STATE COMMITTEE OF WATER ECONOMY (SCWE)
MINISTRY OF AGRICULTURE (MOA)
THE REPUBLIC OF ARMENIA

PREPARATORY SURVEY FOR YEGHVARD IRRIGATION SYSTEM IMPROVEMENT PROJECT

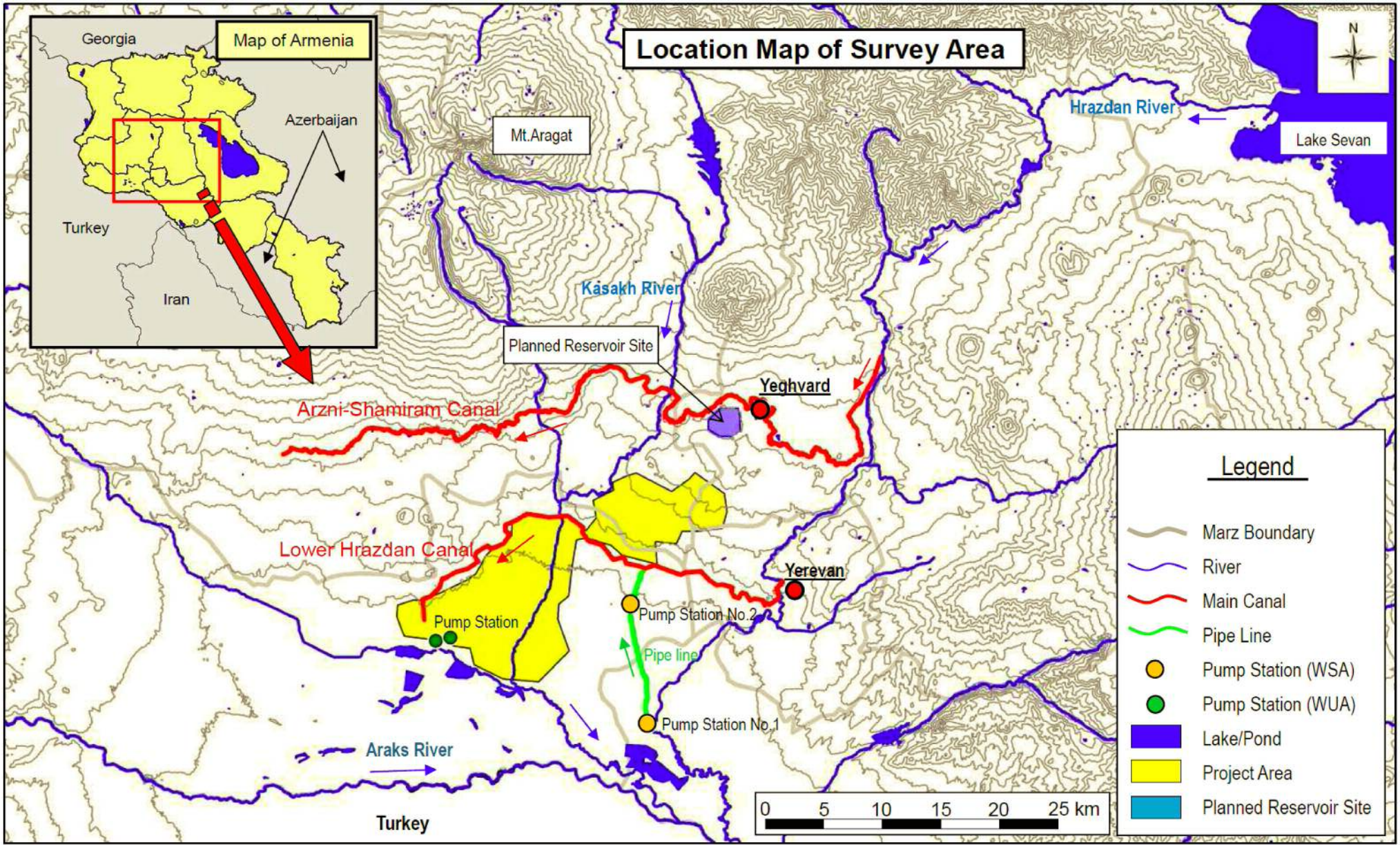
DRAFT FINAL REPORT (DFR)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

SEPTEMBER 2016

SANYU CONSULTANTS INC. (SCI)
ORIENTAL CONSULTANTS GLOBAL CO., LTD. (OCG)

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)


Location Map of Survey Area
Map of Armenia
Georgia
Azerbaijan
Turkey
Iran
N
Hrazdan River
Lake Sevan
Mt.Aragat
Kasakh River
Planned Reservoir Site
Yeghvard
Arzni-Shamiram Canal
Lower Hrazdan Canal
Yerevan
Pump Station
Pump Station No.2
Pipe line
Pump Station No.1
Araks River
Turkey
0 5 10 15 20 25 km
Legend
Marz Boundary
River
Main Canal
Pipe Line
Pump Station (WSA)
Pump Station (WUA)
Lake/Pond
Project Area
Planned Reservoir Site

EXECUTIVE SUMMARY

1. Project Outline

Yeghvard irrigation system improvement project (the Project) was planned during 1970s for improvement of irrigation system in Kotayk, Araghatsotn and Armavir regions. It was suspended in 1980s due to financial issue. In accordance with water level decrease in the Lake Sevan and necessity of water resource development, the proposed scale of this reservoir was reviewed and the Government of the Republic of Armenia requested the loan aid for the Project to the Government of Japan in May 2012. The Japan International Cooperation Agency (JICA) has made decision to dispatch the Team for the "Preparatory Survey for Yeghvard Irrigation System Improvement Project" (the Survey), and the Survey team has implemented a series of studies since June 2015. The Project implementation agency is the State of Water Committee Economy (SCWE), and the supervising organization is Ministry of Armenia (MOA).

Following table shows the structure and scale of proposed reservoir and canals. In addition, Figure 1 shows the location of the proposed structures. Concerning the open-canal, 5m width at both right and left sides will be secured for the canal management.

Table 1 Outline of the Structures

Structure	Scale	Location
Reservoir	Capacity: 94,000,000 m^3 (94MCM) Width of dam crest : 8m Full water surface area: 808ha Reservoir area:796ha	Yeghvard Reservoir
Feeder Canal 1 (Pipeline)	Length: 4.4km ϕ 1,600mm	This canal diverts water from Arzni-Shamiram canal to Yeghvard Reservoir.
Feeder Canal 2 (Open canal)	Length: 0.23km Width : 4m	This canal diverts water from Arzni-Shamiram canal to Yeghvard Reservoir.
Outlet Canal 1 (Pipeline)	Length: 0.73km ϕ 1,200mm	This canal diverts reserved water to Arzni-Branch canal.
Outlet Canal 2 (Pipeline)	Length: 4.7km ϕ 1,700mm	This canal diverts reserved water from Dike 1 to existing Ashtarak pipeline and to Kasakh River

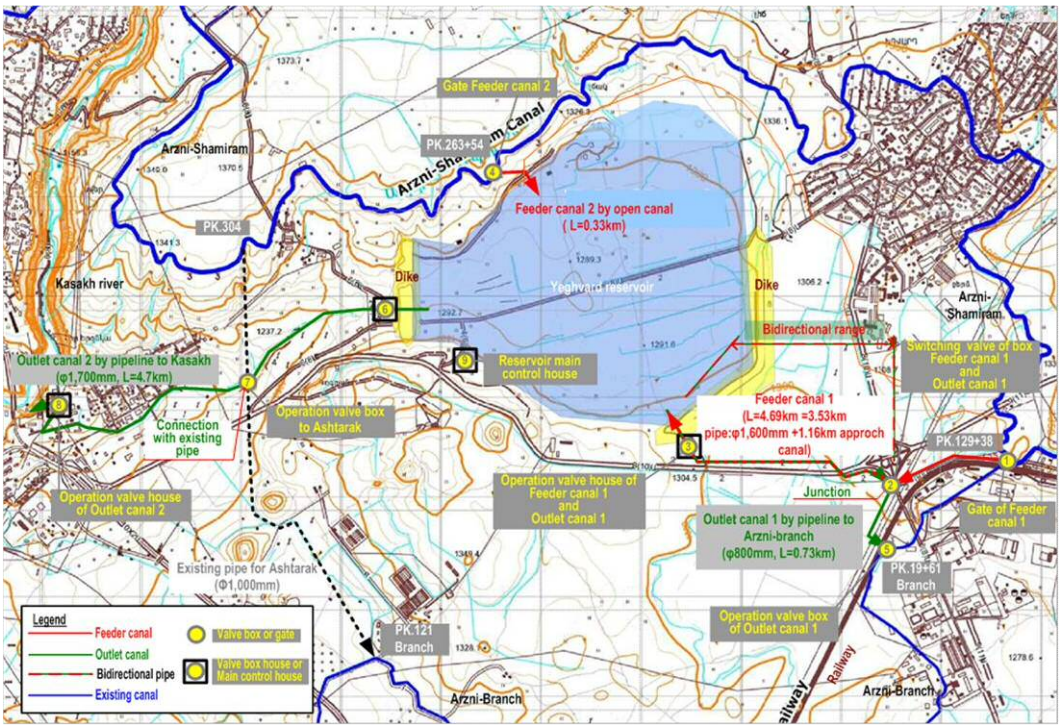


Figure 1 Proposed Project Components

As a part of the Survey, an Environmental and Social Impact Assessment (ESIA) has been conducted to examine the extent of environmental and social impacts by the proposed Project, and to propose some countermeasures against the expected impacts considering the surrounding situations. This ESIA report discusses current natural and social conditions in and around area, expected impacts, mitigation measures and monitoring plan.

2. Institutional and Legal Framework

In Armenia, the "Law on Environmental Impact Assessment and Expertise (hereinafter "the law") was formulated in 2014. Based on the Law, ESIA should be prepared and submitted to the Ministry of Nature Protection (MNP). The Project is classified into "Category A", which requires ESIA report preparation. National norms for air pollution, surface water, noise and so on have been established. However, specific standard for irrigation water, water/soil quality standard for agrichemical and national standard of industrial drainage have not been prepared, and international standards are applied for those matters.

3. Examination of Alternatives

Some alternatives of the Project in terms of water resources, construction site, scale and anti-infiltration work are examined. As a conclusion, the current Reservoir basin is the most suitable to store a large amount of water, and utilization of free water from the Hrazdan River is the most sustainable. Concerning reservoir scale, around 800 ha reservoir area is selected since existing dikes can used and cost is lower than that of 600ha. As anti-infiltration works, in terms of reliability and cost, "Soil-Cement with a sandwiched bentonite sheet" is proposed.

4. General Conditions in the Project Area

The Project beneficiary area is 27 communities, wherein wheat, vegetables, grape, orchard are widely operated in the area. After the Project, the people will can access to stable irrigation water. On the other hand, in and around the construction sites, generally the lands are used for agricultural purpose, wheat, alfalfa, barley, orchard and so on. The affected communities by the Project are Yeghvard Community, Ashtarak Community and Nor-Yerznka Community.

In general, women do not take initiatives in the public, however, women and men share farming activities together. It is traditional that women are protected by men, and those who go to other cities as migrant labors are generally men. In Armenia, ethnic minority people are almost integrated to the Armenian people and they are regarded as Armenian citizens, and they can be the beneficiaries of the Project.

There is a possibility that application amount of agrichemical and fertilizers will be increased due to expansion of irrigation area after the Project. An illegal agrichemical was detected in soil samples in the beneficial area, and nitrate concentrations in some groundwater samples are relatively high. Regardless of the Project implementation, proper agrichemical and fertilizer application in collaboration with MOA is necessary.

At the Reservoir, there is no virgin nature, since the area had been developed as vineyard during the Soviet Union period and it is used for farmland and grazing land. Some wildlife such as fox, wolves, bares, various migratory birds, snakes and so on are identified. There are some endangered species according to IUCN or Republic of Armenia (RA) red list, however, they can easily find other areas outside of the Reservoir, since there are similar places around the Reservoir. Concerning flora, there is no endangered species.

The Project plans to take 103 MCM water from the Hrazdan River to the Reservoir, and to divert the stored water to the Kasakh River, Arzni-Brach Canal and Ashtarak Canal. 28 fish species and 15

species are identified in Hrazdan River and Kasakh River, respectively. In the Hrazdan river, natural flow and canal are in parallel, and those flows merged at the reservoirs. Such situations are repeated in the upstream and middle stream. In general, most of river water is diverted to the canal for irrigation and power generation, while only ecological minimum discharge is secured for the natural flow. The fish in the natural flow in the Hrazdan River have survived under the harsh conditions so far. On the other hand, in the downstream, there is no weir or canal, and some endangered fish species are identified.

Hrazdan River is mainly used for irrigation and hydro power, instead for drinking water, industrial water, aquaculture and so on. In Armenia, irrigation has priority for water use than power generation. Water use for the Arzni-Shamiram Canal, namely, 320 MCM per year, has been already approved by the MNP and the proposed water intake by the Project is within the amount. On the other hand, there are seven Hydro Power Plants in the Hrazdan River, four out of them are located on the downstream in the water intake point for the Yeghvard Reservoir.

5. Main Expected Impacts by the Project

5.1 Impacts before Construction

Before construction, land acquisition is necessary. In total, 819ha will be influenced by the Project and most of the area is communal land. Out of them, 26ha area, mostly farmland, belongs to the privates, and compensation to the affected persons is needed. There are some poor households, who receive poverty allowance, in the affected area, it is recommended to support them by hiring them as labors during construction stage with high priority.

5.2 Impacts during Construction

During construction works, air pollution, mud water, noise, road closure, waste generation and so on are expected. It is necessary to take countermeasures to minimize the impacts. However, they are temporary and the scale will not be significant.

5.3 Impacts during Operation

Due to the expansion of irrigation area, application amount of fertilizer and agrichemical will be increased, and pollution of ground water and soil can be caused. It is important to promote awareness of suitable application methods through MOA staff. Especially, control of illegal agrichemical is essential.

In and around the Reservoir basin, some endangered species are identified, however, they can move to outside of the Reservoir basin, and there are similar places around the Reservoir. Therefore, it is not difficult for them to survive after the Project, and no severe impacts on fauna and flora is expected. On the other hand, after the Project, the Reservoir will be attractive for migratory water birds.

The Project will divert 103 MCM from the Hrazdan River, however, it will not cause severe hydrological change, since the Hrazdan River has already been utilized for irrigation and power generation. Even in the downstream, the peak discharge in spring will be kept after the Project. In case of Kasakh River, discharge will be increased, however, the section is limited only from the inflow point to the Kasakh Intake, namely, 14km, and significant impact is not expected. Regarding the Lake Sevan, the Project can contribute to save the water of the lake, however, water level of the lake will not be drastically increased by the Project, only 4 cm increase annually.

Concerning impacts on fish in the Hrazdan River, it is possible to categorize fish in terms of habitat area, namely, 1) upstream, 2) middle stream and 3) downstream of the Hrazdan River. Fish in the upstream will not be damaged since the area is upstream of the water intake point of the

Arzni-Shamiram Canal for the Reservoir. In the middle stream, there are natural flow and canal in parallel, most of the water is taken to the canal for irrigation and power generation at this moment, and there are several weirs, which prevent migration in the river. The fish in the natural flow has survived in the severe conditions, and the conditions will not be changed after the Project. Therefore, the fish in the middle stream will not be affected by the Project very much.

In the downstream, there is no weir and no canal. The most important season for fish is spawning, namely, spring. In general, spawning triggers of fresh water fish are water temperature change and discharge peak. Sufficient water depth for spawning is also necessary. In case of Hrazdan river, even after the Project, discharge peak will be kept and water temperature will be increased in spring. In the downstream, the lowest depth through the year is around 3m, which is enough for fish spawning. Thus, the Project will not give a damage to fish in the downstream neither. As a whole, the damage to the ichthyological system Hrazdan River by the Project will be small.

At the Reservoir, some fish can be flushed away from the Hrazdan River and they can mix with fish in the Kasakh River through the Outlet Canal-2. However, there are some common fish between the Hrazdan River and Kasakh River, therefore, significant impacts on ichthyological system in the Kasakh River is not expected.

Hrazdan River is mainly used for irrigation and power generation, and even though the Project will take 103 MCM for the Reservoir, the impact will be small, considering that water discharge for hydro power generation in 2013 was 1,875MCM. In Hrazdan River, around 500 million kWh is generated on average per year, while total power generation in Armenia is around 7,800 million kWh annually. The influenced power generation by the Project will be 27million kWh, which accounts for only 0.35% of total national power generation. Therefore, the impact by the Project on the power generation will be very limited.

6. Mitigation Measures and Monitoring

Before construction stage, a Resettlement Action Plan should be prepared and the plan shall be implemented. During construction period, the construction contractor should make efforts to minimize the expected impacts, such as dust generation, noise, mud water, waste management, traffic management and so on. Water Sector Projects Implementation Unit /SCWE will supervise the mitigation measures taken by the contractor in collaboration with the technical consultant. During operation period, MOA, Water User Association (WUA) and Water Supply Agency (WSA) will be key organizations to mitigate the impacts. MOA is requested to control the proper farming management, while WUA and WSA are recommended to comply with regulation for ecological minimum discharge in the Hrazdan River. During operation period, MNP will be responsible for supervision.

In the process of implementation of EMP, regular monitoring is necessary. The monitoring results will be complied as a monitoring report by the responsible organization using the proposed monitoring formats and indicators. It is important to record how the implementation agency took measures against any problems in the process. The report should be submitted to the supervising agency regularly.

7. Stakeholder Meeting

Based on the Law in RA the public hearing on the Project outline was organized on 20th October 2015 in Yeghvard Municipality Office. The participants asked about the Project schedule, budget and expected environmental impacts. There was no objection against the Project. The participation of the general citizens at that time was relatively low, the seminar to explain the Project outline was also organized in Nor-Yerznka Community on 5th November 2015. The people were also interested in the environmental impacts, and some of have concern about safety of the Reservoir. Moreover, they are

interested in transportation of fertile top soil in the Reservoir. On 23rd December 2015, based on the Law, the MNP organized the public hearing at Yeghvard Community to confirm the situation.

Regarding explanation of ESIA Report, a series of public seminars were organized from the end of May 2016 to the beginning of June 20016. The participants are interested in anti-filtration works, compensation measure for land loss, scale of the Reservoir and irrigation canals and so on. In general, negative opinion for the Project was not presented at the public seminars. It is noted that communities concerned have a request that the State will implement some small scale project for the communities, since the communities have to provide their lands for the Project without compensation.

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Abbreviations

ADB	Asian Development Bank
BOD	Biological Organic Demand
CJSC	Closed Joins Stock Company
COD	Chemical Organic Demand
EC	Electric Conductivity
EMP	Environmental Monitoring Plan
ENPARD	European Neighborhood Programme for Agriculture and Rural Development
ESIA	Environmental and Social Impact Assessment
EU	European Union
FAO	Food and Agriculture Organization
F/S	Feasibility study
HPP	Hydro Power Plant
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
MCM	Million Cubic Meter
MNP	Ministry of Nature Protection
MOA	Ministry of Agriculture
OM	Operation and Maintenance
PIU	Water Sector Projects Implementation Unit
RA	Republic of Armenia
SCWE	State Committee of Water Economy
SNCO	State Non-Governmental Organization
SS	Suspended Solid
UNDP	United Nations Development Programme
WB	World Bank
WSA	Water Supply Agency
WUA	Water User Association
WWF	World Wildlife Fund

General Information

Client	Japan International Cooperation Agency
Regulatory body	Ministry of Agriculture of the Republic of Armenia
Undertaker	State Committee of Water Economy under the Ministry of Agriculture of the Republic of Armenia
Contact data of Undertaker	scws@scws.am, +37410 540909
Environmental Consultant	ATMS Solution LTd.

CHAPTER 1 INTRODUCTION

1.1 Background

Yeghvard irrigation system improvement project (the Project) was planned during 1970s for improvement of irrigation system in Kotayk, Araghatsotn and Armavir regions. In 1980s, the construction work of the reservoir with a scale of 228MCM had been started and parts of dike had been constructed. However, it was suspended due to the financial issues. In 1990s, coping with recession of water level in the Lake Sevan, the Yeghvard irrigation system improvement project was re-examined, since the target area mentioned above depends on the water of the Lake Sevan. The proposed scale of this reservoir was reviewed and reduced to 90 MCM. The Government of the Republic of Armenia (RA) requested the loan aid for the Project to the Government of Japan in May 2012; therefore, the Japan International Cooperation Agency (JICA) dispatched a Study Team for "Data collection survey on agriculture and irrigation sector" in 2014.

In the abovementioned survey, physical strength of embankment structure, which had been suspended in 1980s, was identified and some survey reports, which were carried out at the times of Soviet Union, were also reviewed. Through this "Data collection survey on agriculture and irrigation sector", introducing gravity irrigation (abolishing pump irrigation) to alleviate Operation and Maintenance (O/M) cost of pumps, the importance of cnstructing a reservoir and so on have been reviewed to mitigate excessive dependency on water of lake Sevan, which suffers from drawdown of lake water-level. Based on the results, the JICA has made decision to dispatch the Team for the "Preparatory Survey for Yeghvard Irrigation System Improvement Project" (the Survey), and the Survey team has implemented a series of studies since June 2015. The Project implementation agency is the State of Committee Water Economy (SCWE), and the supervising organization is Ministry of Agriculture (MOA).

As a part of the Survey, an Environmental and Social Impact Assessment (ESIA) has been conducted to examine the extent of environmental and social impacts by the proposed Project implementation, and to propose some countermeasures against the expected impacts considering the surrounding situations. This ESIA report discusses current natural and social conditions in and around area, expected impacts, mitigation measures and monitoring plan.

1.2 Approach and Methodology

The ESIA study has been implemented by using following measures:

- Literature review of applicable policies, legislation and regulatory frameworks and of other relevant reports previously undertaken;
- Primary field surveys and site investigations to be commissioned specifically for this study;
- Collection of baseline data and assessment of environmental sensitivity of the Project areas;
- Consultations with key stakeholders, including decision makers and the Project affected and beneficiary groups.

This study report has been prepared in accordance with the following requirements:

- National environmental regulations and standards.
- Recognized international regulations and best practices, including JICA guidelines, Resettlement framework of Asian Development Bank (ADB) and World Bank (WB).

CHAPTER 2 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This Section presents the policy, legal and administrative framework for the proposed Project environmental and social management in the RA with particular reference to the regulations governing water irrigation systems as well as the requirements for ESIA. As RA has committed to the implementation of international conventions and protocols, the relevant documents applicable to the Project are also described.

The Project proposals should be in line with applicable local/national and international environmental and social legislation, regulations and guidelines as well as specific procedures/regulations and policies of international finance institutions.

2.1 Responsible Organization for Environmental and Social Considerations in Armenia

The Ministry of Nature Protection (MNP) is responsible for natural conservation, sustainable use and restoration of natural resources, environmental improvement and so on in Armenia. Also, the MNP formulates national policies for environmental conservation, environmental standards, environmental guideline, etc. In the MNP, there are various departments and agencies, and also thirteen (13) State Non-Commercial Organizations (SNCOs). The number of staff of MNP is around two thousands in total and the organization structure of the MNP is illustrated in Figure 2-1.

The Center of Expertise for Environmental Impact Assessment SNCO, MNP is the responsible for examination and approval ESIA report. The number of staff of the Center is 17 (seventeen) in total, the organization examines the ESIA report under the support from other agencies under the MNP, other ministries and private companies according to necessity.

As illustrated in Figure 2-1, the divisions are under the departments according to the Homepage of the MNP. There is no clear mention about relationship among the departments within the MNP at the Homepage, however, cooperation between some departments are practiced. For instance, when an official letter is submitted to the Environmental Impact Expertize Center in the MNP, the response in the documents is issued after the approval by the Legal Department.

Under the MNP, there is the Environmental Impact Monitoring Center, which is an institution of environmental analysis. The Center has been supported by the USAID through provision of some analytical instruments, and has been requested for water quality analysis by some international organizations such as FAO. Therefore, it can be said that the Center has sufficient experience and ability, which leads to fair and appropriate analysis.

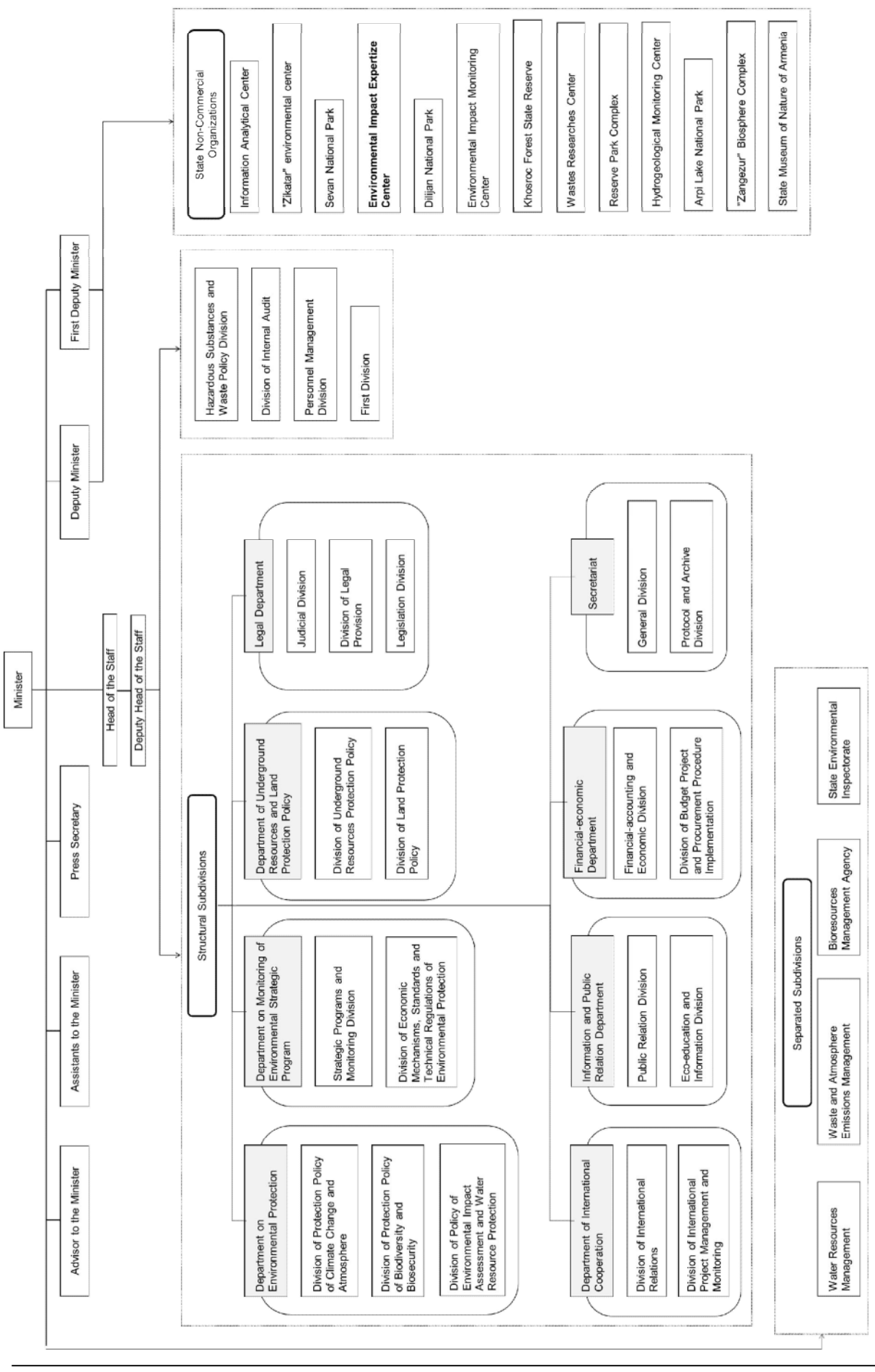


Figure 2-1 Organization Structure of the MNP

Source) Homepage of the MNP, 2015
(The organization chart is modified based on description in the Homepage)

2.2 Relevant Laws on Environmental and Social Considerations

Armenia has laws on the environmental conservation as below. The "Law on Environmental Impact Assessment and Expertise" is the one concerned to the environmental and social considerations.

Table 2-1 Laws on Environmental Conservation

Adaption/ Amended	The name of Laws (in English)
1991/ 2006	Law on Specially Protected Natural Areas
1992	Law on Ensuring Sanitary- epidemiological Security of the RA Population
1994	Law on Atmosphere Air Protection
1995	Law on Environmental Impact
1996	Law on Automobile Roads
1998	Law on the Protection and Use of Fixed Cultural and Historic Monuments and Historic Environment
1998	Law on Environment and Nature Use Charge
1999	Law on Flora
2000	Law on Fauna
1991/ 2001	Land Code
2001	Law on Hydro-meteorological Activity
2001	Law on Environmental Education
2002	Code on Underground Resources
1992/ 2002	Water Code
2002	Law on Seismic Defense
2002	Law on Water Users' Associations and Federations of the Water Users Associations
2004	Law on Waste
2005	Forest Code
2005	Law on Environmental Supervision*
2006	Law on Rates of Environmental Charges Decree of the Government on Approval of Technical Regulation of the Requirements for Decision of Norms for Removal of Fertile Soil Layer, and Storage and Usage of the Removed Fertile Layer**
2006	Law on National Water Program
2008	Law on Oversight of Land Use and Protection
2010	Decree of the Government of RA N 71-N on Approval of the Red List of Animals of the RA Decree of the Government of RA N 72-N on Approval of the Red Book of Plants of the RA
2011	Decree of the Government of RA on Approval of the Order of Usage of Fertile Soil Layer, Annulment of the Decree No. 1622-N of the Government of RA dated on 19.09.2002, and Amendment of the Decree No. 286-N of the Government of RA dated on 12.04.2001**
2014	Law on Environmental Impact Assessment and Expertise
2014	Public Notification and Discussion Procedure approved by RA Government Decree No.25

*The State Environmental Inspectorate under the MNP supervises soil transportation to minimize the environmental impact.

**In case of project which would disturb fertile top-soil, it is needed to transport the top-soil to outside of the area.

(a) Law on Environmental Impact Assessment

In 1991, after the independence of Armenia, it was unclosed that the environmental situation in this country had been deteriorated, and environmental conservation was identified as a high priority issue. Responding to the situation, various laws on environmental conservation have been formulated. The first relevant law to the Environmental Impact Assessment in Armenia was the "Law on Environmental Impact (hereinafter "the previous law") in 1995. However, there were some gaps between the previous environmental law and international standards set by international organization such as WB, ADB, and so on. For the improvement of this issue, the "Law on Environmental Impact Assessment and Expertise (hereinafter "the new law") was formulated in 2014.

(b) Necessity of Environmental and Social Considerations at Each Stage

Any projects are categorized into Category A, B and C depending on the scale and characteristics. Generally, Category A Projects are large scale, or can cause complicated environmental impacts. For instance, Hydropower stations with the power of 30 MWt and more are categorized into A. In case of water management project, construction of Reservoirs, artificial lakes, water basins – 1 million m^3 and more are classified into Category A. In case of Category B, medium-scale projects are categorized, e.g. hydropower stations with 10-30 MWt power and so on. Category C projects include Production of biogas or energy with biogas with the power of 1 MWt and more Hydropower stations with the power of 1-10 MWt and so on. There is no mention of reservoir scale in definition of Category B and Category C. Projects classified into Category C do not need ESIA preparation.

Regarding Environmental and Social Considerations for Master Plan and Development Strategy, a Strategic Environmental Assessment is necessary according to the Law. However, the Strategic Environmental Assessment is not categorized into Category A or B or C. On the other hand, if the project is categorized as Category A or B, the undertaker must prepare an ESIA Report on the Feasibility Study (F/S) Stage and the Detail Design (D/D) Stage. The contents of ESIA Report and the procedure, on F/S Stage and D/D Stage, are the same.

(c) Project of Preparing ESIA Report

As mentioned before, the procedure of preparing ESIA Report on the new law consists of Initial Stage and Main Stage (see Figure 2-2). When the project is categorized as a Category C at the Initial Stage, the undertaker doesn't need to prepare an ESIA Report. However, if it is categorized as Category A and B, ESIA Report preparation is needed. Furthermore, there's no difference between ESIA Report contents of Category A and that of Category B. The difference between the Category A and B is only period of ESIA Report examination, namely, 60 working days and 40 working days for Category A and Category B, respectively. In addition, the examination period for Strategic Environmental Assessment Report is 60 working days.

(i) Initial Stage

The undertaker prepares an initial assessment application and submits it to the MNP. The contents of the initial assessment application include the project components, estimation of the environmental impact by the project, results of Public Hearing and so on. After this, MNP will notify results of the Category and contents which should be included in ESIA Report, if the project is categorized as Category A or B. Before submission of the application document, the undertaker must hold the Public Hearing which explains the project outline and project impact, and include the results of Public Hearing to the application document. After that, MNP will hold the other Public Hearing to confirm contents of the submitted application document. Based on the application, MNP suggests the survey contents of ESIA Report.

(ii) Main Stage

Based on the notice from MNP on Initial Stage, the undertaker should implement the environmental impact assessment and prepare an ESIA Report. The contents of Strategic Environmental Assessment Report and ESIA Report are shown in Figure 2-2.

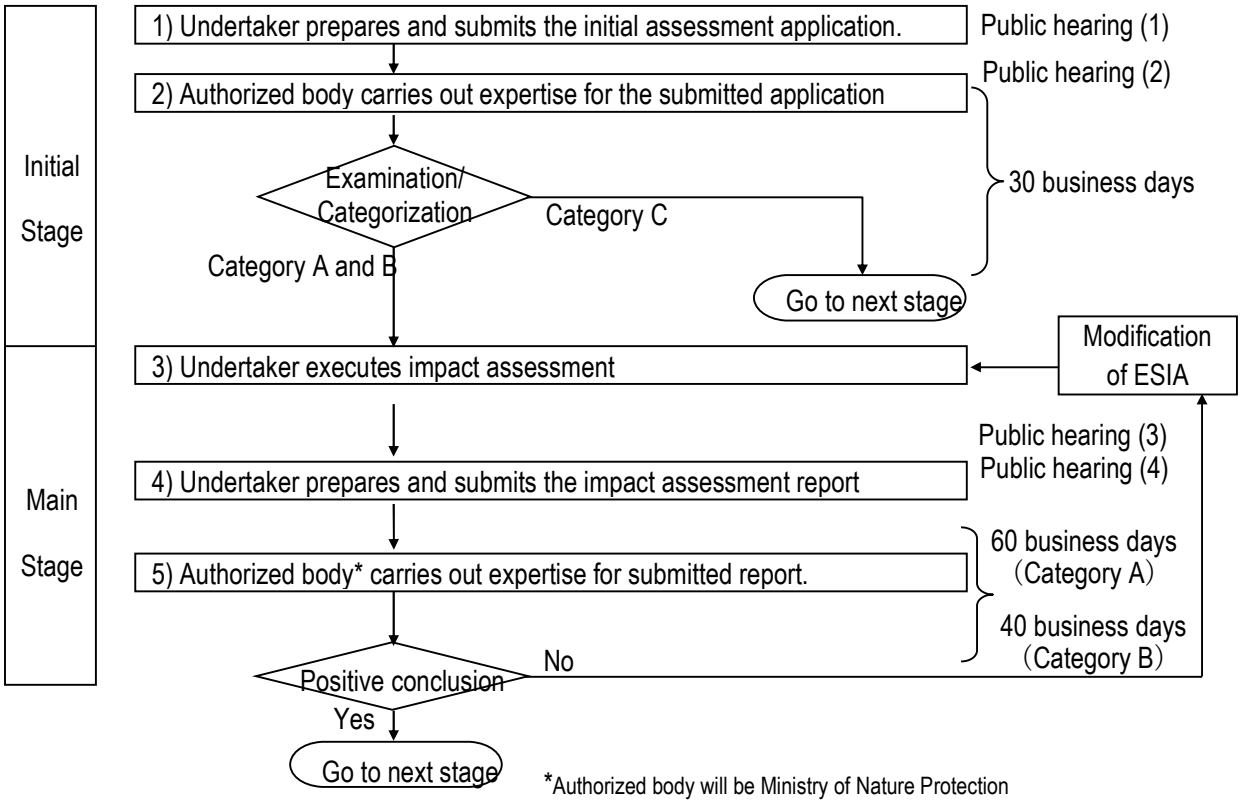


Figure 2-2 Process of Preparing, Application, and Approval of ESIA Report

[Strategic Environmental Assessment Report]

i. The aim of the master plan and the development strategy, and their relation and accordance with master plan of the given area,
ii. International agreements and other related legal acts ratified by the Republic of Armenia related to the master plan and the development strategy,
iii. The environmental issues related to the area subject to impact and their reflection in the master plan and the development strategy,
iv. The natural environmental conditions and socio-economics situations of the area,
v. The comparison of all possible options,
vi. The mitigations,
vii. The monitoring program,
viii. The information on sources of data included in the report,
ix. Information on assessment methods, and issues, including absence of data, arising during their application,
x. Summary of the report.

[ESIA Report]

i. The aim of the project
ii. The natural environmental conditions and socio-economics situations of the area.
iii. The consistency between the development plan of the area and the project
iv. The comparison of all possible options
v. The estimated impacts by implementation of the project (the impacts to natural resources and

materials by the project, air pollution, drainage, waster, emergency situations, and so on)

vi. The impacts to the natural environment and socio-economic environment by the project

vii. The mitigations

viii. The scales, possibilities, and reductions/ mitigations of estimated emergency situations[1]

ix. The monitoring program

x. The information on sources of data included in the report

xi. Information on assessment methods, and issues, including absence of data, arising during their application.

The ESIA Report is examined by the MNP. At this stage, the undertaker and MNP have the Public Hearing to explain the project impact and its mitigation measures again. For the examination by MNP, 60 working days and 40 working days are needed for Category A and Category B, however, if MNP needs more days for examination of ESIA Report, they can extend the period up to half of days of original period. When an ESIA Report is submitted to the MNP, summary of the project report such as F/S report shall be attached. If the ESIA report is satisfactory, the MNP gives positive conclusion, and the project can proceed to next step as Figure 2-2.

According to the Article 20, if the intended activities are not started within one year period after issuing of professional conclusion, the latter is cancelled.

(d) Public Notification and Discussion Procedure approved by RA Government Decree No.25

"Public Notification and Discussion Procedure approved by RA Government Decree No.25" describes the principles for public notification and consultations procedures applied within the environmental impact assessment and expertize process. The public notification is conducted through mass media, e-mail as well as advertising. The notification includes information on the Project Applicant, the area of project implementation, the potential environmental impacts, date for holding of public discussions, date for submission of comments/remarks as well as contacts of public discussions responsible. Before public discussions, the electric file of documentation relevant to the each of environmental permitting stages should be uploaded to web site of the undertaker. Draft copies should be available at discussions responsible office. Based on the available documentation the public can provide written comments and objections.

2.3 Gap Analysis

There are some gaps with the JICA Environmental and Social Guidelines (hereinafter referred to as "JICA Guidelines"). Table 2-2 shows the gap between the Environmental Law in Armenia and the JICA Guidelines.

Table 2-2 Gap Analysis between the Environmental Law in Armenia and JICA Guidelines

Items	JICA Guidelines	Environmental Law in Armenia	GAP	Measure for settlement
Procedure	JICA confirms that projects comply with the laws or standards related to the environment and local communities in the central and local governments of host countries; it also confirms that projects conform to those governments' policies and plans on the environment and local communities. JICA confirms that projects do not	The procedure of the Environmental Impact Assessment is regulated in Law on Environmental Impact Assessment and expertise (2014).	None	—

[1] Emergency situation includes natural disasters, man-made disasters, and accidents

Items	JICA Guidelines	Environmental Law in Armenia	GAP	Measure for settlement
	deviate significantly from the World Bank's Safeguard Policies,			
Language of the Environmental Impact Assessment Report	ESIA Reports must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them.	ESIA Report is to be prepared in Armenian. And the explanation of project is also implemented in Armenian. In general, the local people use Armenian.	None	—
Information Disclosure	In principle, project proponents etc. disclose information about the environmental and social considerations of their projects. JICA encourages project proponents etc. to disclose and present information about environmental and social considerations to local stakeholders.	Before submission of the application documents and ESIA Report to MNP, the Public Hearing is required to be held. In the Public Hearing, it is required to be explained to participants (e.g. relevant municipalities, residents, and so on) about the project outline and the estimated environmental impacts. Furthermore, the public notice, contents of Public Hearing, and the consent form from municipalities are required to be attached to the application documents and ESIA Report. (No. 26 of Article 16/ Law on Environmental Impact Assessment and Expertise). After the Public Hearing for the application, MNP would announce the category of the Project and the contents which the undertaker should implement the environmental impact survey. In addition, after the Public Hearing of submission of ESIA Report, MNP would present the result of the report to relevant person ("Public notification and discussion procedure," 2014).	None	—
Consultation with Local Stakeholders	In principle, project proponents etc. consult with local stakeholders through means that induce broad public participation to a reasonable extent, in order to take into consideration the environmental and social factors in a way that is most suitable to local situations, and in order to reach an appropriate consensus. JICA assists project proponents etc. by implementing cooperation projects as needed. In the case of Category A projects, JICA encourages project proponents etc. to consult with local stakeholders about their understanding of development needs, the likely adverse impacts on the environment and society, and the analysis of alternatives at an early stage of the project, and assists project proponents as needed.	Before the application and submission ESIA Report, the Public Hearings are required to be implemented. The participants can make comments about the project, the estimated environmental impacts, and the mitigations. In addition, the undertaker has to consider the comments from participants. And if the comments are reasonable, the undertaker has to reflect them to ESIA Report. (Article 26, Law on Environmental Impact Assessment and Expertise). The undertaker has to attach the memorandum of the Public Hearing and recorded videotape to the application documents and ESIA Report, and submit them to MNP (Article 26, Law on Environmental Impact Assessment and Expertise).	Since it is needed to organize Public Hearing twice, namely, at initial stage and submission of ESIA report in Armenia, there is no gap.	—

Items	JICA Guidelines	Environmental Law in Armenia	GAP	Measure for settlement
Access to ESIA Report	ESIA Reports are required to be made available to the local residents of the country in which the project is to be implemented. The ESIA Reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted;	When the Public Hearing, the contents of ESIA Report is required to be explained (Article 26, Law on Environmental Impact Assessment and Expertise). Submitted ESIA Report to MNP would be disclosure on the website of MNP, and be allowed to copy or read. Furthermore, if the report revised, the revised version would be disclosure on website.	None	—
Confirmation of Monitoring	JICA confirms with project proponents etc. the results of monitoring the items that have significant environmental impacts. This is done in order to confirm that project proponents etc. are undertaking environmental and social considerations for projects. The information necessary for monitoring confirmation by JICA must be supplied by project proponents etc. by appropriate means, including in writing. When necessary, JICA may also conduct its own investigations. In addition, JICA discloses the results of monitoring conducted by project proponents etc. on its website to the extent that they are made public in project proponents etc.	Monitoring Program is required to be prepared. However, there is no mention that publication of results of Monitoring Program is required or not.	Necessity of Publication of monitoring results is not mentioned.	JICA would confirm the actual situations of publication of monitoring results.

In addition to the table above, some norms/standards are not established in Armenia as described in Chapter 2.4. Therefore, it is recommended to apply international standards as required.

2.4 Environmental Standards in Armenia

Some norms/standards regarding unified effluent from factories, soil contamination, and specific irrigation water quality are not established in Armenia. Moreover, groundwater is used for various purposes, namely, domestic water, aquaculture, irrigation, and so on, however, there is no specific standard/norm. In addition, there is no regulation regarding residual agricultural chemicals in surface water, soil and crop. This sub-chapter describes existing regulation, norms/standard, and laws concerning environmental conservation.

(1) Air quality Standards

Standard of Air quality in Armenia is speculated in "Norms of maximum allowable concentrations of ambient air pollutants in residential areas". In the regulation, 389 parameters of air quality are provided, however, parameters to be monitored are fixed depending on the location, and it is not necessary to monitor all of the parameters. In case of big cities such as Yeghvard City, dust, NO_2, SO_2 and CO are parameters to be monitored according to the MNP. Thus, only those parameters are regarded as the standard in the Project. The allowable values of those parameters are as follows:

Table 2-3 Air quality Standards in Armenia

Air pollutant	Maximum one-time concentration ($mg/m^{3)}$	Mean daily concentration ($mg/m^{3)}$
Dust	0.5	0.15
SO_2	0.5	0.05
NO_2	0.0085	0.04
CO	5.0	3.0

Source: Government Decree #160-N dated 02.02.2006

(2) Industrial Effluent Standards

The Government of Armenia has yet to establish any uniformed standards regarding effluent discharge from industrial factories. According to the Water Code of Armenia, every commercial/industrial unit shall propose their own effluents' permissible values to be discharged to surrounding water basins. All factories should set the permissible values in the document based on the specified formula and submit it to Water Resource Management Agency under the MNP to get approval on the proposed permissible values. During the operation of factories, another organization under the MNP, namely, State Environment Inspectorate is in charge of monitoring of the effluent discharge situations based on the Norms. The parameters, which are generally regulated in discharged water, are temperature, pH, TDS, SS, BOD, COD, SO_4, PO_4, NO_3-N, NO_2-N and so on.

(3) Surface Water Standards in Armenia

In Armenia, there is a surface water quality standard which classifies 5 categories, and the water use are based on the class of water quality. Concerning irrigation water, water which satisfies Class I to Class IV can be used. In Armenia, Background Concentration (BC) is specified for each main river, and water quality threshold depend on the river. Rivers concerned to the Project are Kasakh River and Hrazdan River. BC of those rivers as well as general surface water quality standard is shown below:

Table 2-4 Surface Water Standards in Armenia

Indicator of quality	Unit	Class of quality					Back concentration (BC)	
		I Excellent	II Good	III Moderate	IV Poor	V Bad	Hrazdan River	Kasakh River
Dissolved oxygen (DO)	mg O_2/l	>7 or BC*	>6	>5	>4	<4	>7	>7
Biochemical *oxyge n demand (*BOD_5)	mg O_2/l	3	5	9	18	>18	3	3
Chemical oxygen demand (CODCr)	mg O_2/l	10	25	40	80	>80	10	10
Ammonium ion	mg N/l	0.2 or BC	0.4	1.2	2.4	> 2.4	0.172	0.033
Nitrite ion (NO_2-N)	mg N/l	0.01 or BC	0.06	0.12	0.3	>0.3	0,003	0.011
Nitrate ion (NO_3-N)	mg N/l	1 or BC	2.5	5.6	11.3	>11.3	0.086	0.272
Phosphate ion	mg/l	0.05 or BC	0.1	0.2	0.4	>0.4	0.007	0.060
Total zinc	µg/l	BC	100	200	500	>500	2.7	5.0
Total copper	µg/l	BC	BC+20	50	100	>100	1.5	3.0
Total chrome	µg/l	BC	BC+10 (50)	100	250	>250	1.1	2.0
Total arsenic	µg/l	BC	20	50	100	>100	6.6	0.65
Total cadmium	µg/l	BC	BC+1	BC+2	BC+4	>BC+4	0.03	0.02
Total lead	µg/l	BC	BC+10	25	50	>50	0.17	0.5
Total nickel	µg/l	BC	BC+10 (20)	50	100	>100	2.2	2.1
Total molybdenum	µg/l	BC	2xBC or 10	4xBC or 25	8xBC or 50	>8xBC	5.5	1.19
Total manganese	µg/l	BC	2xBC or 100	4xBC or 200	8xBC or 500	>8xBC	2.3	23
Total vanadium	µg/l	BC	2xBC+5 or 10	4xBC	8xBC or 100	>8xBC	5.2	4
Total cobalt	µg/l	BC	2xBC or 20	4xBC or 50	8xBC or 100	>8xBC	0.15	0.43
Total Iron	mg/l	BC	2xBC or 0.5	0.5	1	>1	0.04	0.61
Calcium	mg/l	BC	100	200	300	>300	26.6	18.5
Magnesium	mg/l	BC	50	100	200	>200	56.5	3.3
Barium	µg/l	BC	2xBC or 100	4xBC or 250	1000	>1000	25	23
Beryllium	µg/l	BC	2xBC	4xBC	100	>100	0.02	0.04
Potassium	mg/l	BC	2xBC	4xBC	8xBC	>8xBC	20.19	3.46
Sodium	mg/l	BC	2xBC	4xBC	8xBC	>8xBC	77.56	3.34
Lithium	µg/l	BC	BC	-	2500	>2500	36.7	1

Indicator of quality	Unit	Class of quality					Back concentration (BC)	
		I Excellent	II Good	III Moderate	IV Poor	V Bad	Hrazdan River	Kasakh River
Boron	µg/l	BC	450	700	1000	>2000	412	11
Aluminum	µg/l	BC	2xBC	4xBC	5000	>5000	12.4	266
Total selenium	µg/l	BC or 10	20	40	80	>80	2.5	0.5
Total antimony	µg/l	BC	2xBC	4xBC	8xBC	>8xBC	1.6	0.5
Total tin	µg/l	BC	2xBC	4xBC	8xBC	>8xBC	0.04	0.04
Chemical oxygen demand (COD Mn)	mg O_2/l	5 or BC	10	15	20	>20	3.78	3.314
Total inorganic nitrogen	mg N/l	1.5 or BC	4	8	16	>16	0.266	0.433
Total phosphorus	mg/l	0.1 or BC	0.2	0.4	1	>1	0,05	0.083
Chloride ion	mg/l	BC	2xBC	150	200	> 200	75.3	3.5
Sulfate ion	mg/l	BC	2xBC	150	250	> 250	32.78	15.3
Silicate ion	mg Si/l	BC	2xBC or 10	4xBC or 20	8xBC	>8xBC	2.22	11.34
Total mineralization	mg/l	BC	2xBC	1000	1500**	>1500	544	95.8
Electrical conductivity	µS/cm	BC	2xBC	1000	1500**	>1500	858	148.4
Rigidity	mg equal/l	2.8	10	20	40	<40	6.7	1.07
Suspended Solids (SS)	mg/l	BC	1.2xBC	2xBC (30)	4xBC	>4xBC	3.4	8.1
Odor (20°C & 60°C)	points	<2 (natural)	2 (natural)	2	4	>4	<2 (natural)	<2 (natural)
Color	degree	(natural)	>5 (natural)	20	30	>200	(natural)	(natural)

*BC: Background Concentration (BC for water parameters is fixed by river) MOA**for irrigation 1000

Remarks: In case of BOD, a water sample which shows 0-3 mg/l is categorized into “Class I Excellent”

Source:

“Protocol of government RA, 27.01.2011 27 N 75-N”; downloaded from HP of Environmental Impact Monitoring Center, MNP for general water quality parameters

Decision of the Republic of Armenia on definition of norms for ensuring water quality for each water basin control area depending on local characteristics (dated on 27.01.2011) for Kasakh River and Hrazdan River

There is no regulation which focuses only irrigation water quality specifically in Armenia, the surface water quality standard has been established, though. According to the official personnel of the MOA, the international standards prepared by the Food and Agriculture Organization (FAO) in case of necessity of evaluation of the influence of irrigation water to environment. There is no big difference between the surface water quality in Armenia and the FAO guidelines for irrigation for common water quality parameters, and the Armenian standard is stricter for some parameters. FAO water quality standard is as shown below:

Table 2-5 Guidelines for Interpretations of Water Quality of Irrigation (FAO)[2]

Potential Irrigation Problem				Units	Degree of Restriction on Use		
					None	Slight to Moderate	Severe
Salinity*(affects crop water availability)*[2]							
	EC_w			dS/m	< 0.7	0.7 – 3.0	> 3.0
	(or)						
	TDS			mg/l	< 450	450 – 2000	> 2000
Infiltration*(affects infiltration rate of water into the soil. Evaluate using EC_w and SAR together)*[3]							
SAR	= 0 – 3	and EC_w	=		> 0.7	0.7 – 0.2	< 0.2

[2] The table is attached as “Table-1 Guidelines for Interpretations of Water Quality of Irrigation” in “Water quality for agriculture” (FAO,1994)

Potential Irrigation Problem				Units	Degree of Restriction on Use		
					None	Slight to Moderate	Severe
	= 3 – 6		=		> 1.2	1.2 – 0.3	< 0.3
	= 6 – 12		=		> 1.9	1.9 – 0.5	< 0.5
	= 12 – 20		=		> 2.9	2.9 – 1.3	< 1.3
	= 20 – 40		=		> 5.0	5.0 – 2.9	< 2.9
Specific Ion Toxicity *(affects sensitive crops)*							
	Sodium (Na)[4]						
	surface irrigation			SAR	< 3	3 – 9	> 9
	sprinkler irrigation			me/l	< 3	> 3	
	Chloride (Cl)[4]						
	surface irrigation			me/l	< 4	4 – 10	> 10
	sprinkler irrigation			me/l	< 3	> 3	
	Boron (B) [5]			mg/l	< 0.7	0.7 – 3.0	> 3.0
	Trace Elements (see Table 21)						
Miscellaneous Effects *(affects susceptible crops)*							
	Nitrogen (NO_3 - N) [6]			mg/l	< 5	5 – 30	> 30
	Bicarbonate (HCO_3)						
	(overhead sprinkling only)			me/l	< 1.5	1.5 – 8.5	> 8.5
	pH				Normal Range 6.5 – 8.4		

1) Adapted from University of California Committee of Consultants 1974.

