Draft Initial Environmental Examination

July 2023

Georgia: Climate Smart Irrigation Sector Development Program

Kvemo Samgori Left Main Canal Irrigation Scheme – Package 1: Main Canal Ch 313+42 to Ch 397+00 and Package 2: Area 1 – Irrigation area G 23 to G 33

Prepared by the Ministry of Environmental Protection and Agriculture, Government of Georgia for the Asian Development Bank.

CURRENCY EQUIVALENTS

(As of 18 June 2023)

Currency unit	–	Georgian Lari (GEL)
GEL 1.00	=	$0.3846
$1.00	=	GEL 2.60

ABBREVIATIONS

ADB	–	Asian Development Bank
AFD	–	Agence France de Developpement
AP	–	Appointed Person
APA	–	Agency of Protected Areas
BOD	–	Biological Oxygen Demand
CEMP	–	Contractor Environmental Management Plan
COD	–	Chemical Oxygen Demand
CR	–	Critically Endangered
CSISD	–	Climate Smart Irrigation Sector Development
EA	–	Executing Agency
EAC	–	Environmental Assessment Code
EARF	–	Environmental Assessment and Review Framework
EHS Guidelines	–	Environmental, Health and Safety Guidelines
EIA	–	Environmental Impact Assessment
EIP	–	Environmental Impact Permit
EMP	–	Environmental Management Plan
EMR	–	Environmental Monitoring Report
EN	–	Endangered
ERP	–	Environmentally Responsible Procurement
FSDC	–	Feasibility Study / Design Consulting Services
GA	–	Georgian Amelioration
GEL	–	Georgian lari
GRCE	–	Grievance Redress Committee
GRM	–	Grievance Redress Mechanism
IA	–	Implementing Agency
IBAT	–	Integrated Biodiversity Assessment Tool
IEE	–	Initial Environmental Examination
IUCN	–	International Union for the Conservation of Nature
IUCN	–	International Union for Conservation of Nature
LARP	–	Land Acquisition and Resettlement Plan
MAD	–	Maximum Allowable Discharge
MEPA	–	Ministry of Environmental Protection and Agriculture
MoF	–	Ministry of Finance
NRM	–	Natural Resources Management
O&M	–	operation and maintenance
OPs	–	Operational Priorities
PIC	–	Project Implementation Consultants
RCP	–	Representative Concentration Pathways
RLG	–	Red List of Georgia
SDG	–	Sustainable Development Goals
SSEMP	–	Site Specific Environmental Management Plan
SPEI	–	Standardized Precipitation Evapotranspiration Index
SPS	–	Safeguard Policy Statement
UN	–	United Nations

VU	–	Vulnerable
WB	–	World Bank
WUO	–	Water Users' Organization

WEIGHTS AND MEASURES

^{o}C	–	degrees Celsius
ha	–	hectare, 10,000 m^3
km	–	kilometre
m	–	Meter

NOTE

In this report, "$" refers to US dollars.

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EXECUTIVE SUMMARY

1. This Draft Initial Environmental Examination (IEE) has been prepared for the Climate Smart Irrigation Sector Development Project (RRP GEO 54014) covering two packages (i) advanced procurement for the Main Canal Ch 313+42 to Ch 397+00 and Area 1 and (ii) for the Irrigation area G 23 to G 33. The proposed Project has been classified as Category B as per ADB SPS 2009 requiring the IEE and the environmental management plan (EMP).

A. The Project

2. Climate Smart Irrigation Sector Development (CSISD) Project (the project) aims to contribute towards economic growth and food security. The project will support the Government of Georgia through the Ministry of Environmental Protection and Agriculture (MEPA) and Georgian Amelioration (GA) to implement policy, legal, institutional and management reforms in agriculture, in particular irrigation, and modernize selected irrigation schemes through priority repairs to irrigation networks and the introduction of innovative on-farm irrigation and agricultural production technologies.

3. The project has two lending components: a policy-based loan (USD $ 15 Million) to promote institutional, governance, management, and financial management reforms in the Georgian irrigation sector; and an investment project (USD $ 33 Million) to modernize outdated irrigation systems at the Kvemo Samgori left main canal scheme and demonstrate innovative agricultural production through water efficient technologies within the project area.

4. The Ministry of Finance (MOF) will be the executing agency and MEPA will be the implementing agency for the policy component. MEPA will be the executing agency and implementing agency for the investment component. Project implementation will be led by the existing MEPA project implementation unit (PIU).

B. Project Impact, Outcome, and Outputs

5. The program is aligned with the following impact: food security in Georgia improved. The outcome will be sustainable, productive, and resilient agriculture system in Eastern Georgia strengthened.

6. The program will have three outputs. The policy-based loan will support water resources management and irrigation reforms under output 1. The project loan will support modernization of the KSL irrigation scheme under output 2, and the demonstration of climate-smart irrigation and agricultural production technologies and pilot windbreaks under output 3.

7. **Output 1: Institutional, Governance, Management, and Financial Management Enhanced.** This will support MEPA to strengthen its water resources management and irrigation policies, institutional capacity, and financial management. It will improve the irrigation subsector and increase its contribution to the economy and development objectives of Georgia. The policy actions under the policy-based loan focus on (i) enhanced legal and institutional framework to achieve irrigation policy outcomes and ensure a sustainable management of water resources; (ii) pricing and contracting change to ensure improved efficiency of water use and financial sustainability of irrigation systems in face of current and expected impact of climate change on water resources; and (iii) enhancing governance and management controls to increase the Georgian Amelioration accountability, transparency, and efficiency of its service delivery. The policy reforms will create an enabling environment for Outputs 2 and 3. A policy matrix was developed to identify and address any safeguarding concerns.

8. **Output 2: Irrigation Schemes Modernized.** Output 2 will support the modernization of the dilapidated, under-utilized KSL irrigation scheme in Kakheti region in eastern Georgia. Modernization of the scheme includes repairs to the main canal and installation of pressurized pipe on-farm irrigation networks. Modernization will take place in two phases. Figure 1 shows the areas to be modernized according to the distributaries serving each area and the reaches of main canal to be modernized. Phase 1 areas are net command areas based on the detailed concept design for each area. Phase 2 areas are gross areas based on GA estimates. Table 1 lists the areas to be modernized in each phase. Modernization of the main canal will include changes to meet the needs of the area modernization design concept. The main canal will be also modernized in two phases (Figure 1). The first section of 8.4 kilometers (Ch 313+42 to Ch 397+00) is required to serve Areas 3 (G-38) and 4 (G-39) in Phase 1 of modernization. The second section of 9.2 kilometers (Ch 397+00 to Ch 488+66.7) will serve Areas 5 (G-41) and 6 (G-42) in Phase 2 of modernization.

Figure 1: Kvemo Samgori Areas to be Modernized

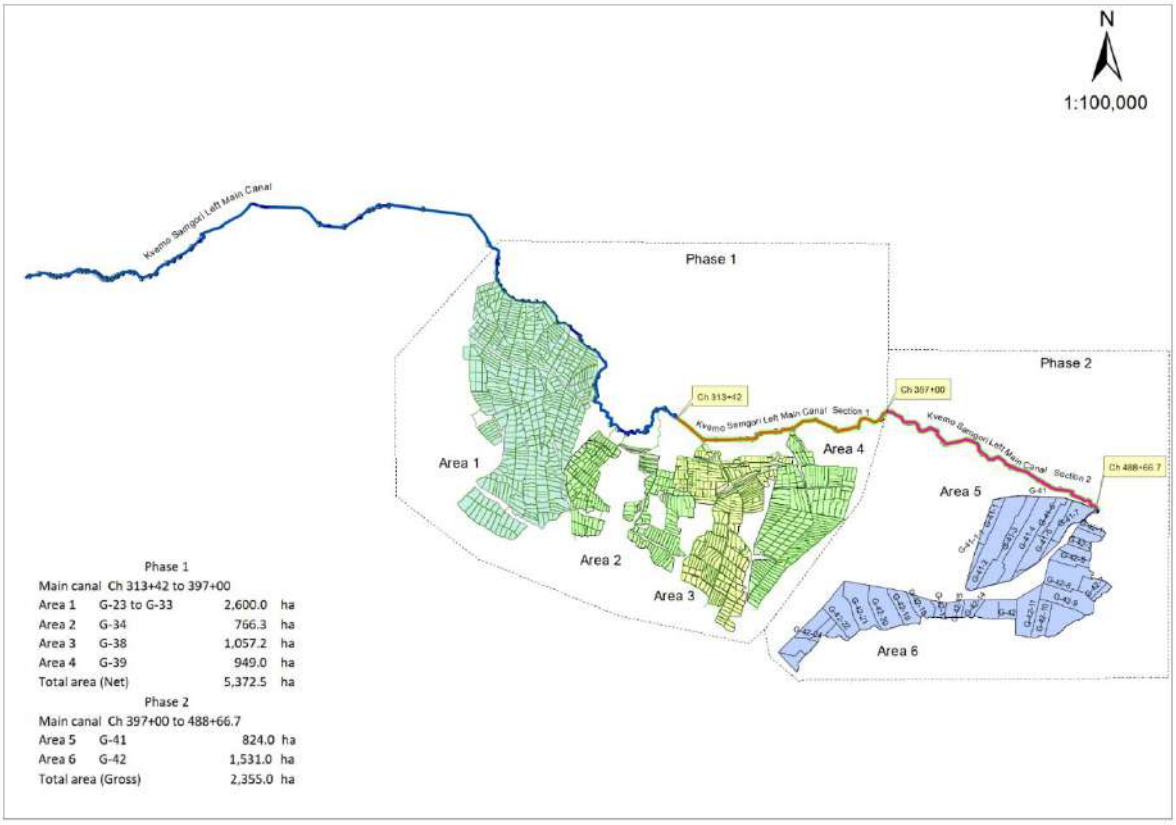

Table 1: Kvemo Samgori Phasing and Areas to be Modernized

Phase/Area	Gross Area (hectare)	Net Area (hectare)
Phase 1		
Area 1 (G-23 to G-33)	3,141	2,600
Area 2 (G-34)	1,074	766
Area 3 (G-38)	1,252	1,057
Area 4 (G-39)	1,047	949
	6,514	**5,373**
Phase 2		
Area 5 (G-41)	824	680
Area 6 (G-42)	1,531	1,263
	2,355	**1,943**

Total Phases 1 and 2	**8,869**	**7,316**

Note: Gross areas are based on Georgian Amelioration (GA) estimates except for Area 3 for which the GA estimate was lower than the net area identified by the concept design for that area. The gross area for Area 3 is based on the transaction technical assistance TA) consultants' estimate. Net areas for Areas 5 and 6 are based on the ratio of net area to gross area for Phase 1 areas since concept designs have been completed only for Areas 1 to 4 prior to implementation.
Figures may not sum due to rounding.
Source: Georgian Amelioration and TA 6648-GEO consultants.

9. **Output 3: Innovative Agriculture Production Systems Demonstrated.** Output 3 will support farmers to modernize and improve their irrigation and agricultural production technologies. The output will:

- Demonstrate innovative irrigation and agricultural production technologies.– The potential benefit of introducing such technologies will be assessed in terms of both improved water productivity and incremental financial and economic returns, for instance from diversification to high value crops. For farm irrigation, demonstration of gravity feed and solar powered systems, where practical, for water distribution.

- Provide capacity development for farmers and scheme stakeholders through training in technology implementation that will facilitate adoption of successful technologies.

- Identify constraints and means of addressing them such as access to finance, market information, adoption of new technologies, smart farming technologies, and mobile technologies and applications to aid decision making by farmers and other value chain actors.

- Establish pilot windbreaks to address soil erosion and to enhance crop protection. Demonstrations will be established on areas modernized in the Kvemo Samgori scheme.

C. Environmental Due Diligence

10. The project is classified as environmental Category B under ADB's SPS (2009), requiring the preparation of an IEE and EMP based on the Rapid Environmental Assessment Checklist. Actions were taken at an early stage of project preparation, to identify potential direct, indirect, cumulative and induced environmental impacts on and risks to physical, biological, socioeconomic, and physical cultural resources to determine their significance and scope, in consultation with stakeholders, including affected people and concerned NGOs. This included site visits to proposed project areas and interactions with key stakeholders. The project is expected to have potential adverse environmental impacts that are site-specific, mostly reversible, and in most cases, mitigation measures can be designed.

11. As this project is the rehabilitation of existing irrigation systems this project does not fall under the Georgian Environmental Assessment Cod 2017 and an EIA is not required. However, environmental and social standards within legislation will be followed and any other required permits will be sorted.

D. Environmental Impacts and Mitigation

12. Potential environmental Impacts and risks were identified, and the environmental assessment process was conducted at an early stage of the project cycle. Approach of avoidance and then if avoidance is not possible, minimizing adverse environmental impacts and risks was adopted. Generally, all impacts can be mitigated and monitored to prevent any

permanent negative change in the environment or compensate for the changes to prevent overall negative changes.

13. **Biodiversity.** The whole project area covers agricultural land plots with vineyards, orchards, annual and perennial agricultural crop land plots, etc. The project area does not cover natural habitats and is a modified habitat,[1] totally represented by agricultural landscape actively used by the population. The project location is in a degraded landscape that is not critical habitat, however, the area has windbreak areas that e are away from the area of construction. There are a few important species that are potentially on-site, such as the Common walnut (*Juglans regia*), Grayish oak (*Quercus pedunculiflora* C.Koch), Georgian weeping Pear (*Pyrus georgica*), Georgian elm (*Ulmus georgica*) and Georgian barberry (*Berberis iberica*).

14. In terms of fauna, many small mammals, 28 birds, 7 species of reptiles and 4 amphibians were identified on-site. Of these species some are protected under national or international legislation or are considered endangered under the IUCN or RLG; this covers 12 birds and 1 reptile (located in the windbreaks).

15. To the South of Area 1 is Korughi Managed Reserve, which is protected for its flood plain forests and is also a hunting reserve. Along the nearby stretch of Iori, no protected or endangered fish are along the relevant stretch of water.

16. A pre-construction biodiversity study for the Samgori irrigation system project area has been conducted (Refer Annex 6) during the preparation of this IEE. While no significant impact on any critically endangered species is expected during the project construction and implementation, further assessments may be undertaken in the subsequent phase of the IEE and throughout implementation to monitor and prevent unplanned impacts. Additionally, actions for minimising removal of vegetation, replanting, and minimising disturbance of fauna will be a key part of the mitigation measures. Other mitigation measures for soil and water pollution, noise, vibrations, dust and air emissions will also minimise any impacts.

17. **Cultural Resources**. A full cultural study was undertaken by a cultural specialist for a similar project for all the key cultural sites near the project. The findings of his study are also being used for this project. The study included site visits, inspections of the area and an archaeological survey. This report was developed by the cultural specialist based on his prior visit to the site for the other project. The area has a long history with several cultural, historical and archaeological sites nearby, the two key sites being the 'Nameless Tower' located in the centre of Area 1 and the Chailuri (Niakhura) Fortress located to the north of Area 1 (Refer Annex 3, Cultural Heritage Survey Report). There may be temporary visual impacts, however, the site will be fully restored to its original condition or better. Vibration monitoring around the tower and minimising all use of heavy machinery and vehicles within 200m of the tower will prevent any damage. Due to the historical activity within the region, there is the potential for chance finds, hence chance finds procedures shall be prepared and included in the Site Specific EMPs. **Noise, Vibration, Dust and Air Emissions**. The location itself is mainly away from residential areas and the baseline conditions are within permissible levels and in compliance with requirements of national standards and international (WBG/WHO) guideline values. During the construction phase, the project will experience an increase in noise, vibration, dust and air emissions from machinery and vehicle movement, from evacuation and laying of pipelines and repair works on the main canal. These impacts will be mitigated and monitored with no residual or long-term impacts.

[1] Refer Annex 6 – Biodiversity Report.

18. **Soil quality**. Excavation and laying of pipes have the potential to cause an impact on soil erosion and quality. Good environmental practices when excavating, spoil pile management and backfilling will be applied to mitigate the impact, this includes siting spoil piles in a good drainage area and refilling as soon as possible.

19. There is also a risk of contamination for spills of oils and fuels, good maintenance and second containment where necessary and spill prevention equipment and training will be provided.

20. **Water Quality and Quantity.** The Iori river is a transboundary river that is part of the Kura River Basin. Values for the Iori catchment area and multi-annual flow differ depending on the source of the data, between 571km2 and 11.7 m3/s to 498 km2 and 10 m3/s. It is already high in suspended sediment, due to untreated domestic wastewater and the main source of nutrient runoff is agriculture, sewage and stormwater. The project is not expected to lead to changes in the amount of water taken by the irrigation scheme and therefore will not impact the downstream use in terms of water quantity, however, water quality can be impacted by pollution from construction activities such as soil erosions and spills and from workers through an increase in domestic wastewater. These impacts can be mitigated through standard good environmental practices during construction.

21. The operation phase will result in increased availability of water in the canal and increased access to irrigation land. This may lead to the induced risk of, excess use of water, pesticides and fertilisers leading to a reduction in water quality at the downstream end of the river. This will have to be responded to ensure that sustainable water management and good fertiliser and pesticide practices are being incorporated into Output 3 activities and if necessary further training to farmers separately to Output 3.

22. **Waste Management**. There is the potential for a lot of waste to be produced during construction; sediment from cleaning the main canal, rubble from main canal repairs, excess soil from laying the new pipes, etc. For all waste produced, the waste hierarchy will be applied meaning waste will be minimised, recycled or reused if possible and the remaining is disposed of in an environmentally sound manner. Waste material will also be appropriately stored and transported.

