ASIAN DEVELOPMENT BANK FUNDED

WATER SUPPLY AND SANITATION SECTOR PROJECT - ADDITIONAL FINANCING

Date of preparation – 2013

SUBPROJECT IV  IMPROVEMENT OF KOTAYK REGION SETTLEMENTS WATER SUPPLY SYSTEMS

L2860-ICB-1-03  IMPROVEMENT OF WATER SUPPLY SYSTEMS IN HRAZDAN TOWN AND QAGHSI VILLAGE

ENVIRONMENTAL MANAGEMENT PLAN
TABLE OF CONTENTS

1. BACKGROUND OF THE PROJECT ................................................................. 4
2. ENVIRONMENTAL AND SOCIAL SAFEGUARD DOCUMENTS ....................... 4
3. INTRODUCTION ......................................................................................... 4
4. SCOPE OF WORKS ................................................................................... 6
   4.1. Description of existing water supply systems ........................................ 6
        4.1.1. Description of existing water supply system of Hrazdan town .......... 6
        4.1.2. Description of existing water supply system of Qaghsi rural community 6
   4.2. Description of proposed rehabilitation works ....................................... 7
5. BASELINE ENVIRONMENTAL CONDITIONS .............................................. 9
   5.1. Geographic location and climate of settlements ..................................... 9
   5.2. Biodiversity ....................................................................................... 9
6. ENVIRONMENTAL AND SOCIAL IMPACTS .............................................. 11
7. ENVIRONMENTAL IMPACT MITIGATION MEASURES ............................... 11
8. INSTITUTIONAL FRAMEWORK OF ENVIRONMENTAL MANAGEMENT ....... 13
9. ENVIRONMENTAL MANAGEMENT PLAN ............................................... 14
LIST OF ABBREVIATIONS

RA MoNP  - RA Ministry of Nature Protection
RA MoH  - RA Ministry of Healthcare
RA MT&C –RA Ministry of Transport and Communication
RA MoC  - RA Ministry of Culture
JV  - Joint Venture
LSGB – Local Self-Governmental Bodies
EIA - Environmental Impact Assessment
AWSC/ADB PMU – Armenian Water Sewage Company/Project Management Unit of Asian Development Bank
EMP- Environmental Management Plan
IEE- Initial Environmental Examination
DD – Detail Design
1. BACKGROUND OF THE PROJECT

WSSP Project will improve public health and environment for about 400,000 people (households and other consumers) living in 18 towns and up to 92 villages through safe, reliable and sustainable water supply. The outcome of the Project is improved access to safe, reliable, and sustainable WSS services managed on commercial principles and environmentally sound practices.

The Project will also support poverty reduction by (i) reducing the incidence of waterborne diseases and costs of medical care; (ii) improving the time poverty of women due to labor intensive housework such as water collection, which may allow them to participate more in social and economic activities; (iii) providing safer and more reliable water supply; and (iv) improving the quality of life of households in all the project towns and villages by improving their access to safe and sustainable drinking water.

Similar to the original WSSP, the Additional Financing Project will fund two project components which include: (i) municipal infrastructure rehabilitation and improvement; and (ii) management improvement and development which include gender features.

2. ENVIRONMENTAL AND SOCIAL SAFEGUARD DOCUMENTS

In accordance with the ADB Environmental policy (November, 2002) the Subproject is ranked to B category which does not need extended EIA, excluding also Environmental expertise, according to the RA law on “Environmental Impact Assessment” (issued on November 20, 1995.) and the RA Government decree “Threshold of environmental impact activities subject to expertiz” (N-193, 30 March 1999).

As a B Category Project ADB Policy required development of Initial Environmental Examination/IEE reports for each Subproject (1 report) and site specific Environmental Management Plan/EMP (separately report for each lot of the subproject).

3. INTRODUCTION

This very report is developed for the Subproject on the Improvement of W&W Systems in Hrazdan town and Qaghsi village of the RA Kotayq marz, the design of which has been performed by JV of “HGSN” and “JINJ” LLCs. The Water supply systems rehabilitation involves activities on reconstruction and repair of water distribution systems, construction of new water pipelines.

1 The number of towns and villages may change subject to further detailed assessments.
As a result of the construction work implementation, as well as further operation and maintenance of the water supply systems there might be negative impacts on the environment.

It is expected that the impacts during construction work implementation will be minimal and temporary. The impacts may involve vegetation cut, soil erosion, air, soil and water resource pollution by lubricants, chlorine compositions as well as household and construction waste.

At the Operation stage the environmental impact, mainly reasoned by improper execution of operation requirements, will decrease.

