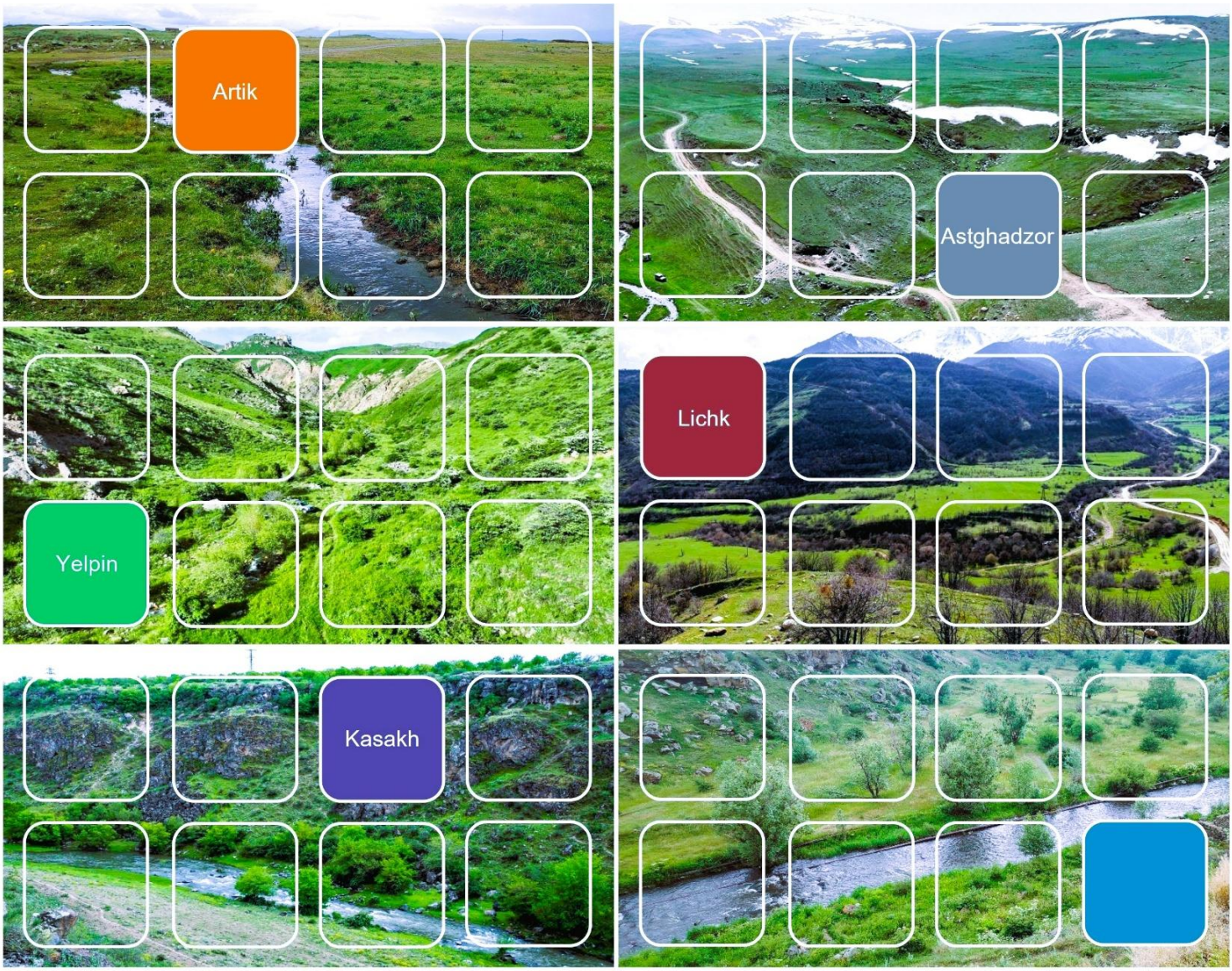


Source: Photos taken by the Consultant during the site visits

WATER RESERVOIRS PROJECT - ARMENIA

ESIA for the Reservoirs Construction Project

NON-TECHNICAL SUMMARY

Rev02

December 2025

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 Ltd.
www.atms.am

WATER RESERVOIRS PROJECT - ARMENIA

ESIA for the Reservoirs Construction Project

NON-TECHNICAL SUMMARY

Rev02

Consultancy Services Contract № 2023.009567

Prepared for:

- **European Bank for Reconstruction and Development**
- **Water Committee under the Ministry of Territorial Administration and Infrastructure of the Republic of Armenia**

Prepared by:

ATMS Solutions Ltd. (Armenia)
Director: Dr. Artak Ter-Torosyan
1, 11 Griboedov str.,
0051, Yerevan, Armenia
Tel.: +37499 109495
E-mail: artak.ter-torosyan@atms.am
www.atms.am

and

Ecoline International Ltd. (Bulgaria)
Director: Dr. Maia Gachechiladze-Bozhesku
Tel.: +380 951 100 727
+ 359 876 63 0522
E-mail: mgachechiladze@ecoline-int.org
www.ecoline-int.org

Document Preparation and Issue:

Version	Status	Prepared by	Reviewed by	Issued by	Date of issue
Rev01	1st draft of the Non-Technical Summary of the ESIAs for Reservoirs Construction Project	A. Ter-Torosyan			10.12.2025
Rev02	Final draft of the Non-Technical Summary of the ESIAs for Reservoirs Construction Project		A. Ter-Torosyan	A. Ter-Torosyan	16.12.2025

Disclaimer

This Non-Technical Summary (NTS) summarises the results of the Environmental and Social Impact Assessment (ESIA) reports completed for the Kasakh, Lichk, Yelpin, Artik and Asthgadzor reservoirs. The ESIAs are inherently predictive in nature, as they are completed well in advance of the actual implementation of the Project being assessed. The information on which the assessments are based comes from multiple sources including the detailed design documents, reports on studies that were conducted as part of the project design and ESIA investigations, records of meetings, other publications, various databases, data that is collected by the teams conducting the national Environmental Impact Assessment (EIA) and ESIA, anecdotal information and others. It is extremely difficult to verify the information that is used other than through testing the logic of that information as well as that can be done. In preparing this document, care has been taken to ensure that whatever information has been available has been accurately reproduced in the ESIAs. Should information be found in this document that is incorrect then it is respectively requested that the incorrect information be brought to our attention so that the ESIA can be updated accordingly. The ESIA Consultant cannot be held accountable for information that have accepted and reproduced in good faith regardless of the consequences of such information being incorrect. Anyone reproducing information contained in this NTS does so entirely at their own risk.

List of Abbreviations

BAP	- Biodiversity Action Plan
CH	- Critical Habitat
CJSC	- Close Joint Stock Company
CIA	- Cummulative Impact Assessment
EBRD	- European Bank for Reconstruction and Development
EIA	- Environmental Impact Assessment
EPRP	- Emergency Preparadness and Response Plan
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
GBVH	- Gender-Based Violence and Harassment
GHG	- Greenhouse Gas
GIP	- Good International Practice
ME	- Ministry of Environment
MTAI	- Ministry of Territorial Administration and Infrastructure
NTS	- Non-Technical Summary
OHS	- Occupational Health and Safety
OHSMP	- Occupational Health and Safety Management Plan
GA	- Government of Armenia
PBF	- Priority Biodiversity Features
PIU	- Project Implementation Unit
PR	- Performance Requirement
RA	- Republic of Armenia
RF	- Resettlement Framework
RP	- Resettlement Plan
SDMP	- Spoil Disposal Management Plan
SEP	- Stakeholder Engagement Plan
SPMP	- Spill Prevention and Management Plan
SSESMP	- Site-Specific Environmental and Social Management and Monitoring Plan
ToR	- Terms of Reference
WCRA	- RA Water Committee
WMP	- Waste Management Plan

Table of Content

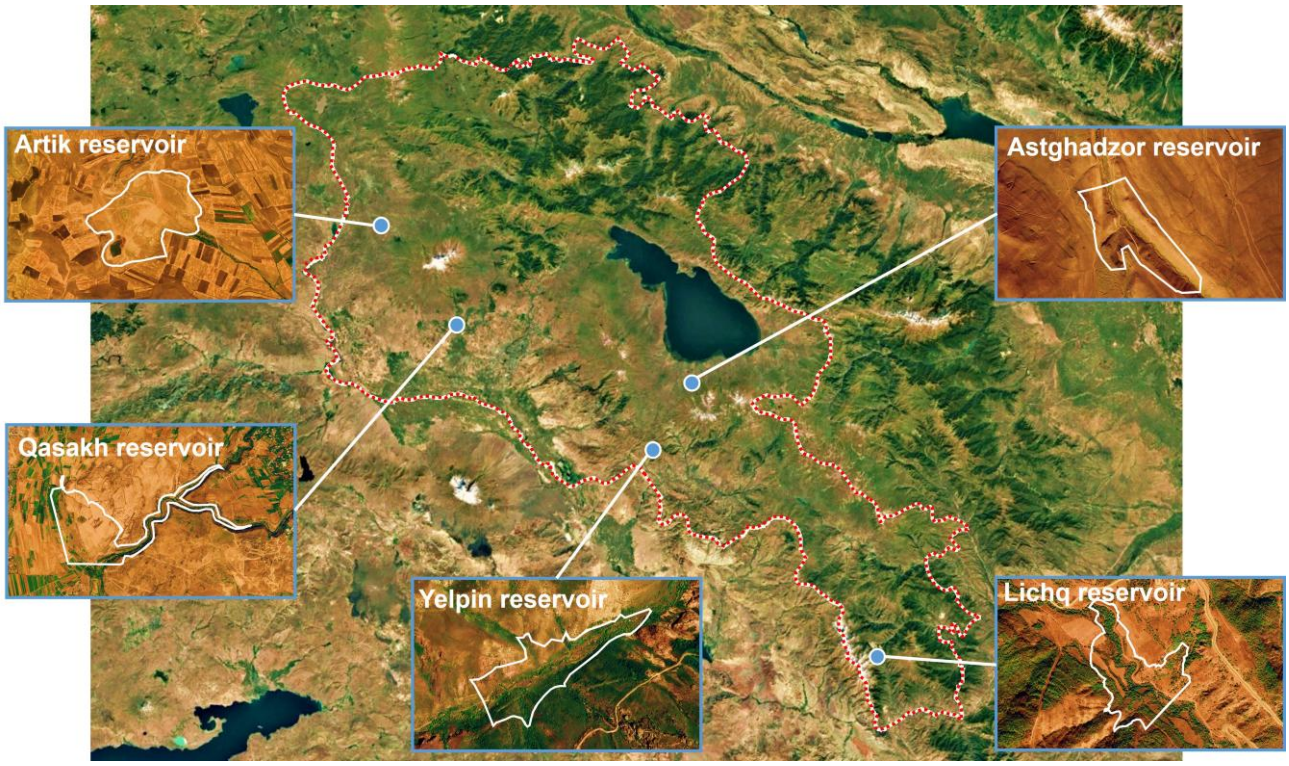
1. Introduction

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 be on-lent to Water Committee under the Ministry of Territorial Administration and Infrastructure (the 'Client'), as the implementing agency, to finance the construction of five water reservoirs in different regions (Marzes) of Armenia (the Project):

- Kassakh reservoir in Aragatsotn Marz[1],
- Lichk reservoir in Syunik Marz,
- Yelpin reservoir in Vayots Dzor Marz,
- Artik reservoir in Shirak Marz,
- Astghadzor reservoir 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') reports for the Kasakh, Lichk, Yelpin, Artik and Asthgadzor reservoirs and associated documents must be elaborated, followed by their public disclosure for a minimum period of 120 days. This framework Non-Technical Summary (NTS) presents the key findings of all five ESIAs and is form part of the Project's disclosure package.

2. Project Description

2.1 Project Rationale

The GA has prioritised the management of water resources for agricultural use and plans to construct 17 reservoirs within the EU support initiative 'Recovery, resilience and reform: post 2020 Eastern Partnership priorities' to the Government of Armenia to enhance the water and food security level in the country. The

[1]«Marz» means «Region» in Armenian

Program for the 17 reservoirs construction was developed by the Ministry of Territorial Development an Infrastructure (MTAI) on 2022 and approved by the GA.

The objective of the Program is to implement large-scale reservoir construction in Armenia to regulate surface water flow, manage water resources effectively, and increase both the availability of usable water and the area of agricultural land to be irrigated. The construction of the planned reservoirs will support the conversion of the existing irrigation system to gravity-based operation, which will help reduce power consumption and, consequently, lower the cost of agricultural production.

2.2 Crop Cultivation in the Project Areas

The irrigation water demand in the Project areas primarily depends on the types of cultivated crops, which are influenced by prevailing weather conditions, precipitation levels, soil characteristics, and the availability of water resources. The regions where the reservoirs will be constructed fall within different landscape and climatic zones, each with distinct agroecological conditions that shape cropping patterns and determine crop-specific water requirements. These variations result in differing irrigation needs across the Project sites. The principal crops cultivated in the respective Project regions are summarized in **Table 1**.

Table 1. Types of crops cultivated in the Project areas

Kasakh	Yelpin	Lichk	Artik	Astghadzor
Orchards - 36% Vegetables - 23% Vineyards - 18% Potato - 10% Perennial grasses and legumes - 9% Winter wheat - 2% Cereal crops such as barley - 2%	Orchards - 55% Wheat - 20% Vineyards - 18% Vegetables - 4% Perennial grass - 3%	Mainly orchards (figs, pomegranates, and persimmons, pear, apple, etc.)	Potato - 53% Vegetables - 40% Wheat - 5% Orchards - 2%	Wheat - 39% Potato - 43% Vegetables - 18% Orchards (prospective)

As a result of the Project's implementation, the area of irrigable agricultural land will increase and the diversity of cultivated crops will be expanded. The Project will also enhance opportunities for cultivating new types of fruits and vegetables, while increasing agricultural yields and overall efficiency.

2.3 Project Overview

The aerial view of the sites selected for the construction of the reservoirs are shown in **Figure 2**.

Figure 2. Aerial view of the sites selected for the reservoirs' construction

Astghadzor site *Yelpin site* *Lichk site*

Artik site *Kasakh site*

Key data/information about the Project's reservoirs as well as their technical characteristics are summarised below in **Table 2**.