2) ECw means electrical conductivity, a measure of the water salinity, reported in deci-Siemens per metre at 25°C (dS/m) or in units millimhos per centimetre (mmho/cm). Both are equiva-lent. TDS means total dissolved solids, reported in milligrams per liter (mg/l).

3) SAR means sodium adsorption ratio. SAR is sometimes reported by the symbol RNa. See Figure1 for the SAR calculation procedure. At a given SAR, infiltration rate increases as water salinity increases. Evaluate the potential infiltration problem by SAR as modified by ECw.Adapted from Rhoades 1977, and Oster and Schroer 1979.

4) For surface irrigation, most tree crops and woody plants are sensitive to sodium and chlor-ide; use the values shown. Most annual crops are not sensitive; use the salinity tolerance tables (Tables 4 and 5). For chloride tolerance of selected fruit crops, see Table 14. With overhead sprinkler irrigation and low humidity (< 30 percent), sodium and chloride may be absorbed through the leaves of sensitive crops. For crop sensitivity to absorption, see Tables 18, 19 and 20.

5) For boron tolerances, see Tables 16 and 17.

6) NO_3 -N means nitrate nitrogen reported in terms of elemental nitrogen (NH_4 -N and Organic-N should be included when wastewater is being tested).

Source: Guidelines for Interpretations of Water Quality for Irrigation (Water Quality for Agriculture, FAO, 1994)

Concerning regulation of organic pollutants such as pesticide and insecticide in Armenia, any standards are not established yet. Therefore, staff of SNCO of Environmental Impact Monitoring Center under the MNP recommends applying the environmental quality standard for the Project mentioned in European Union (EU) journal. The standard of the pollutants is as shown below:

Table 2-6 Environmental Quality Standards for Priority Substances and Certain Other Pollutants

Part A: Environmental Quality Standards (Eqs)

AA:Annual Average; Mac: Maximum Allowable Concentration.

Unit: [µg/l]

No	Name of substance	CAS number (1)	AA-EQS (2) Inland surface waters (3)	AA-EQS (2) Other surface waters	MAC-EQS (4) Inland surface waters (3)	MAC-EQS (4) Other surface waters
(1)	Alachlor	15972-60-8	0.3	0.3	0.7	0.7
(2)	Anthracene	120-12-7	0.1	0.1	0.4	0.4
(3)	Atrazine	1912-24-9	0.6	0.6	2.0	2.0
(4)	Benzene	71-43-2	10	8	50	50

No	Name of substance	CAS number (1)	AA-EQS (2) Inland surface waters (3)	AA-EQS (2) Other surface waters	MAC-EQS (4) Inland surface waters (3)	MAC-EQS (4) Other surface waters
(5)	Brominated diphenylether (5)	32534-81-9	0.0005	0.0002	NA	NA
(6)	Cadmium and its compounds (depending on water hardness classes) (6)	7440-43-9	≤ 0.08 (Class 1) 0.08 (Class 2) 0.09 (Class 3) 0.15 (Class 4) 0.25 (Class 5)	0.2	≤ 0.45 (Class 1) 0.45 (Class 2) 0.6 (Class 3) 0.9 (Class 4) 1.5 (Class 5)	≤ 0.45 (Class 1) 0.45 (Class 2) 0.6 (Class 3) 0.9 (Class 4) 1.5 (Class 5)
(6a)	Carbon-tetrachloride (7)	56-23-5	12	12	NA	NA
(7)	C10-13 Chloroalkanes	85535-84-8	0.4	0.4	1.4	1.4
(8)	Chlorfenvinphos	470-90-6	0.1	0.1	0.3	0.3
(9)	Chlorpyrifos (Chlorpyrifos-ethyl)	2921-88-2	0.03	0.03	0.1	0.1
(9a)	Cyclodiene pesticides: Aldrin (7) Dieldrin (7) Endrin (7) Isodrin (7)	 309-00-2 60-57-1 72-20-8 465-73-6	Σ = 0.01	Σ = 0.005	NA	NA
(9b)	DDT total (7) (8)	NA	0.025	0.025	NA	NA
	para-para-DDT (7)	50-29-3	0.01	0.01	NA	NA
(10)	1.2-Dichloroethane	107-06-2	10	10	NA	NA
(11)	Dichloromethane	75-09-2	20	20	NA	NA
(12)	Di(2-ethylhexyl)-phthalate (DEHP)	117-81-7	1.3	1.3	NA	NA
(13)	Diuron	330-54-1	0.2	0.2	1.8	1.8
(14)	Endosulfan	115-29-7	0.005	0.0005	0.01	0.004
(15)	Fluoranthene	206-44-0	0.1	0.1	1	1
(16)	Hexachloro-benzene	118-74-1	0.01 (9)	0.01 (9)	0.05	0.05
(17)	Hexachloro-butadiene	87-68-3	0.1 (9)	0.1 (9)	0.6	0.6
(18)	Hexachloro-cyclohexane	608-73-1	0.02	0.002	0.04	0.02
(19)	Isoproturon	34123-59-6	0.3	0.3	1.0	1.0
(20)	Lead and its compounds	7439-92-1	7.2	7.2	NA	NA
(21)	Mercury and its compounds	7439-97-6	0.05 (9)	0.05 (9)	0.07	0.07
(22)	Naphthalene	91-20-3	2.4	1.2	NA	NA
(23)	Nickel and its compounds	7440-02-0	20	20	NA	NA
(24)	Nonylphenol (4-Nonylphenol)	104-40-5	0.3	0.3	2.0	2.0
(25)	Octylphenol (4-(1,1′,3,3′-tetramethylbutyl)phenol))	140-66-9	0.1	0.01	NA	NA
(26)	Pentachloro-benzene	608-93-5	0.007	0.0007	NA	NA
(27)	Pentachloro-phenol	87-86-5	0.4	0.4	1	1
(28)	Polyaromatic hydrocarbons (PAH) (10)	NA	NA	NA	NA	NA

No	Name of substance	CAS number (1)	AA-EQS (2) Inland surface waters (3)	AA-EQS (2) Other surface waters	MAC-EQS (4) Inland surface waters (3)	MAC-EQS (4) Other surface waters
	Benzo(a)pyrene	50-32-8	0.05	0.05	0.1	0.1
	Benzo(b)fluor-anthene	205-99-2	Σ = 0.03	Σ = 0.03	NA	NA
	Benzo(k)fluor-anthene	207-08-9				
	Benzo(g,h,i)-perylene	191-24-2	Σ = 0.002	Σ = 0.002	NA	NA
	Indeno(1,2,3-cd)-pyrene	193-39-5				
(29)	Simazine	122-34-9	1	1	4	4
(29a)	Tetrachloro-ethylene (7)	127-18-4	10	10	NA	NA
(29b)	Trichloro-ethylene (7)	79-01-6	10	10	NA	NA
(30)	Tributyltin compounds (Tributhyltin-cation)	36643-28-4	0.0002	0.0002	0.0015	0.0015
(31)	Trichloro-benzenes	12002-48-1	0.4	0.4	NA	NA
(32)	Trichloro-methane	67-66-3	2.5	2.5	NA	NA
(33)	Trifluralin	1582-09-8	0.03	0.03	NA	NA

NA: Not applicable

(1) CAS: Chemical Abstracts Service.

(2) This parameter is the EQS expressed as an annual average value (AA-EQS). Unless otherwise specified, it applies to the total concentration of all isomers.

(3) Inland surface waters encompass rivers and lakes and related artificial or heavily modified water bodies.

(4) This parameter is the EQS expressed as a maximum allowable concentration (MAC-EQS). Where the MAC-EQS are marked as 'not applicable', the AA-EQS values are considered protective against short-term pollution peaks in continuous discharges since they are significantly lower than the values derived on the basis of acute toxicity.

(5) For the group of priority substances covered by brominated diphenylethers (No 5) listed in Decision No 2455/2001/EC, an EQS is established only for congener numbers 28, 47, 99, 100, 153 and 154.

(6) For cadmium and its compounds (No 6) the EQS values vary depending on the hardness of the water as specified in five class categories (Class 1: < 40 mg $CaCO_3$/l, Class 2: 40 to < 50 mg $CaCO_3$/l, Class 3: 50 to < 100 mg $CaCO_3$/l, Class 4: 100 to < 200 mg $CaCO_3$/l and Class 5: ≥ 200 mg $CaCO_3$/l).

(7) This substance is not a priority substance but one of the other pollutants for which the EQS are identical to those laid down in the legislation that applied prior to 13 January 2009.

(8) DDT total comprises the sum of the isomers 1,1,1-trichloro-2,2 bis (p-chlorophenyl) ethane (CAS number 50-29-3; EU number 200-024-3); 1,1,1-trichloro-2 (o-chlorophenyl)-2-(p-chlorophenyl) ethane (CAS number 789-02-6; EU number 212-332-5); 1,1-dichloro-2,2 bis (p-chlorophenyl) ethylene (CAS number 72-55-9; EU number 200-784-6); and 1,1-dichloro-2,2 bis (p-chlorophenyl) ethane (CAS number 72-54-8; EU number 200-783-0).

(9) If Member States do not apply EQS for biota they shall introduce stricter EQS for water in order to achieve the same level of protection as the EQS for biota set out in Article 3(2) of this Directive. They shall notify the Commission and other Member States, through the Committee referred to in Article 21 of Directive 2000/60/EC, of the reasons and basis for using this approach, the alternative EQS for water established, including the data and the methodology by which the alternative EQS were derived, and the categories of surface water to which they would apply.

(10) For the group of priority substances of polyromantic hydrocarbons (PAH) (No 28), each individual EQS is applicable, i.e. the EQS for Benzo(a)pyrene, the EQS for the sum of Benzo(b) fluoranthene and Benzo(k) fluoranthene and the EQS for the sum of Benzo(g,h,i) perylene and Indeno (1,2,3-cd)pyrene must be met.

Source: Official Journal of the European Union (24.12.2008)

(4) Noise

Noise standard has been established in Armenia, and the threshold values are fixed depending on the surrounding conditions and time (daytime or night time). The norm for noise pollution control is described in Table 2-7.

Table 2-7 Noise Standard in Armenia

Facilities and buildings	Day time / night time	Noise equivalent level, dB	Noise maximum level, dB
Territories adjacent to residential buildings, clinics, ambulatories, rest houses, care homes, disabled persons homes, libraries, kinder gardens, schools and other educational facilities	6:00 – 22:00 22:00 – 6:00	55 45	70 60
Rooms of apartments, sleeping rooms of rest houses, care homes, disabled persons homes, kinder gardens, boarding schools	6:00 – 22:00 22:00 – 6:00	40 30	55 45
Noise in workplaces for construction works		80	

Source: Ministerial of Health Care of RA, Order No.138 on The Sanitary Norms N2-III-11.3 "Noise in the Work Places, Residential, Public Buildings and Residential Construction Sites"(2002)

(5) Waste

"Law on Waste" has been established in 2004 in Armenia, waste are classified into six categories, namely, 1) household waste, 2) non-household waste, 3) industrial waste, 4) constructional waste, 5) big-scale waste, and 6) hazardous waste. Costs of waste disposal are maximum 3,000 AMD and 10,000 AMD, for 1 m^3 and 1 ton, respectively. Authorized body for waste management is the MNP. Any construction companies which generate waste must make a "waste passport", and submit to the MNP, and the permission of waste disposal is given by the MNP. The place for disposal is also specified by the MNP.

2.5 Relevant International Conventions

Armenia is a signatory to a number of international agreements related to the protection and management of the natural environment and communities. The list of conventions and ensuing responsibilities summarized related to environmental and social conventions and protocols signed by Armenia and which are directly relevant to the proposed Project is described as follows:

- Convention on Wetlands of International Importance - (Ramsar 1971)
- Paris Convention for the Protection of the World Cultural and Natural Heritage (1972)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (1975)
- Basel Convention on the control of transboundary movements of hazardous wastes and their disposal (1989)
- The Convention on the Conservation of Migratory Species of Wild Animals (1979) (Bonn Convention)
- The Convention on Biological Diversity (1992)
- United Nation Framework Convention on Climate Change (1992)
- The Kyoto Protocol (1997)
- Convention on Environmental Impact Assessment in a Transboundary Context (1991)
- Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (1998)

CHAPTER 3 PROJECT DESCRIPTION (COMPONENTS)

3.1 Proposed Facility Design

Table 3-1 shows the structure and scale of proposed reservoir and canals. In addition, Figure 3-1 shows the location of the proposed structures. Concerning the open-canal, 5m width at both right and left sides will be secured for the canal management[3]. Since steel pipe will be installed for all of the pipelines, and regulation valve for inner pressure of the pipe is not be necessary. However, it is planned to set a regulation valve to regulate discharge to the Kasakh River and the energy absorber.

Table 3-1 Outline of the Main Structures

Structure	Scale	Location
Reservoir	Capacity: 94,000,000 m^3 (94MCM) Width of dam crest : 8m Full water surface area: 808ha Reservoir area:796ha	Yeghvard Reservoir
Feeder Canal 1 (Pipeline)	Length: 4.4km Steel pipe, φ1,600mm	This canal diverts water from Arzni-Shamiram canal to Yeghvard Reservoir.
Feeder Canal 2 (Open canal)	Length: 0.23km Concrete, Width : 4m	This canal diverts water from Arzni-Shamiram canal to Yeghvard Reservoir.
Outlet Canal 1 (Pipeline)	Length: 0.73km Steel pipe, φ1,200mm	This canal diverts reserved water to Arzni-Branch canal.
Outlet Canal 2 (Pipeline)	Length: 4.7km Steel pipe, Φ1,700mm	This canal diverts reserved water from Dike 1 to existing Ashtarak pipeline and Kasakh River

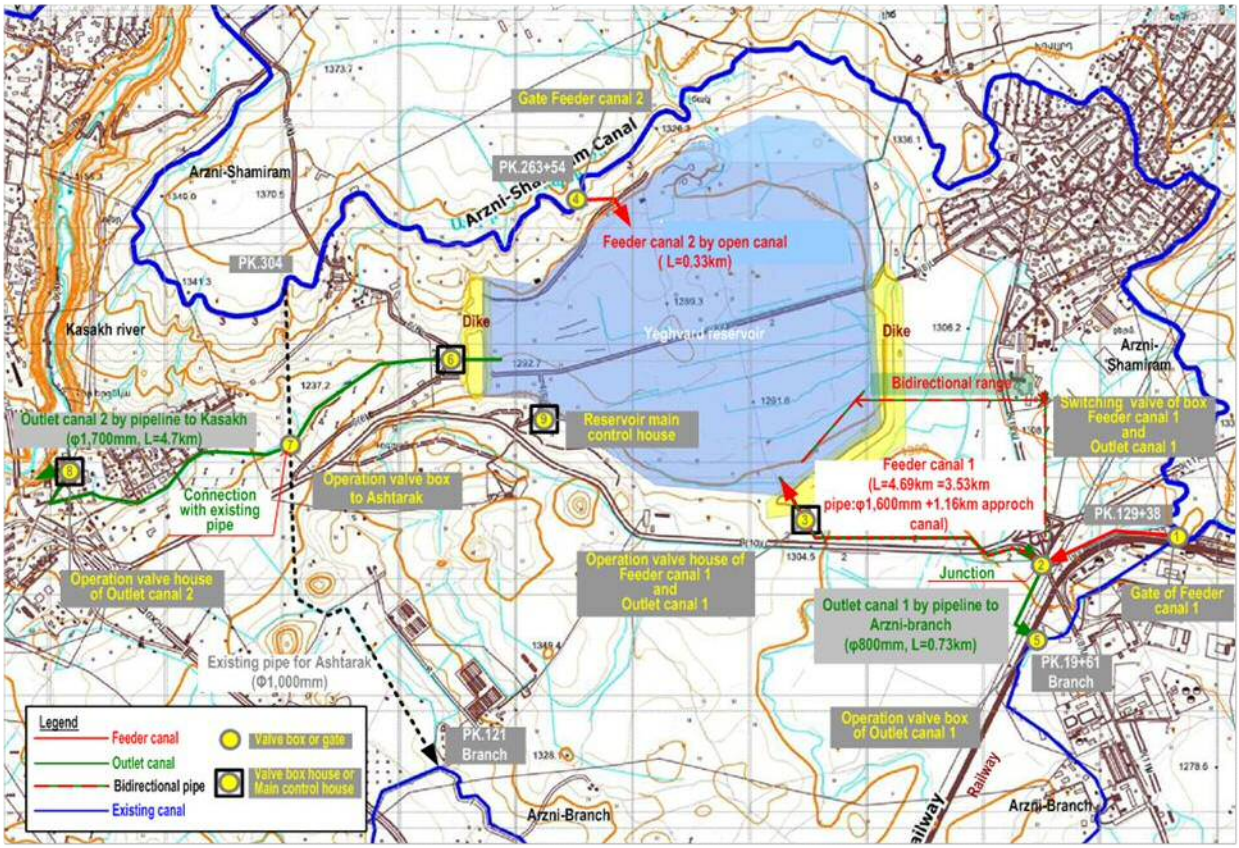


Figure 3-1 Main Components of the Yeghvard Irrigation System

The planned outline of the Yeghvard reservoir is presented below in Table 3-2.

[3] Space for canal management is called as "Protection Zone" and it should be secured in case of canal construction.

Table 3-2 Outline of the Yeghvard Reservoir

No.	Item	Size / Level
1	Total area	around 800ha
2	Total capacity of the reservoir	100.0MCM
3	Available capacity of the reservoir	94.0MCM
4	Full water level	EL. 1,305m
5	Dead water level	EL. 1,290m
6	Full water surface area	808ha

Dikes/dams construction works were started in 1984 and suspended in 1994. The outline of the dikes to be re-constructed in the Yeghvard reservoir is presented in Table 3-3. The proposed dam type is zoned fill dam with inclined impervious core. Figure 3-2 illustrates plan and typical cross section of the Reservoir basin.

Table 3-3 Outline of the Dikes

Item	Dike 1	Dike 2
Dam crest level	1,307.55m	1,307.55m
Maximum dam height	25.55m	14.05m
Dam crest length	1,140m	2,611m
Dam crest width	8.0m	8.0m
Upstream slope inclination	1:3.5	1:3.5
Downstream slope inclination	1:2.5	1:2.5
Total embankment volume*	0.92MCM	0.39MCM

* The embankment volume exclude that of existing dikes, namely it is the volume for only newly construction.

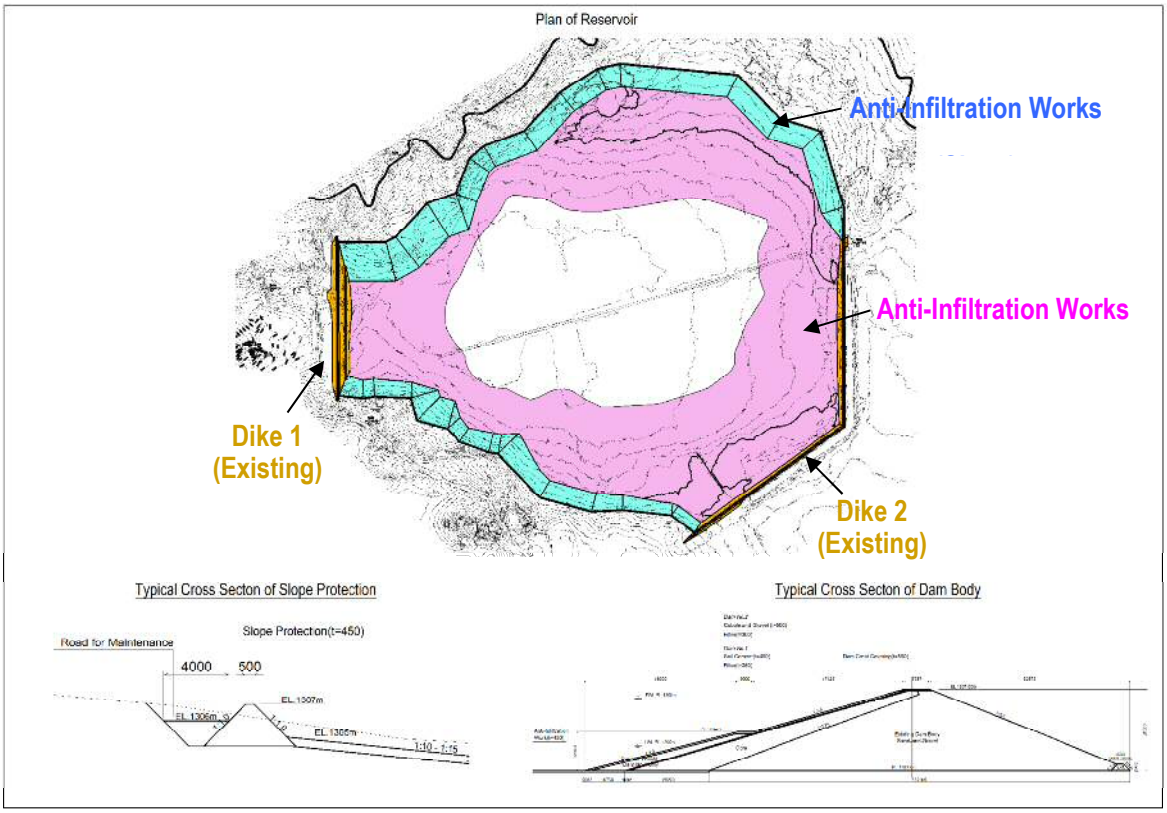


Figure 3-2 Plan and Typical Cross Section of the Reservoir

Figure 3-3 and Figure 3-4 show Typical Design of the Feeder Canals and Typical Design of Outlet Canals, respectively.

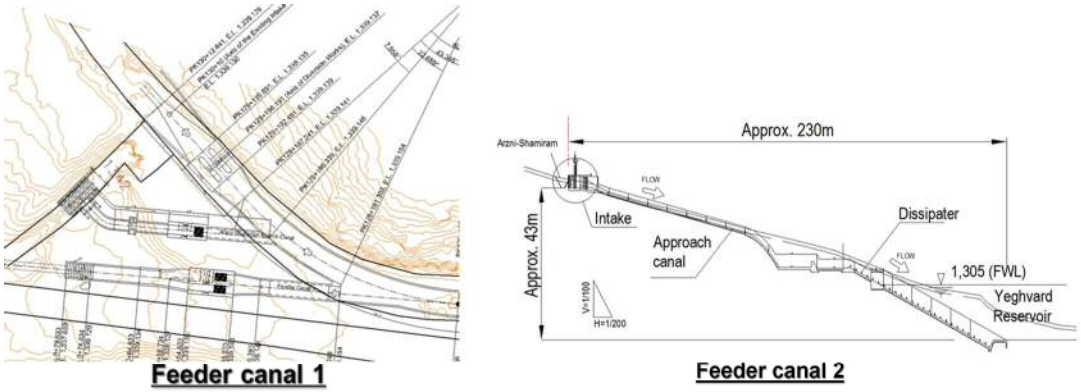


Figure 3-3 Typical Design of the Feeder Canals

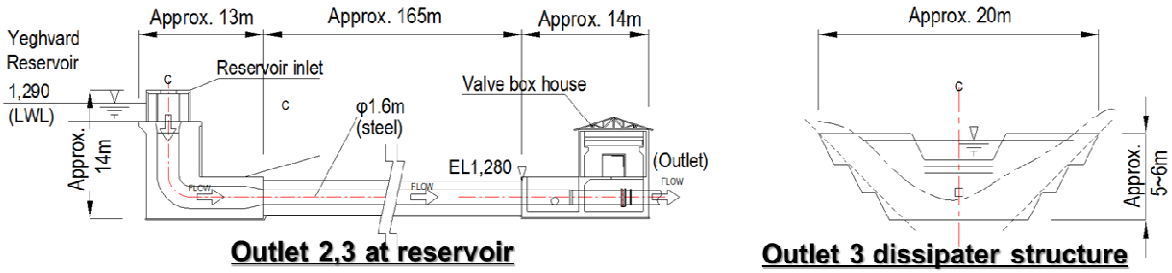


Figure 3-4 Typical Design of the Outlet Canals

In addition to the main structures above, rehabilitation and upgrading of the existing canal system, namely, Arzni-Shamiram Canal, Lower Hrazdan Canal, Arzni-Branch Canal, Shakhi-Au Canal, Inner Aknalich Canal, Upper Aknalich Canal will be implemented. Moreover, due to the Project, existing pump station and deep wells would be abolished, since pump-up irrigation system will be shifted to gravity irrigation system. The location of the proposed rehabilitation facilities is as shown below:

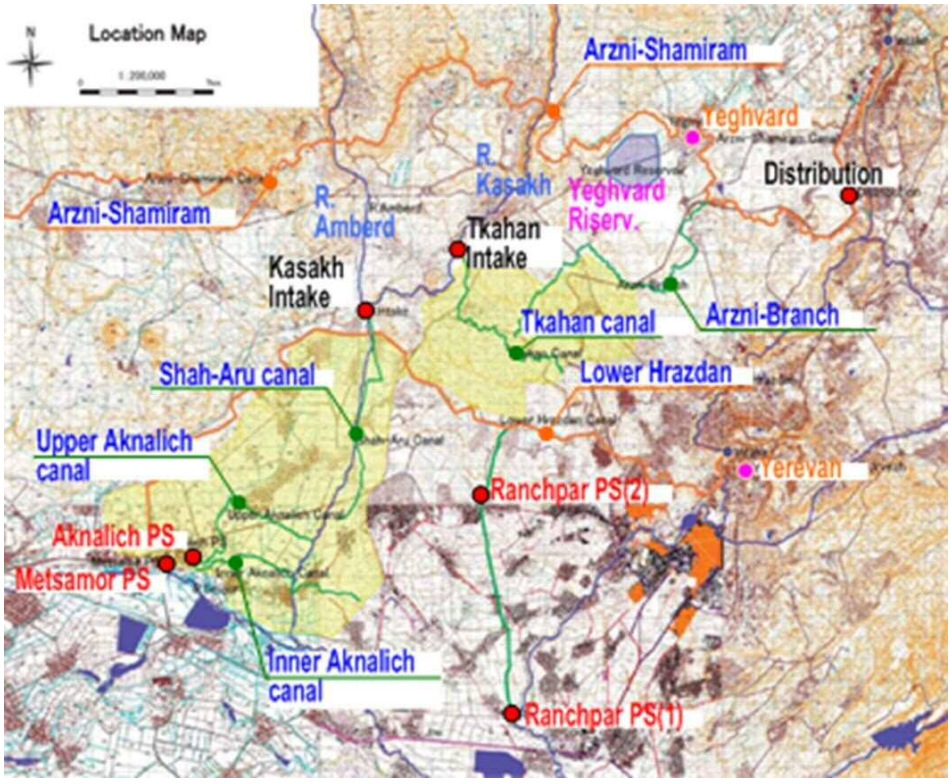


Figure 3-5 Facilities to be Rehabilitated

Contents and scales of rehabilitation by the irrigation facility are described in the following table, while Figure 3-6 illustrates the typical design of rehabilitation section.

Table 3-4 Rehabilitation Plan of the Irrigation Canal System

Facility and structure	Rehabilitation outline
Arzni Shamiram	・ L=5.5km (PK20 to PK45, PK70 to PK90 and PK95 to PK105) ・ Remove concrete panel and lining concrete
Lower Hrazdan part2, BP. to PK219	・ L=17.8km (PK10 to PK188) ・ Add the concrete for raising to the sidewall ・ L=approx. 5km, Φ400mm pipeline (PK16) is installed toward Upper Aknalich ・ L=approx. 6km, Φ1000mm pipeline (PK188)is installed toward inner Aknalich
Aknalich PS.	・ Abolished (4 pumps at house, 3 pumps at outside)
Metsamor PS.	・ Abolished (4 pumps at house)
Ranchaper PS. 1	・ Abolished (4 pumps at house)
Ranchaper PS. 2	・ Abolished (4 pumps at house)
Arzni-Branch	・ L=2.3km (BP to PK23) ・ Remove the current canal and construct the lining concrete and/or install the pre-casting concrete canal ・ Replacement of gates
Arzni-Branch, PK120 to EP (PK165+19).	・ L=3.7km (PK120 to PK152 and PK161 to PK165+19 ・ Remove the current canal and construct the lining concrete and/or install the pre-casting concrete canal ・ Replacement of gates and aqueduct bridge
Tkhan canal, BP. to PK130	・ L=5.9km (PK71 and PK130) ・ Remove the current canal and construct the lining concrete and/or install the pre-casting concrete canal ・ Replacement of gates and aqueduct bridge
Shakhi-Aru canal, BP. to PK118	・ L=8.0km (BP. to PK31, PK69 to PK118) ・ Remove the current canal and construct the lining concrete and/or install the pre-casting concrete canal ・ Replacement of gates
Inner Aknalich canal	・ Construction of intake at Kasakh River ・ Replacement of gates
Upper Aknalich cana BP to PK104	・ L=10.4km (BP to PK104) ・ Replace the current canal to the concrete halfpipe canal ・ Replacement of gates and aqueduct bridge
Metsamor canal	・ No rehabilitation works

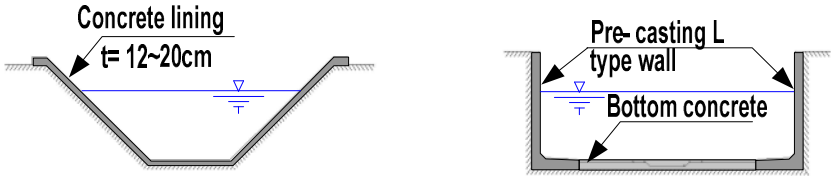


Figure 3-6 Typical Design of the Rehabilitation Section

3.2 Location of Construction Sites and Beneficiary Area

The Yeghvard irrigation project is located on central of the Ararat Plain extends over the western part of the Hrazdan River. As illustrated Figure 3-7, the beneficial area is located administratively at Kotayk Marz, Aragatsotn Marz and Armavir Marz. The Yeghvard Reservoir is to north-west of the beneficial area and it is located on northern part of Kotayk Marz.

The elevation of the planned site for the Yeghvard reservoir is about 1,300m, while the beneficiary area develops over the elevation range of 800m-1,300m. The Kasakh River originates at Mount Aragats and flows in the center of the project site. The Arzni-Shamiram canal flowing at the northern part of the beneficial area is an open canal and the canal water is taken from the Hrazdan River. Lower Hrazdan Canal is an open canal, which is diverted from the Hrazdan River. The Hrazdan flows into the Araks River, which runs along the international boundary with Azerbaijan and Iran, it finally reached to the Caspian Sea after merge with the Kura River.

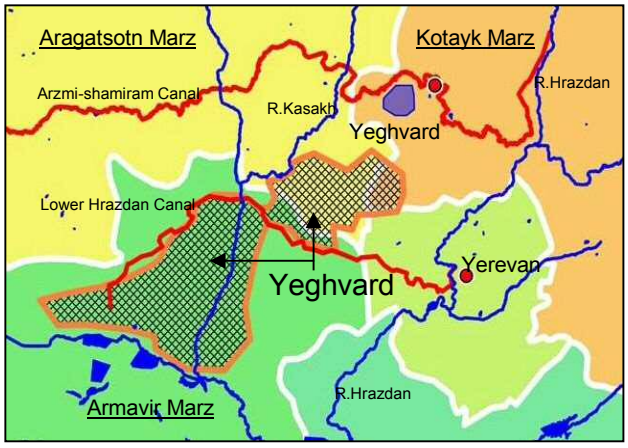


Figure 3-7 Location Map of Yeghvard Project and Related Marz

3.2.1 Current Conditions in and around the Construction Sites

1) Reservoir Basin

The lands within the Reservoir basin are state land, communal lands and private land, and most of the land belong to Yeghvard Community (City) and Nor-Yerznka Community. Northern parts of the lands are farmlands, since they are close to the Arzni-Shamiram canal, on the other hand, western and southern parts of the Reservoir are used as farmlands and rangelands. In some parts, the land is not suitable, since top soil had been already taken, and no crop is cultivated. As of April 2016, 53 plots as farmlands have been identified within the Reservoir basin. Photos showing the situations in the Reservoir basin are as illustrated in Figure 3-8 and 3-9.

Figure 3-8 Overview of the Yeghvard Reservoir

Figure 3-9 Wheat Field in the Yeghvard Reservoir

2) Feeder Canal-1 and Outlet Canal-1

Both Feeder Canal-1 and Outlet Canal-1 will be a pipeline and they will be located on south-east of the Reservoir. The Feeder Canal-1 is planned to divert water of the Arzni-Shamiram canal to the Reservoir. The proposed route of the canal is along the road, which is surrounded by farmlands as shown Figure 3-10. Outlet Canal-1 will be constructed along the railway as shown in Figure 3-11, and the canal is planned to divert water of the Reservoir to the Arzni-Branch Canal. At the junction point of Outlet Canal-1 and Feeder Canal-1, water flow direction will be switched by bulb operation depending on the season. During water storage period at the Reservoir, namely, from March to May, water flow direction is from the Feeder Canal-1 to the Reservoir, while during irrigation season water flow is from the Reservoir to the Feeder Canal-1.

Figure 3-10 Proposed Route of the Feeder Canal-1

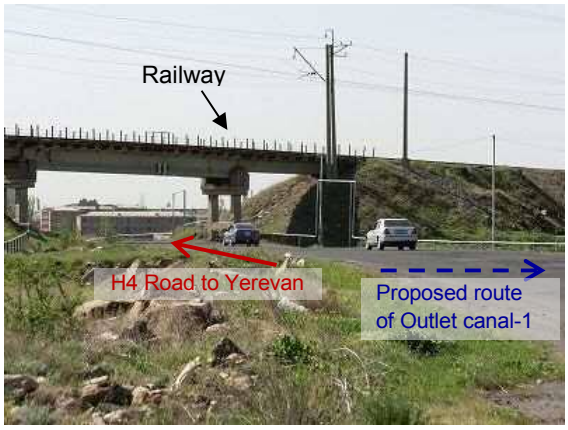


Figure 3-11 Proposed Route of the Outlet Canal-1

3) Feeder Canal-2

Feeder Canal-2 will be an open canal to divert water from the Arzni-Shamiram Canal to the Reservoir. The proposed construction site is grassland (see Figure 3-12), which is located on the northern part of the Reservoir.

Figure 3-12 Proposed Route of the Feeder Canal-2

4) Outlet Canal-2

Outlet Canal-2 will be pipeline along the past waterway (see Figure 3-13). Proposed Outlet Canal-2 will divert water from the Reservoir to the existing pipeline for Ashtarak and from the Reservoir to the Kasakh River. The proposed route is along the natural stream, where water is observed during only early spring and irrigation season.

Figure 3-13 Proposed Route of the Outlet Canal-2

3.2.2 Beneficial Area

The project area extends across 27 communities in 3 Marzes, and the area is managed by four (4) WUA, namely, Yeghvard WUA, Ashtarak WUA, Vagharshapat WUA and Khoy WUAs. It is planned to provide irrigation water for the 12,347 ha, while current irrigation area is 8,391ha in the beneficial area. Location of the 27 target communities and 4 WUAs which covers the communities are illustrated in Figure 3-14 and Figure 3-15, respectively.

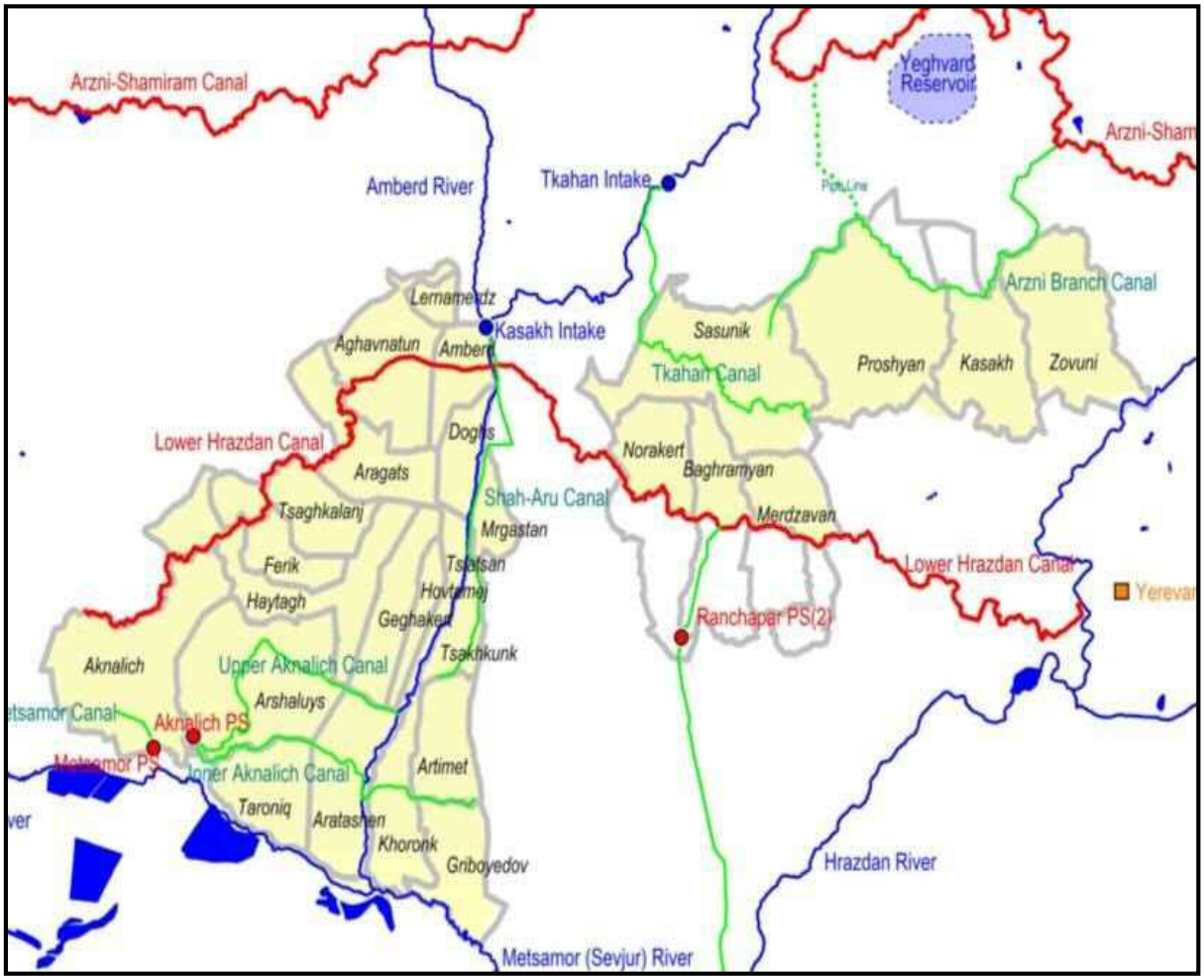


Figure 3-14 Location of the Beneficial Areas

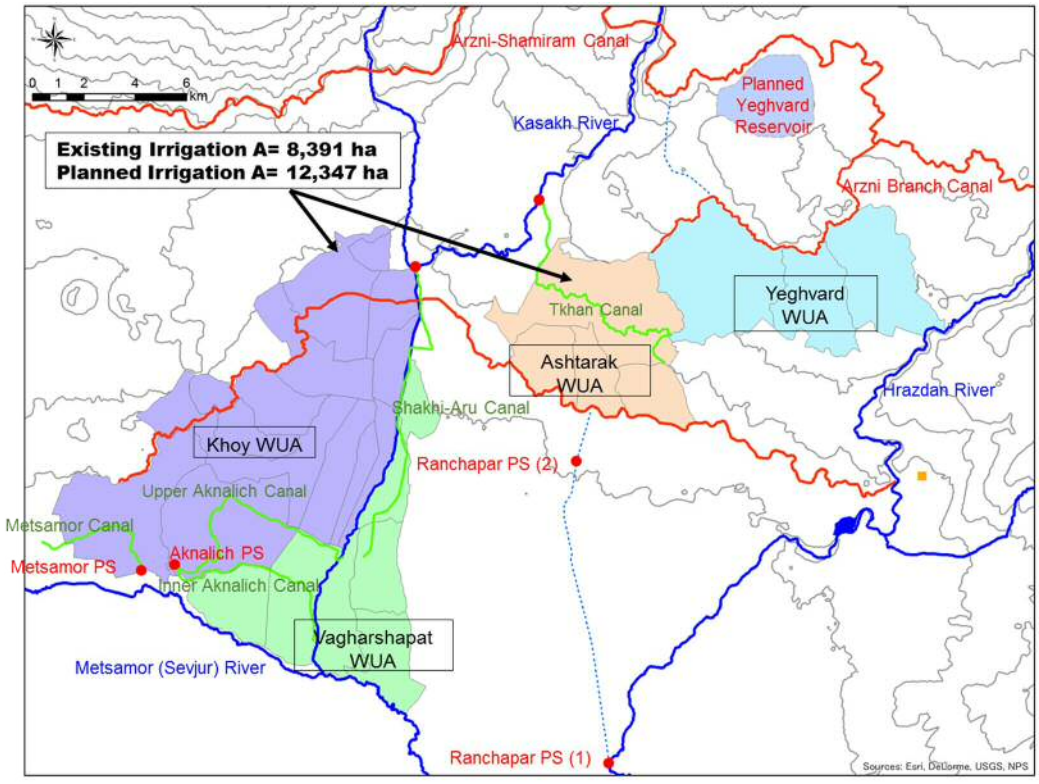


Figure 3-15 Location of WUA Management Area in the Beneficial Area

CHAPTER 4 ALTERNATIVES

4.1 Water Resource

In the Project, the construction of canals and a reservoir is proposed. These facilities together will be able to provide sufficient and stable irrigate water for the target area. Therefore, canals and a reservoir would be considered as one package. When alternatives of the Project are examined, the package of canals and reservoir would be compared with others.

The aim of the Project is irrigation system improvement of the target area, and two options of water resources to fulfil the purpose can be considered. The first option is use of groundwater for irrigation and second one is use of surface water including meltwater. In addition, the case that the Project is not implemented, called as "Zero-option", is also examined.

(1) Zero-option

The Government of Armenia has been controlling the amount of water taken from the Lake Sevan since 1980's and water diversion project for Lake Sevan conservation, such as the construction of the tunnel for taking water from Arpa River and Vorotan River has been implemented. As a result, the water quantity has been recovered up to 38,000 MCM, however, the government restricts the amount of water discharge from the lake to 170 MCM/year except for drought years. If the Project is not implemented, the target area will depend on the Lake Sevan as main irrigation water resource, as ever. It would cause to decrease the water level of Lake Sevan. On the other hand, when the water level of the Lake Sevan is conserved by means of reduction of discharge of irrigation water from the Lake Sevan, the agricultural production in the Project target area can be reduced, since water demand for irrigation cannot be satisfied.

Yeghvard reservoir was planned with the scale of 228 MCM, in the Soviet Union period, and the embankment had been constructed in the early 1980's. Because of financial issues, the construction was stopped in 1985. However, a part of the embankment was constructed. Therefore, if it will not be used, the investment in Soviet Union period would be useless. Furthermore, barley, wheat and alfalfa have been cultivated in the area of the reservoir; however, the farmers understand that the construction of the reservoir will be resumed. That's why they cannot invest enough such as construction of the irrigation systems and so on.

If Zero-option is adopted, it would not be possible to take effective countermeasure for conservation of Lake Sevan and the investment for the construction of Yeghvard Reservoir in the Soviet Union period would not be used. In addition, the farmers, who have cultivated in the Reservoir site, would be forced to keep on cultivating unproductively. Therefore, the Zero-option cannot be recommended.

(2) Use of Groundwater

Under Ararat Plain, high-quality ground water is generated. The groundwater has been used for cultivation, and drinking water. In recent years, however, aquaculture by using ground water has been widely operated in the Ararat Plain. Therefore, the groundwater level of Ararat Plain has been decreased significantly. Comparing the depth of confined groundwater level between 1983 and 2013, it has been reduced by 6 to 9 m (World Bank, 2014). The reduction of groundwater has caused conflicts among the water users for irrigation, drinking water, industries, cooling water for nuclear power, and so on.

In the beneficiary area, there are some cases that Water User Association (WUA) is pumping up the groundwater and use it for irrigation. In such case, the Government has to shoulder operation cost for deep well pumps, which can become a big burden for the national budget. The possible irrigation areas by pumping up groundwater are limited, because the groundwater resources are limited. Considering

the situations mentioned above, stable water supply for the Project beneficiary area cannot be ensured by use of only groundwater.

(3) Use of Surface Water

As mentioned, the amount of flow of Armenian rivers varies depending on seasons. In early spring, after snow is melted, the flow of water is maximized and it is not used for irrigation, which is available as shown in Figure 4-1. Therefore, it is possible to take water from rivers, which have large watershed areas and large amount of flow, such as the Hrazdan River. It is proposed to divert the "free water" into the Yeghvard reservoir through the existing canals during the period that river flow is more than demand. Presently, from June to October, available water volume is lower than that of irrigation demand, and the beneficiary areas depend on the Lower Hrazdan canal that intakes water from the Lake Sevan. If the free water can be used, it would be possible to irrigate instead of dependent on other water resources including the Lake Sevan, which can contribute to conservation of the lake. Moreover, if sufficient irrigation water is provided, agricultural production of the area and the livelihood will be improved.

