



Source: Photos taken by the Consultant during the site visits

## **WATER RESERVOIRS PROJECT - ARMENIA**

### **Environmental and Social Impact Assessment for the Astghadzor Reservoir Construction Project**

## **ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

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](http://www.atms.am)

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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 ESMP for the Astghadzor Reservoir Construction Project	A. Ter-Torosyan		A. Ter-Torosyan	19.12.2025
Rev02	Final draft of the ESMP for the Astghadzor Reservoir Construction Project		A. Ter-Torosyan	A. Ter-Torosyan	28.12.2025

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## Disclaimer

This Environmental and Social Management Plan (ESMP) has been developed as part of the Environmental and Social Impact Assessment (ESIA) for the Astghadzor Reservoir Construction Project (hereinafter referred to as "the Project"). It is intended to guide the implementation of environmental and social management measures during the Project's design (pre-construction), construction, and operational phases, in alignment with applicable national regulations and international best practices.

The information presented in this ESMP is based on data available at the time of its preparation and may be subject to revision as project conditions evolve.

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## List of Abbreviations

BAP	- Biodiversity Action Plan
BMP	- Biodiversity Management Plan
BSMP	- Blasting Safety Management Plan
CESMP	- Construction Environmental and Social Management Plan
CH	- Critical Habitat
CJSC	- Close Joint Stock Company
EBRD	- European Bank for Reconstruction and Development
EIA	- Environmental Impact Assessment
EPRP	- Emergency Preparedness 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
HMMP	- Hazardous Materials Management Plan
ME	- Ministry of Environment
MSDS	- Material Safety Data Sheets
MTAI	- Ministry of Territorial Administration and Infrastructure
OHS	- Occupational Health and Safety
OHSMP	- Occupational Health and Safety Management Plan
GA	- Government of Armenia
PAP	- Project Affected Person
PBF	- Priority Biodiversity Features
PIU	- Project Implementation Unit
PPE	- Personal Protective Equipment
PR	- Performance Requirement
RA	- Republic of Armenia
SDA	- Spoil Disposal Area
SDMP	- Spoil Disposal Management Plan
SPA	- Spoil Disposal Area
SPMP	- Spill Prevention and Management Plan
SSESMP	- Site-Specific Environmental and Social Management and Monitoring Plan
TLV	- Threshold Limit Value
TsMP	- Topsoil Management Plan
ToR	- Terms of Reference
WCRA	- RA Water Committee
WMP	- Waste Management Plan

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## 1. Introduction

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

- Kassakh reservoir in Aragatsotn Marz<sup>1</sup>,
- Lichk reservoir in Syunik Marz,
- Yelpin reservoir in Vayots Dzor Marz,
- Artik reservoir in Shirak Marz,
- Astghadzor reservoir in Gegharkunik Marz.

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

One of the five reservoirs listed above is planned for construction within the administrative boundaries of Astghadzor and Zolaqar rural settlements in Martuni community (Gegharkunik Marz, RA). The Astghadzor Reservoir is designed with a capacity of 1.55 mln. m<sup>3</sup> and will be fed by the Astghadzor River. It is intended to provide irrigation water to Astghadzor, Zolaqar, Vaghashen, and parts of Martuni settlements.

The Bank has engaged the Consultant<sup>2</sup> to update the national Environmental Impact Assessment ('EIA') report for the Artghadzor Reservoir Construction Project in accordance with the EBRD ESP and to prepare the associated Environmental and Social (E&S) documentation, including this Environmental and Social Management Plan ('ESMP') proportionate to the Project's specific impacts, benefits, and opportunities.

## 2. Purpose and Scope

This ESMP is a standalone document associated with the Project's ESIA Report. It comprises a set of mitigation and management measures, criteria for their effective implementation, sources of financing, anticipated targets and institutional arrangements to be undertaken throughout the Project's life cycle to prevent, reduce and compensate adverse E&S impacts to acceptable levels. The ESMP has been prepared based on the findings of this E&S appraisal to ensure that the Project is implemented in compliance with applicable national E&S laws and regulations, the EBRD ESP (2019), relevant EU directives, and Good International Practices (GIP).

The ESMP is a key document that outlines the E&S requirements, including those related to cultural heritage (both tangible and intangible), land tenure, emergency situations, and community and occupational health and safety risks, and specifies the operational procedures necessary to manage significant issues that may arise during Project implementation.

This ESMP designated to:

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<sup>1</sup>Marz - Region in Armenian

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

- Legislative and regulatory framework applicable to the Project,
- Ensure that the requirements of the EBRD are met,
- Outline the organisational structure, and key roles and responsibilities associated with E&S management,
- Document how the E&S risks and impacts identified through the ESIA studies will be managed. Management implies avoiding or limiting the adverse impacts as well as maximising the positive impacts (benefits) of the Project.

The scope of this ESMP encompasses the design (pre-construction), construction, and operation phases of the Project. Accordingly, it applies to the Construction contractor and its sub-contractors; specialized companies engaged to conduct specific studies required under the ESMP; the Supervising engineer; and the Client, represented by the RA Water Committee (WCRA) under the Ministry of Territorial Administration and Infrastructure (MTAI). It also covers the Project Implementation Unit (PIU), which is involved in the design and construction phases of the Project, as well as "Jrar" CJSC, responsible for the operation and maintenance of the completed reservoir.

### 3. Project Overview

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. The reservoir is intended to accumulate the river's floodwaters and ensure sustainable irrigation of 740 ha of agricultural land in the settlements of Astghadzor, Zolaqar, Vaghashen, and part of Martuni in the Gegharkunik Marz, during the low-water months (**Figure 1**). Taking into account the climatic conditions of the Project region, the main crops cultivated are wheat, potatoes, and other vegetables.

The results of the annual seasonal flow regulation, calculated as part of the Project design study, indicate that the total reservoir capacity will be 1.55 mln. m<sup>3</sup>, including 0.036 mln. m<sup>3</sup> of dead storage and 1.514 mln. m<sup>3</sup> of useful (active) storage. This water volume will enable a transition from mechanical irrigation to gravity-based irrigation in the beneficiary settlements. In addition, it will allow the irrigation of land that has previously remained uncultivated due to water shortages.

The availability of a pressurized pipeline creates an opportunity to replace mechanical irrigation using pumping stations with gravity-based irrigation through the construction of an appropriate irrigation network, thereby reducing electricity consumption.

The Astghadzor Reservoir and its associated structures will cover an area of 13.53 ha, of which 11.6 ha will be occupied by the dam and its auxiliary facilities. The reservoir will have a storage capacity of 1.55 mln. m<sup>3</sup>. The reservoir is planned to be constructed to irrigate 740 ha<sup>3</sup> of agricultural land in Astghadzor, Zolaqar, Vaghashen, and parts of the Martuni settlements.

The reservoir hydraulic unit consists of:

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

**Figure 1. Location of the Astghadzor Reservoir site and the surrounding rural settlements**

<sup>3</sup>To irrigate 740 ha of agricultural land in the rural settlements of Astghadzor, Zolaqar, Vaghashen, and Martuni 3.13 mln. m<sup>3</sup> is required of which 1.514 mln. m<sup>3</sup> will be supplied from the reservoir and 1.61 mln. m<sup>3</sup> from the river



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

The height of the dam is 27.9 m from the upstream channel bed and 43.85 m from the downstream side. The total length of the dam is 260 m. The upstream slope has an inclination of  $m = 3.5$ , while the downstream slope is  $m = 2.5$ . The crest width is 10.0 m, and the length of the weir is 14 m.

For the irrigation purposes it is planned to install steel pipes with a diameter of 600 mm and a length of 240.0 m in the foundation to take water from the reservoir at a rate of  $Q = 633.5$  l/s. The minimum water intake level is assumed to correspond to the dead storage level at an elevation of 2133.6 masl. A 342 m long stainless steel irrigation pipeline OJ 1-1 ( $\varnothing 426 \times 6$  mm) to the Astghadzor settlement, and a 3,254 m long stainless steel irrigation pipeline OJ 1-2 ( $\varnothing 426 \times 6$  mm) to Vaghashen, equipped with  $\varnothing 400$  mm disc valves and  $\varnothing 400$  mm water meters, will be constructed.

In total, 54 land plots covering a surface area of 420,111.30 m<sup>2</sup> will be affected as a result of the Project implementation. Of these, 19 are community-owned, and 35 are privately owned. The 19 community-owned plots are agricultural arable lands, totaling 353,510.10 m<sup>2</sup>. The 35 private plots cover 66,601.20 m<sup>2</sup>, with 27 plots (52,875.10 m<sup>2</sup>) classified as agricultural arable lands and 8 plots (13,726.10 m<sup>2</sup>) as agricultural grasslands.

All facilities required for the reservoir construction, except of the sandy loam borrow pit, are situated within the Construction site (42.011 ha area permanently allocated for the Project needs). These facilities include construction camp, pebble-gravel and loam borrow pits and topsoil temporary storage area.

The construction site will cover an area of 42.011 ha, which will be permanently allocated for the project's needs, including:

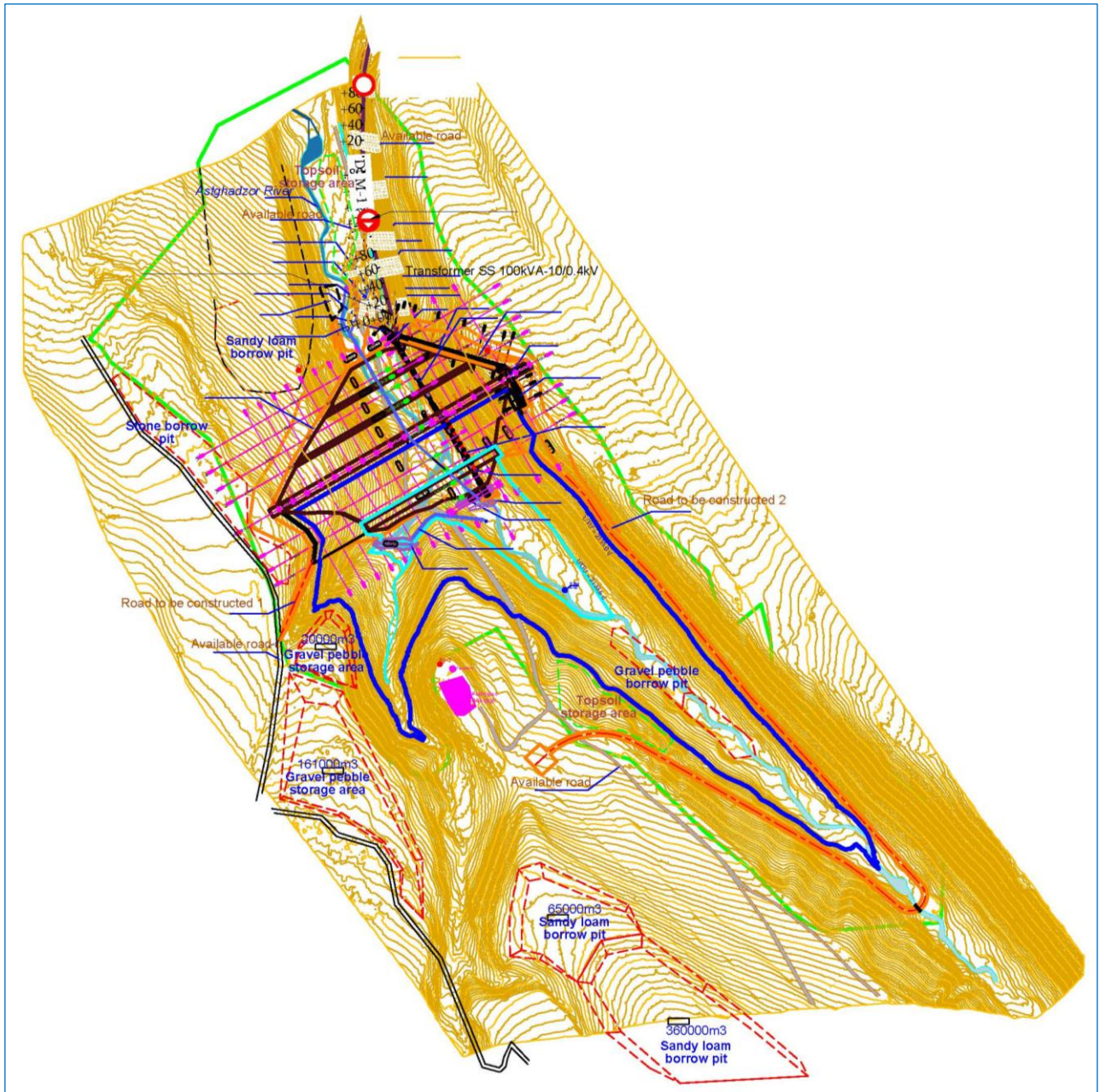
- Two sandy loam borrow pits,



- Stone borrow pit,
- One gravel pebble borrow pit,
- One gravel pebble storage area,
- Two topsoil temporary storage areas,
- Construction camp (location will be selected later).