The improvement activities will be considered environmentally friendly in case of water resource conservation, as well as rational and sustainable use.

The social and economic effect as a result of water supply system improvement are expected to be long-term, mostly positive, excluding potable and waste waters mix, minimization of water pollution risk, prevention and exclusion of infection disease agents penetration into potable water, as well as water supply extension, providing sustainable water supply and rational water use.

The EMP Part 5 introduces description of possible impacts and is facilitating measures required at different stages of realization of Water Supply Systems Improvement Project.

- **Designing stage**

  The design works on water systems have been performed by the JV of HGSN and JINJ, selected as a Consultant to provide services for design, construction supervision of civil works and public awareness campaign within the framework of ADB “Water Supply and Sanitation Sector Project – Additional Financing”. The EMP includes articles on climatic conditions, relief, natural soil types, hydrology and biodiversity of the very package, requirements on obtaining the RA MoNP and other Ministries’ agreements, as well as fulfillment of executive parties’ contractual commitment during all stages. The Design documentation includes corresponding environmental and social articles and separate Matrix of this very Subproject. The Project Consultant is in charge to follow the appropriate statements of the RA Environmental and social legislation, as well as ADB instructions and strategy requirements.

- **Construction stage**

  The list of measures required to mitigate the environmental impact during construction stage is separately provided in the EMP matrix (APPENDIX A).

  The Contractor should strictly follow the requirements on environmental impact mitigation measures, which are involved in the EMP.

- **Operation Stage**

  The Operation should be performed in accordance with the Water System Operational Rules and Standards.
4. SCOPE OF WORKS

4.1. Description of existing water supply systems

4.1.1. Description of existing water supply system of Hrazdan town

The water supply of Hrazdan town is performed through, passing town area in the coastal of Hrazdan river, located on 1700-1705m elevations Maqravan springs: “Maqravan-2” and “Maqravan-3” pumping stations, which total power forms approximately 1350-1400 l/sec.

Through existing pumping stations located in the area of “Maqravan” springs, except Hrazdan town, currently is also performed water supply of Abovyan and Tsaxkadzor towns.

The number of households in the town is 13200, the number of multi-apartment buildings is 290, and residential houses is 3349.

Calculated average daily water demand of the town for drinking and household purposes forms 22000m³/day (including regulatory permissible 20% leakages).

The length of the water supply network is approximately 300 km.

During 2010-2012 yy in the water supply system of Hrazdan town a number of works have been implemented, especially:

- In 2010-2011 yy by the World Bank financing, a number of works have been implemented in the distribution network of Hrazdan town, which include replacement of water pipelines in the “Southern”, “Jrarat” and “Vanatur” blocks of the town, construction of entry lines and water meter hubs of about 80% personal houses, entry lines replacement in the approximately 30% of multi-apartment buildings of “Kentron” and “Mikro” blocks.

- In 2011-2012 yy by the ADB financing, for the water supply purposes of the town, 2 groups, each of 3 pumping aggregates have been installed in the “Maqravan-2” pumping station.

After the implementation of the above mentioned programs, though decrease in supplied water with approximately 30% and in the conditions of existing 82% leakages in the distribution network, currently the average duration of water supply, forms about 15 hours.

- In the “South” district – 15-20 hours
- In the “Kentron” district - 14 - 16 hours
- In the “Jrarat” and “Vanatur” districts - 15 hour
- In the “Mikro” districts - 9 - 13 hours.

4.1.2. Description of existing water supply system of Qaghsi rural community

Qaghsi rural community is included in Hrazdan district of Kotayk marz. The village has 615 households. Water supply is performed through Maqravan-Abovyan DN700 pumping station fed from main pipeline and passing through village area, which was constructed in 2007.
From the new constructed pumping station water is pumped to the new DRR with the capacity of 300m³, located near Erevan-Sevan highway, which was constructed in 2011-2012yy with the program of ADB financing. In the frame of the latter, the pipeline from pumping station to DRR also was reconstructed with DN100 steel pipes.

During 2011-2012yy in the result of the implementation of these works, water supply internal system of Qaghhs village currently is in normal condition. However because of dilapidated and emergency conditions of distribution network pipelines, the general water supply of the village is in extremely inconsolable condition, as a result of which the level of leakages reaches 95%.

Currently 2 times a day (with 2-3 hours), located in the village area the old pumping station in ruined condition also is operating, from which 10 l/sec pumped water directly is given to the distribution network. Virtually, in the huge 95% leakage conditions the operation of the latter is purposeless.

4.2. Description of proposed rehabilitation works

In the frame of this very Subproject is designed:
- to reconstruct those parts of distribution network, fed from Hrazdan “Northern” DRR, which due to lack of funds were not included in 2010-2011 World Bank financing program: to reach all day long water supply of distribution network.
- Completely rebuilt the distribution network of Qaghhs village.