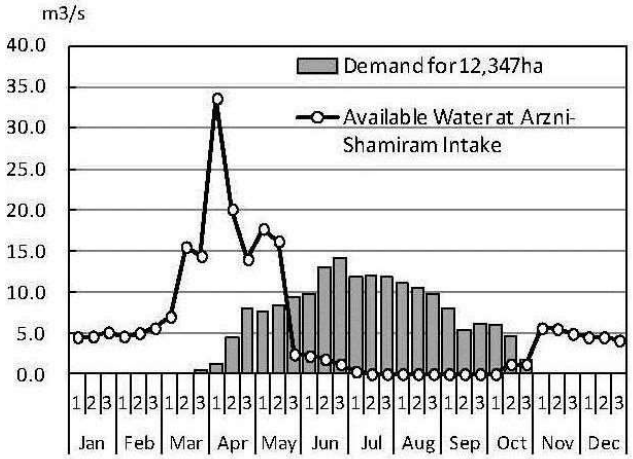


Figure 4-1 Comparison between Demand (12,347ha) and Available Water at Arzni-Shamiram Intake

The RA Government established the National Water Program in 2006 and promotes the conversion from the pumping up irrigation to gravity irrigation based on the policy, finally, aims at independence on groundwater by the effective use of surface. The RA Government has published the concept "the shift from energy high input agriculture" given that groundwater level has been reduced. If the gravity irrigation that uses surface water is operated, it would reduce dependence on ground water and contribute to conservation of groundwater in the Ararat Plain. In addition, by construction of the Reservoir, some pumps will not be used, which can reduce the numbers of pumps and working hours. Finally, it could reduce the maintenance cost. Taking into consideration the above mentioned, alternatives for water resource are examined and summarized in Table 4-1.

Table 4-1 Examination of Alternatives for Water Resource

Item	Zero-option	Use of groundwater	Use of surface water
Impacts during the construction (Ex. Air quality, Water contamination, Noise, and so on)	-	-	△ During the construction period, air and water pollution are expected.
Conservation of Lake Sevan	× Lake Sevan would be used as the water sources for irrigation	○ It would reduce the dependence to Lake Sevan, however, it is limited	◎ The amount of water use from the Lake Sevan would be reduced, and it would contribute to conservation of the Lake Sevan
Impacts to the groundwater of Ararat Plain	-	× Pumping-up might reduce the level of groundwater	◎ The impacts on groundwater are not expected, because the project will not use groundwater
Land acquisition	-	-	×

Item	Zero-option	Use of groundwater	Use of surface water
		No need	Land acquisition is expected
Impacts to the socio-economical activities Regional and development	-	× It would contribute to the irrigation development, but it also would give negative impacts on other industries	○ Stable irrigation agriculture would be possible
Possible irrigation area	8,391ha	8,391ha<area<12,347ha	12,347ha
Project cost	- However, the investment in the Soviet Period would not be used	△ Relatively not expensive	× Expensive
Maintenance and management cost	-	△ Middle	○ Low
Comprehensive evaluation	Not adopted	Not Adopted	Adopted

－：No impact, ×：Huge negative impact, △：Negative impact, ○：Positive impact, ◎：Huge positive impact

4.2 Reservoir Site

Considering topographical conditions, there are 10 points that can be candidate sites for construction the Reservoir on the right and left banks of Hrazdan River. However, water holding capacities of those sites are very small. Even the Meghradzor site (see Figure 4-2), which has the largest storage capacity (located Meghradzor Community of Kotayk Marz), about 30 MCM, and it is much smaller than 90 MCM of Yeghvard Reservoir. Thus, to ensure the same level of water storage capacity of the Yeghvard Reservoir, it is necessary to construct plural reservoirs. In such case, construction cost would be more expensive than that for construction of Yeghvard Reservoir and area for land acquisition would be larger, because they are new constructions (see Table 4-2). In and around the Meghradzor site, there is no protected area to be conserved, and it can be judged that there is no difference between Yeghvard Reservoir and Meghradzor site in terms of natural environment. The alternatives of reservoir site are examined based on scale of land acquisition and cost. Therefore, the site of Yeghvard Reservoir is considered as the most suitable.

Table 4-2 Examination of Alternatives for Reservoir Site

Item	Yeghvard Reservoir	Meghradzor Site and Other Sites
Land Acquisition	△ The land acquisition around canals is expected. However, the area of land acquisition would be limited, because the reservoir is one. And the lands of Yeghvard Reservoir are communal land. Furthermore, the farmers, who has cultivated in the present, understand the necessity to stop cultivation.	× In addition to the land acquisition and resettlement for canal construction, land acquisition of the reservoir construction is also required. Furthermore, the range and scale of land acquisition would be more serious.
Project cost	△ Expensive	× Very expensive
Comprehensive evaluation	Adopted	Not adopted

－：No impact, ×：Huge negative impact, △：Negative

Figure 4-2 Locations of the Yeghvard Reservoir and Meghradzor Site

4.3 Anti-infiltration Works in the Yeghvard Reservoir

The soil in the planned reservoir area has high permeability in terms of geological characteristics and it is necessary to apply anti-infiltration work. There are four (4) options for the anti-infiltration works, namely, 1) Bentonite sheet, 2) Bentonite-soil mixture, 3) Soil-cement, and 4) Soil-Cement with a sandwiched bentonite sheet. Those anti-infiltration works were examined in terms of reliability and cost. As a result, it is judged that the last one, namely, "Soil-Cement with a sandwiched bentonite sheet" is recommended as the best option. It is noted that there is no difference in terms of impacts on environmental and social aspects among the alternatives. The examination result is as shown below:

Table 4-3 Examination of Anti-infiltration Works for the Yeghvard Reservoir

Parameters/Work	1.Bentonite sheet	2. Bentonite-soil mixture	3. Soil-Cement	4. Soil-Cement with a sandwiched bentonite sheet
1) Reliability	Even though due attention is paid during construction works, it is very difficult to prevent human error completely	If the applied material is not completely enclosed, it could be melted and flushed away.	Curing[4]is necessary.	Two kinds of materials are mixed to supplement each other, and execution management can be easy compared with the case of one kind of material.
2) Cost	Reservoir bottom: $12.6/m^2 North slope: $22.4/m^2 South slope: $24.1/m^2	Reservoir bottom: $18.3/m^2 North slope: $28.1/m^2 South slope: $30.4/m^2	Reservoir bottom: $15.3/m^2 North slope: $15.3/m^2 South slope: $15.3/m^2	Reservoir bottom: $14.5/m^2 North slope: $14.5/m^2 South slope: $14.5/m^2
Conclusion	-	-	-	Recommended as the anti-infiltration work

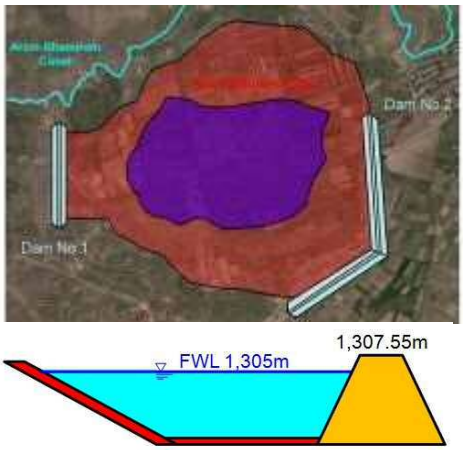
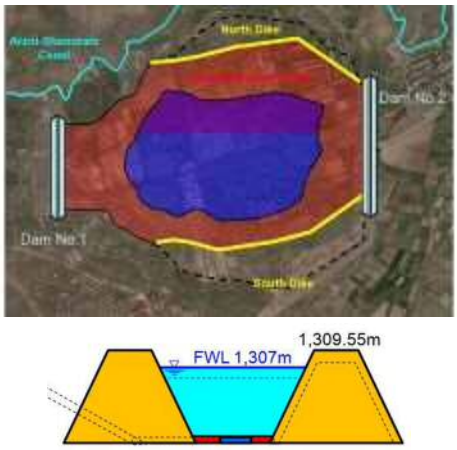
4.4 Dike Construction

There are two (2) options for dike construction, namely, Plan A: Utilization of existing dikes, and Plan B: Construction of new dikes. Those options are examined as illustrated in following table. In case of

[4] "Curing" is to keep moisture of the applied soil cement for increase of strength and impervious capacity

Plan A, cost is relatively low compared with that of Plan B. In addition, it is possible to use the existing dikes in the Reservoir. Concerning social aspect, in case of Plan B, the planned submerged area is small, since southern and northern parts of the Reservoir basin will not be submerged, however, these parts are not used for agricultural purpose at present. It means that there is no big difference between the Plan A and Plan B in terms of social aspect. Therefore, Plan A is proposed for the Yeghvard Reservoir.

Table 4-4 Examination of Dike Construction for the Yeghvard Reservoir

Plan	Plan A: Utilizing of existing dikes	Plan B: Construction of New Dikes
Outline		
Capacity	94 MCM	Same as on the left
LWL	1,290 m	Same as on the left
FWL	1,305 m	1,307 m
Dam Height	25.55 m	27.55 m
Reservoir Area	7.96 km^2	5.42 km^2
Anti-infiltration Area	5.44 km^2	3.10 km^2
Construction Cost	88.8 million USD	90.9 million USD
Social aspect	Existing farmlands (80ha), which are located on the center of the reservoir, will be submerged.	Existing farmlands (80ha), which are located on the center of the reservoir, will be submerged. Even though the area to be submerged is smaller than that of Plan A, productive places for farming are located on the central parts of the Reservoir, therefore, there is no big difference between the plans in terms of social aspect.
Selection	Adopted	Not adopted

4.5 Examination of Route of Outlet Canal-2

At the examination of route of the Outlet Canal 2, there are two options, which is planned to divert stored water at the Reservoir to the Kasakh River as shown Figure 4-3. First one, namely, Outlet Canal 2 (1) is planned to pass through the natural stream, while second one, Outlet Canal 2 (2) is proposed to go through the orchard and residential area. Concerning the first option, the area along the

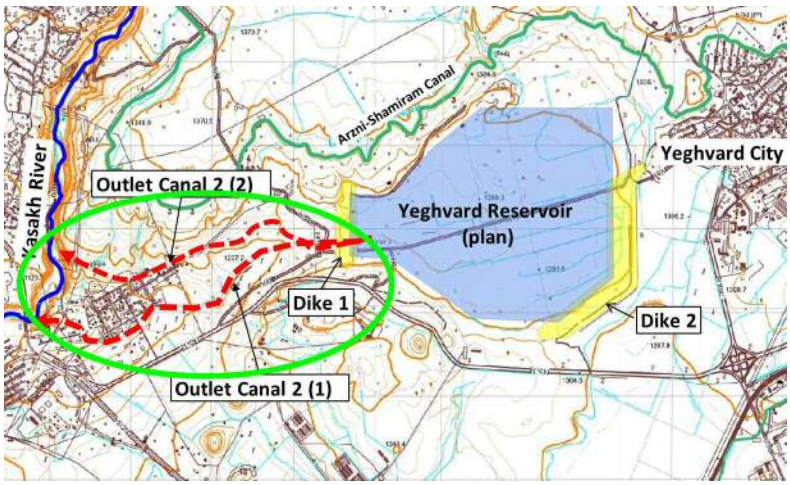


Figure 4-3 Examination of Options for Outlet Canal 2

natural flow belongs to the Nor-Yerznka village, which enables to minimize the acquisition of private lands and no relocation is needed. In case of second one, relocation of several houses is necessary and orchard area along the canal 2 (2) will be damaged. Therefore, the route of Outlet Canal 2 (1) is selected finally as named Outlet Canal 2 as shown in Figure 3-1 above.

4.6 Examination of Pipeline System and Open-canal System

Regarding canal construction, there are two options, namely, open-canal system and pipeline system. Considering topographic conditions, cost, social impact, suitable system is proposed for each canal. Asa result, pipeline system is proposed for all the canals except the Feeder Canal 1. Following table describes examination results:

Table 4-5 Examination of Open-canal System and Pipeline System for the Proposed Canals

(1) Feeder Canal 1

Parameter	Open-canal	Pipeline
Possibility of water storage at the Reservoir	If open-canal system is applied, it is needed to secure at least 15m head between the starting point of the Feeder Canal-1 and the full water level at the Reservoir. However, sufficient water head cannot be secured considering that the proposed canal should pass over the Dike No.2. If an open canal is installed, pump system should be installed to fill the Reservoir to the full water level.	Pipeline installation is not restricted by topographical conditions considering topographic conditions. It is possible to store planned water without pump system installation.
Social impact	3m width for the open canal and additional 4m width for maintenance road (7m width in total) should be secured for open canal construction, which results in permanent land acquisition.	Only temporary land acquisition is needed, which leads to less social negative impact compared with that in case of open-canal installation.
Cost	Compensation for land acquisition will be big due to necessity of wide area of land acquisition. During operation stage, electrical fee for pump operation is needed.	Compensation for land acquisition is limited. Gravity irrigation system can be applied, and operation cost such as electrical fee is not needed.
Selection	Not adapted	Adapted

(2) Feeder Canal 2

Parameter	Open-canal	Pipeline
Possibility of water storage at the Reservoir	There is enough water head between the intake point from the Arzni-Shamiram Canal and the full water level of the Reservoir.	It is possible to store water at the Reservoir.
Social impact	The land in and around the proposed Feeder Canal 2 is not used for agricultural purpose, therefore, the impact on surrounding area by the open-canal construction is not significant.	Same as left
Cost	Cost of open-canal construction is relatively low.	Cost of pipeline installation is higher than that of open-canal.
Selection	Adapted	Not adapted

(3) Outlet Canal 1

Parameter	Open-canal	Pipeline
Possibility of water diversion from the Reservoir to the Arzni-Branch Canal	If open-canal system is applied, it is needed to detour highland, around E.L. 1,300m, which is higher than elevation at bottom of the Reservoir, EL 1,290m. If open-canal (detour) is applied, the alignment length is 6.5km.	If pipeline system is applied, it is possible to share 1.2km length of the canal alignment with the Feeder Canal 1. The pipeline can cross over the railway, and the draft alignment length for outlet part is 0.73km (total canal length is 1.93km), which is much shorter than that of open-canal.
Social impact	Canal width and protection zone should be secured, which leads to larger affected area and permanent loss	Only temporary land acquisition is needed, which leads to minor social negative impact.

Parameter	Open-canal	Pipeline
Cost	Due to long distance of canal alignment, it is costly.	Due to short length of the canal, the cost can be lower than that of open-canal.
Selection	Not adapted	Adapted

(4) Outlet Canal 2

Parameter	Open-canal	Pipeline
Possibility of water diversion to the end point of the Arzni-Branch Canal and Kasakh River from the Reservoir	If open-canal is applied, at least 14m head is needed between the bottom of Reservoir and the end point of the Arzni Branch Canal. However, the estimated head is 13.7m, which is insufficient. Therefore, it is difficult to divert water to the Arzni-Branch Canal from the Reservoir through open-canal system.	It is possible to divert water to the Arzni-Branch Canal from the Reservoir.
Social impact	The proposed route passes through farmlands and buildings. In case of open-canal, the area to be affected will be large and permanent.	In case of pipeline, affected area will be smaller, and only temporary land acquisition is needed.
Cost	Compensation for the affected area is large.	Compensation for the affected area is smaller than that of open-canal system.
Selection	Not adapted	Adapted

CHAPTER 5 PRESENT CONDITIONS OF THE PROJECT AREA

5.1 Natural Conditions

5.1.1 Meteorological Conditions

Figure 5-1 indicates the annual precipitation and mean annual rainfall for 30 years as observed at the Hrazdan meteorological observatory installed in the watershed area of the Hrazdan River (northern part of Kotayk Marz). The average annual precipitation for 30 years is 722mm.

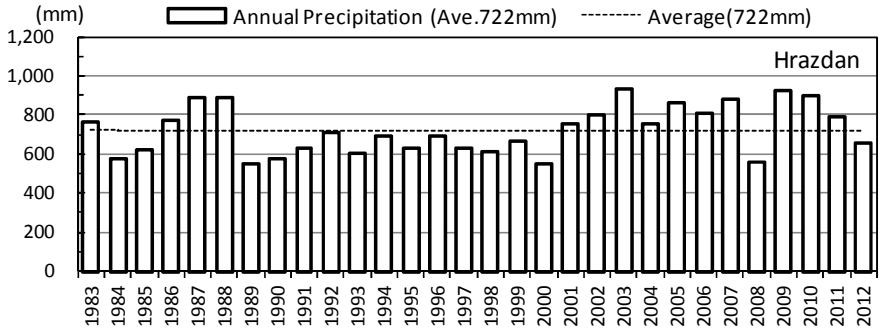


Figure 5-1 Annual Precipitation at Hrazdan Observatory Point

Figure 5-2 indicates the monthly means of average atmospheric temperature, precipitation and evaporation for the past 30 years at the Hrazdan observatory (altitude: 1,765m) and the Yeghvard observatory (altitude: 1,337m). As for precipitation, it shows its peak season in April and May, then reduces towards August. As for evaporation, the peak falls in June with values outweighing precipitation having been observed during summer. In this regard, a 30-year mean value of annual precipitation at the Hrazdan observatory is 722mm, while that at the Yeghvard observatory records 445mm.

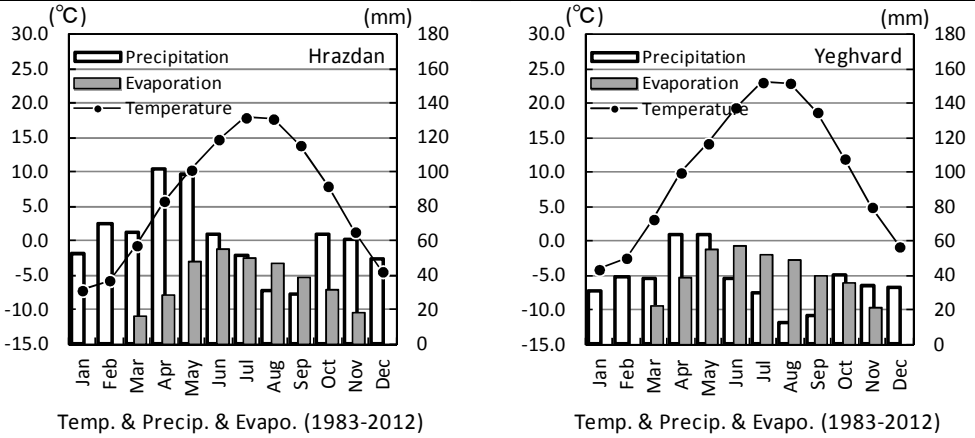


Figure 5-2 Meteorological Features at Hrazdan Observatory and Yeghvard Observatory

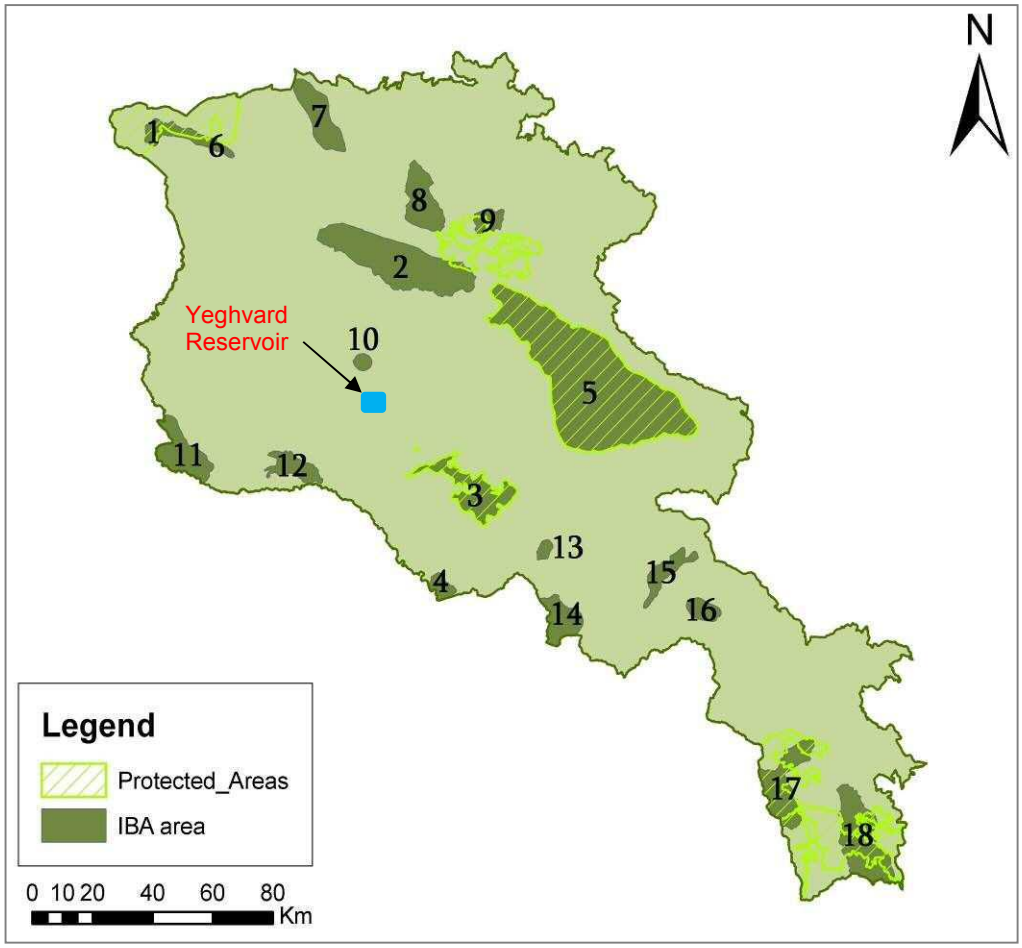
5.1.2 Protected Areas

In Armenia, 35 sites including national parks and sanctuaries have been specified as the Protected Areas. The distribution map of the 35 protected areas was prepared by the World Wildlife Fund (WWF) in collaboration with MNP in 2014 (Figure 5-3).

Figure 5-3 Location of Protected Areas in Armenia

According to the map, there is no Protected Area around the Yeghvard Reservoir and command area. Therefore, it can be said that direct impacts on those Protected Areas by the Project is not expected. It is noted that the Lake Sevan, which is the largest lake in Armenia, is also identified as one of the Protected Areas and it is registered as the Ramsar site in 1993.

Important Bird Areas (IBAs) are identified by the Armenian Society for the Protection Bird in collaboration with the Bird Life International and International Union for Conservation of Nature (IUCN). Figure 5-4 illustrates the location of IBAs in Armenia and the Project site. It can be said that the proposed project site is not located in and around the IBAs, therefore, any negative impacts on IBAs by the Project are not anticipated.

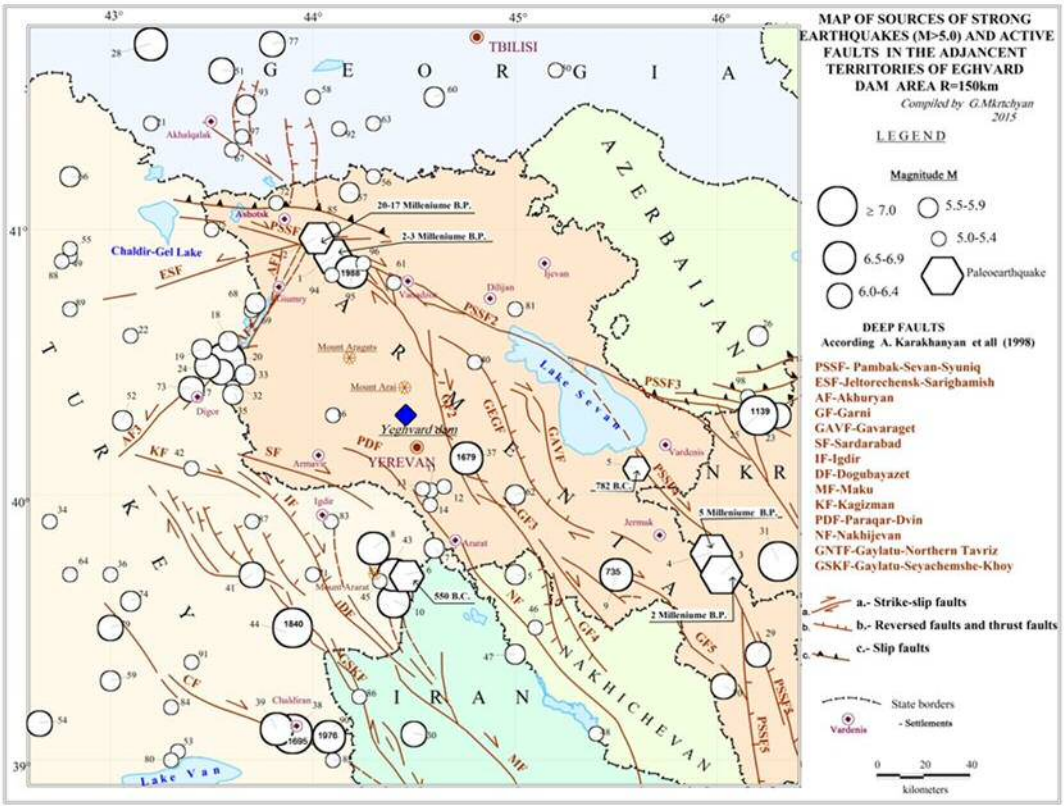


No.	Name of IBA
1	Lake Arpi IBA
2	Pombak Mt. Chain IBA
3	Khosrov Reserve IBA
4	Armash fish-farm IBA
5	Lake Sevan IBA
6	Amasia IBA
7	Tashir IBA
8	Dsegh IBA
9	Haghartsin IBA
10	Mount Ara IBA
11	Sardarapat IBA
12	Metsamor IBA
13	Gndasar IBA
14	Noravank IBA
15	Jermook IBA
16	Gorayk IBA
17	Zangezoor IBA
18	Meghri IBA

Figure 5-4 Location of IBAs in Armenia

5.1.3 Earthquakes

Figure 5-5 shows a location map of strong earthquake (magnitude >5), together with historical earthquake epicenters. The brown color lines show various active faults. Armenia has suffered from earthquakes repeatedly, however, the area around the Yeghvard Reservoir experience few quakes. Moreover, no active fault passes through the Yeghvard Reservoir. Therefore, it can be said that the possibility of earthquake around the proposed construction sites is relatively low.



Source: JICA Survey team

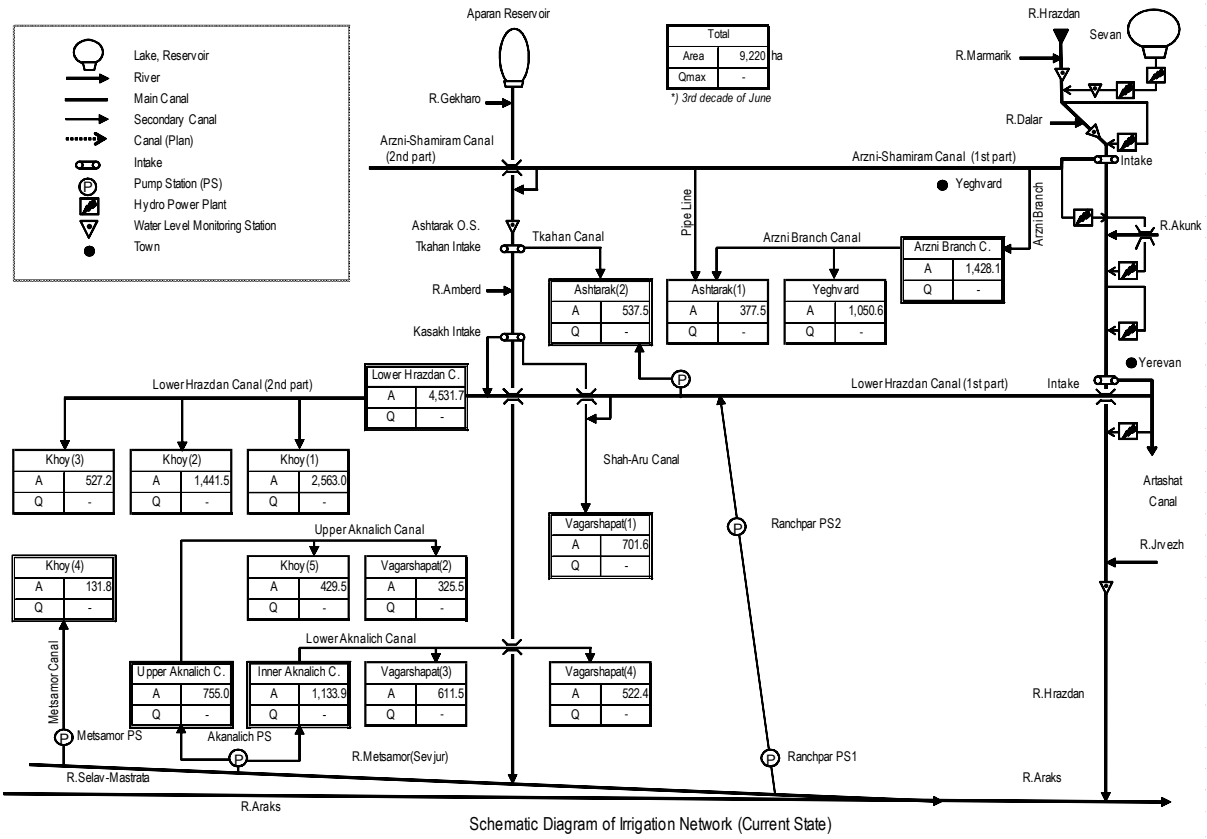
Figure 5-5 Location of Strong Earthquakes around the Yeghvard Reservoir

5.1.4 Hydrological Situations

Main rivers and canals related to the beneficial area are as follows:

- Hrazdan and Kasakh Rivers
- Tkahan canal
- Arzni-Shamiram canal
- Lower Hrazdan canal
- Arzni Branch canal
- Shah Aru canal.

At this moment, the beneficial area utilize water of the Lake Sevan and the Hrazdan River as main irrigation sources, additionally, it utilize pumped-up water through pump stations from the Metsamor River (See Figure 5-6).



Source: JICA Survey team

Figure 5-6 Schematic Diagram of Current Irrigation Network

(1) Hrazdan River

Hrazdan River is one of tributaries originated in the Lake Sevan and flows into the Araks River, which flows along the international boundary with Iran. Hrazdan River is not an international river, therefore, there is no international treaty regarding water distribution of the Hrazdan River according to SCWE. For the purpose of conservation of the river, minimum discharge considering ecology is regulated in the Decree N 927-N (2011), however, in serious drought year, irrigation is given higher priority than that of ecological conservation.

The Hrazdan River has been mainly used by irrigation and hydro power generation. Natural Hrazdan River flows down in parallel with canal as shown in Figure 5-7. At each reservoir for hydro power generation, the natural Hrazdan River and Hrazdan Canal interflow, after that, the water is diverted into Hrazdan canal and natural Hrazdan River again. There are seven Hydro Power Plants (HPP) between the Lake Sevan and the Yerevan Lake[5], namely, Sevan HPP, Hrazdan HPP, Gyumush HPP, Arzni HPP, Qanker HPP, Yerevan HPP-1 and Yerevan HPP-3[6]. In addition, Arzni-Shamiram canal, Artashat canal and Lower Hrazdan canal are diverted from the Hrazdan River.

It is possible to divide three sections of the Hrazdan River, namely 1) upstream, 2) middle stream, and 3) downstream. At the point of the Intake for the Arzni-Shamiram Canal, upstream and middle stream can be divided, since no impact will be caused in the upstream of the intake by the Project. Moreover, the middle stream section is from the Intake to the Lake Yerevan, while the section of downstream is from the Lake Yerevan to the inflow points with the Araks River.

[5] An artificial lake located on Yerevan City

[6] Operation of HPP-2 has been suspended many years ago.

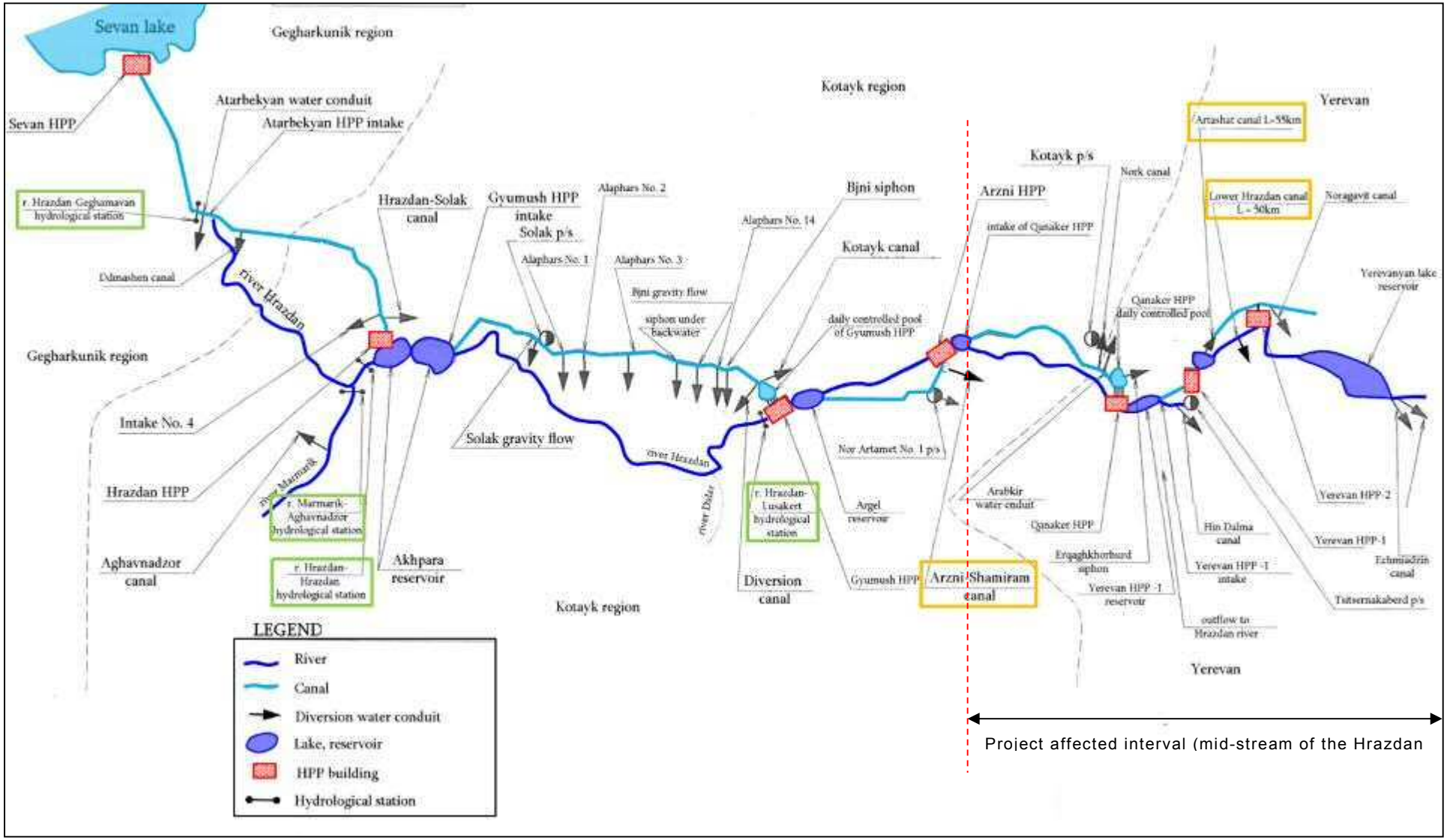


Figure 5-7 Natural River and Canal in the Hrazdan River

According to the gate keeper of the Arzni Intake before the Argel Reservoir, the flow capacity of channel to Arzni HPP is 67m^3/s. If the amount of discharge is 70m^3/s at the Argel Reservor (confluence point of canal and natural of Hrazdan River), the water is diverted to the channel to Arzni HPP at 67m^3/s and natural river at 3m^3/s, respectively. Most of the water is discharged to the channel to Arzni HPP, while only minimum discharge is taken to the natural river at this moment. The same water distribution system is applied in other parts of the Hrazdan River during the irrigation season, namely, March to October.

Lusakert Observatory is located on upstream of the Intake for Arzni-Shamiram Canal, which is the channel for the Yeghvard Reservoir as illustrated in Figure 5-8. At the point, a water mark is fixed for measurement of water level and it is easy to observe the seasonal water level change. Therefore, focusing on the Observatory, the periodical change of water level snow melting season, namely, from February to April, has been monitored by the Survey team.

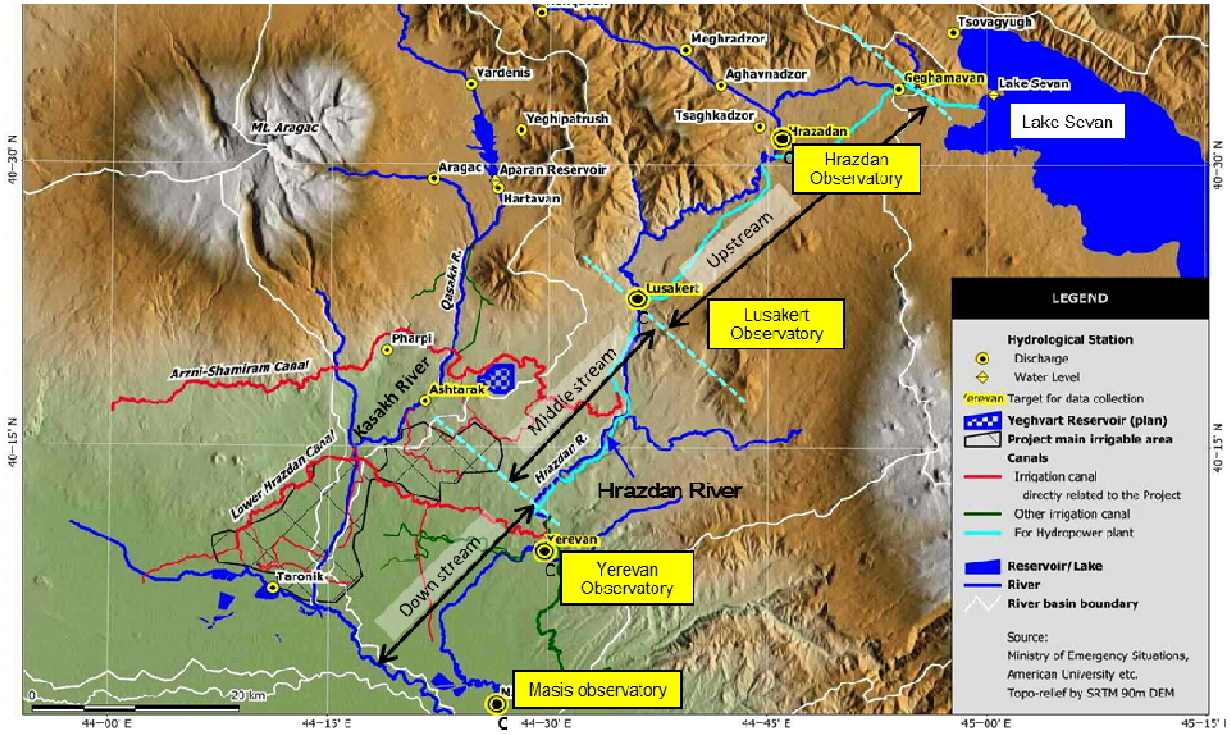
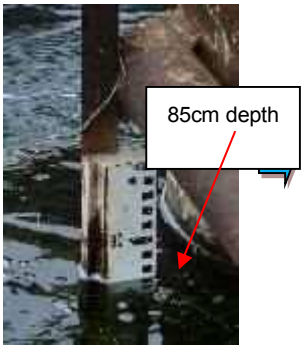
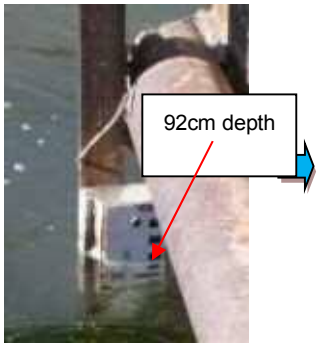


Figure 5-8 Location of Observatory Stations

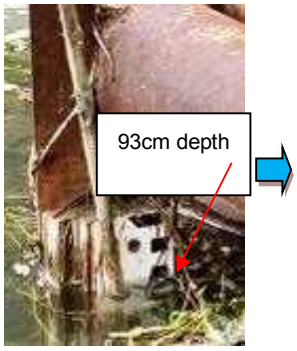
At the Lusakert Observatory, the water depth has not been changed so drastically during snow melting period as shown following photos taken in 2016, probably due to water diversion to the canal of Hrazdan River at the upstream. Rather than that, on 18th April, water level has been decreased, which implies that the discharge of natural flow in Hrazdan River is not influenced by the snow-melted water directly.



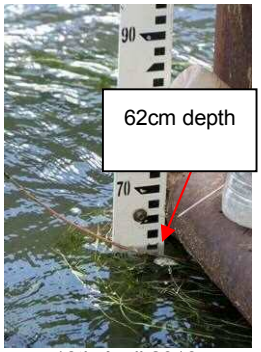
22nd Feb.2016
【water depth：85cm】



2nd March 2016
【water depth：92cm】



30th March 2016
【water depth：93cm】



18th April 2016
【water depth：62cm】

(2) Kasakh River

1) Current conditions in Kasakh River

The river water is diverted at Tkanhan Intake into the Tkhhan Canal, and it is taken at the Kasakh Intake to the both Lower Hrazdan Canal and Shah-Aru Canal. As shown in following photo (August 2015) and Figure 5-9, The river water flows within interval of only 14km, between the Kasakh Intake and inflow point from the Outlet-2 and almost all of river water is at the Kasakh Weir except early spring, and main stream of the river is suspended and water flow is not observed.

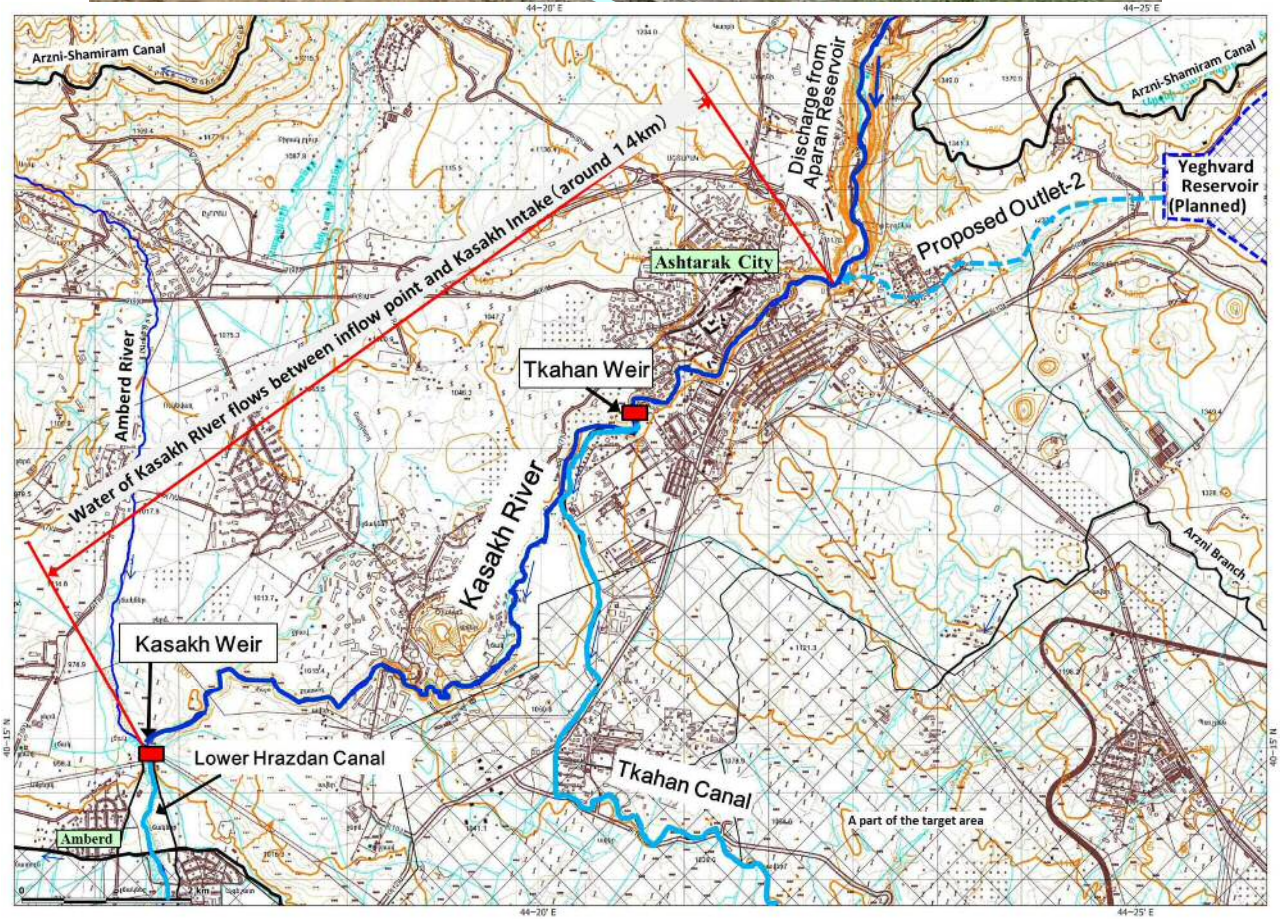


Figure 5-9 Kasakh River and Irrigation Canals

Discharge of the Kasakh River at Ashtarak Observatory, which is located on near the inflow point from proposed Outlet Canal-2, has the peak flow in April, and generally around 3m^3/s through year except that in April (See Figure 5-10). In other words, there is no water in downstream of the Kasakh Intake in the Kasakh River. However, due to the inflow of other streams after the Kasakh Intake, river water is sustained and finally flows into the Araks River.

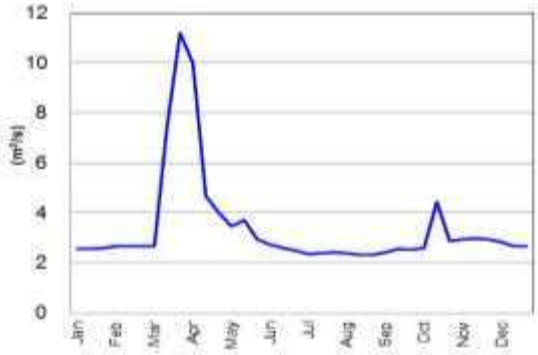


Figure 5-10 Average Discharge of Kasakh River (1983-2013)

(3) Lake Sevan

Figure 5-11 indicates the breakdown of water volume supplied from the Hrazdan River and the Lake Sevan. According to the collected data, the water level of Lake Sevan has shown a rising tendency since 2002. Water flows into Lake Sevan through natural streams and also is conveyed by means of the Arpa-Sevan water tunnel (diverted water volume amounted to 240MCM in 2010). The upper limit of water volume that can be supplied from Lake Sevan is 170MCM, except during drought years. The Arpa-Sevan diversion tunnel has 48km length, which was constructed for the purpose of conservation of the Lake Sevan (See Figure 5-12).

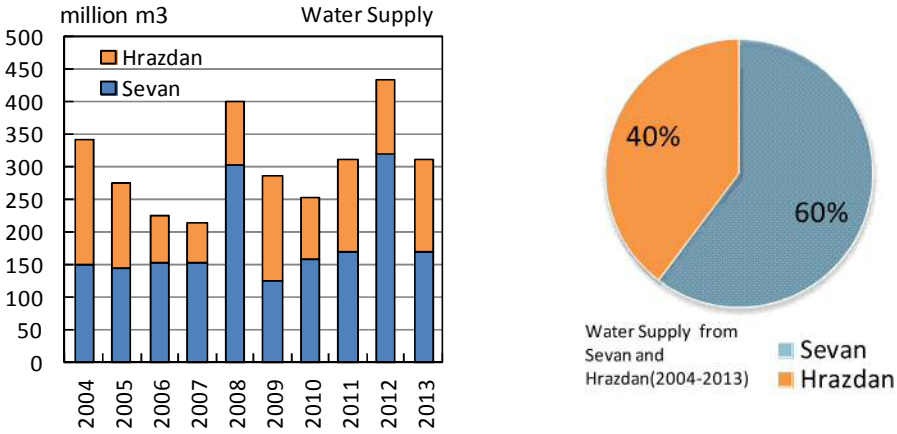
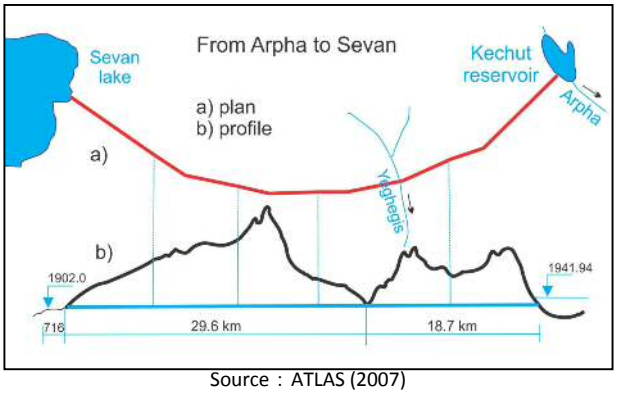


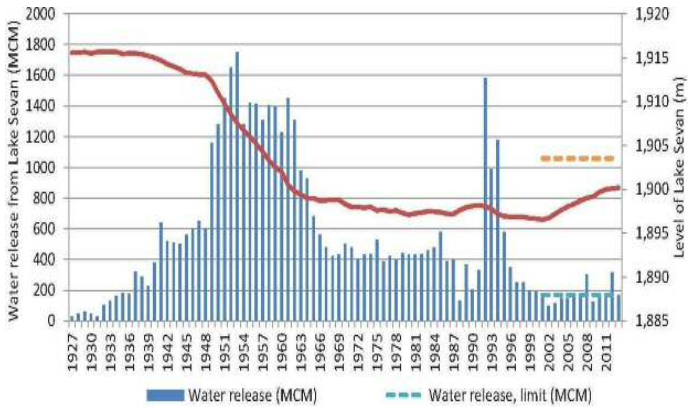
Figure 5-11 Water Use Situation in Irrigation and Rate of Supply Sources, Hrazdan River and Lake Sevan



Source : ATLAS (2007)

Figure 5-12 Arpa-Sevan Tunnel

Judging from Figure 5-13, the water supply during two drought years, 2008 and 2012, outweighed 170MCM, implying that these years experienced a severe water shortage. In this context, since a water shortage condition is likely to prevail again in 2014, the Government of Armenia raised the upper limit of water use in Lake Sevan in August, 2014 from the usual level of 170MCM to 270MCM.