The Master plan of the construction site is presented in **Figure 2**.

**Figure 2. Master plan of the construction site**



The materials required for the construction of the reservoir dam, such as sandy loam, gravel-pebble mix, and stone, will be extracted from areas located within the construction site. Upon completion of the reservoir and dam construction, the used borrow pits will be remediated and landscaped, and the land will be returned to Martini community.

The construction machinery and equipment will be transported to Astghadzor rural settlement via M10 and M11 highways and communal roads. The access to the construction site from Astghadzor settlement will be through the available earthen roads and three new earthen roads to be constructed for the Project needs.

According to the Project Design Document, a combination of drilling and blasting operations is planned for use in the stone borrow pit, as well as for the removal and dislodgement of rock masses.

The Project design document also envisions the construction of power supply lines and a substation.

Duration of the construction works was determined based on the volume and labour intensity of the main earth/excavation and concrete works, the rational sequencing of tasks, and a consolidated assessment of operational constraints in line with Construction Norms and Rules - CN&R №1.04.03-85 "Norms for the duration of construction of facilities, buildings, and structures". The construction period was determined according to the Project's construction time-schedule and amounts to 36 months.

## 4. Legal and Regulatory Framework

### 4.1 Applicable Legal and Regulatory Requirements

The following legal and regulatory requirements have been taken into account during the ESIA study and have accordingly served as criteria for the formulation of the management measures proposed in this ESMP:

- 1) Applicable national E&S laws and regulations,
- 2) Applicable international conventions ratified by Armenia,
- 3) Applicable EU legislation,
- 4) EBRD ESP and Performance Requirements (PRs).

The E&S legal and regulatory acts applicable for the Project are outlined in details in [Section 4](#) of the ESIA report and are listed below:

- The RA Law on Environmental Impact Assessment and Expert Examination (2014, revised in 2023),
  - The procedure for public notification and public discussions is outlined in the RA Government Decree №1325-N dated 19.11.2014,
  - The RA Government Decree №399-N dated 09.04.2015 "On approval of procedure for the environmental impact examination of concept documents and intended activities",
  - The Order №438-N of the RA Minister of environment dated 29.10.2024 "On approval of the guidelines for the strategic environmental assessment and environmental impact assessment",
- The RA Water Code (2002),
  - The quality of surface water in Armenia is monitored as per the principles of EU Water Framework Directive adopted by the RA Government Decree №75-N dated 27.01.2011,
  - The RA Government Decree №1332-N dated 03.08.2023 "On the procedures for issuing a water use permit, its extension, reformulation, review, suspension, revocation, termination, and the approval of the standard form of a water use permit, well passports, and well design geological and technical section forms",
- The Law on RA water national program (2006),

- The RA Law on the fundamentals of national water policy (2005),
- The RA Land Code (2001),
  - The procedure for topsoil use, approved by the RA Government Decree №1396-N dated 08.09.2011,
  - The requirements for determination of topsoil stripping norms and for stripped topsoil preservation and use, approved by the RA Government Decree №1404-N dated 02.11.2017,
  - The procedure for soil excavation, approved by the RA Government Decree №572-N dated 10.05.2019,
- The RA Law on surveillance over the land use and land conservation (2008),
- The RA Law on waste (2004),
- The RA Law on alienation of property for overriding interests of the public (2006),
- The RA Law on atmospheric air protection (1994, revised in 2022),
  - The RA Government Decree №160-N dated 02.02.2006 approving the maximum permissible concentrations of ambient air pollution in residential areas,
- The RA Law on flora (1999),
- The RA Law on fauna (2000),
- The RA Government Decree №71-N on approval of the RA Red Book of animals,
- The RA Government Decree №72-N on approval of the RA Red Book of plants,
- The RA Law on special protected areas of nature (2006),
- The RA Law on protection and use of immovable cultural and historic monuments and historic environment (1998),
- The RA Law on intangible cultural heritage (2009),
  - RA Government Decree №310-A "On Defining the Criteria for Preparing the Lists of Intangible Cultural Values and Approving the List of Intangible Cultural Heritage Values"
  - RA Government Decree №36-N "On the Criteria for Preparing the Lists of Intangible Cultural Heritage in Need of Urgent Safeguarding, and the List of Intangible Cultural Heritage Values Based thereon",
  - RA Government Decree №241-N "On approving the criteria for defining cultural spaces and published the list of cultural spaces",
- The RA Code on subsoil resources (2011),
- The RA Forest Code (2005),
- The RA Law on environmental oversight (2005),
- The RA Law on public health (2024),
- The Labour Code (2004),
- The RA Law №HO-57-N (2013) On ensuring of equal rights and equal opportunities for men and women,
- The RA Law on fire safety (2001),
- The Fire Safety Rules approved by Order №595-N of the RA Minister of Territorial Administration and Emergency Situations (2015).

The International Conventions and Protocols ratified by RA and applicable to the Project are summarised in **Table 1**.

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

International agreements (convention or protocol)	Description
Convention on Wetlands of International Importance - (Ramsar 1971)	The Convention entered into force in Armenia in 1993.
Paris Convention for the Protection of the World Cultural and Natural Heritage (1972)	Armenia became a State party in 1993.
The Convention on the Conservation of Migratory Species of Wild Animals (1979) (Bonn Convention)	Armenia is a State party since 2011
Convention on the Conservation of European Wildlife and Natural Habitats, Bern (1979)	Ratified by Armenia in 2008.
The Convention on Biological Diversity (1992)	Signed by Armenia in 1993.
European Landscape Convention, Florence (2000)	The European Landscape Convention of the Council of Europe promotes the protection, management and planning of the landscapes and organises international co-operation on landscape issues.
United Nation Framework Convention on Climate Change (UNFCCC) (1992)	Armenia became a state party in 2002.
Paris Agreement under the United Nations Framework Convention on Climate Change	Ratified by Armenia in 2017.
UN Convention to Combat Desertification, Paris (1994)	Ratified by Armenia in 1997.
UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage (2003)	Ratified by Armenia in 2006.
Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, Aarhus Convention (1998)	Armenia became a State-party in 2001.
Convention on Environmental Impact Assessment in a Transboundary Context, Espoo Convention (1991)	Ratified by Armenia in 1997.
International Labour Organization (ILO) Conventions	Armenia has ratified 29 ILO conventions including the 8 fundamental ones.

The European Union (EU) legislation that is applicable to the Project includes the following Directives:

- 1) 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),
- 2) Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) (the Industrial Emissions Directive),
- 3) Directive 2009/147/EC on the conservation of wild birds (the Birds Directive),
- 4) Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive),
- 5) Directive 2000/60/EC establishing a framework for Community action in the field of water policy (the Water Framework Directive),



- 6) Directive 2008/98/EC on waste (Waste Framework Directive),
- 7) Directive 2003/10/EC on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise),
- 8) Directive 2002/44/EC on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration).

Specific E&S requirements applicable to the Project are set out in:

- The EBRD's Sub-sectoral Environmental and Social Guidelines: Building and Construction Activities (2010),
- The International Finance Corporation (IFC) General Environmental, Health and Safety Guidelines (2007),
- ICOLD Bulletin 173 (2021) - Integrated Operation of Hydropower Stations and Reservoirs,
- ICOLD Bulletin 96 (1994) - Dams and environment - Water quality and climate,
- ICOLD Bulletin 86 (1992) - Dams and Environment - Socio-economic impacts.

The EBRD outlines its key E&S requirements in the Environmental and Social Policy (ESP, 2019). The PRs applicable to this Project are listed below

- PR1: Assessment and Management of Environmental and Social Risks and Impacts,
- PR2: Labour and Working Conditions,
- PR3: Resource Efficiency and Pollution Prevention and Control,
- PR4: Health, Safety and Security,
- PR5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement,
- PR6: Biodiversity Conservation and Sustainable Management of Living Natural Resources,
- PR8: Cultural Heritage,
- PR10: Information Disclosure and Stakeholder Engagement.

## 4.2 Environmental Criteria and Limits

The environmental criteria and limit values applied to determine baseline physical conditions within the Project area and its affected surroundings, and to guide environmental monitoring during the construction and operation phases, are summarized in **Tables 2-5**.

The criteria for assessing ambient air quality in the residential areas in Armenia is defined by the RA Government Decree №160-N and the World Health Organization (WHO) *Air Quality Guidelines - Global Update 2021*<sup>4</sup>, and are summarized in **Table 2**.

**Table 2. Air quality standards highlighting (in blue cells) the most stringent**

№	Pollutant	Averaging period	Maximal Permissible Concentrations (MPC), mg/m <sup>3</sup>		
			WHO		Armenian standards
			2005	2021	
1	PM2.5	24-hour	0.025	0.015	0.035
		Annual		0.01	
		Maximum			0.16
2	PM10	24-hour	0.05	0.045	0.06
		Annual	0.02	0.015	

<sup>4</sup><https://www.who.int/publications/i/item/9789240034228>

№	Pollutant	Averaging period	Maximal Permissible Concentrations (MPC), mg/m <sup>3</sup>		
			WHO		Armenian standards
			2005	2021	
3	Sulphur dioxide	Maximum			0.3
		1-hour			
		24-hour	0.02	0.04	0.05
		Maximum			0.5
4	Nitrogen dioxide	1-hour			
		24-hour		0.025	0.04
		Annual	0.04	0.01	
		Maximum			0.2
5	Carbon monoxide	Maximum daily 8hour			
		24-hour		4.0	3.0
		Maximum			5.0

Threshold Limit Values (TLVs) for equivalent (average) and maximum noise/sound levels set by the RA Sanitary Norms №2-III-11.3 *Noise in the workplaces, in residential and public buildings and housing in construction areas*<sup>5</sup>, the IFC *Environmental, Health, and Safety General Guidelines (2007)*<sup>6</sup> and WHO *Guidelines for Community Noise (1999)*<sup>7</sup> are presented in **Table 3**.

**Table 3. Threshold limit values (TLV) for noise**

№	Premises and territories, receptors		TLV, dBA		
			National		IFC/WHO
			Equivalent to sound level	Maximum sound level	One hour equivalent sound level
1	Workplace		80		85
2	Shops, trading halls, airport and railway stations waiting rooms, drop-off points of public service providers		60	75	
	Industrial, commercial				70
3	Territories adjacent to residential buildings, clinics, ambulatories, rest houses, care homes, disabled persons homes, libraries, kinder gardens, schools and other educational facilities	day-time <sup>8</sup>	55	70	55
		night-time <sup>9</sup>	45	60	45

The TLVs set by the Hygienic Norms №2.2.4-009-06 *Vibration in the workplaces, in residential and public buildings*<sup>10</sup> and summarised in **Table 4**.