Table 2. Summary of key data for the Project's five reservoirs

Key data	Kasakh	Yelpin	Lichk	Artik	Astghadzor
Geographical location of the reservoirs	Voskehat, Voskevaz and Oshakan villages of Ashtarak community (RA Aragatsotn Marz) and Amberd and Aygeshat villages of Khoy community (RA Armavir Marz).	Yelpin village of Areni community in the RA Vayots Dzor Marz.	Lichk village of Meghri community in the RA Syunik Marz.	Artik community in the RA Shirak Marz.	Astghadzor and Zolaqar villages of Martuni community in the RA Gegharkunuk Marz.
Command area	Aragats, Haytagh, Aghavnatun, Tsaghkalanj, Arshaluys, Doghs, Leramerdz, Geghakert, Hovtamej, Tsiatsan, Tsaghkunq, Mrgastan, Shahumyan, Khoronk, Griboyedov, Amberd Aygeshat, Oshakan, Voskehat, Voskevaz, Artimet, Ferik, Aknalich and Echmiadzin in the RA Armavir Marz.	Yelpin and Rind villages of Areni community in the RA Vayots Dzor Marz.	Agarak, Alvank, Karchevan, Lehvaz, Meghri, Nrnadzor, Shvanidzor, Vardanidzor and Lichk villages of Meghri community in the RA Syunik Marz.	Nor Kyanq, Vardaqar, Panik, Meghrashen, Anushavan, Pemzashen and Tufashen villages of Artik community in the RA Shirak Marz.	Astghadzor, Zolaqar, Vaghashen villages and partly Martuni town of Martuni community in the RA Gegharkunuk Marz.
Area to be irrigated by the Project	503 ha	300 ha	797 ha	300 ha	740 ha
Feeding rivers	Kasakh and Amberd Rivers	Yelpin River	Lichk River	Artikjur River	Astghadzor River
Permanent land intake for the Project needs	145.26 ha	14.7 ha	33.0 ha	31.607 ha	42.011 ha
Reservoir active capacity	10.0 mln.m^3	0.81 mln.m^3	3.76 mln.m^3	1.52 mln.m^3	1.51 mln.m^3
Reservoir surface area (at top water level)	89.7 ha	5.43 ha	27.1 ha	22.0 ha	13.53 ha
Type of reservoir	On-stream	On-stream	On-stream	On-stream	On-stream
Full Supply level (FSL)	977.0 masl[2]	1695,0 masl	1605.0 masl	1668.1 masl	2155.0 masl
Maximum Water Level (MWL)	978.524 masl	1695,6 masl	1605.6 masl	1668.8 masl	2155.93 masl
Dead Storage Level (DSL)	961.1 masl	1674.0 masl	1560.0 masl	1662.0 masl	2133.6 masl
Material of the dam body	Pebble-gravel	Pebble-gravel	Cobble-pebble, stone	Pebble-gravel	Pebble-gravel
Dam length	1686 m	168.0 m	367 m	610.0 m	260 m

[2]masl - meter above sea level

Key data	Kasakh	Yelpin	Lichk	Artik	Astghadzor
Width of the crest	8 m	8 m	8 m	6 m	10 m
Project components	Dam, construction (diversion) outlets 1 and 2, irrigation outlet (offtake), bottom outlet, emergency spillway	Dam, spillway, construction spilway, irrigation outlet and main pipeline.	Dam, construction (diversion) outlet, irrigation outlet, emergency spillway, service facilities and structures.	Dam, reservoir body, construction (diversion) channel, feeding channel, main irrigation channel, outlet, emergency spillway, electricity supply.	Dam, spillway, construction (diversion) outlet, irrigation main outlet OJ 1 and irrigation pipelines OJ 1-1 and OJ 1-2, emergency spillway.
Duration of the construction works	39 months	34 months	45 months	33 months	36 months

The project life cycle comprises the design (current phase), construction, and operation and maintenance phases. The construction of all five reservoirs will require: (i) borrow pits for sourcing sandy clay, gravel–pebble, and stone materials; (ii) construction camps; (iii) access roads to the construction sites; (iv) temporary topsoil storage areas; (v) spoil disposal sites; (vi) reinforced concrete, metallic, and HDPE pipes; and (vii) construction machinery and heavy-duty trucks. In addition, blasting operations will be required at certain locations.

Various technical, engineering-geological, seismic, hydrological, economic, and environmental factors were considered during the project design study. Previous surveys conducted over the past decades were also taken into account. Special attention was given to available water flows (maximum, average, and environmental), seismic stability of the selected sites, infiltration losses from reservoir and dam foundations, the presence of soil erosion and landslide risks, the cost and transportation of construction materials, the proximity of protected natural areas and cultural monuments, and other relevant factors.

Once the reservoirs are constructed, they will be commissioned and operated by "JRAR" Close Joint Stock Company (CJSC) under the MTAI, which is the operator responsible for Category II reservoirs in Armenia. "JRAR" CJSC will also be responsible for the maintenance of the reservoirs during their operation.

2.4 Project Alternatives

During the project design phase and the ESIA studies, various alternative options and solutions were analysed and evaluated, taking into consideration geographical, historical, technical, geological, environmental, and cultural heritage considerations, including the following:

1) The **zero-option** scenario, meaning that the reservoirs would not be constructed or operated, was considered for all five reservoir sites. It can be concluded that the zero option presents several disadvantages compared with the Project implementation scenarios, as it limits opportunities for agricultural development, results in additional electricity consumption due to reliance on mechanical pumping instead of gravity, and leads to other associated inefficiencies.
2) **Alternative storage capacities** were discussed for all project reservoirs, taking into account water availability in the feeder streams, precipitation levels, recent climate change trends and projections, irrigation water demand in the command areas, and other relevant factors. The final reservoir capacities were selected based on a comprehensive assessment of all these considerations.
3) **Alternative dam locations** were analyzed for the Astghadzor, Yelpin, and Lichk reservoirs. For the Kasakh and Artik sites, relocating the dam was not feasible due to the presence of critical sensitive receptors (such as a cemetery and residential areas in the case of Kasakh) and historical constraints. In particular, the selected Artik site had previously been used as a reservoir, but the dam failed in 1994 as a result of flooding.
4) A Multi-Criteria Analysis (MCA) of the Project alternatives was conducted to identify the most preferable dam location options for the Astghadzor and Yelpin reservoirs. The assessment applied a common set of criteria, including environmental and social impacts, economic and technical feasibility, water supply reliability, flood control and drought mitigation, and cultural heritage considerations. For the other sites, an MCA was not required due to strict upstream and downstream constraints.

3. Legal, Regulatory and Institutional Framework

The ESIAs for the Project's reservoirs has been carried out in accordance with:

- RA Law *On Environmental Impact Assessment and Expert Examination (2014, revised in 2023)*[3] as well as applicable Armenian legislation on protection, management and conservation of nature resources, occupational and public health and safety, labour management, biodiversity conservation, country's climate commitments, culture heritage protection, etc.,
- Relevant international agreements and treaties ratified by Armenia and transposed into the national legislation, including International Labour Organisation (ILO) fundamental conventions,
- EBRD's E&S Policy (2019) and associated Performance Requirements (PRs),
- Applicable Good International Practice (GIP) guidelines on resettlement, biodiversity, forced labour, gender issues, non-discrimination and equal opportunities; building and construction activities; occupational health and safety, grievance management, worker accommodation, ICOLD Bulletins, etc.,
- Relevant European Union (EU) Directives, including inter alia: Directive 2011/92/EU, as amended by Directive 2014/52/EU, on assessment of the effects of certain public and private projects on the environment (the EIA Directive), Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control), Directive 2009/147/EC on the conservation of wild birds (the Birds Directive), Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive), Directive 2000/60/EC establishing a framework for Community action in the field of water policy (the Water Framework Directive), Directive 2008/98/EC on waste (Waste Framework Directive), Directive 2003/10/EC on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise), Directive 2002/44/EC on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration), etc.

Several state bodies and their subordinate structures or units are involved in water management in Armenia. The main roles and responsibilities of these bodies in the field of irrigation water management are outlined below:

- **The Ministry of Environment (ME)** is the authorized body responsible for water resources management and protection in Armenia. It is tasked with developing and implementing the National Water Policy, National Water Program, and river basin management plans; protecting natural water bodies, preparing annual water balances and overseeing their implementation.
- **The Environmental Impact Expert Examination Center (EIEEC)**, acting on behalf of the Ministry of Environment (ME), is responsible for organizing and implementing the expert examination and related processes for framework and design documents (projects) initiated by state and private entities, as well as individuals. Among other functions, the EIEEC ensures stakeholder participation in public discussions, facilitates the notification and involvement of interested parties in the expert examination process, and issues environmental impact expert examination conclusions.
- **The Water Resources Management Department**, under the ME, is responsible for regulating water resources management issues, including approving surface and groundwater extraction volumes, issuing water use permits, maintaining the State Water Cadastre, and managing water use related data. It also prepares documents for the suspension, amendment, or cancellation of water use permits.
- **The Ministry of Territorial Administration and Infrastructure (MTAI)**, along with its affiliated authorities and organizations, develops policy and regulations for the overall management of water infrastructure systems.
- **The Water Committee**, under the MTAI, is designated by the Water Code as the Water System Management Body. It is responsible for developing and implementing investment programs and submitting proposals to the Regulatory Commission concerning regulated tariffs and water system use permits.
- Irrigation in Armenia is managed by **"JRAR" CJSC** and 15 **Water Users Associations (WUAs)**. "JRAR" CJSC, a 100% state-owned enterprise, handles water abstraction and delivery, and is responsible for the maintenance and operation of first- and second-category irrigation systems and reservoirs. The WUAs operate other reservoirs.

[3] https://www.arlis.am/documentview.aspx?docid=178468

4. Environmental and Social Baseline

4.1 Environmental Baseline

4.1.1 Geography

The geographical descriptions of the sites selected for Project implementation are presented below:

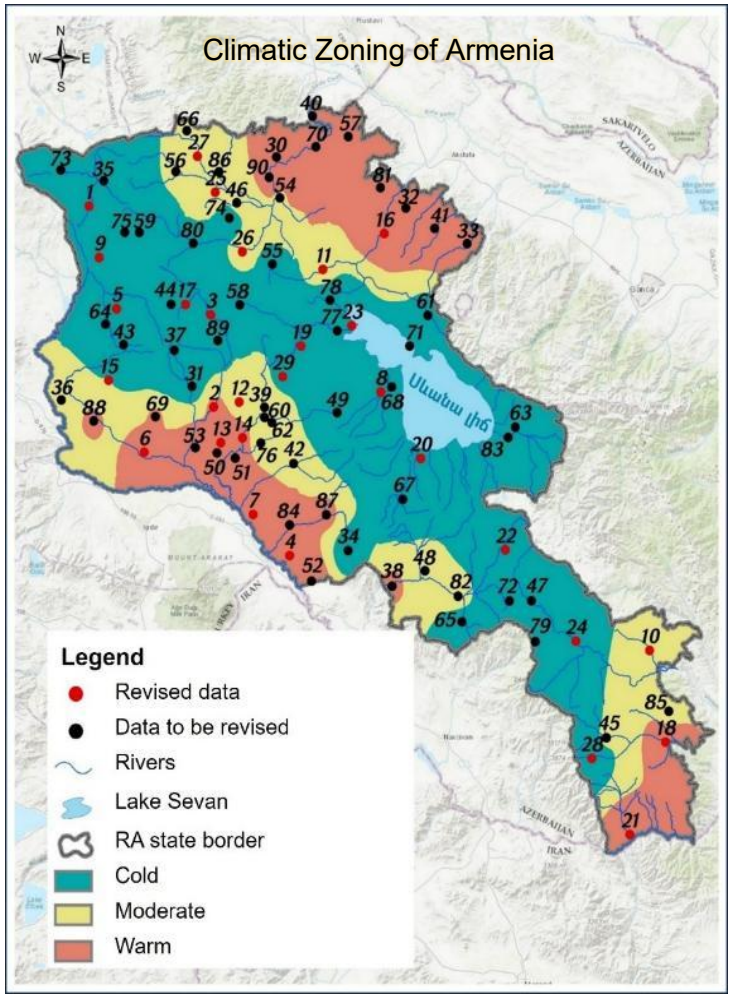
Kasakh	Yelpin	Lichk	Artik	Astghadzor
The Kasakh Reservoir is planned to be constructed within the administrative boundaries of Voskehat, Voskevaz and Oshakan villlages (Ashtarak community, Aragatsotn Marz), and Amberd and Aygeshat (Khoy community, Armavir Marz), at the confluence of the Kasakh and Amberd rivers. The proposed site lies at an elevation of 950-980 masl.	The Yelpin Reservoir is planned to be constructed within the administrative territory of Yelpin rural settlement, on the Yelpin River, a right-bank tributary of the Arpa River, at elevations ranging from 1,650 to 1,700 masl. The Project site is situated in the eastern part of the RA Vayots Dzor Marz.	The Lichk Reservoir is planned to be constructed within the administrative boundaries of the Lichk rural settlement, which is part of the Meghri enlarged community. It will be fed by the Arevik (Lichk) tributary of the Meghri River. The selected site is located at an elevation of 1,529 to 1,602 masl.	The Artik Reservoir is located in the administrative boundaries of Artik enlarged community of Shirak marz, within the Karkachun River basin, northwest of Artik town, at the elevation of 1700 masl.	The Astghadzor Reservoir is planned to be constructed within the administrative boundaries of the Astghadzor and Zolaqar rural settlements. It will be located on the Astghadzor River, at an elevation of 2,100-2,160 masl.

4.1.2 Climate

The climate in Armenia is subtropical, arid and continental. Along with its geographical location, the country's relief and protection by mountain ranges play a major role in shaping the climate. The Greater Caucasus mountains, the proximity of the Caspian and Black Seas, Iranian and Asia Minor plateaus are significant.

According to the RA Construction Norms CN 22-01-2024 *Construction Climatology*[4] the Project sites are situated within the following climatic zones:

- Kasakh (located between points №2 and №53) - warm,
- Yelpin (№38) - warm,
- Lichk (located between №21 and №28) - moderate,
- Artik (№5) - cold,
- Astghadzor (№20) - cold.



Meteorological parameters	Kasakh	Yelpin	Lichk	Artik	Astghadzor
Average annual temperature, °C	11.9	12.3	7.0	6.3	5.9
Average relative humidity, %	65	59	68	68	68
Annual precipitation, mm	377	385	608	554	522
Number of days with snow cover	48	36	112	100	103

[4] https://www.arlis.am/DocumentView.aspx?DocID=188846

4.1.3 Climate Change in Armenia

The results of the CCSM4[5] Global Climate Model used and reported in the NC3[6] were reviewed for the projection of changes in air temperature and atmospheric precipitation, as well as high resolution METRAS (12×12 km) regional climate model was applied.

The average annual temperature across the territory of Armenia is projected to increase by up to 1.6°C by 2040, by 3.3°C - by 2070 and by 4.7°C - by 2100, relative to the baseline annual average (5.5°C) for 1961-1990. As for atmospheric precipitations, these are projected to decline by up to 2.7% by 2040, 5.4% - by 2070 and 8.3% - by 2100, relative to the baseline annual average (592 mm) for 1961-1990.

The projected climate change is expected to have negative effects on the country's water resources, energy, agriculture, ecosystems, human health, settlements and infra structures, as well as a number of other climate-sensitive sectors, including tourism.