For that purpose, it is designed to implement reconstruction works in the “Mikro” and “Kentron” districts, which are constructed with multi-apartment buildings, and in “jrarat” and “Maqravan” districts, which are constructed with personal houses.

The implementation of the Subproject will allow, in the result of water supply systems rehabilitation, to provide the inhabitants of 2 mentioned communities with safe potable water and improve water distribution system.

The permanent population number in Hrazdan town, according to the RA Statistical Service data, on 1 January 2012 makes 10250 in the southern part, 46125 in the northern part, and in Qaghhs village 2454 people. Taking into account the population prospective growth by 2040, assuming 0.43% annual growth, above mentioned communities will have 11558 in the southern part, 52013 in the northern part and 2767 inhabitants in Qaghhs village.

The average hourly discharge of maximal daily water demand of the communities, taking also into account the normative permissible leakages, makes $Q_{av,h}=250\text{l/sec}$ for Hrazdan town and $Q_{av,h}=8.2\text{l/sec}$ for Qaghhs village.

Based on the technical and economical calculations done in the Preliminary Design, as well as submitted justifications, in the Detailed Design there have been developed activities on the water supply rehabilitation.
By the very Detailed Design the works designed for the improvement of water supply system in Hrazdan town and Qaghsi rural community are as follows:

**t. Hrazdan**
- Replacement of inter district de100- de225 main pipelines of the distribution network, with general 19.5 km length, with polyethylene pipes,
- Replacement of multi-apartment buildings entry lines connections, with the total number of 115, for which will be constructed approximately 4.3 km de63-de100 polyethylene pipes,
- Replacement of private house entry lines connections, with the total number of 365, for which will be constructed approximately 2.7 km de20-de32 polyethylene pipes,
- Replacement of business entities entry lines connections, with the total number of 284, for which will be constructed approximately 3.4 km de20-de32 polyethylene pipes,

**v. Qaghsi**
- Replacement of inter district de63-de110 main pipelines of the distribution network, with approximately 10.0 km general length, with polyethylene pipes,
- Replacement of private house entry lines connections, with the total number of 295, for which will be constructed approximately 2.8 km de20-de32 polyethylene pipes,

<table>
<thead>
<tr>
<th>Works</th>
<th>M/U</th>
<th>t.Hrazdan</th>
<th>v.Qaghsi</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reconstruction of de100-de225 diameter polyethylene pipeline of water supply internal system</td>
<td>lm</td>
<td>19500</td>
<td>-</td>
<td>19500</td>
</tr>
<tr>
<td>Reconstruction of de163-de100 diameter polyethylene pipeline of water supply internal system</td>
<td>lm</td>
<td>-</td>
<td>10500</td>
<td>10500</td>
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<td>Replacement of private houses connections</td>
<td>lm</td>
<td>2700</td>
<td>2400</td>
<td>5100</td>
</tr>
<tr>
<td>Replacement of connections of apartment buildings</td>
<td>lm</td>
<td>4300</td>
<td>-</td>
<td>4300</td>
</tr>
<tr>
<td>Replacement of business entities connections</td>
<td>lm</td>
<td>1700</td>
<td>-</td>
<td>1700</td>
</tr>
</tbody>
</table>

The aggregative indexes of the designed works of 2 communities included in the Subproject are introduced in table below.

According to the agreement between the Contractor, Consultant and rural communities, the mentioned beneath works should be implemented by the construction completion, in spite of the pipeline diameter and its function.

1. To restore the asphalt concrete pavement of roads which were previously in favorable condition, providing the same cover quality,

2. To perform backfilling of the trenches in the destroyed and half-destroyed streets paved with asphalt concrete, then 10-15 cm gravelling with compaction.
5. BASELINE ENVIRONMENTAL CONDITIONS

5.1. Geographic location and climate of settlements

Kotayq marz is located in the central part of RA, at 900-2500m elevation marks above see level. The area includes upper and middle basins of Hrazdan river and the Marmarik river basin totally.

From the climatic conditions point of view Kotayq Marz is divided into mountainous and high mountainous zones. By uplands alternation, in the marz relays almost all types of Republic area-specific climate.

Hrazdan town and Qaghsi rural communities are situated in Kotayq marz and are allocated on right and left sides of Hrazdan River. Since December 1995y, Hrazdan town became the marzial center of Kotayq. The distance of Hrazdan town from capital Yerevan is 45km. The length of the town makes 22.0km.