**Table 4. Threshold limit values (TLV) for vibration acceleration**

№	Whole-body vibration	TLV for corrected and equivalent corrected values
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<sup>5</sup><https://www.arlis.am/hy/acts/163246>

<sup>6</sup><https://www.ifc.org/content/dam/ifc/doc/2000/2007-general-ehs-guidelines-en.pdf>

<sup>7</sup><https://www.who.int/publications/i/item/a68672>

<sup>8</sup>between 07:00 and 23:00

<sup>9</sup>between 23:00 and 07:00

<sup>10</sup><https://www.arlis.am/hy/acts/163276>

		m/sec <sup>2</sup>	dB
1	Transport-technological (2nd category)	0.28	109
2	Technological (3rd category a)	0.1	100
3	Technological (3rd category b)	0.04	92
4	Technological (3rd category g)	0.014	83
5	Residential buildings, clinics	0.004	72

Admissible Concentration Limits (ACL) for chemical elements in soil set out in the Sanitary Rules and Norms №2.1.7.003-10 "Hygienic requirements for soil quality"<sup>11</sup> are given in **Table 5**.

**Table 5. Admissible Concentration Limits (ACL) for chemical elements in soil**

№	Chemical elements	Unit	ACL of chemicals in soil
1	Vanadium	mg/kg	150
2	Chrome	mg/kg	6
3	Manganese	mg/kg	1500
4	Cobalt	mg/kg	5
5	Nickel	mg/kg	4
6	Copper	mg/kg	3
7	Zinc	mg/kg	23
8	Arsenic	mg/kg	2
9	Antimony	mg/kg	4.5
10	Lead	mg/kg	32

The quality of surface water in Armenia is monitored in accordance with the principles of the EU Water Framework Directive, as adopted by RA Government Decree №75-N dated 27.01.2011<sup>12</sup>. The environmental water quality standards for watercourses within the Sevan Lake Basin are defined in Annex 15 of the same decree.

## 5. Roles and Responsibilities

### 5.1 RA Water Committee (WCRA)

The WCRA (PIU) is the executing agency with overall responsibility for the Project and for implementing this Environmental and Social Management Plan (ESMP). It is also responsible for ensuring compliance with all Armenian environmental and social (E&S) legal requirements and for meeting the commitments set out in the Environmental and Social Impact Assessment (ESIA) Report.

While many of the ESMP requirements will be implemented by the Construction contractor and its sub-contractors, the WCRA will retain overall accountability for the Project's E&S performance. In addition, the WCRA (PIU) is responsible for the implementation of the Stakeholder Engagement Plan (SEP) and Biodiversity Action Plan (BAP)<sup>13</sup>, Cultural Heritage Management Plan (CHMP) and Resettlement Action Plan (RAP).

The WCRA employs environmental and social specialists who oversee and supervise the implementation of all Project obligations related to Environmental, Social, Health, and Safety (ESHS)

<sup>11</sup><https://www.arlis.am/DocumentView.aspx?docid=146741>

<sup>12</sup><https://www.arlis.am/hy/acts/200962>

<sup>13</sup>The SEP and BAP were developed by the ESIA consultant on behalf of the WCRA and form part of the ESIA disclosure package

matters. For specific E&S studies, the WCRA may engage specialised or licensed companies and consultants, as required.

## 5.2 Supervising Engineer

The Supervising Engineer will be contracted by the WCRA to oversee Project implementation during the construction phase and to ensure compliance with the requirements of the Environmental and Social Management Plan (ESMP) and other Project construction-related E&S management plans and procedures.

Responsibilities include developing and implementing a monitoring program, maintaining records, and reporting to the WCRA and the EBRD on the Construction Contractor's E&S performance. This will cover observed non-compliances, the corresponding corrective actions and defined timelines, roles and responsibilities.

The Supervising Engineer will also provide capacity-building support and training to the Contractor's E&S team as needed and will be responsible for the approval of the management and monitoring plans outlined in [Section 6.2](#) of this ESMP.

The Supervising Engineer will be required to appoint suitably qualified and experienced ESHS individuals into the following specific roles:

- 1) International and local environmental specialists,
- 2) International and local Occupational Health and Safety (OHS) specialists,
- 3) Local social (including Gender) and resettlement specialist/s,
- 4) Local archaeologist,
- 5) Biodiversity (flora and fauna) specialists with international experience / experience with lender requirements.

## 5.3 Construction Contractor

The Construction contractor, selected through the WCRA tendering process, holds overall responsibility for the construction of the Project. The Contractor must fully comply with the requirements of this ESMP and all relevant WCRA management plans.

This includes developing the construction-phase E&S management plans outlined in [Section 6.2](#) of this ESMP and ensuring that all environmental and social management and mitigation measures specified in these plans are effectively implemented throughout construction activities.

The Contractor is also responsible for ensuring that all sub-contractors adhere to the requirements of all Project E&S management plans and procedures.

The Construction contractor will be required to appoint suitably qualified and experienced personnel to the following specific ESHS roles:

- 1) Project Manager,
- 2) Environmental specialist,
- 3) Occupational and community health and Safety specialist(s),
- 4) Social and resettlement specialist,
- 5) Cultural heritage expert,
- 6) Community liaison officers responsible for the implementation of the relevant tasks from the SEP at the community level (at least one such officer being a female),



- 7) Biodiversity (flora and fauna) specialist with international experience / experience with lender requirements.

## 5.4 EBRD

The Project Lender - EBRD will monitor the E&S performance of the Project to ensure compliance with the requirements of their respective E&S policies in relation to the water section which they will finance.

## 5.5 Project Implementation Unit (PIU)

The Project Implementation Unit (PMU) will, inter alia, assist the WCRA in implementing measures required in the ESMP and ESAP, provide training, as appropriate, to increase E&S management capacity of the WCRA and its contractors engaged in the Project implementation, review of the site-specific ESMPs, assist the WCRA in developing and integrating the policies, plans, procedures, actions and mitigation measures required under the ESAP, Resettlement Plan (RP), SEP, BAP, CHMP and other management plans into the Project overall management system and budget approval procedures, as appropriate.

The PMU assist the WCRA in implementing the measures required under the ESMP, the Environmental and Social Action Plan (ESAP) and related management plans. The PMU will also provide training, as appropriate, to strengthen the E&S management capacity of the WCRA and its contractors involved in Project implementation. Training for the JRAR staff on proper reservoir operation will also be arranged by the PIU.

In addition, the PMU will review site-specific E&S management plans and support the WCRA in developing and integrating the policies, plans, procedures, actions and mitigation measures required under the ESAP, SEP, BAP, CHMP and other management plans into the Project's overall management system and budget approval processes, as appropriate.

## 5.6 "Jrar" CJSC - Reservoirs Operator

"Jrar" is a Close Joint-Stock Company (CJSC) under the MTAI, responsible for the operation and maintenance of 1st and 2nd category water reservoirs in Armenia.

"Jrar" CJSC will develop and implement the management and monitoring plans and measures proposed in the ESMP for the operation and maintenance phase of the Astghadzor Reservoir.

## 5.7 Governmental Authorities and Local Self-governmental Bodies

The Ministry of Environment (ME) will issue air emission permits, approve hazardous waste passports and limits for waste generation and disposal. The ME will also provide guidance and support to the Project within the scope of its statutory responsibilities.

The Ministry of Education, Science, Culture and Sport (MESCS) will support the Project in conducting archaeological studies and addressing issues related to tangible and intangible cultural heritage. The MESCS will also assist the Project in accordance with its statutory mandate.

The Martuni Municipality and administrative heads of Astghadzor and Zolaqar rural settlements will identify suitable locations for Spoil Disposal Areas (SDA) and topsoil storage sites, facilitate communication between the Construction Contractor and the populations of affected settlements, and assist the Contractor in cases of temporary land acquisition or use, as needed.

## 6. Environmental and Social Management across the Project Life Cycle

### 6.1 Project Life Cycles

#### Pre-construction Phase

Any requirement 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 Construction contractor(s). This delegation will be governed by the ESMP, which will form part of the tender documents, procurement process, and the Construction contractor's contract.

The Construction contractor(s) will develop their own Construction Environmental and Social Management Plans (CESMP), which must be aligned with this ESIA Report and this ESMP. The CESMP will include Site-Specific Environmental and Social Management and Monitoring Plans (SSESMPs) or procedures to address E&S issues during the construction period. The Supervising engineer, appointed by the Client, shall review and approve these documents.

It will be the responsibility of the Construction 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 following the full commissioning of the reservoir and supporting infrastructure. At that stage, all works will have been handed over by the Construction contractor to the reservoir operator ("Jrar" CJSC), who will 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 Environmental and Social Management System (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 contractor (i.e. the reservoir maintenance contractor). Such delegation will be governed by specific contractual arrangements.

### 6.2 Environmental and Social Management Plans

A set of specific operational, management and monitoring plans should be prepared by the Construction contractor in line with the Project's ESMP and implemented during the pre-construction and construction phases to effectively manage E&S impacts. At a minimum, the proposed SSESMPs shall include:

- Traffic Management Plan,
- Topsoil Management Plan,
- Borrow Pit Management Plan,

- Spoil Disposal Management Plan,
- Hazardous Materials Management Plan,
- Spill Prevention and Management Plan,
- Waste Management Plan,
- Occupational Health and Safety Management Plan,
- Construction Camp Management Plan, including sub-plans for Camp Code of Conduct and Camp Management,
- Local Employment and Procurement Plan,
- Cultural Heritage Management Plan,
- Chance Find Procedure,
- Riverine Habitat Construction Plan,
- Air, Water, and Soil Quality Monitoring Plan,
- Noise and Vibration Monitoring Plan,
- Resettlement Plan,
- Stakeholder Management Plan (that shall be updated at least once a year).

During the operation phase of the Astghadzor Reservoir, a series of E&S management plans will be developed and implemented by the Client (WCRA and PIU) in cooperation with "Jrar" CJSC, taking into account the recommendations and mitigation measures outlined in the Operation Phase section of this ESMP (see table below), including:

- Irrigation Water and Environmental Flow Releases Management Plan,
- Reservoir Operation and Maintenance Plan,
- Traffic Management Plan,
- Emergency Response Plan,
- Operation and Maintenance Plan,
- OHS procedures (Plan),
- Waste Management Plan,
- Stakeholder Engagement Plan,
- Biodiversity Action Plan.

## 7. Environmental and Social Management Measures

The proposed mitigation measures for the Project's pre-construction (design) phase (Section A), construction phase (Section B) and operation phase (Section C) are summarised in **Table 6** below. This table outlines the activities and associated impacts that require mitigation, defines the targets and indicators needed to assess the effectiveness of the implemented measures and identifies the sources of financing and responsible entities.

**Table 6. Environmental and social management measures**

Type of Activity	Expected Impact	Mitigation Measures	Cost (if discrete and feasible for including into bill of quantities)	Target / Indicator	Responsible / Supervising Entities <sup>14</sup>
<b>Section A - PRE-CONSTRUCTION (DESIGN) PHASE</b>					
Vegetation clearance, tree cutting	Impact on Landscape and Visual Amenity (8.2.5)	Develop Tree Management (TrMP) and obtain approval from the Supervising engineer and agreement from the affected community. <i>See also mitigation measures proposed in <a href="#">Section 8.2.12 - Flora</a>.</i>	Within the Project's Construction contract.	TrMP is developed and approved.	D - Construction contractor A - Supervising engineer M - Client (WCRA/ PIU).
Topsoil removal and storage, loading and unloading operations, transportation of spoil and materials, storage of construction materials and oil products, etc.	Impact on Soil (8.2.8)	1) Develop a Topsoil Management Plan (TsMP) and obtain approval from the Supervising Engineer, 2) Obtain the required permits for topsoil transportation and storage operations from the affected municipality, 3) Develop a Hazardous Materials Management Plan (HMMP) and obtain approval from the Supervising Engineer, 4) Develop a Spill Prevention and Management Plan (SPMP) and obtain approval from the Supervising Engineer.	Within the Project's Construction contract.	TsMP, HMMP and SPMP are developed and approved.	D - Construction contractor A - Supervising engineer S&M - Client (WCRA/ PIU) and EBRD.