Source : World Bank (2014),Towards Integrated Water Resources Management : Revisited

Figure 5-13 Change in Water Level in the Lake Sevan

The Lake Sevan is managed by "Sevan National Park" SNCO under the MNP. For promotion of conservation of the Lake Sevan, the law "On Lake Sevan" (2001) and the law "On Approval of Annual and Complex Measures on Conservation, Restoration, Reproduction, and Use of the Ecosystem of the Lake Sevan" (2001) have been established. The laws aim at conservation of the Lake Sevan and surrounding ecosystem by increase of the lake water level through integrated countermeasures, which contributes to sustainable development. Especially, the Arpa-Sevan tunnel has diverted a large amount of water to the Lake Sevan, consequently, the water level of the lake is increased by 3.4 m until now. On the other hand, due to the water level increase in recent years, part of forests, which had been planted during the period the water level was low, have been submerged (see photo right). It causes water pollution due to rotten submerged trees. Not only trees but also some structures, which had been constructed, have been abandoned, since they cannot be used any more.

Structure and trees which are submerged due to increase of water level of the Lake Sevan

(4) Recent Situations of International River Treaty

The River Araks, which is the main stream of the Hrazdan River, rises from the Highland of Armenia, runs through the Turkish territory toward the east, and then flows down along the borders of Armenia with Iran and Azerbaijan, merging into the Kura River, finally flowing into the Caspian Sea (refer to Figure 5-14). Ratios of area of the Hrazdan River basin (around 1,200 km^2) to that of the Araks River basin (around 102,000 km^2) and sum of Araks River basin and Kura River basin (around 188,000 km^2) are 1.2% and 0.6%, respectively, very small.

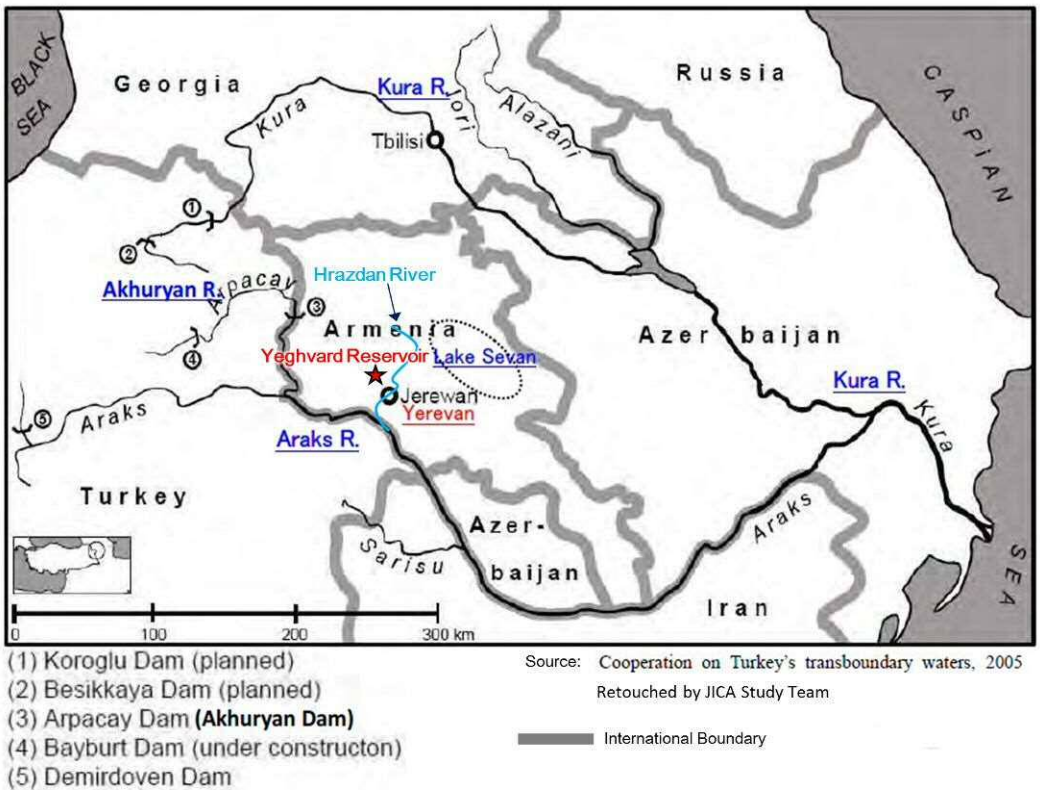


Figure 5-14 Trans-boundary Rivers in and around Armenia

The overall water use agreements on the River Araks, a trans-boundary river, are summerized in the Table 5-1:

Table 5-1 Past Water Use Agreements on the Trans-boundary Rivers in Armenia and Adjacent Countries

	Related countries	Agreed period	Outline
1.	Armenia under Soviet Union	January, 1927	Quantity of water intake from Araks River & Akhuryan River was agreed at 1,230 MCM/year/country (share of water right 50:50)
2.	Turkey, Armenia under Soviet Union	January, 1927	Agreement on the survey & construction of headworks traversing Araks River. Identification on the scale of the facility & joint development by both countries (share of water intake 50:50)
3.	Turkey, Armenia under Soviet Union	October, 1973	Agreement on the joint development of a dam of Akhuryan River (share of water intake 50:50)
4.	Iran, Armenia under Soviet Union	August 1957	Share of water intake for irrigation, power generation and domestic water from Araks River and Atrak River is agreed at 50:50 & the dam is jointly developed.
5.	Republic of Georgia & Republic of Armenia under Soviet Union	November 1971	Detailed agreement on the share of water intake after constructing headworks in Debed River (a tributary of Kura River)
6.	Republic of Azerbaijan and Republic of Armenia under Soviet Union	October 1962	Agreement on the use of water power generation in Arpa River flowing into Lake Sevan
7.	Republic of Azerbaijan and Republic of Armenia under Soviet Union	April 1990	Agreement on controlling discharge in Vorotan River, a tributary of Araks River, the river discharge as of 1990 shared by both countries at the rate of 50:50
8.	Republic of Georgia & Republic of Azerbaijan & republic of Armenia	February 1997 (as a bilateral agreement)	Consultation on monitoring evaluation on the conservation of natural environment / river water conservation of Kura River (though already agreed between Georgia ^ Armenia, still pending between Azerbaijan and Armenia)

Source: Armenia Integrated Water Resources Management Plan (Reference distributed by JICA)

Three (3) Caucasian countries including Armenia participated in the establishment of the Soviet Union in 1922 (independence from the Soviet Union was achieved in 1991), while the republic of Armenia at that time under the Soviet Union and Turkey concluded "Convention on Water Use from Transboundary Rivers, Small Rivers and Brooks of the Union of Soviet and Turkey" in January 1927.

It was agreed in this Convention to equally share the quantity of water intake from the Araks River and the Akhuryan River (also called "Arpacay") 50:50, or 1,230 MCM per year per country. Besides, in the same year, the Soviet Union planned to construct a head-works in the Araks River, and obtained the agreement with Turkey in which water was shared 50:50 with joint management of the facility after construction. Later, in October 1973, an agreement was also closed to construct a reservoir in the Akhuryan River (at a site of the border between Turkey and Armenia).

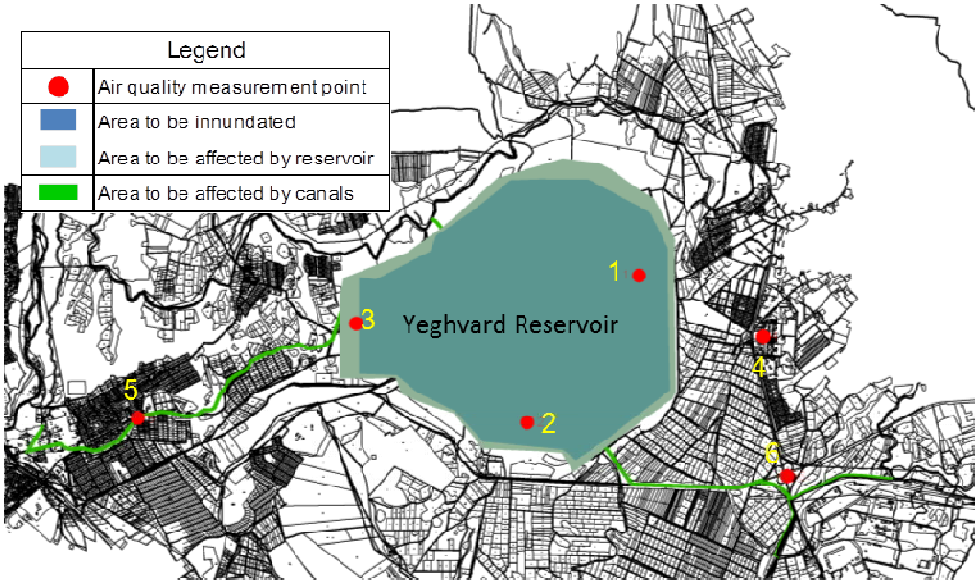
All of the above-cited agreements had been exchanged before the independence of Armenia (1991). However, the stakeholders of SCWE understand they are now still valid. In its background, even though no diplomatic relations have not been established yet between Armenia and Turkey, there lies a fact that water sector stakeholders in both countries have regular meetings as to the application of Akhuryan reservoir located between both countries where the share of 50:50 for water use has been identified.

Also, the Akhuryan reservoir was completely constructed in the 1980s during the regime of the Soviet Union, and after the independence of Armenia, it has jointly been utilized. When the reservoir was constructed, it was agreed between both countries that water should be released to Akhuryan reservoir for its conservation with the rate of 150MCM/year for the side of Armenia and 350MCM/year for the side of Turkey in compliance with the share of the territorial watershed area of the reservoir between the two countries. Further, as to the Kaps project, which F/S is on-going, the Government of Armenia is now planning forward by observing releasing volume of 150MCM/year.

Water distribution of the Hrazdan River is managed by the Sevan-Hrazdan Jrar[7] Closed Joint Stock Company (CJSC) under the SCWE (MOA), and Water Resource Management Agency under the MNP. The Hrazdan River flows within the Armenian territory, therefore, the Hrazdan River is regarded as an in-country river in Armenia, instead of an international river. Therefore, there is no international treaty on utilization of water of the Hrazdan River.

5.1.5 Air Quality

For the purpose of determination of ambient air quality, the concentrations of gas emissions (SO_2, NO_2, and CO) and dust have been measured at six (6) points in and around the proposed Project area at the following locations as shown following figure:



1: Reservoir area (1) (close to the Dike No.2),

[7] "Jrar" means intake.

2: Reservoir area (2) (close to the southern border of the reservoir)

3: Reservoir area (3) (on the Dike No.1)

4: Yeghvard city

5: Nor-Yerznka community

6: Feeder canal 1 (near junction).

Figure 5-15 Location of Air Quality Measurement Points

Gas emissions (SO_2, NO_2, CO) have been measured using indicator tubes with mobile sampling pump. Dust concentration is measured by usage of mass concentration method (simple filtering). The dust is accumulated on the filter and then the filter is weighted. The weight of sampled dust is divided by mass flow volume to calculate the concentration of suspending dust. The duration of dust measurement is 20 minutes. The obtained data is analyzed and compared with corresponding Threshold Limit Value (TLV) and presented below in Table 5-2.

The concentrations of gas pollutants (SO_2, NO_2 and CO) in ambient air at sensitive receptors locations haven't been detected, which means that concentrations of those parameters are within the norms. The results of dust measurements range from 0.037 mg/m^3 (in the area of feeder/outlet canal) and 0.076 mg/m^3 (in Yeghvard city), which means that ambient air quality in and around the Project area are in line with the air quality standard at this moment.

Table 5-2 Results of Ambient Air Quality Measurements

Parameter	Location	Measured value (mg/m^3)	Maximum one-time concentration (mg/m^3)	Mean daily concentration (mg/m^3)
Dust	Reservoir (1)	0.06	0.5	0.15
	Reservoir (2)	0.057		
	Reservoir (3)	0.045		
	Yeghvard	0.076		
	Nor-Yerznka	0.05		
	Feeder Canal-1	0.037		
SO_2	Reservoir (1)	Not detected (ND)	0.5	0.05
	Reservoir (2)	ND		
	Reservoir (3)	ND		
	Yeghvard	ND		
	Nor-Yerznka	ND		
	Feeder Canal-1	ND		
NO_2	Reservoir (1)	ND	0.0085	0.04
	Reservoir (2)	ND		
	Reservoir (3)	ND		
	Yeghvard	ND		
	Nor-Yerznka	ND		
	Feeder Canal-1	ND		
CO	Reservoir (1)	ND	5.0	3.0
	Reservoir (2)	ND		
	Reservoir (3)	ND		
	Yeghvard	ND		
	Nor-Yerznka	ND		
	Feeder Canal-1	ND		

5.1.6 Noise and Vibration

For the purpose of determination of background noise level in and around the proposed Project area noise instrumental measurements were conducted at nine points/locations, which are listed below. Location of noise measurement points is presented in Figure 5-16.

Location	
1: Reservoir area (1) (close to the Dike 2)	6: H4 highway (1)[8] (near Yeghvard city)
2: Reservoir area (2) (close to the southern border of the Reservoir)	7: H6 highway (1)[9] (south of the Reservoir)
3: Reservoir area (3) (on the Dike 1)	8 - H6 highway (2) (south of the proposed Outlet Canal 2)
4: Yeghvard city	9 - H4 highway (2)
5: Nor Yerznka community	

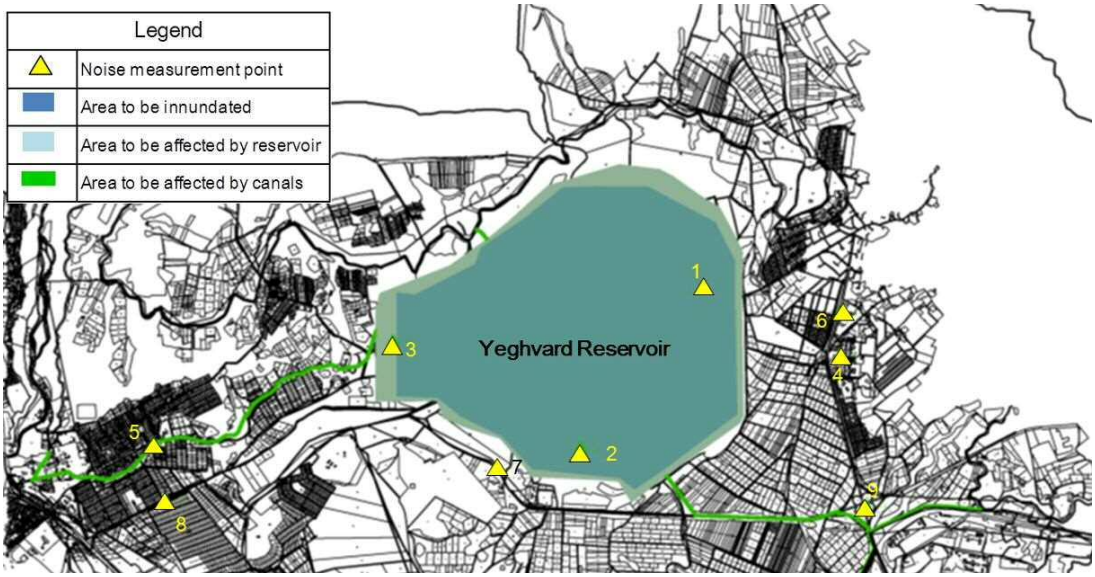


Figure 5-16 Locations of Noise Measurement Points

At each point, instrumental measurements of noise levels are performed by using a Sound Level Meter (SL-834) during 10 minutes. Generally, noise levels at most sensitive receptors, namely, at Yeghvard and Nor-Yerznka communities are within the threshold limit value according to the norm. The measurement results are presented below in Table 5-3.

Table 5-3 Results of Noise Measurements

No	Measurement points	Measured Noise Level		Noise standard	
		Equivalent level (dBA)	Maximum level (dBA)	Equivalent level (dBA)	Maximum level (dBA)
1	Reservoir area (1) (close to the Dike 2)	38.8	53.8	80	
2	Reservoir area (2) (close to the southern border of the Yeghvard Reservoir)	41	59.6	80	
3	Reservoir area (3) (on the Dike 1)	39.8	56.9	80	
4	Yeghvard city	55	68.9	55*	70*
5	Nor-Yerznka community	49	68.4	55*	70*
6	H4 highway (1) (near Yeghvard city)	60	70.7	80	
7	H6 highway (1) (south of the Yeghvard Reservoir)	58.3	78.7	80	
8	H6 highway (2) (south of the proposed Outlet Canal 2)	58.7	80	80	
9	H4 highway (2)	59.1	79.4	80	

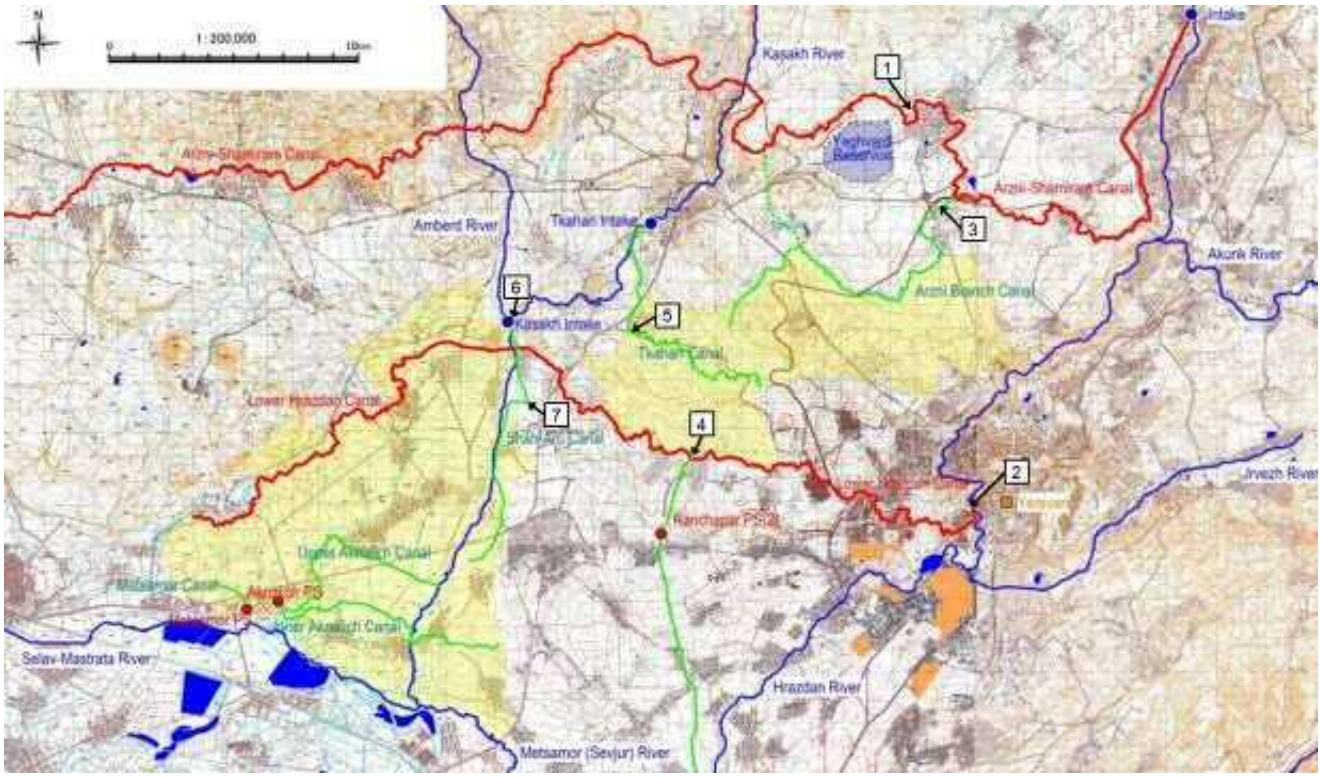
*They are located in Yeghvard and Nor-Yerznka communities correspondingly and for such locations 55 dBA of equivalent sound/noise level and 70 dBA of maximum sound/noise level are applied, while 80 dBA (for Noise in workplaces for construction works) is applied for other places.

[8] H4 Road: Road between Yerevan and Yeghvard

[9] H6 Road: Road between Yeghvard and Nor-Yerznka

5.1.7 Quality of Surface Water

For the purpose of the confirmation of water quality as irrigation water in the Project area, water quality testing was implemented. Considering the surface water standard in Armenia and FAO irrigation water quality standard, pH, EC (Electric Conductivity), TDS (Total Dissolved Solid), SS (Suspended Solid), Temperature, BOD (Biological Oxygen Demand), COD (Chemical Oxygen Demand), DO (Dissolved Oxygen), NO_3-N (Nitrate-Nitrogen), PO_4 (Phosphate), Na (Sodium), Cl (Chloride), Magnesium (Mg) and Calcium (Ca) have been determined as parameters. Sampling points/locations are illustrated in Figure 5-17.



1 - Arzni-Shamiram canal at cross point of road
2 - Hrazdan River before intake to Lower Hrazdan canal
3 - Arzni-Branch canal before outlet under the railway
4 - Lower Hrazdan canal before outlet of pipeline from Ranchpar Pump station
5 - Cross point between Tkahan canal and road
6 - Kasakh Intake at Kasakh River
7 - Middle point of Shah-Aru canal.

Figure 5-17 Location of Surface Water Sampling Points

The results of water quality test and their comparison with environmental norms defined by the RA Government Decree No 75-N dated 27.01.2011 and FAO Irrigation Guidelines are presented below in Table 5-4.

Table 5-4 Water Quality Test Results of Surface Water

Parameter	Unit	Sample point No.							Standard	Used analytical method
		1	2	3	4	5	6	7		
Temperature	ºC	11.5	13.8	10.8	16.1	11.8	12.4	13.1	-	-
TSS	mg/l	16.8	15.4	9.5	12.3	12.1	11.1	17.5	<30*	Gravimetric analysis
pH	-	7.88	7.06	7.83	8.08	8.31	8.34	8.32	6.5 - 8.4**	pH meter
DO	mg/l	13.14	9.5	10.27	16.4	13.7	10.3	10.7	>5*	DO meter in-situ
Chloride ion	mg/l (meq)	21.9 (0.62)	257.6 (7.26)	20.9 (0.59)	216.2 (6.09)	18.0 (0.51)	17.0 (0.48)	15.817 (0.45)	<142** (<4**)	Ion chromatography
Nitrate	mg/l	0.592	2.103	0.542	1.168	0.129	0.976	1.106	<5**	Ion chromatography

Parameter	Unit	Sample point No.							Standard	Used analytical method
		1	2	3	4	5	6	7		
(NO_3-N)										
Mineralization	mg/l	401	1,888	362	1,740	342	333	328	<1,000*	Electrochemical analysis
Phosphates	mg/l	0.089	0.296	0.074	0.445	0.252	0.252	0.282	<0.4*	Spectrophotometric analysis
BOD	mg/l	3.24	2.98	6.46	6.58	3.3	1.67	2.85	<9*	Electrochemical analysis
COD (Cr)	mg/l	14	12	14	32	12	34	14	<40*	Dichromate oxidizability
EC	uS/cm (dS/m)	590 (0.59)	2,768 (2.768)	533 (0.533)	2,568 (2.568)	503 (0.503)	490 (0.49)	482 (0.482)	<700 (<0.7)**	Electrochemical analysis
Na	mg/l (meq)	42.77 (1.86)	284.76 (12.38)	40.06 (1.74)	263.22 (11.44)	36.44 (1.58)	34.46 (1.50)	33.42 (1.45)	69 (<3**)	ICP- Mass Spectrometry (ICP-MS)
Mg	mg/l (meq)	22.19 (1.85)	28.70 (2.39)	21.58 (1.80)	30.34 (2.53)	18.94 (1.58)	18.45 (1.54)	18.32 (1.53)	<100 (<5)**	ICP-MS
K	mg/l	9.13	7.38	7.68	8.29	7.09	6.74	6.84	-	ICP-MS
Ca	mg/l (meq)	47.02 (2.35)	64.03 (3.20)	43.06 (2.15)	63.86 (3.19)	40.61 (2.03)	40.23 (2.01)	39.20 (1.96)	<200** (<10)**	ICP-MS

Source: JICA Survey Team (2015)

*Ecological Norm (RA Government Decree No 75-N dated 27.01.2011),"Moderate" is applied.

** FAO Irrigation Guidelines, Table -1 "None Restriction on Use" is applied.

Date of sampling: 19th October 2015

This anal was done by "Environmental Impact Monitoring Center" SNCO under the MNP and it has various experiences to work international organizations.

Considering the result of water quality test mentioned above, water quality is generally appropriate for irrigation water. It can be said that water quality of Arzni-Shamiram Canal is suitable for irrigation. On the other hand, salinity of the water at No.2 and No.4 sampling points is high. It is probably because that waste water from surrounding residential areas is discharged into the Lower Hrazdan Canal and Hrazdan River. The water sampling was done on October, almost end of irrigation period and there was small discharge, therefore, water quality was affected by the waste water at the point No.4. In October, main cultivated crop is wheat, which has moderate salinity tolerance according to the "Water Quality for Agriculture" (FAO), and the farmers can depend on rain in autumn. Therefore, the high salinity in the irrigation water is not an issue at this moment. Regarding sampling point No.2 (Hrazdan River), it is natural flow, and discharge is small compared with the inflow of waste water. It flows within the Yerevan City, therefore, the water was deteriorated by the effluence from the residential area.

Main irrigation water source for the Yeghvard Reservoir is Arzni-Shamiram Canal. Considering water quality in the Canal, water quality in the Reservoir will be appropriate for irrigation. On the other hand, the water in the Lower Hrazdan Canal contains relatively high salinity. However, it is noted that the sampling was done at almost end of the irrigation season, and the discharge was low. Average water discharge in the irrigation season from the end of April to mid of September is 6.9m^3/s, while the discharge in early October is 1.5 m^3/s[10]. It means that saline concentration will be low during the irrigation peak season. So far, no crop damage due to water salinity has been observed, according to the Director of Ashtarak WUA, which use the Lower Hrazdan Canal. The salinity does not have direct relation with the Project. In other words, further salinization of the water is not caused. It can be judged that no water quality deterioration due to the project is expected.

[10] Source) Sevan-Hrazdan Jrar, Closed Joint Stock Company, SCWE

It is noted that there is saline soil called as "Alkali meadow sodium-sulfate-chloride" which is saline soil along the Araks River in the Ararat Plain. However, the beneficial area of the Project is located on other types of soil (see Appendix 5). Concerning groundwater, the main direction of the ground water flow is to the southwest, toward the Kasakh River canyon and Total Dissolved Solid of the ground water is 0.21 - 0.54 g/l (≒0.34 – 0.86dS/m of EC),[11] which can be regarded fresh. Moreover, the water source of the Project is snow melted water, which has low salinity. Taking into consideration those conditions mentioned above, soil salinization due to the Project is not expected.

5.1.8 Soil and Groundwater

(1) Analysis of Soil and Groundwater

(a) Agrochemical Analysis of Soil

In general, agrochemicals are applied for fruit and vegetables more than for wheat and feed crop such as alfalfa according to a FAO staff in Armenia. To conduct analysis nine (9) communities (Aratashen, Taronik, Baghramyan, Tsiatsan, Tsaghkalanj, Aragats, Aghavnatun, Mrgastan and Hovtamej), where fruit and vegetables have been intensively cultivated, were selected from the target 27 communities. In addition, one control point (no chemical application) was set for comparison in Taronik community. Therefore, the number of sampling points was ten (10) in total. One farmland plot, where agrichemicals have been applied, was identified at each community mentioned above, six (6) soil samples per each plot, totally 60 samples were taken. The soil samples were analyzed for the parameters listed in the surface water standard in EU[12], since there is no regulation for soil and water for agrochemical in Armenia[13].

(b) Agrichemical and Fertilizer Analysis of Groundwater Resources

Flow direction of the groundwater in the command area shows the same trend of that of the surface water, namely, from northern part to southern part. When applied fertilizers and agrichemicals will be infiltrated into the underground, the concentration of them could be higher in south-western part of the area. Based on the idea, ten (10) groundwater samples were taken from the private and communal tube wells in the four communities, namely, Artimet, Khoronk, Aratashen, and Griboyedov, which are located on south-west part of the command area. Concentrations of nitrate, nitrite[14] and agrichemical[15] in the groundwater were analyzed. Those sampled groundwater are mainly used for domestic purpose and irrigation, not for drinking. Furthermore, given that there are many green houses, vegetable farmlands and orchards in the four communities, it was thought that the groundwater quality in the communities has been influenced by those farming activities. Location of soil and groundwater sampling points are illustrated below in Figure 5-18.

[11] Source) "Feasibility Study of the Design and Construction of a Reservoir on Hrazdan River in Armenian SSR", Report on Engineering-Geological and Hydro-Geological Surveys and Study on Yeghvard Reservoir, Part II, Book 2,1980

[12] Environmental Quality Standards for Priority Substances and Certain Other Pollutants

[13] According to the Environmental Impact Expertise Center SNCO under the MNP, the EU environmental quality standard is recommended to be applied in Armenia. Only qualitative analysis (detected/not detected) for some agrichemical parameters can be practiced in Armenia

[14] Mainly, chemical fertilizers contain nitrogen, phosphor and potassium, and nitrogen is the most influential for groundwater quality after the application and nitrogen fertilizers is very popular in Armenia. Nitrogen is detected as nitrate or nitrite anaerobic condition

[15] Analyzed parameters of agrichemical types are the same for soil and groundwater.

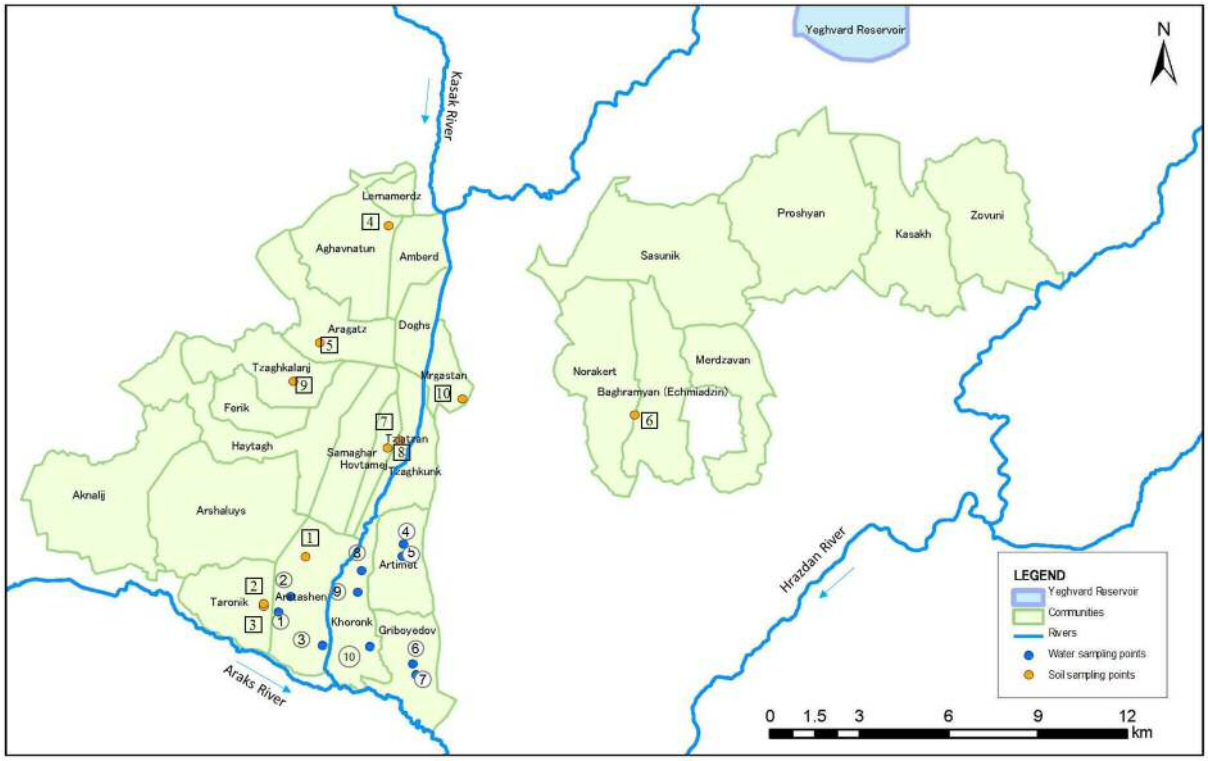


Figure 5-18 Location of Soil and Groundwater Sampling Points

(2) Results of Analysis

(a) Results of Soil Analysis

Soil analysis results are shown in Table 5-5. Chlorfenvinpho[16], which is one of organophosphorus pesticides, was detected from eight (8) farm plots including non-cultivated land out of 10 sampling plots. The agrichemical has strong toxicity, and its utilization has been already banned in the USA and EU countries. In Armenia, Chlorfenvinphos is not described in the officially registered agrichemical list by the MOA as of March 2016. It means that use of the Chlorfenvinphos is illegal in Armenia, however, the agrichemicals are applied in the many communities in the command area at this moment.

The first half-life of Chlorfenvinphos is 10-45 days, and the chemical is categorized into "Moderate" in terms of degradation according to FAO[17]. In general, degradation of organophosphorus pesticides is high. Therefore, detected Chlorfenvinphos will be decomposed by ultraviolet radiation and micro-organisms in soil gradually. Moreover, water solubility of the chemical is very low, and possibility of filtration of the chemical through soil moisture would be also low. On the other hand, Chlorfenvinphos was detected in the non-cultivated field in Taronik (sample 3) also. Given that the chemical was detected at another sampling point in Taronik and those two sampling points are located at opposite site on the road, it can be thought that the detected Chlorfenvinphos is originated from the neighboring farm plot. Benzene was detected at all of the soil samples, however, the values are around 1μg/kg soil and Benzene is volatile chemical. It is noted that according to the EU environmental quality standard for surface water, the standard value of Benzene is not over 8μg/l, it is not suitable to compare those values unconditionally, though. Taking the situations into consideration, it can be said that residue of Benzene in soil is not a big problem.

[16] Only qualitative analysis is possible for the chemical

[17] FAO, 2000, Assessing soil contamination A reference manual, APPENDIX 3 "Fact sheets on pesticides, Chlorfenvinphos (Birlane)"

(b) Results of Groundwater Quality Analysis

Table 5-6 shows the result of ground water quality analysis. One sample at the private tube well in Khoronk community (sample 8) shows high concentration of NO_3-N, 31.74mg/l, it is categorized into "Severe" in terms of use restriction according to the FAO irrigation guidelines[18]. Five (5) samples are more than 5mg/l, it is not desirable for nitrogen sensitive crops e.g. apple, apricot and grains (FAO guideline, Rev.1, 1994). Overall, groundwater quality in the area is not significantly polluted by the fertilizer application, however, it is not very suitable for crops. It is noted that according to the WHO Guidelines for Drinking-Water Quality (Version 4, 2011), nitrate concentration guideline value is 50mg/l (11 mg/l as NO_3-N). Most of the samples satisfy the value, the groundwater in the area is not used as drinking water, though.

No agrichemicals except Benzene are detected in the groundwater samples, and the concentrations of Benzene are within the regulated value in the EU standard. Therefore, it can be said that underground is not polluted by agrichemical application so far, even though residual agrichemical is detected in some soil samples.

[18] "Guidelines for Interpretation of Water Quality for Irrigation" (FAO, Rev. 1, 1994) is applied as the irrigation norm in Armenia, since no guideline of water quality for irrigation is established according to Ministry of Armenia.

Table 5-5 Results of Chemical Analysis of Soil Samples (1/3)

	Compounds	Detection limit, (mg/kg)	No.1						No.2						No.3					
			Aratashen <Tomato>						Taronik <Green pepper>						Taronik <Non-cultivated>					
			2 weeks before soil sampling						2 months before soil sampling						None					
			1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	Alachlor	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	Atrazine	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	Chlorfenvinphos	0.04	D	D	D	ND	D	D	ND	D	D	D	D	D	ND	D	D	ND	ND	ND
4	Chlorpyrifos	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	Fluoranthene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6	Hexachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	Nonylphenols (4-Nonylphenol)	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	Pentachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	Pentachlorophenol	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10	Benzene	0.0005	0.00184	0.0017	0.0019	0.0017	0.0018	0.0018	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11	Simazine	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12	Trichlorobenzenes	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
13	Trichloromethane	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
14	Trifluralin	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
15	Aldrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16	Dieldrin	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
17	Isodrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
18	Endrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
19	para-para-DDT	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
20	Hexachlorocyclohexane (α,β,δ and γ (lindan) isomers)	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
21	Endosulfan I	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22	Endosulfan II	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
23	Naphthalene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24	Anthracene	0.01	D	D	D	D	D	D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Source: JICA Survey Team (2016)

Remarks: Quantitative analysis for Benzen, Aldrin, Endrin, para-para-DDT, Hexachlorocyclohexane (α,β,δ and γ (lindan) isomers), Endosulfan I, Endosulfan II, Naphthalene and Anthracene, while qualitative analysis for other compounds

Table 5-5 Results Of Chemical Analysis of Soil Samples (2/3)

	Compounds	Detection limit, (mg/kg)	No.4						No.5						No.6						No.7					
			Aghavnatun <Appricot>						Aragats <Cabbage>						Baghramyan <Grape>						Tziatzan <Potato>					
			7 months before soil sampling						3 months before soil sampling						3 months before soil sampling						3 months before soil sampling					
			1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	Alachlor	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	Atrazine	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	Chlorfenvinphos	0.04	D	D	D	D	D	D	D	D	ND	ND	ND	ND	ND	ND	D	D	D	D	D	D	D	D	D	D
4	Chlorpyrifos	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	Fluoranthene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6	Hexachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	Nonylphenols (4-Nonylphenol)	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	Pentachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	Pentachlorophenol	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10	Benzene	0.0005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00296	0.00221	0.0027	0.003	0.0025	0.003	ND	ND	ND	ND	ND	ND
11	Simazine	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12	Trichlorobenzenes	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
13	Trichloromethane	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
14	Trifluralin	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
15	Aldrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16	Dieldrin	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
17	Isodrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
18	Endrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
19	para-para-DDT	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
20	Hexachlorocyclohexane (α,β,δ and γ (lindan) isomers)	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
21	Endosulfan I	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22	Endosulfan II	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
23	Naphthalene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24	Anthracene	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 5-5 Results of Chemical Analysis of Soil Samples (3/3)

	Compounds	Detection limit, (mg/kg)	No.8						No.9						No.10					
			Tzaghkalanj <Grape>						Hovtamech <Tomato in greenhouse>						Mrgastan <Onion>					
			4 months before soil sampling						3 months before soil sampling						3 months before soil sampling					
			1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	Alachlor	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	Atrazine	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	Chlorfenvinphos	0.04	ND	D	ND	D	ND	D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	Chlorpyrifos	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	Fluoranthene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6	Hexachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	Nonylphenols (4-Nonylphenol)	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	Pentachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	Pentachlorophenol	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10	Benzene	0.0005	0.0017	0.0015	0.0016	0.0018	0.0017	0.0015	0.0008	0.00070	0.00060	0.0008	0.0009	0.0009	ND	ND	ND	ND	ND	ND
11	Simazine	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12	Trichlorobenzenes	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
13	Trichloromethane	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
14	Trifluralin	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
15	Aldrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16	Dieldrin	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
17	Isodrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
18	Endrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
19	para-para-DDT	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
20	Hexachlorocyclohexane (α,β,δ and γ (lindan) isomers)	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
21	Endosulfan I	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22	Endosulfan II	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
23	Naphthalene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24	Anthracene	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 5-6 Results of Chemical Analysis of Groundwater Samples

Sampling place		Unit	Aratashen 1	Aratashen 2	Aratashen 3	Artimet 1	Artimet 2	Griboyedov 1	Griboyedov 2	Khoronk 1	Khoronk 2	Khoronk 3	Detection limits
			①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	
Depth of groundwater level			6m	25m	10m	4m	8m	2m	6m	8m	1m	10m	
Well depth			9m	30m	80-100m	6m	11m	4.5m	7m	17m	6m	80-100m	
Comoponents of fertilizer													
1	Nitrates (NO_3-N)	mgN/l	11.51	0.90	2.15	5.91	7.91	4.85	9.34	**31.74**	14.10	3.00	0.01
2	Nitrites (NO_2-N)	mgN/l	0.0585	0.0014	ND	0.0045	0.0476	0.0095	0.0041	0.0009	0.0005	0.0023	0.0003
Components of pesticide/insecticide													
1	Alachlor	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.07
2	Atrazine	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.060
3	Chlorfenvinphos	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
4	Chlorpyrifos	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.002
5	Fluoranthene	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0
6	Hexachlorobenzene	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
7	Nonylphenols	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.20
8	Pentachlorobenzene	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
9	Pentachlorophenol	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10
10	Benzene	µg/l	0.40	0.20	1.40	0.30	0.60	0.50	0.10	0.20	0.30	ND	0.05
11	Simazine	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
12	Trichlorobenzenes	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
13	Trichloromethane	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
14	Trifluralin	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05
15	Aldrin	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02
16	Dieldrin	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
17	Isodrin	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.015
18	Endrin	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.012
19	para-para-DDT	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0025
20	Hexa-chlorocyclohexane	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
21	Endosulfan I	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02
22	Endosulfan II	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02
23	Naphthalene	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.20
24	Anthracene	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01

Source: JICA Survey Team (2016)

ND: Not Detected

Methodology: Ion chromatography for Nitrate, Spectrometer for Nitrite, Gas Chromatography flame ionization detector for Benzene, Gas Chromatography/Mass Spectrometer for other pesticides/insecticides.

Groundwater depth is based on interview to the users.

Khoronk 3 and Aratashen 3 are from pump stations, while others are from individual wells.

Highlighted cells show high nitrate concentration.

5.1.9 Fauna and Flora

(1) Fauna

The survey on eco-system in and around the Yeghvard reservoir and proposed canals was implemented through literature review and field survey. The survey of terrestrial animals has been conducted using the methods by Formozov (1951 and 1976), and Novikov (1953). Concerning mammals, footprints, traces of animal feeding (remains of food, stubs and so on), animals scat, nests, holes were confirmed through the field survey, and species within the area were identified. Birds monitoring was conducted using binocular "Bushnell" and monocle "Kowa". The observation distance for relatively big species of birds was 100-500 m. Information/data about the reptiles, amphibians and insects were obtained based on the combination of field survey and literature review. The field survey for all of the species was done on 15th September 2015 and 7th March, 2016.

The survey result, namely, identified number of species is shown in following table. Ten (10) mammals, 56 birds, one (1) Amphibian, five (5) Reptiles and 36 insects were identified. The bird diversity is rich compared with others, and four bird species are registered in the RA red list. Moreover, one (1) species, namely, Egyptian Vulture (*Neophron percnopterus*) is categorized into "Endangered" in the IUCN Red list and also registered in RA red list. In addition, one snake, *Elaphe quatuorlineata* is categorized as "Near threatened" in the IUCN red list.

Table 5-7 Identified Species

Category	No. of species	No. of species registered in Red list
Mammals	10	0
Birds	56	4 for RA red list (1 for IUCN red list)
Amphibians	1	0
Reptiles	5	1 for IUCN red list
Insects	36	0

Source: JICA Survey Team

(a) Mammals

Ten (10) species of mammals were identified and they are Hedgehog, Hare, Wolf, Fox, Marten and Rodents (Hamster, Mouse, Vole and Gerbil). No species is resisted in the IUCN and RA red list. The identified species can be categorized into three groups as follows:

i. Species that uses the area for transition purposes:

The group includes species with rather high activity and movement during the day, namely, wolf (Canis Lupus), Red fox (Vulpes vulpes, see photo). They sometimes pass through the area, but rarely use it for feeding.

ii. Species that partially uses the area:

The group includes European hare (Lepus europaeus), Beech marten (Martes foina, see photo) with less movement and activity during the day, which can live in project area or in adjacent territories. Furthermore, they can use these areas for feeding also.

iii. Inhabitants of the project area:

The group consists of species, who permanently lives in the project area and whose movement areal is not large. They are Hedgehog (Erinaceus concolor), Least weasel (Mustela nivalis, see photo), number of small rodents. Rodents attract predator birds and sometimes even some types of mammals.


Red fox *(Vulpes vulpes)*


Beech marten *(Martes foina)*


Least weasel *(Mustela nivalis)*

(b) Birds

Out of all identified birds in the area, 17 species are nested in and around the project site. They are Red-backed Shrike (Lanius collurio), Hoppoe (Upupa epops), European roller (Coracias garrulus) and so on. European roller (Coracias garrulus), which is registered in the RA red list, is nested within the project area, however, it is migratory bird in Armenia.


European roller *(Coracias garrulus)*


Red-backed Shrike (*Lanius collurio*)


Hoppoe (*Upupa epops*)

Out of total 56 species, 16 species seems occasionally drop by the area for hunting, taking a rest, drinking water and so on, and they are not nested in and around the project area. These species include Black Kite (Milvus migrans), Green Sandpiper (Tringa ochropus) and so on. Some of them are migratory and rarely observed in Armenia.


Wormwood (*Artemisia absinthium)*


Chicory (*Cichorium intybus)*

There are four (4) bird species, which are registered in the red list for IUCN and RA, were identified in the area. All of them are categorized into "full migrant" in terms of moving pattern in the IUCN, and their habitats and ecological characteristics are as described below:

i. Egyptian Vulture (*Neophron percnopterus*): registered in both IUCN red list and RA red list

The species is migratory and forms a nest on ledges, caves, large trees, buildings. No nest is in the reservoir area and it was accidentally found. Probably, the project area is not suitable to nest for the

species, considering the situation in the area.

ii. Short-toed Eagle (*Circaetus gallicus*): registered in RA red list

Movement pattern is full migrant. It forms a nest in the low trees. No nest is in the reservoir area and it was accidentally found in the survey.

iii. Golden Eagle (*Aquila chrysaetos*): registered in RA red list

No nest is in the reservoir area and it was casually identified. It widely ranges on flat or mountainous, open habitat area, and forms a nest on cliff ledges, large trees and artificial structures.

iv. European Roller (*Coracias garrulus*): registered in RA red list

There is nest of the species in the Reservoir. The bird prefers an open countryside with forests, orchards, mixed farmlands and the project area is suitable for the species to nest. It is regarded migratory bird in Armenia.

(c) Reptiles and Amphibians

Concerning Reptiles which range in and around the project area, Blind snake (*Typhlops vermicularis)*, Snakes (*Eirenis collaris, Elaphe quatuorlineata* and *Vipera lebetina*), Lizard (*Laudakia caucasica*) were identified. On the other hand, regarding Amphibians, only one frog (*Laudakia caucasica*) was identified. Out of snakes, *Elaphe quatuorlineata* is categorized as "Near threatened" in the IUCN red list, it is not registered in RA redlist, though. The snake is generally found in forest, cultivated area, open woodland and near water body. It tend to have very large home range[19].

(d) Insects

36 species of Insects were identified. Ground beetles are dominating in the project area. Compared with the existing data list in the past, composition of insect species was drastically changed. It is probablly because that fertile top soil had been taken and earth works was done during the Soviet Unit period.

(2) Flora

Until 1980s, vineyard had been operated in the Reservoir, and after the independence in 1991, some parts of the reservoir has been utilized as farmlands such as wheat and barley fields, while other parts have been used for grazing. At this moment, the Project area is mostly steppe zones with few trees, and wormwood and mixed herbs-wormwood are prevailing. Main species are Wormwood (*Artemisia absinthium*), Chicory (*Cichorium intybus*), Goldenrod (*Solidago virgaurea*), Scorzonera suberose (*Scorzonera suberosa*), Quackgrass (*Elytrigia repens*) and so on. Representatives of other plant families are Stinging nettle (*Urtica dioica*), Catch weed (*Galium aparine*).

There are variou herbs in the area, however, they are common species in Armenia. There are no flora species which are rare, threatened, endangered, vulnerable. No flora species in and around the Project site is registered in the Red Book of the RA and IUCN Red List.