Qaghsi rural community is located 3km far from Hrazdan town, at 1700-1750m elevation marks. The Northern border is Tsaxkunianc Mountain range, and from East Gexama Mountain range. Through village are passing Hrazdan-Sevan, Hrazdan-Ashtarak highways, Sevan-Yerevan railroad.

The climate of the studied area is characterized by cold winter and mild, cool summer. The air absolute maximal temperature is +33°C. The air absolute minimal temperature is -31°C. The air relative humidity makes 71%. The average annual atmospheric rainfalls reaches 588 mm. The main rainfalls occure in March-June months. In summer the north-eastern and in winter south-western winds dominate. The snow cover maximal thickness of the ten-day period reaches 132.0cm. The ground freezing maximal depth reaches 0.96m.

Among exogenic phenomena there are storm flows, storm-beaten; rainfall flows, deepening of the gullies, in some parts stone flows, some technogenic phenomena, etc.

From geomorphological point of view the area is located in the south-eastern verge of Tsaxkunianc mountain range, which from East part is limited by north-western verge of Gexama mountains, which are formed from low mound ranges and not deep concavities.

5.2. Biodiversity

The studied area of marz is located in the upper stream left sided and right sided Valley of Hrazdan River and it adjacent parts. Here the surfaces are uneven; they have Volcanic Plateau typical hill-dam cut relief types, which absolute marks varies between 1700-1780m ranges.

The lands are belonging to mountainous black soils type. The structure of relief and the lithological composition of mountain rocks in the black soil distribution areas are diverse. In the relief formation of these marzs participared volcanic and volcanic sediment rocks: andesite, andesite- basalts, tuffs and atc.

The Geological structure is diverse. There are meeting average quaternary aged basalts and andesite volcanic flows, lower Eocene limestone and sand-stone sediments, also chalk aged limestone and margas, which are coverd with modern delluvial-proluvial, and due to Hrazdan river activities, lake-alluvial formations, with quite different capacities.

From the hydrogeological aspect the area, depending on geological structure and relief, is represented by two different hydrogeological conditions. Middle cemberian and Eocene aged rocks are considered as Repelling zones and only quaternary aged cracked and porous volcanic rocks are considered as good infiltration zone.

From the orographic aspect, the biggest rivers of the studied area are Hrazdan and its right
confluent Marmarik, with their numerous temporary and permanent flows. The marz is situated in 8-9 magnitude potential seismicity zone and has 0.3g acceleration.

**Flora.** Kotayq marz has rich and diverse vegetation, it is located on dry mountain heath and wormwood semidesert borderline. From the plant-geographical aspect the area belongs to floristic area of Aparan.

The forests of the marz are mountainous; they have significant soil protective, water protective and climate regulatory meaning, and also are distinguished by their plant species diversity. The studied area is described with quite huge thermal resources and with longevity of vegetation period. The plant cover in the black soils spread marzs is represented mainly with different, wood-grass plants.

The position and relief of the marz contributed to the development of rich biodiversity, unique assortment and agro-biodiversity formation. Here are dominating semidesert, mountain heath landscapes with their corresponding plant and animal worlds.

The vegetation of the studied area is the plant symbiosis typical to the treeless parts of Aparan floristic marz. It is represented with the typical, specific to this marz phytocenosis.

The flora of Marmarik pool is represented with more then 801 species and subspecies of superior plants, which are belonging to the 86 families and 360 nations.

In Hrazdan marz the main forest forming tree species are oak, hornbeam and little quantity of pine.

In the forest symbiosis of the marz a great place occupies large-perpage oak, which very well adapts to the local climatic conditions, dute to its high cold resistance.

Here the spread plant symbiosis mainly consists of annual Poaceae: Aegilops cylindrica, Amblyopyrum muticum, Secale Vavilovii, Triticum araraticum, T. Boeoticum, T. Urartu and etc. There are also meeting various Vascular plants: Achilles millefolium L., Arctium palladini Grossh, Arteisia armeniaca Lam, Arteisia absinthium L., Falcaria vulgaris Bernh., Eryngium billardieri Delar., Inuia auriculata Boiss. Et Bal., Taraxacum officinale Wigg., Tragopogon reticulatus Boiss. Et Huet, Anchusa azurea Mill., Leontodon crispus Vill., Cichorium intybus L., Helichysum plicatum DC. and etc.

Although in Kotayq Marz also are meeting other rare and endangered species, which are recorded in the RA Red Book (Iris reticulata, Rhizocephalus orientalis, Hohenackeria excapa, Cundelia tournefortii and etc.), however in the vegetation structure of the Subproject there are no rare, endangered and Armenian endemic species.