<sup>14</sup>D-development, I-implementation, A-approval, S-supervision, M-monitoring, O-Operation



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Type of Activity	Expected Impact	Mitigation Measures	Cost (if discrete and feasible for including into bill of quantities)	Target / Indicator	Responsible / Supervising Entities <sup>14</sup>
All waste generation processes and activities during the construction phase	Waste Generation and Management (8.2.9)	1) Obtain all required permits and mandatory documents regulating waste management in Armenia, as a minimum including: <ul style="list-style-type: none"> <li>- hazardous waste passports,</li> <li>- waste generation norms, and their disposal limits,</li> <li>- waste generation register, etc.,</li> <li>- waste primary registration log-books,</li> <li>- contracts with licensed waste handling companies.</li> </ul> 2) Prepare and put into effect the Waste Management Plan (WMP) for the Project.	Within the Project's Construction contract.	All permits required by the RA waste sector legislation are obtained. WMP is prepared and approved. SDAs are identified and agreed.	D - Construction contractor A - Supervising engineer and Head of Martuni community (for SDA locations) S&M - Client (WCRA/ PIU) and EBRD.
Transportation of construction materials, oil products, workers	Traffic Impacts (8.2.11)	1) Develop a Traffic Management Plan (TMP), that will be approved by the Supervising engineer and agreed with relevant regional authorities and road police. 2) Inspect and document the condition of community roads to be used for project purposes prior to the commencement of construction works, shall be with the participation of construction contractors and representatives from the affected settlements. In the event that significant damage is caused by the Project, the Construction Contractor shall restore the roads to at least their pre-construction condition. <i>The TMP shall also cover measures outlined in Section 8.3.5.</i>	Within the Project's Construction contract.	TMP is prepared and approved.	D - Construction contractor A - Supervising engineer, Head of Martuni community, Road Police S&M - Client (WCRA/ PIU) and EBRD.
Site clearance and removal of vegetation.	Impact on Biodiversity (8.2.12)	<b>Habitats</b> 1) Study the priority habitats (PBFs) in the Project area, their plant composition and ecological structure, and determine their precise extent,	25,000 EUR or can be included into the Project's	Project impacts on habitats are avoided, reduced,	D - Specialised company hired by the Construction contractor

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		<p>2) Develop detailed habitat maps,</p> <p>3) Develop a Riverine Habitats Construction Plan to guide the development, construction and maintenance of the priority habitat (PBF) along the reservoir banks:</p> <p style="padding-left: 40px;">C3.2 Water fringing reedbeds and tall helophytes other than canes,</p> <p>4) Study areas along the river in the reservoir protection/buffer zone, as wells as upstream and downstream to define existing habitats similar to the following:</p> <p style="padding-left: 40px;">C2.27 Mesotrophic vegetation of fast-flowing streams,</p> <p style="padding-left: 40px;">C3.55 Sparsely vegetated river gravel banks,</p> <p style="padding-left: 40px;">C3.62 Unvegetated river gravel banks,</p> <p>5) Develop a habitat offset project aimed at conserving/restoring habitats in areas most suitable for conservation.</p> <p><u>Preliminary quantitative assessment</u></p> <p><i>The total lost area of the riverine habitat C3.22 is 0.1 ha. The reservoir perimeter potentially suitable for riverine habitat creation is estimated at approximately 1.5 km. Taking these figures into account, if take the width of the shoreline strip 5 m, that's reasonable for the habitat, a "net gain" will be achieved with multiplier 7.5 (1500 m × 5 m = 7500 m<sup>2</sup>/1000 m = 7.5).</i></p> <p><i>Total lost area of the habitats C2.27, C3.55, C3.62 is 2.43 ha (these habitats are riverbed habitats of the fast-flowing streams). At the same time, area of the reservoir protection/buffer zone that can be</i></p>	Construction contract.	mitigated, or compensated.	A - Supervising engineer S&M - Client (WCRA/PIU) and EBRD.

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		<i>used for conservation of these three habitats is about 0.3 ha. Accordingly, there is not enough area in the protection/buffer zone to apply even «no net loss» approach for conservation of these habitats. Additional areas should be found and conserved upstream and downstream. Proposals for the construction and conservation of the habitats, including multiplier, should be finally developed in the BAP.</i>			
Site clearance and removal of vegetation.	Impact on Biodiversity (8.2.12)	<b>Flora</b> 1) Study plant composition and structure of the priority riverine habitats, 2) Develop a Riverine Habitats Construction Plan using indigenous plant species as the basis for habitat creation, 3) Develop a Tree Management Plan (TMP). <i>See also mitigation measures proposed in <a href="#">Section 8.2.5</a>.</i>	Within the Project's Construction contract.	Riverine Habitats Construction Plan and TMP are developed.	D - Construction contractor A - Supervising engineer S&M - Client (WCRA/ PIU) and EBRD.
Behaviour of workers of the Construction contractor.	Impact on Biodiversity (8.2.12)	<b>Fauna</b> Develop the Worker Code of Conduct for employees of the Construction contractor to prevent poaching.	Within the Project's Construction contract.	Worker Code of Conduct is developed and approved.	D - Construction contractor A - Supervising engineer S&M - Client (WCRA/ PIU) and EBRD.
Site clearance and removal of vegetation.	Impact on Biodiversity (8.2.12)	<b>Sedentary animals</b> 1) Survey the footprint area to map local habitats and estimate the number of individuals of lizards and snakes, especially Armenian steppe viper, 2) Identify existing rocky habitats which are suitable for relocation of snakes and lizards in	Within the Project's Construction contract.	Project impacts on sedentary animals are avoided, reduced, mitigated, or compensated.	I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU) and EBRD.

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		<p>the vicinities of the flooded area (first of all, in the reservoir buffer/protection zone),</p> <p>3) Create additional rocky outcrops in the vicinity of the flooded area to increase the number of native bush species to enhance habitats for snakes and lizards,</p> <p>4) Survey the area to map inhabited burrows of badger and other burrowing animals.</p> <p><i>The results of this survey will be used at the end of the construction phase, prior to reservoir filling, to inspect the mapped burrows. Any remaining individuals will be captured and relocated to safe areas.</i></p> <p><i>See also measures proposed in <a href="#">Section B, Sedentary animals</a>.</i></p>			
Site clearance and removal of vegetation.	Impact on Biodiversity (8.2.12)	<p><b>Medium and large mammals</b></p> <p>1) Survey the footprint area to confirm/rule out presence of the den of Gray Wolf; if den is found, take measures to scare away animals from the reservoir area,</p> <p>2) Conduct the survey before or after the breeding season.</p>	Within the Project's Construction contract.	Project impacts on medium and large mammals are avoided, reduced, mitigated, or compensated.	I - Construction contractor S - Supervising engineer M - Client (WCRA/PIU) and EBRD.
Conservation of bird species	Impact on Biodiversity (8.2.12)	<p><b>Birds</b></p> <p>Provide conservation/restoration of grasslands upstream (around) of the reservoir, to support the breeding habitat of the Corn Crane.</p> <p><u>Preliminary quantitative assessment</u></p> <p><i>Potential area of the protection/buffer zone, suitable for the grasslands restoration and conservation is approximately 20 ha.</i></p>	Within the Project's Construction contract.	Project impact on birds is avoided, reduced, mitigated, or compensated.	D&I - Construction contractor with the assistance of qualified biodiversity experts S - Supervising engineer M - Client (WCRA/PIU), EBRD.



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		<p><i>The minimum area (multiplier = 1) for compensation of the lost habitats of the priority bird species, based on a "no net loss" approach is 39.25 ha (see sub-section Loss of breeding and foraging habitats for birds - above). Accordingly, the buffer area is not sufficient to achieve "no net loss" outcome. To achieve "no net loss" outcome, and, moreover, "net gain", additional areas of grasslands should be defined upstream of the reservoir site.</i></p> <p><i>If sustainable grazing practices are applied in the grasslands surrounding the buffer area, they will help to maintain the necessary food supply for the two priority species (see Operation phase). In this case, these areas may be taken into account in the compensation.</i></p> <p><i>Proposals for the use of restored and conserved habitats within the protection/buffer zone, as well as for the additional habitats, including multipliers and related calculation, should be developed as part of the BAP.</i></p>			
Conservation of invertebrates.	Impact on Biodiversity (8.2.12)	<p><b>Invertebrates</b></p> <p>Study and quantify the lost habitats of the <i>Carabus cribratus</i>, establish habitat features for this species in the surrounding grasslands (namely, increase the number of large stones, which serve as diurnal shelters for this species).</p> <p><i>These habitats may be included in the restored grassland habitats (see above) in the buffer/protection zone and/or in areas surrounding the reservoir site.</i></p>	Within the Project's Construction contract.	Project impacts on invertebrates are avoided, reduced, mitigated, or compensated.	<p>I - Construction contractor with the assistance of qualified biodiversity expert</p> <p>S - Supervising engineer</p> <p>M - Client (WCRA/ PIU) and EBRD.</p>

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Land acquisition and compensation. Receiving and registering grievances and concerns from project stakeholders, investigating issues, providing solutions and maintaining communication and records throughout the resolution process.	Land Tenure Impacts (8.3.3)	<ol style="list-style-type: none"> <li>1) Ensure that all users (if any) of the pasture land to be withdrawn for the Project needs are provided with alternative land of equal or better quality for cattle grazing as per approved RAP,</li> <li>2) Based on the Resettlement Framework, develop and implement the Resettlement Plan to ensure that the compensation for private and community land is fully provided prior to any construction works on site,</li> <li>3) Ensure that public consultations with Affected People and Communities are conducted in all affected settlements as per the RP to present the Project's aims, stages of land acquisition and compensation process, timelines.</li> <li>4) Establish a Grievance Mechanism to deal with the Project-related concerns.</li> </ol>	Separate budget for the RP consultant	RF with the Grievance Mechanism and RP are developed and implemented.	D&I - RP consultant A - Supervising engineer S&M - Client (WCRA/ PIU) and EBRD.
		<ol style="list-style-type: none"> <li>5) Arrange an alternative access to Vanki Berd Church prior to the start of construction activities.</li> </ol>	Within the Project's Construction contract.	Alternative road to the to Vanki Berd Church is constructed.	I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU) and EBRD.
Construction activities, excavation and blasting works, movement of trucks along the communal roads, etc.	Impact on Community Health and Safety (8.3.5)	<ol style="list-style-type: none"> <li>1) Supplement the TMP (<i>in addition to the measures proposed in Section 8.2.11</i>) with the following: <ul style="list-style-type: none"> <li>- Avoid community access roads if possible and documenting quality of roads prior to their use,</li> <li>- Optimise routes and times of the day for transporting materials to site, especially bulky</li> </ul> </li> </ol>	Within the Project's Construction contract.	TMP and EPRP are prepared and approved.	D - Construction contractor A - Supervising engineer S&M - Client (WCRA/ PIU) and EBRD.

