3.55 Sparsely vegetated river gravel banks (1.87 ha),
- C3.62 Unvegetated river gravel banks (0.25),

Lost species habitats (in brackets - codes of the habitats/ecosystems where the species occur):

- Birds: Corn crane, Red-backed Shrike, Ortolan Bunting, totally about 10 ha (C3.2, C2.27, C3.55, as well as habitats in the footprint area that are not PBF - E2.162-AM Forbs meadow - steppes, F2.3371-AM Steppe scrub with *Spiraea* spp²⁸).

Habitats of Armenian steppe viper and Ground beetle *Carabus cribratus* (PBF) in the footprint area borders, and, apparently, beyond the borders, will be lost. Exact habitats areas of the each of the species is currently unclear and will be estimated under the offset project.

An additional component of the offset should be offsetting the habitats destroyed outside the footprint area (in the buffer zone and beyond) (see [Table 4](#)). The design and contents of this offset depend on the results of the habitat field survey planned under the S3 measure.

Lost habitats have a different state of nature – from insignificant disturbances to areas with disturbed lands due to grazing, water intake and people passing. So, appropriate quality

²⁸Description of all habitats (ecosystems) of the footprint area is included in the ESIA

coefficients were defined for the habitats (see **Table 6**). The same coefficients are accepted for similar habitats located in the buffer/protection zone.

According to the literature sources²⁹ and expert (geobotanist) opinion, all lost habitats (ecosystems) are common for Armenia, there are no rare features among them. According to the practices in Armenia, offsetting multiplier has a range between 1 and 10.

Taking into account all the above, the multiplier of 1.5 is proposed for the PBF habitats (ecosystems) to reach the 'no net loss' target, taking into consideration a potential restoration success rate of around 70%.

The multiplier will need to be discussed and agreed with relevant stakeholders. If validated, this approach would imply the need to realize the below gains through offsetting actions (**Table 6**).

Table 6. Gains needed regarding Habitats/ecosystems to achieve NNL (PBF)

Code	Habitats	Residual impact			Offset			
		Physical Loss (ha)	Quality coefficients	Calculated loss (Qha)	Multiplier	Quality coefficients	Gain needed (Qha)	Gain needed, physical *(ha) ³⁰
C2.27	Mesotrophic vegetation of fast-flowing streams	0.31	0.85	0.264	1.5	0.85	0.395	0.465
C3.21	Water fringing reedbeds and tall helophytes other than canes	0.1	0.9	0.09	1.5	0.9	1.135	0.15
C3.55	Sparsely vegetated river gravel banks	1.87	0.8	1.496	1.5	0.8	2.244	2.805
C3.62	Unvegetated river gravel banks	0.25	0.8	0.2	1.5	0.8	0.3	0.375
	Total PBF	2.53		2.05			3.074	3.795
	Other habitats, ha	8.05						
	Footprint area, ha	10.58						
	Buffer zone, ha	31.43						

As the concerned bird species occur in suitable habitats/ecosystems, the species loss and gain analysis is developed based on calculations related to the habitats/ecosystems (**Table 6**). In addition to the three habitats that are PBFs, two more suitable habitats that will be lost in the footprint area (E2.162-AM, F2.3371-AM) are included in the calculation³¹.

²⁹Habitats of Armenia, 2016, G.M. Fayvush, A.S. Aleksanyan

https://www.researchgate.net/publication/303689840_Habitats_of_Armenia

³⁰Physical gain needed is calculated by dividing "Gain needed" (Qha) by the respective quality coefficients.

³¹Lost area of the habitat E2.162-AM is 6.87 ha, quality coefficient 0.8, lost area of the habitat F2.3371-AM is 1.1 ha, quality coefficient 0.9. Multiplier 1.5 is taken for the both habitats to provide conservative approach for the bird species habitats offsetting

The received multiplier for the species is 1.5 that provides a “net gain” for the bird species ([Table 7](#)).