**Fauna.** From the animal world representatives here are meeting many types of reptiles, from which are Gyrza, Malpolon monspesscullanus, Mabuya aurata, Eumeces schneideri and etc. From the amphibious are meeting Rana ridibunda, Bufo viridis, Hyla savigna. From birds (about 50 type) are remarkable Coturnix coturnix, Perdix perdix, Streptopelia turtur, Falco tinunculus, Circus macrourus, Athene noctua, Coracias careulus and etc.

Species of mammals are fox and weasel, deer, rabbit, rarely also marten, bear, wolf and badger.

Within common beetles and butterfly species are recorded also Armenian, Caucasian and Transcaucasia endemic species: Milbaris sedilithorax, Omophilus caucasicus Kirsch, Cicindela desertorum, Geutorrhinchus biplagiatus Schz., Anisoplia signata Fald., Stenus buffalmus Grav..

Near the Hrazdan town is also meeting Bradyporus dilatatus, which is recorded in the RA Red Book.
6. ENVIRONMENTAL AND SOCIAL IMPACTS

Due to the implementation of works aimed at the improvement of water supply systems of Hrazdan town and Qaghsi rural community the expected positive environmental and population health effects are as follows:

- water resource protection and sustainable use,
- excluding mixing of drinking, irrigation and sewerage water,
- preventing, excluding penetration of infectious disease viruses into drinking water,
- reduction of drinking water pollution hazard,
- providing high drinking water quality,
- improvement of health condition of population,
- water loss reduction,
- increasing duration of water supply to population,
- introduction of water metering system,
- increasing water consumption efficiency.

IEE reveals that the implementation of works aimed at water supply systems improvement in Hrazdan town, Qaghsi village of the Kotayq marz will have no harmful effects on the selected for this purpose area – either landscape or flora and fauna.

The probable negative effects might be mainly caused by construction works implementation, with little damage and carrying temporal character. To prevent or mitigate negative impacts there have been developed mitigation measures which are involved into the EMP.

EMP is the integral part of the bidding document and based on the IEE the expected negative impacts are as follows:

- air pollution
- noise
- traffic and pedestrian roads damage and loading
- soil erosion and soil eroding processes
- environment pollution by construction and household waste
- soil and water resources pollution by fuels and lubricants,
- soil and water resources pollution by chlorine.

Subproject implementation will have positive social effects directly improving the targeted communities population life quality providing sustainable and reliable water supply and water resource rational use for about 56000 person.

7. ENVIRONMENTAL IMPACT MITIGATION MEASURES

The probable harmful impacts on the environment and people’s health, caused by the works aimed at the W&W internal system improvement of Hrazdan town and Qaghsi village of RA
Kotayq Marz, depend on construction works of water pipeline trenches and pits for control and water measuring junc.

To prevent soil erosion and eroding processes the preventive measures should be performed on slopes protection on the inclined areas designed for the pipe laying, providing minimal short time of keeping open the trenches and pits made for the pipelines and control and water measuring junctions.

The slopes protection measures should be performed to prevent soil eroding processes on the areas close to the riverbeds.

After construction work completion the sites should be recovered by performing the mentioned beneath activities:

- Remove the excess soil mass and building material from the construction sites,
- Recover the asphalt – concrete pavement, providing its previous good condition and quality,
- Provide graveling with compaction on the streets with damaged and half-destroyed asphalt -concrete pavement, as well as on dirt roads.

To prevent the topsoil layer damage, or landscape degradation, the topsoil should be stored on the assigned site, there after used for the areas restoration. The construction site should be cleaned from the household ad construction waste providing the landscape previous state.

To prevent the soil and water resources pollution by fuels and lubricants, the latter should be stored on the area isolated from soil and water resources, in special tanks. Special containers should be prepared for the utilized lubricants, which thereafter will be disposed in landfills or places for reprocessing.

To prevent the environment pollution by construction waste and excess soil mass, they should be disposed on special sites according to the agreements signed beforehand between community head and disposal site superintendent.

To avoid water and soil resources pollution by chlorine, the works on chlorine washing and disinfection should be arranged considering special calculations. Chlorine handling needs treating the appropriate way, following the established technological procedures. After washing the pipes, the chlorine outflow to the surface water unit, or land area, should be controlled according to the designed mode and calculation.

Water quality change. While performing the environment monitoring the supervision on water quality and residual chlorine should be arranged.

To minimize dust emission caused by construction works the site should be regularly watered.

To prevent noise impact the schedule should be developed on limiting the night works on the residential areas, avoiding noisy vehicles and equipment use, installing mufflers, if necessary.