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		<p>equipment parts (e.g., pipes) agreed with the traffic police and local administrations to avoid deterioration of roads and landscapes prone to landslides,</p> <ul style="list-style-type: none"> <li>- Enhance the access roads and construction sites and reservoir basins with technical measures (e.g. installing gabions, rip-rap, adequate bedding materials, etc.) to minimise the risk of displacement, collapse or damage in case of seismic events or landslides</li> <li>- Should any blasting be required, use minimal charge to prevent potential impacts on geological stability of the area</li> <li>- Ban any refuelling or storage of hazardous materials or waste in the water buffer zones to prevent potential spills and contamination</li> <li>- Identify sensitive receptors (schools, hospitals, residential areas, other social infrastructure) along the transportation routes and implement traffic diversion and speed restriction measures, install warning signage, use traffic marshals, etc.,</li> </ul> <p>2) Install physical barriers, ensure restricted access to the construction site,</p> <p>3) Screen worker influx for communicable disease and provide treatment, as appropriate, to reduce exposure to local population,</p> <p>4) Conduct information campaigns on STDs among the workers and local community.</p>			
All processes and operations during the construction activities.	Health and Safety Impact (8.3.6)	Develop an Occupational Health and Safety Management Plan (OHSMP), covering the key	Within the Project's Construction contract.	OHSMP is developed and approved.	D - Construction contractor

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		<p>elements of the OHS performance management during the construction stage, including:</p> <ul style="list-style-type: none"> <li>- Allocation of OHS roles and responsibilities</li> <li>- Identification of OHS risks and hazards,</li> <li>- Briefing, training and knowledge check,</li> <li>- OHS procedures and regulations,</li> <li>- Medical examination,</li> <li>- Emergency response,</li> <li>- Management of hazardous materials, explosive materials (if used), chemicals and oil / fuel,</li> <li>- Fire safety and emergency response,</li> <li>- Performance of high hazard tasks</li> <li>- Use of PPE,</li> <li>- Supervision of sub-contractors,</li> <li>- Investigation of safety accidents,</li> <li>- Responsibilities for non-compliance, etc.</li> </ul>			<p>A - Supervising engineer S&amp;M - Client (WCRA/ PIU) and EBRD.</p>
Operations and activities related to labour and working conditions, including the management of the construction camp and accommodation facilities.	Workers' Rights and Working Conditions Related Impacts (8.3.7)	<ol style="list-style-type: none"> <li>1) Include requirements related to the compliance with the national labour regulations and EBRD PR2 in the contractual clauses with the Construction contractor,</li> <li>2) Develop a Labour and Working Conditions Management Plan (at least a month before the construction) and implement it which is inclusive of inclusive of measures to manage local employment and procurement,</li> <li>3) Develop and implement a Construction Camp Management Plan, including sub-plans for Camp Code of Conduct and Camp Management, with requirements for worker accommodation in compliance with the Armenian labour, sanitary and health standards,</li> </ol>	Within the Project's Construction contract.	Relevant requirements of the EBRD PR2 are included in the Construction contract. Labour and Working Conditions Management Plan and Construction Camp Management Plan are developed.	<p>D - Client (WCRA/ PIU) (for item 1) and Construction contractor (for items 2 and 3) A - Supervising engineer (for items 2 and 3) S&amp;M - Client (WCRA/ PIU) and EBRD.</p>

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		EBRD PR 2 requirements, EBRD/IFC guidance on worker accommodation (2009), ILO Workers' Housing Recommendation 1961 (No. 115), and gender-specific provisions. 4) Set up and maintain grievance mechanism available to all project workforce, including the opportunity for anonymous complaints			
Interactions between workers and residents of affected settlements.	Gender-Based Violence and Harassment (8.3.8)	Develop GBVH Policy and assign focal points responsible for handling GBVH incidents within the workforce and for external communities including GBVH sensitive grievance management mechanism.	Within the Project's Construction contract.	Management of GBVH risks related to interactions between workers and residents of affected settlements.	D - WCRA/PIU I - Construction contractor A - Supervising engineer S&M - Client (WCRA/PIU) and EBRD.
Emergency situations such as landslides, earthquakes, incidents, spills and leakages.	Emergency Situations and Response (8.4)	1) Develop an Emergency Response and Preparedness Plan, 2) Prepare site-specific emergency response procedures for incidents such as landslides, machinery accidents, or hazardous material spills. <i>See also measures proposed in Section 8.3.5.</i>	Within the Project's Construction contract.	Emergency response procedures are developed and approved.	D - Construction contractor A - Supervising engineer S&M - Client (WCRA/PIU) and EBRD.
Earthworks, excavation, borrow pit operations, construction of electricity transmission lines, and other related construction activities that have the potential to impact cultural heritage sites situated beyond the Project's direct impact	Impact on Tangible Cultural Heritage (8.5.1)	3) Carry out a detailed archaeological survey before the start of construction works, including: - Conduct test excavations (trial trenching), - Delineate the impacted areas, identify the surface area and volume requiring safeguard excavations, and carry out such excavations to preserve the affected units, if relevant, - Assess the possibility of relocating monuments to areas outside the reservoir impoundment,	Within the Project's Construction contract.	The CFP are prepared and approved; detailed field archaeological investigations are completed prior to the start of construction; and a qualified cultural heritage expert is engaged within the	D - Construction contractor A - Supervising engineer and MESCS (for CHMP) S&M - Client (WCRA/PIU) and EBRD.



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area, yet within its designated buffer zone.		<ul style="list-style-type: none"> <li>- Assess the structural resistance to vibration-generating activities,</li> <li>- Propose specific protection measures to prevent damage during construction activities, including construction of protection walls, restriction of vibration-generating activities, etc.,</li> <li>- Recommend appropriate preservation measures for each of the identified cultural heritage sites.</li> </ul> <p>4) Develop a Cultural Heritage Management Plan (CHMP) for the Project, to be agreed upon by the supervision engineer, the Client, the Bank and the authorized state body (the CHMP may include the measures proposed in item 1 above),</p> <p>5) Hire a qualified cultural heritage expert from an authorized institution to be present during the construction works and implement archaeological surveillance for all construction sites, as well as to help implement all heritage focused mitigations and reporting to Client/Bank,</p> <p>6) Prior to construction works, develop a Chance Finds Procedure (CFP)<sup>15</sup> for the Project and train the relevant workers in applying it (so that they can identify the chance finds, stop the works and notify the management); keep the</p>		construction contractor's team.	

<sup>15</sup>A template of this procedure can be found in the 2023 EBRD's guidance note for PR8 at <https://www.ebrd.com/documents/environment/guidance-note-performance-requirements-8-cultural-heritage.pdf>. In addition, the regulations with regards to 'chance finds' are defined by the RA Law №HO-261 (1998) "On the protection and use of immovable historical and cultural monuments and historical environment". Particularly, according to Article 11 of the Law, if during the construction, agricultural and other works, the unknown historical and cultural monument/heritage is discovered, the above-mentioned works must be stopped and the authorized state body must be immediately informed by the local self-government bodies.

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		training log up to date and include reporting on it in monitoring reports, 7) Relocate the cross-stone dedicated to the memory of Artyom Mkhoyan (2009-2016), along with its shelter shed, to a location agreed upon by the relatives and the administrative head of the Astghadzor settlement.			

Type of Activity	Expected Impact	Mitigation Measures	Cost (if discrete and feasible for including into bill of quantities)	Target / Indicator	Responsible / Supervising Entities <sup>16</sup>
<b>Section B - CONSTRUCTION PHASE</b>					
Site clearance, earth and excavation works, operation of construction machinery and heavy trucks, operation of borrow-pits, loading-unloading operations, etc.	Impact on air quality (8.2.4)	1) Use modern construction machinery equipped with engines compliant with at least Euro IV standards, with emission control and minimal noise characteristics, 2) Perform regular technical maintenance of used construction machinery and heavy vehicles, 3) Cover friable materials with tarpaulin during the transportation, 4) Minimise dust from open area sources, including storage piles and top-soil storage areas, by using control measures such as installing enclosures and covers, and increasing the moisture content, 5) Restrict excavation and earthworks during the periods of strong winds,	Within the Project's Construction contract	Air, water, and soil quality monitoring plan is developed, approved prior to the start of construction and implemented during the construction. All specified mitigation measures are implemented effectively throughout construction.	I - Construction contractor S - Supervising engineer M - Client (WCRA/PIU), EBRD.

<sup>16</sup>D-development, I-implementation, A-approval, S-supervision, M-monitoring, O-operation

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		6) Select the sites for construction facilities and construction machinery with due regard to the prevailing wind directions, 7) Apply regular watering to on-site and off-site dirt roads, especially during the excavation and other earthworks, 8) Minimize the period between excavation and backfilling works, 9) Prohibit construction materials and waste burning, 10) Engage with the beekeepers and map the locations of the bee-hives. In case they are located closer than 100m from the village road used by Project transport, assist the bee-keepers in the relocation of the bee-hives farther from the sources of disturbance (roads).			
Planting of trees in accordance with the Tree Management Plan.	Impact on Landscape and Visual Amenity (8.2.5)	Implement TrMP. Plant 190 trees in locations agreed upon with the head of Martuni community, preferably downstream of the reservoir, to gradually screen the dam from view over time. Ensure a two-year aftercare period, which may be carried out during the reservoir's operation phase. The proposed types of trees to be planted are: <ul style="list-style-type: none"> <li>- Salix purpurea L.,</li> <li>- Populus nigra L.</li> </ul> See also mitigation measures proposed in <a href="#">Section 8.2.12 - Flora</a> .	Within the Project's Construction contract	Proposed types of trees are planted.	D&I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD.
Site clearance, earth and excavation works, operation of construction machinery and heavy trucks, operation of	Impact on Geology (8.2.6)	1) Install diversion ditches or berms to redirect surface runoff away from disturbed areas, 2) Ensure proper grading to enhance slope stability and direct water flow along controlled paths,	Within the Project's Construction contract	Site inspections of construction material and spoil storage areas are regularly	I - Construction contractor S - Supervising engineer

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borrow-pits, loading-unloading operations, storage of construction materials and spoil, etc.		including through designated construction outlets, 3) Install slope breakers: Break long slopes into smaller segments to reduce erosion potential, 4) Implement phased construction to limit the area of exposed soil at any given time, 5) Avoid earthworks during the rainy season: Where feasible, schedule earthworks outside of the rainy season to reduce erosion risk.		conducted, and sediment control measures are effectively maintained to ensure the stability of geological conditions within the Project area.	M - Client (WCRA/ PIU), EBRD
Site clearance, earth and excavation works, operation of construction machinery and heavy trucks, operation of borrow-pits, loading-unloading operations, storage of construction materials and spoil, etc.	Impact on Water Resources (8.2.7)	<b>Water Contamination</b> 1) Construct intermediate collection pools between runoff-generating surfaces and downstream watercourses to regulate flow to water bodies. These pools will allow soil particles to settle at the bottom, thereby reducing the turbidity of the runoff, 2) Limit excavation and other earthworks near the Astghadzor River during the rainy season, 3) Prohibit the discharge of any untreated wastewater effluent into surface water bodies, 4) Where practical, construct local perimeter drains and install sand and oil traps around working areas (e.g., storage and parking areas) to collect suspended runoff and prevent its discharge into surface water resources.	Within the Project's Construction contract	Surface water quality is protected, and adverse impacts from construction activities are minimized through implementation of mitigation measures.	I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD
Topsoil removal, storage, transportation, reuse, loading and unloading operations.	Impact on Soil (8.2.8)	<b>Topsoil management</b> 1) Carry out the removal, transportation, storage, and use of topsoil in accordance with RA Government Decrees №1396-N and №1404-N, 2) Store topsoil separately to prevent mixing with subsoil, maintaining it in a condition that	Within the Project's Construction contract	The provisions of the Topsoil Management Plan are implemented and controlled.	I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD.