Type of Waste generated	**Quantity (in Tons)**	**Method / location of disposal**
Soil waste (spoil) generated during excavation. # 4,810m3 of sedimentation # soil – Area 1 # Topsoil to be removed to lay the pipes.	4810m3 50,424m3 82,947m3	Low lying areas Site location to be confirmed prior to start of construction.
Construction and demolition waste and debris	To be confirmed during detailed design	Government approved sites for dumping.
Hazardous waste generated during construction phase. Medical wastes generated during construction phase.	To be confirmed during detailed design.	Government guidelines / approved sites for hazardous waste management.
Asbestos Waste during dismantling / demolition of old structures.	140m of asbestos pipe across the project.	To be stored / disposed of following Asbestos Management Plan

23. **Visual and landscape.** This is a historical and agricultural landscape, however, any negative impacts on the visual or landscape will be temporary, and the overall impact will be negligible to positive. After site restoration to the original condition, the changes to the

landscape will be less than before as secondary channels in Area 1 will be replaced by pipelines and degraded systems repaired.

24. **Loss of Access and Resettlement**. The works within Area 1 will lead to the resettlement of farmland, the area is mostly privately owned, and the current system often runs along the borders. Pipes can follow preferred routes however this project will cause issues over temporary loss of access as well as resettlement issues. These issues will be managed through the LARP and include consultation and appropriate compensation. Early consultations about this have generally been positive.

25. **Health and Safety.** Occupational health and safety plans need to be in place to prevent injury to workers and anyone on-site from any construction activities. This will cover everything from first aid, PPE and emergency response to training. Appropriate labour facilities, such as toilets and drinking water, are also key to ensuring vital occupational health and safety. Contractor upon mobilization will prepare a site-specific H&S plan and get it approved by MEPA prior to start of construction.

26. Social disruption due to the influx of workers could lead to issues if not managed, siting the construction camps away from residential areas, local employment preferred and training and awareness to workers should manage this issue.

27. During the operation, there will be a risk along the main canal of people falling into the canal, leading to injury or death. Appropriate signs, fencing and awareness will be needed to minimise this impact. The upgrading of the bridges and overpasses as part of the Main Canal works is also important to this.

28. **Traffic Management**. During construction, there will be an increased amount of traffic caused by the movement of materials and waste and machinery and equipment. At times works may also require the temporary full or partial closure of roads. Without management of this, it can cause disruption and congestion across the area, disturbance (noise and dust) on fauna and cultural resources and safety issues for the public and workers. Generally, speed limits, planned routes and timeframes, maintenance of vehicles and training will prevent any issues. Contractor upon mobilization will prepare a site-specific Traffic Management Plan and get it approved by MEPA prior to start of construction.

29. **Asbestos.** Some of the pipes in Area 1 may contain asbestos-containing material. At this point, it is unclear how much and where these pipes are as well as if we will cause any disturbance. If the pipes will need to be removed or will be disturbed then an Asbestos Specialist will need to develop a plan to safely manage the pipes so as not to pose a risk to workers or the environment.

30. **Positive Impacts**. Overall, without the project, the system will continue to degrade, supplying less water to farmers and significantly negatively affecting their agricultural outputs and household income. With the works, the system will significantly reduce water and lead to a more equitable distribution of water and more land being irrigated for the same amount of water taken from the Iori River. Leading to a greater agricultural output per water used.

31. The project will also improve the monitoring and understanding of the irrigation systems making management of the system easier and more sustainable.

32. The system is designed with climate resilience in mind, and this is a key part of this overall project.

Implementation Arrangements

33. MEPA is the executing agency responsible for overall guidance, strategic decisions, oversight of the implementation of the project, and financial management and administration, program procedures and guidelines. The MEPA PIU is the implementation agency and will be responsible for the day-to-day implementation and needs to have sufficient capacity to manage and monitor environmental safeguards. The PIU will be responsible for overall compliance with ADB's safeguard requirements and national environmental regulations and will ensure that the preparation, design, construction, implementation, operation and decommissioning of the projects and all project facilities comply with all applicable national laws and regulations relating to the environment, health and safety, environmental safeguards, and all measures, and requirements outlined in the EARF and IEEs, and any corrective or preventive actions outlined in the safeguards monitoring reports.

34. The bidding and contract documents shall include specific provisions requiring contractors to comply with all environmental, health and safety, labour and similar provisions to manage impacts and to comply with ADB's SPS and national legislation. The estimated budget for environmental safeguards implementation is as indicated in Table 25.

E. Public Consultation and GRM

35. Engaging with stakeholders is important to the success of the project. Project consultation so far highlights the need for the project and the issues such as the disparity on who is receiving the water. Consultation in regard to the IEE will be undertaken after the draft IEE is disclosed and before the final IEE is submitted, as at this point more information will be able to be provided to the public.

36. The draft IEE and final IEE disclosure is an important part of stakeholder engagement and should be available through the ADB's website, MEPA and GA to be accessible by all interested parties.

37. During implementation, engagement with stakeholders is still required and important to prevent and manage impacts. Consultations around resettlement, loss of access, health and safety, traffic and other issues should be maintained to prevent issues.

38. Another part of this, is the Grievance Redress Mechanism, a system where the public and workers can raise issues to which the construction contractor and project supervision consultants (PIC), with the overview of the PIU, respond to the issue. Below is the GRM process:

- Stage I: Registration and Initial Assessment.
- Stage II: Initial Resolution
- Stage III: Selection of Approach and Strategy
- Stage IV: Execution of Measures and Documentation

F. Conclusion

39. As a great part of the existing system is damaged, the irrigation system uses excess water. With the modernisation works the irrigation will be able to serve a larger area while not increasing the take from the Iori River. This will lead to socio-economic improvements as well as support GA's management of the system.

40. During the construction phase, there is the potential for negative environmental impact on biodiversity, cultural resources, noise, vibration, dust, air emissions, water quality, soil quality, waste, visual and landscape, resettlement, health and safety and traffic. These will be managed under the EMP, with limited residual impacts. The project will not have transboundary impacts.

41. During the operation phase, there is a risk that the project will have the following induced impacts, in particular: (i) as the region suffers from a lack of irrigation water, the areas of the agricultural fields may increase following the project implementation, perhaps at the expense of cutting down the existing forests; (ii) the number of processing and transportation companies may increase in the area what will increase the risk of the environmental impact; (iii) as the areas of the agricultural land increase, the use of pesticides and fertilizers in the area will increase as well. In the case of improper use of pesticides and fertilizers, the risk of soil pollution will increase, while in the long term, the risk of Iori river pollution will increase as well. These will be managed under the EMP through the provision of training to farmers on good practices. The IEE / EMP shall be updated based on final designs and alignments and submitted to ADB for approval prior to start of construction.

I. INTRODUCTION

A. Purpose of the Report

1. This Draft Initial Environmental Examination (IEE) has been prepared for the Climate Smart Irrigation Sector Development Project (RRP GEO 54014) for the advanced procurement package for the Main Canal Ch 313+42 to Ch 397+00 and Area 1 – Irrigation area G 23 to G 33. This area has been classified by the ADB as Category B requiring the IEE and EMP.

B. The Project

2. Climate Smart Irrigation Sector Development (CSISD) Project (the project) aims to contribute towards economic growth and food security.

3. The project will support the Government of Georgia through the Ministry of Environmental Protection and Agriculture (MEPA) and Georgian Amelioration (GA) to implement policy, legal, institutional and management reforms in agriculture, in particular irrigation, and modernize selected irrigation schemes through priority repairs to irrigation networks and the introduction of innovative on-farm irrigation and agricultural production technologies.

4. The project has two lending components: a policy-based loan to promote institutional, governance, management, and financial management reforms in the Georgian irrigation sector; and an investment project to modernize outdated irrigation systems at the Kvemo Samgori left main canal scheme and demonstrate innovative agricultural production through water efficient technologies within the project area.

5. The project is financed and contracted through a policy based loan and a project loan by the ADB; with co-financing by the Agence France de Developpement (AFD).

C. Structure of Report

6. The remainder of this report consists of the following sections:

(i) Description of the project
(ii) Policy, legal, and administrative framework
(iii) Description of the environment
(iv) Anticipated impacts and mitigation measures
(v) Public consultation and information disclosure
(vi) Grievance redress mechanism (GRM)
(vii) Environmental management plan (EMP) for Package 1
(viii) Environmental management plan (EMP) for Package 2
(ix) Conclusion and recommendations

II. DESCRIPTION OF THE PROJECT

A. Project Rationale

7. Productivity, production and contribution to GDP has declined significantly since the Soviet Union times. The agricultural output provided 8.3% of GDP output with 20% employed in the agricultural sector overall; and outside of urban areas agriculture is one of the main economic activities. This highlights an important issue with the productivity of the sector[2].

8. This sector is facing a lot of physical difficulties, exasperated by the deteriorating environmental issues, and is not sustainable. Farms face issues over yields from water availability, decreasing farm sizes, increasing fragmentation and marketing constraints.

9. Effective irrigation and drainage services have declined over the past two decades, mainly due to a lack of new investment and poorly maintained. At the end of the Soviet period, the total irrigated area in Georgia was approximately 386,000 ha[3], approximately 66% of the total cultivable area.[4] This significantly declined to only 24,000 ha in 2010 – only 7% of the total cultivable area[5] – before Government intervention started to reverse the decline. There is a reliance on ageing irrigation systems and equipment, and a lack of understanding amongst farmers is resulting in poor environmental management, further fuelling environmental issues.

10. On top of this, climate change is and is likely to continue to affect water availability and climate extremes within the region, increasing the pressure on yields. As such annual harvests are variable and on average are decreasing.

11. Food imports exceed exports[6] and with the above factors the agricultural sector is in decline and Georgia is vulnerable in terms of food security[7].

12. The MEPA and GA are working on reforms, through the 2017 Irrigation Strategy, to develop and manage their irrigation systems. However, further support is needed to address the lack of access to effective and efficient irrigation systems. The government requested the support of ADB.

13. This project is in the ADB's Country Operations Business Plan for Georgia, 2021-2023. It is in line with one of the three strategic approaches underlying the goal of ADB's Country Partnership Strategy 2019-2023 for Georgia which focuses on optimizing domestic value addition and increasing productivity. The program is aligned with ADB's Strategy 2030, particularly for operational priorities (OPs) that involve (i) addressing remaining poverty and reducing inequalities (OP1); (ii) accelerating progress in gender equality (OP2); (iii) tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability (OP3); (iv) promoting rural development and food security (OP5); and (v) strengthening governance and institutional capacity (OP6).

14. The program will contribute to multiple Sustainable Development Goals (SDGs), including (i) addressing poverty (SDG 1); (ii) achieving food security (SDG 2); (iii) supporting gender equality (SDG 5); (iv) promoting integrated water resources management and

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[2] Source: National Statistics Office of Georgia
[3] Ministry of Agriculture of Georgia, "Georgian Amelioration", 2017. *Irrigation Strategy for Georgia 2017-2025*.
[4] Calculated using FAOSTAT data for 1992, which approximates the total growing areas as 581,100 ha.
[5] Calculated using FAOSTAT data for 2010, which approximates the total growing areas as 334,785 ha.
[6] https://transparency.ge/sites/default/files/georgias_agriculture_sector.pdf and TOR
[7] National Statistics Office of Georgia

restoration of ecosystems (SDG 6); and (v) strengthening resilience and adaptive capacity to climate-related and natural hazards (SDG 13).

B. Impact, Outcome and Outputs

15. The project is aligned with the following impact: food security in Georgia improved (Irrigation Strategy). The outcome will be sustainable, productive, and resilient agriculture system in eastern Georgia strengthened. The project will have three outputs. The policy-based loan will support water resources management and irrigation reforms under Output 1. The project loan will support the modernization of irrigation systems under Output 2, and the demonstration of climate-smart irrigation and agricultural production technologies under Output 3.

16. **Output 1: Institutional, Governance, Management, and Financial Management Enhanced.** This will support MEPA to strengthen its water resources management and irrigation policies, institutional capacity, and financial management. It will improve the irrigation subsector and increase its contribution to the economy and development objectives of Georgia. The policy actions under the policy-based loan focus on (i) enhanced legal and institutional framework to achieve irrigation policy outcomes and ensure a sustainable management of water resources; (ii) pricing and contracting change to ensure improved efficiency of water use and financial sustainability of irrigation systems in face of current and expected impact of climate change on water resources; and (iii) enhancing governance and management controls to increase the Georgian Amelioration accountability, transparency, and efficiency of its service delivery.. The policy reforms will create an enabling environment for Outputs 2 and 3.

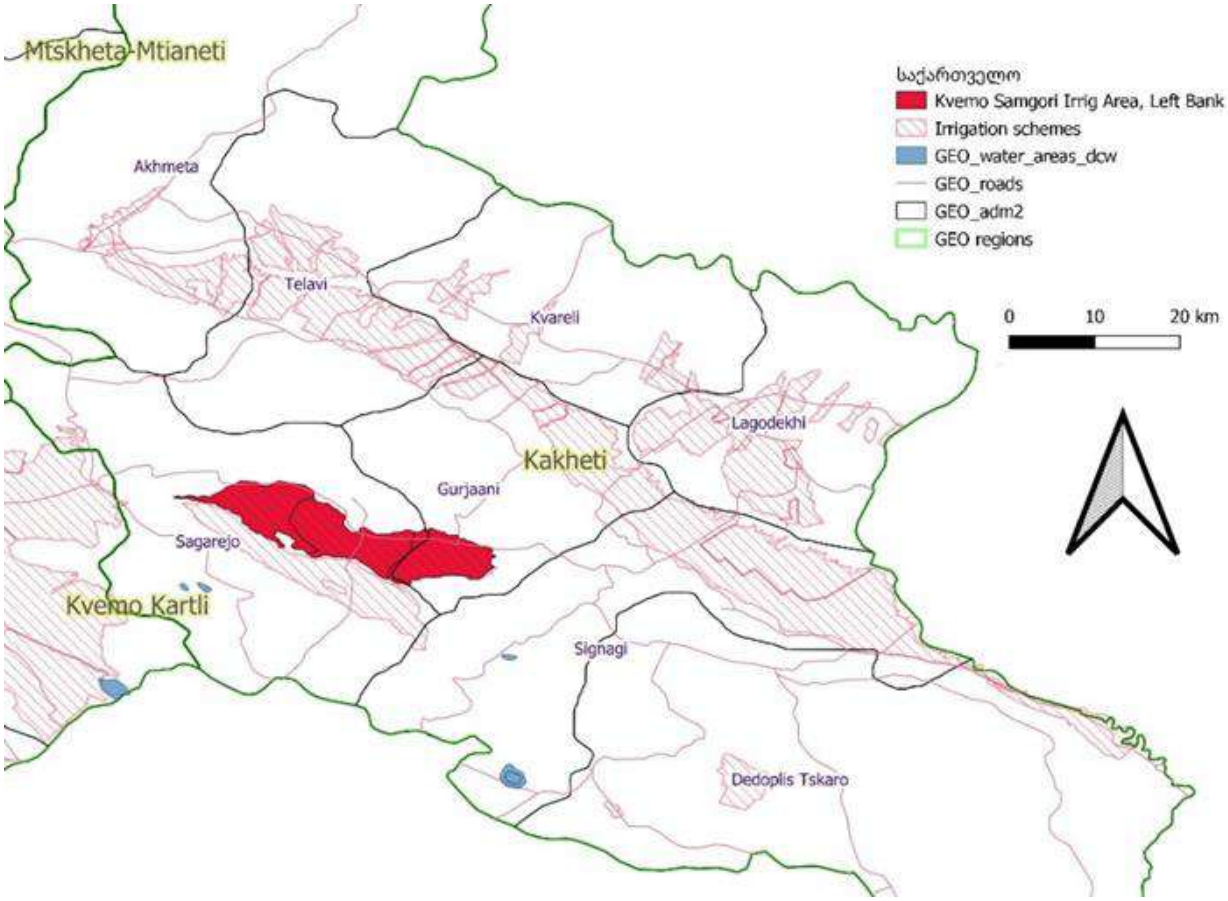
17. **Output 2: Irrigation Schemes Modernized.** The output will support the modernization of the dilapidated, under-utilized Kvemo Samgori left canal irrigation scheme in the Kakheti region in eastern Georgia. Modernizations include repairs to main, secondary and tertiary canals, and on-farm irrigation networks.

18. **Output 3: Innovative Agriculture Production Systems Demonstrated.** This output will support farmers to modernize and improve their irrigation and agricultural production technologies. The output has two subcomponents: (i) demonstrating and introducing innovative on-farm technologies; and (ii) developing the capacity of farmers, farmers' organizations and water users' organizations. Improved on-farm technologies include (i) introducing water-saving, climate-smart irrigation methods (e.g. drip and sprinkler irrigation), digital technologies, and remote sensing (e.g. for irrigation scheduling); (ii) realizing local water storage and recycling opportunities; (iii) supporting high-value crop production; and (iv) implementing advanced water management and resource monitoring.