To minimize the population disturbance caused by roads damage and loading, the special parking lots for trucks should be provided, and the construction works should be performed by stages, arranging population awareness campaign, including provision of special traffic signs, providing bypasses, or barriers.

To provide population and builders’ safety and prevent risks during the construction, the unauthorized persons’ entrance to the construction site should be controlled, warning signs should be placed in the accident-prone sectors, regular inspection of equipment by qualified specialists should be performed, including safety audits, first aid and safety courses organization for builders.

The affected parties and local population should be appropriately informed through public consultations on the coming activities, their schedules and all measures involved in the EMP.
since information lack can bring forth discontent causing complaints. Providing the communities' participation in the Subproject will minimize the disturbance caused by construction works to the social life of community.

**Potable water quality change**: EMP should involve monitoring of water quality and residual chlorine level.

To provide water quality in Hrazdan town and Qaghsi village the AWSC should perform routine sampling from the springs feeding the communities, testing, the water for all criteria required by MoH. Water quality monitoring is also performed by the State Hygiene Anti-Epidemic Inspectorate according to the document “Potable water. Requirements on water quality of centralized water supply systems. Sanitation rules and norms of quality inspection № 2-III-A2-1” (recorded on 28.12.2002), which specifies the potable water quality requirements, including the rules of quality inspection of water produced and supplied through water distribution systems to the residential areas.

Since water disinfection is performed by chlorine, the monitoring of residual chlorine level is also of great importance.

8. **INSTITUTIONAL FRAMEWORK OF ENVIRONMENTAL MANAGEMENT**

To perform the proposed mitigation measures, the obligations on their arrangement have been allocated between the agencies, as follows:

- **Executive agencies, which are responsible for implementation of the measure.**

  1. To perform this special task the implementing unit (JV of HGSN and JINJ) in the Designing stage should provide the obtaining of all required agreements and permissions from the corresponding public administrative and local self-governing bodies before civil works distribution according to the bidding terms.
     - Environmental expertise (if necessary).
     - Consent of Protection Agency of Historical and Cultural Heritage, in case of expected impact on the latter.

  2. The implementing agencies in the construction stage (Contractors) will covenant to physically implement the specified in the EMP facilitating measures, as well as obtain all permissions and consents relating to the civil works implementation, which are as follows:
     - local municipal bodies’ written consents on the specified sites for household and construction waste disposal,
     - Consent of Historical and Cultural Heritage Protection Agency, in case of historical, cultural or ancient monuments occurrence during civil works implementation.

  3. Before civil works startup the mentioned beneath permissions and certificates should be obtained by ADB/PMU, if necessary:
     - Certificate on land use right registration
     - Water use permission, if necessary.

- **Controlling agencies, which are responsible for controlling the executive units to provide implementation of the EMP measures by the latter**

  1. The environment and safety specialists of “AWSC” CJSC/ADB PIU will be responsible to supervise the implementation of mitigation measures specified in EMP. The mentioned experts will regularly perform site visits to supervise the proper implementation of works and
corresponding activities on mitigating the impacts. During the visits the probable omissions will be revealed by the check list, as well as violations of mitigation measures implementation by Contractors.

“AWSC” CJSC /ADB PIU is also entitled to require and checkup the availability and validity of all permissions, complete implementation of mitigation measures and monitoring according to the EMP in terms of ADB environmental instructions and the RA nature protection and social legislation.

2. The JV of HGSN and JINJ are also to carry out the supervision over the implementation of mitigating measures during civil works implementation. The environmental specialist of the Consultant should make visits to control the implementation of EMP.

- **State monitoring agencies, which are responsible for observing the extent and efficiency of EMP implementation and mitigation measures, and making corrections in the project, if needed.**

The state monitoring agencies are as follows:

- State Environmental Inspectorate of the RA MoNP,
- State Hygiene and Anti-Epidemic Inspectorate of the RA MoH,
- Historical and Cultural Heritage Protection Agency of the RA MoC, if necessary,
- The RA local self-governance bodies,
- The RA MT&C.

Costs envisaged for implementation of environmental measures included in the EMP are included in the detailed design.

Implementation of mitigating measures for environmental impacts will be controlled regularly through visits to the construction sites. With the help of the specially developed check list the gaps and drawbacks will be discovered.

In case of not implementing or infringing the implementation of the mitigating measures, after warning, the followed payment will be terminated until the infringement is completely eliminated.

### 9. ENVIRONMENTAL MANAGEMENT PLAN

The EMP will be based on the results of IEE developed by the subproject and will include appropriate mitigation measures.

EMP consists of two components:

1. Mitigation measures and institutional responsibilities for implementation;
2. Environmental monitoring.

The **Contractor** should strictly follow the environmental mitigation measures prescribed in the EMP. The costs foreseen for the implementations of all the measures prescribed in the EMP are included the total cost of the Contract and reflected in the bill of quantities.