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		<p>preserves the natural seed bank, until construction works are completed,</p> <p>3) Locate topsoil stockpiles at least 50 m away from watercourses to prevent water siltation,</p> <p>4) Avoid placing topsoil stockpiles near planned excavation areas,</p> <p>5) Limit the height of stockpiles to a maximum of 3 m, and ensure the slope gradient does not exceed 25°,</p> <p>6) Clearly label all topsoil stockpiles to ensure easy identification,</p> <p>7) Cover topsoil stockpiles to prevent soil erosion, where natural revegetation has not occurred,</p> <p>8) Fence off topsoil stockpiles to prevent unauthorized access and compaction by Project vehicles,</p> <p>9) Reuse the stored topsoil for landscaping the disturbed areas and/or tree planting within the Project area after the completion of reservoir and dam construction.</p>			
<p>Transportation, storage and use of spoil, construction (friable) and hazardous materials, including oil products, refueling of construction equipment and trucks.</p> <p>Accidental spills of friable materials, leakages of oil, fuel, and other liquid chemicals during the field</p>		<p><b>Hazardous materials</b></p> <p>1) Store all hazardous materials in dedicated warehouses and clearly labeled, secure, and ventilated areas,</p> <p>2) Clearly label the hazardous materials containers according to contents and hazards,</p> <p>3) Equip sites with spill response kits and train workers on emergency response,</p> <p>4) Maintain Material Safety Data Sheets (MSDS) in accessible language(s) for all hazardous materials on-site,</p>	Within the Project's Construction contract	Provisions of the HMMP and SPMP are implemented and controlled.	<p>I - Construction contractor</p> <p>S - Supervising engineer</p> <p>M - Client (WCRA/ PIU), EBRD.</p>



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works within the construction site.		<p>5) Do not store incompatible hazardous materials together,</p> <p>6) Equip hazardous materials storage areas with eye wash kits and fire extinguishers,</p> <p>7) Use appropriate PPE.</p> <p><b>Soil contamination</b></p> <p>1) A total volume of 608,089 m<sup>3</sup> of spoil material, generated during excavation and earthworks, will be re-used as backfill material for the reservoir and dam body, Therefore, designated Spoil Disposal Areas will not be required for the Project</p> <p>2) Store construction and other friable materials in separately designated areas that are fenced and covered with waterproof tents,</p> <p>3) Store oil products and chemicals separately, in special drums or tanks placed on secondary containment systems or trays (110% of the volume of the container),</p> <p>4) Carry out refueling of oil, fuel, and other chemicals only in dedicated area with impervious surface equipped with protective berms,</p> <p>5) Equip storage facilities for oil and chemicals, as well as heavy trucks transporting these materials, with appropriate spill kits,</p> <p>6) Immediately stop work in the event of uncontrolled spillage of fuel, engine oil, or chemicals. Contain the spill and remediate contaminated soil by removing the affected layer (to be treated as hazardous waste) and replacing it with clean soil,</p>			

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		7) Train all staff on the safe execution of construction works and on response procedures for environmental incidents such as spills and leaks, 8) Ensure spoil piles do not exceed 3 m in height, and maintain slope gradients not exceeding 25°. Manage spoil piles to prevent erosion and runoff.			
All waste generation processes and activities during the construction phase.	Waste Generation and Management (8.2.9)	<b>General</b> 1) Train the workers engaged in waste management on provisions of the WMP, 2) Apply waste hierarchy approach (prevention, minimization, reuse, recycling, energy recovery, disposal) while implementing the construction activities, 3) Elaborate and implement waste handling procedures for the construction operations, 4) Equip the construction site and construction camps with the waste separate collection / storage containers and locations, 5) Furnish the waste storage / collection facilities with fences, fire extinguishers, secondary containment trays, oil and chemicals spill clean-up kits, etc., 6) Store liquid waste leak-proof, sealed containers. 7) Sign contracts with the licensed waste handling (recycling, treatment, disposal) companies to hand them over the generated wastes. <b>Waste transportation</b> 1) Transport all types of wastes using adequate, sealed and covered trucks to avoid the leakage	Within the Project's Construction contract	Waste management during the reservoir construction phase shall be implemented in accordance with applicable national legislation, the waste hierarchy principles and GIP.	I - Construction contractor S - Supervising engineer M - Client (WCRA/PIU), EBRD.

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		<p>or dispersal of the waste on roads and surroundings,</p> <p>2) Ban fly-tipping waste on the route and/or their disposal in unauthorized locations,</p> <p>3) Select less risky transportation route from the waste generation and temporary storage area to its transfer and recycling / disposal area,</p> <p>4) Train the waste truck drivers on waste transportation safety rules.</p> <p><b>Household waste management</b></p> <p>1) Equip the construction site with clearly labelled household collection containers / bins,</p> <p>2) Sign a contract with the communal company for the regular removal of household waste from the construction site and construction camps.</p> <p><i>In addition to the measures listed above: enforce the use of PPE and in particular, the protective clothes, shoes, gloves, respirator / masks for the workers dealing with the waste.</i></p>			
Site clearance, earth and excavation works, operation of construction machinery and heavy trucks, operation of borrow-pits, loading-unloading operations, etc.	Noise and Vibration Impact (8.2.10)	<p>1) Keep all diesel-powered vehicles and equipment (such as generators and air compressors) at a high level of maintenance. This will particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers,</p> <p>2) Shut down or throttle back the machinery/vehicles that are used intermittently when not in use,</p> <p>3) Whenever possible: enclose noisy equipment, restrict non-stop operation of noisy equipment, avoid simultaneous operation of noise generating equipment,</p>	Within the Project's Construction contract.	Noise and vibration impacts arising from construction activities are effectively controlled to prevent exceedance of acceptable levels and to minimize disturbance to nearby receptors.	I - Construction contractor S - Supervising engineer M - Client (WCRA/PIU), EBRD

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		4) Avoid unnecessary idling times, 5) Enforce the reverse parking policy to minimise the need for equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur, 6) Avoid unnecessary horn hooting from the used construction machinery, 7) Limit truck speeds - not to exceed 40 km/h, when driving through local community roads, 8) Inform population of Astghadzor and Zolaqar settlements of the schedule and duration of construction activities, particularly where these are likely to generate high noise levels and before the blasting works, 9) Ban the movement of heavy trucks along the communal roads between 10 PM and 6 AM near residential areas. <i>In addition to the measures listed above:</i> 1) <i>Enforce the use of PPE and in particular, the protective devices capable to reduce the sound level at the ear to acceptable levels,</i> 2) <i>Ensure that all workers exposed to local vibration are provided with and use appropriate PPE,</i> 3) <i>Provide employees engaged in 'noisy' operations with additional 15 minutes break per 2 hours.</i>		Noise and vibration monitoring plan is implemented.	
Transportation of construction materials, oil products, workers	Traffic Impacts (8.2.11)	3) Implement the Traffic Management Plan, 4) Construct the access roads as envisioned in the Project design document, 5) Train drivers of heavy vehicles on the key requirements of the TMP,	Within the Project's Construction contract.	Traffic risks are minimized through effective implementation of the TMP, driver training programs,	I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD

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		<p>6) Inform local residents of anticipated construction-related traffic impacts at least two weeks prior to the start of construction, and periodically consult with the community regarding any changes in road traffic,</p> <p>7) Equip roads used by Project vehicles with appropriate road safety signs and posters,</p> <p>8) Provide additional crossings for cattle where necessary.</p> <p><i>See also mitigation measures proposed in Sections 8.3.2 and 8.5.2.</i></p>		installation of clear safety signs and awareness posters along project roads, etc.	
Site clearance and removal of vegetation.	Impact on Biodiversity (8.2.12)	Implement Biodiversity Action Plan (BAP) during the pre-construction phase to cover mitigation activities of the pre-construction, construction, and operation phases. The BAP will outline and provide guidance for components such as the Biodiversity Management Plan (including monitoring) and the Riverine Habitats Construction Plan. The mitigation and/or management measures listed below shall be incorporated into the BAP.	Within the Project's Construction contract.	BAP is effectively implemented. Other plans related to the biodiversity are developed and implemented during the construction phase.	D&I - Construction contractor with the assistance of qualified biodiversity expert S - Supervising engineer M - Client (WCRA/PIU), EBRD.
Site clearance and removal of vegetation.	Impact on Biodiversity (8.2.12)	<p><b>Flora</b></p> <p>Plant 190<sup>17</sup> trees and ensure their aftercare for a period of two years (aftercare may be carried out during the reservoir operation phase).</p> <p>The proposed<sup>18</sup> species of trees to be planted include:</p> <ul style="list-style-type: none"> <li>- <i>Salix purpurea</i> L.,</li> <li>- <i>Populus nigra</i> L.</li> </ul>	Within the Project's Construction contract.	190 trees are planted and maintained.	D&I - Construction contractor S - Supervising engineer M - Client (WCRA/PIU), EBRD.

<sup>17</sup>According to calculations conducted in the frames of the national EIA study, these trees shall be planted as a compensatory measure; there were used 1:5 ratio. Number of trees to be planted are  $38 \times 5 = 190$ .

<sup>18</sup> Proposed in the national EIA study



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		<i>See also mitigation measures proposed in Section 8.2.5.</i>			
Site clearance and removal of vegetation. Earth and excavation works. Behaviour of workers of the Construction contractor.	Impact on Biodiversity (8.2.12)	<b>Fauna</b> 1) Plan and commence construction works (including tree cutting) starting from one edge of the dam area progressing along the valley; this approach will allow animals to leave the area, 2) Begin the construction works before or after the breeding season - prior to April or after August; this will protect lives of animals, including offspring, 3) Monitor compliance with the Worker Code of Conduct by the construction company workers to prevent poaching, 4) Develop the Worker Code of Conduct for the operator of the reservoir to prevent poaching.	Within the Project's Construction contract.	Required measures for the preservation of fauna species are implemented.	D&I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD.
Site clearance and removal of vegetation. Earth and excavation works.	Impact on Biodiversity (8.2.12)	<b>Sedentary animals</b> 1) Before the reservoir construction starts, survey the construction area and capture found lizards and snakes (if found before, Armenian steppe viper), and relocate them to safe habitats identified during the pre-construction phase, 2) Before filling the reservoir, survey the site and capture as many individuals as possible, including snakes and lizards, and relocate them to the safe habitats identified and/or arranged during the pre-construction phase, 3) Before filling the reservoir, inspect the mapped residential burrows of badger and other animals; if any individuals remain, capture them and relocate to the safe habitats.	Within the Project's Construction contract.	Project impact on sedentary animals is avoided, reduced, mitigated, or compensated.	D&I - Specialised company and/or Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD.

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Conservation of bird species	Impact on Biodiversity (8.2.12)	<b>Birds</b> Maintain the restored parts of grasslands.	Within the Project's Construction contract.	Project impact on birds is avoided, reduced, mitigated, or compensated.	D&I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD.
Conservation of invertebrates	Impact on Biodiversity (8.2.12)	<b>Invertebrates</b> Maintain developed habitats.	Within the Project's Construction contract.	Project impact on invertebrates is avoided, reduced, mitigated, or compensated.	D&I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD.
Accidents and incidents during the construction works	Impacts on Public Facilities and Infrastructure (8.3.2)	<p>1) Develop a Traffic Management Plan (TMP) aiming to minimise pressure on the regional and local road infrastructure and avoiding as much as possible sensitive receptors.</p> <p><i>See also measures proposed in Sections 8.2.11 and 8.5.2.</i></p> <p>2) Oblige the construction contractor to set up a medical post at least at one of the labour accommodation camps,</p> <p>3) Consider the need to have an ambulance posted at the construction site or sign an agreement with the Martuni Medical Centre to ensure emergency response when medical services are required for the contractor's workers. This should take into account the 12-15 minutes ambulance response time.</p>	Within the Project's Construction contract.	<p>TMP is effectively implemented.</p> <p>A medical post is established in accommodation camp.</p> <p>An agreement between the Construction contractor and Medical Centre is signed.</p>	I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD.
Stakeholder engagement process, recruitment and remuneration of	Impact on Vulnerable Groups (8.3.4)	1) Implement the SEP to ensure that information about the Project and its opportunities is widely available and communicated to vulnerable	Within the Project's Construction contract.	The Project's SEP is effectively implemented.	I - Construction contractor