C. Kvemo Samgori Left Canal Irrigation Scheme

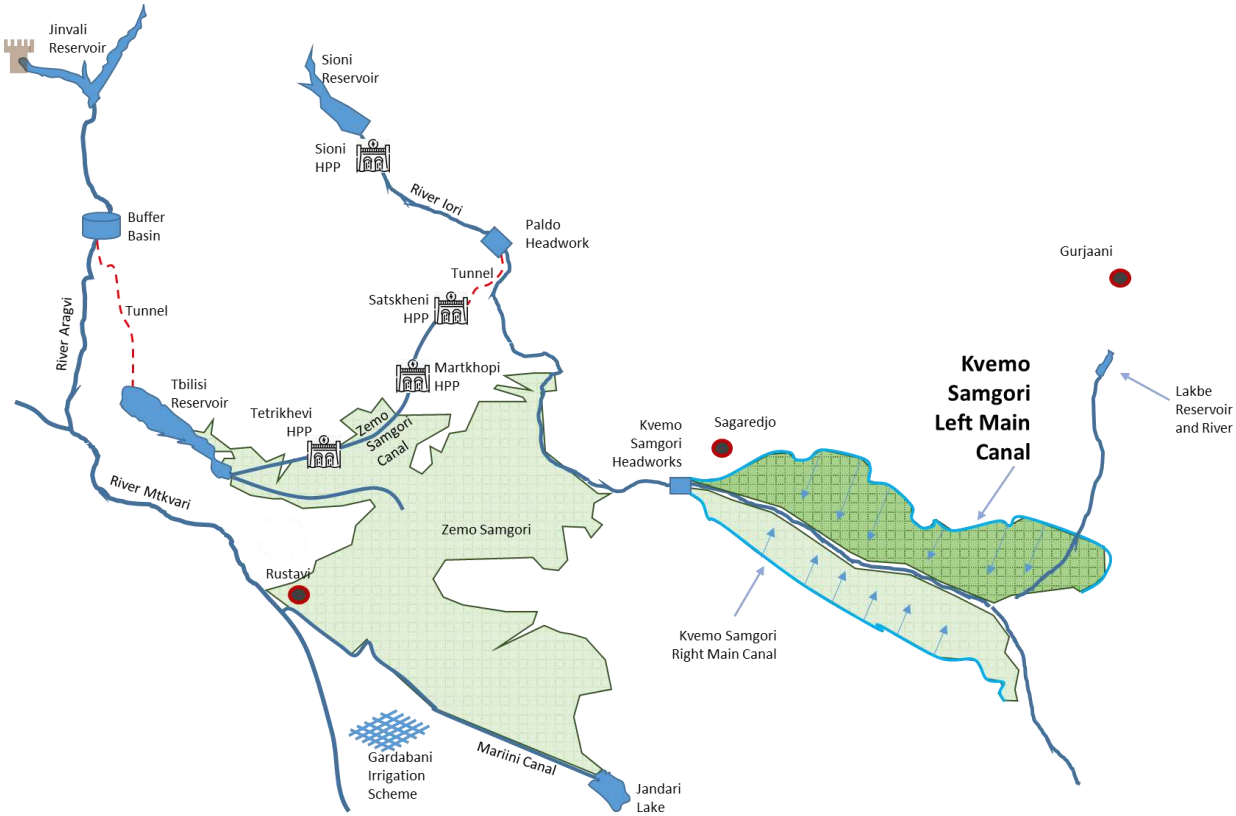
19. The Kvemo Samgori Irrigation scheme lies in the Kakheti Region of Eastern Georgia in the municipalities of Sagarejo and Gurjaani, Figure 1. The Kvemo Samgori Irrigation Area, with the focus of the Climate Smart Irrigation Sector Development Project (CSISDP) focuses on the left or upper bank of this scheme, shaded in red.

Figure 1: Eastern Georgia and Kvemo Samgori irrigation scheme, in the Kakheti Region Source: TA-6648 GEO consultants



20. The Kvemo Samgori Irrigation scheme is part of a larger complex that originates at Sioni Reservoir (Figure 2). From Sioni Reservoir water flows through the Iori River over a distance of about 22.5 km to Paldo Headworks. At this junction, part of the water is abstracted for the Zemo Samgori Irrigation scheme. The remaining amounts flow again through the Iori River over a distance of about 28 km to the Kvemo Samgori Headworks where the flow is divided into the two separate systems of the Left and Right Main Canals. The Iori river continues in the southeast direction towards Azerbaijan (where it is called the Gabirri River) and finally flows into the Mingachevir Reservoir.

Figure 2: Overview of Kvemo and Zemo Samgori Irrigation Schemes[8]



21. The original project (command) area was 14,245 ha, out of which 12,445 ha were formerly irrigated by gravity and the rest was irrigated through pumping stations. The potential irrigatable area of the Left Main Canal was reported by GA as 12,445 ha. As of 2020, the current irrigation water supply area, without any intervention, is estimated to be 4,430 ha. In that year, the total area under irrigation contracts signed with GA was 2,227 ha. In 2021, the total area under contracts was 1,987 ha. Flow data, Table 1, for the left and right main canals for 4 months (June, July, August and September) for the years 2019 and 2020 is shown below.

Table 1: Kvemo Samgori Annual Distribution of Flows during Growing Season (m^3 million)[9]

Year	Headworks	Right Main Canal	Left Main Canal
2019	127.10	57.89	49.82
2020	103.85	36.45	36.44

22. On average, during the growing season, around 37% of the water flow at the headworks is routed into the Kvemo Samgori left main canal and around 40% to the right main canal. With this distribution, the available water distribution for the years 2000 until 2020 was extrapolated. Based on the 1st Quartile, there are 20,428,802 m^3 of irrigation water available in the system, meaning that in 3 out of 4 years there is more than this amount available, and in 1 out of 4 years less. If it is assumed that there are 20% losses through the transmission

[8] Source: TA-6648 GEO consultants, Detailed Design of Output 2.
[9] Source: TA-6648 GEO consultants, Detailed Design of Output 2.

there would be an amount of 16.34 million m^3 available at the farm level per irrigation season depending on the operation and management.

23. The irrigation water demand ranged between 0.39 l/s/ha to 0.82 l/s/ha (for the most severe climate change scenario in the year 2099), and the actual water consumption of 2.49 l/s/ha in the system is much higher. This high water use could be attributed to a combination of transmission losses, inefficient irrigation and poor monitoring of discharged amounts, inefficient reservoir releases or the fact that more plots might be connected than the 2,227 ha that is currently under contract.

24. Around 75% of the farmers were connected to the Kvemo Samgori Irrigation system based on the 2020 GA Landowners' Survey; however, supply of water varies between farms with farmers further away from the headworks being more likely to report having no water at all.[10]

D. System Elements

25. **Available water versus crop demand** - the availability of water on an annual basis determines the area that can be connected to the irrigation system. When the available water matches or exceeds the demand from the area connected, the system is designed to meet peak crop demand. if the land area is not limiting but the available water is limiting then the system is designed where the peak demand is calculated as a peak daily percentage of the maximum available volume. In this case, it is assumed that:

(i) There is excess available water on an annual basis;
(ii) Therefore, the system shall be designed to meet a peak crop demand of 0.75 to 1 l/s/ha; and
(iii) The system shall be designed to allow flexibility in the timing of delivery which means that the peak supply is larger than the average crop demand.

26. **Individual flow rate** required by the farmer is determined not by the individual farmer's irrigation system and technique. The size of the farm determines how many hours the system will operate for each irrigation. It is not practical to enable the majority of farmers to irrigate at the same time, but it is essential that they are provided with an individual flow rate large enough that enables efficient on-farm irrigation.

27. For furrow irrigation where there is a section or subsystem of <15 individual connections, the capacity of the system is driven by the individual flow rate, which means that the system is designed as a combination of:

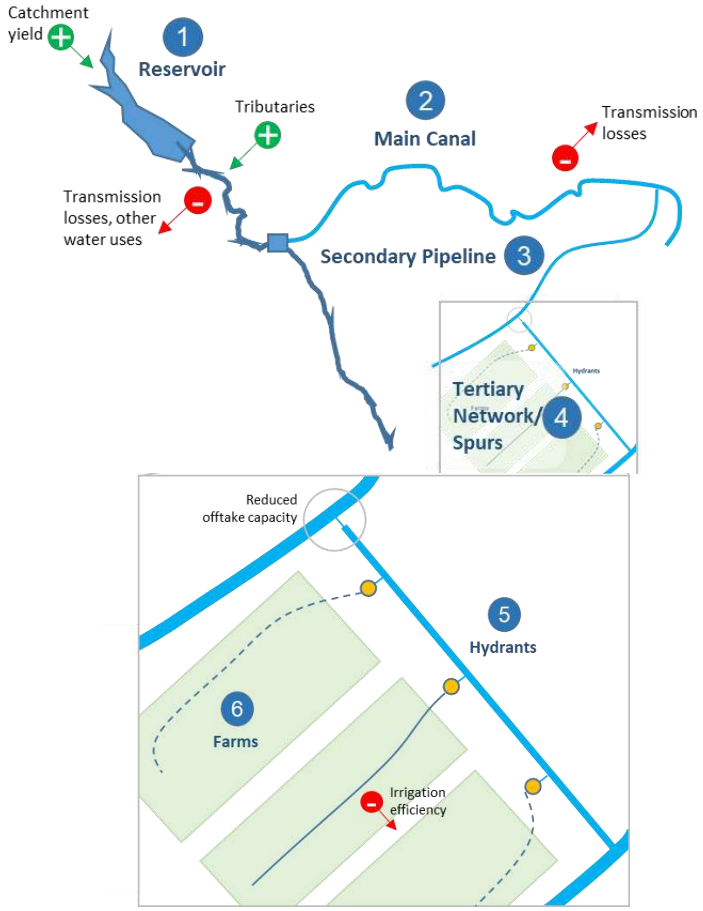
(i) mainlines that are sized according to the available water/land and associated peak crop; and
(ii) groups of spurs that supply 15 individuals (in this case 3 spurs supplying 5 individuals each).

28. **Supply System Elements** - The planned system (Figure 3) will be a combination of three main sub-systems:

(i) Reservoir with storage releasing to a river to downstream weir offtake (1)
(ii) Main canal transferring water (2)
(iii) Gravity-pressurized pipeline direct to the farmer (3, 4, 5, 6)

[10] Landowners' survey by the GA in 2020

Figure 3: Components of the Irrigation Scheme[11]



29. Harmonizing the three systems is key to the design and operation of this system. The following describes the proposed methods of harmonizing this system taking into account the other irrigation areas and the modernization works to date.

(i) Different Concept - The design of gravity pipelines for irrigation is very different in concept to a canal-based system.
(ii) Different and Varying Operating Conditions - Gravity-fed pressurized pipeline networks have a range of operating options. Unlike canal systems, the maximum flow for the system depends upon delivery pressures respectively head loss permitted.

30. **General Design Principles** will be the basis of the detailed design for the modernization of the Kvemo Samgori Left Irrigation scheme:

(i) Continuous system: there shall be no "breaks" in the supply chain up to the farm connection, i.e., no storage or no separate main canals operated by one group and tertiary systems operated locally
(ii) Direct connections: farmers must directly couple a pipe to the system, and the pressure/head is maintained
(iii) Almost "water on demand": there is no need for a sophisticated ordering or complicated management system to operate
(iv) Equitable distribution: the water is distributed across the whole area giving each area a fair share and limiting waste and over-irrigation by using strategic flow

[11] Source: TA-6648 GEO consultants, Detailed Design of Output 2.

(and consumption) constraints without the need for elaborate management inputs.

(v) Interconnecting pipe: creating a true “network” rather than a traditional “tree” supply system to enable the system to be designed with less spare capacity as the network inherently equalizes around the system effectively delivering more efficient and higher flow

31. **Specific Design Principles for** the following main components must be adhered to:

(i) Reservoir (river and canal offtake):

(a) Capacity must be sufficient to secure the overall demand: Reservoir capacity + Catchment yield + Tributaries – Transmission loss (including other uses) to Headworks > Overall system demand.
(b) Management of the overall system must commit to certain amounts under defined certain conditions.

(ii) Main Canal:

(a) Flow capacity > Irrigation Water Demand (Farm Level) + Transmission losses in Secondary and Tertiary Networks.
(b) Storage capacity is sufficient to balance demand peaks (operate at a range of depths).
(c) Must automatically adjust to demand: the canal must have control structures.
(d) Requires measurement throughout the canal and pipe offtakes,
(e) Needs SCADA control using operating formulas that enable the system to meet demand without having to have complicated management systems.
(f) Uses the concept of “overshot weirs” to ensure sufficient head in the upstream canal sections, incl. gates on top of the overshot weirs to store excess flows to minimize spills.
(g) Uses the concept of “undershot offtakes” to pipelines to ensure sufficient flow at all times in the pipes, incl. overflow weirs to enable surplus flows to be discharged back to the river.
(h) Includes. overflow weirs to enable surplus flows to be discharged back to the river.

(iii) Secondary Pipelines:

(a) Flow capacity >= Required System Average Irrigation Water Demand (Farm Level) + Transmission losses Tertiary Network + flexibility for the level of service.
(b) Designed for an average peak daily demand between 0.75 to 1 l/s/ha, depending on the desired level of service.
(c) Online continuous flow measurement at each offtake from the main canal.
(d) Requires flow controls to distribute water across the whole area giving each area a fair share.
(e) Needs loops and interconnectivity to increase the ability to balance peaks within the network.

(iv) Tertiary Network/Spurs:

(a) Flow rate into each spur is limited, e.g., by reduced diameter in offtake from the secondary canal.
(b) Allowed flow rate per spur <= 1 – 1.2 x Individual Hydrant Flow.

(c) Diameters of intakes of spurs between 80 mm (top of the system) and 40mm (bottom of the system).
(d) Area supplied per spur < 4 – 6 ha.
(e) Ratio of spurs operating at one time is ~ 35 - 45%.

(v) Hydrants/Supply Nodes:

(a) Individual Hydrant Flow < 15l/s.
(b) Pressure at node > 2 meters in all system conditions.
(c) Average number of plots / supply node <= 3 – 4.
(d) Hydrants must be capable to be equipped with individual water meters in the future.

(vi) Farms:

(a) Farmers have individual hydrants to directly connect to the system.
(b) Farmers have 24/7 access to their connection points.
(c) Farmers can choose their irrigation method and apply surface, sprinkler or drip irrigation.
(d) Farmers have control over an endpoint with a pipe fitting that is located either at each property boundary or a reasonable distance (<200m) from the property.
(e) Each connection point should have a valve that the farmer has access to and is secured so that it is protected from damage or unauthorised people interfering.

32. **Pipeline Design Process** - The system shall be designed using hydrodynamic network modelling software.

33. **Metering and SCADA**- Potential locations for water meters should be considered as follows:

(i) Reservoir at the reservoir offtake.
(ii) Canal system at each structure and overflow structure in the canal.
(iii) Piped offtakes at the offtake point.
(iv) Piped network at each spur offtake
(v) Farmer supply point at each farm connection point.

34. There would be SCADA monitoring and real-time measurement enabling the system to be operated automatically. In practice, metering and SCADA can be very expensive and depends upon the method of canal operation and the method of scheduling, ordering or on-demand supply that is adopted. As a minimum, it is recommended that measurement at the first three above is required and SCADA real-time measurement is preferred. SCADA has two elements:

(i) Canal structure control (if applicable) by depth sensors and monitoring flows.
(ii) Monitor water levels, volumes, and pipeline pressures by displaying real-time data but using alarms that report on exceptions.

35. Individual metering of each farm connection point is to be considered in the near future once the legal framework for meterized billing of irrigation water is implemented.

36. **Operating Objectives** - There are the following key operating objectives:

(i) There is sufficient water in the weir pool for diversion to the main canal

(ii) Storage and canal offtakes are operated to keep a minimum head above the pipeline offtakes.
(iii) A limited number of spurs are operating at one time (assuming furrow irrigation, if in the future more efficient irrigation techniques are more widespread, e.g., sprinkler or drip, every spur can operate).
(iv) On average one person per spur operates at a maximum, though in periods of lower demand several may operate at once and/or if they adopt sprinkler or drip with lower (5l/sec) flow rates.

37. The operation of each main sub-system as outlined above (reservoir, canal and pipeline network) can be either

(i) Scheduled: farmers are told when the water will be available – the old system.
(ii) Planned: farmers order water and are told when it will be available.
(iii) On-demand: farmers simply take the water, and the reservoir and canal operators use SCADA to monitor flows and levels to automatically ensure delivery.
(iv) On-demand within constraints: farmers in a local area have to organise (or be organized) to share water: they mostly can irrigate when they want but within some local limits during peak periods; the operators shall use SCADA to monitor and support sufficient delivery. This operation principle is anticipated for this system.

38. **System Operations -** The system has three key operations:

(i) Reservoir operations – releases water according to either a schedule/plan or monitored demand.
(ii) Canal operations – divert water according to either a schedule/plan or monitored demand.
(iii) Farm operations – irrigate according to either a schedule/plan or on-demand subject to some local rules.

39. It is possible that future reservoir operations and canal operations will be combined into one SCADA system with more or less automatic operations and that the farmers' operations be undertaken at a very local spur system informally with some system oversight. The detailed design should consider the potential implications.

E. Modernization Approach and Construction Works

40. The approach to modernization of the selected areas is based on (i) modernization through a network of closed pipes rather than reconstruction of existing infrastructure and facilities, and (ii) providing an improved level of service by allowing farmers to connect directly to the piped network. The three key design elements are:

(i) The canal system will be controlled by a supervisory control; and data analysis system, which will provide real-time measurement of water flows into the piped system and will enable the system to automatically supply the appropriate volume of water.[12]

[12] The supervisory control and data analysis system will self-regulate based on the lowest level of the farm outputs depending on the defined level of service, water demand and the limitation of water availability. This will convert the system from a scheduled system to an “on-demand” system. A key benefit will be the reduction of operation and maintenance cost compared to a scheduled system, especially given the high degree of land fragmentation within the area. It will also provide a more equitable distribution of the water to allow greater participation of farmers in irrigation delivery.

(i) The main pipe network will be distributed so that all farms will have reasonable access. The sizing of the pipe network will ensure sufficient capacity (minimum 0.5 litres [l]/second[sec]/ha) to meet peak crop demand.
(ii) There will be local hydrants where individual farmers can connect directly to the pipe system and receive a sufficient minimum flow (3-5 l/sec) to enable farmers to choose their irrigation system i.e., surface, drip or sprinkler. The sizing of the hydrants is critical to ensure that farmers can obtain water within a reasonable time frame each day but that the system will not be completely unrestrained as this would require a much bigger pipe network supply.

41. Under modernization works, a variety of development packages are considered:

(i) network infrastructure: (a) reinstate existing canals, structures, etc. as originally designed, (b) install closed underground pipelines and hydrants, and (c) install closed underground pipelines and hydrants and water storage facilities to improve irrigation efficiency;
(ii) supervisory control and data analysis: (a) flow measurement on main and secondary canals, (b) manual or smart water meters at individual farm outlets, (c) automated gates, and (d) remote sensing, climate data collection;
(iii) solar power for pumping and operation of gates/valves;
(iv) storage of water from floods, climate events, and excess canal water. This will also affect drainage systems, and may require increased investment and re-engineering of spillways, culverts and canals, and designing systems to deal with larger peak flows and flood events;
(v) farm water storage options support as dams, ponds and tanks; and
(vi) other measures, e.g., hail protection.