4.1.4 Ambient Air Quality

Ambient air quality in Armenia varies significantly by region, influenced by geography, meteorological conditions, industrial activity, and urbanization patterns. Overall, urban areas, experience more air quality challenges, while rural and mountainous regions generally maintain cleaner air. The main air pollutants monitored in Armenia include:

- Particulate Matter (PM10 and PM2.5) - the most critical pollutants, especially in urban and industrial areas.
- Nitrogen dioxide (NO_2) - primarily from vehicle emissions and energy production.
- Sulfur dioxide (SO_2) - associated with industrial facilities and mining operations.
- Carbon monoxide (CO) - mainly from motor vehicles.

4.1.5 Seismic stability

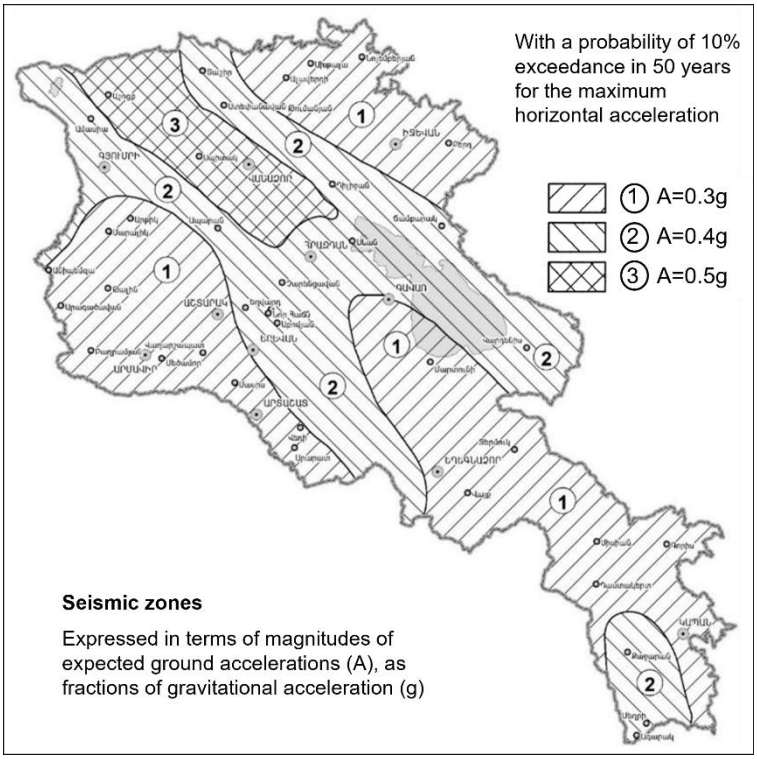
Armenia is located in a seismically active zone. The seismicity of the territory of Armenia has a complex pattern which is conditioned by the presence of numerous active faults and blocks of the earth's crust. Due to the location of Armenia in the collision zone of the Arabian and Eurasian lithospheric plates, tectonic stresses constantly accumulate and discharge here.

As per the RA CN 20.04 *Earthquake-resistant construction, Design norms*[7], Armenia is divided into 1st, 2nd and 3rd seismic zones, with the last the most seismically hazardous. The magnitudes of expected ground horizontal accelerations per seismic zones are:

Seismic zones	1st	2nd	3rd
Ground horizontal accelerations magnitudes a, cm/sec^2	300	400	500

Seismic zones of the selected reservoirs' sites are the following:

Reservoir	Seismic zone	Amax	Seismic hazard zone
Kasakh	1	0.3g	low
Yelpin	2	0.4g	medium
Lichk	2	0.4g	medium
Artik	1	0.3g	low
Astghadzor	1	0.3g	low



[5]CCSM4 - Community Climate System Model, version 4
[6]NC3 - Third National Communication
[7]https://www.arlis.am/documentview.aspx?docid=172012

4.1.6 Natural Hazards

Armenia is prone to several natural hazards due to its geological, topographical, and climatic conditions. Here are the main natural hazards typical to Armenia:

1. **Earthquakes**
   - Armenia is located in a seismically active zone (part of the Alpine-Himalayan seismic belt).
   - Strong earthquakes have historically caused significant damage (e.g., the 1988 Spitak earthquake).
   - Earthquake risk is high in northern and central parts of the country.
2. **Landslides**
   - Common in mountainous and hilly areas, especially where there is deforestation, road construction or heavy rainfall.
   - Southern and northeastern regions are particularly vulnerable.
3. **Floods and Flash Floods**
   - Caused by intense rainfall, rapid snowmelt, or dam breaches.
   - More frequent in spring and early summer.
   - Rivers like the Arpa, Debed, and Vorotan can flood surrounding areas.
4. **Mudflows (Debris flows)**
   - Occur in mountainous river valleys, especially during heavy rains.
   - Common in the Lori, Tavush, Syunik, and Vayots Dzor regions.
5. **Droughts**
   - Particularly affect the Ararat Valley and other agricultural regions.
   - Reduced water availability impacts farming and hydropower.
6. **Hailstorms**
   - Can occur during spring and summer, causing severe damage to crops.
   - Agriculture in regions like Armavir, Ararat, and Shirak is often affected.

4.1.7 Relief and Landscape Zones

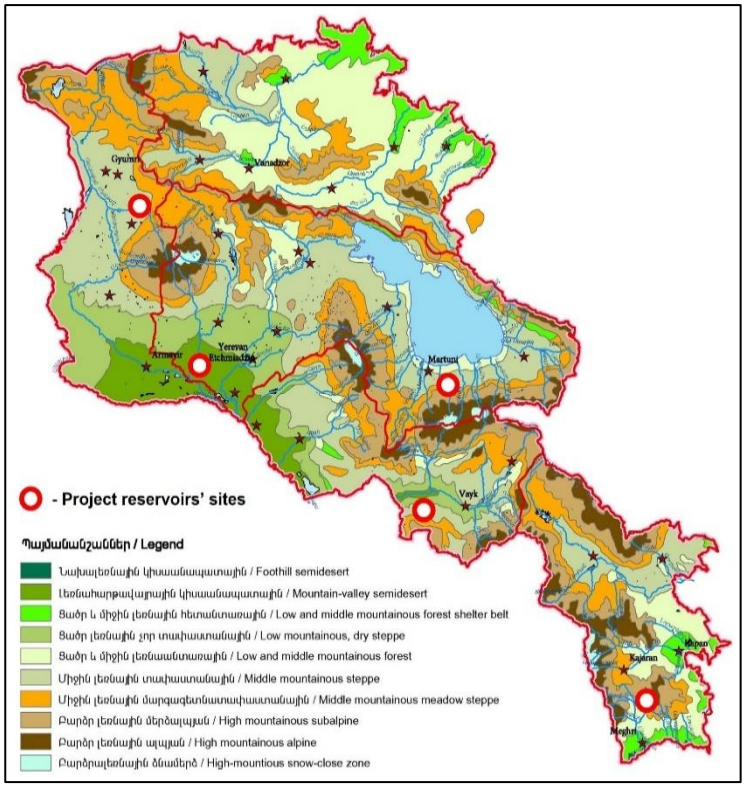
The Yelpin reservoir area occupies the south-western slopes of the Qarkatar Mountains. The entire region is characterized as a typical mountainous area with rugged topography.

The relief of the Kasakh reservoir area is a combination of flat and hilly terrain, featuring valleys and canyons intersected by the rivers' network.

The Lichk site is located on the south-southeastern slopes of the Zangezur and Meghri mountain ranges. The region is characterized as a typical mountainous terrain with a highly dissected relief.

The Artik reservoir area is situated in the southwest Shirak marz and lies on the elevated Armenian volcanic highlands. The regional relief is characterized by a combination of volcanic plateaus, gentle hills, and isolated ridges.

The terrain of the Astghadzor site features a typical mountainous landscape with rugged topography. The lowest point is Lake Sevan, at 1,900 masl, with the relief gradually rising toward the south.



4.1.8 Soil Quality

During the national EIA study, soil samples were collected from the planned Kasakh, Yelpin, Lichk, and Astghadzor sites between March and May 2024. The samples were analyzed in the accredited laboratory of the Hydrometeorology and Monitoring Center using the ISO 17294-2:2016 standard method.

The results were compared with the Admissible Concentration Limits (ACLs) for chemical elements in soil as defined in Sanitary Rules and Norms №2.1.7.003-10, *Hygienic Requirements for Soil Quality*. The analyses showed that the concentrations of vanadium, chromium, manganese, cobalt, nickel, copper, zinc, arsenic, antimony, and lead in all samples were below the established ACLs.

The concentrations of additional elements, including iron, titanium, cadmium, molybdenum, selenium, beryllium, lithium, sodium, magnesium, aluminium, calcium, barium, bismuth, boron, and total phosphorus, were also determined. However, national standards do not establish ACLs for these substances.

4.1.9 Water Quality

The RA Government Decree №75-N establishes the classification system (categories) and environmental quality standards for surface water bodies, including rivers. The Decree defines five water quality classes for Armenia's river basins: Class 1 - Excellent, Class 2 - Good, Class 3 - Fair, Class 4 - Poor and Class 5 - Bad.

During the national EIA study conducted in 2024-2025, water samples were collected from the feeder streams of the planned Kasakh, Yelpin, Lichk, and Astghadzor reservoirs. The results indicate that:

- **Yelpin River** near the planned reservoir site generally falls within the **Excellent** and **Good** categories, except for suspended solids and sulfate ions, which fall under the **Poor** category.
- **Kasakh River** near the planned reservoir site generally falls within the **Excellent** and **Good** categories, except for suspended solids and nitrate ions, which fall under the **Fair** and **Poor** categories, respectively.
- **Lichk River** near the planned reservoir site meets the criteria for the **Excellent** and **Good** categories.
- **Astghadzor River** near the planned reservoir site, generally falls within the **Excellent** and **Good** categories, except for suspended solids and sulfate ions, which are classified as **Fair**.

4.1.10 Groundwater Resources

The results of the geotechnical field surveys indicate that groundwater was encountered in the boreholes at the following depths:

- **Astghadzor site:** Groundwater was detected in some boreholes at depths ranging from 1.2 to 2.2 m, and in certain cases at depths between 40.5 and 44.5 m.
- **Yelpin site:** Groundwater was encountered in nine boreholes at depths ranging from 0.3 to 33.0 m, as well as in some test pits at depths of 3 to 4 m.
- **Kasakh site:** The upper groundwater horizon was recorded at depths of 1.2 to 3.6 m. According to archival data and geophysical materials, the main groundwater horizon is located at a depth greater than 50 m.
- **Artik site:** Stable groundwater horizons were not identified within the reservoir basin or dam site down to the investigated depth of 24.0 m. Groundwater was encountered in two boreholes at depths of 4.5 m and 10.5 m, respectively.
- **Lichk site:** The upper groundwater horizon was observed at depths ranging from 2.8 to 17.6 m. Based on installation conditions, recharge sources, and discharge characteristics, this groundwater is classified as near-surface and unconfined.

4.1.11 Noise and Vibration

The main sources of noise and vibration within the Project areas and their surroundings are agricultural machinery and vehicles used by local residents to access and cultivate their land. These activities are infrequent but can generate noticeable noise. At the Lichk site, additional noise impacts are anticipated from the operation of construction machinery associated with the ongoing North–South Road construction works.

Instrumental noise measurements conducted within the planned reservoir sites during the national EIA study indicated that recorded noise levels were within the Threshold Limit Values (TLVs) established by the RA Sanitary Norms No. 2-III-11.3 *Noise in Workplaces, Residential and Public Buildings, and Housing in Construction Areas* and were also compliant with the World Health Organization (WHO) *Guidelines for Community Noise* (1999).

4.1.12 Biodiversity

Flora

The biodiversity baseline presented in this section is based on key findings from the national EIAs report for the Project reservoirs' sites, including data from field surveys conducted in April-May 2024. These findings are further supplemented by results from supplementary studies, including field surveys carried out in spring-summer 2025.

According to the floristic divisions proposed by A.L. Takhtajyan (1954)[8], the areas selected for construction of the Artik and Kasakh reservoirs are situated within the Yerevan floristic region, while the sites of the Astghadzor, Lichk and Yelpin reservoirs are located in the Sevan, Meghri and Dareghegis floristic regions, respectively.

Species of higher vascular plants registered in the vicinities of the Project sites, including those listed in the RA Red Book and IUCN Red List, are summarised in **Table 3**.

Table 3. Summary of key data for the Project's five reservoirs

Key data	Kasakh	Yelpin	Lichk	Artik	Astghadzor
Number of registered species	63	128	196	103	87
Families	30	41	44	33	27
Registered in RA Red Book	2	3	10	-	-
Registered in IUCN Red List	-	-	-	-	-

Fauna and Habitats

Key findings from the fauna surveys conducted across all five Project sites and their surrounding areas are summarised below.

Kasakh site

Terrestrial mammals: Of the 20 identified species, one (Transcaucasian water shrew) is classified as PBF under EBRD PR6, Criterion 12(ii), as it is listed in the Red Book of RA, category Endangered. Two more species are classified as PBF as they are listed in Resolution 6 of the Bern Convention and Annex II of the EU Habitats Directive. These species and their habitats are also qualified as CH. In addition, the European wildcat (Felis silvestris) and its habitat is qualified as CH on the same basis. The bat species, although not identified, is qualified as CH as *Pipistrellus* genus belongs to *Microchiroptera* suborder that is listed in Annex IV of the EU Habitats Directive.

Birds: From the 120 identified species, 32 species are assessed as the PBF according to the EBRD PR6 criterion 12-ii as 30 species are listed in the Resolution 6 of Bern Convention and Annex I of the EU Birds Directive, one species (Mountain Chiffchaff, *Phylloscopus sindianus*) is a regularly occurring range-restricted species and one species (White-throated Robin, *Irania gutturalis*) is included into the RA Red Book (VU).

Amphibians and Reptiles: Of the 18 identified reptilian species, one species (Schneider's skink, *Eumeces schneideri*) is included into the RA Red Book (VU) and identified by as significant biodiversity feature, 6 species and their habitats are qualified as the CH according to the EBRD PR 6. One species of amphibian - European green toad *(Bufo viridis)* and its habitat is qualified as the CH as well.