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employees during the construction works.		households, including the female-headed and elderly households engaged in agricultural activities, households below the poverty line, 2) Deliver for the special needs of the vulnerable groups when developing RAP/RF and the Project's grievance mechanism, 3) Provide equal employment opportunities and payment for men and women during the Project construction stage.		Inclusive stakeholder engagement with vulnerable groups, equitable recruitment and fair remuneration during construction.	S - Supervising engineer M - Client (WCRA/ PIU), EBRD.
Emergency situations such as landslides, earthquakes, incidents, spills, and leakages.	Impact on Community Health and Safety (8.3.5)	Prepare and implement Emergency Preparedness and Response Plan (EPRP). <i>See also measures proposed in Section 8.4.</i>	Within the Project's Construction contract.	EPRP is effectively implemented.	D - Construction contractor A - Supervising engineer S&M - Client (WCRA/ PIU) and EBRD.
All processes and operations during the construction activities.	Health and Safety Impact (8.3.6)	1) Implement the provisions of the Occupational Health and Safety Management Plan, 2) Conduct regular audits of the construction site to monitor the OHS performance of the contractors.	Within the Project's Construction contract.	Compliance with applicable national legislation and GIP concerning OHS requirements.	I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD.
Operations and activities related to labour and working conditions, including the management of the construction camp and accommodation facilities.	Workers' Rights and Working Conditions Related Impacts (8.3.7)	Set up and maintain grievance mechanisms available to all project workforce, including the opportunity for anonymous complaints.	Within the Project's Construction contract.	Compliance with applicable national legislation, EBRD PR2 and GIP concerning labour and working conditions.	I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD.
Interactions between workers and residents of affected settlements.	Gender-Based Violence and Harassment (8.3.8)	1) Implement GBVH policy, 2) Conduct mandatory and regular training for workers on required lawful conduct in local	Within the Project's Construction contract.	All workers receive mandatory induction and regular refresher	I - Construction contractor

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		community, the Code of Conduct and GBVH Policy and consequences for failure to comply with the above, 3) Maintain a grievance mechanism, which includes a specific mandate on GBVH, 4) Organize information and awareness raising campaigns for community members, specifically women and girls, 5) Provide information to communities on how to use the grievance mechanism to report GBVH issues.		training on the Code of Conduct, GBVH Policy and expected behaviour in the local community.	S - Supervising engineer M - Client (WCRA/ PIU), EBRD.
Emergency situations such as landslides, earthquakes, incidents, spills and leakages.	Emergency Situations and Response (8.4)	1) Prepare and implement an Emergency Preparedness and Response Plan (EPRP), 2) Prepare site-specific emergency response procedures for incidents such as landslides, machinery accidents, or hazardous material spills, 3) Install and maintain firefighting equipment and first aid kits at all construction sites and project-related delivery vehicles. Trained selected workers on their usage. <i>See also measures proposed in <a href="#">Section 8.3.5</a>.</i>	Within the Project's Construction contract.	All construction sites are equipped with appropriate firefighting kits. Warning systems and equipment are properly installed, maintained and operational (if required). EPRP is effectively implemented.	I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD.
		1) Conduct Dam Integrity Risk Assessment, 2) After completion of the dam integrity risk assessment and flood safety check, consider the need of an early-warning system and provision of the life-saving equipment in the local communities, with the requirement of regular maintenance and emergency evacuation drills,		A Dam Integrity Risk Assessment is conducted, dam integrity risks are assessed, and warning systems and equipment are planned and in place.	I - Construction contractor S - Supervising engineer M - Client (WCRA/ PIU), EBRD.

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		3) Establish traffic and access management plans to reduce accident risks for workers and local residents.			
Earthworks, excavation, borrow pit operations, construction of electricity transmission lines, etc.	Impact on Tangible Cultural Heritage (8.5.1)	1) Implement the CHMP, 2) Implement the CHP, 3) Deliver regular briefing to all workers involved in implementing heritage focused mitigations.	Within the Project's Construction contract.	Relevant staff are properly trained and aware of the provisions and requirements of the CFP.	I - Construction contractor S - Supervising engineer M - Client (WCRA/PIU), EBRD.
Rituals, ceremonies and celebrations representing the traditional and cultural identity of the affected settlements.	Impact on Intangible Cultural Heritage (8.5.2)	Communicate the provisions of the Traffic Management Plan to the population of Astghadzor and Zolaqar rural settlements to help them plan Christmas, New Year, Easter, Trndez, weddings, and other celebrations and to avoid additional nuisance. <i>See also mitigation measures proposed in Sections 8.2.11 and 8.3.2.</i>	Within the Project's Construction contract.	Residents of the Project-affected settlements are informed and aware of the provisions of the TMP and the measures proposed to reduce potential nuisance.	I - Construction contractor S - Supervising engineer M - Client (WCRA/PIU), EBRD.

Type of Activity	Expected Impact	Mitigation Measures	Cost (if discrete and feasible for including into bill of quantities)	Target / Indicator	Responsible / Supervising Entities <sup>19</sup>
<b>Section C - OPERATION (MAINTENANCE) PHASE</b>					
Regular maintenance of the reservoir body, dam and supporting infrastructure.	Impact on air quality (8.2.4)	1) Use modern construction machinery equipped with engines that comply with at least Euro IV standards, featuring emission control systems and low-noise characteristics,	Within the Project's Construction contract.	Only modern and maintained construction	I - Operator ("Jrar" CJSC) or engaged contractor S - WCRA/PIU

<sup>19</sup>D-development, I-implementation, A-approval, S-supervision, M-monitoring, O-operation



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		2) Perform regular technical maintenance of all construction machinery, 3) Ensure that maintenance contractors use modern, well-maintained equipment that complies with all applicable technical requirements.		machinery are operated	M - State Inspection Body.
Technical and maintenance measures that could potentially be included in the Project design documents	Impact on air quality (8.2.4)	<p><b><i>The following cost-efficient and technically feasible measures should be included in the tendering specifications, Project design documentation, reservoir operation and maintenance plans:</i></b></p> 1) Consider aeration systems to oxygenate water and suppress anaerobic methane production, 2) Install surface aerators or diffused air systems to increase dissolved oxygen, 3) Remove decaying vegetation, crop residues, or debris from the reservoir and inflows, 4) Keep banks and inflow channels clear to reduce organic loading, 5) Establish buffer zones with vegetation to absorb nutrients before they reach the reservoir.	Can be included in the loan agreement, if deemed appropriate for the project.	Proposed equipment is installed and operated; clearance and cultivation measures is implemented.	I - Specialised contractor O - Operator S - WCRA/PIU.
Tree planting according to the Tree Management Plan	Impact on Landscape and Visual Amenity (8.2.5)	Ensure maintenance and aftercare of the planted trees envisioned by the TrMP for two years. <i>Over time, natural regeneration and vegetation growth may reduce visual contrasts and facilitate the integration of the area into the surrounding landscape.</i> <i>If well integrated with the natural landscape, the reservoir may contribute positively to the area's overall visual character.</i>	Within the Project's Construction contract.	The area allocated for the tree planting is covered by tree species.	I - Specialised company hired by the Construction contractor. S&M - Client (WCRA/PIU) and affected municipality.

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Planning, design and cultivation of agricultural land within the command area of the Astghadzor Reservoir		Consult the heads of affected settlements and landowners who will gain access to irrigation water as a result of the project implementation, regarding the design solutions for establishing orchards and cultivating wheat and vegetables based on modern cultivation and irrigation technologies.  <i>This may transform the organically evolved cultural landscape, characterized by traditional crop fields and orchards, into a designed cultural landscape.</i>	-	Landowners and cultivators within the Astghadzor, Zalaqar, Vaghashen and part of Martuni settlements plan and cultivate their agricultural plots using modern, water-efficient and sustainable agricultural and irrigation practices.	I - Martuni municipality with support of the WCRA/PIU S&M - Client (WCRA/PIU).
Coastal erosion around the entire perimeter of the reservoir due to water encroachment during the initial years of operation	Impact on Geology (8.2.6)	<i>If technically and economically feasible, implement all or some of the following activities:</i> 1) Bioengineering / Vegetative Measures <ul style="list-style-type: none"> <li>- Planting native grasses, shrubs, and trees to stabilize soil through root systems and reduce erosion,</li> <li>- Using biodegradable or synthetic mats that support vegetation growth while preventing initial soil loss.</li> </ul> 2) Embankment Stabilization Measures <ul style="list-style-type: none"> <li>- Placing layers of large, durable stones along vulnerable shorelines to dissipate wave energy and prevent erosion,</li> <li>- Using sloped structures on reservoir banks/walls to absorb and deflect the energy of incoming water.</li> </ul> 3) Reservoir Operation Management	Can be included in the loan agreement, if deemed appropriate for the project.	Recommended mitigation measures for controlling coastal erosion are implemented effectively.	I - Specialised contractor S&M - Client (WCRA/PIU)

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		<ul style="list-style-type: none"> <li>- Gradually filling the reservoir to allow the slope soils to stabilize and minimize sudden saturation that can lead to collapse,</li> <li>- Avoiding large, rapid fluctuations in water level during early years to reduce destabilization of new shorelines.</li> </ul> <p>4) Erosion Monitoring and Adaptive Management</p> <ul style="list-style-type: none"> <li>- Regular monitoring: Using drones, surveys, or satellite imagery to detect early signs of erosion and assess the effectiveness of mitigation measures,</li> <li>- Adaptive management plans: Revising and enhancing embankment protection measures based on ongoing monitoring results,</li> <li>- Erosion-sensitive zoning: Identifying high-risk areas and applying stricter protection or engineering controls there.</li> </ul>			
Water contamination	Impacts on Water Resources (8.2.7)	<p>1) Minimize potential stormwater and agricultural runoff release to the Astghadzor River, if any,</p> <p>2) Eliminate manmade inflows from domestic or industrial activities into the reservoir.</p>	-	The inflow of wastewater to the reservoir is minimised/ eliminated.	I&O - Operator together with WUA and affected municipality S&M - Client (WCRA/ PIU).
Delivery of irrigation water to end users		<p><b>Pre-operation phase - Hydrological Regime</b></p> <p>1) Develop Irrigation Water and Environmental Flow Releases Management Plan to:</p> <ul style="list-style-type: none"> <li>- Ensure reliable and efficient delivery of irrigation water to agricultural areas,</li> <li>- Maintain minimum environmental flows to support the health of downstream aquatic and riparian ecosystems,</li> </ul>	Within the Operator's budget.	Irrigation water is supplied to users in a manner that ensures the maintenance of the minimum environmental flow.	I&O - Operator S&M - Client (WCRA/ PIU)

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		<ul style="list-style-type: none"> <li>- Prevent over-extraction and degradation of water resources,</li> </ul> 2) Comply with national water use regulations and environmental protection standards. <b>Operation phase - Hydrological Regime</b> 3) Review the irrigation water and environmental flow releases management plan annually, or after major hydrological events, to incorporate new data, regulatory changes, and operational experience, 4) In the event of low reservoir levels or critical drought conditions, implement a prioritisation protocol that protects environmental flows up to a predefined minimum threshold before allocating water for irrigation.			
		<b>Pre-operation phase - Water losses</b> 5) Develop Reservoir Operation and Maintenance Plan, <b>Operation phase - Water losses</b> 6) Carry out technical maintenance of the reservoir's supporting infrastructure to eliminate incidents and breakdown in accordance with the Reservoir Maintenance Plan.	Within the Operator's budget.	Reservoir Operation and Maintenance Plan for the operation phase is developed and implemented.	I&O - Operator S&M - Client (WCRA/PIU).
Regular maintenance of the reservoir body, dam and supporting infrastructure	Impact on Soil (8.2.8)	Outsource the maintenance of the operated reservoirs to the contractors equipped with modern and technically serviced equipment.	Within the Operator's budget.	Only modern and maintained construction machinery are operated.	I&O - Operator or engaged contractor S - WCRA M - State Inspection Body.
All waste generation processes and activities	Waste Generation and Management (8.2.9)	1) Obtain all required permits and mandatory documents relevant to the operation of reservoirs in Armenia, as required by local	Within the Operator's budget.	Waste management during the reservoir	D,I&O - Operator S - WCRA

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during the operation and maintenance works		<p>waste-related legislation (can be done at the corporate level),</p> <p>2) Develop and implement WMP for the operation and maintenance of the reservoir (can be done at the corporate level),</p> <p>3) Apply waste hierarchy approach (prevention, minimization, reuse, recycling, energy recovery, disposal) for the generated waste,</p> <p>4) Equip the site with clearly labelled waste collection and storage containers and areas,</p> <p>5) Sign contracts with the licensed waste handling (recycling, treatment, disposal) companies to hand them over the generated wastes,</p> <p>6) Sign a contract with the communal company for the regular removal of household waste from the reservoir site.</p>		operation phase shall be carried out in accordance with applicable national legislation, the waste hierarchy principles and GIP.	M - State Inspection Body
Conservation of flora species and habitats.	Impact on Biodiversity (8.2.12)	<p><b>Habitats</b></p> <p>1) Implement the Riverine Habitats Construction Plan: construct and maintain the following habitat (PBF) along the reservoir's banks:</p> <p style="padding-left: 20px;">C3.2 Water fringing reedbeds and tall helophytes other than canes,</p> <p>2) Implement the offset project to conserve the following three priority habitats:</p> <p style="padding-left: 20px;">C2.27 Mesotrophic vegetation of fast-flowing streams,</p> <p style="padding-left: 20px;">C3.55 Sparsely vegetated river gravel banks,</p> <p style="padding-left: 20px;">C3.62 Unvegetated river gravel banks.</p>	Within the biodiversity conservation budget.	All proposed mitigation measures are effectively implemented.	D&I - Specialised company via WCRA/PIU S&M - Client (WCRA/PIU) and EBRD.