42. Construction works will be the installation of buried pipes, trenching, laying pipes underground along the existing channels, backfilling and reinstatement, including:

(i) excavation of ground III category in a trench with an excavator (bucket 0.25 cubic meters);
(ii) manual digging of grounds in a trench;
(iii) arrangement of sand bedding around pipe;
(iv) backfilling of ground with a bulldozer, transportation at 20 m distance;
(v) loading remaining ground and disposals at 20 kilometres (km) distance;
(vi) installation of polyethylene pipes;
(vii) installation of electric and manual cast iron valves;
(viii) arrangement of prefabricated reinforced concrete wells (with vase and roofing slabs, retaining rings and insulation of external surface) H =1.5 m, D = 2.0 m; and
(ix) installation of flow meters.

F. Project Packages

43. The project has been split into 5 different packages. Two of which are active and the last three are indicative, listed below and in Figure 4.

44. Phase 1 - Active Packages:

(i) Package 1 (CSISDP NCW 01) Advanced Procurement. This comprises of the Left Main Canal Ch 313+42 to 397+00 which will focus on the repair and modernisation of the main canal, access roads and bridges and supporting structures and pipelines

(ii) Package 2 (CSISDP NCW 02) Advanced Procurement for Area 1 (GA distribution branches G23 to G33). This is for the design and build of pressurised pipe distribution network, structures and hydrants and SCADA.

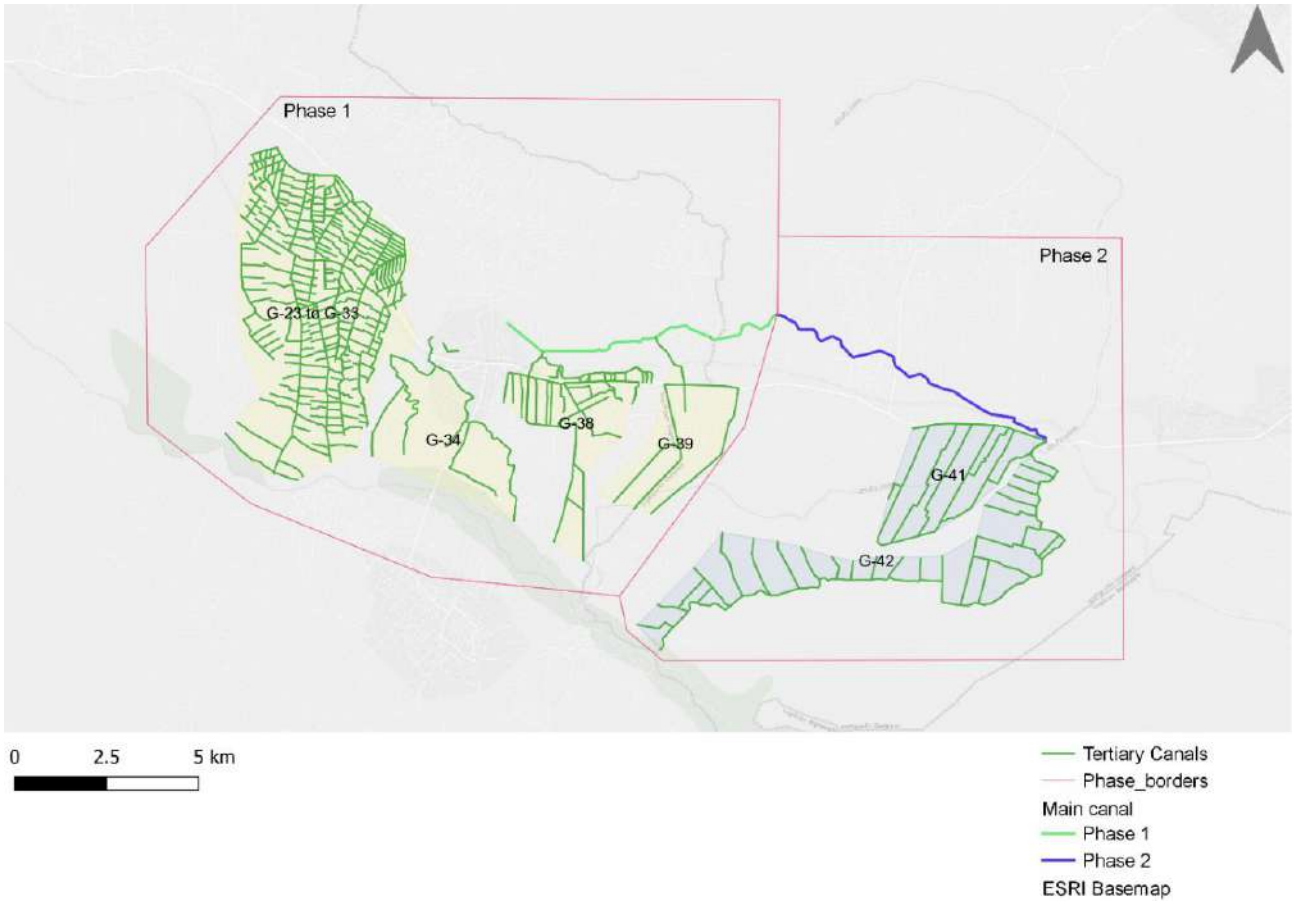
45. This IEE focuses on the Active Packages; Package 1 for Main Canal Ch 313+42 to Ch 397+00 and Package 2 for Area 1 (GA distribution branches G23 to G33).

46. Phase 2 - Indicative Packages:

(iii) Package 3 (CSISDP NCW 03) Area 2 to 4 (GA distribution branches G34 to G39). For the design and build of the pressurised pipe distribution network, structures and hydrants and SCADA.
(iv) Package 4 (CSISDP NCW 04) This covers the repair and modernisation of the main canal, access roads and bridges and supporting structures and pipelines of the Left Main Canal Ch 397+00 to 488+66.7.
(v) Package 5 (CSISDP NCW 05) Area 5 and 6 (GA distribution branches G41 and G42). For the design and build of the pressurised pipe distribution network, structures and hydrants and SCADA.

47. A separate EARF has been developed for the Indicative Package.

Figure 4: Project Target Areas[13]



[13] Source: Produced for IEE by TA-6648 GEO Environmental Consultants

1. Package 1 - Main Canal Ch 313+42 to Ch 397+00

48. The main open canals are in poor condition with encroached vegetation, blockages due to sediment and other debris build-up, sides of the canal cracking and collapsing and the lining of the tunnel is eroded. This main canal will need to be cleared, cleaned, repaired or replaced, cleaning, repairs of other structural units, improvements to the access road and repairs and improvements of overpasses and bridges.

49. The main canal is 8358 m (Pk. 313 + 42 ÷ Pk. 397 + 00), comprising of 3,938.7m open trapezoidal canals, 309m rectangular canal, 9 tunnels (3,623m), inverted siphons (440.3m) and a spillway (47m), Figure 5. The tunnels range in size from 96 to 4,104m with a width of 3.0 to 3.3m and a height of 3.0 to 3.2m. All tunnels need to be cleared of sediment.

1. Tunnel inlet has already been rehabilitated but the outlet walls and arch are eroded. This is 2m by 1.9m.
2. Canal is a trapezoidal canal lined with monolithic concrete. The lining is damaged on the sides and the bottom is defected with holes.
3. Tunnel walls and ceiling are eroded.
4. Canal is a trapezoidal canal lined with monolithic concrete. The side has collapsed in places and damaged in others, the bottom is also damaged
    a. Culvert water outlet for G37 only guide wall was seen and is damaged.
5. Tunnel wall and ceiling are partially eroded.
6. Canal is a trapezoidal canal lined with monolithic concrete. The concrete is damaged and the lining on the sides has collapsed, the base and sides are defected and there are stones within the canal.
7. Tunnel walls and ceiling have partially eroded.
    a. Culvert water outlet for G37 – at the tunnel outlet there is a steel pipe 250mm with no sluice gate and should be cutoff.
8. Canal is a rectangular canal reinforced with concrete slabs and the bases are made out of monolithic concrete. 20% of the canal needs to be plastered, the base has gaps in it that require filling or replacing.
9. Tunnel walls and ceiling have partially eroded.
10. Canal is a rectangular canal made of monolithic concrete. Requires sediment build up to be removed.
    a. Two culvert water outlets for G37 – both channels from the walls.
11. Tunnel wall and ceiling are partially eroded.
12. Canal is a trapezoidal canal lined with monolithic concrete. The canal is sedimented, overgrown with shrubs, there are stones in the canal and the concrete in the bottom is damaged and the sides need replacing in parts.
    a. Culvert water outlet for G37 - handmade 200mm pipe.
13. Tunnel walls and ceiling have partially eroded.
14. Canal is a rectangular canal which is sedimented, and overgrown with shrubs, with 60% of the sides and 20% of the base damaged. About 30% of the base gaps need to be filled.
    a. Culvert water outlet for G37 – 200mm pipe without valve.
15. Tunnel wall and ceiling are partially eroded. The outlet is also overgrown and filled with rubble and the headwall needs to be raised by 0.5m.
16. Canal is a trapezoidal canal lined with monolithic concrete. The lining is damaged, overgrown and sedimented. The left slope is damaged in places and the right slope needs to be replaced in places. The canal is overgrown by 15 trees over 30cm in diameter.
    a. Culvert water outlet for G38 (Area 3) – steel pipe without a headwall.
17. Inverted Siphon - headway is eroded and the bottom and sides are damaged in places.

18. Canal is a trapezoidal canal lined with monolithic concrete. The concrete surface is eroded, some of the slopes are damaged, and are sedimented.
    a. Culvert water outlet for G39 (Area 4) – the channel that is sedimented and needs a new sluice gate.
19. Inverted Siphon is 168m longs, the inlet is damaged, and the outlet needs rehabilitation with the headway being eroded.
20. Canal is a trapezoidal canal lined with monolithic concrete and reinforced concrete slabs on old concrete. Some of the sides are damaged, sedimented, some slabs are broken, and the retaining wall is washed out in places.
    a. There is a super passage 293m along that requires to be cleared of sediment, and the wall needs plastering.
    b. There is a pedestrian bridge that needs to be rehabilitated and is out of order about 381m along this section.
21. Tunnel inlet is raised by monolithic concrete, transitions are outdated, and the walls and ceiling of the tunnel are partially eroded. There's a gallery, the gallery walls need filling.
22. Canal is a trapezoidal canal lined with monolithic concrete and reinforced concrete slabs for the first two parts. The bases are sedimented. The first 1507m of the canal needs plastering, repairing and replacing of different parts. The second part needs to be cleaned. Part three canal is old concrete, with the slopes collapsing in places,
    a. There is a bridge 1507m along from the start of this section of the canal, there is some erosion, and the ceiling needs to be reinforced and some plastering of the sides.
    b. At the end of 22 are a spillway and bridge. The wall at the bottom of the spillway is eroded, a few pillars need replacing and parapets need replacing.
    c. Water inlet of the pumping station with no sluice gate.
    d. Three culvert water outlets for distribution branches G39, GI and GII. G39 is a hole drilled into the galley and the pipe is made out of asbestos, GI is a channel that is sedimented, the wall needs plastering but the sluice gate is in working order, and GII is a steel pipe without a sluice gate and is sedimented.

Figure 5: Package 1 - Main Canal Features[14]

[14] Source: Produced for IEE by TA-6648 GEO Environmental Consultants

50. Along the canal, there are 51 trees over 30cm in diameter along the canal that will likely need to be removed in order to rehabilitate the canal safely and effectively – the majority of these trees have encroached and/or are damaging the structures. Only 3 of these are over 1m in diameter.

51. There is an estimated 4810m^3 sedimented soil to be removed (though the number is likely higher as not all parts of the main canal could be calculated). Rubble and old concrete removal will likely be very high.

Figure 6: Condition of the Main Canal[15]

52. Main Canal has a detailed design. The main canal should be cleared of sediment, rubble and encroaching vegetation, after this works include:

- **Rehabilitation/repair of the section of the main canal by arranging the surface of the canal with shotcrete:** washing the surface, anchoring steel mesh, wetting the surface, applying shortcrete and fitting expansion joints with bitumen impregnated planks.
- **Rehabilitation /repair of obsolete section of the main canal:** washing and wetting the surface, placing lean concrete, anchoring with adhesive concrete mortar, wetting

[15] Source: TA-6648 GEO consultants, Detailed Design of Output 2.

the surface, applying shortcrete and fitting expansion joints with bitumen impregnated planks.

- **Rehabilitation/repair of the canal covered with reinforced concrete slabs:** disassembly and disposal of broken and damaged slads, removal of fall slabs and installation, washing the surfaces, cleaning the gaps and filling with mortar, arrangement of expansion joints and installing reinforced concrete slabs.
- **Rehabilitation /repair of the main canal with cast-in-situ concrete:** removing damaged surface, laying gravel, laying in situ cast concrete on reinforced mesh and fitting expansion joints with bitumen impregnated planks.

53. For the **tunnels and gallery**:

- Tree cutting and removal of thorny bushes from transition sections, inlet and outlet portals;
- Removal of sediments from transition sections, inlet and outlet portals and tunnels;
- Washing of transition sections, inlet and outlet portals with water jet, drilling of holes in concrete, fastening of anchors with adhesive mortar, arrangement of reinforcement mesh 150/1505/5 and shotcreting with wet-mix shotcrete (thickness 7 cm) with addition of active materials;
- Raising of the transition sections and portals with cast-in-situ concrete if necessary;
- Filling of cavities with cast-in-situ concrete;
- Washing inlet and outlet portals with water jet and plastering with sandy-cement mortar with addition of active materials;
- Pumping of water from the outlet portals of tunnels if necessary;
- Installation of temporary power supply and ventilation in tunnels. Dismantling of power supply and ventilation materials and equipment after completion of underground works;
- As there is no power transmission line across the main canal, power supply should be provided using portable power stations;
- Removal of sedimentary soil and construction waste from the tunnel.

54. The condition of tunnels is still not fully known and therefore a site survey is required.

55. For the **inverted siphon and spillways**, this includes

- Removal of vegetation, sediment, rubble and broken structures
- Repairs with a cast in situ by removing damaged surface, washing surfaces, laying gravel, laying in situ cast concrete on reinforced mesh and fitting expansion joints with bitumen impregnated planks.
- Repairs to the inlets and outlets by cleaning and wetting the surface, anchoring adhesive mortar, placing a reinforced mesh and applying shortcrete.
- Arranging drainage, repairs to the service platform, filling cavities with shortcrete and plastering

56. For the **outlets**:

- Bulkhead:
    - Cleaning of bulkheads from sedimentary soil;
    - Cleaning of bulkheads from thorny bushes and cutting trees;
    - Filling of holes in the concrete bulkheads with cast-in-situ concrete;
    - Raising of bulkhead walls if necessary;
    - Washing of bulkheads and guide wings with water jet;
    - Wetting of bulkheads and guide wings and plastering with sandy-cement mortar to a thickness of 2 cm with the addition of active materials;

    - Dismantling of the existing damaged deep gate and disposal to the territory of Bezhanbaghi pumping station;
    - Installation of new deep gates;
- For 9 outlets out of the trapezoidal canal:
    - Cleaning of the canal from sedimentary soil;
    - Removal of thorns and bushes from the outlet area and tree cutting;
    - Demolition of existing damaged concrete structures;
    - Disassembly of existing pipes;
    - Arrangement of the headwork with cast-in-situ concrete B-20;
    - Excavation of a trench, installation of steel pipes of different diameters in the finished trench with normal anti-corrosion insulation and filling with previously excavated soil;
    - Installation of new deep gates
- For 5 outlets out of rectangle canal:
    - Cleaning of the canal from sedimentary soil;
    - Removal of thorns and bushes from the outlet area and tree cutting;
    - Disassembly of existing pipes;
    - Drilling of holes (d=250mm) in concrete wall;
    - Installation of steel pipe d=219 m and filling of the opening with sandy-cement mortar;
    - Excavation of a trench, installation of steel pipe d=219mm in the finished trench with normal anti-corrosion insulation;
    - Installation of well d=1,0 m (flooring slabs, wall-mounted rings and roofing slabs) with precast concrete ring at the beginning of the outlet;

57. **Other activities**:

- Repairs to two bridges and one super passages
    - Demolition and disposal of existing damaged nodes;
    - Rehabilitation of existing walls, wings and parapets;
    - Filling of cavities in transition sections and structures with cast-in-situ concrete;
    - Raising of existing walls, wings and parapets with cast-in-situ concrete, if necessary;
    - Drilling of holes in concrete wall;
    - Installation of steel pipe d=219 m and filling of the opening with sandy-cement mortar;
    - Excavation of a trench, installation of steel pipe d=219mm in the finished trench with normal anti-corrosion insulation;
    - Installation of well with precast concrete ring at the beginning of the outlet;
    - Washing of surfaces, wetting and plastering with sandy-cement mortar;
- Reinforced concrete pipes under main canal:
    - Arrangement of cast in situ concrete walls in front of bulkheads and anchoring of structure
    - Arrangement of new bulkheads
    - Raising inlet and outlet bulkheads
    - Plastering of bulkhead with sandy cement mortar
- Repairs to access roads
- Restoration of curbs and plastering surfaces.