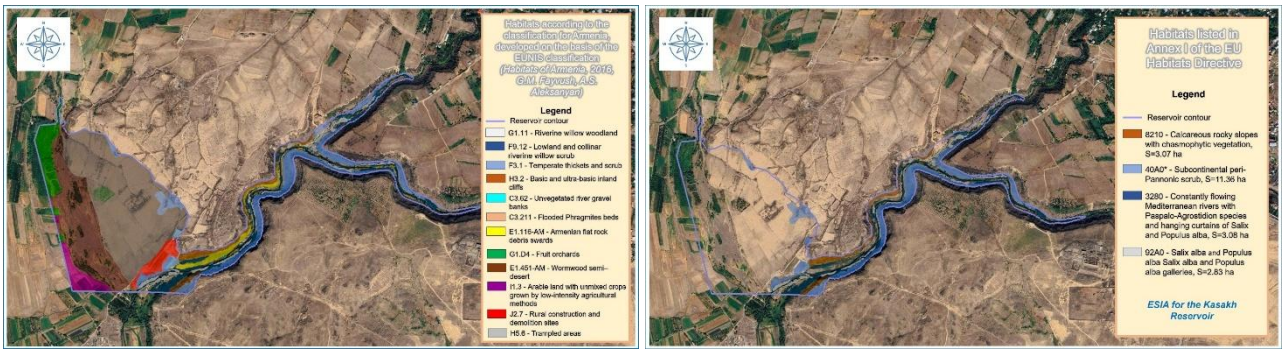
Ichthyofauna: Due to poaching and illegal fishing, several native species, especially the Trout, have nearly disappeared from the main channel of the Kasakh River and are now mostly found in some of its tributaries, namely Amberd. Rainbow trout, by contrast, is found sporadically and in small numbers. Unlike the Topmouth gudgeon and Prussian carp, these species do not breed in the Kasakh River. One species (Bulatmai barbel, Luciobarbus capito) is assessed as the PBF.

Terrestrial invertebrates: From the 76 identified species, ten are assessed as the PBF under to the EBRD PR6 as they are range-restricted species of the Caucasian region, and one species (Euphydryas aurinia) as this species is included to the Resolition 6 of the Bern Convention.

Habitats: Of the 12 identified habitats, one (*Armenian habitat F3.1 Temperate thickets and scrub = 40A0* Subcontinental peri-Pannonic scrub*, in Annex I of the EU Habitats Directive) is assessed as the CH according to the EBRD PR as this is marked as priority habitat in Annex I of the EU Habitats Directive (**Figure 3**).

[8]Armenian botanist and plant taxonomist known for his influential work on floristic regionalization and the classification of flowering plants. His floristic divisions are widely used in vegetation and biodiversity studies in Armenia and globally.

Figure 3. Habitats according to the Armenian classification (left side) and Habitats listed in Annex I of the EU Habitat Directive (right side) in the Kasakh site footprint area



Yelpin site

Terrestrial mammals: Of the 17 identified species, three are classified as the PBF under EBRD PR6, Criterion 12(i), as they are listed in Resolution 6 of the Bern Convention and Annex II of the EU Habitats Directive. These species and their habitats are also qualified as CH under EBRD PR6, Criterion 14(ii), as they are listed in Annex IV of the EU Habitats Directive. In addition, the Forest Dormouse (Dryomys nitedula) and its habitat is qualified as the CH on the same basis.

Birds: From the 70 identified species, 20 are assessed as the PBF according to the EBRD PR6 criterion 12: 17 species as they are listed in the Resolution 6 of Bern Convention and Annex I of the EU Birds Directive, three species as they are included into the RA Red Book, category "Vulnerable".

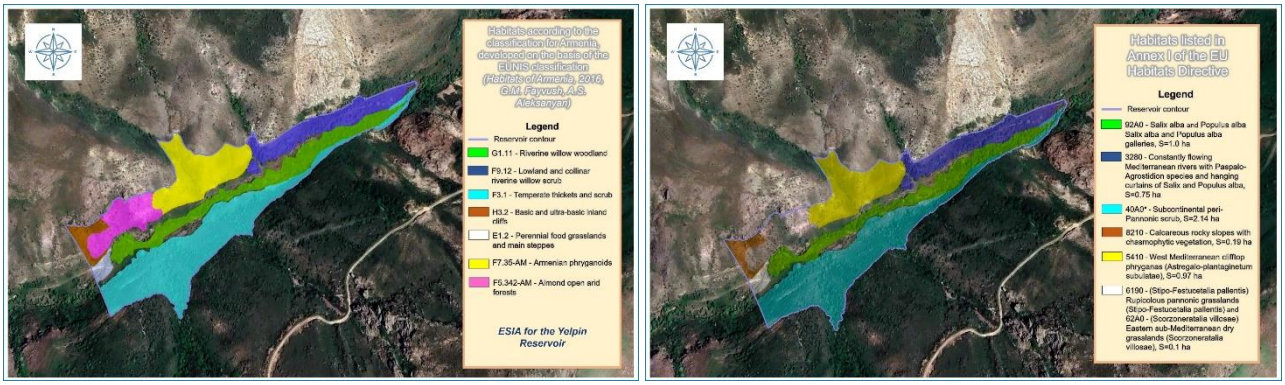
Amphibians and Reptiles: Of the 10 identified reptilian species, four species and their habitats are qualified as the CH according to the EBRD PR 6. One species of amphibian - European green toad (Bufo viridis) and its habitat is qualified as the CH. One reptilian species *(Zamenis hohenackeri*) is qualified as PBF according to the EBRD PR6 criterion 12 (iii) as it is listed in the RA Data Book, category "Vulnerable".

Ichthyofauna: The Yelpin River almost completely dries up during the summer, and at its confluence with the Arpa it remains dry for most of the year. These conditions do not support the development of a stable fish community in the Yelpin River. Ichthyological studies conducted as part of the EIA in the upper reaches of the river, where the Yelpin reservoir is planned, confirmed the absence of fish.

Terrestrial invertebrates: From the 100 identified species, 21 species are assessed as the PBF under the EBRD PR6 criterion 12 (ii). One more species (*Papilio alexanor*) is idenified as PBF according to the EBRD criterion 12 (iii) as it is listed in the RA Data Book, category "Vulnerable".

Habitats: Of the 7 identified habitats, one (Armenian habitat *F3.1 Temperate thickets and scrub = 40A0* Subcontinental peri-Pannonic scrub*) is assessed as the CH. Five habitats (corresponding to the six habitats listed in the EU lists) are assessed as the PBFs according to the EBRD PR6 criterion 12-i (**Figure 4**).

Figure 4. Habitats according to the Armenian classification (left side) and Habitats listed in Annex I of the EU Habitat Directive (right side) in the Yelpin site footprint area



Lichk site

Terrestrial mammals: The study area is home to 20 mammal species, of which two are classified as Priority Biodiversity Features (PBF) under EBRD PR6. One of these, Lynx, is also qualified as Critical Habitat (CH). Two more species are listed in the RA Red Book under category "Vulnerable" and therefore classified as PBFs.

Bats of two species were visually observed in the Project area during field survey and both of them are qualified as CH under EBRD PR6.

Birds: From the 81 identified species, 18 species are assessed as PBF according to the EBRD PR6 criterion 12: seventeen species as they are listed in the Resolution 6 of Bern Convention and Annex I of the EU Birds Directive, and one species, *Phylloscopus nitidus*, as regularly occurring range-restricted species.

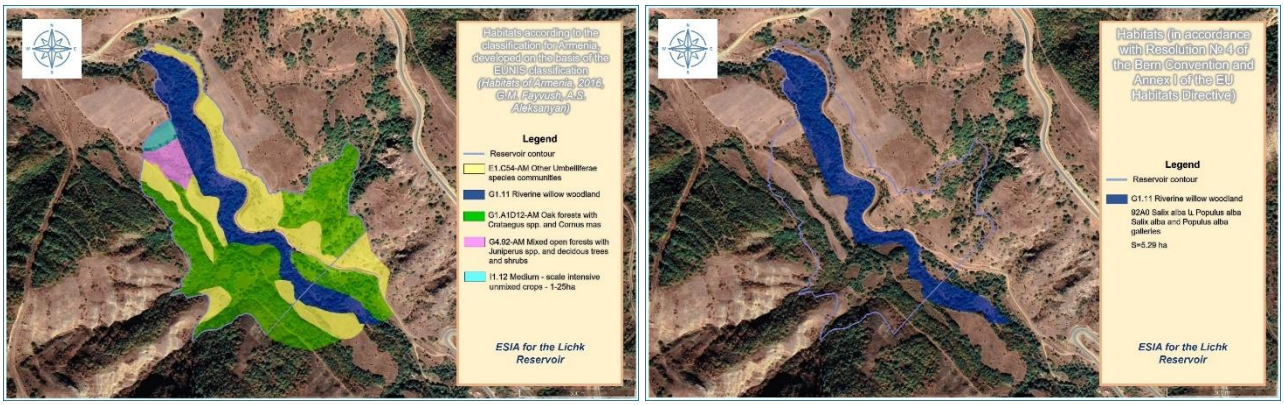
Amphibians and Reptiles: Eleven species of reptiles can potentially inhabit the area (including six species of lizards and five species of snakes) and three species of amphibians. Three reptilian species and their habitats are qualified as PBF according to the EBRD PR6, two of these species are also listed in the RA Red Book under the category "Vulnerable". Three reptilian species and one amphibian species are assessed as the CH.

Ichthyofauna: The following fish species may migrate from the Meghri River into the Lichk River: Trout, South Caspian sprilin, Kura barbel, and possibly Rainbow trout, which is not native to Armenia. However, no fish were recorded in the Lichk River during the spring 2024 field survey.

Terrestrial invertebrates: From the 43 identified species, five species are assessed as the PBF according to the EBRD PR6.

Habitats: Five habitats were identified according to the habitat classification for Armenia; of which *Armenian habitat G1.11 Riverine willow woodland = 92A0 Salix alba and Populus alba galleries* is assessed as the PBF as per the the EBRD PR 6 (**Figure 5**).

Figure 5. Habitats according to the Armenian classification (left side) and Habitats listed in Annex I of the EU Habitat Directive and Resolution №4 of the Bern Convention (right side) in the Lichk site footprint area



Astghadzor site

Terrestrial mammals: Of the 14 identified species, one (Gray wolf) is classified as PBF under EBRD PR6, Criterion 12(i), as this is listed in Resolution 6 of the Bern Convention, and Annex II of the EU Habitats Directive. This species is also qualified as CH under EBRD PR6, Criterion 14(ii), as the species is listed in Annex IV of the EU Habitats Directive. No species are listed in the RA Red Book; Grey wolf is listed in the IUCN Red list, Category "Least Concern".

Birds: From the 95 identified species, 33 species are assessed as the PBF under to the EBRD PR6 criterion 12: namely, 29 species are listed in the Resolution №6 of Bern Convention and Annex I of the EU Birds Directive, 3 species are considered "significant biodiversity features" by a broad set of stakeholders or governments and one species, *Phylloscopus sindianus*, as regularly occurring range-restricted species.

Amphibians and Reptiles: Of the 6 identified reptilian species, one species (Armenian Steppe Viper) and its habitats is qualified as the PBF. One repitilian species (Dice snake) and one amphibian species (European green toad) are assessed as CH according to the EBRD PR 6 criterion 14-ii as they are listed in Annex IV of the EU Habitats Directive.

Ichthyofauna: The ichthyofauna of Lake Sevan was historically dominated by three main species: Sevan trout, represented by four subspecies (Sevan bream, Sevan bullfish, *Salmo ischchan aestivalis*, and *Salmo ischchan gegarkuni*), *Capoeta sevangi*, and Sevan barbel. The ichthyofauna of the Astghadzor River, particularly in the area designated for the Astghadzor Reservoir, is extremely limited. Recent survey conducted in April 2024 recorded no fish species in the surveyed sections of the Astghadzor River or its tributaries.

Terrestrial invertebrates: From the 42 identified species, one species is assessed as the PBF according to the EBRD PR6 criterion 12 (ii) - as range-restricted species of the Caucasian region.

Habitats: Of the seven identified habitats, four habitats are assessed as the PBF as they are listed in Resolution №4 of the Bern Convention, namely: *C2.27 Mesotrophic vegetation of fast-flowing streams = C2.27 Mesotrophic vegetation of fast-flowing streams*, *C3.21 Common reed beds (Phragmites australis) = C3.2 Water fringing reedbeds and tall helophytes other than canes*, *C.3.55 Sparsely vegetated river gravel banks = C3.55 Sparsely vegetated river gravel banks*, *C3.62 Unvegetated river gravel banks = C3.62 Unvegetated river gravel banks* (**Figure 6**).

Figure 6. Habitats according to the Armenian classification (left side) and Habitats according to Resolution №4 of the Bern Convention (right side) in the Astghadzor site footprint area

Artik site

Terrestrial mammals: Three species are listed in the RA Red Book; two species are listed in the IUCN Red list - Marbled polecat in Category "Vulnerable", and Asia Minor ground squirrel in Category "Least Concern". Of the eight identified species, one (Marbled polecat) is classified as PBF according to the EBRD PR6. This species is also qualified as CH under EBRD PR6, Criterion 14(ii), as the species is listed in Annex IV of the EU Habitats Directive. Two species (Schidlovsky's vole and Asia Minor ground squirrel) are classified as PBF.

Birds: From 78 identified species, 30 species are assessed as the PBF according to the EBRD PR6 criterion 12: namely, 28 species are listed in the Resolution №6 of Bern Convention and Annex I of the EU Birds Directive, two species are considered "significant biodiversity features" by a broad set of stakeholders or governments (and listed in the RA Red Book, category "Vulnerable").

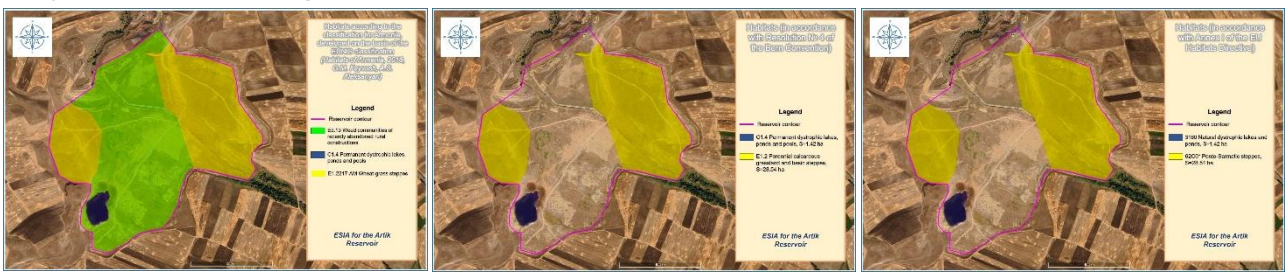
Amphibians and Reptiles: Of the identified species, one species of reptilia and one species of amphibia are qualified as the PBF. Two repitilian species and one amphibian species are assessed as CH according to the EBRD PR 6 criterion 14-ii as they are listed in Annex IV of the EU Habitats Directive.

Ichthyofauna: Ichthyological surveys conducted in 2025 showed that there are no fish species in the pond and surveyed areas of Artikjur river. According to the information from local residents, years ago, the pond was inhabited by Silver carp (*Carassius gibelio*), which was eliminated by poachers using prohibited fishing methods such as electric stunning and the use of toxic substances.