Table 7. Gains needed regarding species habitats to achieve NNL

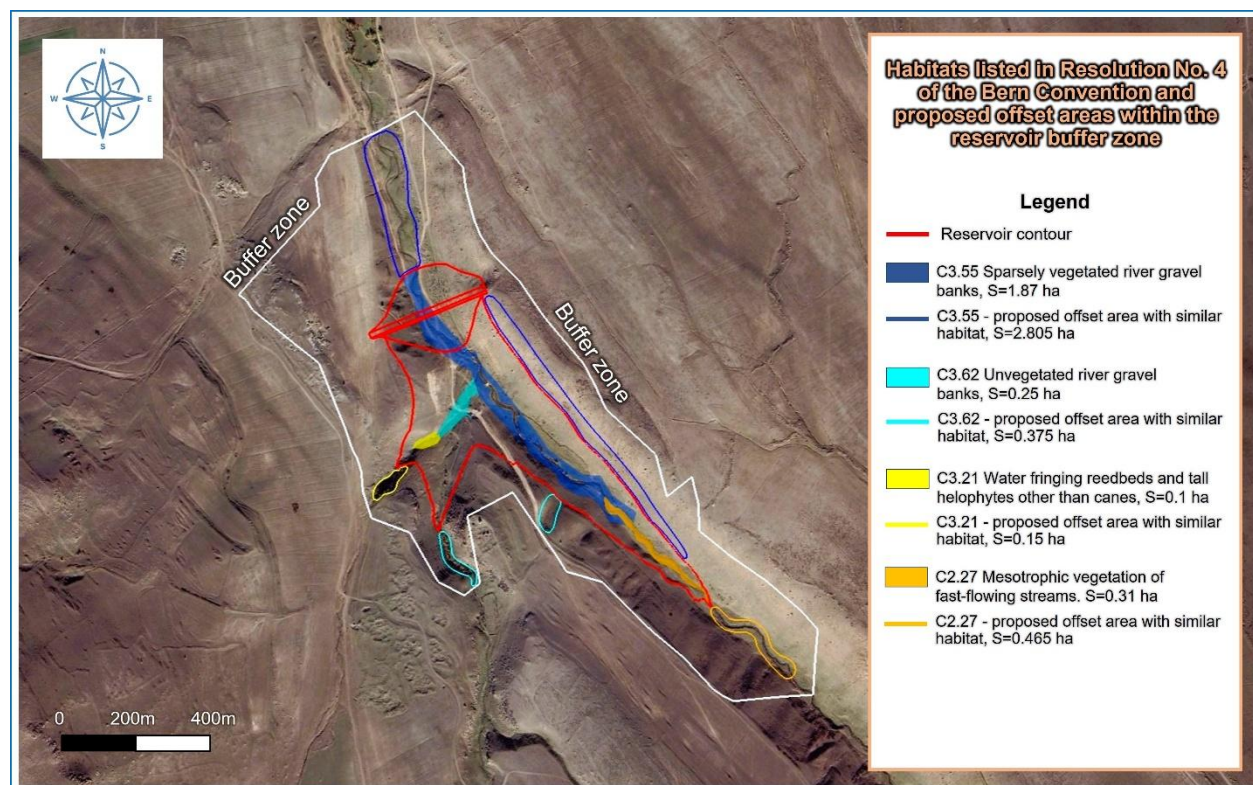
Species	Codes of suitable habitats	Residual impact		Offset		Multiplier
		Physical Loss (ha)	Calculated loss (Qha)	Gain needed (Qha)	Gain needed, physical (ha)	
		a	b	c	d	c/b
Birds Corn crane 1-2 pairs Red-backed Shrike 2-3 pairs Ortolan Bunting 2-3 pairs	C2.27, C3.21, C.3.55, E2.162-AM, F2.3371-AM	10.25	8.336	12.503	15.375	1.5

The losses and gains will have to be precisely assessed within the framework of a detailed Biodiversity Offsetting Management Plan (BOMP), based on fieldwork to identify potential conservation and construction areas for the different targets.

Preliminary, potential offsetting areas for the habitats (ecosystems) located in the buffer zone are presented in [Figure 5](#). But taking into account that auxiliary objects are planned to be constructed in the buffer zone, locations of some offsetting areas will have to change. In this case the targeted habitats are available beyond the protection zone, upstream and downstream.

Offsetting areas for the bird species are suggested upstream focusing on the most suitable meadow and steppe habitats that are available at the scale of the larger EAAA beyond the protection zone. But the precise locations will need to be identified during the BOMP process through fieldwork.

Figure 5. Offsetting areas suggested for the four habitats - PBFs



9.2 Offsetting measures

Offset measures are proposed to achieve>NNL for the PBF. The details are presented in the measures below; the BAP consists of the following four components.