58. **Operation.** The main task of the technical operation of the irrigation system is the management of a efficiency of the irrigation system, individual junctions and equipment, efficient functioning and taking measures to prevent damage; ensuring of water supply, transportation and rational distribution among water users; and upgrading and improving technical equipment of the irrigation system. According to the technical operation rules of

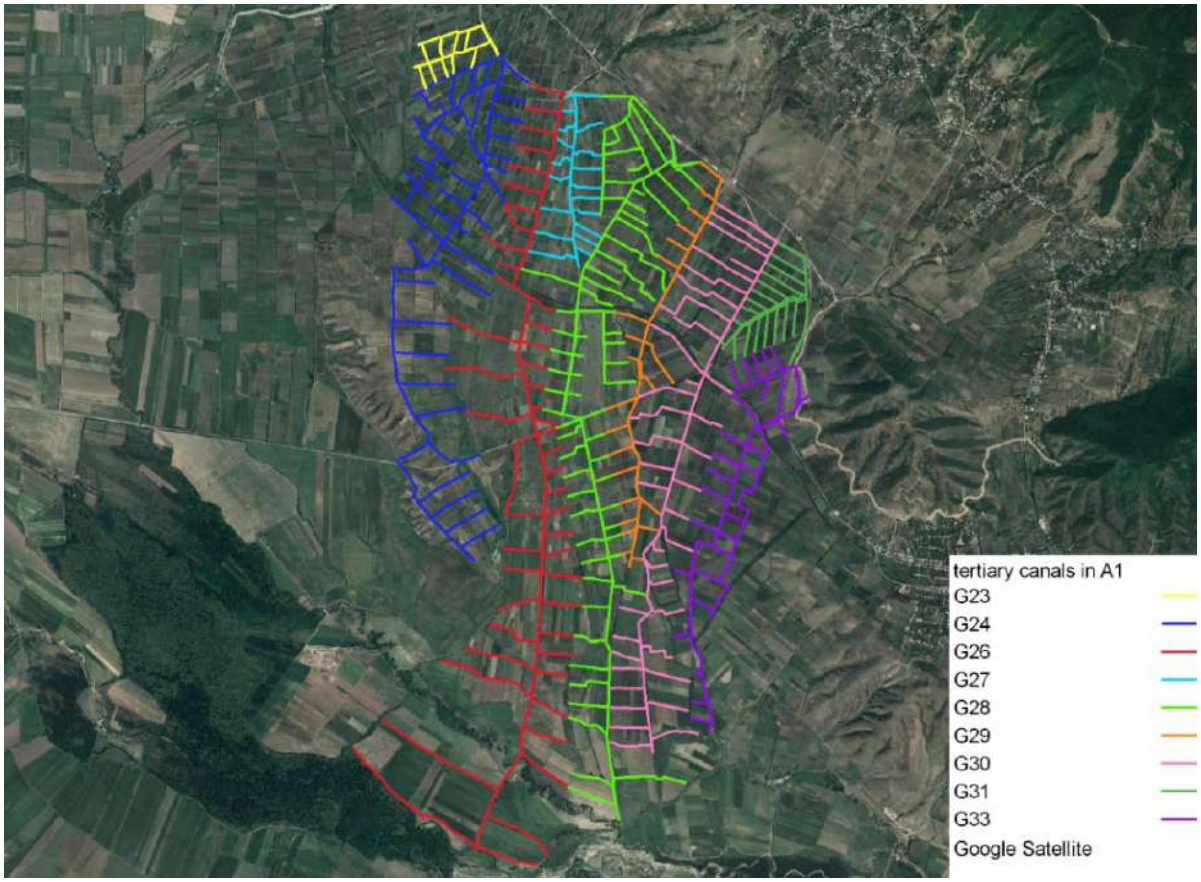
amelioration systems, the maintenance, maintenance and operation of the main canals include:

- Cleaning from sediment, sedimentary soil and plants;
- Carry out ongoing repairs of damaged sections of paved canals and filtration areas to ensure the stability of the canal;
- Maintenance of water regulating nodes and gates arranged on the canal and carrying out ongoing operational repairs;
- Preventive measures - minor and ongoing repairs.

2. Package 2 - Area 1 (GA distribution branches G23 to G33)

59. Area 1 covers 2,946 ha, however only 568ha is connected, due to issues the potential area being irrigated could be less. It is made up of G23, G24, G26, G27, G28, G29, G30, G31 and G33 distribution branches, Figure 7. The total length of this is 46.2km, with 34% being earth channels and 19% distributor pipes. The diameter of channels and pipes ranges from 63 to 710; 47% is in poor condition. The G23 to G33 distribution branches contain 1,273 hydrants and 241 distribution wells. No pumping is required to run this irrigation system.

Figure 7: The distribution branches within Area 1[16]



[16] Source: Produced for IEE by TA-6648 GEO Environmental Consultants

Table 2: Description of Area 1 system[17]

Canal Diameter	Length of Canal (m)	Length of Planned Pipeline Width
63	9057	22448
75	6679	17550
90	7380	20226
110	14476	38741
160	9050	20434
200	9677	10375
250	5625	4900
315	3001	5008
400	5246	5252
450	1329	-
500	5133	6455
630	5676	5704
710	4069	4068

60. Detailed design has yet to be completed, therefore it is unclear on the exact activities, amount of material to be removed, whether the old channels while be removed, trees that will need to be removed and similar is unclear. It's unclear how many, if any, are asbestos – these pipes will be left in the ground.

61. In the feasibility study, Area 1 construction activities are:

- Excavation of trenches
- Laying polyethylene HDPE pipes – the size and length of the pipes are outlined in the Table above.
- Installation of 451 electric valves at key junctions
- Bedding the pipes in sand
- Backfilling of the soil
- Installation of 306 flow meters
- Arrangement of prefabricated reinforced concrete wells

62. There is an estimated 82,947m^3 excavation if land through excavators and 9,216m^3 excavated manually. Of this 41,739m^3 will be backfilled and the remaining 50,424m^3 will require disposal.

63. Currently, the proposed plan is to leave old pipes in the ground. It's unclear what the plan is for any of the open channels.

[17] TA-6648 GEO consultants, Detailed Design of Output 2.

III. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

A. Overview

65. The project is classified as environmental Category B under ADB's SPS (2009), requiring the preparation of an IEE and EMP. The current project, and IEE, have been prepared to these requirements.

66. As this project is the rehabilitation of existing irrigation systems this project does not fall under the Georgian Environmental Assessment Cod 2017 and an EIA is not required. However, environmental and social standards within legislation will be followed and any other required permits will be sorted.

B. Georgian Policies and Administrative Framework

1. Environmental Policy and Legal Framework

67. **The Constitution of Georgia 1995 (Last amended 29/06/2020)**[18] is the overarching legal document establishing the basic rights of people to live in a healthy environment and the obligation to protect it. According to the constitution, everyone has the right to obtain complete, objective, and timely information about environmental conditions (Article 37 Part 3). It assures that the state shall protect the environment and foster sustainable development (Article 37 Part 4). It establishes a legal framework that guarantees public access to information about the condition of the environment (Article 37 Part 5, Article 41 Part 1).

68. Also, the Constitution of Georgia states that the legislation of Georgia shall correspond to universally recognized principles and rules of international law. An international treaty or 4. agreement of Georgia unless it contradicts the Constitution of Georgia, the Constitutional Agreement, shall take precedence over domestic normative acts (change is added by the Constitutional Law of Georgia of 30 March 2001).

69. Georgia has a comprehensive legal framework for the environment. The environmental legislation is managed through the **Law on Environmental Protection 1996 (Last amended 02/03/2021)**[19]**.** The Law defines the principles and norms of legal relations, rights and obligations and responsibilities, awareness raising, education and scientific research in the field of environment and climate change.

2. Administrative Framework

70. **Ministry of Environmental Protection and Agriculture**[20] (MEPA) is responsible for the implementation of policy in relation to the environment, agriculture and rural development. They are responsible for environmental administration, issuing and enforcement of permits, implementations of state control, data analysis and management in the field of environmental protection and use of natural resources (except for minerals, oil and gas) through its subordinated structural units. They are also responsible for agriculture including irrigation systems. MEPA has departments that include:

(i) Department of Environment and Climate Change
(ii) Department of Hydro-melioration and Land Management
(iii) Department of Environmental Supervision
(iv) LEPL National Environmental Agency

[18] https://matsne.gov.ge/en/document/view/30346?publication=36
[19] https://matsne.gov.ge/en/document/view/33340?publication=21
[20] https://mepa.gov.ge/En

(v) Waste and Chemical Management Department
(vi) Department of Biodiversity and Forestry
(vii) Department of Strategic Communication
(viii) Department of Policy Coordination and Analytics
(ix) Department of Agriculture, Food and Rural Development

71. MEAP also has several agencies under them. Key agencies for the project include:

(i) Georgian Amelioration – is responsible for the management and rehabilitation of the irrigation systems
(ii) Agency of Protected Areas – manage reserves, national parks, natural monuments, protected landscapes, world heritage sites and wetland sites of international importance.
(iii) Agency of Wildlife
(iv) National Environmental Agency – issues and disseminates information on environmental conditions including pollution, hydro-meteorological, geodynamic processes and conducting Environmental Assessment..

72. **Ministry of Culture, Sports and Youth** - responsible for protecting Georgia's cultural heritage supervision as well as sports and youth development. If construction is to be carried out in historic sites or zones of cultural heritage, consent of the Ministry of Culture, Monument Protection and Sport is also required for issuing a construction permit.

73. **Ministry of Economy and Sustainable Development**[21] – responsible for planning and construction to ensure sustainable and safe construction works, sets technical standards of construction works and energy efficiency building. The key agency under this ministry is the **Technical and Construction Supervision Agency** who are responsible for issuing construction permits. LEPL The National Agency for Mineral Resources is there for issuing licenses for mineral resources.

3. Georgian Environmental Impact Assessment Rules and Procedures

74. **Environmental Assessment Code (EAC) 2017 (Last amended 16/08/2021)**[22]. The Code establishes a legal basis for regulating issues related to projects and strategic documents, the implementation of which may have a significant impact on the environment, human life and health. It regulates the procedures related to environmental impact assessment, strategic environmental assessment, public participation in decision-making, transboundary environmental impact assessment; defines the rights and obligations of the developer, the planning authority, the public and the competent authorities in the course of decision-making envisaged by this Code; describes procedures of issuing Environmental Decision; exemption rules. The law includes two annexes. Annex I list activities subject to EIA, and Annex II - lists activities/projects that require screening procedure. Screening is the responsibility of MEPA. According to the document, the main stages of environmental impact assessment include:

(i) Screening.
(ii) Scoping procedure.
(iii) Preparation of the EIA Report by the developer or the consultant.
(iv) Ensuring public participation.
(v) Examination of the information presented in the EIA Report and any supplementary information provided by the developer to the Ministry as well as

[21] http://www.economy.gov.ge/?lang=en
[22] https://matsne.gov.ge/en/document/view/3691981?publication=2

assessment of the information received through the public participation and consultation processes.
(vi) Expertise procedure.
(vii) Implementation of transboundary environmental impact assessment procedure (weather appropriate).
(viii) Issuance of Environmental Decisions or the decision on refusal to implement the
(ix) project by the Minister.

75. In the case of rehabilitation of the irrigation systems, the development of a screening document is not required within the scope of the project.

76. **Law of Georgia on Licenses and Permits 2005[23] (Last amended 17/07/2020)**. The Law regulates activities that may result in an increased hazard to human life or health, involves interests of importance to the State or public, or are connected to the consumption of State resources. The Law defines the full list of activities that require licenses and permits, and sets out the rules for granting, amending and abolishing licenses and permits.

77. This is being amended to align with EU Industrial Emissions Directive and is due to be enacted, probably in 2022. This will change the permit and licencing processes. This will enact the polluter pays principle, with polluters having to comply with limits imposed based on the best available techniques.

4. Relevant Laws of Georgia

78. **Law of Georgia on Water (Last amended 15/07/2023)[24]** covers the sustainable use and protect of water and to prevent contamination, pollution and depletion of water. This law regulates the intake and discharge of water as well as setting out the procedures for water standards and maximum permissible rates of emissions. It also sets out the river water protection zone to protect the river from pollution, littering, fouling and depletion. For rivers such as Iori, the protected area is 50m from the edge of the riverbed.

79. **Environmental Assessment Code of Georgia (2017):** The Environmental Assessment Code regulates EIAs in Georgia. It consists of eight chapters: General provisions (I); Environmental Decision (II); Strategic EIA (III); Public participation in environmental decision-making contemplated under the Code (IV); Assessment of transboundary environmental impact (V); Expert commission (VI); Supervision and responsibilities in the field of EIAs (VII); and Transitional and final provisions (VIII). The main purposes of the Code include regulating the relations in the cases where EIAs are required and protecting the environment and public health.

80. **Law of Georgia on Water Users Organisation 2019**[25]. This law aims to create the foundation of Water User Organisations in irrigation, regulating issues related to the use of irrigation infrastructure, determining the main principles of irrigation services and state control of water users organisations. This sets the tariffs for water users and set up, function, rights and management of the Water User Organisations;

81. **Law on regulation and engineering protection of the sea and river banks 2002 (Last amended 05/05/2011)**[26]**.** This law is to protect the stability of coastal zones, waterways and rivers and to prevent erosion.

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[23] https://matsne.gov.ge/en/document/view/26824?publication=62
[24] https://matsne.gov.ge/ka/document/view/5846594?publication=0
[25] https://matsne.gov.ge/en/document/view/4736322?publication=0
[26] https://matsne.gov.ge/ka/document/view/53230?publication=0

82. **Waste Management Code 2015 (Last amended 15/07/2020)**[27] covers the implementation of measures to i-mplement the waste management hierarchy (prevent, reuse, recycle and recover) as well as to ensure safe disposal to protect the environment and human health. The waste is responsible for the storage, collection, transportation, disposal or recovery, recording and reporting of waste to prevent pollution and risks to human health. If more than 2 tons of hazardous waste is produced in a year, a separate collection system and appropriate training for all staff handling the waste are required and an appropriate environmental manager should ensure safe management.

83. The Construction Contractor must hire a duly qualified environmental manager who will be obliged to develop Waste Management Plan and submit it to MEPA for approval. The Construction contractor is obliged to control the process of managing the originated waste through the final disposal of the waste.

84. **Law of Georgia on Protection of Ambient Air 1999 (Last amended 17/02/2022)**[28] regulates the protection of atmospheric air from harmful anthropogenic influences (including hazardous, radiation, microorganisms and biological matter, noise, vibration, electromagnetic fields and other impacts) to ensure a safe environment for human health and the natural environment. It outlines the procedures for the maximum permitted limits for hazardous substances into the air.

85. **Law of Georgia on Cultural Heritage 2007 (Last amended 16/11/2021)**[29] covers the protection of cultural resources. It outlines the chance find procedures, requiring the construction to pause until appropriate investigation and mitigation measures are taken and to protect known cultural resources.

86. **Law of Georgia on Soil Protection 1994 (Last amended 02/11/2021)**[30]**.** The Law sets the maximum permissible concentrations of hazardous matter in soil and restricts the use of fertile soil for non-agricultural purposes, the execution of any activity without prior striping and preservation of topsoil, open quarry processing without subsequent re-cultivation of the site, terracing without a preliminary survey of the area and approved design, agricultural activities that could lead to overgrazing, woodcutting, damage of soil protection facilities, and any activity that could deteriorate soil quality (e.g. unauthorized chemicals, etc.). The law sets a general basis for the protection of soil from erosion, contamination, sedimentation, sanitization, secondary swamping, etc., regulation of the open extraction of natural resources and construction materials, and impacts from human economic activity.

87. **Law on Wildlife 1996 (Last amended 15/07/2020).** The law mandates the MEPA to regulate wildlife use and protection overall territory of the country, including existing protected areas. The law empowers the MEPA to issue hunting permits and licenses, declare hunting areas, control poaching, etc. It is one of the main goals of the Environmental Protection Law to support the preservation of biodiversity of the country, the preservation of rare, endemic and endangered species, the protection of the marine environment, and the maintenance of the ecological balance (Art. 3.1 (d)). The Law contains regulations on both wild animals and plants which are threatened by extinction and those which are not. Two main legal acts regulate species protection in Georgia. This law also determines activities in protected areas by the corresponding structural units. Potential poaching by the workers should be controlled also during construction works.

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[27] https://matsne.gov.ge/en/document/view/2676416?publication=10
[28] https://matsne.gov.ge/en/document/view/16210?publication=14
[29] https://matsne.gov.ge/en/document/view/21076?publication=16
[30] https://matsne.gov.ge/ka/document/view/93874?publication=9

88. **Law on Red List and Red Book of Georgia 2003 (Last amended 16/03/2021)**[31] The Law establishes the legal basis for the preparation and approval of the Red List and Red Data Book to provide these instruments for the protection and restoration of threatened species of flora and fauna.

89. **Forest Code of Georgia 2020 (Last amended 15/12/2021)**[32]. This aims to conserve the biodiversity of Georgia's forests and preserve the natural and cultural environment of the forest. The protected forest; is an area of forest forming species that are within 100m from road edge headworks or riverbanks, on eroded land, etc. and should be managed in line with the law on the system of protected areas and the protected area management plan.

90. **Law on the system of the protected areas 1996 (Last amended 26/04/2022)**[33]**.** Aims to protect and restore the biodiversity of Georgia by establishing an area for protecting and restoring significant national heritage. There are different types of protected areas – state reserves, national parks, natural monuments, managed reserves etc. Each of the protected areas requires management plans outlining the boundaries, management and monitoring of the area.

91. **Law on Environmental Liability 2021**[34]. This law introduces the polluters pays principle, regulating the prevention of significant environmental damage, mitigation (prevention) of damage, damage assessment and remedial measures. This includes criteria for determining significant harm.

92. **Law on Public Health 2007 (Last amended 22/11/2021)**[35]**.** The law defines the rights and obligations of the population and legal entities in the field of public health. To establish an environment safe to public health, the Ministry sets the qualitative mandatory standards for the environment safe for human health (atmospheric air, water, soil, noise, vibration, electromagnetic radiation), including maximum permissible concentrations and rates of harmful impact. It's an obligation to prevent activities which cause infectious and non-infectious diseases to spread, to protect the sanitary and epidemiological standards, and to inform the public health department about all emergencies caused by the violation of the sanitary norms. The observance of the standards is controlled by appropriate state structures. The responsibility for the internal and external audits rests with a certified, independent laboratory.