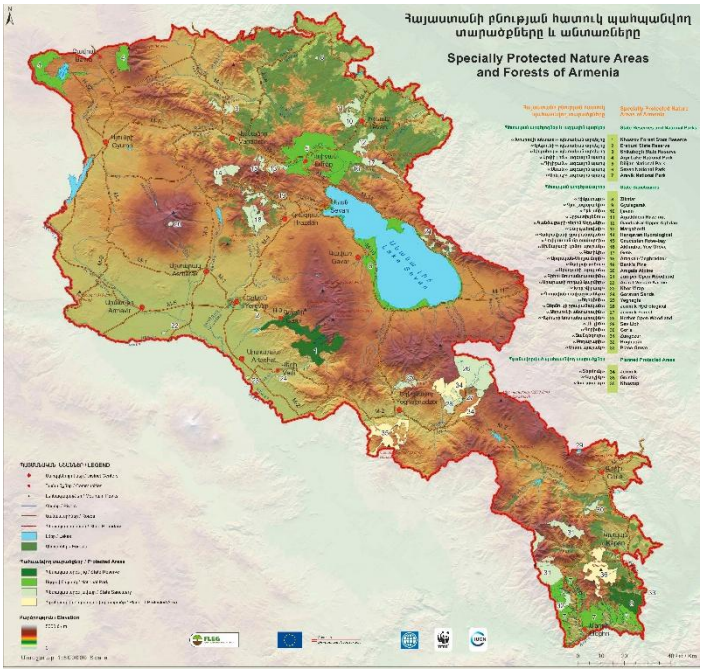
Terrestrial invertebrates: Totally, from the 160 identified species, seven species are assessed as the PBF according to the EBRD PR6 criterion 12 (ii) - six species as range-restricted species of the Caucasian region, and one species as listed in Resolution №6 of the Bern Convention.

Habitats: Of the three identified habitats, one habitat is assessed as the PBF according to the EBRD PR 6 criterion 12s-i as it is listed in Resolution №4 of the Bern Convention and Annex 1 of the EU Habitats Directive, and one habitat is assessed as the CH according to the EBRD PR 6 criterion 14-i as it is listed in Annex 1 of EU Habitats Directive marked as "priority habitat type" (**Figure 7**).

Figure 7. Habitats according to the Armenian classification (left side), Habitats according to Resolution №4 of the Bern Convention (in the center) and Habitats listed in Annex I of the EU Habitat Directive (right side) in the Artik site footprint area



4.1.13 Protected Areas of Nature



Armenia is rich in Specially Protected Areas of Nature (SPAN). There are 34 officially registered SPANs in Armenia, of which: 3 state reserves - Khosrov Forest, Shikahogh, and Erebuni, occupying a total area of 35,439.6 ha (1.19% of Armenia's territory); 4 national parks - Sevan, Dilijan, Lake Arpi, and Arevik, covering 236,802.1 ha (7.96% of the country's area); 27 state sanctuaries and 232 natural monuments together occupying 114,812.7 ha (3.95% of Armenia's territory).

None of the selected reservoir sites fall within any SPAN. The planned Lichk Reservoir site is located approximately 300 m from the boundary of Arevik National Park, while the Astghadzor site is situated about 5 km from the boundary of Sevan National Park. The other three sites are located well outside the vicinity of any nationally protected areas.

As of June 2025, Armenia had not officially adopted any Emerald Network sites. However, 23 sites within the territory of the country had been officially nominated as candidate Emerald Sites. The Astghadzor and Lichk reservoir areas are located inside the Candidate Emerald sites Sevan (AM 0000002) and Arevik (AM 0000014).

The Gndasar Key Biodiversity Area (KBA) / Important Bird Area (IBA) is located approximately 320 m northeast of the planned Yelpin Reservoir site. The Lichk Reservoir site lies between the Meghri KBA/IBA and the Zangezur KBA/IBA. The Astghadzor Reservoir area is situated about 1.5 km from the Lake Sevan and Environs KBA/IBA. The Artik and Kasakh sites are located at considerable distances from the nearest KBAs/IBAs.

4.2 Social Baseline

4.2.1 Demography

The demographic data for the Project affected communities and settlements are summarized in **Table 4**.

Table 4. Summary of demographic data for the Project affected communities and settlements

Kasakh	Yelpin	Lichk	Artik	Astghadzor
The villages in the Kasakh area vary in size but generally have a balanced gender composition. Oshakan is the largest settlement, with 6,000 residents, including 3,250 women. Voskevaz follows with 4,649 residents, 2,335 of whom are women. Aygeshat has 1,750 residents, including 922 women, while Amberd has 1,646 residents, 903 women. Voskehat is smaller, with 1,130 residents, including 680 women.	Yelpin village has 1,239 residents (45% women), with 68% aged 18–63, 20% under 18, and 12% over 63. According to the head of the Yelpin administrative unit, the village's population has remained stable in recent years. Chiva village had 822 residents (45% women), with 69% aged 18-63, 18% under 18, and 13% over 63. The village lies in a landslide-prone zone, which has previously prompted out-migration to safer areas.	The settlements in the Meghri area vary significantly in size. Meghri is the largest, with a population of 4,175, followed by Agarak with 3,350 residents. The remaining settlements are much smaller: Shvanidzor has 282 residents, Karchevan 223, Alvank 201, Vardanidzor 168, Nrnadzor 125, Lehvaz 451, and Lichk 93.	In the Artik area, the actual population figures show some variation from the registered numbers. Panik has 2,927 permanent residents, including 1,590 women. Anushavan hosts 2,148 residents, of whom 937 are women. Nor Kyank has a actual population of 1,562, including 995 women. Meghrashen is home to 1,248 residents, with 612 women, while Vardakar has 696 residents, including 352 women.	Martuni town itself has around 13,700 residents, 6,350 of whom are women. Zolaqar has an actual population of 6,617, including 3,190 women and 1,758 households. Astghadzor is home to 4,386 people, with 2,036 women and 1,352 households. Vaghashen has 4,052 residents, including 1,925 women and 1,218 households.

4.2.2 Regional and Local Economy

Key characteristics of the regional and local economy in the Project affected communities and settlements are summarized in Table 5.

Table 5. Summary of regional and local economy characteristics for the Project affected communities and settlements

Kasakh	Yelpin	Lichk	Artik	Astghadzor
In Amberd, Aygeshat, Oshakan, Voskevaz, and Voskehat, agriculture is the primary source of livelihood, supplemented in some cases by commuting for work to nearby urban centers such as Ashtarak and Yerevan. Amberd and Aygeshat residents mainly engage in crop production with limited animal husbandry, but chronic irrigation shortages prevent full cultivation; households are unable to grow a second harvest, and some orchards have been abandoned as a result. In Oshakan, Voskevaz, and Voskehat, agriculture focuses on viticulture as well as fruit, vegetable, and berry production. While animal husbandry remains common, villagers note a decline in livestock numbers. Additional income sources in these communities include public-sector employment, construction work, and, in Voskehat, jobs at the "Ashtarak Dzu" poultry farm.	The population of Yelpin is primarily engaged in agriculture, including grain and tobacco cultivation, horticulture, and animal husbandry. According to the village head, the lack of adequate irrigation water significantly affects crop quality, leading to reduced yields and smaller produce. As a result, most crops are consumed within households rather than sold, generating little to no income.	The majority of community residents are engaged in agriculture, with the area particularly known for producing figs, pomegranates, and persimmons. Most agricultural products are consumed locally, as the community has no commercial links to foreign markets. The region is also home to one of the largest copper and molybdenum deposits. The Agarak Copper-Molybdenum Combine (CJSC) is the largest industrial facility in the Meghri area and a major employer, providing jobs to more than 1,000 people and contributing significantly to local employment and regional revenues. Residents of nearby settlements, including Agarak, Karchevan, Lehvaz, and Meghri, work at the plant. No other industrial-scale enterprises operate in the area.	The majority of the Artik community is engaged in agriculture, hunting, and forestry, with irrigated farming playing a central role. On privately owned and leased lands, residents mainly cultivate grain crops such as wheat and barley. However, limited access to irrigation water significantly restricts the community's ability to generate substantial income. The area's natural conditions are favorable for grain cultivation, potato growing, and livestock rearing, yet the development of these sectors remains moderate. This is largely due to low capitalization and the lack of modern processing technologies, which limit opportunities for added value and growth.	Agriculture is the dominant economic activity in Gegharkunik Marz and the Martuni community, with residents primarily engaged in cultivating grain, potatoes, and vegetables, as well as livestock farming. However, the sector faces significant challenges, including the absence or deterioration of irrigation networks and a shortage of agricultural machinery. In Astghadzor, villagers mainly rely on livestock farming and gardening, with some residents employed in Martuni, the administrative center. According to local interviews, livestock numbers had grown in recent years but declined in 2025 year due to rising forage prices. Farmers cultivate wheat, barley, potatoes and cabbage, and have recently started engaging in beekeeping.

4.2.3 Ethnic Minorities

The profiles of ethnic minorities in the Project affected communities are presented in Table 6.

Table 6. Profiles of ethnic minorities in the Project affected communities and settlements

Kasakh	Yelpin	Lichk	Artik	Astghadzor
There are five households (20 persons) and six households (38 persons) of Yezidis in Amberd and Aygeshat	The majority of the Vayots Dzor Marz population are ethnic Armenians who belong to the Armenian Apostolic	Syunik Marz, Meghri community and the settlements are almost entirely populated by ethnic Armenians who belong to the	The majority of the Shirak Marz population are ethnic Armenians who belong to the Armenian Apostolic	Gegharkunik Marz, Martuni community and Project affected settlements are almost entirely populated by ethnic

Kasakh	Yelpin	Lichk	Artik	Astghadzor
villages respectively. There are 23 households (116 persons) and 50-60 households (311 persons) of Yezidis in Voskehat and Oshakan villages respectively. Kurds are present in the village of Alagyaz, which is around 60 km from the planned reservoir.	Church. The region hosts small communities of Yezidis, Russians, Assyrians, and other groups. Yelpin and Chiva villages are populated by ethnic Armenians; the predominant religion is Armenian Apostolic Christianity.	Armenian Apostolic Church. There are some ethnic minorities, mainly in Meghri town and a few nearby villages of Russians and Persians/Iranians, who historically settled there due to cross-border trade and cultural ties. No detailed information was obtained on the presence of minority groups in the Project affected villages.	Church. 97% of Artik Community population are Armenians while the remaining 3% are ethnic minorities, including Russians, Yezidis, Kurds, Ukrainians and Greeks. Presence of the ethnic minorities representatives in the Project affected settlements is not known.	Armenians who belong to the Armenian Apostolic Church. Gegharkunik hosts small numbers of national minority individuals. These include Yezidis, Russians, Kurds, Ukrainians, Greeks, Assyrians, etc. As of 2022 reports, there were about 495 persons from national minorities across 57 communities in Gegharkunik.

4.2.4 Gender Issues

According to the National Statistical Committee, 52% of women in Armenia are not employed and are not seeking employment[9]. A major reason for women's absence from the labour market is their engagement in unpaid household activities. The gender pay gap in Armenia was 39.2% in 2022. The poorest households in the country tend to be women-headed households. National gender problems such as underrepresentation in labour market and decision-making processes, gender pay gap are relevant in the Project affected villages as well.

In general, women's participation in decision-making at the community level, especially in rural communities, is fairly low. The principal reasons for their limited involvement in community leadership include public opinion, men's lack of acceptance of women's leadership, women's fear of expressing themselves, and a lack of self-confidence among women[10]. Women underrepresentation remains also a problem in Water Users Associations.

4.2.5 Social Infrastructure

The social infrastructure of the project-affected communities is summarized in **Table 7**.

Table 7. Summary of social infrastucture in the Project affected communities

Kasakh	Yelpin	Lichk	Artik	Astghadzor
There is one school each in Amberd, Aygeshat, Voskehat, and Voskevaz, and two schools in Oshakan. Each village also has a medical unit or first-aid station staffed by a single paramedic, as well as a post office. Residents have access to gas, electricity, and water.	Both Yelpin and Chiva villages have one secondary school, a medical center providing first aid, and a post office. Residents have access to electricity and water, but there is no centralized gas supply. Both villages are located along the M2 highway, which connects Yerevan in one direction and the Iranian border in the other.	Meghri and Agarak have more developed social infrastructure, including schools, a college, a vocational training center, and a House of Culture. Other settlements are gradually improving their facilities through regional development projects. Most project-affected settlements have at least one school, a kindergarten, and a medical unit. Residents of these settlements have	Panik, Vardakar, Anushavan, Meghrashen, Nor Kyank, Pemzashen, and Tufashen each have one school, while Artik town hosts 7 schools, 4 kindergartens, a music school, sports complexes, a medical college, and a House of Culture. All project-affected settlements have access to electricity and water supply. However, only residents of Artik	Martuni town has four kindergartens, while Astghadzor, Zolaqar, and Vaghashen villages each have one kindergarten. Primary healthcare centers are available in Astghadzor and Vaghashen, and the 'Martuni' Medical Centre serves the town of Martuni. The town also hosts a music school and a cultural center. Residents of Martuni community including affected settlements

[9]European Union. 2024. Country Gender Profile Armenia. Eu4genderequality Reform Helpdesk. Available at: https://euneighbourseast.eu/wp-content/uploads/2024/04/eu4genderhelpdesk_armenia_countrygenderprofile_2024-cgp_v3__compressed.pdf
[10]Ibid

Kasakh	Yelpin	Lichk	Artik	Astghadzor
		access to centralized electricity and water supply. According to available information, there is no centralized natural gas supply in the area.	town, all of Nor Kyank, and part of Meghrashen are connected to a natural gas supply.	have access to electricity, gas and water.

4.2.6 Tangible Cultural Heritage

Kasakh site

As a result of the archaeological surveys conducted in May 2024, 30 cultural heritage units were identified within the reservoir contour area and protection zone of the Kasakh reservoir site, of which 14 are located within the reservoir impoundment area and are likely to be impacted during Project implementation. These cultural heritage units include: eight archaeological monuments, four historical-architectural and spiritual monuments, one natural monument and one geological monument.

Yelpin site

During the national EIA study, an archaeological field surveys were conducted in May 2024. As a result, numerous structures made of stone fragments were documented. At the first glance, these appear to be tombs or walls, but they are of natural origin, formed by the movement and accumulation of materials during river floods. However, among them, several artificial stone structures were also identified. These likely served a livestock-related function and may date to the late Middle Ages or the Soviet era.

Lichk site

During the field archaeological survey conducted at the Lichk Reservoir site in April 2024, numerous natural and artificial cuts consisting of alluvial deposits and boulders from the Meghri River were thoroughly examined. No historical or cultural features or traces were documented, likely due to the steep slopes of the site and the impact of intensive land reclamation and agricultural activities previously carried out in the area.