BAP 1: Community-based conservation of valuable habitats (PBF)	
THE SCOPE OF THE MEASURE	
Objective:	Set-up a community-based conservation of valuable habitats (PBF) in the vicinity of the project area, by conciliating local development objectives and biodiversity conservation objectives
CH/ PBF concerned	PBFs: • C3.21 Water fringing reedbeds and tall helophytes other than canes • C2.27 Mesotrophic vegetation of fast-flowing streams • C3.55 Sparsely vegetated river gravel banks • C3.62 Unvegetated river gravel banks
MEASURE IMPLEMENTATION	
Project phase	Project lifespan (pre-construction, construction, operation and maintenance)
Measure description	<i>Pre-construction phase</i> 1. Study the valuable habitats (four PBFs) in the Project area, their plant composition and ecological structure, specify areas, 2. Study the reservoir protection/buffer zone and areas around it, upstream and downstream of it to define existing habitats including those that are equivalent to the priority lost habitats, 3. Develop a BOMP to provide the conservation of the valuable habitats in the areas most suitable for conservation (using the «averted loss» offsetting approach); the BOMP will include a Riverine Habitats Construction Plan to plan and support the construction and maintenance of the habitat similar to C3.55 habitat in the suitable areas along the reservoir's banks (using the «restoration» offsetting approach); agree the BOMP with all stakeholders. But the final determination of the boundaries of habitats that are equivalent to the valuable lost habitats and the conservation procedures should be detailed in the BOMP and set-up precisely by scientists and the Client in close collaboration with the local community in order to ensure the sustainability of the conserved habitats. <i>Construction, operation and maintenance</i> 4. Ensure the conservation of valuable habitats in agreed borders
Timeline	Year 1: Seasonal habitat studies, development of a BOMP, workshop and consultations with local community, the BOMP approval Year 2 and onwards: Implement the conservation measures
Location	Predominantly within the reservoir's water protection zone; possibly in the area around, upstream and downstream of the zone
Party responsible for implementing the measure	Client - overall responsibility
Institutional or technical support	Project Implementation Unit Support Consultant - biodiversity expert / geobotanist
Plan to ensure the measure durability	• Dedicate an internal Client staff responsible for Biodiversity conservation linked with local community

Implementation constraints and other remarks:	- Necessary involvement of local community - Necessary management and control of the Client - Law enforcement (for protection of the reservoir's water protection zone)
MEASURE MONITORING	
Key Performance Indicators (KPI) and targets	- Field report on the study of habitats - Developed BOMP - Consultations and workshop with local communities to set-up the habitat conservation - The area of C3.21 Water fringing reedbeds and tall helophytes other than canes (target 0.15 ha) - The area C2.27 Mesotrophic vegetation of fast-flowing streams (target 0.465 ha) - The area C3.55 Sparsely vegetated river gravel banks (target 2.805 ha) - The area C3.62 Unvegetated river gravel banks (target 0.375 ha) - Annual report presenting the progress of implementation and the results and analysis of the conservation process monitoring (target = the availability of the annual report)
Monitoring frequency	annually during the two first years, then bi-annually
Party responsible for monitoring the measure	Supervision Engineer

BAP 2: conservation and construction of the sedentary species' habitats (PBF/CH)**THE SCOPE OF THE MEASURE**

Objective	Set-up a conservation and construction/support of the sedentary species habitats (PBF)
CH/ PBF concerned	PBF: Armenian steppe viper

MEASURE IMPLEMENTATION

Project phase	Project lifespan (pre-construction, construction, operation and maintenance)
Measure description	<i>Pre-construction phase</i> - Study the Project area to estimate the structure and size of the sedentary species population, areas of habitats, - Study the reservoir's water protection /buffer zone and adjacent areas to estimate habitats suitable for the population relocation/development, including the "capacity" of the habitats and possibilities to construct additional habitats to increase their capacity; define boundaries of the suitable habitats, - Develop a BOMP, agree the BOMP with all stakeholders, - Within the framework of the BOMP: - provide additional rocky outcrops to increase habitat capacities for the Armenian steppe viper as well as for other reptilian inhabiting species (snakes and lizards),