93. **Acoustic Noise Limits for Rooms/Premises in Residential Houses and Public Establishments Regulation 2017**. This sets the maximum permissible noise limits.

94. **Organic Law on Agricultural Land Ownership 2019**[36]**.** The law ensures improved agricultural land structure through rational resource use, avoiding fragmentation of land and avoiding unsustainable use. Defines land acquisition of state-owned agricultural land, and land ownership issues related to preventing land alienation.

95. **Civil Code of Georgia 1997 (Last amended 09/06/2022)**[37]**.** This code regulates the contrail relation, rights and responsibilities of persons, differential between movable and immovable property and acquisition of property.

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[31] https://matsne.gov.ge/ka/document/view/12514?publication=18
[32] https://matsne.gov.ge/en/document/view/4874066?publication=0
[33] https://matsne.gov.ge/en/document/view/32968?publication=15
[34] https://matsne.gov.ge/ka/document/view/5109151?publication=0#DOCUMENT:1
[35] https://matsne.gov.ge/en/document/view/21784?publication=37
[36] https://matsne.gov.ge/en/document/view/4596123?publication=0
[37] https://matsne.gov.ge/en/document/view/31702?publication=115

96. **Law on Determination of the Designated Purpose of Land and on Sustainable Management of Agricultural Land 2019[38].** The law ensures the rational use and protection of land through determining and monitoring agricultural land, compensation for changing the use of land from agricultural to non-agricultural and state acquisition of agricultural land.

97. **Law on Rules for Expropriation of Property for Social Needs 1999 (Last amended 15/07/2020)[39].** This law outlines the requirements and procedure for expropriation for social needs, including the preconditions and requirements for fair compensation.

98. **Organic Law of Georgia on Labor Safety 2019 (Last amended 29/09/2020)[40].** The Law defines basic requirements and preventive measures in terms of workplace safety for employers. The Law applies to jobs considered to be of increased danger, hard, harmful, and hazardous. The employer's compliance with the labour safety regulations in Georgia is overseen by the Ministry of Health, Labor and Social Affairs of Georgia through its respective departments.

99. **Law on State Property 2010 (Last amended 30/12/2021)[41].** This law covers state property management and transfer for use. The Ministry of Economy and Sustainable Development are responsible for the property.

100. **Labour Code of Georgia 2010 (Last amended 01/12/2021)[42].** The code regulates employment relations. Employers are obliged to comply with the requirements and clauses of the document to ensure that the rights of employees are protected.

101. Other relevant decrees, resolutions and orders are listed below.

Table 3: Georgian Decrees

Environmental Decrees
Decree No. 303 'On approving the Red List of Georgia', 2006
Order No. 297 'On Approval of Norms of Quality of Environment'
Resolution No 383 (27/07/2018) on approval of European ambient air quality standards (EU directives 2008/50/EC, 2004/107/EC)
Resolution No 383 (27/07/2021) on the approval of the regulation on forest protection, restoration and maintenance
Resolution No 145 (29/03/2016) on the approval of the technical regulation on special requirements for the collection and treatment of hazardous waste
Resolution No 190 (20/02/2014) on approving the Red List of Georgia
Resolution No 424 (31/12/2013) on removal, storage, use and recultivation of fertile soil
Resolution No 423 (31/12/2013) on approval of technical regulations for the protection of fisheries and fish stocks
Resolution No 414 (31/12/2013) on approval of the technical regulations on the calculation of the maximum permissible discharge of polluting substances into surface water bodies
Resolution No 425 (31/12/2013) on the approval of the technical regulations for the protection of surface water of Georgia from pollution
Resolution No 413 (31/12/2013) on the approval of the technical regulations for the self-monitoring and reporting of the release of harmful substances from stationary sources of pollution

[38] https://matsne.gov.ge/en/document/view/4596113?publication=0
[39] https://matsne.gov.ge/en/document/view/16480?publication=6
[40] https://matsne.gov.ge/ka/document/view/4486188?publication=1#DOCUMENT:1;
[41] https://matsne.gov.ge/en/document/view/112588?publication=29
[42] https://matsne.gov.ge/en/document/view/1155567?publication=21

Environmental Decrees
Resolution No 146 (25/03/2022) on the approval of the rules for the restoration, cultivation, maintenance, protection and supervision of the windbreak strip
Resolution No 414 (23/06/2014) on the approval of the procedure for demarcation of the borders of the protected areas
Resolution No 398 (15/08/2017) on acoustic noise norms in the premises and areas of residential homes and public / public institutional buildings
Resolution No 143 (31/03/2016) regarding the approval of the technical regulation - "Waste Transportation Rules"
Resolution No 144 (26/03/2016) about the rules and conditions for registration of waste collection, transportation, preliminary treatment and temporary storage
Ordinance No 386 (01/07/2020) on the Approval of the Procedure and Conditions for Payment and Exemption from Payment of Compensation for Changing the Designated Purpose of a Plot of Agricultural Land, as well as for Changing the Category of a Plot of Agricultural Land

Table 4: Gap analysis between ADB safeguard requirements and Georgia national environmental legislation

Aspect	Asian Development Bank	National Regulations	Harmonized Framework
Environmental Policy and Regulations	ADB SPS sets out the policy objectives, scope and triggers, and principles for three key safeguard areas: Environmental safeguards, Involuntary resettlement safeguards, and Indigenous people safeguards	Environmental assessment and permitting procedure in Georgia are set out in the following laws and regulations: #Law of Georgia on Licenses and Permits 2005 (Last amended 17/07/2020). # Environmental Assessment Code (EAC) 2017 (Last amended 16/08/2021) .	
Screening	ADB carries out project screening and categorization at the earliest stage of project preparation when sufficient information is available for this purpose using rapid environmental assessment (REA) checklist. Categories A, B, C, FI	Project is the rehabilitation of existing irrigation systems. This project does not fall under the Georgian Environmental Assessment Cod 2017 and an EIA is not required.	The project is classified as Category B (ADB classification)
Scoping	Avoid, minimize, mitigate and/or offset any adverse impacts and enhance positive impacts through environmental planning and management	The environmental assessment will consider: (i) compliance of the proposed project with the environmental requirements, (ii) level of risk related to project implementation and efficiency of developed	The environmental and social standards within Georgian Legislation, Decrees and Rules will be followed and any other required permits will be sorted.

Aspect	Asian Development Bank	National Regulations	Harmonized Framework
		measures to mitigate identified impacts.	Law on Environmental Protection 1996 (Last amended 02/03/2021): The Law defines the principles and norms of legal relations, rights and obligations and responsibilities, awareness raising, education and scientific research in the field of environment and climate change.
	Executing Agency considers potential impacts (direct, indirect and cumulative) and risks on physical, biological, resettlement, socio-economic (including health and safety), and physical cultural resources	Environmental assessment considers the project's potential impacts on physical, biological, socio-economic, and cultural resources, including cumulative impacts.	The required permits and approvals will consider natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous people, and physical cultural resources).
Alternatives	Examination of financially and technically feasible alternatives to the project location, design, technology and components, their potential environmental and social impacts Consider "without project" scenario.	Project Alternatives not required.	Assessment of alternatives will include alignment and "without project" project scenario.
Environmental Assessment Report	Guidelines and Table of Contents are provided for environmental assessment report in ADB SPS: (i) Executive Summary, (ii) Policy, Legal and Administrative Framework, (iii) Description of the project, (iv) Description of the Environment,		The IEE and EMP reports will follow the table of contents proposed in ADB SPS. Following the requirements of ADB SPS, MEPA shall apply pollution prevention and control

Aspect	Asian Development Bank	National Regulations	Harmonized Framework
	(v) Anticipated Environmental Impacts and Mitigation Measures, (vi) Analysis if Alternatives, (vii) Information disclosure, Consultations, and Participation, (viii) Grievance Redress Mechanism, (ix) Environmental Management Plan, and (x) Conclusion and Recommendation. EMP will include proposed mitigation measures, monitoring andreporting requirements, institutional arrangements,schedules, cost estimates and performance indicators.		technologies and practices consistent with international good practices. When the Government of Georgia regulations differ from these levels and measures, MEPA shall achieve whichever is more stringent.
Public Consultations	Carry out meaningful consultations with affected people and facilitate their informed participation Ensuring women's participation in consultation. Involving stakeholders, project-affected people and concerned NGOs early in the project preparation and ensure that their views and concerns are made known and understood by decision makers and considered. The consultation process and its results are to be documented and reflected in the environmental assessment report.	Public meetings are mandatory for the Projects requiring EIA.	Consultations will be carried out with stakeholders, affected people, NGOs in accordance with COVID-19 restrictions. Questions and concerns raised during preliminary consultations held during preparation stage have been considered. All questions and concerns raised during stakeholder consultations have been considered in IEE. Also, a signed list of participants and photos from meetings are attached to this IEE.
Public Disclosure	IEE will be disclosed on the websites of ADB. The borrower needs to provide relevant environmental information in a timely manner, in an accessible place and in a form and	National environmental legislation does not require disclosure of IEE.	The summary of the final IEE, EMP and GRM will be translated into Georgian language, documents will be

Aspect	Asian Development Bank	National Regulations	Harmonized Framework
	language(s) understandable to affected people and other stakeholders. For illiterate people, other suitable communication methods will be used.		posted on MEPA / GA website.
Monitoring and Reporting	The borrow/client must monitor and measure the progress of implementation of the EMP and prepare periodic monitoring reports that describe progress with implementation of the EMP and compliance issues and corrective actions if any	The Construction Contractor shall hire a duly qualified environmental staff who will develop Waste Management Plan and submit it to MEPA for approval. The report on waste generation will have to be submitted by the Implementing Agency to concerned authorities as per the Waste Management Code 2015 (Last amended 15/07/2020)	Environmental Monitoring Plan (EMoP) has been developed under this IEE to monitor implementation of EMP requirements. The IEE also includes requirements on preparation of semi-annual Environmental Monitoring Reports and their submission to ADB for further disclosure on ADB and MEPA / GA websites.
Grievance Redress Mechanism	The GRM must be established to receive and facilitate resolution of affected peoples' concerns and grievances about the project/s environmental performance.	No GRM requirements applicable to the Project.	The GRM for this Project will be developed in accordance with ADB and national requirements.

C. International Agreements

102. Georgia is part of multiple international treaties and regional Multilateral Environmental Agreements (MEAs), including 18 conventions. The international conventions ratified are below:

Table 5: Key International Conventions Ratified

Agreement	Date Ratified
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1975	1996
Paris Convention on protection of the Archaeological Heritage, 1982	1992
UN Convention on Biological Diversity 1993	1994
UN Framework Convention on Climate Change 1994	1994
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 1992	1995
Vienna Convention for the Protection of the Ozone Layer, 1985	1996

Agreement	Date Ratified
Montreal Protocol on Substances that Deplete the Ozone Layer, 1987 (and its London, Copenhagen, Montreal and Beijing Amendments 2000 and 2011)	1996
European Cultural Convention, 1954	1997
Kyoto Protocol to UNFCC, 1997	1999
UN Convention to Combat Desertification 1996	1999
Convention on the Conservation of Migratory Species of Wild Animals (also called the Bonn Convention), 1983	2000
Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention), 1998	2000
European Convention on the Protection of the Archaeological Heritage, 1985	2000
Convention for the Protection of the Architectural Heritage of Europe, 1985	2000
Agreement on The Conservation of African-Eurasian Migratory Waterbirds, 1995	2001
Agreement on The Conservation of Populations of European Bats, 1991	2002
Ministerial Conference on the Protection of Forests in Europe (known as Forest Europe), 1990	2003
International Plant Protection Convention (1997 Revised Text), 1997	2007
Stockholm Convention on Persistent Organic Pollutants, 2001	2007
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 1998	2007
UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage, 2003	2008
International Convention for The Protection of New Varieties of Plants, 1961	2008
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, 1997	2009
Convention on the Conservation of European Wildlife and Natural Habitats (Bern), 2008	2010
European Landscape Convention, 2000	2011
Council of Europe Framework Convention on the Value of Cultural Heritage for Society (Faro Convention), 2005	2011
2030 Agenda for Sustainable Development, 2015	2015
Paris Agreement 2016	2017

a. Regional Cooperation

103. **Ecoregion Conservation Plan for the Caucasus**[43] Georgia has worked with its neighbouring countries to create an "Ecoregion Conservation Plan for the Caucasus" (2006, updated 2012), which aligns with the Aichi biodiversity goals. This identifies regional hotspots and regional corridors to be prioritized for conservation and proposed specific actions to be taken with regard to the establishment of a protected area network, enhancement of transboundary connectivity, restoration of degraded ecosystems, harmonization of policies and legislation, coordination of scientific researches and monitoring activities, environmental education and raising awareness. A "Regional Biodiversity Council" facilitates the coordination of activities at the Ecoregion level.

[43] https://wwfeu.awsassets.panda.org/downloads/ecp_2020_part_1_1.pdf?1388891/Ecoregion-Conservation-Plan-for-the-Caucasus

D. ADB Safeguards Policy Statement (2009)

104. ADB's SPS (2009)[44] purpose is to avoid, minimise, or mitigate environmental and social impacts and is covered by three operational policies: (i) environmental safeguards; (ii) involuntary resettlement safeguards; and (iii) indigenous peoples safeguards. The objectives of ADB's safeguards are to:

- Avoid adverse impacts of projects on the environment and affected people, where possible;
- Minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and,
- Help borrowers/clients strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

105. At an early stage, projects are screened and categorised based on the significance of potential project impacts and risks and determine the level of assessment required:

- **Category A.** Likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented; impacts may affect an area larger than the sites or facilities subject to physical works. An Environmental Impact Assessment is required.
- **Category B.** Proposed project's environmental impacts are less adverse and fewer in number than those of category A projects; impacts are site-specific, few if any of them are irreversible, and impacts can be readily addressed through mitigation measures. An Initial Environmental Examination is required.
- **Category C.** Proposed project is likely to have minimal or no adverse environmental impacts.

106. The SPS also promotes the use of international standards, including the World Bank Group's EHS Guidelines. EHS guidelines relevant to the project include environment protection, water conservation, hazardous materials, waste management, noise control, sanitation, and community and occupational health and safety. Where EHS standards are higher than national standards, efforts are made for ADB-funded projects to target the EHS standards.

107. Under the SPS, this project proponent is Category B based on the Rapid Environmental Assessment Checklist, see Annex 1. As a Category B project an Initial Environmental Examination, establishing the baseline and identification of all potential impacts are required. As part of this, an Environmental Management Plan and Grievance Redress Mechanism will also be required.

E. Environmental Regulations and Standards

108. The project will need to follow World Bank's Environment, Health and Safety Guidelines (EHS Guidelines)[45] as environmental and social standards that are in line with good international practice (as required under the ADB SPS) and ensure we comply with national law. Limits from Georgian legislation and the EHS Guidelines are summarised below.

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[44] https://www.adb.org/sites/default/files/institutional-document/32056/safeguard-policy-statement-june2009.pdf
[45] https://documents1.worldbank.org/curated/en/157871484635724258/pdf/112110-WP-Final-General-EHS-Guidelines.pdf

F. Ambient Air Quality Standard

109. Maximum permissible concentrations for air-borne pollutants are set by the **Law of Georgia on Protection of Ambient Air 1999**[46]. These sets standards are set to limit hazardous emissions. Annual maximum capacity is defined for each hazardous substance and is calculated so that for each stationary source of emission cumulative emission from all registered sources of discharge does not exceed the relevant maximum permitted value. The polluter is responsible for monitoring the emissions and managing the polluting processes to ensure compliance with the law.

110. Following **Resolution No 383 (27.07.2018) on approval of European ambient air quality standards**[47] (EU directives 2008/50/EC, 2004/107/EC), Georgian legislation also complies with the EU Air Quality Directive limits.

Table 6: Ambient Air Quality Standards

Parameter	Average Period	Reference Limit (µg/m^3)		Project Limits (µg/m^3)
		National	EHS Guidelines Limits	
Carbon Monoxide (CO)	8 hours	10		10
Ozone	8 hours	120	100	100
PM10	24 hours	50	50	50
	1 year	40	20	20
PM2.5	24 hours		25	25
	1 year	25	10	10
Nitrogen Dioxide (NO_2)	1 hour	200	200	200
	1 year	40	40	40
Sulphur Dioxide (SO_2)	10 minutes		500	500
	1 hour	350		350
	24 hours	125	20	20

G. Surface Water Quality Standards

111. Surface Water Quality Standards are required under the **Law of Georgia on Water 2023** [48]. For discharge to water, permits are needed with Maximum Permissible Discharge Documents calculating the volumes of the discharge and impact on the environment. The standards are set by **Order No 297 'On Approval of Norms of Quality of Environment'**[49].