Artik site

As per the letter 1-16 dated 04.06.2024 from the "Historical and Cultural Reserves-Museums and Historical Environment Preservation Service" SNCO under the Ministry of Education, Science, Culture and Sports, four cultural heritage units were identified in the vicinities of the planned Artik Reservoir irrigation channel: one tomb field and three cultural and historical monuments.

Astghadzor site

During the field archaeological survey, the entire area designated for the construction of the Astghadzor Reservoir and its surroundings was examined. The survey confirmed the boundaries of the ‘Vanqi Berd’ archaeological complex and documented newly discovered cultural units not previously included in the state-protected list of monuments. These units include fully or partially preserved structural remains, intact and looted tombs, remnants of individual walls and structures, medieval and modern cross-stones (khachkars), cut features containing pottery fragments, and surface finds of ceramic material, among others.

4.2.7 Intangible Cultural Heritage

Armenia has eight elements inscribed on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity[11] (**Figure 8**):

1) **Duduk and its music** (2008): The distinctive Armenian woodwind instrument made of apricot wood, traditionally played in pairs.
2) **Armenian cross-stones art: symbolism and craftsmanship of Khachkars** (2010): carved memorial steles bearing crosses and intricate motifs.
3) **Performance of the Armenian epic "Daredevils of Sassoun" (David of Sassoun)** (2012): oral storytelling of the national heroic epic.
4) **Lavash: the preparation, meaning and appearance of traditional bread** (2014): the communal baking of flatbread in clay ovens.
5) **Kochari, traditional group dance** (2017): a vigorous circle dance embodying bravery and unity.

[11] https://ich.unesco.org/en/state/armenia-AM?info=elements-on-the-lists

6) **Armenian letter art and its cultural expressions** (2019): the decorative art of the Armenian alphabet, created by Mesrop Mashtots.
7) **Pilgrimage to the St. Thaddeus Apostle Monastery** (2020): a joint Armenian-Iranian nomination honoring historic religious pilgrimages.
8) **Tradition of blacksmithing in Gyumri** (2023): the local craft of forging iron objects central to Gyumri's identity.

Figure 8. Photos of Armenia's elements inscribed on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity

1) 2) 3) 4)

5) 6) 7) 8)

According to Annex 2 of RA Government Decision №310-A, around ten of the 68 nationally registered Intangible Cultural Heritage (ICH) elements are practiced across all regions of Armenia. These include: (i) the preparation of lavash, inscribed on both the UNESCO and national ICH lists, which is an integral part of Armenian cuisine; (ii) the tradition of producing tondir (underground clay ovens), used for baking lavash and other traditional dishes, recognized as an ICH element of national significance; (iii) the making and playing of the duduk; (iv) the Kochari dance; (v) the celebration of Christmas, New Year, and Easter, among others.

5. Summary of Environmental and Social Benefits, Potential Adverse Impacts, Mitigation and Management Measures

5.1 Transboundary Impact

Transboundary Impact Assessment for the Project's Reservoirs has been performed by SLR Consulting between February - May 2025[12].

The cumulative impacts of the reservoirs at the transboundary sites were assessed under two climatic scenarios: an average year and a 75% exceedance year (a low-rainfall year that, on average, occurs once every four years across the entire Aras River basin). As a result, taking into account the available data and assumptions, it is unlikely that the Project generates significant hydrological transboundary impacts.

Given the inflow quality and the low annual flow ratios between the reservoirs' outflows and the transboundary rivers, the Project is unlikely to have a significant transboundary impact on nutrient loads and water quality. However, due to land use changes, such as increased agriculture and the use of fertilizers and pesticides, it cannot be concluded that these impacts will be negligible.

The operation of the Kasakh reservoir may have a localised impact on the movement of fish. The other reservoirs EIAs studies (Artik, Astghadzor, Yelpin and Lichk) show an absence of fish and aquatic habitats in the reservoir impounded rivers.

Similarly, as the Project's impact on flow, water quality, and sediment load is expected to be minimal, significant transboundary socio-economic impacts are also unlikely.

[12]Armenia Reservoir Project - Transboundary Impact Assessment - Report, June 2025

5.2 GET Assessment[13]

The Project is assessed as aligned with the goals of the Paris Agreement[14] based on the directly financed methodology. The Project is on the aligned list under the water supply and wastewater category[15]. No Project activities have been identified as on the 'non-aligned list'. The Project is assessed as aligned with the mitigation goals of Paris Agreement (BB1 aligned).

The NDC for Armenia outlines an intention to achieve an unconditional Greenhouse Gas (GHG) emissions reductions target of at most 2.07 t CO2eq/capita by 2050. These are reflected in Armenia's Draft Long Term - Low Emission Development Strategy (LT-LEDS). Armenia's LT-LEDS outlines improvements in water supply and irrigation as a priority area to reduce energy consumption, with an estimated total GHG emissions reduction of 8.946 Gg CO2eq until 2050. As such, the Project does align with some of the targets outlined in Armenia's draft LT-LEDS and, therefore, the country's NDC in that it is designed to improve water supply and efficiency in irrigation. However, it is noted that GHG emission estimates at this stage show net positive carbon emissions for reservoir over 100 years.

5.3 GHG Emissions

The CO2eq impact analysis relied on the use of the GHG Reservoir Tool (G-res Tool), which is based on principles agreed upon by the IPCC[16] for assessing net reservoir emissions. When calculating CO2eq for a reservoir, a whole-catchment approach was followed to account for terrestrial areas that act as net carbon sinks. Net GHG emissions caused by a reservoir are defined as the difference between the total CO2eq emissions fluxes in the river basin before and after the reservoir's creation. The G-res tool is built on this principle of estimating net anthropogenic GHG emissions, i.e., what the atmosphere "sees" when a new, man-made reservoir is introduced into the landscape. The resuilts of GHG emissions calculations are summarised in **Table 8**.

Table 8. Results of the G-res outputs for all Project reservoirs

Total net GHG footprint, tCO2eq/yr					
Total net GHG footprint	**Kasakh**	**Yelpin**	**Lichk**	**Artik**	**Astghadzor**
Total reservoir emissions per year	9	37	12	0	7
Total reservoir emissions at year 1	595.5	18.2	101.7	81.6	293
Total reservoir emissions at year 50	127.4	3.69	29.7	16.5	65

5.4 Impact on Air Quality

Air emissions expected during the Project's construction phase from both stationary and mobile sources, along with their estimated volumes, were calculated and presented in the national EIA report. The calculations were based on the CORINAIR methodology[17] for vehicles and construction machinery, and the guide for calculating unorganized air emissions from the construction industry for dust emissions. The calculated air emissions (in g/sec and ton/year) from the reservoir construction activities are provided in **Table 9**. The majority of these emissions consist of dust particles (PM2.5 and PM10).

Table 9. Calculated volumes of air emissions

Air pollutants	Kasakh		Yelpin		Lichk		Artik		Astghadzor	
	t/year	gr/sec	t/year	gr/sec	t/year	gr/sec	t/year	gr/sec	t/year	gr/sec
Dust	160.0	-	25.58	2.82	160	10.29	313.2	-	35.2	2.55
Nitrogen dioxide	9.6	-	5.33	0.58	8.88	0.57	9.16	-	8.04	0.58
Carbon oxide	2.22	-	4.58	0.5	7.64	0.49	7.86	-	6.9	0.5
Hydrocarbons	11.17	-	1.06	0.116	1.76	0.113	1.82	-	1.6	0.116
Solid particles	1.13	-	0.54	0.06	0.9	0.058	0.93	-	0.82	0.06
Sulphur anhydride	1.06	-	0.5	0.055	0.84	0.054	0.86	-	0.76	0.055

[13]This GET Assessment has been prepared based on the *Armenia Water Reservoirs - Technical, Economic and Green Due Diligence Gap Analysis, Draft Final Report*, 2023-2024, Ove Arup & Partners
[14]https://unfccc.int/sites/default/files/english_paris_agreement.pdf
[15]Implementing the Green Economy Transition Technical Guide, EBRD, March 2024 and Annexes to Implementing the Green Economy Transition - Technical Guide, EBRD, March 2024
[16]Intergovernmental Panel on Climate Change
[17]The methodology is based on the classification of vehicles in accordance with the "Core Inventory of Emissions in Europe"

Some minor air emissions may occur during the maintenance activities of the operated reservoir. The types of emissions will be similar to those generated during the construction phase; however, their quantities will be significantly lower and can be considered negligible.

5.5 Impacts on Landscape and Visual Amenity

The main sources of visual disturbance during the construction phase include the movement of construction machinery and heavy vehicles, as well as the presence of borrow pits, topsoil stockpiles, storage areas for construction materials and oil products, and other temporary infrastructure. The impact is considered moderate; however, it can be reduced to low provided that the management and monitoring measures recommended in **Section 5.24** are properly implemented.

During the operation phase the landscape of the Project area will experience a permanent transformation due to the formation of the reservoir and the presence of supportive infrastructure. Overall, the visual impact during the operation phase is long-term, but generally more stable and potentially less intrusive than during the construction phase. Effective landscaping and environmental integration can help mitigate negative visual effects. Over time, the Project's visual impact may even become positive.

The irrigation of currently uncultivated agricultural land using reservoir water is also expected to have an indirect positive effect on the visual amenity of the Project region by promoting greener and more cultivated landscapes. The Project implementation may also have a positive impact on the cultural landscape.

5.6 Impact on Geology

The impact of vegetation clearance and topsoil removal is minor and is unlikely to generate significant erosion processes as these works deal with the ground surface layer (up to 0.2 m) only. Excavation and earthworks will involve the movement of a certain amount of soil (including topsoil and excavated subsoil), which may potentially trigger landslides, mass movements, and other erosion processes. Another potential impact of the Project on geological erosion is the temporary destabilization of disturbed soils due to precipitation and surface runoff. These effects on the soil, along with resulting changes in topography, may create conditions that lead to temporary erosion and sedimentation.

During the operation phase, impacts on the geological conditions of the Project area may result from water infiltration from the reservoir body and the dam base, potentially affecting groundwater and coastal erosion around the entire perimeter of the reservoir due to water encroachment during the initial years of operation. The implementation of the proposed mitigation measures (**Section 5.24**) will reduce the residual impact from moderate to low.

5.7 Impact on Water Resources

During the construction phase, contamination of surface water streams may occur due to the deposition of dust and exhaust gas emissions from construction machinery and heavy trucks, spills of hazardous materials, and improper management of storage areas. Surface water quality may also deteriorate as a result of soil erosion and runoff caused by rainfall or snowmelt. Earthworks and improper transportation or storage of topsoil, spoil, friable construction materials, and oil products, as well as loading and unloading activities, can cause pollutants to enter nearby surface watercourses and potentially infiltrate groundwater, thereby degrading overall water quality.

During the operation phase, several natural processes occurring within the reservoirs contribute to water self-purification. These include sedimentation of suspended solids, adsorption and precipitation of nutrients and metals, microbial degradation of organic matter, and nutrient uptake by aquatic vegetation. Collectively, these processes help maintain and improve water quality, supporting the long-term sustainability of irrigation activities.

Project implementation will significantly alter the hydrological regime of the feeder rivers. Anticipated changes include the regulation of natural flow variability, reduction of peak discharges, shifts in flow timing, and sediment retention. While these modifications enhance water availability for irrigation, they may also affect downstream ecosystems and groundwater dynamics. Relevant mitigation measures to minimize impacts on water resources are proposed in **Section 5.24**.

5.8 Impact on Soil

Construction works will begin with vegetation clearance and topsoil removal. If not properly managed, the removed topsoil may be damaged through mixing with subsoil (spoil) or other materials. Additionally, topsoil

can lose its physical and biological properties due to compaction by heavy machinery both within and outside the construction site. Spoil material generated during excavation and earthworks must also be managed in accordance with the designated Spoil Disposal Management Plans.

Accidental spills of friable materials and leakages of oil, fuel, and other liquid chemicals may occur during field works, as well as during the transportation, storage, and use of such materials, potentially leading to soil contamination. Therefore, the use of old or technically outdated construction machinery and heavy trucks must be strictly prohibited. The handling of hazardous materials, including their transportation, storage and use, must be carefully controlled. During refueling or the transfer of oil, fuel, or other chemicals, protective berms shall be used. Construction and other friable materials shall be stored in separately allocated, fenced areas covered with waterproof sheeting. In addition, regular soil quality monitoring is recommended near potentially contaminated areas, in accordance with the relevant Air, Water, and Soil Quality Monitoring Plan.

During the operation phase, small-scale accidental spills of oil products and friable materials may occur during routine maintenance of the reservoir body, dam and associated infrastructure, as well as during regular cleaning of the irrigation channels. These spills can be prevented or minimized through the implementation of appropriate administrative and organizational measures (**Section 5.24**).

5.9 Waste Management

Proper management of the waste streams to be generated during the construction phase will be ensured through a detailed Waste Management Plans (WMP) that at a minimum shall include:

- Waste storage locations, containers and conditions,
- Environmental, fire, health and safety of the waste storage facilities,
- Actions to be implemented to ensure the provisions of waste management hierarchy (prevention, minimization, reuse, recycling, energy recovery and disposal),
- Safe transportation of waste,
- Response to the accidents (leakages of liquid waste, spills of friable materials, etc.),
- Requirements and responsibility of the engaged personnel,
- Waste inventory and records, etc.

All required permits and normative documents regulating waste management in Armenia shall be obtained by prior to the commencement of construction. These documents shall include, at a minimum: (i) hazardous waste passports, (ii) waste generation norms, and their disposal limits, (iii) waste generation register, etc., (iv) waste primary registration log-books, etc.

5.10 Noise and Vibration Impact

The dominant source of noise from most construction equipment is the engine, which typically runs on diesel and may lack adequate muffling. In some cases, noise generated by construction activities may exceed that produced by the equipment itself. Noise levels during construction will vary depending on the specific activities, scheduling, and combinations of equipment in use.

There are no residential areas in the immediate vicinity of the Project sites; therefore, construction noise and vibration are not expected to affect the local population. However, minor noise impacts on residents of nearby rural settlements may occur when heavy trucks transport construction and other materials along community and access roads leading to the Project site.

No significant noise or vibration impacts are expected during reservoir operation. Only periodic maintenance activities may produce noise, and these impacts are anticipated to be negligible.

5.11 Traffic Impacts

The implementation of the Project may increase traffic intensity within the affected rural settlements. However, the construction of the access roads described above will provide bypass routes for transporting materials, thereby reducing the negative traffic impacts on these communities. Increased traffic intensity is also associated with higher noise levels; therefore, the mitigation measures proposed in **Section 5.24** are partially applicable to traffic-related impacts. Traffic Management Plans are recommended for the construction activities to be agreed with the relevant regional authorities and road police.

5.12 Impact on Biodiversity

This section summarises the assessment of the potential impacts on biodiversity resulting from Project-related construction and operational activities. These impacts will occur within the Project footprint areas (dam and reservoir), the designated construction sites, and the potential influence (buffer) zones surrounding the footprint areas, which vary from site to site.