	- survey the Project area to capture as many individuals as possible, first of all Armenian steppe viper, and other species of snakes and lizards and to move them to the safe habitats identified and/or arranged. Taking into account that auxiliary objects are planned to be constructed in the buffer zone, according to the preliminary estimation, rocky habitats for reptilians can be defined to the south from the reservoir site, outside the buffer zone. The final determination of the habitats should be detailed in the BOMP and set up precisely by zoologists and the Client specialists in close collaboration with local community in order to ensure the sustainability of the habitats. <i>Construction, operation and maintenance</i> 5. Before filling the reservoir, survey the flooded area and capture as many individuals as possible (if remained), and to move them to the safe habitats identified and/or arranged before 6. Monitor and maintain forest and rocky habitats of the species, 7. Introduce/support a sustainable grazing practice in the areas that surround the planned reservoir, as the improved quality of the habitats can provide higher and diverse food supply for reptilians (increasing insect quantity), thus supporting an increase in the density of the snake and lizard species. This measure requires additional involvement, awareness and sensitization of the local community that will be planned in the BOMP. Reptilians safely relocation and settlement procedures will be elaborated in terms of protocols developed basing on national and international requirements. The following national regulatory documents of the RA will be followed: ▪ The Procedure for relocating wild animals to natural conditions³², ▪ The Procedure for issuing permits for the resettlement of wild animals into natural conditions³³ Internationally coordinated approaches for animal relocation are presented in IUCN Guidelines for Reintroductions and Other Conservation Translocations³⁴. For the species-specific approaches and technics the following manuals have to be followed: 1. Reptile Habitat Management Handbook https://www.arc-trust.org/shop/reptile-habitat-management-handbook 2. Reptile Guidance for Developers https://www.lbp.org.uk/downloads/Publications/PlanningGuidance/NE_reptilesguidelines.pdf Taking into account that Armenian steppe viper is a poisonous snake, capture and relocation of the species individuals have to be carried out by the herpetologist experienced in snake catching
Timeline	Year 1: Seasonal studies, development of a BOMP, workshop and consultations with local community, the BOMP improvement

³²Approved by the RA governmental decree #758-N from 23.03.2024 <https://www.arlis.am/hy/acts/193176>

³³Approved by the order of the Ministry of Environment of the RA #113-N from 03.04.2024 <https://www.arlis.am/hy/acts/191577>

³⁴IUCN/SSC (2013). Guidelines for Reintroductions and Other Conservation Translocations. Version 1.0. Gland, Switzerland: IUCN Species Survival Commission <https://portals.iucn.org/library/efiles/documents/2013-009.pdf>

	Year 2: habitats construction, relocation of the species individuals Year 3 and onwards: monitoring of the populations
Location	Predominantly within the reservoir's water protection zone, possibly in the area around, upstream and downstream of the zone
Party responsible for implementing the measure	The Client - overall responsibility
Institutional or technical support	Project Implementation Unit Support Consultant - biodiversity expert / zoologist
Plan to ensure the measure durability	Dedicate an internal Client staff responsible for Biodiversity conservation linked with local community
Implementation constraints and other remarks	- Necessary involvement of local community - Necessary management and control of the Client - Law enforcement (for protection of the reservoir's water protection zone)
MEASURE MONITORING	
Key Performance Indicators (KPI) and targets	- Field report on the study of the species populations and habitats - Developed BOMP - Consultations and workshop with local community - Area of inhabiting reptilians: Armenian steppe viper (target will be established after the pre-construction survey) - Annual report presenting the progress of implementation and the results and analysis of the monitoring (target = the availability of the annual report)
Monitoring frequency	annually during the first three years, then bi-annually
Party responsible for monitoring the measure	Supervision Engineer

BAP 3: conservation and construction of the bird species' habitats (PBF)**THE SCOPE OF THE MEASURE**

Objective:	Set-up a conservation and construction/support of the bird species' habitats (PBF)
CH / PBF concerned	PBFs: - Corn crane - Red-backed Shrike - Ortolan Bunting

MEASURE IMPLEMENTATION

Project phase	Project lifespan (pre-construction, construction, operation and maintenance)
Measure description	<i>Pre-construction phase</i> - Study the reservoir's water protection zone and adjacent areas to estimate habitats suitable for the bird species, including the "capacity" of the habitats and possibilities to construct additional habitats to increase their capacity; define suitable habitats, - Develop a BOMP, agree the BOMP with all stakeholders, - Within the framework of the BOMP implementation.