Table 7: Applicable Standards for Surface Water Quality

Parameter	Maximum Permissible Concentration	
	National	IFC Guideline Limits
pH	6.5-8.5	
Diluted Oxygen, mg/l	4-6	
Biological Oxygen Demand (BOD), mg/l		30

[46] https://matsne.gov.ge/en/document/view/16210?publication=14
[47] https://matsne.gov.ge/ka/document/view/4277611?publication=0
[48] https://matsne.gov.ge/ka/document/view/5846594?publication=0
[49] https://matsne.gov.ge/ka/document/view/52384?publication=0

Parameter	Maximum Permissible Concentration	
	National	IFC Guideline Limits
Chemical Oxygen Demand (COD), mg/l		125
Total Nitrogen, N, mg/l		10
Total Phosphate, mg/l		2
Chlorides, mg/l	350	
Oil Products, mg/l	0.3	
Zinc (Zn2+)	1g/kg	
Lead (Pb total)	23.0	
Chrome (Cr6+)	32.0	
Cadmium (Cd, total)	6.0	
Total Suspended Solids, mg/l		50

112. The maximum permissible concentration of micronutrients for agricultural water supply as per **Order No 297 'On Approval of Norms of Quality of Environment'**[50] are as follows:

Table 8: Maximum Permissible Concentration of Micronutrients for Agricultural Water Supply

Parameter	Maximum Permissible Concentration (mg/l)
Arsenic	0.05
Barium	0.1
Beryllium	0.0002
Bismuth	0.1
Boron	0.5
Bromine	0.1
Cadmium	0.001
Chromium	0.5
Cobalt	0.1
Copper	1.0
Fluoride	1.5
Lead	0.03
Lithium	0.3
Molybdenum	0.25
Nickle	0.1
Selenium	0.01
Silver	0.0005
Strontium	7.0
Tin	0.1
Tungsten	0.05
Vanadium	0.1
Zinc	1.0

[50] https://matsne.gov.ge/ka/document/view/52384?publication=0

H. Groundwater Quality Standards

113. There is no Georgian legislation with regard to the quality and standards for groundwater. Instead, the quality of groundwater is regulated by norms set for potable water.

Table 9: Potable Water Criteria Index[51]

	Measuring Unit	Standard Not more than:
Common Characteristics		
Hydrogen index	PH	6-9
Permanganate oxidation	mg O2 /L	3,0
Nonorganic substance		
Barium (Ba 2+)	mg/L	0.7
Boron (B, total)	mg/L	0.5
Arsenic (As, total)	mg/L	0.01
Quicksilver (Hg, nonorganic),	mg/L	0.006
Cadmium (Cd, total)	mg/L	0.003
Mangan (Mn, total)	mg/L	0.4
Molybdenum (Mo, total)	mg/L	0.07
Nickel (Ni, total)	mg/L	0.07
Nitrate (short impact by NO-3)	mg/L	50
Nitrite (long impact by NO-2)	mg/L	0.2
Selenium (Se, total)	mg/L	0.01
Copper (Cu, total)	mg/L	2.0
Lead (Pb, total)	mg/L	0.01
Fluorine (F)	mg/L	0.7
Chromium (Cr6+)	mg/L	0.05
Antimony (Sb)	mg/L	0.02
Cyanide (CN-	mg/L	0.07
Organic substance		
Total content of pesticides	mg/L	0.05

1. Noise

114. Noise standards are set according to the **Acoustic Noise Limits for Rooms/Premises in Residential Houses and Public Establishments Regulation 2017**[52] and are included in Table 10.

115. For EHS Guidelines, the noise impacts should not exceed the levels presented in Table 11 and Table 12, nor result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

116. Generally, the noise level limit is represented by the background or ambient noise levels that would be present in the absence of the facility. It is also important to note that when

[51] https://matsne.gov.ge/ka/document/view/52384?publication=0
[52] https://matsne.gov.ge/ka/document/view/3779710?publication=0

identifying background noise levels, highly intrusive noises such as passing trains should not be excluded.

Table 10: Georgian Standards for Noise Levels (Allowable Limits Indoors, not at the Building Façade)

Purpose/ use of area and premises	Allowable Limits (A-Weighted Decibels (dBA))		
	Day (8am to 7pm)	Evening (7pm to 11pm)	Night (11pm to 8am)
Educational facilities and library halls	35	35	35
Medical facilities/chambers of medical institutions	40	40	40
Living quarters and dormitories	35	30	30
Hospital chambers	35	30	30
Hotel/motel rooms	40	35	35
Trading halls and reception facilities	55	55	55
Restaurant, bar, cafe halls	50	50	50
Theatre/concert halls and sacred premises	30	30	30
Sport halls and pools	55	55	55
Small offices (≤100m3) – working rooms and premises without office equipment	40	40	40
Small offices (≤100m3) – working rooms and premises without office equipment	40	40	40
Conference halls /meeting rooms	35	35	35
Areas bordering with houses residential, medical establishments, social services and children's facilities (<6 story buildings)	50	45	40
Areas bordering houses residential, medical establishments, social service, and children's facilities (>6 story buildings)	55	50	45
The areas bordering hotels, trade, service, sport, and public organizations	60	55	50

Note: 1. in case noise generated by indoor or outdoor sources is an impulse or tonal, the limit must be 5dBA less than indicated in the table. 4. Acoustic noise limits given above are set for routine operation conditions of the 'space', i.e. windows and door are closed (exception – built-in ventilation canals), ventilation, air conditioning, lighting (in case available) are on; functional (baseline) noise (such as music, speech) not considered.
Note 2. Technical Regulation does not apply to the construction and repairs during the day.

Table 11: Applicable Noise Level Guidelines Per WB EHS Guideline

Receptor	One-hour LA_{eq} (dBA)	
	Daytime 07.00-22.00	Night-time 22.00 – 07.00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Table 12: Applicable Work Environment Noise Limits Per WB EHS Guidelines

Type of Work, workplace	IFC General EHS Guidelines
Heavy Industry (no demand for oral communication)	85 Equivalent level Laeq,8h
Light industry (decreasing demand for oral communication)	50-65 Equivalent level Laeq,8h

a. Vibration

117. Vibration standards for human health are set out in Residential Houses, Hospitals and Rest Houses, Sanitary Norms 2001**,** see Table 13. The EHS Guidelines do not set limits on vibration themselves instead refer to ACGIH for safety limits on vibration, Table 14. The American Association of State Highway and Transportation Officials provides maximum vibration levels for preventing damage to buildings, Table 15.

Table 13: Georgian General Admissible Vibration Values

Average Geometric Frequencies of Octave Zones (Hz)	Allowable Values X0, Y0, Z0			
	Vibro-acceleration		Vibro-speed	
	m/sec2	dB	m/sec 10-4	dB
2	4.0	72	3.2	76
4	4.5	73	1.8	71
8	5.6	75	1.1	67
16	11.0	81	1.1	67
31.5	22.0	87	1.1	67
63	45.0	93	1.1	67
Corrected and equivalent corrected values and their levels	4.0	72	1.1	67

Note: It is allowable to exceed vibration normative values during daytime by 5 dB. In this table of inconstant vibrations, a correction for the allowable level values is 10dB, while the absolute values are multiplied by 0.32. The allowable levels of vibration for hospitals and rest houses must be reduced by 3dB. Note that no standards for building damage exist.

Table 14: ACGIH hand-arm vibrations threshold limit values

Total Daily Exposure Duration	Values	
	m/s^2	g^c
Between 4 and 8 hours	4	0.40
Between 2 and 4 hours	6	0.61
Between 1 and 2 hours	8	0.8
Under 1 hour	12	1.22

Table 15: American Association of State Highway and Transportation Officials (AASHTO) Maximum Vibration Levels for Preventing Damage

Type of Situation	Limit (in/sec)
Historic sites or other critical locations	0.1
Residential buildings, plastered walls	0.2-0.3
Residential buildings in good repair with gypsum board walls	0.4-0.5
Engineered structures, without plaster	1.0-1.5

b. Soil Quality

118. To prevent the contamination of soils, the anthropogenic releases of hazardous materials, as well as those naturally occurring, must be monitored and limited by the following set standards in Table 10 to align with the **Law of Georgia on Public Health** (adopted in 2007). These admissible concentrations must be kept in line to prevent further contamination into groundwater, surface water, and surrounding locations, limiting the potential risks to human and ecological health. The Law on Soil Protection, adopted in 1994, also sets out the policy requirements for maintaining fertile soils and preventing deterioration, including the use and action taken on the soil.

Table 16: Maximum Admissible Concentrations of Various Substances and Elements in Soils

Parameter	Unit	Limit
Arsenic	mg/kg	2-10
Copper	mg/kg	3
Mercury	mg/kg	2.1
Nickel	mg/kg	4
Lead	mg/kg	32
Zinc	mg/kg	23
Compound Hydrocarbons	mg/kg	0.1
Benzoyl	mg/kg	0.3
Toluene	mg/kg	0.3
Compound Xylene (ortho, meta, para)	mg/kg	0.3
Benzopyrene	mg/kg	0.02
Isopropylen-benzol	mg/kg	0.5
Atrazine	mg/kg	0.5
Linden	mg/kg	0.1
DDT (and its metabolite)	mg/kg	0.1

2. Permits Potentially Required

119. Necessary regulatory clearances and approvals need to be obtained prior to the commencement of works. PIU, with the support of project consultants and contractors, are responsible for obtaining the clearances/permits and ensuring the provisions are incorporated in the subproject design, costs, and implementation. Table 17 shows the list of clearances or permissions required for the subprojects. This list is indicative.

Table 17: Different permits required under Georgian National Legislation

Construction Activity	Clearance Required	Implementation	Supervision
Land for Project Activity	Allotment and approval for specific land use in the pre-construction stage	Implementing Agency	Executing Agency
Construction in heritage areas	Relevant conclusion of the National Agency for Cultural Heritage Preservation of Georgia	Implementing Agency	Executing Agency
Tree Cutting	Relevant conclusion of the National Forestry Agency under the MEPA.	Implementing Agency/ Construction contractor	Executing Agency

Construction Activity	Clearance Required	Implementation	Supervision
Hot mix plants, crushers, batching plants	Relevant conclusion of the MEPA	Construction contractor	Implementing Agency
Storage, handling, and transport of hazardous materials	Relevant conclusion of the MEPA	Construction contractor	Implementing Agency
Sand mining, quarries and borrow areas	LEPL The National Agency of Mineral Resources	Implementing Agency	Implementing Agency
Temporary traffic diversion during construction	Relevant conclusion from the Ministry of Internal Affairs of Georgia (Patrol Police Department)	Implementing Agency	Implementing Agency
Establishment of construction camps	Relevant conclusion of the MEPA	Implementing Agency	Executing Agency
Disposal of Construction waste and demolition debris	Relevant conclusion of the MEPA	Implementing Agency	Executing Agency
Pipe laying and other construction works	For pipe laying activities with a length of 5km and more, it is necessary to prepare a screening report for submission to MEPA.	Implementing Agency	Executing Agency

IV. BASELINE ENVIRONMENT AND SOCIO-ECONOMIC DATA

A. Physical Setting

1. Climate[53]

120. The climate in the plains of East Georgia is a dry subtropical climate, and in the mountainous areas, it is alpine. The plains of eastern Georgia are shielded from the western, sub-tropical influence of the Black Sea by mountains that provide a more continental climate.

121. **Precipitation** is presented in Figure 8. Sagarejo precipitation as annual totals from 1960 to 2020, with a suggested estimated annual decline from 800 to 700 mm over the period. This is about a 12 % reduction over 60 years or 2% per decade. In the Kvemo Kartli region, south of Tbilisi, by more than 5% per decade.[54]

122. **Temperature** trends for three stations in Eastern Georgia are presented in Figure 9. The mean monthly (maxima and minima) temperature trends across the period from 1960 to 2020 for January and July respectively. The trends are slightly upward for minimum temperatures, though this is a non-significant regression of temperature over years. For winter months the CV % (stdev/ mean) are very high for minima and shows significant variance in minimum temperatures over months.

123. **Wind** has shown little change over the years with the averages being 130km/day; with July, August and October typically lower and December to February typically experiencing higher winds. The majority of the winds are north western and northern winds in Sagarejo Muncipilatiy and western and south-western in Gurjaani Municipality.[55]

124. **Humidity** averages at 71%, lowest in July at 63% and highest at 79% in November. This has been consistent over the years.

125. **The total ice area loss** between 1911–1960 was 8.1% or 49.9 km^2, while the number of glaciers increased from 515 to 786. Between 1960–2014, the glacier area decreased by 36.9%, from 563.7 km2 to 355.8 km2 278 and glacier numbers from 786 to 637.[56]

[53] Source: TA-6648 GEO consultants - RRP CVRA
[54] Mariam Elizbarashvili et al, 2017. Georgian climate change under global warming conditions. Annals of Agrarian Science 15.
[55] https://eiec.gov.ge/Ge/Documents/ViewFile/510
[56] Tielidze, 2014

Figure 8: Statistics of monthly mean precipitation data for Sagarejo from 1960 to 2020[57]

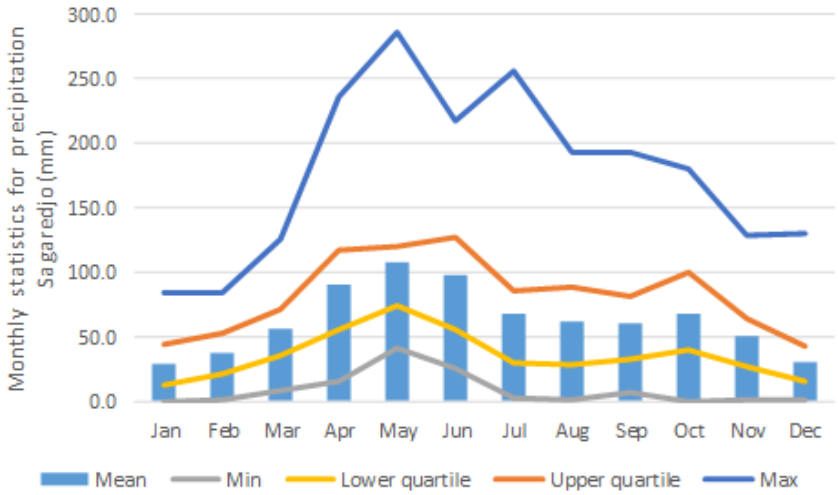


Figure 9: Mean monthly temperature trends for three stations in Eastern Georgia and over different reporting periods for Tbilisi, Sagarejo and Gurjaani.[58]

126. **Natural Disasters.** The WB Think Hazard identified the following disaster risks for Sagarejo Municipality in Georgia based on historical trends, shown in Table 18 and

127. Figure 10.[59] The historical trend shows that in the Sagarejo area, the main natural disasters are likely to be (in order of likelihood): wildfires, extreme heat events, river floods,

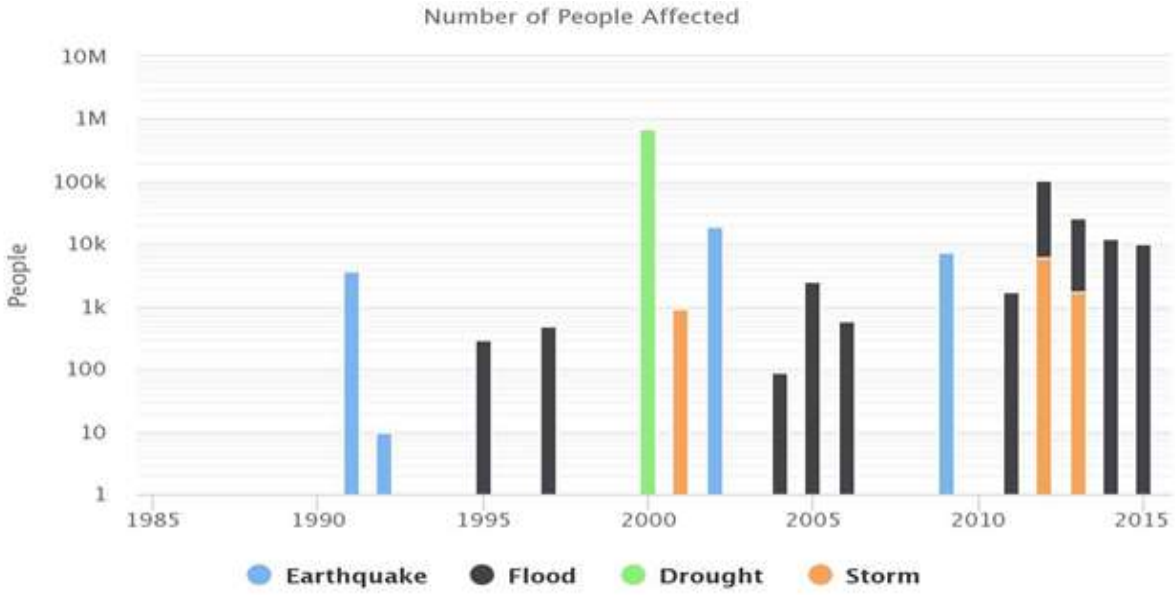
[57] Source: TA-6648 GEO consultants
[58] Source: TA-6648 GEO consultants
[59] WB Think Hazard! is developed and maintained by the Global Facility for Disaster Reduction and Recovery (GFDRR Labs) http://thinkhazard.org/

earthquakes and landslides. The first two are likely to be exacerbated by rising temperatures from climate change. The frequency of hailstorms, frosts and strong winds has been increasing in Georgia, affecting the Kakheti and Adjara regions among others.

Table 18: Probability of possible natural disasters in Georgia. [60]

Type of hazard or disaster	Geoportal of Natural Hazards and Risks[61]		ThinkHaxard Risk rating	Probability of occurrence
	Package 1	Package 2		
River floods	None	Areas of High	Medium	>20% in 10 years
Earthquakes	Medium	Medium	Medium	>10% in 5 years
Landslides and Mudflow	1 - 16: Medium 17<: Low	Low	Medium	NA
Wildfires	1 - 16: Medium 17<: High	High	High	50%
Extreme heat events			Medium	>25% in 5 years

Figure 10: Key natural hazards for Georgia 1985 to 2018. [62]



128. The **Standardized Precipitation and Evaporation Indicator** (SPEI) assessment indicates an increasing deficit of precipitation over PET and for longer periods. This is in line with temperatures which have risen during the period contributing to higher levels of PET. The mean annual baseline SPEI for Sagarejo (KS) from Jan 2008 to June 2021 is -0.68 (12 months) and -0.54 (six months). For the period from Jan 1960 to Dec 2007 SPEI were both positive at 0.09 and 0.07 for 12 and 6 months periods respectively. The conclusion is then that from about 2008 onwards the climate in Sagarejo has changed from a non-drought to a mild drought condition, and the trend continues.