[19] IUCN Red list


Wormwood (*Artemisia absinthium)*


Chicory (*Cichorium intybus)*


Goldenrod (*Solidago virgaurea,)*


Scorzonera suberose (*Scorzonera suberosa)*


Quackgrass (*Elytrigia repens)*


Stinging nettle (*Urtica dioica)*

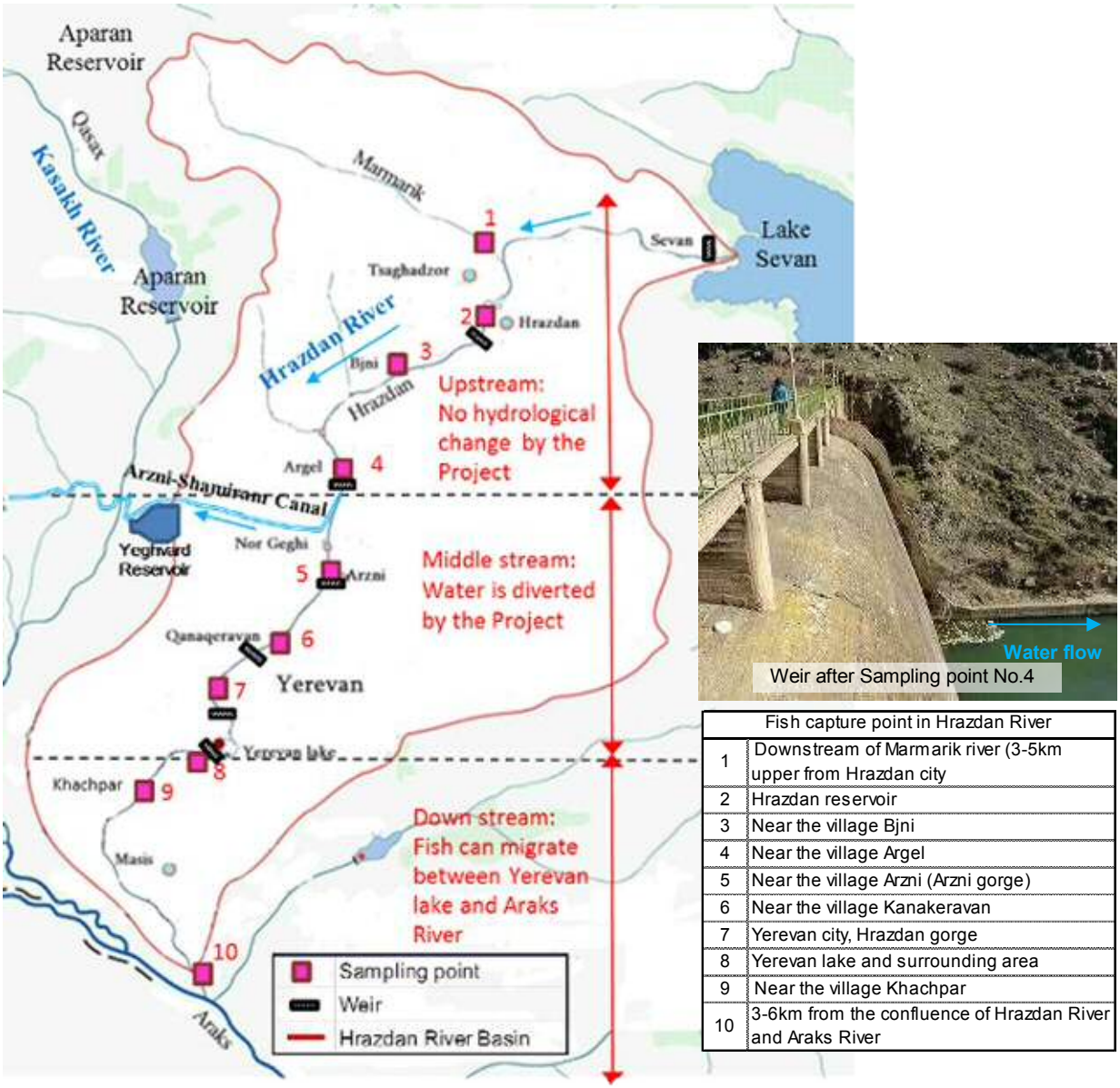

Catch weed (*Galium aparine)*

5.1.10 Ichthyological Situations in Hrazdan River and Kasakh River

(1) Fish Species in Hrazdan River

A series of Ichthyological surveys in the Hrazdan River was implemented in October to November 2015. Ten (10) points were identified for capture of fish in Hrazdan River as shown in Figure 5-19. It is noted that Hrazdan River has been highly controlled and utilized for irrigation and hydro power generation, and there are seven (7) weirs between the Lake Sevan and Lake/reservoir Yerevan. Based on the current situation and project design, Hrazdan River can be divided into 1) upstream, 2) middle stream and 3) downstream as illustrated in Figure 5-19. Water for Yeghvard reservoir will be diverted through Arzni-Shamiram canal at upstream of weir in Argel (No.4), upstream is from No.1 to No.4. In the midstream, existing weirs for hydropower prevent fish migration even at this

moment due to no fish gate. In the downstream, fish can migrate without difficulty due to the absence of weir.



Fish capture point in Hrazdan River	
1	Downstream of Marmarik river (3-5km upper from Hrazdan city
2	Hrazdan reservoir
3	Near the village Bjni
4	Near the village Argel
5	Near the village Arzni (Arzni gorge)
6	Near the village Kanakeravan
7	Yerevan city, Hrazdan gorge
8	Yerevan lake and surrounding area
9	Near the village Khachpar
10	3-6km from the confluence of Hrazdan River and Araks River

Figure 5-19 Location of Fish Capture Points in Hrazdan River

In total, twenty-eight (28) species were identified in Hrazdan River by the ichthyological survey (JICA, 2015) in October and November, 2015. At the fish capture points.8, 9 and 10, more species were observed. It is probably because that discharge in the downstream is more than that in upstream, and there are no weir in the downstream. Considering that the water for the Yeghvard reservoir is planned to be diverted at downstream of the sampling point 4, no hydrological change is expected in the upstream, therefore, ichthyological ecosystem in the upstream will not influenced by the Project. The fish species in the Hrazdan River are presented below in Table 5-8.

Table 5-8 Identified Fish in Hrazdan River

Point No	Fish species	Date of survey
1	Kura barbell (*Barbus lacerta cyri*), Sevan khramulya (*Capoeta capoeta sevangi*/ Varicorhinus capoeta sevangi), South Caspian sprilin (*Alburnoides eichwaldii*), Prussian carp (*Carassius gibelio*), Brown trout (*Salmo trutta fario*), Rainbow trout (*Oncorhynchus mykiss)*	Oct. 17

Point No	Fish species	Date of survey
2	Kura barbell (*Barbus lacerta cyri*), Kura nase (*Chondrostoma cyri)*, Chub (*Squalius orientalis)*, Sevan khramulya (*Capoeta capoeta sevangi*), South Caspian sprilin (*Alburnoides eichwaldii*), Prussian carp (*Carassius gibelio*), Rainbow trout (*Oncorhynchus mykiss*), Topmouth gudgeon (*Pseudorasbora parva*)	Oct. 17
3	Kura barbell (*Barbus lacerta cyri*),Sevan khramulya (*Capoeta capoeta sevangi*), South Caspian sprilin (*Alburnoides eichwaldii*), Prussian carp (*Carassius gibelio*), Brown trout (*Salmo trutta fario*)	Oct. 18
4	Kura barbell (*Barbus lacerta cyri*), Sevan khramulya (*Capoeta capoeta sevangi*), South Caspian sprilin (*Alburnoides eichwaldii*)	Oct. 18
5	Kura barbell (*Barbus lacerta cyri*), Sevan khramulya (*Capoeta capoeta sevangi*), South Caspian sprilin (*Alburnoides eichwaldii*), Kura loach (*Oxynoemacheilus brandtii*), Prussian carp (*Carassius gibelio*), Rainbow trout (*Oncorhynchus mykiss*)	Oct. 31
6	Kura barbell (*Barbus lacerta cyri*), Sevan khramulya (*Capoeta capoeta sevangi*), South Caspian sprilin (*Alburnoides eichwaldii*), Kura loach (*Oxynoemacheilus brandtii*), Topmouth gudgeon (*Pseudorasbora parva*), Prussian carp (*Carassius gibfelio)*, Rainbow trout (*Oncorhynchus mykiss*)	Oct. 31
7	Kura barbell (*Barbus lacerta cyri*), Sevan khramulya (*Capoeta capoeta sevangi*), South Caspian sprilin (*Alburnoides eichwaldii*), Angora loach (*Oxynoemacheilus angorae*), Kura loach (*Oxynoemacheilus brandtii*), Topmouth gudgeon (*Pseudorasbora parva*), Prussian carp (*Carassius gibelio*), Rainbow trout (*Oncorhynchus mykiss*)	Nov. 7 and Nov. 21
8	Kura barbell (*Barbus lacerta cyri*), Sevan khramulya (*Capoeta capoeta sevangi*), Kura khramulya (*Capoeta capoeta capoeta)*, South Caspian sprilin (*Alburnoides eichwaldii*), Angora loach (*Oxynoemacheilus angorae*), Sunbleak (*Leucaspius delineatus*), Topmouth gudgeon (*Pseudorasbora parva*), Prussian carp (*Carassius gibelio*), Monkey goby (*Neogobius fluviatilis*), Common carp (*Cyprinus carpio*), Eastern mosquitofish (*Gambusia holbrooki*).	Nov. 7 and Nov. 21
9	Blackbrow bleak (*Acanthalburnus microlepis*), Kura barbell (*Barbus lacerta cyri*), White bream (*Blicca bjoerkna transcaucasica*), Kura nase (*Chondrostoma cyri*), Gudgeon (*Gobio gobio*), Chub (*Squalius orientalis)*, Sevan khramulya (*Capoeta capoeta sevangi*),Kura khramulya (*Capoeta capoeta capoeta)*, South Caspian sprilin (*Alburnoides eichwaldii*), Angora loach (*Oxynoemacheilus angorae*), Kura loach (*Oxynoemacheilus brandtii*), Sunbleak (*Leucaspius delineatus*), Topmouth gudgeon (*Pseudorasbora parva*), Prussian carp (*Carassius gibelio*), Monkey goby (*Neogobius fluviatilis*), Bulatmai barbell (*Luciobarbus capito*), Mursa (*Luciobarbus mursa*), Common carp (*Cyprinus carpio*), Rainbow trout (*Oncorhynchus mykiss*), Eastern mosquitofish (*Gambusia holbrooki*).	Oct. 10 and Oct. 24
10	Blackbrow bleak (*Acanthalburnus microlepis*), North Caucasian bleak (*Alburnus hohenackeri*)**,** Kura bleak (*Alburnus filippii*), Kura barbell (*Barbus lacerta cyri*), White bream (*Blicca bjoerkna transcaucasica*), Kura nase (*Chondrostoma cyri*), Gudgeon (*Gobio gobio*), Chub (*Squalius orientalis)*, Sevan khramulya (*Capoeta capoeta sevangi*), Kura khramulya (*Capoeta capoeta capoeta*), European bitterling (*Rhodeus amarus)*), South Caspian sprilin (*Alburnoides eichwaldii*), Angora loach (*Oxynoemacheilus angorae*), Sunbleak (*Leucaspius delineatus*), Topmouth gudgeon (*Pseudorasbora parva*), Prussian carp (*Carassius gibelio*), Monkey goby (*Neogobius fluviatilis*), Armenian roach(*Rutilus rutilus schelkovnikovi)*, Asp (*Aspius aspius*), Bulatmai barbell (*Luciobarbus capito*), Mursa (*Luciobarbus mursa*), Common carp (*Cyprinus carpio*), Common bream (*Abramis brama*), Wels catfish (*Silurus glanis*), Eastern mosquitofish (*Gambusia holbrooki*).	Oct. 10 and Oct. 24

Source: JICA Survey Team (2015)

*1. It is controversial whether Kura khramulya (*Capoeta capoeta capoeta)* is different species from *Capoeta capoeta sevangi, and Capoeta capoeta is called as* Sevan Kharamulya (*Varicorhinus capoeta sevangi*) according to Wikipedia. Sevan khramulya (it was also called as *Varicorhinus capoeta sevangi*) are identified at many points as shown in the table above, and the fish is common in many rivers in Armenia recently, while it has been decreased in the Lake Sevan rapidly and listed in the Armenian Red list.

*2. Armenian Roach (*Rutilus rutilus schelkovnikovi*) is synonym of *Rutilus rutilus.*

*3. Highlighted fish are endangered species as follows:

1) Common carp: Vulnerable (VU) A2ce in the IUCN Red list

2) Sevan khramulya (*Capoetacapoeta sevangi or* Varicorhinus capoeta sevangi*):* VU A1cd in the Armenian Red list

3) Armenian roach (*Rutilus rutilus schelkovnikovi):* Endangered (EN) B 1ab (iii) +2ab (III) in the Armenian Red list; and

4) Asp *(Aspius aspius):* VU B1ab (iii) in the Armenian Red list.

(2) Fish Species in Kasakh River

A series of Ichthyological surveys in the Kasakh River was implemented in October to November 2015. Eight (8) points were identified as the fish capture points in the Kasakh River as shown in Figure 5-20. Kasakh River passes through the Aparan Reservoir and the river discharge is influenced by the discharge from the reservoir. After the merge with the Amberd River, Kasakh River flows and merges with the Metsamor River, and finally it flows into the Araks River.

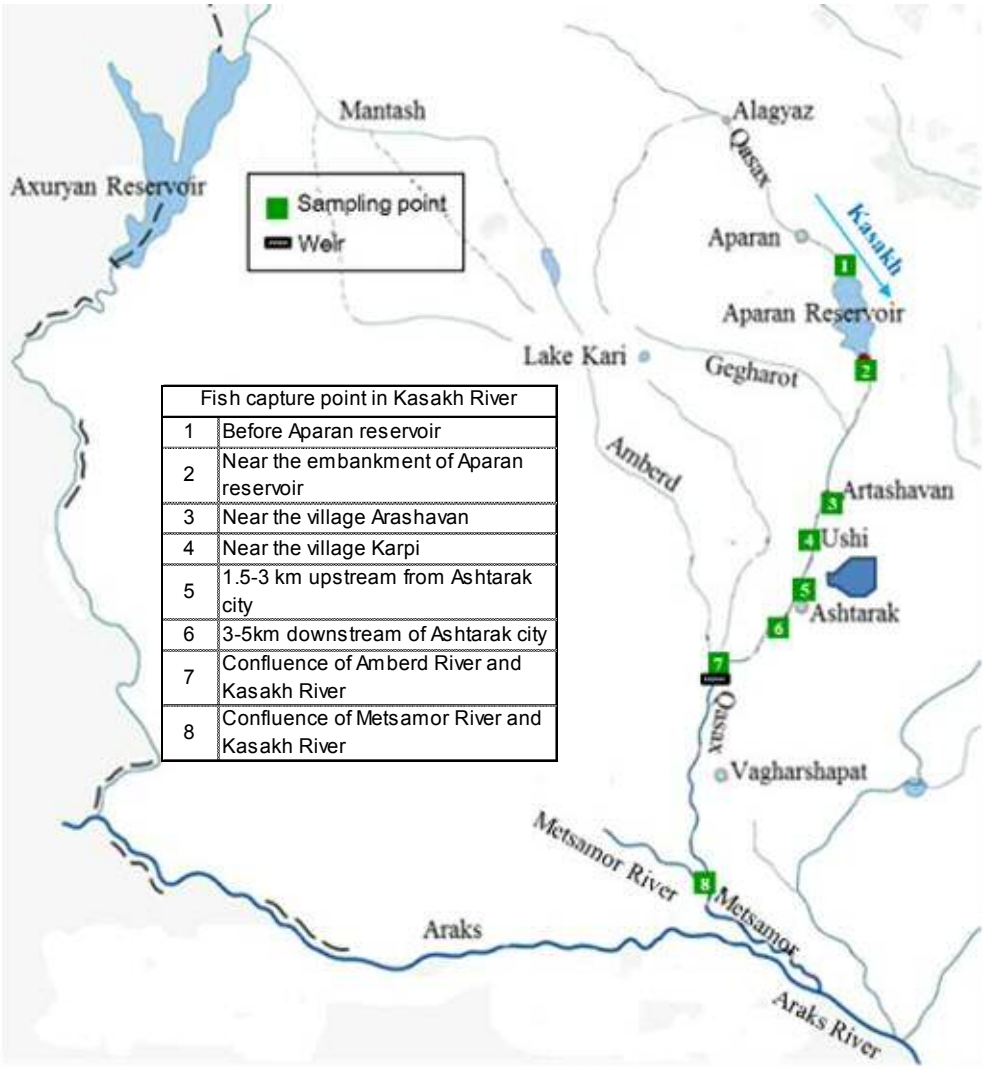


Figure 5-20 Location of Fish Capture Points in Kasakh River

In Kasakh River, fifteen (15) species were identified by the survey in October and November, 2015, less than that in Hrazdan River. It is probably because that water of the Kasakh River has been utilized maximally for irrigation at the Kasakh Weir (sampling point), which results in no water in and after the Kasakh Intake.

Table 5-9 Identified Fish in Kasakh River

Point No	Fish species	Date of survey
1	South Caspian sprilin (*Alburnoides eichwaldii*), Kura barbell (*Barbus lacerta cyri*), Sevan khramulya (*Capoeta capoeta sevangi*), Prussian carp (*Carassius gibelio*), Brown trout (*Salmo trutta fario*)	Oct. 11
2	South Caspian sprilin (*Alburnoides eichwaldii*),Kura barbell (*Barbus lacerta cyri*), Chub (*Squalius orientalis*), Sevan khramulya(*Capoeta capoeta sevangi*), Prussian carp (*Carassius gibelio*)	Oct. 11
3	South Caspian sprilin (*Alburnoides eichwaldii*), Kura barbell (*Barbus lacerta cyri*), Topmouth gudgeon	Oct. 09

Point No	Fish species	Date of survey
	(*Pseudorasbora parva*), Prussian carp (*Carassius gibelio*)	
4	South Caspian sprilin (*Alburnoides eichwaldii*), Kura barbell (*Barbus lacerta cyri*), Sevan khramulya (*Capoeta capoeta sevangi*), Topmouth gudgeon (*Pseudorasbora parva*), Prussian carp (*Carassius gibelio*), Rainbow trout (*Oncorhynchus mykiss)*	Oct. 09
5	South Caspian sprilin (*Alburnoides eichwaldii*), Kura barbell (*Barbus lacerta cyri*), Sevan khramulya (*Capoeta capoeta sevangi*), Kura khramulya (*Capoeta capoeta capoeta)*, Prussian carp (*Carassius gibelio*), Rainbow trout (*Oncorhynchus mykiss)*	Nov. 08
6	South Caspian sprilin (*Alburnoides eichwaldii*), Kura barbell (*Barbus lacerta cyri*), Kura nase (*Chondrostoma cyri*), Topmouth gudgeon (*Pseudorasbora parva*), Prussian carp (*Carassius gibelio*), Mursa (*Luciobarbus mursa*), Common Common carp (*Cyprinus carpio*), Rainbow trout (*Oncorhynchus mykiss)*	Nov. 08
7	South Caspian sprilin (*Alburnoides eichwaldii*), Kura bleak (*Alburnus filippii*), Kura barbell (*Barbus lacerta cyri*), Kura nase (*Squalius orientalis*), Chub(*Alburnus filippii*), Sevan khramulya (*Capoeta capoeta sevangi*), Topmouth gudgeon (*Pseudorasbora parva*), Prussian carp (*Carassius gibelio*), Brown trout (*Salmo trutta fario*), Rainbow trout (*Oncorhynchus mykiss)*	Nov. 14
8	South Caspian sprilin (*Alburnoides eichwaldii*), Kura bleak (*Alburnus filippii*), Kura barbell (*Barbus lacerta cyri*), Kura nase (*Squalius orientalis*), Chub(*Alburnus filippii*), Sevan khramulya (*Capoeta capoeta sevangi*), Kura khramulya (*Capoeta capoeta capoeta)*, Angora loach (*Oxynoemacheilus angorae*), Topmouth gudgeon (*Pseudorasbora parva*), Prussian carp (*Carassius gibelio*), Bulatmai barbell (*Luciobarbus capito*), Mursa (*Luciobarbus mursa*), Common Common carp (*Cyprinus carpio*), Rainbow trout (*Oncorhynchus mykiss)*	Nov. 15

Source: JICA Survey Team (2015)

Highlighted fish are endangered species as follows:

1) Common carp: Vulnerable (VU) A2ce in the IUCN Red list; and

2) Sevan khramulya (*Capoeta capoeta sevangi*/Varicorhinus capoeta sevangi*):* VU A1cd in the Armenian Red list.

In Hrazdan River and Kasakh River, Most of the identified fish species except Brown trout (*Salmo trutta fario)* and Armenian Roach (*Rutilus rutilus schelkovnikovi*) spawn in spring, March or April to June or July. Some fish are migratory from downstream to upstream in spring, while from upstream to downstream in autumn, and others are not migratory. However, due to weirs which are not equipped with fish gates, migration in the Hrazdan River is probably very limited to short intervals between a weir and the following weir. Generally the fish spawn on the river gravels or plants in the shallow river water or lake. Necessary depth for spawning is around 0.2-0.5 m. Appendix 4 shows ecological and habitat conditions of each fish in the Hrazdan River and Kasakh River.

5.2 Social Environment

5.2.1 Population and Main Industries

(1) Beneficial Area

The command area of the Project ranges Kotayk, Aragatsotn and Armavir Marzes. The Yeghvard Reservoir is located in Kotayk Marz. The Marz is located in central part of Armenia and it is important in terms of domestic traffic/communication. In Kotayk Marz, energy industry such as electricity and food manufacture by using meat, fruit, vegetable, milk, wheat flour and beverage are actively operated. Total area of the Marz is 2,986 km^2, half of the land, 1,546 km^2, is used as farmlands. Concerning Aragatsotn Marz, main sector of economy is agriculture, and cereals, grass, potato and so on are cultivated mainly. Other industries are food manufacture and mining. Total area of Aragatsotn Marz is 2,756 km^2, farmland accounts (2,182 km^2) for about 80% of the whole area. Regarding Armavir, horticulture including grape cultivation and livestock such as sheep and goat are widely operated. Total area of the Marz is 1,242 km^2 and around 80% of the area (971 km^2) is farmland.

The beneficial area consists of 27 communities in Korayk Marz, Aragatsotn Marz, Armavir Marz. The area is covered by four (4) WUA, Yeghvard WUA, Ashtarak WUA, Vagharshapat WUA and Khoy

WUA. Population by community is shown below in Table 5-10. There is a tendency that the actual male residents' number is smaller than that of registered one, it depends on the community, though. It is probably because young men go to the urban area or foreign countries to work as seasonal workers. In case of women, the same trend is observed, however, the extent is not very big compared with that of men.

Table 5-10 Population of Beneficiary Area by Community and WUA

Region (Marz)	WUA	Community	Living			Registered		
			Male	Female	Total	Male	Female	Total
Kotayk	Yeghvard	1. Zovuni	2,657	2,744	5,401	2,729	2,750	5,479
		2. Qasakh	2,603	2,602	5,205	2,596	2,590	5,186
		3. Proshyan	2,426	2,561	4,978	2,556	2,591	5,147
Aragatsotn	Ashtarak	4. Sasunik	1,231	1,348	2,579	1,397	1,486	2,883
Armavir		5. Norakert	1,339	1,351	2,690	1,382	1,357	2,739
		6. Baghramyan	1,361	1,443	2,804	1,379	1,459	2,838
		7. Merdsavan	1,563	1,659	3,222	1,616	1,687	3,303
	Vagharshapat	8. Mrgastan	444	485	929	461	496	957
		9. Tsaghkunk	527	572	1,099	556	588	1,144
		10. Artimet	726	796	1,522	832	872	1,704
		11. Taronik	915	931	1,846	947	945	1,892
		12. Aratashen	1,255	1,219	2,474	1,268	1,237	2,505
		13. Khoronk	1,212	1,239	2,451	1,243	1,264	2,507
		14. Griboyedov	832	922	1,754	906	939	1,845
	Khoy	15. Lernamerds	186	181	367	197	187	384
		16. Amberd	604	674	1,278	682	730	1,412
		17. Aghavnatun	1,268	1,399	2,667	1,371	1,469	2,840
		18. Doghs	518	584	1,102	678	661	1,339
		19. Aragats	1,393	1,421	2,814	1,480	1,444	2,924
		20. Tsaghkalanj	571	632	1,203	637	646	1,283
		21. Hovtamej	493	551	1,044	497	547	1,044
		22. Tsiatsan	494	518	1,012	526	530	1,056
		23. Geghakert	1,139	1,236	2,375	1,241	1,323	2,564
		24. Haytagh	1,260	1,285	2,545	1,318	1,294	2,612
		25. Ferik	157	141	298	164	146	310
		26. Arshaluys	2,104	2,148	4,252	2,104	2,146	4,250
		27. Aknalich	1,253	1,268	2,521	1,297	1,269	2,566
Total			**27,874**	**31,910**	**62,432**	**32,060**	**32,653**	**64,713**

Source: National Statistical Service of the Republic of Armenia, 2011

(2) Project Affected Area

The Project affected area, construction site of reservoir and feeder/outlet canals, are located in Yeghvard and Nor-Yerznka communities in Kotayk Marz and Ashtarak community in Aragatsotn Marz. However, the affected area in Ashtarak community is very limited. Yeghvard city is located at the south foot of mountain Ara; distance from Yerevan City is around 16 km. The key sector is manufacturing industry, including production of food and beverages such as distilled alcoholic beverages, dairy products, flour production as well as production of leather goods and shoes. The people of Yeghvard community are also involved in agricultural sector, mainly grain farming. Nor-Yerznka community is located at the distance of around 20 km from Yerevan City. The main activity of the community is agriculture, fruit production and cattle rearing, in particular. Population of each community of the affected area is shown below in Table 5-11.

Table 5-11 Population of Affected Area

Region (Marz)	Community	Living			Registered		
		Male	Female	Total	Male	Female	Total
Kotayk	Yeghvard	5,338	5,996	11,334	5,632	6,040	11,672
	Nor-Yerznka	716	796	1,512	822	806	1,628
Aragatsotn	Ashtarak	9,018	9,464	18,482	9,749	9,866	19,615
Total		**15,072**	**16,256**	**31,328**	**16,203**	**16,712**	**32,915**

Source: National Statistical Service of the Republic of Armenia, 2011

5.2.2 Ethnic Minorities

In Armenia, major ethnic is Armenian, while ethnic minority people, Russians, Yezidi, Assyrian, Greeks, Kurds people also stay as citizens. For example, in Kotayk Marz, 98% of the population is Armenian, 1.2% of that is Yezidi (Census, 2011). The minority people are generally well integrated with Armenian people and they are not classified into indigenous people. Basically, the minority people do not have difficulty of communication by Armenian language. The minority people are regarded as citizens of Armenia, they can get passport as Armenians and can purchase lands officially. One of the beneficiary communities, Ferik Community, many Yezidi people have stayed since around 100 years ago, and they also will be beneficiaries of the Project. On the other hand, it was confirmed that there is no ethnic minority people in the Project affected areas.

5.2.3 Gender Issue

Generally, women do not take leaderships in Armenia, and traditionally it is thought that women have to be protected by men. There is a tendency that migrant labors who go to other countries/cities are men. In rural area, roles and responsibilities for farming are shared between men and women. For instance, heavy works such as harvest and irrigation works are shouldered by men, while relatively light works such as selection of harvested fruits to be packed are done by women. In other words, cereal production which needs operation of agricultural machines is implemented by men, while vegetable production which requires manual works is done by women. If heads of farm households are female, they can hire labors for those heavy works easily, since it is common for Armenian farmers to purchase seeds/fertilizers and employ labors by using loan. Sometimes, widows are supported by the neighbors, friends and relatives for the works.

The situations regarding gender issues is changing in Armenia, and the Head of Ashtarak Community, which is located on near the Project site, is female. Moreover, in June 2015, European Neighborhood Programme for Agriculture and Rural Development (ENPARD) was established under the support by the EU and Austrian Development Cooperation. The ENPARD does not focus on gender mainstreaming, however, one of the program component is to enhance women's leadership in farming activities. The program will support 56 agricultural groups, and it is planned that more than 40% of leaders of target groups have to be female. Considering those situations mentioned above, gender issue in Armenia is not a big problem.

5.3 Farming Conditions in the Beneficiary Area

The beneficial area is covered by four (4) WUAs. The area utilizes the Lake Sevan and the Hrazdan River as main irrigation sources, additionally, it utilizes pumped-up water through pump stations from the Metsamor River at this moment. The crop diversification is well advanced in the area. The planted area of each WUA is summarized as follows.

- Yeghvard WUA: High percentage of orchard and perennial grass (Alfalfa), and low percentage of vegetables and wheat.
- Ashtarak WUA: High percentage of grape, and low percentage of vegetables and wheat.

- Vagarshapat WUA: High percentage of wheat and vegetables, and low percentage of fruits and others.
- Khoy WUA: All kinds of crops are equally planted. Representing the cropping in the target irrigation area.

There is no specific agricultural statistical data for the target irrigation area. Water Sector Projects Implementation Unit (PIU) has data about the planted area of crops for the area in 2013 (see Table 5-12). Since it is impossible to grow crops without irrigation on a commercial scale in the area, the irrigated area is equal to the planted area. Out of 12,200ha of farmland in the cadaster, 9,220ha has been actually cultivated.

Table 5-12 Planted Area by Crops in the Project Area in 2013

Name of WUA		Farmland in Cadaster (ha)	Planted Area/Irrigated Area (ha)						
			Wheat	Vegetables	Grape	Orchard	Perennial grass	Others	**Total**
1	Yeghvard	2,428	152.0	53.0	76.0	348.0	213.0	208.4	**1,050.4**
	%	-	(14.5)	(5.0)	(7.2)	(33.1)	(20.3)	(19.8)	**(100.0)**
2	Ashtarak	1,739	109.0	81.0	416.0	69.0	67.0	174.0	**916.0**
	%	-	(11.9)	(8.8)	(45.4)	(7.5)	(7.3)	(19.0)	**(100.0)**
3	Vagarshapat	2,797	656.0	751.0	105.0	50.0	211.0	388.0	2,161.0
	%	-	(30.4)	(34.8)	(4.9)	(2.3)	(9.8)	(18.0)	100.0
4	Khoy	5,236	1,107.0	1,222.0	766.0	523.0	347.0	1,128.0	**5,093.0**
	%	-	(21.7)	(24.0)	(15.0)	(10.3)	(6.8)	(22.1)	**(100.0)**
Total		**12,200**	**2,024.0**	**2,107.0**	**1,363.0**	**990.0**	**838.0**	**1,898.4**	**9,220.4**
%		-	**(22.0)**	**(22.9)**	**(14.8)**	**(10.7)**	**(9.1)**	**(20.6)**	**(100.0)**

Source：PIU, the State Committee for Water System, 2013

According to the Department of Horticulture Crop Production and Plant Protection, MOA, applied agrichemicals in Armenia are imported from various countries. Consequently, prices of agrochemicals are relatively high, and the amount of agrichemical consumed by farmers is not very big. During Soviet Union period, agrichemical had been applied for farming in the Ararat Plain intensively, however, it has not been done very much after the independence. Moreover, no case of agrichemical pollution of irrigation canals and rivers has been reported so far in Armenia according to the official personnel of MOA and MNP. On the other hand, there is no surface water quality or soil quality standard regarding agrochemicals in Armenia. Environmental Impact Monitoring Center under the MNP conducts water quality monitoring of some river waters regularly, however, the monitoring does not cover agrochemicals.

CHAPTER 6 IMPACT ASSESSMENT

The content and extent of the environmental and social matters, which needed to be addressed in this ESIA were identified through scoping. This helps to ensure that information used for decision making provides a comprehensive picture of the effects of the Project, including issues of particular concern to affected groups. Scoping also helps to focus the resources on the important issues for decision making, and avoids wasted effort on issues of little relevance.

This sub-chapter discusses the expected environmental impacts by the Project. It is noted that the impacts will be caused by the newly constructed facilities, namely, the Reservoir, Outlet Canals and Feeder Canals. On the other hand, the rehabilitation of the existing canals such as Arzni-Shamiram Canal, Lower Hrazdan Canal will cause only very minor impacts, and the extend will be negligible, since the main rehabilitation works are lining of the canals and abolishment of existing pump stations. It is planned to rehabilitate the existing facilities during winter season, which will result in no disturbance of farming and water distribution. The irrigation water in the canals does not flow in

winter, and mud water by the rehabilitation works will not be caused. Moreover, land acquisition or physical relocation are not necessary. Therefore, the following description focuses on the expected impacts by the newly construction works.

Impacts have also been assessed as to whether they are of construction or operation phase, whether they are reversible or irreversible, and whether they are positive or negative. Measures to avoid, reduce, mitigate or compensate for potentially significant negative impacts have been presented in Environmental Management Plan.

6.1 Impacts before Construction

6.1.1 Involuntary Resettlement/ Land Acquisition

Since there are no residential buildings in close proximity to the Yeghvard Reservoir and proposed Feeder/Outlet Canals construction sites, no physical relocation is expected by the Project. However, the Yeghvard Reservoir basin will be submerged and some farmlands along the proposed canals will be affected. In total, 819.36ha will be influenced by the construction works. The breakdown of the affected area is as follows:

Table 6-1 Affected Area

Land Ownership	Affected Area (ha)
State Land	54.49
Communal Land (Yeghvard Community)	705.66
Communal Land (Nor-Yerznka Community)	31.36
Communal Land (Ashtarak Community)	1.92
Private Land (Yeghvard Community)	10.05
Private Land (Nor-Yerznka Community)	14.44
Private Land (Ashtarak Community)	1.44
Total	819.36

It is noted that the compensation measures and supports for the affected persons due to the land acquisition are described in Resettlement Action Plan, which is prepared apart from this ESIA Report.

6.2 Impacts during Construction Period

6.2.1 Air quality

During the construction stage, in total 50 construction vehicles per day will be operated. However, most of them will be used around the Reservoir area, while 3-6 vehicles per day are operated around the Feeder Canals and Outlet Canals. The nearest residential area from the construction sites is Nor-Yerznka Community, it is planned that six (6) construction vehicles will be operated. However, the six vehicles will come to the community one by one, and gas emission will be limited. Proposed excavation period for the Outlet Canal 2 is 10 days, which will not result in severe dust generation, since water will be sprayed during the excavation. Moreover, moisture of soil cement should be kept at the certain level for reliability of anti-filtration, as a result, heavy dust generation can be avoided. On the other hand, in and around the Reservoir basin, most of the land use is for agricultural purpose, and the number of residential buildings around the reservoir is very limited. According to the in-situ test, all of parameters of ambient air are within the standard, especially, SO_2, NO_2 and CO were not detected. It is planned to spray water to minimize dust generation. At the residential area, which is sensitive for air quality, the number of vehicles to be operated is very limited. It is noted that strong wind is observed in around Nor-Yerznka Community in May to June, and it is needed to keep sufficient moisture around the construction sites to minimize dust generation. Generally, air pollution

by the Project will be not significant and probably, the air quality which exceeds the standard will not be caused.

6.2.2 Water Pollution

Due to the construction works, it is expected that mud water will be discharged from the construction site. However, it will be temporary and the situation will be caused during only construction period. It is needed to take countermeasures to minimize the impact to the downstream. It is proposed to set up sedimentation ponds to store the mud water from the construction sites, which will make it possible to minimize the mud water discharge to the surrounding environment.

6.2.3 Waste

During the construction stage both household and hazardous waste (oil, fuel, iron scrap, contaminated soil, oiled clothes, wood, construction waste, etc.) will be generated. They should be classified, separately stored in marked containers and disposed in accordance with the Law on Waste at the specified place specified by the MNP. It is necessary to get permission for waste disposal from the MNP. A large amount of soil waste also will be generated, however, it will be recycled for the construction works as much as possible. As whole, the impact is temporary and can be managed by implementation of proper waste handling procedures.

6.2.4 Soil Contamination

At the construction stage leakages of liquids, such as oil and fuel, from the vehicles and other equipment could take place. However, this impact is short term, relatively low. Regular check of the construction vehicles is necessary to prevent oil leakage.

6.2.5 Noise and Vibration

During the construction stage, traffic density also will be increased due to the delivery of materials and workforce and removal of soil and waste from the Project sites. The distance between the eastern dam of reservoir and the nearest residential building is approximately 400 m, however, the construction works will not be done within the Yeghvard Community, the noise and vibration by the Project will be limited. Regarding, Nor-Yerznka community, disturbance by noise during the construction will be inevitable. However, the period of noise disturbance due to soil exavation will be 10 days only, and noise by back hoe operation will be expected for 30 days. Therefore, the impact will be temporary, and efforts to minimize works during night time around the residential area wil be made. Therefore, it can be judeged that noise and vibration are not significant. The number of the vehicles to be operated around the communities cooncerned is very limited, the possibility that noise by the Project will exceed the standard level is very low. Still, it is needed to avoid concentration of vehicles in and around the communities.

6.2.6 Ecosystem (Fauna and Flora)

The reservoir area had been developed as vineyards until 1980s, and after the independence, it has been utilized as grassland and farmland for wheat and barley. Therefore, the area is not virgin land with original nature. 10 species of mammals were identified in and around the project site, and, they can be regarded as the ones which have adjusted such man-made environment so far. Those species can easily migrate to other areas which have similar characters, namely, orchards, farmland, grassland and so on around the project site. Considering the situation, the mammals in the area will not be affected by the Project very severely.

There are four (4) birds which are registered in the IUCN and RA red list. However, their movement patterns are categorized into as “full migratory” according to the IUCN, and all of them except

European Roller are not nested in the project site. Given that European Roller prefers to mixed farmland and orchard for nesting, they can easily find new places for their nests outside of the project area, where farmlands and orchards are extensively operated. Generally, the birds as well as mammals have adapted themselves to surrounding conditions, which is not primitive natural zone, so far. Consequently, it can be said that negative impacts on the birds by the Project. Rather than that, after the works, it is expected that the reservoir is attractive for birds as water resource, especially migratory birds, which will result in biodiversity promotion.

Regarding the snake, *Elaphe quatuorlineata,* is registered in the IUCN as "Near threatened". The species is generally identified in forest, cultivated area, open woodland and near water body, and it has very large home range and can move to other areas. Taking consideration into the characteristics, and it is not difficult for the species to find preferable habitat in the outside of the reservoir. Therefore, it can be judged that severe negative impact on the snakes by the Project is not expected. Still, it is noted to consider the poisonous snake species, which ranges the Reservoir, will also escape to outside of the Reservoir. It is needed to promote awareness of the surrounding persons how to handle the snake during construction stage. In general, severe negative impact on fauna in and around the project site is not expected.

Concerning flora, no dangers species were identified according to the survey. The area in and around the Project site has been developed by human beings and used for agricultural purpose so long time, therefore, mainly, weeds and grasses, which have relationship with the people and do not represent primitive natural conditions, will be inundated by the Project. However, the species can survive in other areas, since similar natural conditions. Therefore, significant negative impact on the flora by the Project in the area is not anticipated.

It is needed to secure enough time for the wildlife in the Reservoir to evacuate themselves to outside of the area. Therefore, it is recommended to divide the Reservoir basin into four (4) blocks, and the sequent construction works will be implemented by block. The method is expected to mitigate the anticipated damage to the fauna in the Reservoir to some extent.

6.2.7 The Poor

In Project affected area in and around the construction site, several households which get poverty allowance are identified. It is needed to pay some special attention to them, for instance, through employment of them as labors of the Project construction works with high priority and lump sum money payment.

6.2.8 Indigenous and Ethnic People

As mentioned before, some minority groups stay in the beneficial area, and they will be able to access to stable irritation water more than present. In the affected area, no ethnic minority people are identified.

6.2.9 Livelihood/Local Economy

Due to the land acquisition by the Project, some persons will be affected through land loss and so on. It is necessary to provide compensation and considerations to the affected persons.

6.2.10 Land Use and Local Resource Utilization

(1) Grazing Land

The reservoir basin has been used for farmland and grazing. The cultivators within the reservoir will lose their farmland, which can lead to decrease of their income, and it is needed to pay consideration to the affected persons. Concerning grazing land, some parties use the Reservoir basin for livestock

grazing, however, they do not stay in the same place continuously, and they are moving from flat grassland to mountainous area with their livestock. According to the person, who was grazing in the Reservoir basin, there are sufficient places for grazing, the loss of grassland area by the Project is not a big issue for him. Consequently, negative impacts on land use and local resource utilization will not be significant.

(2) Topsoil of the Reservoir Basin Area

According to the original project plan elaborated during the Soviet Union period, it is envisaged to transport top-soil from the Yeghvard Reservoir basin area to surrounding communities for production improvement. Therefore the people around the Project sites request the Project to transport the fertile top-soil of the Yeghvard Reservoir basin to Yeghvard Community and Nor-Yerznka Community during the construction stage. It is necessary to examine the volume of top-soil to be transported, storage sites and equal distribution measures among the people. After the Loan Agreement between Government of RA and Government of Japan, the SCWE and Communities concerned shall discuss the matter in collaboration with the MNP. The detailed procedure and method of soil transportation, storage and distribution is to be discussed at the community councils.

6.2.11 Existing Social Infrastructures and Services

During the construction works, traffic jam can be caused by the increase of traffic volume. The expected number of construction vehicles is around 50 per day. The vehicles will be operated within the Reservoir basin mainly and they will be parked in the area during the night. It means that the construction works within the Reservoir will not cause severe traffic jam. On the other hand, along the proposed Outlet Canal-2, the existing road is very narrow, and temporary road closure will be needed for around 30 days, which leads to inconvenience for the residents. However, it is possible for the people to access another road and the impact will be temporary. Therefore, it can be judged that the impact will not be significant. It is recommended to decentralize the use of construction vehicles to avoid traffic jam.

6.2.12 Misdistribution of Benefit and Damage and Conflict

There are beneficiaries and negatively affected persons of the Project, and it is planned to provide compensation to the affected persons to restore their livelihood to the original level. Given that there is sufficient distance between the beneficial area and affected area, the affected persons will not have a feeling of jealousy against the beneficiaries. Moreover, no case that any conflicts between beneficiaries and affected persons due to some projects have been reported so far in Armenia according to the official personnel of PIU. Therefore, the possibility of misdistribution of benefit and damage, and conflict is very low.

6.2.13 Cultural Heritage

In Yeghvard city, the nearest cultural heritage to the Project site is the Second World War victims monument that located at the distance of around 200 m away from reservoir. In Nor-Yerznka, the memorial fountain is located at the distance of 100 m away from the proposed Outlet Canal-2. It is recommended to conduct field reconnaissance survey during the Project technical design stage. Besides, construction contractors should be instructed to ensure pre-excavation checks for any cultural or archaeological artifacts. In case if some heritage are found, they shall stop all works and inform the Ministry of Culture of RA and resume only after securing proper clearances from the State authorities.

6.2.14 Hazards (Risk), Infectious Diseases such as HIV/AIDS

There could be no possibility of HIV infection during the construction works, given that there has no such case reported in Armenia so far. Moreover, malaria is not a common disease in Armenia, and

case of Malaria is very few. The proposed reservoir will have enough water depth, where mosquito cannot survive in the Reservoir. Therefore, no risk of infectious diseases by the Project is expected.

6.2.15 Work Environment

Improper working environment for labors can cause some accident related to construction works. It is needed to distribute necessary tools, proper uniform, helmet and glasses to the construction workers, and proper work shift management of the labors is essential to minimize the accident. Working condition, such as work hours per day shall be based on the regulation in Armenia.

6.2.16 Accident

During the construction stage, there is a possibility of traffic accident due to the increase of traffic volumes, it is needed to control construction vehicles and to set signboard showing construction site for warning surrounding people.

6.3 Impact during Operation Stage

6.3.1 Eutrophication of the Reservoir

Water source of the Reservoir is melted snow water in the Hrazdan River, and there is no waste water inflow point in the Hrazdan River before the Intake to the Arzni-Shamiram Canal. Moreover, water quality of Hrazdan River is suitable for irrigation as mentioned in Table 5-4. It means that the water quality at the Reservoir will be clean. It is planned to store water at the Yeghvard Reservoir from March to May and to divert the water for irrigation in summer season. It is expected that water flow, namely, from the Reservoir to the proposed canals, will be generated, as a result, water in the Reservoir will not be stagnant completely. Moreover, any cases that reservoir eutrophication have not been reported so far in Armenia according to the official personnel of PIU, SCWE. Therefore, it can be judged that eutrophication in the Reservoir will not be caused.

6.3.2 Water Pollution in the Canal/River

Main irrigation water source for the Yeghvard Reservoir is Arzni-Shamiram Canal. Considering water quality in the Canal, water quality in the Reservoir will be appropriate for irrigation. On the other hand, the water in the Lower Hrazdan Canal contains relatively high salinity, however, the condition will not be worsen by the Project, in other words, further salinization of the water is not expected. Therefore, it can be judged that no water quality deterioration due to the project is expected.

6.3.3 Soil Contamination

Illegal agrichemical has been detected in soil samples in several communities, and it is an issue to be considered during the operation stage. Staff of MOA regularly visit agrichemical dealers for monitoring of quality, expiration date for use, types and so on of their goods, however, sale of illegal agrichemical are found every year. The staff does not have authority to make an order to the sellers. The agrichemical handbook, which stipulates proper amount of agrichemical to be applied or suitable application timing, is issued annually, however, only thousands of them are distributed in nationwide due to the budgetary limitation. Due to the Project, it cannot deny the increase of the illegal agrichemical, even though the illegal agrichemical application is not direct effect of the Project. Regardless of the Project implementation, enhancement of the monitoring and proper agrichemical application should be promoted.

6.3.4 Ground Water Pollution

The MOA subsidizes fertilizer for farmers in Armenia, moreover, international donors such as United Nation Development Programme also provides nitrogen fertilizers. At this moment, parts of ground

water are influenced by nitrogen fertilizers, it depends on the location, though. Proper amount of fertilizer application should be promoted through awareness by staff of MOA regardless of the Project implementation. Furthermore, instead of groundwater, melted snow water will be mainly used for irrigation after the Project, conditions for nitrogen sensitive crop cultivation could be better than present. On the other hand, given that agrichemical concentration in the ground water is acceptable level, it can be concluded that ground water pollution by agrichemical by the Project is not very severe. Due to the reservoir construction, no ground water will be expected.

6.3.5 Hydrological Situation

(1) Hrazdan River

Due to the water diversion through the Project, hydrological situations will be changed to some extent. However, the Hrazdan river has been utilized for irrigation and power generation even now. The water of Hrazdan River is diverted to the natural flow and canal, and those flows are merged after the power generation in the Hrazdan River repeatedly. Ecological minimum discharge is secured for the natural flow at this moment based on the regulation. The same water management system will be continuously applied after the Project implementation.

It is planned to take 103 MCM water for the Yeghvard Reservoir. The amount of 103MCM will be taken 33MCM, 45MCM and 25MCM in March, April and May, respectively. Based on the conditions, trends of discharge after the Project at Yerevan Observatory and Masis Observatory are estimated, as shown illustrated in Figure 6-1. The Hrazdan River discharge would be reduced by the Project, and peak season could be changed from March-June to April-May, which means the peak period could be shorter than present. However, the similar pattern/trend of the discharge peak will be still kept. On the other hand, according to the operator of the Ranchapar Pump Station No.1 in the downstream of Hrazdan River, the drainage conditions around the pump station during snow-melting season is poor, which means the Hrazdan River in the downstream keeps high water level in the season.

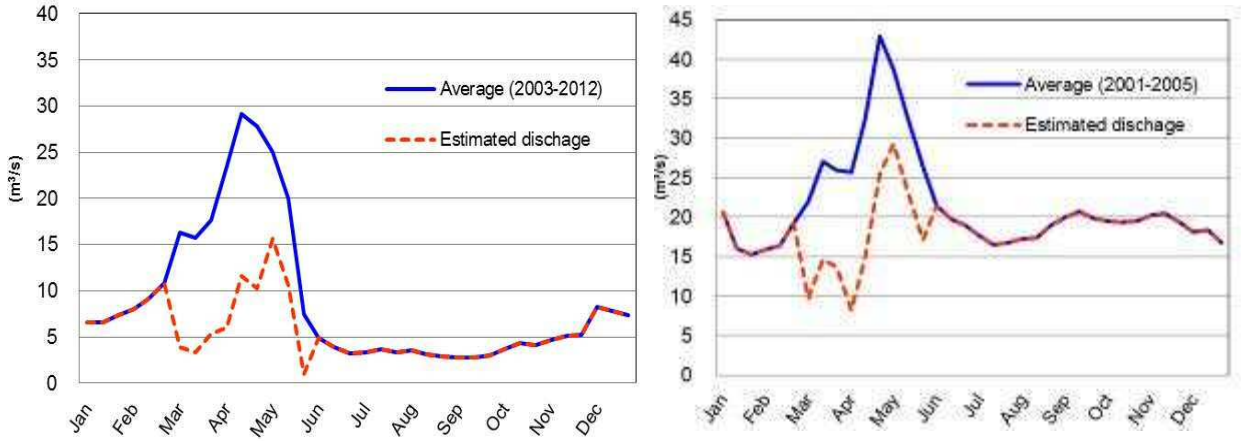


Figure 6-1 Current and Estimated Discharge (left: Yerevan Observatory, right: Masis Observatory)

Source of discharge data: Meteorological Department

(2) Kasakh River

The stored water at the Yeghvard Reservoir will be diverted to canals concerned through the Kasakh River. Therefore, the discharge in the river will be increased, however, it will not exceed the discharge in May as of present. It is noted that the interval which receive increased discharge is from the inflow point to the Kasakh Intake, namely, only 14km, and the impact will not be significant. Moreover, at the Kasakh Intake, most of the river water will be diverted to the canals as well as current operation. Therefore, no severe hydrological change in the Kasakh River by the Project is expected.

(3) Lake Sevan

Regarding the Lake Sevan, due to the suspension of water diversion from the lake by the Yeghvard Project, it is estimated that water level of the lake will be increased by 4cm per year, which is only 10% of the scale of impact compared with that by the Arpa-Sevan tunnel. Therefore, it can be said that the Project will not result in submerge of existing structures and trees around the Lake Sevan.