	- Plant additional thorny bush species in the vicinities of the Project area as breeding spots for Red-backed Shrike, helping to discover new breeding sites. The habitats that are most suitable for the species are steppe, meadow, grass and scrub habitats. According to the preliminary estimation, habitats potentially suitable for the bird species can be ca. 15 ha located outside of the buffer zone; the upstream areas look as the most suitable. The final determination of the habitats should be detailed in the BOMP and set up precisely by zoologists and Client specialists in close collaboration with local community in order to ensure the sustainability of the habitats. <i>Construction, operation and maintenance</i> 4. Monitor and maintain the planted bush species, 5. Introduce/support sustainable grazing practices in the local community, which would improve the quality of grassland habitat, increase the number and diversity of invertebrates, and support the necessary food supply for the bird species This measure requires additional involvement, awareness and sensitization of the local community that will be planned in the BOMP.
Timeline	Year 1: Seasonal studies, development of a BOMP, workshop and consultations with local community, the BOMP approval Year 2: habitats construction Year 3 and onwards: monitoring of the populations
Location	The reservoir's water protection zone, areas around, upstream and downstream of the zone
Party responsible for implementing the measure	Client - overall responsibility
Institutional or technical support	Project Implementation Unit Support Consultant - biodiversity expert / zoologist
Plan to ensure the measure durability	• Dedicate an internal Client staff responsible for Biodiversity conservation linked with local community
Implementation constraints and other remarks	• Necessary involvement of local community • Necessary management and control of the Client • Law enforcement (for protection of the reservoir's water protection zone)
MEASURE MONITORING	
Key Performance Indicators (KPI) and targets	• Field report on the study of the species habitats • Developed BOMP • Consultations and workshop with local community • The area inhabited by birds: Corn crake, Red-backed Shrike, Ortolan Bunting (target 15.375 ha) • Annual report presenting the progress of implementation and the results and analysis of the monitoring (target = the availability of the annual report)
Monitoring frequency	• annually during the first three years, then bi-annually
Party responsible for monitoring the measure	Supervision Engineer

BAP 4: conservation and construction of the insect species' habitats (PBF)	
THE SCOPE OF THE MEASURE	
Objective:	Set-up a conservation and construction/support of the insect species' habitats (PBF)
CH / PBF concerned:	PBF: • Ground beetle <i>Carabus cribratus</i>
MEASURE IMPLEMENTATION	
Project phase	Project lifespan (pre-construction, construction, operation and maintenance)
Measure description:	<i>Pre-construction phase</i> 1. Study the Project area to estimate the size of the beetle species population and areas of the habitats, lost by this species, 2. Study the reservoir's water protection zone and adjacent areas to estimate habitats suitable for the species, including the "capacity" of the habitats and possibilities to construct additional habitats to increase their capacity; define suitable habitats, 3. Develop a BOMP, agree the BOMP with all stakeholders, 4. Within the framework of the BOMP implementation. - Develop similar habitats in unflooded areas. The insect species habitats have to coincide with the conserved valuable habitats, and habitats conserved/constructed for the reptilian and bird species (see BAP1-3) supporting the food chains. The determination of the habitats should be detailed in the BOMP and set up precisely by entomologists and Client specialists in close collaboration with local community in order to ensure the sustainability of the habitats. <i>Construction, operation and maintenance</i> 5. Monitor and maintain the habitats, 6. Introduce/support sustainable grazing practices in the local community, which would improve the quality of grassland habitat and increase the number and diversity of invertebrates. This measure requires additional involvement, awareness and sensitization of the local community that will be planned in the BOMP.
Timeline	Year 1: Seasonal studies, development of a BOMP, workshop and consultations with local community, the BOMP approval, Year 2: habitats construction, Year 3 and onwards: monitoring of the population.
Location	Predominantly within the reservoir's water protection zone
Party responsible for implementing the measure	Client - overall responsibility
Institutional or technical support	Project Implementation Unit Support Consultant - biodiversity expert / zoologist
Plan to ensure the measure durability	• Dedicate an internal Client staff responsible for Biodiversity conservation linked with local community
Implementation constraints and other remarks	• Necessary involvement of local community • Necessary management and control of the Client

	• Law enforcement (for protection of the reservoir's water protection zone)
MEASURE MONITORING	
Key Performance Indicators (KPI) and targets	• Field report on the study of the species and their habitats • Developed BOMP • Consultations and workshop with local community • The area inhabited by the beetle (target will be established after the pre-construction survey) • Annual report presenting the progress of implementation and the results and analysis of the monitoring (target = the availability of the annual report)
Monitoring frequency	• annually during the first three years, then bi-annually
Party responsible for monitoring the measure	Supervision Engineer

10. Biodiversity monitoring

After the completion of the studies and surveys, a robust baseline will be established. Only after that can the BMP be updated and detailed. Reliable and high-quality monitoring and evaluation are the keys to adaptive management. Adaptive management is a good practice that is necessary to ensure the efficiency of the mitigation and offsetting.

For the PBFs, it is proposed to establish the long-term joint-monitoring of habitats and indicator species with the involvement of the national/local key specialists/stakeholders. The following two types of monitoring will be maintained: 1) the monitoring of mitigation measures and 2) the monitoring of habitats and species of the BOMP.