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Conservation of flora species and habitats.	Impact on Biodiversity (8.2.12)	<b>Flora</b> Construct and maintain the riverine habitats along the reservoir's banks based on indigenous plant species.	Within the biodiversity conservation budget.	Riverine habitats are constructed and maintained.	D&I - Specialised company S&M - Client (WCRA/ PIU) and EBRD.
Behaviour of the Operator's workers	Impact on Biodiversity (8.2.12)	<b>Fauna</b> Monitor compliance of the reservoir's operator with the Worker Code of Conduct to prevent poaching during operations.	-	Worker Code of Conduct for the Operator is developed. The project impact on the fauna species is reduced and/or mitigated.	D&I - Specialised company S&M - Client (WCRA/ PIU).
Conservation of flora, fauna and habitats.	Impact on Biodiversity (8.2.12)	<b>Sedentary animals</b> 1) Introduce or support sustainable grazing practices in the areas that surround the planned reservoir, as improved quality of the habitats can provide a more diverse food supply for reptilians, thus supporting an increase in the population density of the snake and lizard species, 2) Maintain rocky habitats which are habitats for relocation snakes and lizards in the vicinities of the flooded area. <u>Preliminary quantitative assessment</u> <i>Area suitable for the construction and conservation of rocky habitats is about 4 ha in the reservoir buffer/protection zone.</i> <i>Proposals for the construction and conservation of the habitats, including multipliers, should be developed in the BAP.</i>	Within the biodiversity conservation budget.	Project impact on sedentary animals is avoided, reduced, mitigated, or compensated.	I - Specialised company S&M - Leadership of affected community with training support from Client (WCRA/ PIU).



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Conservation of bird species	Impact on Biodiversity (8.2.12)	<b>Birds</b> 1) Introduce/support sustainable grazing practices in the Astghadzor community to improve the quality of grassland habitat, increase the number and diversity of invertebrates, and support the necessary food supply for the Red-backed Shrike and Ortolan Bunting, thereby contributing to a potential increase in their population density, 2) Maintain the restored parts of grasslands.	Within the biodiversity conservation budget.	Project impact on birds is avoided, reduced, mitigated, or compensated.	I - Specialised company S&M - Leadership of affected community with training support from Client (WCRA/ PIU).
Conservation of invertebrates	Impact on Biodiversity (8.2.12)	<b>Invertebrates</b> 1) Introduce/support sustainable grazing practices in the Astghadzor community around the reservoir site, that can improve quality of grassland habitat, 2) Maintain developed habitats.	Within the biodiversity conservation budget.	Project impact on invertebrates is avoided, reduced, mitigated or compensated.	I - Specialised company S&M - Leadership of affected community with training support from Client (WCRA/ PIU).
Irrigation of the agricultural land by water from the Astghadzor Reservoir. Efficient use of irrigible water.	Impacts on Public Facilities and Infrastructure (8.3.2)	1) Maximize water use efficiency by introducing modern irrigation technologies (e.g., drip systems) promoted under the RoA Government Decree № 1695-L dated 14.10.2021 <sup>20</sup> and communicate with farmers about the benefits of drip irrigation benefits, including the government's financial compensation for water use payments when drip irrigation is adopted (to be organised by the WCRA and supported by the communities and regional authorities), 2) Encourage community participation in water user associations to improve governance,	-	Drop irrigation systems are implemented as much as possible. Participation of vulnerable groups in water user associations or community decision-making on irrigation is prioritised.	D&I - Affected community with training support from the Client (WCRA/ PIU) and Operator S&M - Client (WCRA/ PIU).

<sup>20</sup><https://www.arlis.am/hy/acts/168164>

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Astghadzor Reservoir operation.		<p>maintenance, and fair access to irrigation services.</p> <ol style="list-style-type: none"> <li>1) Conduct regular inspections and maintenance of access roads, power lines, and waste systems to anticipate and address infrastructure strain,</li> <li>2) Maintain embankments, spillways, and outlet structures to ensure controlled water releases and avoid downstream flooding that could damage public infrastructure.</li> </ol> <p><i>See also mitigation measures proposed in Sections 8.3.5 and 8.4.</i></p>	Within the Operator's budget.	Safe operation of irrigation water supply infrastructure.	I - Client (WCRA/ PIU) and Operator S&M - Client (WCRA/ PIU)
Stakeholder engagement process, recruitment and remuneration of employees during the construction works.	Impact on Vulnerable Groups (8.3.4)	<ol style="list-style-type: none"> <li>1) Implement subsidies or reduced fees for low-income households to access irrigation water or reservoir-related services, as well as to the water saving technologies under the RA Government Decree № 1695-L dated 14.10.2021,</li> <li>2) Ensure transparent and equitable allocation of water to all farmers, prioritizing disadvantaged users,</li> <li>3) Ensure emergency response plans explicitly consider vulnerable groups, including designated evacuation routes and assistance during floods or dam releases,</li> <li>4) Encourage participation of vulnerable groups in water user associations or community decision-making on irrigation schedules and reservoir management.</li> </ol>	Within the Operator's budget.	Participation of vulnerable groups in water user associations or community decision-making on irrigation is prioritised.	D&I - WUA and Operator S&M - Client (WCRA/ PIU)
Transportation of materials, oil products and workers.	Impact on Community Health and Safety (8.3.5)	<ol style="list-style-type: none"> <li>1) Monitor the technical conditions of the reservoir, provide timely maintenance,</li> </ol>	Within the Operator's budget.	TMP and EPRP for the operation	D&I - Operator S&M - Client (WCRA/ PIU).

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Operation and maintenance of the Astghadzor Reservoir.		2) Implement vector-disease control measures, including targeted mosquito larviciding in high-risk areas and clearing of excess vegetation, 3) In case if heavy machinery or large number of vehicles is needed for the performance of the maintenance works, a Traffic Management Plan should be developed, accounting for the recommendation outlined above, 4) Update and implement the Emergency Preparedness and Response Plan (EPRP) for the Project operation stage (see also <a href="#">Sections 8.3.2 and 8.4</a> ).		phase are implemented.	
Operation and maintenance of the Astghadzor Reservoir.	Health and Safety Impact (8.3.6)	1) Develop an OHS procedure/instructions for the maintenance and repair works, 2) Comply with the requirements of the relevant national OHS legislation.	Within the Operator's budget.	OHS procedures are prepared and implemented. The activities of the Operator are in line with the national OHS requirements.	D&I - Operator S - Client (WCRA/ PIU) M - Health and Labor Inspection body.
Labour and working condition-related operations, including management of reservoir operations staff.	Workers' Rights and Working Conditions Related Impacts (8.3.7)	1) If a large-scale maintenance is planned, oblige the Maintenance Contractor to develop a Labour and Working Conditions Management Plan and Worker Code of Conduct (if needed) in line with Armenian labour laws and EBRD PR2 at least a month before any maintenance works, and implement it, 2) Ensure formal contracts for all workers specifying wages, roles, and duration of employment, 3) Implement regulated working hours with adequate breaks and rest periods,	Within the Operator's budget.	Compliance with applicable national legislation, EBRD PR2 and GIP concerning labour and working conditions.	D&I - Operator or Maintenance contractor S - Client (WCRA/ PIU) M - Health and Labor Inspection body.

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		4) Establish transparent grievance and complaint mechanisms for all staff, 5) Promote gender equality and inclusivity of persons with disabilities in recruitment, training, and promotion, 6) Provide regular training on operational procedures, safety, and skills development.			
Interactions between workers and residents of affected settlements.	Gender-Based Violence and Harassment (8.3.8)	1) Monitor access to the irrigation infrastructure following the Project completion, 2) Maintain the grievance mechanism during the Project operation, including the GBVH cases.	Within the Operator's budget.	Effective grievance mechanism, including provisions for addressing GBVH-related cases is implemented.	D&I - Operator and WUA S&M - Client (WCRA/PIU).
Operation of the Astghadzor Reservoir.	Emergency Situations and Response (8.4)	1) Carry out preventive maintenance of gates, valves, and pumps, and ensure staff are trained in emergency response, 2) Protect workers by enforcing PPE use, confined space entry protocols, and safety training on electrical and mechanical hazards, 3) Develop and implement an Emergency Response Plan (ERP), including early warning systems, evacuation routes, and periodic drills with local authorities and communities (both for staff and local residents), 4) Develop and implement Operation and Maintenance Plan (OMP) for the reservoir, 5) Enhance community safety with fencing, signage, and awareness programs on drowning risks, 6) Engage with local communities and provide grievance mechanisms to address concerns.	Within the Operator's budget.	Emergency Response Plan and Operation and Maintenance Plan are developed and implemented.	I&O - Operator S&M - Client (WCRA/PIU).

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		<i>See also measures proposed in Sections 8.3.2 and 8.3.5.</i>			
Earthworks, excavation, borrow pit operations, construction of electricity transmission lines, etc.	Impact on Tangible Cultural Heritage (8.5.1)	1) Relocate and reinstall the cultural heritage units on elevated terrain, such as hills, as high as possible to avoid the negative impacts of humidity and breezes from the reservoir, in case there is a risk of adverse humidity impacts, 2) Establish green buffer zones (e.g., planting trees or shrubs) between the reservoir and heritage structures to absorb excess moisture and reduce direct humidity transfer (this measure can be combined with TMP), 3) Apply conservation-grade coatings or treatments to protect against moisture absorption without harming historic materials, where relevant.	Within the budget of the Cultural Heritage Management Plan.	Cultural Heritage Management Plan is implemented.	I&O - Specialised contractor S&M - Client (WCRA/ PIU).
Promotion of rituals, ceremonies, celebrations, and cultural heritage values that represent the traditional and cultural identity of the affected settlements, socio-economic development of Martuni community.	Impact on Intangible Cultural Heritage (8.5.2)	Conduct consultations with relevant staff from the Martuni community, the administrative heads of the Astghadzor and Zolaqar villages, as well as with local cultural NGOs, tourism organizations, and other relevant stakeholders to explore the possibility of including the Astghadzor Reservoir and the 'Vanqi Berd' archaeological complex in the potential list of sightseeing sites featured in tours to Lake Sevan.	5,000 EUR	Events promoting the intangible cultural heritage values of Martuni community are organized and implemented.	D&I - Specialised company (for example cultural NGO) S&M - Client (WCRA/ PIU) and EBRD