6.3.6 Ecosystem (Ichthyological System)

(1) Impact on Existing Ichthyological Eco-system in the Hrazdan River

Generally, spawning trigger of fresh water fish are water temperature change and generation of discharge peak. Moreover, enough water depth for spawning is necessary. When impacts on fish in the Hrazdan River are examined, it is possible to category 1) fish in the upstream of the intake for Arzni-Shamiram Canal, 2) fish in the middle stream (from the intake to the Lake Yerevan) and 3) fish in the downstream of the Hrazdan River. This matter is discussed as shown below.

(a) Fish in the Upstream

The fish in the upstream will not be damaged at all, since the area is upstream of the water intake point of the Arzni-Shamiram Canal for the Reservoir.

(b) Fish in the Middle Stream

As mentioned before, there are natural flow and canal in the Hrazdan River, and discharge in the natural flow is small. In addition, weirs for the hydro power generation prevent fish from migration between upstream and downstream. Such conditions will not be changed by the Project. Even now, the discharge in the middle stream of Natural Hrazdan River is not drastically increased by the meltwater. At this moment, 2-3 m^3/s discharge in the natural flow in the middle stream is observed as shown in following photos and it will be kept after the Project. Therefore, it can be said that spawning conditions for fish in middle stream will not be changed and the impacts on fish will be limited.

Natural Hrazdan River on 2nd March 2016, at just upstream of Lake Yerevan
(Left: beside of a restaurant along the river, right: just downstream of the point of the photo of left)

(c) Fish in the Downstream

In the downstream of the Hrazdan River, namely, from the Yerevan Lake to the Araks River, there is no big-scale of canal and weir. At Masis Observatory in the downstream, water depth is changed monthly, and it was highest in April and lowest in July in 2003. The lowest depth is around 3m in July 2003 as illustrated in following figure. Sufficient water depth for spawning will be secured in the downstream even in the lowest period, considering necessary depth for fish spawning is 0.2m to 0.5m as shown in Appendix 5.

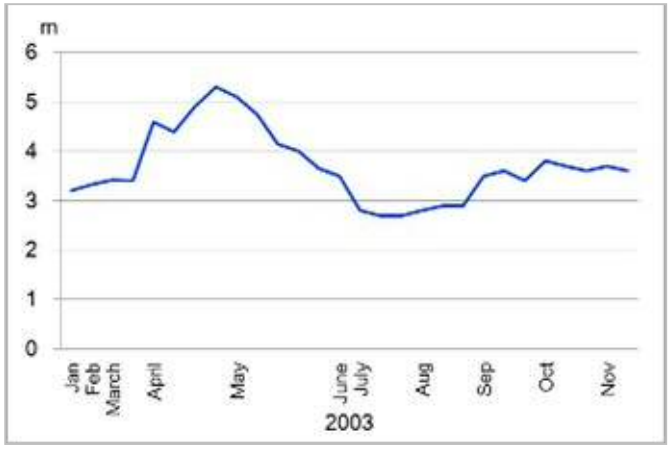


Figure 6-2 River Water Depth at Masis Station in 2003

Triggers for spawning are various depending on species, and they are summarized in Table 6-2. Spawning trigger for the thirteen (13) species, out of identified 28 fish species in the Hrazdan River, is a certain level of water temperature. It means that water diversion for the Yeghvard Reservoir will not give significant damages to the spawning of the 13 species. Concerning remaining species, the condition is unknown, however, even if their spawning trigger is discharge peak, they can also survive after the Project, since discharge peak will be secured as mentioned in Figure 6-1. Consequently, it can be judged that the current ichthyological system in the Hrazdan River will not be influenced by the Project significantly.

Table 6-2 Trigger for Spawning

No	Species of fish	Trigger	Remarks
1	Angora loach (*Oxynoemacheilus angorae)*	No data	-
2	Armenian roach (*Rutilus rutilus schelkovnikovi*)	In case of Rutilus rutilus, the trigger is mainly water temperature, the suitable one is very various from more than 6℃ to 10-12℃. Roach spawned synchronously with rapid increase in temperature, whereas they had a prolonged spawning with low or with slow increase in water temperature *1	Registered in the Red list in Armenia
3	Asp (*Aspius aspius*)	Above 8℃*2	Registered in the Red list in Armenia
4	Blackbrow bleak (*Acanthalburnus microlepis*)	No data	-
5	Brown trout (*Salmo trutta fario)*	Spawn in autumn	It ranges in the upstream of Hrazdan River, and it will be conserved after the Project
6	Bulatmai barbel (*Luciobarbus capito)*	No data	-
7	Chub (*Squalius orientalis)*	No data	It ranges in the upstream of Hrazdan River, and it will be conserved after the Project
8	Common bream (*Abramis brama*)	Above 15℃ *2	-
9	Common carp (*Cyprinus carpio)*	17-18℃*3	Registered in the IUCN Red list
10	Eastern mosaquitofish (*Gambusia holbrooki*)	No data	It is regarded as "invasive species" *4
11	European bitterling (*Rhodeus amarus*)	No data	-
12	Gudgeon (*Gobio gobio*)	Above 13℃ for spawning *2	-
13	Kura barbel (*Barbus lacerta cyri*)	No data	It ranges in the upstream of Hrazdan River, and it will be conserved after the Project
14	Kura bleak (*Alburnus filippii*)	No data	-
15	Kura khramulya (*Capoeta capoeta*	If the species is synonymy of Sevan	-

No	Species of fish	Trigger	Remarks
	capoeta)	khramulya (Capoeta Capoeta Sevangi), Spawning start at 12℃ and peaks at 15℃ *5	
16	Kura loach (*Oxynoemacheilus brandtii*)	No data	-
17	Kura nase (*Chondrostoma cyri*)	No data	It ranges in the upstream of Hrazdan River, and it will be conserved after the Project.
18	Monkey goby (*Neogobius fluviatilis*)	Above 13℃ *2	-
19	Mursa (*Luciobarbus mursa*)	No data	-
20	North Caucasian bleak (*Alburnus hohenackeri*)	Above 18～23℃for spawning *2	-
21	Prussian carp (*Carassius gibelio)*	Above 14℃ for spawning *7	It ranges in the upstream of Hrazdan River, and it will be conserved after the Project. However, it is regarded as an invasive species
22	Rainbow trout (*Oncorhynchus mykiss)*	In the wild, there are rainbow trout populations that spawn in autumn and there are other populations that spawn in spring *6	It ranges in the upstream of Hrazdan River, and it will be conserved after the Project
23	Sevan khramulya (*Capoeta capoeta sevangi*)	Spawning start at 12℃ and peaks at 15℃ *3	It ranges in the upstream of Hrazdan River, and it will be conserved after the Project. Registered in the Red list in Armenia
24	South Caspian sprilin (*Alburnoides eichwaldii*)	No data	It ranges in the upstream of Hrazdan River, and it will be conserved after the Project
25	Sunbleak (*Leucaspius delineates*)	When temperature reaches 16℃*2	-
26	Topmouth gudgeon (*Pseudorasbora parva*)	No data	It ranges in the upstream of Hrazdan River, and it will be conserved after the Project. However, it is regarded as pest due to its high reproductive rate*2
27	Wels catfish (*Silurus glanis*)	Above 20℃ *2	-
28	White bream (*Blicca bjoerkna transcaucasica*)	Above 15℃ for spawning *2	-

Remarks: Highlighted fish are registered in IUCN Red list and Armenian Red list.

Source: *1: Environmental Biology of Fishes Vol. No.3, p19-227, 1987,"Reproductive biology of stream spawning roach, Rutilus-Rutilus"

*2: IUCN Red list

*3: FAO, Cultured Aquatic Species Information Programme, "*Cyprinus carpio*"

*4: Global Invasive Species Database

*5: FAO, Corporate Document Repository, Fish and Fisheries in Lake Sevan, Armenia, and in some other high altitudes lakes of Caucasus. Since Kura khramulya (*Capoeta capoeta capoeta) and* Sevan khramulya (*Capoeta capoeta sevangi) could be the same species, it is presumed that their spawning conditions are the same.*

*6: FAO, 2011, Fisheries and Aquaculture Technical Paper 561, Small-scale rainbow trout farming

*7: Pipoyan S., Ichthyofaunal of Armenia, 2012

(2) Impact on Existing Ichthyological Ecosystem in the Kasakh River

There are some species which range in both Hrazdan River and Kasakh River. The number of species in the Hrazdan River is much more than that in Kasakh River, and 15 species are common as shown in following table. Since the water of Hrazdan River will be diverted between sampling point No.4 and No.5 to the Yeghvard Reservoir, the fish which are identified at No.5 sampling point may be moved to the Kasakh River through the Yeghvard Reservoir and they could mix with the fish in Kasakh River. They are Kura barbell (*Barbus lacerta cyri*), Sevan khramulya (*Capoeta capoeta sevangi*), South Caspian sprilin (*Alburnoides eichwaldii*), Kura loach (*Oxynoemacheilus brandtii*), Prussian carp (*Carassius gibelio*) and Rainbow trout (*Oncorhynchus mykiss*). All of them except Kura loach are

identified in the Kasakh River also. Considering the situation, the Project will not change severely the ichthyological eco-system in the Kasakh River.

Table 6-3 Comparison of Identified Fish in Hrazdan River and Kasakh River

No.	Fish Species	In Hrazdan River	In Kasakh River
1	Angora loach (*Oxynoemacheilus angorae*)	+	+
2	Armenian roach (*Rutilus rutilus schelkovnikovi*)	+	-
3	Asp (*Aspius aspius*)	+	-
4	Blackbrow bleak (*Acanthalburnus microlepis*)	+	-
5	Brown trout (*Salmo trutta fario*)	+	+
6	Bulatmai barbel (*Luciobarbus capito*)	+	+
7	Chub (*Squalius orientalis*)	+	+
8	Common bream *(Abramis brama*)	+	-
9	Common carp (*Cyprinus carpio*)	+	+
10	Eastern mosquitofish (*Gambusia holbrooki*)	+	-
11	European bitterling (*Rhodeus amarus*)	+	-
12	Gudgeon (*Gobio gobio)*	+	-
13	**Kura barbel (*Barbus lacerta cyri*)**	+	+
14	Kura bleak (*Alburnus filippii*)	+	+
15	Kura khramulya (*Capoeta capoeta capoeta*)	+	+
16	**Kura loach (*Oxynoemacheilus brandtii*)**	+	-
17	Kura nase (*Chondrostoma cyri*)	+	+
18	Monkey goby (*Neogobius fluviatilis*)	+	-
19	Mursa (*Luciobarbus mursa*)	+	+
20	North Caucasian bleak (*Alburnus hohenackeri*)	+	-
21	**Prussian carp (*Carassius gibelio*)**	+	+
22	**Rainbow trout (*Oncorhynchus mykiss*)**	+	+
23	**Sevan khramulya (*Capoeta capoeta sevangi*)**	+	+
24	**South Caspian sprilin *(Alburnoides eichwaldii*)**	+	+
25	Sunbleak (*Leucaspius delineatus*)	+	-
26	Topmouth gudgeon (*Pseudorasbora parva*)	+	+
27	Wels catfish (*Silurus glanis*)	+	-
28	White bream *(Blicca bjoerkna transcaucasica*)	+	-
	Total number of fish species	28	15

+: identified, -: not identified

Highlighted fish species are the ones identified at No.5 of Hrazdan River

The table is prepared based on the Table 5-8 and Table 5-9.

6.3.7 Livelihood/Local Economy

The farmers in the beneficial area will be able to stable irrigation water more than present, and crop diversification will be promoted, which will result in production increase and income improvement for each household. It is expected that such improvement can contribute to the local economy activation.

6.3.8 Water Usage or Water Rights and Rights of Common

It has been approved to take 17.7 m^3/s of water volume for 210 days (in total 320 MCM per year) from the Hrazdan River for the Arzni-Shamiram canal by the Water Resource Management Agency, under the MNP. Out of 320 MCM mentioned above, 160 MCM water from the Hrazdan River has been annually used for irrigation so far, while proposed water intake volume for Yeghvard reservoir is 103 MCM. It means that water intake of 103 MCM is within the specified volume under that water use right, and the Project will not encroach other water use right. In addition, 103 MCM water diversions for Yeghvard reservoir accounts for only 5.5% of total discharge of Hrazdan River for hydro power generation, namely, 1,875 MCM in 2013 (International Energy Cooperation CJSC).

In Hrazdan River, around 500 million kWh is generated by seven (7) hydro power plants (International Energy Cooperation CJSC). If 103 MCM water is taken, 27 million kWh (=103/1,875*500) power generation will be affected. However, considering the total power generation in Armenia is around 7,800 million kWh annually (Ministry of Energy and Natural Resources, 2015), the affected amount is only 0.35%. Therefore, the impact by the Project on the power generation will be very limited.

6.3.9 Transboundary Impact, Climate Change

A certain amount of greenhouse gas emission, such as CO_2, during the construction period is expected, however, it will be temporary and the scale will not be large, which result in no climate change. Rather than that, the Project can contribute to saving electricity through the shift from pump irrigation to gravity irrigation, which leads to reduction of greenhouse gas emission.

The Project will take 103 MCM water for the Reservoir, while annual discharge amount of the whole Hrazdan River is 1,874 MCM for power generation as of 2013, which means that the proposed water intake will not give a serious damage to the Hrazdan River. On the other hand, the flow of Hrazdan River is completed within the territory of Armenia and it is not an international river. Therefore, no international treaties on water use of Hrazdan River have been established. The river finally flows into the Araks River, which is an international river and runs through the boundary with Turkish. The area of the Araks River basin is around 102,000 km^2, while that of Hrazdan River basin is around 1,200 km^2, namely, the ratio of Hrazdan River basin to that of the Araks River basin is only 1.2%. Considering those situations, it can be said that the impact will not cause transboundary impacts.

6.4 Environmental Evaluation

Based on the discussion mentioned above, the stage-wise expected impacts by the Project are summarized and presented below in Table 6-4. Herein, evaluation at two stages, namely, scoping stage and evaluation stage based on the survey results, are compared.

Table 6-4 Impact Examination Results

Environmental parameter	Evaluation at Scoping		Evaluation based on survey result		Reason of evaluation
	Before and during construction	Operation stage	Before and during construction	Operation stage	
1. Air quality	B-	D	B-	D	**Construction stage:** Dust and gas emission will be caused, especially, Outlet Canal-2 is expected to pass through residential area, which leads to impacts on the area. In addition, strong wind can cause dust and give damage to Nor-Yerznka Community. **Operation stage:** Increase of vehicles is not expected, and there is low possibility of air pollution.
2. Water	B-	B-	B-	D	**Construction stage:** Mud water from the construction site will be caused. **Operation stage:** There is no case reported that surface water is polluted by agrichemicals in Armenia [20]. Moreover, there is no drainage from the farmland in the target area, and no impact on surrounding environment through surface water, even though increase of applied amount of fertilizers and agrichemicals is expected.

[20] It is based on hearing to official personnel of MNP, PIU and MOA.

Environmental parameter	Evaluation at Scoping		Evaluation based on survey result		Reason of evaluation
	Before and during construction	Operation stage	Before and during construction	Operation stage	
					Irrigation water by using canals and rivers quality will not be deteriorated by the Project. Water flow direction in the Reservoir will be generated through water supply from the reservoir to the Kasakh River, thus, the water in the Reservoir will not be stagnant.
3. Waste	B^-	D	B^-	B^-	**Construction stage:** Waste from new construction sites and rehabilitation sites of existing irrigation system will be generated and proper disposal is needed. **Operation stage:** Dredging of canals is needed, however, the amount will be limited. If the Reservoir becomes a sightseeing point and some restaurants are constructed, waste will be generated. In such case, the owners should shoulder the cost for waste disposal. Regardless of tourism or other activities, it is needed t to follow laws of Armenia, and there is no special regulation for waste management in tourism.
4. Soil Contamination	B^-	C	B^-	B^-	**Construction stage:** Oil leakage from construction vehicles and equipment is expected. **Operation stage:** Due to the irrigation area expansion, application of illegal agrichemical can be increased, which lead to pollution.
5. Noise and Vibration	B^-	D	B^-	D	**Construction stage:** Noise and vibration due to construction works are expected. **Operation stage:** Given that traffic increase is not expected, noise and vibration will not be caused.
6. Ground Surbsidence	D	D	D	D	
7. Offensive Odor	D	D	D	D	
8. Bottom sediment	D	D	D	D	
9. Protected area	D	D	D	D	
10. Ground water	D	C/B^+	D	B^-/B^+	**Construction stage:** No impact on the ground water by the project is expected. **Operation stage:** The project can contribute to recovery of ground water resource due to shift from use of ground water to use of surface water. Irrigation area expansion can cause increase of chemical fertilizer application, which can results in groundwater pollution by nitrogen.
11. Hydrological Situation	D	C	D	D	**Construction stage:** It is not planned to close any natural rivers nor to change /expand existing water courses, which will not result in hydrological change. **Operation stage:**

Environmental parameter	Evaluation at Scoping		Evaluation based on survey result		Reason of evaluation
	Before and during construction	Operation stage	Before and during construction	Operation stage	
					The project will divert the free water of the Hrazdan River during March to May, considering the regulated minimum discharge. Even now, most of the Hrazdan River water is used for canal, while only minimum discharge is secured for the natural flow, thus, dynamic hydrological change is not expected.
12. Ecosystem	B^-	B^-/B^+	B^-	B^-/B^+	**Construction stage** Lands in and around the construction sites have been already developed for agricultural purpose and there is no virgin nature to be damaged by the Project. Thus, expected impact is not severe. Wildlife within the Reservoir will be able to escape to the outside and to survive during construction if the construction site is divided into 4 blocks. Poisonous snake species is identified in the Reservoir, and there is possibility that the snake comes to neighboring villages. It is needed to take measures against the snake. **Operation stage:** There is a possibility that bio-diversity will be richer than present, since the reservoir construction will attract birds. There are 4 red list birds and 1 red list snake in the reservoir basin, however, they can move to other areas which have similar characteristics of the reservoir area. Concerning ichthyological system, ecological minimum discharge of the Hrazdan River secured. Even now, most of the river water is used for irrigation and power generation, amount of natural flow is only minimum discharge. In the downstream, necessary depth for spawning will be expected, and some rare fish species survive in Hrazdan River. Some fish species are common in Hrazdan River and Kasakh River. Therefore, if Hrazdan River water is mixed with the Kasakh River water by the water diversion through Yeghvard Reservoir, the eco-system in the Kasakh River will not be affected. The project could reduce dependency of the command area on the Lake Sevan as the water resource, however, water level of the lake is increased by only several centimeters by the Project.
13. Topography and Geographical features	D	D	D	D	
14. Involuntary Resettlement/ Land Acquisition	B^-	D	B^-	D	**Before and during construction stage:** Around 80 farming plots in and around the construction site will be affected by the construction works and land expropriation is needed, however, no resettlement is planned. **Operation stage:** No impact is expected.

Environmental parameter	Evaluation at Scoping		Evaluation based on survey result		Reason of evaluation
	Before and during construction	Operation stage	Before and during construction	Operation stage	
15. The poor	C	C	B^-	D	**Before and during construction stage:** There are some households who get poverty allowance in the affected area, they can be influenced by the Project, and it is needed to pay special considerations to such persons. **Operation stage** No impact on the poor people is expected.
16. Indigenous and ethnic people	C	C	D	D	**Before and during construction stage:** There is an ethnic minority household in the affected area. They are to be compensated for their land loss based on the law/regulation. **Operation stage** There are ethnic minority people in the target area, and they can access to the project benefit as well as other beneficiaries.
17. Livelihood/local economy	B^-/B^+	B^+	B^-/B^+	B^+	**Construction stage:** Given that the Project will provide job opportunities for the local people, positive impact is expected. On the other hand, the Project will cause negative impacts on some people whose land will be acquired. **Operation stage:** Stable agricultural production can be promoted by stable irrigation water. The cost for pump operation shouldered by the government, will be reduced. It is expected that the Yeghvard Reservoir will attract tourists and the area will be developed.
18. Land use and local resource utilization	B^-	D	B^-	D	**Construction stage:** It is needed to acquire land for construction of reservoir and canals. Some of existing farmlands will be changed to stock yard for construction, construction office, canals and so on. **Operation stage:** No negative impact on land use and local resource utilization is expected.
19. Water Usage or Water Rights and Rights of Common	D	B^-/B^+	D	D	**Construction stage:** 1) Since the Project will take water of the Hrazdan River and use existing facilities, new construction will be not done, impacts on the downstream of the Hrazdan River is not expected. 2) Given that the construction works will not close natural rivers and change existing canals, scale of mud water due to construction works will be small and the impact is negligible. **Operation stage:** The water use permission was given by the MNP for the Arzni-Shamiram Canal. The proposed amount of water intake for the Reservoir is within the approved volume. Therefore, the Project will not interfere with other water use of Hrazdan River water.
20. Existing social infrastructures and services	B^-	D	B^-	D	**Construction stage:** Due to increase of construction vehicles, traffic jam can be caused. **Operation stage:**

Environmental parameter	Evaluation at Scoping		Evaluation based on survey result		Reason of evaluation
	Before and during construction	Operation stage	Before and during construction	Operation stage	
					No impact on traffic is expected.
21. Social institutions	D	D	D	D	
22. Misdistribution of benefit and damage	B-	B-	D	D	**Construction stage:** There are some person who will lose their lands in the affected area, while beneficiaries can enjoy the stable irrigation water. However, the former will be compensated for the loss. Thus, misdistribution of benefit and damage, is not expected. **Operation stage:** While the farmers in the project target area can enjoy the project benefit, while other farmers in non-command area cannot. Still, in Armenia, no case has been reported that non-beneficiaries envy or feel antipathy to beneficiaries, which results in conflict in between, according to the PIU official personnel. Therefore, it can be said that no big issue will be caused by the Project.
23. Conflict	B-	C	D	D	**Construction stage :** Probably the affected persons will not have jealousy to the beneficiaries, since there is enough distance between the both groups and they will be provided with compensation. Thus, any conflicts are not expected. **Operation stage:** While the farmers in the project target area can enjoy the project benefit, while other farmers in non-command area cannot. Given that there is no case that conflict in between beneficiaries and non-beneficiaries has been identified so far in Armenia, according to the PIU official personnel. Therefore, it can be said that no conflict due to the Project is expected.
24. Cultural heritage	C	C	D	D	**Before and Construction stage:** No cultural heritage to be conserved in and around the construction site is identified. If some assets are found during the construction, immediate report should be done. **Operation stage:** The Project plans to cover existing farming area that has been developed, instead of virgin land, therefore, no damage to cultural asset in operation stage is is expected.
25. Land scape	D	D	D	D	
26. Gender	D	D	D	D	
27. Children rights	D	D	D	D	
28. Hazards (Risk), Infectious diseases such as HIV/AIDS	B-	D	D	D	**Construction stage:** Any cases of Infectious diseases such as Malaria and HIV during construction works have not been reported in Armenia.
29. Work environment	B-	D	B-	D	**Construction stage:** There is a possibility of accident during the construction works. Special considerations to prevent and minimize the possibility by

Environmental parameter	Evaluation at Scoping		Evaluation based on survey result		Reason of evaluation
	Before and during construction	Operation stage	Before and during construction	Operation stage	
					distribution safety goods and proper labor management are needed.
30. Accident	B^-	D	B^-	D	**Construction stage:** There is a possibility of accident during the construction works in and around the construction site. Warning by setting signboard for the surrounding people is needed. **Operation stage:** There is a possibility of accident in and around the Reservoir. However, the potential is very limited.
31. Transboundary impact, climate change	D	C	D	B^+	**Construction stage:** Construction vehicles are operated, which bring about greenhouse gas emission, however, it is temporary and not huge scale. **Operation stage:** The Project proposes to shift from pump irrigation to gravity irrigation, which can contribute to reduction of greenhouse gas emission. Proposed water intake is very small compared with the total discharge of Hrazdan River. Moreover, area of Hrazdan River basin accounts for only 1% of the Araks River, an international river. Consequently, transboundary impact and climate change are not expected.

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown (A further examination is needed, and the impact could be clarified as the study progresses).
D: No impact is expected.

CHAPTER 7 EMERGENCY SITUATIONS AND RESPONSE

Emergency situation for Yeghvard reservoir is dam collapse. This can be caused by:

1) Over flow of dam body
2) Efflux of dam body material by piping
3) Sliding failure of dam body.

To prevent these events happen the following measures (see Table 7-1) are considered for design and operation.

Table 7-1 Emergency Prevention Measures

Event	Factor	Measures	
		(To prevent an event happens)	(In case an event happen)
(1) Over flow of dam body	i) A trouble happens on a feeder canal gate and a gate cannot be closed ii) An operator forgets to close a gate of a feeder canal	1) Installation of water gauge to detect abnormal water level 2) Design of discharging structure which can discharge water to lower the water level	1) Alarming system for evacuation for Nor-Yerznka Village (To mitigate damage in case dam collapse) 2) Alarming system for evacuation for the areas along Kasakh River (To mitigate damage in case huge volume of water is discharged from
(2) Efflux of dam boy material by	i) Seepage surface reaches to downstream	Zoning design of dam body which does not lead seepage	

Event	Factor	Measures	
		(To prevent an event happens)	(In case an event happen)
piping	slope of dam body ii) Dam body material is moved by seepage flow	surface to downstream slope and makes dam body material stable	reservoir by 3) mentioned below) 3) Design of discharging structure which can discharge water more than the volume for irrigation *If huge volume of water is discharged, the area along Kasakh River is flooded in exchange for the safety of dam body.
(3) Sliding failure of dam body	i) Once per 500years earthquake	Earthquake resistant design for dam body against earthquake which is reoccurrence period	

CHAPTER 8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Taking into consideration expected environmental impacts discussed in Chapter 8, Environmental Management Plans (EMPs) showing mitigation measures by stage are proposed. Based on the EMPs, monitoring plans by stage and monitoring formats are also presented. In construction stage, mitigation measures will be mainly taken by the construction company, and PIU/SCWE will supervise the measures as planned in collaboration with the private consultant. The consultant will provide technical advices to the PIU/SCWE for the supervision. In the operation stage, instead of the PIU/SCWE, MNP will be responsible for supervision while WUA/WSA and MOA will implement take countermeasures.

It is noted that the mitigation measures or considerations for 1) Physical relocation and land acquisition, 2) The poor, 3) Land use and local resource utilization, and 4) Livelihood /local economy are discussed in the RAP, which is prepared separately from the ESIA Report. The proposed monitoring structure for those matters is discussed in the RAP in detail.

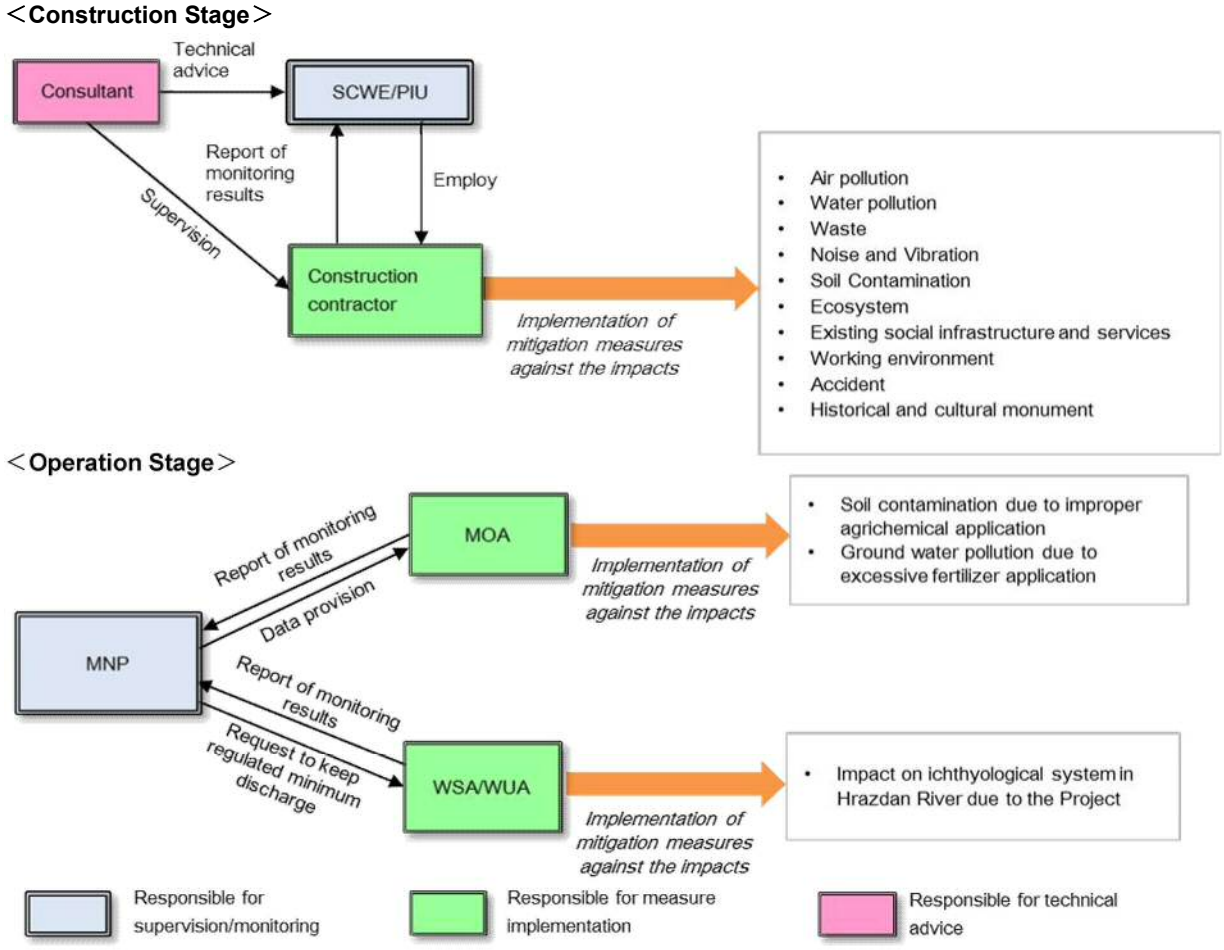


Figure 8-1 Proposed Structure for EMP implementation and Monitoring

In the monitoring process, monitoring results will be complied as a monitoring report by the responsible organization for mitigation measurement implementation using the proposed monitoring formats as shown. The report should be submitted to the supervising agency regularly.

Table 8-1 Environmental Management Plan (Construction Stage)

Environmental parameters	Mitigation measures	Responsible organization	Supervising agency	Cost
1. Air quality	• Regular check and full maintenance of construction vehicles • Water spray in and around entrances of construction sites to minimise dust generation and dust diffusion • Store and handle granular materials appropriately to limit dust (e.g. protect with tarpaulins) • Prohibit open burning of construction / waste material at the site	Construction contractor	PIU/SCWE and Consultant	Included in construction cost
2. Water quality	• Disposal of waste water from construction site and labor camp before discharge into rivers • Mud water treatment at the construction site before discharge to downstream • Repair any damage to riparian areas, including river/canal banks and river/canal beds (if any), as soon as construction is complete	Construction contractor	PIU/SCWE and Consultant	Included in construction cost
3. Waste	• Reuse of excavated soil as other construction materials as much as possible • Store flammable waste (e.g. oil, fuel, spill contaminated soil, scrap, oiled clothes), construction and municipal waste separately • Sign contracts with licensed organizations specialized in the area of hazardous and municipal waste collection from the site, treatment/recycling or disposal	Construction contractor	PIU/SCWE and Consultant	Included in construction cost
4. Soil Contamination (oil leakages)	• Proper management of construction vehicles • Proper storage of all liquid materials and lubricants	Construction contractor	PIU/SCWE and Consultant	Included in construction cost
5. Noise and Vibration	• Setting of temporary enclosure • Minimize construction work during night time • Reduce vehicle speeds (stick to recommended speeds) in residential areas • Regular check and full maintenance of construction vehicles • Notify nearby residents and businesses at least 24 hours in advance if particularly noisy activities are anticipated • For workers noise levels shall be kept below 80 dB (A), wherever possible. In case of exceeding this value, hearing protections must be provided to workers	Construction contractor	PIU/SCWE and Consultant	Included in construction cost
6. Ecosystem	• 4 block in the Reservoir will be set up and sequential construction works will be done. • Confirmation of nature of poisonous snake identified in the Reservoir area, and awareness of the measure against the snake to the people	Construction contractor	PIU/SCWE and Consultant	Included in construction cost
7. Involuntary Resettlement/Land acquisition	• Preparation of an abbreviated Resettlement Action Plan • Compensation to the affected persons and special considerations to the vulnerable people and affected persons who do not have legal status	Community concerned, PIU/SCWE	PIU/SCWE, communites concnerned and Consultant	Included in the Project cost

Environmental parameters	Mitigation measures	Responsible organization	Supervising agency	Cost
8. The poor	• Attention to the poor in the affected area	Community concerned, PIU/SCWE	PIU/SCWE, communites concnerned and Consultant	Included in the Project cost
9. Livelihood economy	• Preparation of an abbreviated Resettlement Action Plan • Compensation to the affected persons and special considerations to the vulnerable people and affected persons who do not have legal status	Community concerned, PIU/SCWE	PIU/SCWE, communites concnerned and Consultant	Included in the Project cost
10. Existing social infrastructures and services	• Decentralization of construction vehicles as much as possible	Construction contractor	PIU/SCWE	Included in construction cost
11. Land use and local resource utilization	• Preparation of an abbreviated Resettlement Action Plan • Compensation to the affected persons and special considerations to the vulnerable people and affected persons who do not have legal status	Community concerned, PIU/SCWE	PIU/SCWE, communites concnerned and Consultant	Included in the Project cost
12. Working environment	• Compliance with labor law and proper labor control • Proper management of sanitary conditions for labors, including hand-washing facilities and rest rooms • Provision of special uniforms, helmets, masks , goggles and so on • Preparation of first aid kits • Instruction for workers on health and safety practices	Construction contractor	PIU/SCWE	Included in construction cost
13. Accidents	• Proper management of construction vehicle operation to minimize centralization • Identify nearby medical canters to secure urgent health care for injured workers • Instruction on compliance with prescribed routes, speed, to drivers of construction vehicles • Health examination of drivers initially and periodically	Construction contractor	PIU/SCWE	Included in construction cost
14. Historical and cultural monuments	• Implementation of Chance Find Procedure and training of the construction workers • Report to the Ministry of Culture of RA, Department Protection of Monuments and Historical Sites, in case of cultural asset detection	Construction contractor	PIU/SCWE, Ministry of Culture	Included in construction cost

Table 8-2 Environmental Management Plan (Operation Stage)

Environmental parameters	Mitigation measures	Responsible organization	Supervising agency	Cost
1. Waste by tourists when restaurants and shopd are constructed around the Reservoir	• Proper disposal of waste based on the regulation regarding waste	Owners of shops and restaurants	WSA	Shouldered by the owners of restaurant and shop
2. Soil contamination due to improper agrichemical application	• Further promotion of proper application of pesticides/insecticides • Enhancement control of illegal pesticide/insecticide • Establishment of monitoring system of pesticides/insecticides in water, soil and crops	MOA	MNP	Within budget for routine work
3. Ground water pollution due	• Promotion of proper application of fertilizers in	MOA	MNP	Within budget

to excessive fertilizer application	accordance with the application standard in Armenia			for routine work
4. Impact on fish ecosystem due to water diversion for the Yeghvard Reservoir	• Compliance with minimum discharge/ecological flow for ecosystem conservation in Hrazdan River	WUA & WSA	MNP	Within budget for routine work

In the process of implementation of EMP, regular monitoring is necessary. Following are proposed monitoring plan by stage.

Table 8-3 Monitoring Plan (Construction Stage)

Environmental Parameter	Monitoring Item	Survey point	Standard	Frequency	Responsible Organization
1. Air quality	Dust, NO_2, CO and SO_2	At construction site, and Nor-Yerznka Community (measurement points are No 3, No2, No1 and No5 in Figure 5-15)	Mean daily concentration Dust:<15mg/m^3 NO_2:<0.04 mg/m^3 CO:<3.0 mg/m^3 SO_2:<0.05 mg/m^3	Once per month	PIU/SCWE and Consultant
2. Water quality (mud water)	Suspended Solid (SS)	1) Outlet point from the Outlet Canal 2 to the Kasakh River 2) Outlet point from the Outlet Canal 1 to the Arzni Branch Canal	SS<30 mg/l	Once per month	PIU/SCWE and Consultant
3. Noise and vibration	Noise (dB)	At Yeghvard city and Nor-Yerznka community (measurement points are No.4 and No.5 in Figure 5-16)	Allowable noise level in accordance with Armenian Norm	Once per month	PIU/SCWE and Consultant
4. Waste	Conditions of reuse of excavated soil and classification, proper disposal of garbage by field observation	At construction site and labor camp	-	Once per month	PIU/SCWE and Consultant
5. Soil contamination	Oil leakage	At construction site	-	Once per month	PIU/SCWE and Consultant
6. Ecosystem	• Sequential construction works by block • Number of accident by poisonous snakes	At the reservoir	-	• Once (when sequential construction is practiced) • As required	PIU/SCWE and Consultant
7. Involuntary Resettlement/Land acquisition	Payment (before construction) Number of complaints and frequency	In Yeghvard community, Nor - Yerznka community and Ashtarak community	-	Quarterly before construction and yearly in construction stage	PIU/SCWE and Consultant
8. The poor	Payment (before construction) Number of complaints and frequency	In Yeghvard community, Nor - Yerznka community and Ashtarak community	-	Quarterly before construction and yearly in construction stage	PIU/SCWE and Consultant
9. Livelihood/local economy	Number of complaints and frequency	In Yeghvard community, Nor - Yerznka community and Ashtarak community	-	Quarterly before construction and yearly in construction stage	PIU/SCWE and Consultant
10. Existing social infrastructures	Conditions of traffic jam by field	Around construction site	-	Once per month	PIU/SCWE

Environmental Parameter	Monitoring Item	Survey point	Standard	Frequency	Responsible Organization
and services (traffic jam)	observation				
11. Land use and local resource utilization	Number of complaints and frequency	In Yeghvard community, Nor - Yerznka community and Ashtarak community	-	Quarterly before construction and yearly in construction stage	PIU/SCWE and Consultant
12. Safety/Working environment	Safety and working environment by field inspection	At the construction site	-	Once per month	PIU/SCWE
13. Accident	Number of accident	In and around the construction site	-	Every time any accidents are caused	PIU/SCWE
14. Historical and cultural monuments	Number of discovered historical and cultural assets	In and around the construction site	-	When any cultural assets are uncovered	PIU/SCWE and Consultant

Table 8-4 Monitoring Plan (Operation Stage)

Environmental Parameter	Monitoring Item	Survey point	Standard	Frequency	Responsible Organization
1. Waste	• Proper disposal of garbage by field observation	Around the Reservoir	-	Once per 3 months	WSA
2. Soil contamination	• Check of sale conditions of pesticide and insecticide at retailers • Check of application method of pesticide and insecticide by the farmers • Establishment of monitoring system residual pesticide/ insecticide in water/soil/crops	At the project target communities	-	Once per 3 months	MNP
3. Ground water	• Check of application method of fertilizers by the farmers	At the project target communities		Once per 3 months	MNP
4. Impact on fish ecosystem due to water diversion for the Yeghvard Reservoir	• Confirmation of river water discharge	At discharge observatory stations	-	3 times per year	MNP

Due to implementation of the abbreviated RAP (apart from the ESIA Report), it is possible to mitigate expected impacts described in No.7, No.8, No.9 and No.11 in Table 5-1-9.1. Therefore, monitoring indicators for those matters can be set as “number of complaint by the affected persons” and “how the implementation agency (the Government of Armenia) takes measures against complaints” as mentioned in Table 8-5.

In the process of monitoring, utilization of following monitoring formats by stage is recommended. The formats can be used for both construction period and operation period. The monitoring results are to be complied and submitted to the responsible organization.

Table 8-5 Draft Monitoring Form (Construction Period)

(1) Response and actions by the government

Comments and response	Monitoring results
Number and contents of comments from the people	
Number and response to the comments from the government	

Remarks: The format is to record and report how the government (implementation agency) takes measures against any issues by the Project.

(2) Pollution

Environmental Parameter	Monitoring Item	Measured value (min)	Measured value (max)	Survey point	Frequency
Air quality	Mean daily concentration Dust:<15mg/m^3 NO_2:<0.04 mg/m^3 CO:<3.0 mg/m^3 SO_2:<0.05 mg/m^3			Construction site, Yeghvard Community and Nor-Yerznka Community	Once per month
Water quality	SS<30mg/l			Drainage outlet	Once per month
Noise and vibration	Complaint from the people			Construction site, Yeghvard Community and Nor-Yerznka Community	Once per month
Soil contamination	Oil leakage			Construction site	Once per month

(3) Natural Environment

Environmental Parameter	Monitoring indicator	Monitoring results	Measures taken
Waste	• Waste classification • Waste permission by the MNP • Waste disposal point		
Ecosystem	• Whether Reservoir construction by bloc is implemented or not		

As mentioned in the monitoring indicator in the table, it is needed to monitor waste disposal based on the Law on Waste.

(4) Social Environment

Environmental Parameter	Monitoring indicator	Monitoring results	Measures taken
Existing social infrastructures and services	• Traffic conditions • Complaint from the people		
Historical and cultural monuments	• Whether Historical and cultural monuments are discovered		
Accident	Number of incidence		

As mentioned in the monitoring indicator in the table, measures taken against the issues are to be recorded.

Table 8-6 Draft Monitoring Form (Operation Period)

(1) Response and actions by the government

Comments and response	Monitoring results	Measures taken	Frequency
Number and contents of comments from the people			
Number and response to the comments from the government			

Remarks: The format is to record and report how the government (implementation agency) takes measures against any issues by the Project.

(2) Natural Environment

Environmental Parameter	Monitoring results	Measures taken	Frequency
Waste	Regular monitoring by field observation		
Soil contamination by illegal agrichemical application in the beneficial area	Regular monitoring activities by the MOA for control of illegal agrichemical sale		
Pollution of groundwater by excessive fertilizer application in the beneficial area	Regular monitoring activities by the MNP		
Keeping ecological minimum discharge of Hrazdan River to minimize impact on eco-system	Water distribution by WSA and WUA		

As mentioned in the monitoring indicator in the table, it is needed to monitor, 1) sale and application of illegal agrichemical application, 2) nitrogen chemical fertilizer application and ground water quality check, and 3) water distribution to natural flow to secure the regulated ecological minimum discharge

CHAPTER 9 STAKEHOLDER MEETING

According to the Law on Environmental Impact Assessment and Expertise, public hearing shall be organized at two stages. At first, before the start of the environmental impact assessment survey (Scoping Stage), the 1st Public Hearing should be organized. At this time, the project outline and environmental expected impacts would be presented. In addition, before the submission the draft of ESIA Report, the second Public Hearing would be organized to share the environmental impact assessment results and gain comments from the participants.

Based on the Law mentioned above, the 1st Public Hearing of the Project was organized in Yeghvard City Office. According to the JICA Guidelines, it is needed to organize a series of Stakeholder Meeting and the necessary procedure and purpose are almost same as those in Armenia. Therefore, the Public Hearing can be regarded as Stakeholder Meeting.

9.1 Arrangement of the Public Hearing

Republic of Armenia has been a member country of the Aarhus Convention which has regulated the access-ability to the environmental information, since 2002. In the Republic of Armenia, there are 15 Aarhus Centers, which was founded by Organization for Security and Cooperation in Europe (hereinafter, "OSCE"), in each Marzes. Especially, Ministry of Territorial Administration and Emergency Situations and MNP had been involved with their establishments. And Aarhus Center has promoted information disclosure and public involvement, with supporting of the Armenian Governmental organizations, including SCWE. Moreover, the centers have taken charge of arrangement for Public Hearing. Actually, SCWE requested Aarhus Center of Yeghvard City to support for holding of the first Public Hearing. SCWE, the Survey Team, and Aarhus Center of Yeghvard City worked together.

According to the Law on Environmental Impact Assessment and Expertise, seven working days before of Public Hearings, information of public hearing shall be noticed. On 8th October 2015, public notice was presented at the newspaper (see Appendix 1) and website of Aarhus center. And Table 9-1 shows the contents of the Public Notice which would be organized on 20th October 2015. And the same contents were published on the website of Aarhus Center.

Table 9-1 Contents of the Public Notice

A public hearing (discussion) about the document of "Application of the Initial Assessment of Environmental Impact of the Yeghvard Irrigation System Improvement Project" will be held on 20th October, 2015, at 15.00 - 18.00 at the Yeghvard Municipality Conference hall (address: Yeghvard, 1Yerevanyan street) as follows:	
Undertaker	State Committee of Water Economy, MOA, RA
Venue of the public hearing	1 Yerevanyan str., Yeghvard, Conference Hall of the Municipality
Possible environmental impact	Some environmental impacts due to the project are expected.
Time, date, location and method to learn about the application mentioned above	The initial assessment application is uploaded in website of following addresses: · State Committee of Water Economy (Yerevan, Vardanants deadlock 13A) – www.scws.am · Yeghvard Municipality info@yegvard.am, and · Yeghvard Aarhus Center - www.aarhus. Furthermore, you can contact the offices mentioned above every day at 14.00-18.00 from the day of public notice to the deadline mentioned below, if you want to make the comments and suggestions on the application.
The deadline for submitting comments and suggestions on the application	7 working days after, counting from the date of public notice.
Responsible officer for discussions	Yeghvard Municipality
E-mail address and telephone number of Responsible Officer	E-mail address info@yegvard.am Tel. (0224) 2 11 10

9.2 Public Hearing on the Project Outline by SCWE

On 20th October 2015, the Public Hearing on the Project Outline was organized at Yeghvard City office. This Public Hearing was organized by the Project, and general project outlies was explained to the participants. Table 9-2 shows the comments and questions from the participants. Seemingly, the attendants do not oppose to the Project.

Table 9-2 Discussion at the Public Hearing on the Project Outline (20th October 2015)

No.	Speakers	Questions/ Comments	Respondents	Answers
1.	Director of Vagharshapat WUA	How is the stakeholder territory of the project distributed among WUA? How much territory will be served by each of 4 WUAs?	Hydro-technical Engineer of PIU	Mentioned that the studies are still being carried out, but the areas being served are known. The biggest areas are in Khoy and Vagharshapat WUAs.
2.	Director of Yeghvard WUA	How about the progress and results of geological survey for determination of water permeability of the bottom of Yeghvard reservoir?	Team leader of the Survey Team	We started the investigations in June. The geological survey and the ground water survey were implemented. The preliminary data show that the permeability coefficient is high and the water may easily infiltrate through the existing layer. Therefore, it is necessary to take anti-filtration measures. The type of impervious material and the method of application will be determined as a result of survey. The expenses related to reservoir construction are mostly dependent on the type of impervious layer.
3.	Mayor of Ashtarak City	How much is the approximate budget for Yeghvard irrigation system improvement project and is it planned to create a recreation zone near the reservoir?	Hydro-technical Engineer of PIU	As it was mentioned by Mr. Tsumura, the project budget depends on the method and material of impervious layer. The budget will be calculated after selection of the abovementioned. Regarding the creation of recreation zone near the reservoir, it is not a subject of this project and is not being considered by the survey team.
4.	Director of Ashtarak WUA	Some areas of the 27 communities are located on higher altitude than Yeghvard reservoir. How will the irrigation be done for them? Do you plan to construct new canals?	Hydro-technical Engineer of PIU	New canals will not be constructed. The water from Yeghvard reservoir will flow to Arzni-Branch canal and Kasakh river, and will be guided to stakeholder communities by the use of existing system.
5.	Social Expert of PIU	How is the status and ownership of the lands of the territory of reservoir?	Social Specialist of ATMS Solutions LLC	Mentioned that the issues of alienation and compensation of the lands are being considered in the frames of F/S of Yeghvard irrigation system improvement project. At this moment the studies are still being carried out and there are no final results. However, there will be several explanations. Particularly, the actual reservoir is located on community lands that belong to Yeghvard and Nor-Yerznka communities. This means that large scale resettlement is not envisaged. However, in case of feeder and intake canals, resettlement issue may arise. However, the canal routes have not been determined yet. Detail information will be provided to the Client soon.
6.	Mayor of Ashtarak City	Is there an issue of transportation of topsoil?	Hydro-technical Engineer of PIU	Most part is transported to Ashtarak to establish gardens. There is a few humus in the territory.