The assessment has been carried out in accordance with EBRD Performance Requirement 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2019), the Guidance Notes to EBRD PR 6 (March 2023), and applicable national legislation of the Republic of Armenia.

Potential impacts on biodiversity (including PBFs and CHs) derive from the Project implementation activities are summised below:

Construction phase

- Destruction (loss) of habitats (vegetation clearance, removal of top-soil, excavation, quarrying, movement and placement of topsoil and quarried materials, reservoir filling),
- Flora species loss (vegetation clearance, including trees cutting, removal of top-soil, quarrying, movement and placement of topsoil and quarried materials, reservoir filling),
- Disturbance of fauna species by noise, vibration and light pollution (construction and mining machinery, traffic, lighting of the building area),
- Destruction of sedentary animals' habitats and a risk of their death (removal of top-soil, excavation, quarrying, movement and placement of topsoil and quarried materials, reservoir filling),
- Loss of foraging habitats for transit species of mammals (vegetation clearance, removal of top-soil, excavation, quarrying, movement and placement of topsoil and quarried materials, reservoir filling),
- Loss of breeding and foraging habitats for birds (vegetation clearance, removal of top-soil, quarrying, excavation, movement and placement of topsoil and quarried materials reservoir filling),
- Loss of breeding, foraging and wintering habitats of invertebrates and a risk of death of their overwintering stages (vegetation clearance, removal of top-soil, quarrying, excavation, movement and placement of topsoil and quarried materials reservoir filling,
- Destruction of the habitats of the aquatic and semi-aquatic species and a risk of the species death,
- Obstacle to migration of the aquatic species (blocking the river native water flow by the construction site),
- Impact on protected areas and internationally designated areas.

Operation phase

- Emergence of new habitats (water, riparian),
- Increased access to the area,
- Obstacle to migrations of aquatic species (blocking the native water flow by the dam).

The negative impacts occur mainly at the construction phase and are caused by the type of required activities. Some positive impacts on biodiversity occur during the operational phase; they are linked with the emergence of new habitats - large water surface and riparian vegetation which will attract some species of animals.

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

A set of measures is recommended to manage the Project's impacts on biodiversity, following the Biodiversity Mitigation Hierarchy outlined in EBRD PR 6: *Biodiversity Conservation and Sustainable Management of Living Natural Resources*. In addition to the measures proposed in the Environmental and Social Management Plans (ESMPs) for the reservoir construction components, an overarching action - the Biodiversity Action Plans (BAPs) for all five reservoirs, developed by the ESIA Consultant and incorporating mitigation activities for the pre-construction, construction and operation stages shall be implemented.

The BAPs will provide detailed guidance for the development and implementation of the Biodiversity Management Plan, Riverine Habitats Construction Plan, and the Biodiversity Offset Program.

The Appropriate Assessments have identified that a) Astghadzor Reservoir site may insignificantly contribute to the fragmentation of the Candidate Emerald site "Sevan" National Park, and b) development of Lichk reservoir is predicted to contribute to the fragmentation of the Arevik Candidate Emerald Site (though the boundaries of the site are planned to be reduced by the Ministry of Environment and eventually the reservoir will appear to be outside of the Candidate Site). With the implementation of proposed mitigation measures,

the impacts on the integrity of the protected areas or internationally recognized areas of biodiversity will be reduced.

5.13 Impacts on the Local/Regional Economic Growth, Employment and Business / Investment Opportunities

The construction phase will require both skilled and unskilled labour, creating employment opportunities for residents of nearby villages and temporarily increasing household incomes. The influx of construction workers will also generate additional short-term economic opportunities for local communities, such as accommodation services, food preparation and delivery, and cleaning services.

However, an influx of workers can also elevate the risks of Gender-Based Violence and Harassment (GBVH). Women, young people, and economically disadvantaged residents may be particularly vulnerable, especially in rural communities with limited health and social support services. Given the traditional, family-oriented lifestyle of rural settlements in Armenia, the prevalence of sexually transmitted diseases (STDs) among the local population is expected to be low. A set of actions is proposed in the Project ESMPs to address GBVH risks, including preparation of the Code of Conduct and GBVH Policy, trainig and awareness raining compaings, grievance mechanism, etc.

Once completed, the reservoir will supply water to the beneficiary communities, improving living conditions and potentially increasing household incomes. Households will be able to cultivate their land more productively or bring new land under cultivation, thereby increasing agricultural output. Larger farmers may also expand their operations, creating additional employment opportunities in land preparation, harvesting, and crop processing.

5.14 Impact on Public Facilities and Infrastructure

Additional pressure on local infrastructure, including power lines, roads and healthcare facilities, may occur during the Project's construction phase. Sensitive receptors along transportation routes (such as schools, hospitals, residential areas and other social infrastructure) have been identified, and appropriate mitigation measures have been developed where necessary. These include avoidance of certain routes, timing adjustments, installation of additional traffic signs, and reinforcement of speed limits.

It is also recommended to coordinate with nearby medical centres to ensure the timely delivery of medical services if required. A Traffic Management Plan should be developed, and all transportation routes should be disclosed to the public.

No significant impacts on public facilities or infrastructure are anticipated during the Project's operational phase.

5.15 Land Tenure Impacts

Kasakh site

Based on the preliminary Detailed Measurement Survey (DMS) and the valuation of affected assets, the Project will permanently acquire a total of 1,452,605.4 m² of land (280 land plots) in the Ashtarak (Voskehat, Voskevaz, and Oshakan villages) and Khoy (Amberd and Aygeshat villages) communities of Aragatsotn and Armavir marzes, affecting a total of 123 households.

A total of eight uninhabited buildings/structures will be affected by the Project. In addition, two fences with a combined area of 16.87 m² will be impacted. The Project is also expected to affect 640 fruit/berry bushes and 15,928 fruit trees (of which approximately 14% are not yet productive or are seedlings) located on community and privately owned land plots. Additionally, 7,474.90 m² of crops on two land plots may be affected.

Yelpin site

Within the territory allocated for the construction of the reservoir (including within the buffer zone) there is no land in private ownership, all land is in communal ownership (with the intended purpose of pasture). According to the interview with the head of Yelpin settlement, at present, the territory under the reservoir is practically not used as a pasture, due to the lack of suitable vegetation. If there is an interest among Yelpin villagers to use the community land for grazing, alternative pastures can be made available to them.

Lichk site

Estimated land needs for Lichk reservoir are 582,501.6 m^2, of which 17,490.5 m^2 (3%) is private land, 531,848.70 m^2 (91.5%) is community land and 33,162.40 m^2 (5.5%) - state land. Lichk Reservoir will affect

state, communal and private land and assets. Within the reservoir area, there are land plots currently used as pastures and hayfields; however, their size is insignificant compared to the total area of land to be alienated.

Artik site

The Artik Reservoir is expected to affect around 130 land plots with the area of 96,065 m^2 in Nor Kyanq, Anushavan, Panik, Artik, Tufashen, and Pemzashen settlements to construct the feeding and irrigation channels. Of these, 85 are community-owned, 17 are state owned, and 28 are privately owned land plots. The private plots are mainly agricultural lands and cover 6,090 m^2. Due compensation and livelihood restoration activities have been outlined in the RF (to be further detailed in the RP).

Astghadzor site

The Astghadzor Reservoir is expected to affect 54 land plots with a total area of 420,111.30 m² in the Astghadzor and Zolaqar settlements (within the Martuni Community). Of these, 19 plots are community-owned and 35 are privately owned. The 19 community-owned plots, totaling 353,510.10 m², are classified as agricultural arable lands; however, as noted in the baseline, the terrain and limited irrigation capacity make these areas unsuitable for cultivation by the municipality.

The 35 privately owned plots cover 66,601.20 m² in total, of which 27 plots (52,875.10 m²) are agricultural arable lands and 8 plots (13,726.10 m²) are agricultural grasslands. Appropriate compensation and livelihood restoration measures have been outlined in the Resettlement Framework (RF) and will be further detailed in the Resettlement Plans (RP) for each reservoir. According to the Preliminary RP, no impacts are expected on residential buildings/structures or trees.

5.16 Impact on Vulnerable Groups

During the stakeholders screening process, the following vulnerable groups within the project affected communities were identified: women headed households, elderly households, and households below the poverty line. In addition, there are internally displaced people, mainly from Artsakh (Karabakh). These groups require special attention and meaningful engagement during project-related consultation process (meaningful stakeholders' engagement foresees consultations, collaboration and empowerment of stakeholders, and the two-way communication). Special information and communication materials will be prepared and disseminated among the vulnerable groups and separate meetings can be held with the representatives of those groups to reveal their opinions about the project, concerns and specific needs.

Women may have less opportunities for temporal employment during the construction phase. At the same time, if they are involved in construction activities and/or in services provision, their salaries may be lower than those of men. Therefore, equal access to job opportunities and equal pay should be ensured during the Project implementation to the extent possible.

The operation of the reservoir will have positive impact on the residents' standards of living, including vulnerable households. The Project implementation will support food security in the households engaged in the subsistence agriculture and might enable accumulation of a larger surplus for sale. At the same time, the price of the irrigation services should account for the affordability to the low-income households. The Resettlement Framework also includes measures to support vulnerable groups and provides an outline of the measures to be included in the Resettlement Plan to ensure affected people are properly compensated.

5.17 Impact on Community Health and Safety

Although the construction of the reservoir will bring benefits the local communities, it will also increase the communities' exposure to risks and impacts arising from temporary labour influx to the project area, increased traffic in the project area, security provisions, and potential emergency situations at the construction site.

Construction areas present physical hazards, including the risk of falls, injuries, and drowning, particularly for vulnerable groups such as children. There is also a risk of animals or livestock entering the construction site and falling into excavations or other hazardous zones. Unauthorized access to the area further increases the likelihood of accidents. These risks should be mitigated through the implementation of controlled access measures, installation of fencing and warning signage, and continuous community awareness activities to inform residents about potential hazards and safety requirements during construction.

Potential impacts can occur during the maintenance works and emergency situations that exceed the limits of the Project site and can have significant impacts on the downstream communities. Therefore, an Emergency Preparedness and Response Plan should be in place (**Section 5.21**), and potentially affected communities should be informed and trained accordingly.

5.18 Impact on Occupational Health and Safety

The main Occupational Health and Safety (OHS) risks during the Project construction are associated with earthworks and excavation activities, the use of construction machinery and equipment, and the delivery of construction materials to the site. Key physical hazards include:

- Falls from heights while working on scaffolding or steep slopes around the dam site,
- Trips and slips on wet, uneven, or muddy surfaces,
- Entrapment or impact from the operation of construction machinery, such as cranes, bulldozers and concrete mixers,
- Exposure to elevated noise levels from machinery operations.

Inadequate human resource practices and isolation from family can contribute to mental strain, fatigue, and stress, which should be actively managed by workforce supervisors. Natural hazards, such as extreme weather events and encounters with wildlife (e.g., snakes and insects), also pose potential risks.

These occupational health and safety (OHS) risks will be managed through Occupational Health and Safety Management Plans (OHSMPs), developed specifically for all five reservoir sites.

During the Project's operational stage, OHS risks are primarily associated with workers performing maintenance and repair activities. A dedicated OHS procedure for maintenance and repair works should be developed and strictly managed.

5.19 Workers' Rights and Working Conditions Related Impacts

Contractors should be required, through contractual clauses, to comply with national labour regulations, EBRD PR2 and EBRD/IFC joint guideline of worker accommodation[18]. Monitoring of the HR practices should be performed among the workers on site (work schedule and shift duration, full rest days, provision of paid sick leave, payments above the minimum required level etc.), and in the labour accommodation camps (freedom of movement, availability and conditions of sanitary facilities, sufficient private space, dining facilities etc.) as well as sanitary and rest amenities at the construction area.

The contractor should be obliged to maintain the workers grievances mechanism, including an opportunity to submit anonymous complaints.

5.20 Gender-Based Violence and Harassment

Local women in the Project-affected areas may be exposed to risks and impacts associated with the influx of construction workers. To address this, a Worker Code of Conduct and a GBVH Policy should be developed and communicated to all construction workers and contractors. A dedicated grievance mechanism with a specific mandate to address GBVH cases should be established and publicly disclosed, with a designated staff member responsible for managing and overseeing it.

Women, particularly those from single-headed households, may face barriers in accessing irrigation infrastructure due to limited participation in decision-making processes. To mitigate potential GBVH cases, the Project's implementing agency, in coordination with local authorities, should implement appropriate measures to monitor, prevent, and respond to such incidents. The Project's grievance mechanism also contains provisions for the GBVH-sensitive complaints.

5.21 Emergency Situations and Response

Various emergency situations may arise during reservoir construction, triggered by natural hazards, the use of hazardous materials, particularly during blasting operations, or other man-made accidents and disasters.

In accordance with the World Bank's Good Practice Note (GPN) on Dam Safety (2020), emergencies include events such as flow releases that may threaten downstream life, property, or economic activities dependent on river flow levels, intentional or accidental water releases, and dam failure.

The GPN requires the development of an Emergency Preparedness Plan (EPP) and an Emergency Response Plan (ERP) during the construction of a high dam. These plans should be prepared at least one year before

[18]Workers' accommodation: processes and standards - a guidance note by IFC and the EBRD (2009). Available at: https://documents.worldbank.org/en/publication/documents-reports/documentdetail/604561468170043490/workers-accommodation-processes-and-standards-a-guidance-note-by-ifc-and-the-ebrd.

the start of reservoir filling. An effective EPP should provide clear and concise guidance on emergency actions, including:

- How to identify an emergency as early as possible,
- How to classify the emergency, and
- How to respond appropriately to the emergency.

Furthermore, the EPP should be coordinated with key entities, including national and regional emergency or disaster management agencies, as well as downstream districts and communities.

5.22 Cultural Heritage Impact

Kasakh site

Fourteen cultural heritage sites units been identified within the Project footprint (designated reservoir area and the surrounding protection zone) during the preliminary archaeological surveys conducted within the Kasakh reservoir site national EIA study. These units are newly discovered sites and, as such, are not included in the State list of registered cultural heritage units. They consist of archaeological, natural, geological, historical-architectural, and spiritual monuments that could potentially be impacted as a result of Project implementation.

Astghadzor site

In case of the Astghadzor reservoir, the northwestern part of the hill occupied by the "Vanqi Berd" archaeological complex will be partially affected, where, based on the archaeological findings, evidence of the remnants of a medieval habitation is still present. The documented cultural heritage units on the right slope and valley side of the Astghadzor River gorge, such as traces of structures and tombs, will also be negatively impacted. A portion of the site known as "Yerku Juri Arank," "Gomeri Arank," or "Mtnadzor" is included under ref. 4.34.6 and will be entirely submerged by the Astghadzor reservoir. A group of cross-stones (khachkars) located within the dam's impact zone also appears to be a continuation of the same monument complex, likely representing part of the cemetery associated with this historical village site. Evidence of additional livestock-related structures has also been identified in this area. Additionally, a modern monument of spiritual significance, the cross-stone dedicated to the memory of Artyom Mkhoyan (2009-2016) with shelter shed, is located within the Project implementation area and will also be submerged.