- Notice on the failure to implement measures prescribed by the Technical Supervision Company (TSC) or the Client would be sent to the Contractor as precaution.
- After one precaution the next recorded violation would trigger charging of liquidated damages in amount of 0,1 % of the total cost of the contract. The penalties do not relieve the Contractor from remedying the violation. The recorded violation should be remedied in two working days period. Penalty fees would be retained from the next Performance Certificate and after the completion of the construction activities the liquidated damages for the
recorded violation will be retained from the guarantee amount.

- In case of three liquidated damages the Contract could be terminated unilaterally.

The environmental management matrix for Hrazdan town and Qaghsi village is presented in Appendix A.

### Appendix A.

**ENVIRONMENTAL MANAGEMENT MATRIX**

<table>
<thead>
<tr>
<th>Works and possible impacts</th>
<th>Proposed mitigating measures</th>
<th>Monitoring</th>
<th>Responsible bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Air pollution, noise and traffic congestion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| • Dust and noise during the construction works | - Install fencing around construction site  
- Regularly water the construction site and roads  
- Limit night work in residential areas  
- Avoid usage of machines/equipment with extra noise; installation of silencers if needed. | Daily site inspection | Contractor, Consultant, PIU |
| • Disturbance to population because of overloaded roads | - Provide safe area for trucks,  
- Do not accumulate and burn waste on the construction site.  
- Carry out construction in stages; give adequate notice of construction activities to the population.  
- Provide effective road signs, bypasses or barriers; provide areas for parking.  
- Provide community participation in subproject works, which will minimize disruption to community social activities. | Daily site inspection | Contractor, Consultant, PIU, LSGB |
| **2. Environmental pollution** | | | |
| • Soil erosion | - In inclined sites of the pipeline route implement measures for retaining the inclinations to prevent soil erosion and sand spreading,  
- Minimize the time during which trench and pit excavations for pipelines, regulation and water metering junctions are open. | Daily inspection of construction and contract tecservices stages. | Constructor, Consultant, PIU |
### Damage to soil fertile layer or landscape degradation
- To store soil fertile layer in the specially provided areas and to use them in future with area restoration purposes.
- To clean, to level the area after completion of construction works, and to bring the landscape to its original view.

### Environment pollution with construction waste
- Remove construction waste to corresponding landfill of the community, having in advance a contract agreement with the community heads or landfill operators.
- Rehabilitate disturbed surfaces as soon as possible after completion of construction activity, according to the design.

### Land and water resources pollution with fuels and lubricants
- Store oil, fuels and lubricants on a sealed surface, away from land water resources.
- For collection of used oil special containers furnished with leakage collecting system to be provided.

### Land and water resources pollution with chlorine
- Organize works for washing the water supply distribution network with chlorine, according to calculations and technological terms.
- Implementation of chlorine discharge to surface water body or land area after washing the pipes, according to the established regulation and calculations.

### 3. Health and Safety

#### Hazards for workers and the population
- Fence the construction site.
- Control access of unauthorized persons to site.
- Place warning signs in dangerous places.
- Carry out regular examination of equipment by highly qualified staff, as well as make regular safety audits.
- Provide first aid and safety training to construction staff.

<table>
<thead>
<tr>
<th>Action</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>To store soil fertile layer in the specially provided areas and to use them in future with area restoration purposes.</td>
<td>Contractor, Consultant, PIU, LSGB</td>
</tr>
<tr>
<td>To clean, to level the area after completion of construction works, and to bring the landscape to its original view.</td>
<td>Contractor, Consultant, PIU, LSGB</td>
</tr>
<tr>
<td>Remove construction waste to corresponding landfill of the community, having in advance a contract agreement with the community heads or landfill operators.</td>
<td>Contractor, Consultant, PIU, LSGB</td>
</tr>
<tr>
<td>Rehabilitate disturbed surfaces as soon as possible after completion of construction activity, according to the design.</td>
<td>Contractor, Consultant, PIU, LSGB</td>
</tr>
<tr>
<td>Store oil, fuels and lubricants on a sealed surface, away from land water resources.</td>
<td>Contractor, Consultant, PIU</td>
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<tr>
<td>For collection of used oil special containers furnished with leakage collecting system to be provided.</td>
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<td>Organize works for washing the water supply distribution network with chlorine, according to calculations and technological terms.</td>
<td>Contractor, Consultant, PIU</td>
</tr>
<tr>
<td>Implementation of chlorine discharge to surface water body or land area after washing the pipes, according to the established regulation and calculations.</td>
<td>Contractor, Consultant, PIU</td>
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</tbody>
</table>
## Field visits checklist