No.	Speakers	Questions/ Comments	Respondents	Answers
		Is it completely transported? If there is such an issue, then you have to consider it.		
7.	Deputy Mayor of Yeghvard City	As I know the Japanese company is mainly implementing technical surveys. Do you have any preliminary data on the possible impact on the environment?	Environmental Consideration of the JICA Survey Team	The environmental impact assessment of Yeghvard irrigation system improvement project is on-going. Impacts on ecosystem, especially to the fishes of Hrazdan and Kasakh rivers, are examined. Besides, underground water and soil contamination by pesticides/fertilizer in the beneficial areas are studied.
8.	Director of Vagharshapat WUA	If the water of Kasakh river will flow to Yeghvard reservoir, is there a possibility, that the irrigation of the territories served by "Khoy" and "Vagharshapat" WUAs will depend on reservoir?	Hydro-technical Engineer of PIU	Water of Kasakh river will not be used. Only the additional surplus water will be directed to the reservoir. The reservoir will store 90 MCM of water, which will be used by WUAs (Khoi, Vagharshapat, Yeghvard and Ashtarak). The water will be stored in the reservoir during non-irrigation season, mainly during spring floods.
9.	Deputy Chairman of SCWE	What are possible social and environmental risks during construction of reservoirs and if they are typical for Yeghvard reservoir?	Environmental Consideration of the JICA Survey Team	Regarding the social impact, in case of construction of canals, the issue of alienation and compensation will arise. The lands in the actual reservoir area are not private. However, the people who cultivate there will have to leave their lands. As for natural environmental impact, there will be air pollution because of large-scale construction works with various types of machines and vehicles. As the reservoir will be filled by the water from Hrazdan river, which will then flow to Kasakh river, the ecosystems of Hrazdan and Kasakh rivers will possibly mix with each other. In case of such projects, it is very difficult to avoid environmental impact completely, however, our goal is to minimize it.
10.	Resident of Yeghvard City	How many years will the construction of Yeghvard reservoir last?	Hydro-technical Engineer of PIU	The F/S stage of Yeghvard irrigation system improvement project will be finished in May 2016. 1-1.5 years will be required for agreement of it. After that, 4-5 years will be required for construction of the reservoir.
11.	Resident of Yeghvard City	Is there any initial calculation of minimum and maximum depths of the reservoir to be constructed?	Hydro-technical Engineer of PIU	According to the initial calculations the maximum depth is going to be 15 m. The minimum depth is going to be 1.5 meters. It means that 6 MCM will always remain in the reservoir.

As Table 9-3 shows participant list, the total numbers of the attendants was 35. 17 persons out of 35 are from SCWE, PIU, JICA Survey team member, Aarhus Center staff and the environmental consultants for ESIA and RAP preparation, while 18 persons out of 35 are from beneficial communities, 4 WUAs concerned to the Project, and additional 2 WUAs.

Table 9-3 Participant List of the Public Hearing on the Project Outline (20th October 2015)

No.	Name	Position	Organization
1.	Volodya Narimanyan	Deputy Chairman	SCWE, MOA
2.	Viktor Martirosyan	Advisor of Chairman	
3.	Khoren Tsarukyan	Hydro-technical Engineer	PIU, SCWE, MOA
4.	Marine Vardanyan	Social Expert	

No.	Name	Position	Organization
5.	Martiros Nalbandyan	Environmental Expert	
6.	Kazumitsu Tsumura	Team Leader	The Survey Team of JICA
7.	Rie Kitao	Environmental Consideration	
8.	Shohey Natsuda	Social Consideration (1)	
9.	Ayumi Shiga	Social Consideration (2)	
10.	Gevorg Gevorgyan	Assistant/ Interpreter	
11.	Luiza Manyan	Assistant/ Interpreter	
12.	Khristine Goroyan	Assistant/ Interpreter	
13.	Ruzanna Manyan	Head Officer	Aarhus Center
14.	Anush Beybutyan	Coordinator	
15.	Artak Ter-Terosyan	Environmental Specialist, Director	ATMS Solutions LLC, Local ESIA Consultant
16.	Suren Gyunrjinyan	Social Specialist	
17.	G.Sahakyan	Cameraman	
18.	Karen Harutyunyan	Deputy Mayor	Yeghvard Community (City)
19.	-	Resident (Head of Library)	
20.	-	Resident (Librarian)	
21.	-	Resident (Librarian)	
22.	-	Resident	
23.	Armen Antonyan	Mayor	Ashtarak Community (City)
24.	Armen Sargsyan	Head of Community	Hovtamej Community
25.	Suren Baghdasaryan	Deputy Head of Community	Zovuni Community
26.	Sedrak Khachatryan	Head of Community	Kashakh Community
27.	V.Mkhitaryan	Representative	Sasunik Community
28.	G.Shahgeldyan	Representative	Arshaluys Community
29.	A.Movsesyan	Representative	Aragats Community
30.	MIhran Hovhannisyan	Director	Yeghvard WUA
31.	Sedrakyan Sedrakyan	Director	Vagharshapat WUA
32.	Arsen.Khachatryan	Director	Ashtarak WUA
33.	Sargyan Sargsyan	Director	Khoy WUA
34.	Hovik Gevorgyan	Director	Parpi WUA*
35.	Armen Karapetyan	Director	Nairi WUA*

Remarks: Parpi WUA and Nairi WUA are outside of project beneficiary and affected areas.

*In Armenia, generally, there are one or plural communities under one community. Both Yeghvard and Ashtarak are categorized into city, those cities have one community each, Yeghvard City is sometimes called as Yeghvard Community. Communities are politically managed by “Head”, while City is headed by ”Mayor”.

9.3 Seminar in Nor-Yerznka Community

Given that the number of participants from the communities, namely, general residents, at the public hearing is limited, a seminar was organized to promote the local residents to attend more to supplement the public hearing on 5th November, 2015 in Nor-Yerznka Community.

Nor-Yerznka Community is located on west of the Yeghvard Reservoir, and parts of the Community could be affected by the Project. At the arrangement of the seminar, the Project side tries to enhance women’s participation in the seminar in terms of gender balance, since women’s participation rate in the Public Hearing was low. On the other hand, it is noted that Head of Nor-Yerznka Community is female.

At the seminar, the project outlines and expected impact by the Project were explained by the Project Coordinator of PIU/SCWE, Mr. K.Tsarukyan, using the same presentation material as the one at the Stakeholder Meeting was used. Moreover, the location map illustrating the affected area in the Community was also presented to the participants. It is noted that two routes for Outlet Canal-2, namely, 1) northern route which passes through orchard and houses and 2) southern route passes

through natural stream, were proposed at that time, both route on the map ware presented[21]. The participants made some questions and comments as shown in following table. As a whole, no objection against the Project was presented, however, some issues to be examined were raised.

Table 9-4 Discussion at the Seminar in Nor-Yerznka Community (5th November 2015)

No.	Speaker	Question and Comment	Answer
1.	Head of Community	Proposed northern route for Outlet Canal passes through the graveyard, and it is very difficult to expropriate the lands around the route On the other hand, another option, namely, southern route passes through natural stream, which results in small impacts on the residents. The community supports the Project, if southern route is selected.	-
2.	Resident	My concerns are counteraction of the Reservoir and earthquake proof.	Japan has experienced many natural disasters, Japanese engineer's design is reliable. It is planned to implement quake-resistance study during the survey.(Mr. Khoren Tsarukyan, PIU)
3.	Resident	Impact on the community by water leakage from the Reservoir is also a concern.	After the completion of the reservoir construction, it is planned to maintain the Reservoir continuously and take measures against any problems. The Project is not first reservoir construction project. Your concern has been already examined in other reservoir construction projects so far, and you do not have to be worry about the issue. Safe reservoir construction is examined. (Mr. Khoren Tsarukyan, PIU)
4.	Resident	What is the reason for intake from the Arzni-Shamiram Canal? Do you have a plan to use the irrigation water of the canal?	It is planned to use free water of the Hrazdan River through the Arzni-Shamiram Canal, and to store the water at the Yeghvard Reservoir. (Mr. Khoren Tsarukyan, PIU)
5.	Resident	I think the free-water is only one million tons.	According to current estimation, amount of the free water is 90 million tons and the water will be stored during 2-3 months. (Mr. Khoren Tsarukyan, PIU).
6.	Head of Community	Nor-Yerznka Community uses Aparam Canal and Arzni-Shamiram Canal for irrigation. Is it possible for the community to use the store water at the Yeghvard Reservoir?	The Project plans to divert the stored water at the Reservoir to the Kasakh River for irrigation of Ararat Plain. Beneficial communities are Kasakh, Zovuni, Proshyan and so on. (Mr. Khoren Tsarukyan, PIU)
7.	Resident	Is it planned to use canals to discharge the Reservoir water to the Ararat Plan?	Kasakh River will be used for water distribution to the Ararat Plain. (Mr. Khoren Tsarukyan, PIU)
8.	Resident	When river water is used, around 20% of the water will be lost?	In general, water loss in river is observed even in natural conditions. However, free water, which is planned to be diverted to the Kasakh, can be used without loss. Mr. Khoren Tsarukyan, PIU)
9.	Resident	Existing roads are included in the affected areas, and how the roads will be changed after the construction works?	After the pipelines are buried, the roads will be restored to the original conditions. (PIU, Mr. Khoren Tsarukyan Mr. Khoren Tsarukyan, PIU)
10.	Resident	I think that capacity of the Reservoir becomes smaller than that before.	Original plan of reservoir capacity was 230 MCM, while current planned capacity is around 90 MCM.(Mr. Khoren Tsarukyan, PIU)
11.	Head of Community	How do you evaluate the compensation rate? Is it based on the market price or official price t?	Based on the law/regulation, land evaluation and compensation will be implemented. (Mr. Artak Ter-Torosyan, ATMS Solutions LLC) The Reservoir basin is owned by State/Community, therefore, compensation for the

[21] Ultimately, the northern route was not proposed as the Project component.

No.	Speaker	Question and Comment	Answer
			loss in the reservoir will not be a big issue. Regarding temporary land acquisition, compensation for the loss during the construction period will be provided. (Mr. Khoren Tsarukyan, PIU)
12.	Resident	Which place is the highest point of water pressure by the Reservoir?	Nor-Yerznka Community side in the Reservoir is relatively higher. (Mr. Khoren Tsarukyan, PIU)
13.	Resident	If the Reservoir capacity is 90 MCM, how deep in the reservoir?	Around 15-16m depth. Since the reservoir area is wide, water depth is not very huge. It is noted that the standard of quake-resistant during Soviet Union period was not very strict, however, new standard becomes strict than before. The quake-resistant design/measure is examined in collaboration with the Academy at this moment. (Mr. Khoren Tsarukyan, PIU)
14.	Resident	When will the construction works start?	It is F/S stage at this moment and after the F/S completion, Loan Agreement (L/A) will be exchanged. After the L/A, it will take 1.5 years for Detailed Design (D/D). After the D/D completion, the construction works will be started. (Mr. Khoren Tsarukyan, PIU)
15.	Resident	Climate change due to the construction works is expected?	It is recommended to ask the environmental expert for the issue. (Mr. Khoren Tsarukyan, PIU)
16.	Head of Community	Are there any environmental impacts on Nor-Yerznka Community?	During construction stage, heavy construction vehicles will be used, which can cause air pollution. (Mr. Khoren Tsarukyan, PIU)
17.	Resident	What kinds of materials will be used during construction stage? Do you have a plan to use oil?	It is planned to reduce the impacts on natural environment by the construction materials as much as possible. (Mr. Khoren Tsarukyan, PIU)
18.	Head of Community	There can be some dangerous situations by the Project. However, due to the increase of soil moisture, I think that Nor-Yerznka Community can be rich.	Indirect impact such as increase of agrichemical application amount will be examined. (Mr. Khoren Tsarukyan, PIU)
19.	Resident	The most important matter for the Community is safety, namely, quake-resistant measures of the Reservoir. Permeability examination during the construction stage is necessary.	If no measure is taken, all of the 90MCM water for the Reservoir will be infiltrated into the soil. Therefore, any measures have to be done. At this moment, anti-infiltration works are examined, and main construction cost will be for the works. In the Reservoir basin, most of area consists of sand and clay, while only a part of northern part of the Reservoir basin is rock. (Mr. Khoren Tsarukyan, PIU)
20.	Resident	Do you have a plan to transport of the fertile top-soil within in the Reservoir basin to other areas?	Some parts of top-soil in the Reservoir basin had been already transported during the Soviet Union period. If necessary, before the construction works, transportation of the top-soil will be examined. (Mr. Khoren Tsarukyan, PIU)
21.	Resident	The most important matter for the Community is safety. If safety is considered and secured, we will support the Project.	―
22.	Resident	Water leakage will give damage to not only Nor-Yerznka Community, but also Zovuni Community.	―
23.	JICA Survey Team	We would like to some female participants to express their opinions.	It seems that everybody regards the Project as very good one. However, there can be a possibility that dangerous situations in the Community will be caused by the Project, and I cannot support the Project completely. (a female resident)

At the seminar, official personnel of the PIU, the Survey team members, private environment experts (ATMS Solutions LLC), staff of Aarhus Center, the Community Head, and fifteen (15) residents including WUA Deputy Head participated. Participant list of the seminar is as shown in Table 9-5.

Table 9-5 Participant List of the Seminar in Nor-Yerznka Community (5th November 2015)

No.	Name	Position	Organization
1.	Alina Sahakyan	Head of the Community	Nor-Yerznka Community
2.	Haikush Nazaryan	Community office worker	Nor-Yerznka Community
3.	Lolita Tonotyan	Community office worker	Nor-Yerznka Community
4.	Artur Tonyan	Deputy Head	Ashtarak WUA
5.	-	Resident	
6.	-	Resident	
7.	-	Resident (a vehicle Operator)	
8.	-	Resident (Director of Culture House)	
9.	-	Resident (School Director)	
10.	-	Resident (Librarian)	
11.	-	Resident	
12.	-	Resident	
13.	-	Resident (Farmer)	
14.	-	Resident	
15.	-	Resident	
16.	-	Resident	
17.	Khoren Tsarukyan	Hydro-technical engineer	PIU, SCWE, MOA
18.	Kazumitsu TSUMURA	Team Leader	JICA Survey Team
19.	Ayumi SHIGA	Environmental and Social Consideration	JICA Survey Team
20.	Gevorg GEVORGYAN	Interpreter	JICA Survey Team
21.	Ruzanna Manyan	Coordinator	Aarhus Center
22.	Artak Ter-Torosyan	Director	ATMS Solutions LLC

9.4 Public Hearing on the Project Outline by the MNP

Based on the law in Armenia, the Public Hearing by the MNP on application of the Initial Environmental was held in Yeghvard municipality on 23rd December 2015. The Public Hearing was organized under the responsibility of the MNP, for the purpose of confirmation of the result of the Public Hearing, which had been already done by the Project. The opening remarks were done by Mr. K. Harutyunyan, Deputy Mayor of Yeghvard city and Ms. A. Drnoyan, the specialist of "Environmental Impact Expertise Center" SNCO. The discussion at the Public Hearing by the MNP is as shown below:

Table 9-6 Discussion at the Public Hearing on Project Outline by the MNP (23rd December 2015)

No	Speaker	Question and Comment	Answer
1.	Resident	What water will be used to fill the reservoir? Will the water of Sevan Lake be used? Is there enough water reserve, which will ensure irrigation of agricultural lands during irrigation period?	Water of Hrazdan river will be used to fill the reservoir through Arzni-Shamiram canal during springtime before irrigation season. Regarding the irrigation water reserves, 90MCM water will be reserved annually, which is quite huge amount for irrigation of lands. (Mr. Khoren Tsarukyan, PIU)
2.	Resident	You mentioned during presentation that the construction of reservoir will solve social issues. What kind of labor issues will be solved and is a fishing industry planned?	Currently our task is to construct the reservoir for the purpose of irrigation of lands. Regarding the recreation zone, maybe in the future fishing industry and recreation zone will also be considered, but such works are not envisaged in current project. (Mr. Khoren Tsarukyan, PIU)
3.	Resident	Is there a possibility to create a recreational zone around the reservoir?	
4.	Resident	What will happen to the humus (top soil) after removal during reservoir construction works?	The removed humus will be used for agriculture. (Mr. A. Ter-Torosyan, Environmental expert of ATMS

No	Speaker	Question and Comment	Answer
		Will it be provided to land users of that territory?	Solutions LLC) Answers of such questions related to humus will be given in the main stage of environmental impact assessment and alternative options for solution of those issues may be proposed. All the proposals and remarks will be taken into consideration. (Ms. A. Drnoyan)
5.	Resident	What kind of compensations will be provided to the owners of lands in the territory of reservoir?	Beside the laws of the Republic of Armenia there are international regulations, according to which, the land user, who has no ownership of the land, will not receive compensation as a land owner, but investments he made for cultivation of the land will be compensated. (Mr. M. Vardanyan, Chief accountant of "Welfare and housing fund" office)
6.	Resident	Will there be independent experts in the stage of assessment of environmental impact?	Independent experts are also being involved during the main stage of expertise, but this is still an initial stage and no independent expert is involved. (Ms. A. Drnoyan)

Table 9-7 Participant List of the Public Hearing by MNP (23rd December 2015)

No.	Name	Position	Organization
1.	K.Harutyunyan	Deputy-Mayor	Yeghvard city
2.	A.Drnoyan	Specialist	"Environmental Impact Expertise Center" SNCO, MNP
3.	N.Karapetyan	Leading specialist of Yeghvard City	Yeghvard City
4.	R.Manyan	Coordinator	Yeghvard Aarhus center
5.	M.Vardanyan	Specialist of social affairs	PIU, SCWE, MOA
6.	D.Zakaryan	Hydrologist	PIU, SCWE, MOA
7.	K.Tsarukyan	Hydro-technical engineer	PIU, SCWE, MOA
8.	A.Ter-Torosyan	Director	ATMS Solutions LLC
9.	A.Vardanyan	Chief accountant	"Welfare and Housing Fund" office
10.	A.Aleksanyan	Clerk	"Welfare and housing fund" office
11.	-	Resident of Yeghvard Community	
12.	-	Resident of Yeghvard Community	
13.	-	Resident of Yeghvard Community	
14.	-	Resident of Yeghvard Community	
15.	-	Resident of Yeghvard Community	
16.	-	Resident of Yeghvard Community	
17.	-	Resident of Yeghvard Community	
18.	-	Resident of Yeghvard Community	
19.	-	Resident of Yeghvard Community	
20.	-	Resident of Yeghvard Community	
21.	-	Resident of Yeghvard Community	
22	-	Resident of Yeghvard Community	

9.5 Public Seminar on Environmental and Social Impacts by the Project

It is not a duty for any project undertakers to organize public hearings for Category A projects more than twice. However, the Project could cause land acquisition and several dozen people will be affected, and expected impacts by the Project should be presented to the people at early stage, so that, the Project can be implemented smoothly. Based on the concept, the public seminars to explain about anticipated impacts were organized on 31st May 2016 prior to the official public hearing on the ESIA report. The most affected areas by the Project are Yeghvard Community and Nor-Yerznka Community,

and the seminars were held at those municipality offices. Public notice were presented at two (2) community offices mentioned above and four (4) WUA offices concerned (see the photos of public notice in Appendix 6) to encourage the people concerned to participate in the seminar as much as possible.

At the seminars, as a whole, there were no objection against the Project, and the participants are interested in compensation policy, transportation of fertile top-soil in the Reservoir basin, anti-infiltration works and involuntary communal land provision. It is noted that both heads of communities hope governmental support, e.g. small scale of project, in case of voluntary communal land provision. The discussions and participant lists at Nor-Yerznka Community and Yeghvard Community are shown in Table 9-10, Table 9-11, Table 9-12, and Table 9-13, respectively.

Table 9-8 Discussion on the Draft ESIA Report at the Public Seminar in Nor-Yerznka Community (31st May 2016)

No.	Speaker	Question and Comment	Answer
1.	Resident	What benefit will Nor Yerznka community receive from the reservoir? I think we have a privileged use of water, however, people don't get water even now.	If you have water shortage issue, please apply to PIU and explain your problem, they will record it. At this moment, we are in the F/S stage. We will implement further study in next stage (D/D). (Khoren Tsarukyan / PIU)
2.	Alina Harutyunyan/ Head of Community	We have gathered today in order to discuss issues related to the reservoir. If you have some other issues related to PIU, we will discuss it later.	Today's topic of discussion is environmental and social impacts by the Project, in terms of positive and negative impact. (Khoren Tsarukyan / PIU)
3.	Resident	How long does it take for the construction works?	Around 4 years (Khoren Tsarukyan / PIU)
4.	Resident	What if I do not agree with the compensation amount? (***1)**	It is today's main subject to be discussed. If you do not agree, we may decide not to pass the pipeline through your land (Khoren Tsarukyan / PIU)
5.	Alina Harutyunyan/ Head of Community	How many meters of width is necessary for burying the pipeline (φ1,600mm) which will pass through the community?	In general, 15m width for one-side (excluding canal) is secured for the proposed pipeline, still, in this Project, more than 15 m width for the pipeline is secured for safety side. It is noted that this is F/S stage and it will be finally decided during D/D stage. Everything will be done in accordance with the law. (Khoren Tsarukyan / PIU)
6.	Alina Harutyunyan/ Head of Community	Are you going to use existing dam or implement some additional works related to the dam?	Yes. It will be a high quality dam by using existing dam and additional works. The specialists from Japan have a rich related experience. We will take all the possible measures to ensure the safety of the dam. (Khoren Tsarukyan / PIU)
7.	Resident	There are many sandy areas in the reservoir basin. According to my experience, sprayed water is immediately absorbed into the soil. So, there will be a problem of infiltration.	We have carried out many surveys. The most severe issue is the anti-infiltration works. We have planned to implement anti-infiltration works to solve the issue. (Khoren Tsarukyan / PIU)
8.	Resident	Do you have a plan to construct a spill way?	No, the water is going to be discharged into Kasakh river through Outlet canal pipeline. In case of Yeghvard reservoir, we do not have the issue of catastrophic discharge facilities, because it is not going to be constructed on the river. In case of river, it is necessary to construct spill way.(Khoren Tsarukyan / PIU)
9.	Resident	But what if we have an earthquake?	We are going to design an emergency action

No.	Speaker	Question and Comment	Answer
			plan where all the issues and scenarios will be considered. (Khoren Tsarukyan / PIU)
10.	Resident	How deep will the reservoir be?	10-15m (Khoren Tsarukyan / PIU)
11.	Alina Harutyunyan/ Head of Community	Why does the section related to fertile soil contain only the name of Yeghvard community?	It is possible to discuss the matter, If you have the land within the Reservoir. (Artak Ter-Torosyan / ATMS Solutions) There is not going to be any biased towards any of the communities. There will be multi-party supervision not only by PIU, SCWE, Ministry of Agriculture (Suren Gyurjinyan / ATMS Solutions)
12.	Resident	You said that it will take 4 years for the construction works. Have you considered that we have very strong wind from end of May to end of June? And all the construction dust will be blown away to Nor Yerznka community. So, it can be a kind of environmental impact on the village by the Project.	We will certainly take it into account **(*2)** (Artak Ter-Torosyan / ATMS Solutions)
13.	Alina Harutyunyan/ Head of Community	I have a concern related to donation of the community lands to the state. If the land is taken from the community, at least some investments should be made in the community by the state. We do not want money. If the state can implement some small scale project for the community, it is OK. We need improved irrigation systems. Please mention this issue in your minutes of meeting because we have made some investments in many lands and donated them to the state.**(*4)**	The law is on your side. According to law, you can receive compensation.**(*3)** (Suren Gyurjinyan / ATMS Solutions) The community should defend your own interests. You can demand any supports from the state. (Suren Gyurjinyan / ATMS Solutions) I think this should be mentioned in the minutes of meeting and it can be taken into account later (Marine Vardanyan / PIU)
14.	Resident	In the presentation, construction of a new pipeline which will pass through the community is proposed. Is it possible to connect the new pipeline with an existing pipeline which provides water to Ashtarak canal?	Yes, it is planned in the Project. If your land is located under this pipeline, you will get water. (Khoren Tsarukyan / PIU)

*1: The question No.4 mentioned above was made before explanation of compensation policy, and the speaker understand the policy after the explanation.

*2: It is possible to minimize dust generation by water spray at the construction site.

*3: There is a case that the State provided compensation for communal land loss in Armenia (RAP for Construction of Road Links of Yerevan Western Ring Road, ADB, 2015). However, in the Project, it has yet to be decided whether the communities concerned to the Project will provide the communal land to the State voluntarily. This issue will be discussed after the Loan Agreement.

*4: It is possible to request to the Government to provide some small scale projects for the community. However, it is not fixed whether the Project will be implemented, therefore, after the loan agreement, such negotiation will be done between the community and the government.

Table 9-9 Participant List of the Public Seminar in Nor-Yerznka Community (31st May 2016)

No.	Full Name	Position	Organization
1	Alina Harutyunyan	Head of Community	Nor Yerznka Community
2	Lolita Tonoyan	Chief Specialist	Nor Yerznka Community
3	Yupik Rzgoyan	Chief Specialist	Proshyan Community
4	-	Resident, Nor Yerznka	
5	-	Resident, Nor Yerznka	

No.	Full Name	Position	Organization
6	-	Resident, Nor Yerznka	
7	-	Resident, Nor Yerznka	
8	-	Resident, Nor Yerznka	
9	-	Resident, Nor Yerznka	
10	-	Resident, Nor Yerznka	
11	-	Resident, Nor Yerznka	
12	-	Resident, Nor Yerznka	
13	-	Resident, Nor Yerznka	
14	Artur Tonyan	Deputy Head	Ashtarak WUA
15	Khoren Tsarukyan	Hydro-technical Engineer	PIU
16	David Zakaryan	Hydrologist	PIU
17	Marine Vardanyan	Social Expert	PIU
18	Ruzan Khojikyan	Program Coordinator in Armenia	JICA Armenia Liaison Office
20	Ayumi Shiga	Social Consideration	JICA Survey Team
21	Gevorg Gevorgyan	Assistant	JICA Survey Team
22	Kristine Goroyan	Assistant	JICA Survey Team
23	Luiza Ohanian	Assistant	JICA Survey Team
24	Artak Ter-Torosyan	Environmental Specialist	ATMS Solutions LLC
25	Suren Gyurjinyan	Resettlement Specialist	ATMS Solutions LLC

Table 9-10 Discussion on the Draft ESIA Report at the Public Seminar in Yeghvard Community (31st May 2016)

No.	Speaker	Question and Comment	Answer
1.	Karen Harutyunyan / Deputy Mayor	There are many poisonous snakes in the Reservoir basin. When the construction works are started, they will escape to outside of the Reservoir. We should not allow them to hurt people. The reservoir is surrounded by communities. Wherever the snakes go, we will face danger. Please consider the countermeasure against the issue.	At the moment, we do not have any ready-made solutions. We will try to find an optimal solution to the issue. (Artak Ter-Torosyan / ATMS Solutions)
2.	Karen Harutyunyan / Deputy Mayor	Currently, Hrazdan River and Kasakh River are not connected each other. If fish from the Hrazdan River are flushed to the Kasakh River through Yeghvard Reservoir, fish in both rivers can be mixed. Any ecological problems will be caused?	We are going to take the water at Arzni-Shamiram intake from the Hrazdan River. Around the intake point in Hrazdan River, 6 fish species are identified, and 5 species out of them are also identified in Kasakh River. Hence, it will not be a big issue. (Rie Kitao / JICA Survey Team)
3.	Karen Harutyunyan / Deputy Mayor	What if only a part of the land is to be alienated?	If the owner of the alienated land can prove that the remaining part of land (not to be alienated) also cannot be used any more since it is useless, he/she can demand compensation for whole land. In case of large lands, there is a principle of partial alienation. But in case of small lands, we have adopted the principle of alienating the whole area of the land. (Suren Gyurjinyan / ATMS Solutions)
4.	Garush Simonyan / Kasakh Community	We also have a problem of the difference of market price of the lands before and after construction of the reservoir.	Armenian legislation stipulates a very clear price determination methodology. Unit price of land is market price plus 15%. The land price should be determined before the construction. According to the regulation, a professional land evaluator with license makes measurement of the affected area,

No.	Speaker	Question and Comment	Answer
			and set the market price. A notification is sent to the owner. If the owner does not agree the price, he/she can appeal to the court. Governmental decree simply states which area of land should be alienated for public interest, however, there is no provision of market price in case of alienation. (Suren Gyurjinyan / ATMS Solutions)
5.	Karen Harutyunyan / Deputy Mayor	Isn't the Government responsible for determining the market price?	No. Government will not determine the land price. Land evaluators will do that. (Suren Gyurjinyan / ATMS Solutions)
6.	Garush Simonyan / Kasakh Community	Can the resident insist on getting land as compensation instead of money?	He can negotiate and come to an agreement. He cannot take the case to the court. Experience shows that the amount of compensation is almost always acceptable for the land owner. (Suren Gyurjinyan / ATMS Solutions)
7.	Garush Simonyan / Kasakh Community	When the Reservoir is constructed, the land price will be increased. If compensation is done before construction, the land price can be lower than that after the project completion.	We have to follow the law for land price estimation regardless of land price increase or decrease. (Suren Gyurjinyan / ATMS Solutions)
8.	Sargis Hovhannisyan / land owner /officer of community	I have two pieces of lands in the affected area, in one land, 2 year-old apple trees are planted, while 8 years apple trees are planted in another land. How the compensation will be done?	One of the lands (8-year-old trees) is out of the affected area. Regarding the other one, you will get compensation for the land, as well as for your expenses made for the apple trees. (Suren Gyurjinyan / ATMS Solutions)
9.	Karen Harutyunyan / Deputy Mayor	Which company will construct the reservoir? Is there going to be an international or a local tender?	Irrespective of international or local contractor, we will suggest the contractor to hire the local population as much as possible. We will also suggest the contractor to provide job opportunity for local women, for instance, to employ women as cook for labors. (Marine Vardanyan /PIU)
10.	Karen Harutyunyan / Deputy Mayor	Those who get a pension at this moment can receive allowance by the Project. It means that they receive both the pension and allowance.	That is why we have introduced some additional criteria, namely families headed by single mothers, old people and families that have disabled members. If you can suggest any other criteria, we are ready to discuss it. (Suren Gyurjinyan / ATMS Solutions)
11.	Karen Harutyunyan / Deputy Mayor	We provide community lands to the state but don't get anything in return. So, we would like to get some benefits. For instance, we could have free irrigation system for 10-15 years.**(*1)**	I would suggest that you negotiate on some social projects, for instance, construction of a school (Suren Gyurjinyan / ATMS Solutions)
12	Karen Harutyunyan / Deputy Mayor	Are you going to completely use the stored water at the reservoir during the irrigation period?	No, it is going to keep a "dead" water level. In the area close to Nor Yerznka, the water depth will be 2-3m, while it will be around 0.5m near Yeghvard Community. (Khoren Tsarukyan / PIU)
13.	Karen Harutyunyan / Deputy Mayor	In such case, a swamp can be formed?	No, because the water will flow all the time. The water is continually stored and discharged for irrigation. Therefore, water

No.	Speaker	Question and Comment	Answer
			will not be stagnant and no swamp will be formed. (Khoren Tsarukyan / PIU)
14.	Karen Harutyunyan / Deputy Mayor	What kind of anti-infiltration measure do you plan to use?	We plan to use bentonite sheet and soil-cement. This soil-cement will be kind of a weak concrete. And the slopes will be protected from wave action and infiltration. (Khoren Tsarukyan / PIU)
15.	Garush Simonyan / Kasakh Community	Are the ground waters affected by the Project?	The ground waters range in very deep layer, at around 120-130m, the water is filtrating into the ground, finally to the Kasakh River. After anti-infiltration works by the Project, stored water at the Reservoir almost will not permeate into the soil. Thus, no impact on the ground water by the Project is expected. (Khoren Tsarukyan / PIU)
16.	Karen Harutyunyan / Deputy Mayor	How the fertile top soil of the Reservoir basin will be managed by the Project?	We should have a discussion with the communities and decide the method of fertile layer transportation and the destination.**(*2)** (Khoren Tsarukyan / PIU)
17.	Garush Simonyan / Kasakh Community	What if, for instance, my land is evaluated and given a lower price than my neighbor's land?	If you do not agree with the price determined for your land, you have some options, and finally you can take the case to court.**(*3)** (Suren Gyurjinyan / ATMS Solutions)

*1: Whether the communal land will provided voluntarily cannot be determined at F/S stage. After the loan agreement, it will be discussed between community concerned and the Government.

*2: In case of any projects which would disturb fertile top-soil, it is needed to transport the soil to outside of the area based on decrees in Armenia. However, there is no mention who is requested to transport the fertile soil and how the soil is distributed among the stakeholders in the decrees.

*3: Three patterns for lodging of complaints are proposed in the Project, it is possible to consult with the communities concerned and PIU prior to court.

Table 9-11 Participant List of the Public Seminar in Yeghvard Community (31st May 2016)

No.	Name	Position	Organization
1	Karen Harutyunyan	Deputy Head	Yeghvard Community
2	Lilit Harutyunyan	Officer	Yeghvard Community
3	Narine Karapetyan	Officer	Yeghvard Community
4	Sona Karapetyan	Officer	Yeghvard Community
5	Narine Harutyunyan	Officer	Yeghvard Community
6	-	Resident, Kasakh Community	
7	-	Resident of Yeghvard Community	
8	-	Resident of Yeghvard Community	
9	Khoren Tsarukyan	Hydro-technical Engineer	PIU
10	Marine Vardanyan	Social Expert	PIU
11	David Zakaryan	Hydrologist	PIU
12	Ruzanna Manyan	Coordinator	Aarhus Center, Yeghvard Community
13	Anush Beybutyan	Coordinator	Aarhus Center, Yeghvard Community
14	Ayumi Shiga	Social Consideration	JICA Survey Team
15	Rie Kitao	Environmental Consideration	JICA Survey Team
16	Gevorg Gevorgyan	Assistant	JICA Survey Team
17	Kristine Goroyan	Assistant	JICA Survey Team
18	Luiza Ohanian	Assistant	JICA Survey Team
19	Artak Ter-Torosyan	Environmental Specialist	ATMS Solutions LLC
20	Suren Gyurjinyan	Resettlement Specialist	ATMS Solutions LLC

Since the number of farmers who participated in the public seminar in Yeghvard Community on 31st May was limited, additional seminar in Yeghvard WUA office was organized. The discussion at the seminar and participant list are as shown in Table 9-12 and Table 9-13.

Table 9-12 Discussion on the Draft ESIA Report at the Public Seminar in Yeghvard WUA (3rd June 2016)

No.	Speaker	Question and Comment	Answer
1.	Resident	How large was the Reservoir area during the Soviet Union period and how large is current proposed area of Reservoir?	During the Soviet Union period, it was around 1,000 ha, at this moment, the planned area is around 800 ha. (Khoren Tsarukyan / PIU).
2.	Resident	Are only cereal crops cultivated in the reservoir area?	Both cereal and fodder crops are cultivated. (Suren Gyurjinyan / ATMS Solutions)
3.	Resident	How much is the minimum monthly salary rate in Armenia?	Currently, it is 55,000 AMD per month (Suren Gyurjinyan / ATMS Solutions)
4.	Resident	In case we need to apply to the court for solution of some issues, who is going to pay for court expenses?	The person who applies to the court should pay when he/she applies. But if the applier wins the case, the expenses will be reimbursed to him/her. (Suren Gyurjinyan / ATMS Solutions)
5.	Resident	Is the community land compensated by the State? If there are any vulnerable people (regardless of directly affected or not affected by the Project), what kind of compensation can be provided to them?	This issue should be solved through negotiations between the State and the community. If the State provides compensation for communal land loss, it will be provided to the community, not to vulnerable people in the community, In general, vulnerable people are provided by social support program, like renovation of schools, some cultural houses, etc. It means that the State already has special supporting to such kind of people. (Suren Gyurjinyan / ATMS Solutions)
6.	Resident	When will the Project be officially launched?	It will take one year for negotiation between Government of Japan and Government of Armenia for signing the loan agreement. After that, D/D and construction works will be started. The construction stage will last 4-5 years. (Khoren Tsarukyan / PIU)
7.	Resident	What do you mean by saying partial alienation of land?	After completion of the design, the land size to be alienated will be decided based on the inventory survey. For example, if you have a land with 50 m width and only 15 m width of that will be alienated by the Project, the amount of compensation will be calculated only for the part of 15 m width. (Suren Gyurjinyan / ATMS Solutions)
8.	Resident	What type of canal will be constructed?	It is going to be a pipe with 1,600 mm diameter, buried at 2-2.5 m depth (Khoren Tsarukyan / PIU)
9.	Resident	Will the compensation be provided equal to market price or cadastral price?	Higher price between them will be applied. However, usually market price is higher than the cadastral one. (Suren Gyurjinyan / ATMS Solutions)
10.	Resident	I expect that tourism around the Reservoir will be developed after construction.	-
11.	Resident	My private land will be affected by canal construction. However, I support the Project, since I know its importance.	-

Table 9-13 Participant List of the Public Seminar in Yeghvard WUA (3rd June 2016)

No.	Name	Position	Organization
1.	-	Resident	
2.	-	Resident	
3.	-	Resident	

No.	Name	Position	Organization
4.	-	Resident	
5.	-	Resident	
6.	-	Resident	
7.	-	Resident	
8.	-	Resident	
9.	-	Resident	
10.	-	Resident	
11.	-	Resident	
12.	-	Resident	
13.	-	Resident	
14.	-	Resident	
15.	-	Resident	
16.	Gayane Karapetyan	WUA officer	Yeghvard WUA
17.	Aida Hovhannissyan	WUA officer	Yeghvard WUA
18.	Gyurjinyan Suren	Resettlement expert	ATMS Solutions
19.	Ayumi Shiga	Social Consideration	JICA Survey Team
20.	Rie Kitao	Environmental Consideration	JICA Survey Team
21.	Gevorg Gevorgyan	Assistant	JICA Survey Team
22.	Tatevik Minasyan	Assistant	JICA Survey Team
23.	Luiza Ohanyan	Assistant	JICA Survey Team

Appendixes

Appendix 1 Public Notice of Consultation Meeting on the Project Outline (in Newspaper)

8 ՀՈԿՏԵՄԲԵՐ 2015, ՀԻՆԳՇԱԲԹԻ էջ 6 Հայաստանի

8th October, 2015

ԳՈՎԱԶԴ ԾԱՆՈՒՑՈՒՄ

ՀԱՅՏԱՐԱՐՈՒԹՅՈՒՆ

Երեւանի Մխիթար Հերացու անվան պետական բժշկական համալսարանը հայտարարում է 2015-2016 ուսումնական տարվա հեռակա ասպիրանտուրայի ընդունելություն (նպատակային՝ ուսման վճարի փոխհատուցմամբ, հեռակա ուսուցմամբ անվճար հիմունքով պետական պատվերի շրջանակներում) հետեւյալ մասնագիտությունների գծով՝

1. ԺԴ.00.07 Նյարդաբանություն, հոգեբուժություն եւ թմրաբանություն (ԼՂՀ)՝ 1 տեղ

Մրցույթին կարող են մասնակցել բժշկական բուհի կլինիկական օրդինատուրայի շրջանավարտները կամ դիպլոմավորված մասնագետի որակավորում ունեցող բժիշկ-մասնագետները, ովքեր ունեն հանձնած «Օտար լեզու» եւ «Համակարգչից օգտվելու հմտություններ» առարկաներից տարբերակված ստուգարքները՝ հաղթահարելով անհրաժեշտ անցումային շեմերը:

Մասնագիտական քննությունները կազմակերպվելու են նոյեմբերի 2-ից 7-ը:

Փաստաթղթերն ընդունվում են հայտարարության հրապարակման օրվանից յուրաքանչյուր աշխատանքային օր՝ ժամը 12:00-17:00-ն, մինչեւ հոկտեմբերի 31-ը ներառյալ, ք. Երեւան, Կորյունի փողոց 2, ԵՊԲՀ գիտության վարչություն (մուտքը Հերացի փողոցից):

Լրացուցիչ տեղեկությունների համար զանգահարել՝(060) 621-221:

ՀԱՅՏԱՐԱՐՈՒԹՅՈՒՆ

[illegible]

<<ՀՀ Արարատի և Վայոց ձորի մարզերի ընդհանուր իրավասության առաջին ատյանի դատարանի վարույթում է գտնվում թիվ ԱՎԴ/3000/02/15 քաղաքացիական գործն ըստ դիմումի Արմինե Արաիկի Խանգելդյանի՝ Արարատի մարզի Բարձրաշեն գյուղի բնակիչ, 01.07.1963թ.-ին ծնված Արաիկ Լևոնի Խանգելդյանին անհայտ բացակայող ճանաչելու պահանջի մասին:

Արաիկ Լևոնի Խանգելդյանի (վերջին հայտնի բնակության վայրը՝ ՀՀ Արարատի մարզ, գ.Բարձրաշեն) վերաբերյալ տեղեկություն ունեցող անձանց խնդրում ենք այդ մասին հայտնել ՀՀ Արարատի և Վայոց ձորի մարզերի ընդհանուր իրավասության առաջին ատյանի դատարան (ՀՀ, Արարատի մարզ, ք.Արտաշատ, Շահումյան 19) կամ զանգահարել (0235) 2-23-87 հեռախոսահամարով>>:

ԾԱՆՈՒՑՈՒՄ

ՆԱԽԱՏԵՍՎՈՂ ԳՈՐԾՈՒՆԵՈՒԹՅԱՆ ՎԵՐԱԲԵՐՅԱԼ ԱՆՑԿԱՑՎԵԼԻՔ ՀԱՆՐԱՅԻՆ ԼՍՈՒՄՆԵՐԻ (ՔՆՆԱՐԿՈՒՄ) ՄԱՍԻՆ

2015 թվականի հոկտեմբերի 20-ին ժ. 15.00-18.00 Եղվարդի քաղաքապետարանի նիստերի դահլիճում (հասցե՝ ք. Եղվարդ, Երևանյան 1) տեղի կունենա հանրային լսում (քննարկում) <<Եղվարդի ոռոգման համակարգի բարելավման նախագծի շրջակա միջավայրի ազդեցության նախնական գնահատման հայտ>> փաստաթղթի վերաբերյալ:

Ձեռնարկող	ՀՀ ԳՆ Ջրային տնտեսության պետական կոմիտե
Նախատեսվող գործողության իրականացման վայրը	Եղվարդ, Երևանյան 1, քաղաքապետարանի նիստերի դահլիճ
Շրջակա միջավայրի բաղադրիչների վրա հնարավոր ազդեցություն	Հնարավոր է որոշակի ազդեցություն շրջակա միջավայրի բաղադրիչների վրա
Փաստաթղթին ծանոթանալու եղանակները, վայրերը, օրը, ժամը	Փաստաթուղթը տեղակայված է Ջրային տնտեսության պետական կոմիտեի (ք. Երևան, Վարդանանց փակուղի 13 Ա) էլ. կայքում՝ www. scws.am, Եղվարդի քաղաքապետարանի (ք. Եղվարդ, Երևանյան 1) էլ. կայքում՝ info@ yegvard.am, Եղվարդի Օրհուս կենտրոնի (ք. Եղվարդ, Երևանյան 1) էլ. կայքում՝ www.aarhus , ինչպես նաև կարող են ծանոթանալ նշված հասցեներում սույն հայտարարության հրապարակման օրվանից ամեն օր ժ. 14.00-18.00 մինչև դիտողություններ ու առաջարկություններ ներկայացնելու ժամկետի ավարտը:
Դիտողություններ և առաջարկություններ ներկայացնելու ժամկետը	7 աշխատանքային օր՝ հաշված այս ծանուցման հրապարակման օրվանից
Քննարկումների պատասխանատու	Եղվարդի քաղաքապետարան
Քննարկումների պատասխանատուի էլ. փոստի հասցեն և հեռախոսահամարը	էլ. փոստ՝ info@ yegvard.am, հեռ.(0224) 21110

Appendix 2 Letter from Yeghvard Community to Chairman of SCWE

(1) Original

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԿՈՏԱՅՔԻ ՄԱՐԶԻ ԵՂՎԱՐԴԻ
ՔԱՂԱՔԱՊԵՏ

Հայաստանի Հանրապետության Կոտայքի մարզի Եղվարդ համայնք,
ք. Եղվարդ, Երևանյան 1, Հեռ. (0224) 21110, info@yeghvard.am

N 370
03 նոյեմբեր 2015թ.

ՀՀ ՋՐԱՅԻՆ ՏՆՏԵՍՈՒԹՅԱՆ ՊԵՏԱԿԱՆ
ԿՈՄԻՏԵԻ ՆԱԽԱԳԱՀ
ՊԱՐՈՆ Ա. ՀԱՐՈՒԹՅՈՒՆՅԱՆԻՆ

Հարգելի պարոն Հարությունյան.

Ի կատարումն "Շրջակ··· միջավայրի վր··· ···զդեցության գնահատման և փորձաքննության մասին" ՀՀ սխնական համաձայնություն եմ տալիս Եղվարդ քաղաքային սրաձքում "Եղվարդի ոռոգման համակարգի բարելավման նախ Հարգանքներով՝

ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ՝ ՆՈՐԱՅՐ ՍԱՐԳՍՅԱՆ

Կատ. ՝ Կ. Հարությունյան

Հեռ.0224-2-11-58

(2) English (translated)

N370
03.11.2015

To: Chairman of State Committee of Water Economy, MoA of RA
Mr. A. Harutyunyan

Dear Mr. Harutyunyan,
As an implementation of Article 16 of the law on "Environmental impact assessment and expertise", I initially give my agreement for implementation of "Yeghvard Irrigation System Improvement Project" within the administrative territory of Yeghvard community.

Regards,
Head of community
Norayr Sargsyan

Appendix 3 Letter from Nor Yerznka Community to Chairman of SCWE

(1) Original

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԿՈՏԱՅՔԻ ՄԱՐԶԻ ՆՈՐ ԵՐԶՆԿԱ ՀԱՄԱՅՆՔ

Հայաստանի Հանրապետության Կոտայքի մարզի Նոր
Երզնկա համայնք
ՀՀ, Կոտայքի մարզ, գ. Նոր Երզնկա , 2-րդ փող., 33 շ.,
հեռ. (0232)3-67-91, norerznka-village@mail.ru

03.11.2015թ.

ՀՀ ՋՐԱՅԻՆ ՏՆՏԵՍՈՒԹՅԱՆ
ՊԵՏԱԿԱՆ ԿՈՄԻՏԵԻ ՆԱԽԱԳԱՀ
ՊԱՐՈՆ Ա. ՀԱՐՈՒԹՅՈՒՆՅԱՆԻՆ

Հարգելի պարոն Հարությունյան

Ի կատարումն «Շրջակա միջավայրի վրա ազդեցության գնահատման և փորձաքննության մասին» ՀՀ օրենքի հոդված 16-ի նախնական համաձայնություն եմ տալիս Նոր Երզնկա համայնքի վարչական տարածքում «Եղվարդի ոռոգման համակարգի բարելավման նախագծի» իրականացմանը:

ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ՝ Ա. ԱԼԻՆԱ ՀԱՐՈՒԹՅՈՒՆՅԱՆ

(2) English (translated)

03.11.2015

To: Chairman of State Committee of Water Economy, MoA of RA
Mr. A. Harutyunyan

Dear Mr. Harutyunyan,
As an implementation of Article 16 of the law on "Environmental impact assessment and expertise", I initially give my agreement for implementation of "Yeghvard Irrigation System Improvement Project" within the administrative territory of Nor Yerznka community.

Head of community
Alina Harutyunyan

Appendix 4 Terms of Reference for ESIA Report from the MNP

(1) Original

Հավելված N2

ՀՀ բնապահպանության նախարարի

2014թ նոյեմբերի << 18 >>-ի

N 347-Ն հրամանի

ՏԵԽՆԻԿԱԿԱՆ ԱՌԱՋԱԴՐԱՆՔ

/նախատեսվող գործունեության/

ՏԱ --04--

<<--14-->> -----01------ 2016թ

Սույն առաջադրանքը կազմված է <<Շրջակա միջավայրի վրա ազդեցության գնահատման և փորձաքննության մասին>> ՀՀ օրենքի (այսուհետ՝ Օրենք) դրույթների համաձայն և հիմք է հանդիսանում նախատեսվող Ա կամ Բ կատեգորիայի գործունեության՝ փորձաքննության հիմնական փուլին ներկայացվող շրջակա միջավայրի վրա ազդեցության հիմնական գնահատման հաշվետվության մշակման համար՝ ըստ ստորև ներկայացվող պահանջների.