Artik site

Four cultural heritage units have been identified in the vicinity of the planned Artik reservoir area and supporting infrastructure. Two of these assets are located within the Project's direct impact zone, approximately 6 m and 20 m from the irrigation channel, respectively. Another monument is situated at a distance of approximately 75 m from the irrigation channel. According to the conclusion of the Historical and Cultural Reserves-Museums and Historical Environment Preservation Service SNCO, the construction works associated with the irrigation channel are of limited scale, involving a relatively small land area. Therefore, the potential impact on these cultural heritage sites is assessed as moderate and will be reduced to low provided that appropriate mitigation measures are implemented.

Lichk site

None of the seven cultural and historical monuments located in Lichk settlement and officially registered in the State List of Immovable Historical and Cultural Monuments of the Syunik Marz of the Republic of Armenia, fall within the Project's impact area. Additionally, no historical or cultural features, or traces thereof, were documented during the field-archaeological survey of the Project area.

Yelpin site

As a result of recently conducted field archaeological surveys carried out as part of the national EIA study in 2024, the list of archaeological monuments in the Yelpin settlement has been extended. However, none of the newly discovered monuments are located within the planned Yelpin reservoir site. Several structures consisting of stone fragments were observed within the Project site during the field surveys. These are of natural origin, formed by the movement and accumulation of materials during river floods. Among them, several artificial stone structures were also identified. These likely served a livestock-related function and may date to the late Middle Ages or the Soviet era.

Before the commencement of construction activities, detailed field archaeological surveys shall be conducted at all reservoir sites to:

1) Delineate the areas that will be impacted, identify the surface area and volume requiring test excavations, and carry out such excavations to preserve affected units, if applicable;

2) Conduct test excavations (trial trenching);
3) Assess the feasibility of relocating monuments to areas outside the reservoir impoundment but within the designated protection zone;
4) Propose specific protection measures to prevent damage during construction activities; and
5) Recommend appropriate preservation measures for each identified cultural heritage site.

For the Kasakh, Astghadzor, and Artik sites, site-specific Cultural Heritage Management Plans (CHMPs) will be developed and approved by the Supervision Engineer, the Client, and the authorized state body (Ministry of Education, Science, Culture, and Sport). Progress in the implementation of the CHMPs will be regularly reported to these entities. A chance find procedure will also be established within construction management plans to manage impacts on cultural heritage.

No adverse impacts on tangible cultural heritage sites or units are anticipated during the Project's operation phase. On the contrary, the presence of the reservoir may generate positive synergistic effects by enhancing the area's attractiveness and potentially increasing visitor interest in the historical monuments located in the affected rural settlements.

5.23 Cumulative Impact Assessment

Cumulative Impact Assessments (CIA) carried out for all reservoir sites considering the E&S impacts of the Project, as well as those of other projects or activities that are currently being implemented or planned in the foreseeable future within the Project's areas of influence. The CIA considers human developments for which sufficient publicly available information exists to identify potential interactions with the Project over time and/or space and to assess the resulting cumulative effects.

As a result of the CIAs, construction traffic was identified as the most significant cumulative impact. A set of measures has been recommended to prevent, mitigate, and reduce adverse cumulative effects. The implementation of these measures is expected to reduce the significance of traffic-related cumulative impacts to a minor level.

5.24 Project Environmental and Social Management

A Project Environmental, Social, Health, and Safety Management System (ESMS), covering both the construction and operation phases of the reservoirs and encompassing the activities of the WCRA (and PIU), the Design and Build Contractor (and its subcontractors), and JRAR CJSC[19], shall be established and include, at a minimum, the following:

1) Environmental, Social, Health and Safety (ESHS) policy and objectives,
2) Organisational structure, roles and responsibilities,
3) Contractor and Supplier Management Procedure (to manage their E&S and Health & Safety performance),
4) A framework for monitoring and reporting on E&S performance,
5) Stakeholder Engagement Plan with Project's Grievance Mechanism,

The Project's Environmental and Social Management Plans (ESMPs) are standalone documents associated with the ESIA reports. They set out the mitigation and management measures recommended through the impact assessment process, along with the criteria for their effective implementation and the institutional arrangements required throughout the Project's life cycle to prevent, reduce, or compensate adverse environmental and social impacts to acceptable levels.

The ESMPs have been prepared to ensure that the Project is implemented in compliance with applicable national environmental and social legislation, the EBRD Environmental and Social Policy (2019), relevant EU directives, and Good International Practice (GIP). Five separate ESMPs have been developed, one each for the Kasakh, Yelpin, Lichk, Artik and Astghadzor reservoirs.

The ESMPs cover the Project's pre-construction, construction, and operation (maintenance) phases and form the basis for the development and implementation of the following Site-Specific Environmental and Social Management Plans (SSESMPs), including:

- Traffic Management Plan,
- Tree Management Plan,

[19]Operator of irrigation water reservoirs of 1st and 2nd category

- Topsoil Management Plan,
- Hazardous Materials Management Plan,
- Spill Prevention and Management Plan,
- Waste Management Plan,
- Occupational Health and Safety Management Plan,
- Labour and Working Conditions Management Plan,
- Construction Camp Management Plan, including Sub-plans for Camp Code of Conduct and Camp Management,
- Local Employment and Procurement Plan,
- Worker Code of Conduct;
- Emergency Preparedness and Response Plan,
- Borrow Pit Management Plan,
- Cultural Heritage Management Plan,
- Chance Find Procedure,
- Air, Water, and Soil Quality Monitoring Plan,
- Noise and Vibration Monitoring Plan,
- Stakeholder Management Plan (that shall be updated at least once a year),
- Resettlement Plan.

Pre-construction Phase

Any requirements arising from the process of obtaining specific Project-related decisions (such as approvals, permits, or consents) from national and/or local self-governmental bodies (e.g., ministries, communities, inspection bodies, agencies) and/or the Client and EBRD during the pre-construction stage will be incorporated into the final construction documentation.

Construction Phase

In principle, the implementation of the key E&S mitigation measures related to the construction phase will be delegated to the Design and Build contractors. This delegation will be governed by the relevant ESMPs, which will form part of the tender documents, procurement process, and the Design and Build contractor's contract.

It will be the responsibility of the appointed Design and Build contractor(s) to further elaborate on the issues addressed in the ESMP as the Project planning progresses, both prior to and during construction. This includes, but is not limited to, the establishment of construction zones, temporary facilities for the workforce, details for storing construction and other materials, traffic and transport management, environmental protection and waste management, labour management, occupational and community health and safety, emergency preparedness, and other relevant matters.

Operational Phase

The operation phase will commence after the full commissioning of the reservoirs and supporting infrastructure. At that stage, all works will have been handed over by the Design and Build Contractor to the reservoir operator ("Jrar" CJSC), who will then be responsible for implementing the majority of E&S management measures to ensure continued compliance with the Project's mitigation strategy. These measures will be managed through "Jrar" CJSC's ESMS, in alignment with applicable regulations and guidelines.

In addition, the implementation of key E&S mitigation measures related to maintenance activities may be delegated to a designated contractors (i.e., the reservoir maintenance contractors). Such delegation will be governed by specific contractual arrangements.

A framework Environmental and Social Action Plan (ESAP), covering all five reservoirs, has been prepared and will form an integral part of the loan agreement to be signed between the Client and the Bank. The ESAP defines the actions to be implemented by the WCRA and its contractors to ensure the Project's compliance with applicable national E&S legal requirements, the EBRD PRs and Good International Practice (GIP). The ESAP, inetar alis, contains::

- Management and monitoring measures aimed at enhancing the Project's overall E&S performance, including that of contractors and other third parties involved in Project implementation,
- Effective, meaningful, and inclusive stakeholder engagement measures, including grievance mechanisms for the timely and transparent resolution of complaints and inquiries,

- Specific actions related to biodiversity conservation, pollution prevention and control, occupational and public health and safety, and labour and working conditions,
- A structured reporting system to support monitoring, accountability, and continuous improvement.

6 Public Consultations and Disclosure

Separate EIA and expert examination processes were organized and implemented for all five reservoir construction components. As part of the national EIA and expert examination procedures, four public discussions were held in the project-affected communities or settlements, covering all five reservoir construction components, in accordance with the RA Law on Environmental Impact Assessment and Expert Examination and RA Government Decree №1325-N dated 19.11.2014. These discussions took place between December 2023 and September 2024. The agenda of each public discussion is presented below:

1st public discussions
- Presentation of the Project objective and main components,
- Environmental and social framework,
- Initial consent of the affected community.

2nd public discussions
- Key findings of the preliminary environmental impact assessment,
- Draft Terms of Reference to be issued by the State Authorized Body (ME).

3rd public discussions
- Key findings of the EIA studies,
- Recommended mitigation and monitoring measures.

4th public discussions
- Main outputs of the EIA report,
- Feedback to the comments raised by the EIA process participants and stakeholders,
- Draft environmental impact expert examination conclusion.

During the public discussions, participants, primarily residents of the affected communities and settlements, expressed a generally positive attitude toward the Project's implementation. They noted that the Project is expected to create temporary jobs for local residents during the construction phase and permanent employment opportunities during the operational phase of the reservoirs. They also anticipate expanded opportunities for land cultivation due to the increased availability of irrigation water.

At the same time, participants raised several questions and concerns related to the Project's implementation, including:

i) Land use and acquisition, ownership, compensation mechanisms, and safety issues;
ii) Operational and community-related considerations, including employment opportunities;
iii) Environmental and hydrological aspects, biodiversity issues, and protected areas;
iv) Technical and design-related matters, including key technical characteristics of the Project.

Most of these issues were addressed and incorporated into the national EIA reports. Remaining concerns were reviewed by the ESIA consultant and, where relevant, have been reflected in the appropriate sections of the ESIA documentation.

Positive EIA and expert examination conclusions were issued by the Ministry of Environment for the EIA reports of all five reservoirs in 2024. Information on the national EIA stages, public discussions and the conclusions obtained is summarised in **Table 9**.

Table 8. Summary of information related to the national EIA and expert examination processes

Component	Preliminary EIA stage		Main EIA stage		EIA and expert examination conclusion
	1st public discussion	2nd public discussion	3rd public discussion	4th public discussion	
Kasakh EIA	20.12.2023	26.03.2024	29.05.2024	20.08.2024	№233-24 dated 01.11.2024
Yelpin EIA	20.12.2023	25.03.2024	27.05.2024	06.08.2024	№197-24 dated 23.09.2024
Lichk EIA	26.12.2023	03.04.2024	06.06.2024	03.09.2024	№215-24 dated 16.10.2024

Component	Preliminary EIA stage		Main EIA stage		EIA and expert examination conclusion
	1st public discussion	2nd public discussion	3rd public discussion	4th public discussion	
Artik EIA	15.09.2023	15.12.2023	11.07.2024	12.11.2024	№278-24 dated 13.12.2024
Astghadzor EIA	18.12.2023	08.05.2024	27.06.2024	09.10.2024	№265-24 dated 06.12.2024

The next round of stakeholder consultation meetings will take place during the 120-day public disclosure period for the ESIA package, which includes the ESIA Report, Non-Technical Summary (NTS), Environmental and Social Management Plan (ESMP), Environmental and Social Action Plan (ESAP), Stakeholder Engagement Plan (SEP), Resettlement Framework (RF), and Biodiversity Action Plan (BAP).

One public consultation event will be held in the affected communities, with another planned in Yerevan. These consultations will involve relevant state authorities, NGOs, and other Project stakeholders, covering all five reservoirs. The meetings are tentatively scheduled for the third quarter of 2026. This component will be led by the ESIA consultant, with support from the Water Committee.

The Stakeholder Engagement Programme, developed as part of the SEP, is designed to ensure effective engagement with all identified stakeholders, foster constructive relationships between the Water Committee and affected parties, and help prevent potential conflicts. It covers the Project's design, pre-construction, and construction phases.

Stakeholder engagement will continue in parallel with ESIA information disclosure, with the aim of facilitating meaningful consultation and providing timely information on the Project and its environmental and social (E&S) implications (see the SEP for further details). In accordance with the SEP, Project-related information and documents will be uploaded to the WCRA website in both English and Armenian.

The WCRA will establish a Project grievance mechanism for external stakeholders that complies with national legislation and Lender requirements. Stakeholders may contact the WCRA using the details provided below and on the WCRA website. Information will also be posted on the notice boards of the Martuni, Meghri, Ashtarak, Etchmiadzin, Artik, and Areni communities, in affected settlements, and on designated boards at construction sites, together with the contact details of the Design and Build Contractor.

Once the Design and Build Contractor and the Supervision Engineer are appointed, their contact details will also be disclosed, allowing inquiries and grievances to be directed to them as appropriate. At a later stage, additional Project contact persons, such as Community Liaison Officers, will be introduced.

All grievances and inquiries will be registered, reviewed, and responded to in accordance with the procedure outlined in the SEP.

Grievances and inquiries can be addressed to the WCRA using the contact details below:

Water Committee's contact person for Project-related inquiries and grievances	
Name:	Ms. Naira Avetyan
Position:	Head specialist of irrigation and collector-drainage systems department
Address:	Vardanants str. 13a, Yerevan 0010, Armenia
E-mail:	nairavetyan2013@gmail.com
Telephone:	+37410 540135, +37491 726111

Water Committee's details for general inquiries	
Address:	Vardanants str. 13a, Yerevan 0010, Armenia
Hot-line:	+37410 547283, +37410 540135
Reception:	+37410 540909
Fax:	+37410 540613
E-mail:	scws@scws.am

The residents of the affected settlements can also submit their inquiries and complaints to the administrative heads of their respective villages as presented below.

Reservoir	Settlements
Artik	Nor Kyanq, Vardaqar, Panik, Meghrashen, Anushavan, Pemzashen and Tufashen
Astghadzor	Astghadzor, Zolaqar, Vaghashen and parts of Martuni
Kasakh	Oshakan, Voskehat and Voskevaz
	Artimet
	Ferik
	Aknalich
	Echmiadzin
	Aragats, Aghavnatun, Tsaghkalanj, Arshaluys, Doghs, Leramerdz, Haytagh, Geghakert, Hovtamej, Tsiatsan, Tsaghkunq, Mrgastan, Shahumyan, Khoronk, Griboyedov, Amberd and Aygeshat
Lichk	Agarak, Alvank, Karchevan, Lehvaz, Meghri, Nrnadzor, Shvanidzor, Vardanidzor and Lichk
Yelpin	Yelpin and Chiva

Any inquiries or concerns communicated to the local authorities (heads of villages or communities) will be immediately transmitted to the WCRA for review and redress.