### General information

<table>
<thead>
<tr>
<th>Amis/Ames</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
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<tbody>
<tr>
<td>EEC</td>
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<tr>
<td>Subproject</td>
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<tr>
<td>Location</td>
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<tr>
<td>Contractor</td>
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<tr>
<td>Marz</td>
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### Design

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<tr>
<th>Amis/Ames</th>
<th>Yes</th>
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<tbody>
<tr>
<td>Subproject</td>
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<tr>
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<tr>
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### Construction

<table>
<thead>
<tr>
<th>Amis/Ames</th>
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<tbody>
<tr>
<td>Subproject</td>
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<td></td>
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<tr>
<td>Location</td>
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### Public awareness

<table>
<thead>
<tr>
<th>Amis/Ames</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
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</thead>
<tbody>
<tr>
<td>Համայնքիի մասնակցություն շինարարական աշխատանքներին համաձայն նախագծի /community's participation in construction works according to the project design</td>
<td>Ուղի Yes</td>
<td>Ուղի No</td>
<td>Ո/Ո N/A</td>
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<tr>
<td>Այո</td>
<td>Ոչ</td>
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<tr>
<td>Ո/Կ</td>
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### Safety

<table>
<thead>
<tr>
<th>Բանվորների անվտանգություն Safety of workers</th>
<th>Բանվորների անվտանգության հանձնարարության ապահովում /availability of safety uniforms (earflaps, mask)</th>
<th>Ուղի Yes</th>
<th>Ուղի No</th>
<th>Ո/Ո N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Այո</td>
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<tr>
<td>Ո/Կ</td>
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</tbody>
</table>

| Երթևեկության սահմանափակման կամ խախտման ժամանակ համապատասխան ճանապարհային նշանների կազմակերպում / Installation of road signs or fences, organization of a bypass during interrupted or limited traffic | Ուղի Yes | Ուղի No | Ո/Ո N/A |
|---|---|---|---|---|
| Այո | Ոչ | N/A |
| Ո/Կ | N/A |

### Management measures during construction

<table>
<thead>
<tr>
<th>Օդի ժամանավոր աղտոտում Temporary air pollution/dust</th>
<th>Օդի հարստապանության/տնտեսական պատկերացույցը / regular sprinkling to area/construction site</th>
<th>Ուղի Yes</th>
<th>Ուղի No</th>
<th>Ո/Ո N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Այո</td>
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<td>Ո/Կ</td>
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</tbody>
</table>

| Մեքենաների համար ապահով տարածքի առկայություն / availability of safe place at the construction site for vehicles | Ուղի Yes | Ուղի No | Ո/Ո N/A |
|---|---|---|---|---|
| Այո | Ոչ | N/A |
| Ո/Կ | N/A |

<p>| Յուղերի և քսուկների պահեստների առկայություն / availability of storage for oils and lubricants at the appropriate part of the construction site | Ուղի Yes | Ուղի No | Ո/Ո N/A |
|---|---|---|---|---|
| Այո | Ոչ | N/A |
| Ո/Կ | N/A |</p>
<table>
<thead>
<tr>
<th><strong>HGSN - JINJ</strong></th>
<th><strong>Settlements of Kotayk marz</strong></th>
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</thead>
</table>

<table>
<thead>
<tr>
<th><strong>IV.1 Hrazdan town and Qaghsi village Environmental Management Plan</strong></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Shinanyot tranporting construction waste</strong></th>
<th><strong>Use of cover for the vehicle transporting construction waste</strong></th>
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</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Ghirla iranhy</strong></th>
<th><strong>Soil erosion</strong></th>
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<tbody>
<tr>
<td>Yes</td>
<td>No</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Yen aranyuny</strong></th>
<th><strong>Water pollution</strong></th>
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</thead>
<tbody>
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<td>No</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Yen aranyuny</strong></th>
<th><strong>Noise close to settlements</strong></th>
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<tbody>
<tr>
<td>Yes</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Ghirla aranyuny en peqamuny tranporting</strong></th>
<th><strong>Construction waste disposal</strong></th>
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<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Transportation and disposal of construction and consumer waste in appropriate community landfill</strong></td>
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<td><strong>Այո</strong></td>
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<table>
<thead>
<tr>
<th><strong>Operation</strong></th>
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<tbody>
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<table>
<thead>
<tr>
<th><strong>Correspondence of balance quantity of residual chlorine to the quality of potable water</strong></th>
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*Package IV.1 Hrazdan town and Qaghsi village Environmental Management Plan*