1. Ձեռնարկողի անվանումը և հասցեն՝	ՀՀ գն ջրային տնտեսության պետական կոմիտե Ք. Երևան 0010, Վարդանանց 13ա.
2. Նախատեսվող գործունեությունը և նրա կատեգորիան՝	<<Եղվարդի ոռոգման համակարգի բարելավումը>> նախագծի նախնական գնահատման հայտ՝ <<Ա>> կատեգորիա
3. Ազդակիր համայնքը (ները)	Եղվարդ, Նոր Երզնկա համայնքներ
4. Շրջակա միջավայրի վրա ազդեցության գնահատման գործընթացում դիտարկվող օբյեկտները և բնութագրերը նախատեսել համաձայն Օրենքի 7-րդ հոդվածի 1-ին մասի 1-ից 13-րդ կետերի	Անհրաժեշտ է դիտարկել կետերում նշված բոլոր օբյեկտները և բնութագրերը:
5. Շրջակա միջավայրի և մարդու առողջության վրա ազդեցության գնահատման հաշվետվության բովանդակությունը և դրան կից ներկայացվող փաստաթղթերը նախատեսել համաձայն Օրենքի 18-րդ հոդվածի 2-րդ մասի 1-ից 15-րդ և 3-րդ	Շրջակա միջավայրի վրա ազդեցության գնահատման հաշվետվությունում անհրաժեշտ է ներառել նշված բոլոր կետերի ցուցանիշները և փաստաթղթերը: Անհրաժեշտ է հաշվետվությունում ներառել նախատեսվող բոլոր գործունեությունների /ջրամբար, ջրանցքներ և այլն/ շրջակա

	մասի 2-ից 6-րդ կետերի	միջավայրի վրա հնարավոր ազդեցությունները, նաև գումարային ազդեցությունները՝ շինարարության, շահագործման, արտակարգ և վթարային իրավիճակների դեպքում: Անհրաժեշտ է դիտարկել նաև նախատեսվող գործունեության ազդեցությունը Հրազդան, Քասախ գետերի, Արզնի Շամիրամ ջրանցքի վրա: Անհրաժեշտ է՝ - ներկայացնել պահպանման սանիտարական գոտու նկարագրությունը, դրա պահպանմանն ուղղված միջոցառումները: - մշտադիտարկումների իրականացումը, եղանակները, դիտակետերի տեղադրման քարտեզագրական նյութերը: - տարածքի վերականգնմանն, ռեկուլտիվացիային ուղղված միջոցառումները, դրանց իրականացման ֆինանսական միջոցները: Հողաբուսաշերտի հետագա օգտագործման այլընտրանքային լուծումները՝ համապատասխան հիմնավորումներով: Որպես առաջնահերթություն քննարկել հարցին վերաբերող ազդակիր համայնքի առաջարկությունները:
6.	Համապատասխան ոլորտի պետական լիազորված մարմնի եզրակացության կամ կարծիքի վերաբերյալ պահանջը՝	ՀՀ առողջապահության, ՀՀ տարածքային կառավարման և արտակարգ իրավիճակների նախարարություններ, ՀՀԳԱԱ Հիդրոերկրաբանության ինստիտուտ:
7.	Գործընթացի մասնակիցները համաձայն Օրենքի 4-րդ հոդվածի 1-ին մասի 22-րդ կետի	Եղվարդ համայնքի քաղաքապետարան, Նոր Երզնկա համայնքապետարան համայնքներ, հանրություն:
8.	Հանրության ծանուցումը և քննարկումների իրականացումը կատարել համաձայն Օրենքի 26-րդ հոդվածի 2-րդ մասի 2-րդ, 3-րդ կետերի, 3-րդ մասի, 5-րդ մասի 1-ին, 2-րդ կետերի, 7-րդ և 8-րդ մասերի և <Հանրային ծանուցման և քննարկումների իրականացման կարգը սահմանելու մասին>> ՀՀ	Գնահատման ընթացքում համայնքների քաղաքապետարան /գյուղապետարանը՝ ձեռնարկողի հետ համատեղ պետք է իրականացնի հանրության ծանուցում և հանրային քննարկումներ: Արձանագրությունները, տեսաձայնագրության կրիչը, հանրության դիտողությունների հիմնավորված

կառավարության 19.11.2014թ N1325-Ն որոշման	պատասխանների ամփոփաթերթը պետք է ներառել շրջակա միջավայրի վրա ազդեցության գնահատման հաշվետվությունում և ներկայացնել ՀՀ բնապահպանության նախարարություն՝ փորձաքննության:
9. Պետական տուրքի չափը՝	500.000 (հինգ հարյուր հազար) դրամ՝ Ա կատեգորիայի համար
10. Ստացողը և հաշվի համարը՝	ՀՀ ֆինանսների նախարարության գանձապետարան՝ 900005000196
11. Վճարման նպատակը՝	Նախատեսվող գործունեության փորձաքննության գործընթացի իրականացման համար
12. Փորձաքննության հիմնական փուլի սկիզբը համաձայն Օրենքի 19-րդ հոդվածի և <<Շրջակա միջավայրի վրա ազդեցության փորձաքննության իրականացման կարգը սահմանելու մասին>> ՀՀ կառավարության որոշման	Տեխնիկական առաջադրանքի համապատասխան կազմված ՇՄԱԳ հաշվետվությունը՝ ՀՀ բնապահպանության նախարարություն՝ շրջակա միջավայրի վրա ազդեցության փորձաքննություն ներկայացնելը:

<<Շրջակա միջավայրի վրա ազդեցության փորձաքննական կենտրոն>> ՊՈԱԿ-ի տնօրեն / Վ. Սահակյան

<<Շրջակա միջավայրի վրա ազդեցության փորձաքննական կենտրոն>> ՊՈԱԿ-ի փոխտնօրեն Ս. Փահլևանյան

<<Շրջակա միջավայրի վրա ազդեցության փորձաքննական կենտրոն>> ՊՈԱԿ-ի մասնագետ Ա. Դոնոյան

(2) English (translated)

Appendix N2
Of the order N 347-N
Of the Minister of Nature Protection of RA
Dated on 18th November 2014

TECHNICAL REQUIREMENTS (Terms of reference)
(of the planned activity)
ToR 04
14.01.2016

Current ToR is composed according to the provisions of the law of RA "about environmental impact assessment and expertise" (hereinafter referred to as "Law"), and is the basis for preparation of environmental impact assessment report for planned activity of category A or B during the main stage of expertise, with the following requirements:

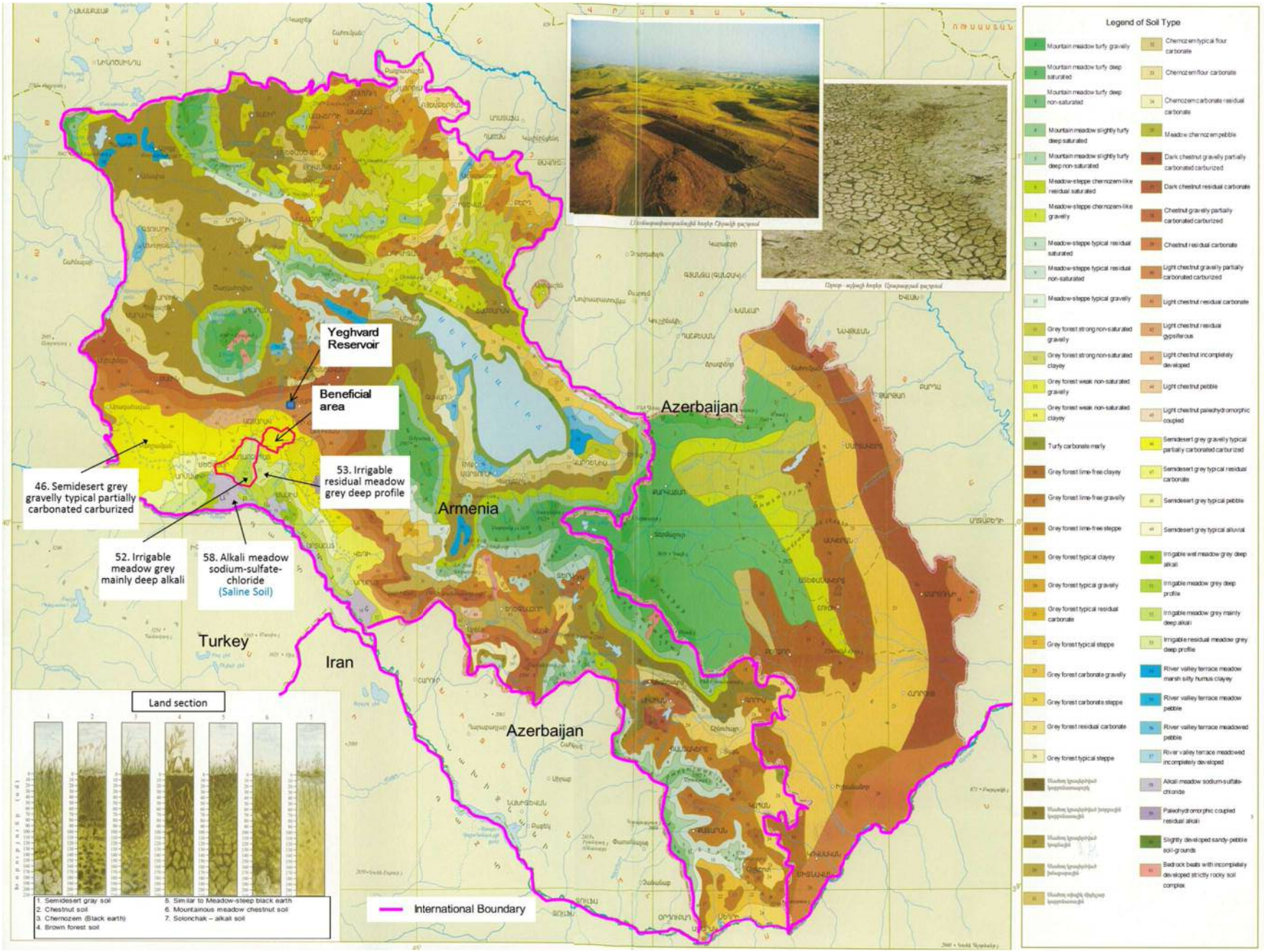
1	Name and address of undertaker	SCWE, MoA of RA 13a Vardanants str., 0010, Yerevan city
2	Planned activity and its category	Application of initial assessment of "Yeghvard irrigation system improvement" project, category A
3	Affected community (-ies)	Yeghvard, Nor Yerznka community
4	The objects and features subject to environmental impact assessment shall be considered according to the points 1 to 13 of the 1st part of the 7th Article of the Law.	All the objects and features mentioned in those points shall be considered.
5	The content of environmental and human health impact assessment report and attached documents shall be considered according to the points 1 to 15 of part 2 and points 2 to 6 of part 3 of the Article 18 of the Law.	Indices and documents of all the mentioned points must be included in the Environmental impact assessment report. Possible environmental impacts of all the planned activities (reservoir, canals, etc.), and also sum impacts (in case of construction, exploitation, emergency situations) must be included in the report, Impact of the planned activity to the Hrazdan and Kasakh rivers and Arzni-Shamiram canal must also be considered. It is necessary to: - Submit the description of the protection sanitary zone, measures for its maintenance; - Implementation and methods of monitoring, cartographic materials of

		locations of the observation points; - Measures for recovery and recultivation of the territory, financial means for its implementation: Alternative solutions for further use of the soil and grass cover with appropriate substantiations. Discuss the proposals of the affected community as a priority issue.
6	Requirement on conclusion or opinion of the state authorized body of the appropriate field.	RA Ministry of Healthcare, RA Ministry of Territorial Administration and Emergency Situations, RA NAS Institute of Hydrogeology
7	Participants of the activity according to the point 22 of the 1st part of the Article 4 of the Law.	Municipality of Yeghvard community, Nor Yerznka community office, public.
8	Public notification and discussions should be done according to the points 2 and 3 of the part 2, part 3, points 1 and 2 of the part 5, parts 7 and 8 of the Article 26 of the Law and according to the RA Government decision N1325-N (dated on 19.11.201) about "defining the order of implementation of public notification and discussions".	The community office together with the undertaker shall implement public notification and public discussions. The minutes, video recording and summary of substantiated answers to the comments of the public must be included in the environmental impact assessment report, which must be submitted to the Ministry of Nature Protection for expertise.
9	Amount of the State fee	500,000 (five hundred thousand) drams for Category A
10	Recipient and account Number	Treasury of the Ministry of Finances: 900005000196
11	Purpose of the payment	for implementation of expertise of the planned activity
12	Start of the main stage of expertise according to the Article 19 of the Law and RA Government decision "about defining the order of implementation of expertise of environmental impact"	Submission of the ESIA report composed according to the ToR to the Ministry of Nature Protection for expertise.

Director of the "Environmental Impact Expertise Center" SNCO V.Sahakyan

Deputy Director of the "Environmental Impact Expertise Center" SNCO S.Pahlevanyan

Specialist of the "Environmental Impact Expertise Center" SNCO A.Drnoyan



Source: NATIONAL ATLAS OF ARMENIA Volume A "Center of Geodesy and Cartography" SNCO

Appendix 6 Main Ecological Characteristics of Identified Fish in the Hrazdan River and Kasakh River

Fish species	Migratory	Size of the fish	Main habitat	Spawning conditions	Capture point
1.Angora loach *(Oxynoemacheilus angorae)*[1, 2]	Not migratory	L: 5-8 cm, H:1.5-2 cm, max:11x2.5cm	Widespread from downstream to middle upstream of Hrazdan River. In the shallow water of rivers and channels	Spawning season is from April to July. Favorite places for spawning is on the sand or water plants at coastal parts of rivers at 0.1-0.7 m depth	Middle & down stream
2.Armenian roach *(Rutilus rutilus schelkovnikovi)*[1, 2, 3]	Not migratory	L:12-15 cm, H:3-5 cm, max:25x7.5cm	In the In the shallow water of rivers and channels	Spawning season is from January to March. Favorite places for spawning are and channels on the water plants at the coastal parts of rivers at the depth of 0.2-0.5 m	Down stream
3.Asp *(Aspius aspius)*[1, 2, 3]	From upstream to downstream at middle autumn and from downstream to upstream at middle spring	L:40-60 cm, H:8-12 cm, max:80x18.5cm	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. Rivers, lakes, channels and reservoirs	Spawning season is from March to April. Favorite places for spawning is on the sand or gravel bottom of rivers and reservoirs at the depth of 0.5-2.0 m	Down stream
4.Blackbrow bleak (*Acanthalburnus microlepis)*	Not migratory[2]	L:12-15 cm, H:4-6 cm, max:25x9cm[1, 2]	Widespread in downstream of the Hrazdan River. In the shallow water of rivers, reservoirs, channels and ponds[2]	Spawning season is from late April to the end of July. Favorite places for spawning is on the water plants at the coastal parts of rivers and reservoirs at the depth of 0.5-1.5 m [1]	Down stream
5.Brown trout *(Salmo trutta fario)*[1, 2, 3]	From upstream to downstream at late winter and from downstream to upstream at middle autumn	L:25-30 cm, H:5-6 cm, max:50x10cm	Widespread in upstream of the Hrazdan River and in small rivers in its basin. Mountain stream, sometime In the shallow water of rivers	Spawning season is from October to December. Favorite places for spawning is on the sand or gravel at the upstream of rivers at the depth of 0.1-0.4 m	Up stream
6.Bulatmai barbell *(Luciobarbus capito)*	Not migratory [1, 2, 3]	L:35-50 cm, H:8.5-12 cm, max:90x19cm[1, 2, 3]	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. Rivers, also channels and reservoirs [1, 2, 3]	The males spawn in June. Favorite places for spawning is on the rocks or gravel bottom of river at the depth of 0.2-0.5 m[1, 2]	Down stream
7.Chub (Squalius orientalis)[1, 2, 3]	Partially, from upstream to downstream at autumn or from downstream to upstream at middle spring	L:15-25 cm, H:4- 7.5 cm, max:40x10cm	Widespread from downstream to middle stream of Hrazdan River. In the shallow water of rivers, channels, ponds, lakes and reservoirs	Spawning season is from May to August. Favorite places for spawning are at the coastal parts of the small rivers at the depth of 0.3-0.7 m. The eggs are pelagic (the eggs are laid in the midwaters)	Up & down stream
8.Common bream *Abramis brama*	From upstream to downstream at early autumn and from downstream to upstream at middle spring[2]	L:25-35cm, H:10-15cm, max:50x22cm[2]	Widespread in downstream of the Hrazdan River, channels, ponds, and sometime reservoirs[1, 4]	Spawning season is from April to June. Favorite places for spawning is on the water plants at the coastal parts of rivers/channels at the depth of 0.2-0.7 m [2]	Down stream
9.Common carp *(Cyprinus carpio)*	From upstream to downstream at early autumn and from downstream to upstream at	L:35-45cm, H:8.5-14cm, max:70x23cm[1, 2, 3]	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. Rivers, lakes, also channels, reservoirs and ponds[1, 2, 3]	Spawning season is from April to June. Favorite places for spawning are at the coastal parts of rivers, ponds, channels, reservoirs at the depth of 0.2-0.5 m on the	Down stream

Fish species	Migratory	Size of the fish	Main habitat	Spawning conditions	Capture point
	middle spring. This species does not make the migration in the lakes, reservoirs and ponds[1, 3]			water plants [1, 2, 3]	
10.Eastern mosquitofish (*Gambusia holbrooki)*	Not migratory[2]	L:2-4cm, H:0.4-0.8cm, max:6x1.2cm[1, 2]	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. In the shallow water and ponds, reservoirs[1, 2]	Spawning season is from March to November. Favorite places for spawning in the water plants on the surface water [1, 2]	Down stream
11.European bitterling *(Rhodeus amarus)*[2]	Not migratory	L:4-6 cm, H:1.5-2.5cm, max:9x3.5cm	Widespread downstream of Hrazdan River. In the In the shallow water of rivers, channels and ponds	Spawning season is from late March and to September. Favorite place for spawning is in the shell of Anadonta sp. (freshwater mussels) at the depth of 0.1-1.0 m	Down stream
12.Gudgeon *(Gobio gobio)*[5]	Not migratory	L:6-10 cm, H:2-2.5cm, max:15x3.5cm	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. In the shallow water of rivers, channels and ponds	Spawning season is from April to June. Favorite places for spawning is on the sand, small rocks, gravel ground, water plants at the coastal parts of the rivers, channels and ponds at the depth of 0.1-0.5 m	Down stream
13.Kura barbell *(Barbus lacerta cyri)*	Yes (partially), From upstream to downstream at late autumn and from downstream to upstream at early spring[1,3]	L:12-18cm, H:3.5-5.5cm, max:25x7cm[1, 2, 3]	Widespread from downstream to upstream of Hrazdan River. In the shallow water of rivers, mountain stream and channels[1, 2, 3]	Spawning season is from April to August. Favorite places for spawning is on the sand and gravel ground at the coastal parts of rivers and channels at the depth of 0.2-1.0 m [1]	Up, mid and down stream
14.Kura bleak *(Alburnus filippii)* [1,2]	Not migratory	L:7-12 cm, H:2.5-3.5cm, max:15x4cm	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. In the shallow water of rivers and channels	Spawning season is from late April to the end of June. Favorite places for spawning is on the water plants or bottom gravel of the coastal parts of rivers and channels at the depth of 0.3-1.0 m	Down stream
15.Kura khramulya *(Capoeta capoeta capoeta)*	From upstream to downstream at middle autumn and from downstream to upstream at early spring[1]	L: 30-40 cm, H:7-10 cm, max:70x18 cm[1, 2]	Widespread from downstream to middle stream of Hrazdan River. In the shallow water of rivers, channels and reservoirs[1, 2]	Spawning season is from early June to July. Favorite places for spawning is on the sand or gravel ground at the coastal parts of rivers at the depth of 0.3-1.0 m. The biology of Kura khramulya in reservoirs of Armenia is unknown [2]	Down stream
16.Kura loach *(Oxynoemacheilus brandtii*)	Not migratory[2]	L:4-7 cm, H:1.2-1.8 cm, max:10x2 cm[1, 2]	Widespread from downstream to middle upstream of Hrazdan River. In the shallow water of rivers and channels[2]	The biology of Kura loach in Armenia is unknown [2]	Mid & down stream
17.Kura nase *(Chondrostoma cyri*)	From upstream to downstream at autumn and from downstream to upstream at middle spring[1, 3]	L:12-15 cm, H:2.5-4.0 cm, max:25x5.0 cm[1, 2]	Widespread from downstream to middle stream of Hrazdan River. In the shallow water of rivers, channels and reservoirs[1, 2, 3]	Spawning season is from late March to June. Favorite places for spawning is on the sand and gravel ground at the coastal parts of the upstream rivers at the depth of 0.3-0.5 m [1, 2]	Up & down stream

Fish species	Migratory	Size of the fish	Main habitat	Spawning conditions	Capture point
18.Monkey goby *(Neogobius fluviatilis)*[2]	Not migratory	L:6-12 cm, H:1.2-2.5 cm, max:20x4 cm	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. In the shallow water of rivers, channels, reservoirs and ponds	Spawning season is from February to June. Favorite places for spawning are under the stones at the coastal parts of rivers, channels, reservoirs at the depth of 0.4-1.5 m	Down stream
19.Mursa (*Luciobarbus mursa)*	Not migratory[1, 3]	L:30-40 cm, H:6-8 cm, max:50x10cm[1, 2, 3]	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. Rivers, also in the channels [1, 2, 3]	Spawning season is from April to June. The biology of Mursa in reservoirs of Armenia is unknown [1, 2, 3]	Down stream
20. North Caucasian bleak *(*Alburnus hohenackeri)2	Not migratory	L:6-10 cm, H:2-3 cm, max:14x4.5 cm	Widespread in downstream of the Hrazdan River. In the shallow water of rivers, channels and ponds	Spawning season is from late April to the end of May. Favorite places for spawning is on the water plants or bottom gravel at the coastal parts of rivers and channels at the depth of 0.1-0.5 m	Down stream
21.Prussian carp *(Carassius gibelio)*[2]	From upstream to downstream at middle autumn and from downstream to upstream at middle spring. This species does not make the migration in the lakes, reservoirs and ponds	L:12-18 cm, H:4-6.5 cm, max:35x9.5cm	Widespread from downstream to upstream of Hrazdan River. In the shallow water of rivers, channels, reservoirs and ponds	Spawning season is from March to July. Favorite places for spawning is on the water plants at the coastal parts of rivers, ponds, channels, reservoirs at the depth of 0.1-1.5 m	Up, mid and down stream
22.Rainbow trout *(Oncorhynchus mykiss)*[2]	It is not observed regularly. The Rainbow trout is identified throughout of the Hrazdan River, where penetrates from the fish farms	L:20-30cm, H:4.5-6.5cm, max:60x14cm	Rivers, ponds, however, It has no main habitat in Armenia	Spawning of rainbow trout in the rivers of Armenia is unknown	Up, mid and down stream
23.Sevan khramulya *(*Capoeta capoeta sevangi)[1, 2, 3]	From upstream to downstream at late autumn and from downstream to upstream at early spring	L: 20-30 cm, H:5-7.5 cm, max:50x12 cm	Widespread from downstream to upstream of Hrazdan River. Lakes and In the shallow water of rivers, channels and reservoirs	Spawning season is from April to August. Favorite places for spawning is on the sand or gravel ground at the coastal parts of rivers, lakes, ponds and reservoirs at the depth of 0.1-0.6 m	Up, mid and down stream
24.South Caspian sprilin *(Alburnoides eichwaldi)*[1, 2, 3]	Partially migratory. From upstream to downstream at late autumn and from downstream to upstream at early spring	L:6-8 cm, H:2-3 cm, max:12x3.5 cm	Widespread from downstream to upstream of Hrazdan River. In the shallow water of rivers and mountain stream, channels and reservoirs	Spawning season is from April to July. The fish can spawn 2-3 times per year. Favorite places for spawning is on the rocky bottom of the coastal parts of rivers at the depth of 0.1-0.5 m	Up, mid and down stream
25.Sunbleak *(Leucaspius delineatus)*[2]	Not migratory	L:4-6 cm, H:1-1.3 cm, max:8x1.8 cm	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. In the shallow water of rivers and ponds	Spawning season is from April to May. Favorite places for spawning is on the water plants at the coastal parts of rivers, ponds at the depth of 0.5-1.5 m	Down stream
26.Topmouth gudgeon	Not migratory	L:3.5-6 cm,	Widespread in downstream of the Hrazdan	Spawning season is from April to July. Favorite places	Up, mid

Fish species	Migratory	Size of the fish	Main habitat	Spawning conditions	Capture point
(Pseudorasbora parva)[2]		H:1-1.5 cm, max:9x2 cm	River from Araks River to Yerevan. In the shallow water of rivers and channels, reservoirs and ponds	for spawning is on the water plants or rocky ground at the coastal parts of rivers, ponds, channels, reservoirs at the depth of 0.2-0.8 m	and down stream
27.Wels catfish *(Silurus glanis)*[1, 2, 3]	Not migratory	L:80-120 cm, H:15-20 cm, max:300x48 cm	Widespread in downstream of the Hrazdan River, generally in the deep rivers and channels	Favorite places for spawning is on the water plants and muddy bottom at the coastal parts or average depth of rivers, channels at the depth of 0.5-3.0 m	Down stream
28.White bream *(Blicca bjoerkna transcaucasica)*	Not migratory[1]	L:10-12 cm, H:3.5-5 cm, max:18x7 cm[1, 2, 3]	Widespread in downstream of the Hrazdan River from Araks River to Yerevan, In the shallow water of rivers, channels and ponds[1, 2, 3]	Spawning season is from April to end of May. Favorite places for spawning is on the water plants at the coastal parts of rivers and channels at the depth of 0.1-0.5 m [1, 2]	Down stream

*Identified location is categorized into upstream, mid-stream and downstream of the Hrazdan River as shown in Figure-1.

L: the medium length of the body, H: the medium height of the body, max: the maximum body size

Source 1: Dadikyan, 1986, Fishes of Armenia.Yerevan, Academy of Sciences of the Armenian SSR

2: Pipoyan, 2012, The Ichthyofauna of Armenia: Stages of Formation and Present State, Publishing-ISBN 978-3-8473-9977-3

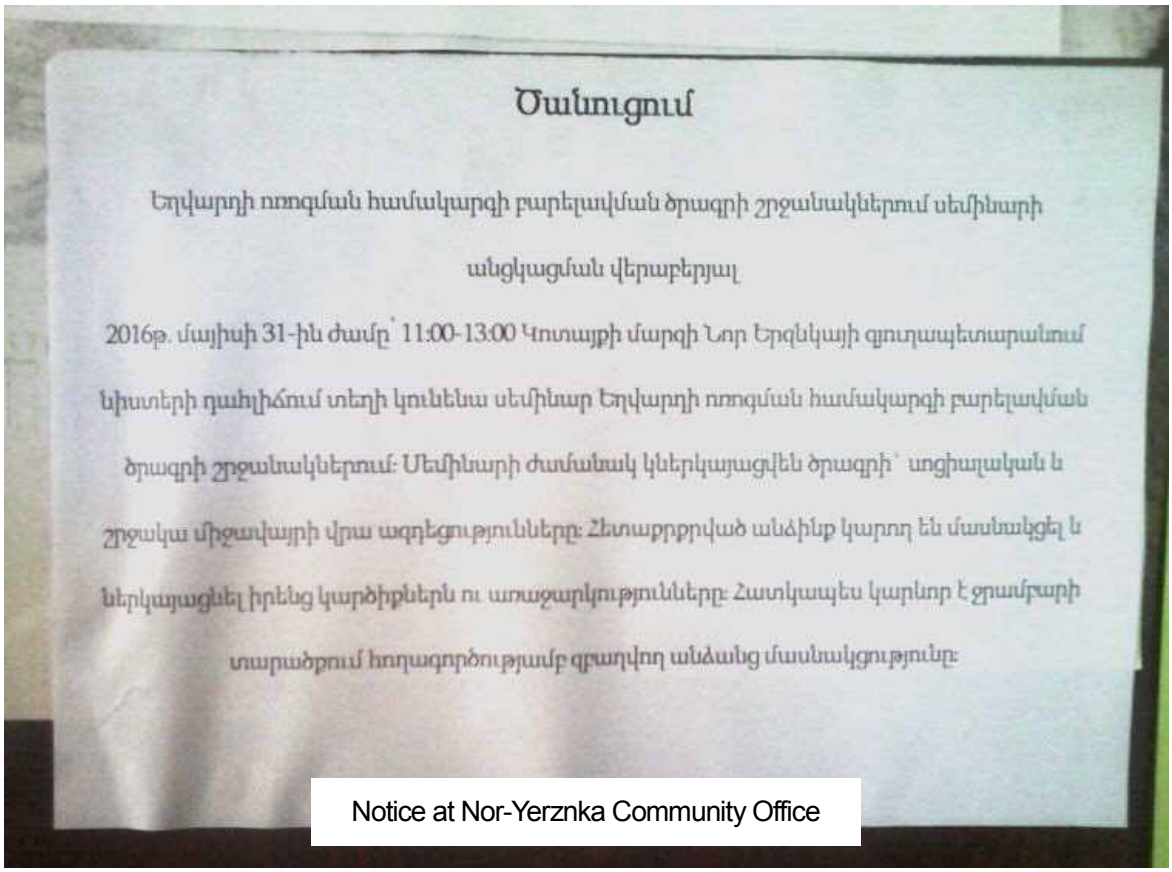
3: Barach, 1940, Fishes of Armenia// Proceedings of the Sevan Hydro biological Station. 1940 - Volume 6

4: Pipoyan, 1998a, Reconstruction of fish fauna under the influence of anthropogenic factors // Environmental issues. Abstracts of scientific conference in Yerevan

5: Pipoyan, 1998b, The new species for the fauna of Armenia - gudgeon Gobio gobio (Cyprinidae) // Journal of Ichthyology

Appendix 7 Public Notice at Municipality Offices and WUA Offices for Public Seminar on Natural and Social Impacts on 31st May 2016

(1) Photos of the Public Notice at Community Offices

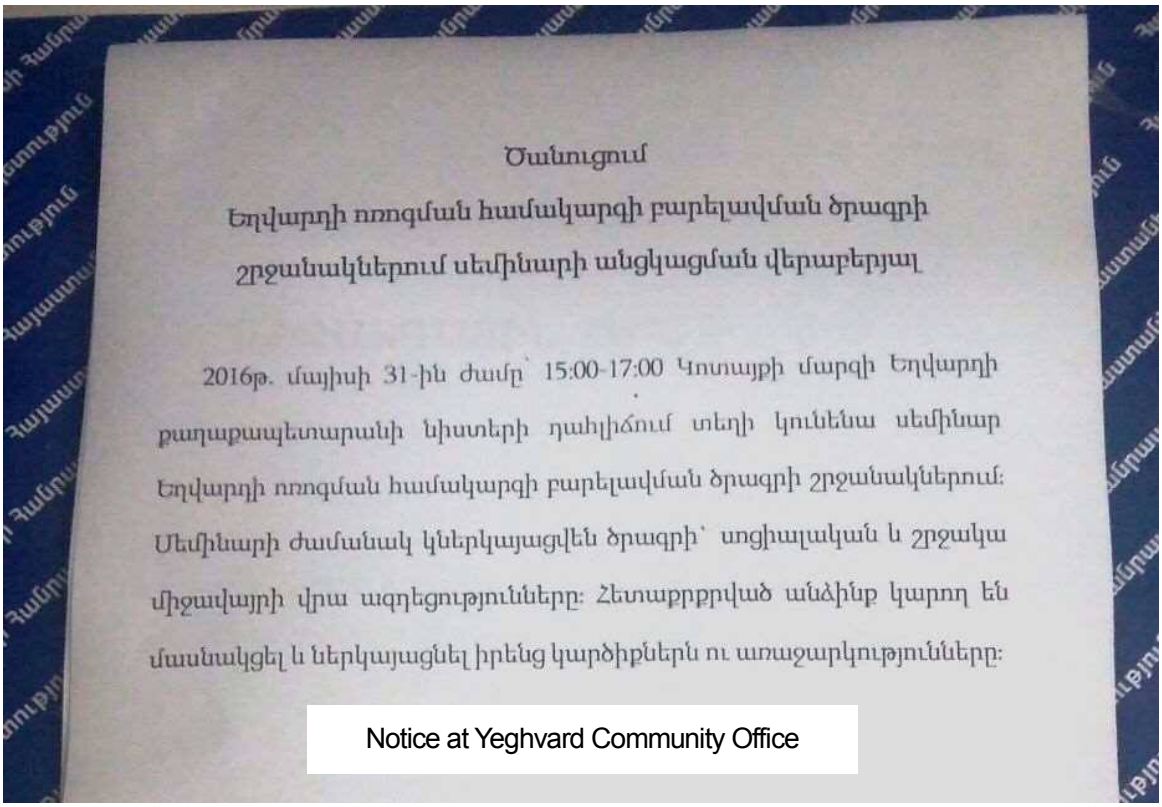


Ծանուցում

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում սեմինարի անցկացման վերաբերյալ

2016թ. մայիսի 31-ին ժամը՝ 11:00-13:00 Կոտայքի մարզի Նոր Երզնկայի գյուղապետարանում նիստերի դահլիճում տեղի կունենա սեմինար Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում: Սեմինարի ժամանակ կներկայացվեն ծրագրի՝ սոցիալական և շրջակա միջավայրի վրա ազդեցությունները: Հետաքրքրված անձինք կարող են մասնակցել և ներկայացնել իրենց կարծիքներն ու առաջարկությունները: Հատկապես կարևոր է ջրամբարի տարածքում հողագործությամբ զբաղվող անձանց մասնակցությունը:

Notice at Nor-Yerznka Community Office



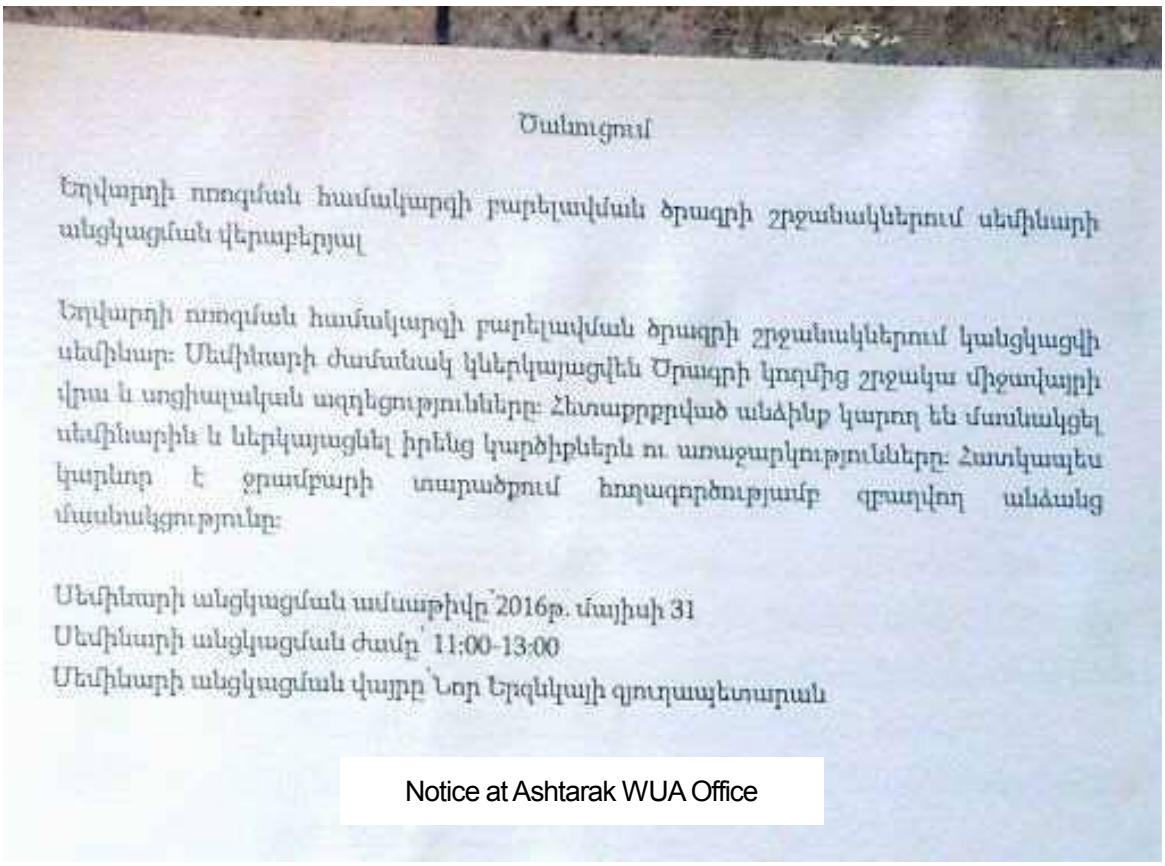
Ծանուցում

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում սեմինարի անցկացման վերաբերյալ

2016թ. մայիսի 31-ին ժամը՝ 15:00-17:00 Կոտայքի մարզի Եղվարդի քաղաքապետարանի նիստերի դահլիճում տեղի կունենա սեմինար Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում: Սեմինարի ժամանակ կներկայացվեն ծրագրի՝ սոցիալական և շրջակա միջավայրի վրա ազդեցությունները: Հետաքրքրված անձինք կարող են մասնակցել և ներկայացնել իրենց կարծիքներն ու առաջարկությունները:

Notice at Yeghvard Community Office

(2) Photos of the Public Notice at WUA Offices



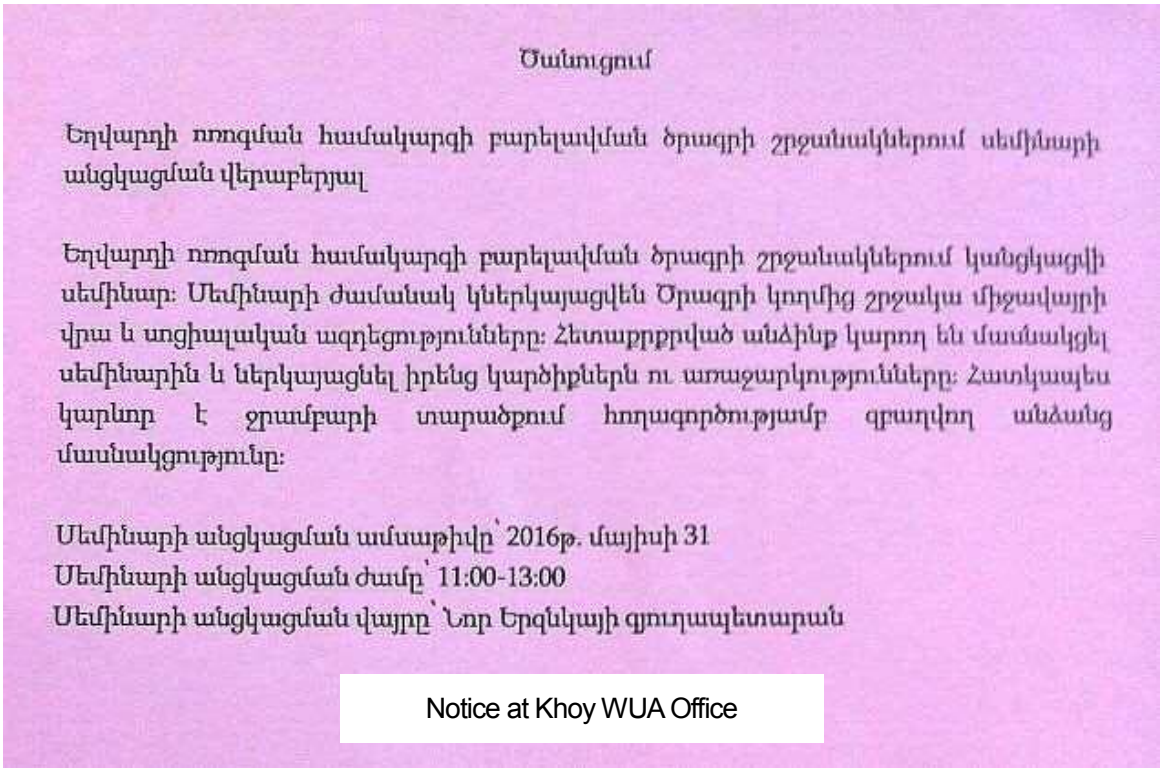
Ծանուցում

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում սեմինարի անցկացման վերաբերյալ

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում կանցկացվի սեմինար: Սեմինարի ժամանակ կներկայացվեն Ծրագրի կողմից շրջակա միջավայրի վրա և սոցիալական ազդեցությունները: Հետաքրքրված անձինք կարող են մասնակցել սեմինարին և ներկայացնել իրենց կարծիքներն ու առաջարկությունները: Հատկապես կարևոր է ջրամբարի տարածքում հողագործությամբ զբաղվող անձանց մասնակցությունը:

Սեմինարի անցկացման ամսաթիվը՝ 2016թ. մայիսի 31
Սեմինարի անցկացման ժամը՝ 11:00-13:00
Սեմինարի անցկացման վայրը՝ Նոր Երզնկայի գյուղապետարան

Notice at Ashtarak WUA Office



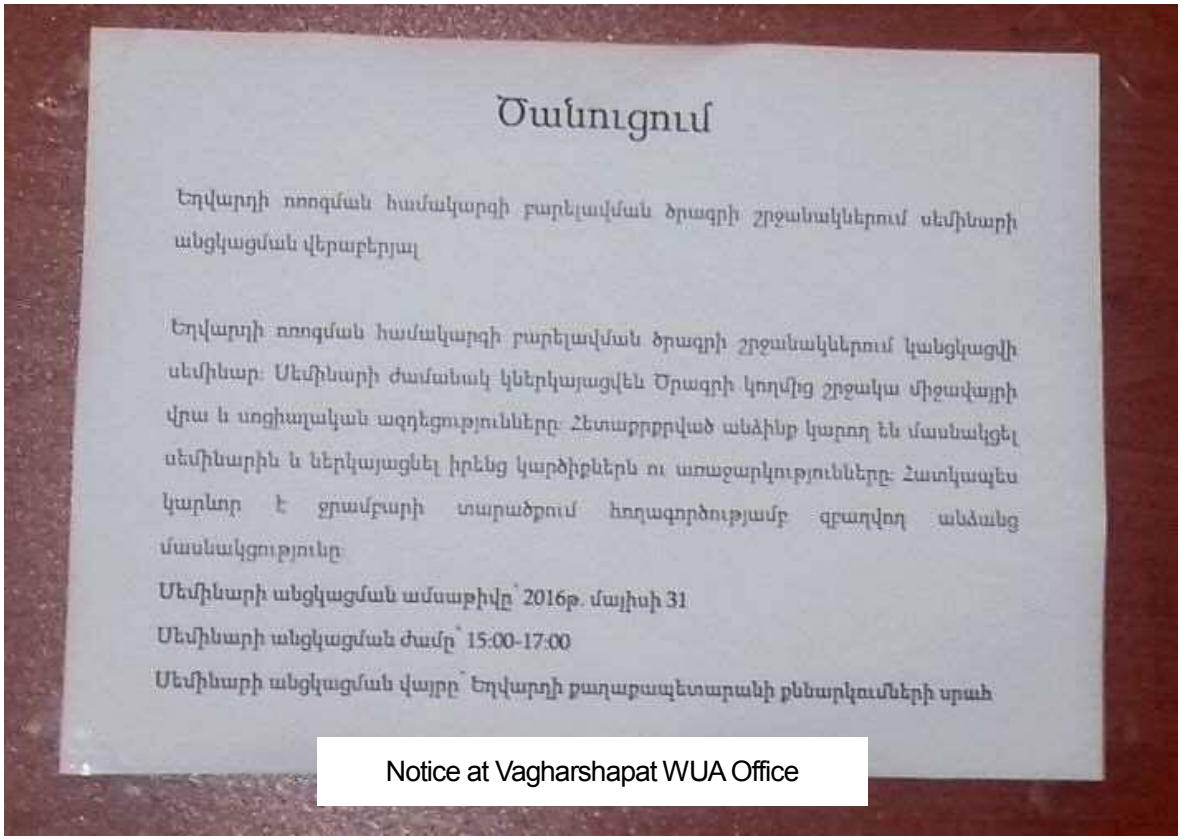
Ծանուցում

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում սեմինարի անցկացման վերաբերյալ

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում կանցկացվի սեմինար: Սեմինարի ժամանակ կներկայացվեն Ծրագրի կողմից շրջակա միջավայրի վրա և սոցիալական ազդեցությունները: Հետաքրքրված անձինք կարող են մասնակցել սեմինարին և ներկայացնել իրենց կարծիքներն ու առաջարկությունները: Հատկապես կարևոր է ջրամբարի տարածքում հողագործությամբ զբաղվող անձանց մասնակցությունը:

Սեմինարի անցկացման ամսաթիվը՝ 2016թ. մայիսի 31
Սեմինարի անցկացման ժամը՝ 11:00-13:00
Սեմինարի անցկացման վայրը՝ Նոր Երզնկայի գյուղապետարան

Notice at Khoy WUA Office



Ծանուցում

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում սեմինարի անցկացման վերաբերյալ

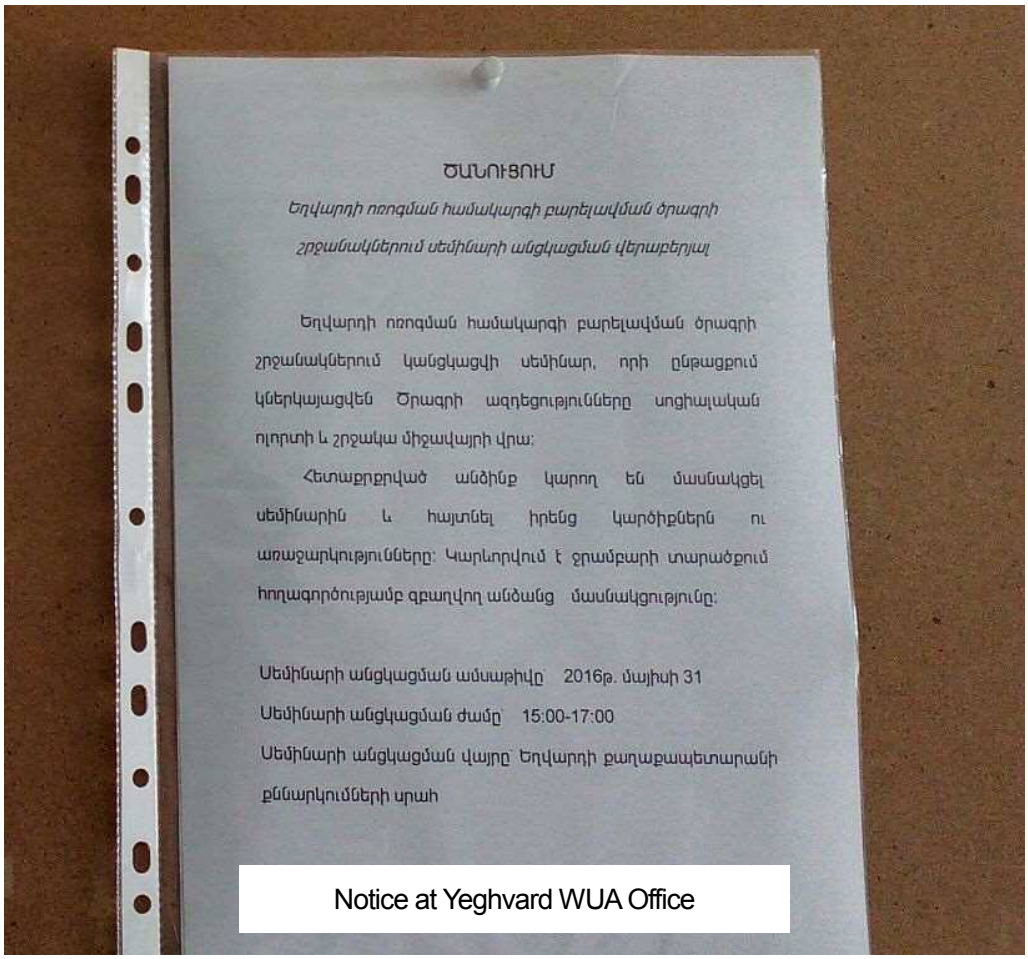
Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում կանցկացվի սեմինար: Սեմինարի ժամանակ կներկայացվեն Ծրագրի կողմից շրջակա միջավայրի վրա և սոցիալական ազդեցությունները: Հետաքրքրված անձինք կարող են մասնակցել սեմինարին և ներկայացնել իրենց կարծիքներն ու առաջարկությունները: Հատկապես կարևոր է ջրամբարի տարածքում հողագործությամբ զբաղվող անձանց մասնակցությունը:

Սեմինարի անցկացման ամսաթիվը՝ 2016թ. մայիսի 31

Սեմինարի անցկացման ժամը՝ 15:00-17:00

Սեմինարի անցկացման վայրը՝ Եղվարդի քաղաքապետարանի քննարկումների սրահ

Notice at Vagharshapat WUA Office



ԾԱՆՈՒՑՈՒՄ

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում սեմինարի անցկացման վերաբերյալ

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում կանցկացվի սեմինար, որի ընթացքում կներկայացվեն Ծրագրի ազդեցությունները սոցիալական ոլորտի և շրջակա միջավայրի վրա:

Հետաքրքրված անձինք կարող են մասնակցել սեմինարին և հայտնել իրենց կարծիքներն ու առաջարկությունները: Կարևորվում է ջրամբարի տարածքում հողագործությամբ զբաղվող անձանց մասնակցությունը:

Սեմինարի անցկացման ամսաթիվը՝ 2016թ. մայիսի 31

Սեմինարի անցկացման ժամը՝ 15:00-17:00

Սեմինարի անցկացման վայրը՝ Եղվարդի քաղաքապետարանի քննարկումների սրահ

Notice at Yeghvard WUA Office

(2) English (translated)

Notice

Re: Seminar for the Yeghvard Irrigation System Improvement Project

To: all the concerned
The Seminar for the Yeghvard Irrigation System Improvement Project will be organized. Expected environmental and social impacts by the Project will be explained at the seminar. Concerned people are welcome to join and express your opinions at the seminar. Especially, those who cultivate within the Reservoir Area are the most welcome.

Day: 31st May, 2016
Time: 15:00-17:00
Venue: Yeghvard City Conference Room

Notice

Re: Seminar for the Yeghvard Irrigation System Improvement Project

To: all the concerned
The Seminar for the Yeghvard Irrigation System Improvement Project will be organized. Expected environmental and social impacts by the Project will be explained at the seminar. Concerned people welcome to join and express your opinions at the seminar. Especially, those who cultivate within the Reservoir Area are the most welcome.

Day: 31st May, 2016
Time: 11:00-13:00
Venue: Nor Yerznka Community Office

Appendix 8 Photos of Public Hearing and Public Seminar

(1) Public Hearing on the Project Outline at Yeghvard Community by SCWE on 20th October 2015

(2) Public Seminar on the Project Outline at Nor-Yerznka Community on 5th November 2015

(3) Public Seminar on the ESIA Report at Nor-Yerznka Community on 31st May 2016

(4) Public Seminar on the ESIA Report at Yeghvard Community on 31st May 2016

(5) Public Seminar on the ESIA Report at Yeghvard WUA on 3rd June 2016