[60] Source: https://thinkhazard.org/en/
[61] http://drm.cenn.org/index.php/en/community-profile
[62] Source: https://thinkhazard.org/en/

a. Climate Change

129. A Climate Risk and Vulnerability Assessment has been undertaken by the TA-6648 GEO consultants – Climate Specialists, the key findings are below.

130. **Temperature**: Under the RCP (Representative Concentration Pathways) 2.6 and 4.5, the changes will be manageable. Temperatures under RCP 6.0 and above predict a substantial projected increase from 2080 onwards. Changes in maximum temperature are projected to increase by almost 10 degrees C under RCP 8.6 by 2099. Under the various RCP scenarios, mean monthly variations are from < 1 to 2 degrees C up to 2039, increasing in the range from <2 to 6 degrees C by 2099, with RCP 8.5 consistently giving the largest increases. Average daily maximum show significant increases from the historical average under all RCP models, with RCP 8.5 showing slightly higher median values and greater variability. The number of hot days (>35 degrees C) is from 6.2 to 6.5 for all RCP scenarios out to 2039, but this increases to 9 to 41 days for RCP 2.6 and RCP 8.5 by 2099

Figure 11: Projected Change in Temperature near Sagarejo between 2020 to 2039, left to right RCP2.6, RCP6 and RCP 8.5

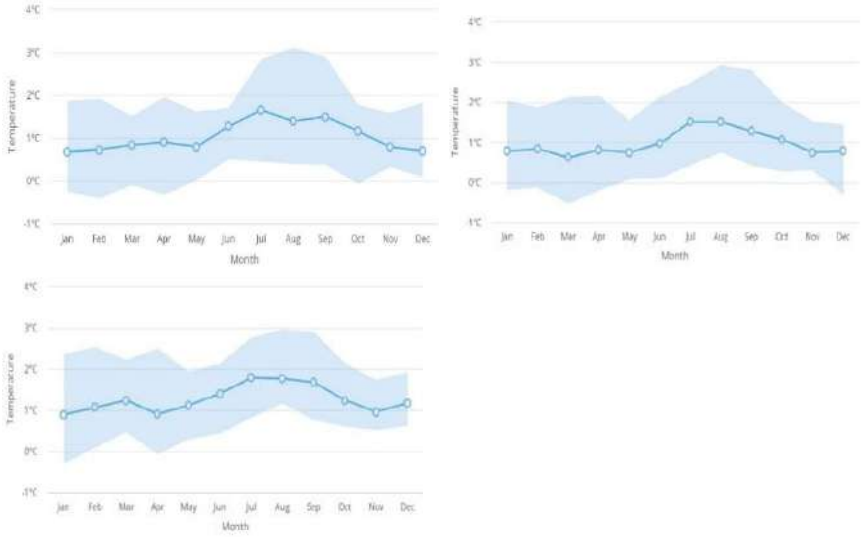
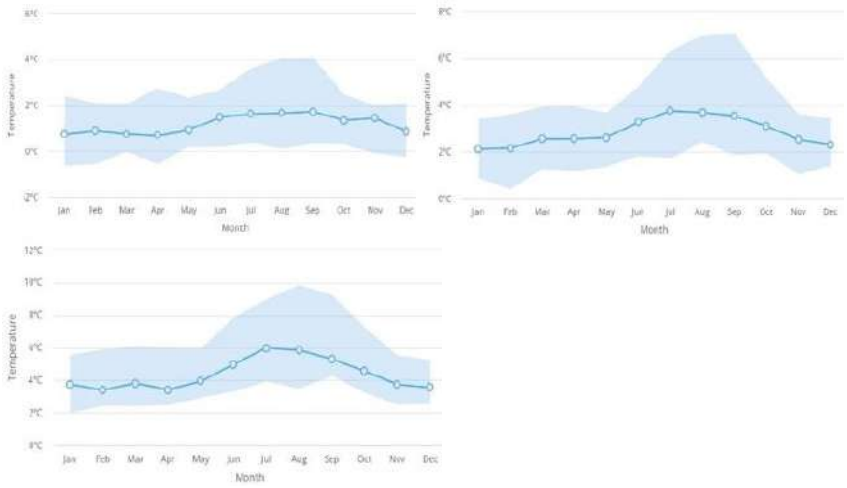


Figure 12: Projected Change in Temperature near Sagarejo between 2060 to 2079, left to right RCP2.6, RCP6 and RCP 8.5



131. **Precipitation** projected changes near Sagredjo are minor across all years and RCP models, except for RCP 8.5 after 2050, with reductions in median monthly rainfall in summer months. Some reports project up to 20% reductions.

Figure 13: Projected Change in Monthly Precipitation near Sagarejo between 2020 to 2039, left to right RCP2.6, RCP6 and RCP 8.5

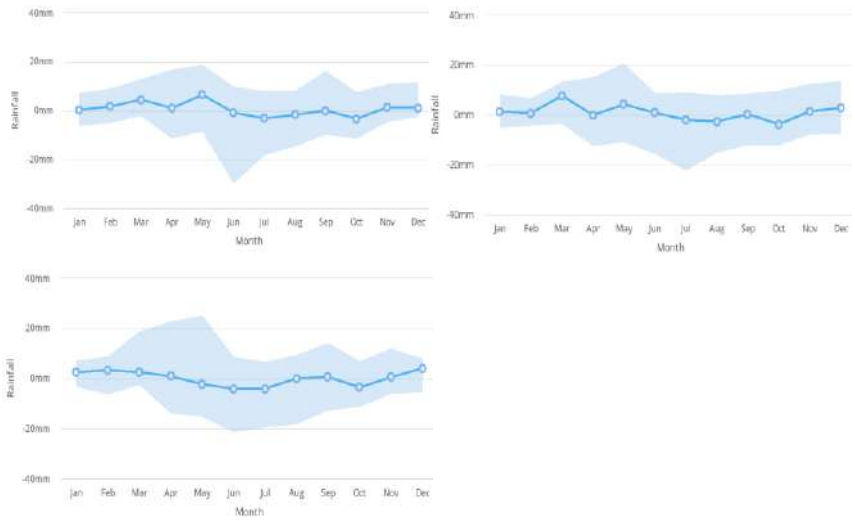
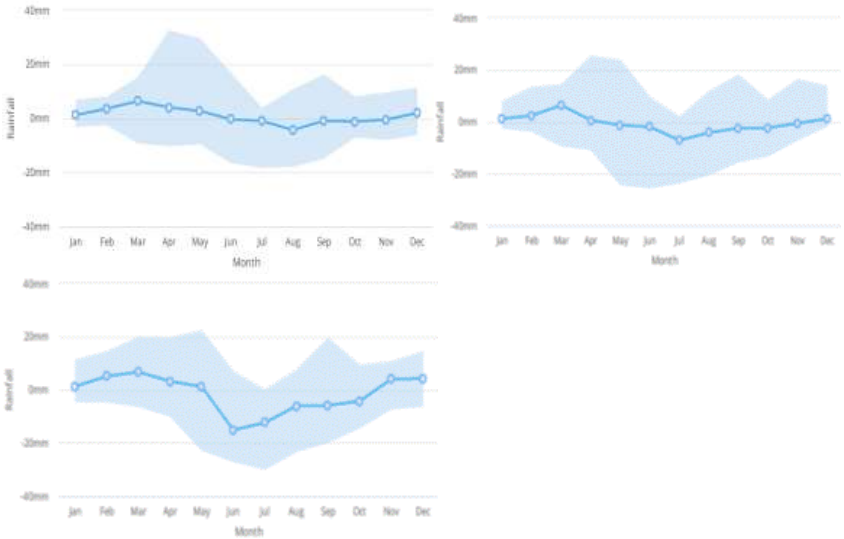
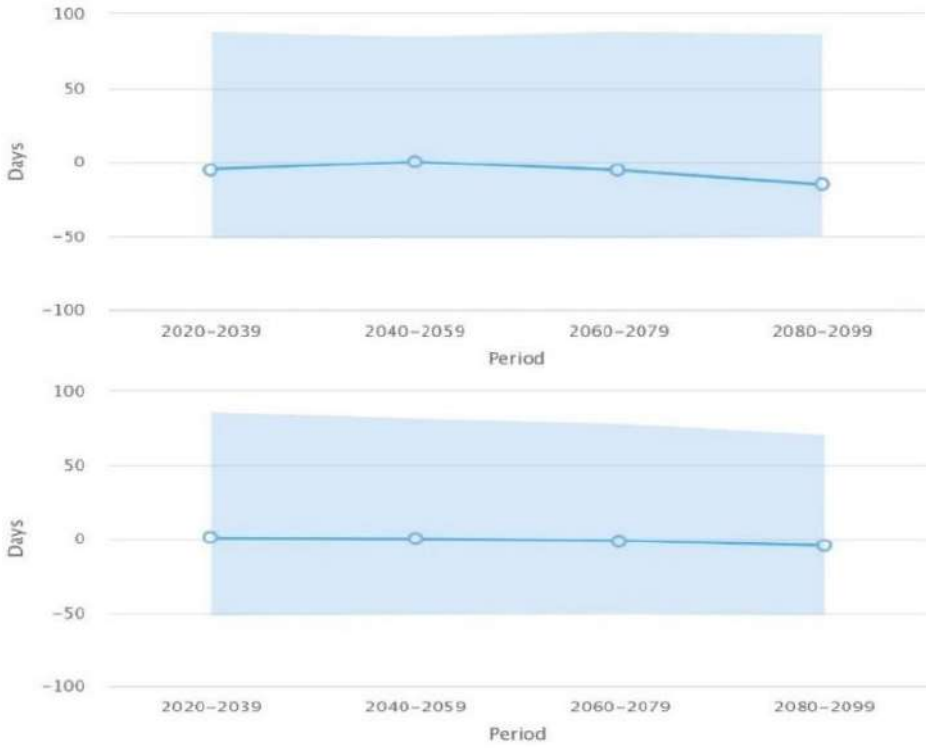


Figure 14: Projected Change in Monthly Precipitation near Sagarejo between 2060 to 2079, left to right RCP2.6, RCP6 and RCP 8.5



132. **Wind speed and duration**. This is poorly studied within the region and historically more of a problem in places such as Dedoplistskaro and Akhmeta. The impact of climate change on wind speed and duration of winds beyond 1 meter / second has not been projected.

Figure 15: Projected changes in wind speed (days less than 1m/s) RCP 2.6 (left) and RCP 8.5 (right).



133. **Hail**, low-level moisture and convective instability will increase, raising hailstorm likelihood and enabling the formation of larger hailstones; thus, the projection is for increased hail severity in Georgia.

134. **Impact on Water Resources**. Beyond 2040 water supply and availability are expected to worsen, and water demand is expected to increase. Glacier meltdown until 2160 will yield abundant waters and may present problems in terms of erosion and floods in irrigation infrastructure, waterways and drainage outlets.

135. **Impact on Agriculture.** Food security is threatened by ongoing, declining productivity, low levels of investment in farms, lack of modernization of climate-resilient farming systems, and threats from climate change. There is an increase in growing season, evapotranspiration (which increases the water need of crops), climate and geohazards increase causing damage, increase droughts, and flooding.

2. Geology

136. In general, Iori Plateau (also called Gare Kakheti) is built mainly with slightly folded Cenozoic sandstones, conglomerates, clays and limestones. Tectonically, the Plateau is a system of ejected folds, developed based on Neogene formations and only its north-western corner, bordered by the Tbilisi basin and Ujarma-Sartichala section of the Iori Valley, is built with Paleogene deposits. Extensive syncline depressions, such as Didi Shiraki, Naomari, etc., are filled with Quaternary continental sediments: clays and rocks.

137. Tectonically, the wider study area is rather complex, located within the eastern extension of the Transcaucasian intermontane basin and surrounded by numerous faults and

geological shear zones.[63]. The area is considered by the GoG to be in an area of 8 in macroseismic intensity.

3. Topography

138. The overall area is located on a plain-hilly Iori Plateau (also known as Gare Kakheti Plateau); a wavy, slightly dissected relief and dry continental climate with resultant hydrological, soil and geographical and geobotanic conditions. The given territory is distinguished from other parts of Georgia by lack of water, scarce vegetation and vast badlands lacking soil cover.

139. The Gombori Ridge divides the watershed of the Iori and Alazani Rivers. Its length is 107 km. The highest peak is Tsivi (1991 m above sea level). The territory is mainly formed by cretaceous and tertiary sedimentary strata.

140. The project is located on the slopes of the Gombori Ridge by the Iori River, ranging from 591m (Mt Sakaraulo in Package 3 - Area 2) to 420m (Package 5 - Area 6). The main canal ranges from 590m (at offtake for Area 1) to 560m (at offtake for Area 6), and the tunnels run through hills up to 700m. The slopes are gentle and below the gradient which generally poses a risk of slips in Package 2.

141. There is a medium risk of landslides within the area of Package 1 according to ThinkHazard and Geoportal of Natural Hazards and Risks. Tunnel 1 was built after a landslide in the nearby Kandaura Village. However, there has been no landslide or mudslide along the main canal in the last 30 years.

4. Soil

142. The soil cover is quite diversified[64]. All soils have good soil water storage capacity, and the alluvial soils are highly porous as indicated by infiltration data. The major soil types are listed below (listed in order from largest area to smallest):

- Cinnamonic calcareous soils (Calcic Cambisols)
- Black calcareous soils (Calcic Vertisols)
- Grey Cinnamonic soils (Ermic Cambisols)
- Meadow black alkalised and halomorphic
- Alluvial calcareous (Calcaric fluvisols)
- Black vertisols

143. The main problem with soils is weathering and pollution with different substances. The reason for this is improper use of organic and inorganic fertilizers, destruction of field protection and wind-breaking belts and faulty operation of irrigation systems on the one hand and wind and water erosion on the other hand. Soil fertility is mostly finite, and within Georgia, there is an issue with degraded soils.

5. Water resources

144. The project area crosses many surface water bodies, including rivers and dry ravines. The following rivers can be distinguished among the watercourses crossing the project area:

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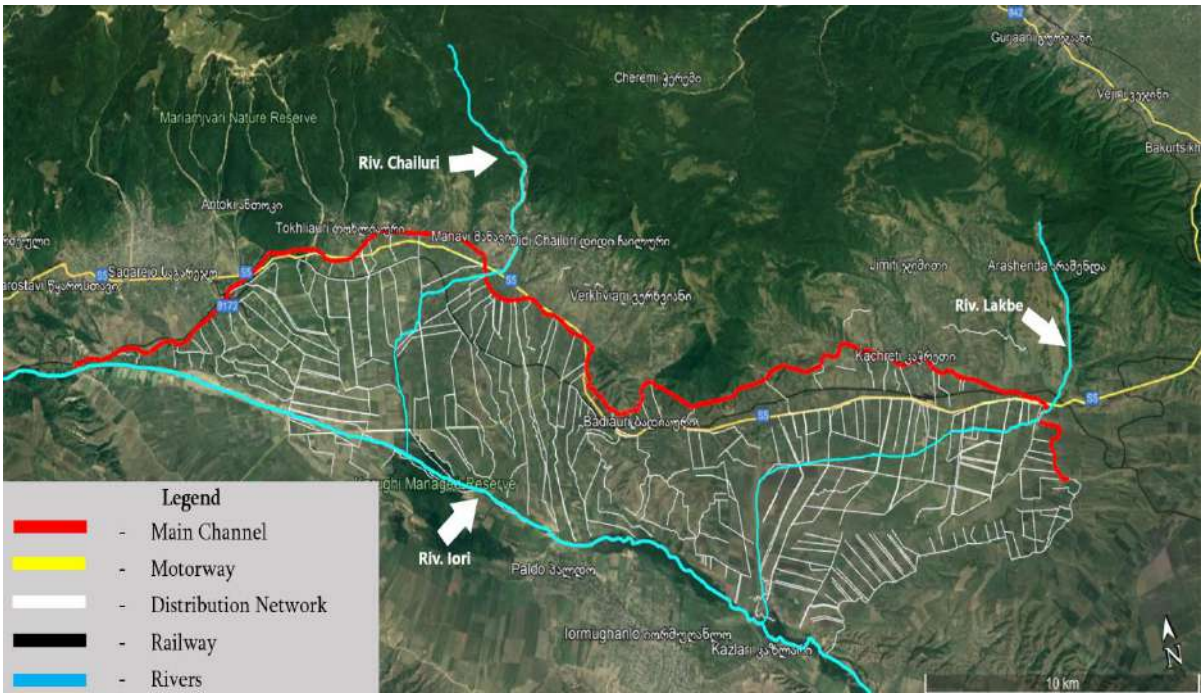
[63] TY - JOUR AU - Adamia, Shota AU - Alania, V. AU - Chabukiani, A. AU - Chichua, G. AU - Enukidze, Onise AU - Sadradze, Nino PY - 2010/09/14 SP - 239 EP - 259 T1 - Evolution of the Late Cenozoic basins of Georgia (SW Caucasus): A review VL - 340 DO - 10.1144/SP340.11 JO - Geological Society of London Special Publications ER.

[64] Soil Map of Georgia: Georgian Academy of Sciences 1999.

the rivers Chailuri and Lakbe (Figure 16). The water in the beds of the gullies appears only in periods of intense rains and the melting of a thin snow cover. Besides, the discharges and levels of freshets caused by rains much exceed the discharges and levels caused by snowmelt.

Figure 16: River Network in the Kvemo Samgori Area[65]



145. **Iori River[66]** heads on the southern slopes of Caucasian Ridge, at 2600 m elevation above sea level and flows into the Mingachevir water reservoir near the southern end of the Iori Plateau. The asymmetric basin of the river is divided into two zones, with the project area falling within the high- and average-mountainous zone covering the north-western part of the basin.

146. The length of the river is 320 km, its total fall is 2520m and its average slope is 0,0079.[67] Values for the Iori catchment area and multi-annual flow differ depending on the source of the data, between 571km^2 and 11.7 m^3/s[68] to 498 km^2 and 10 m^3/s.[69]

147. The river is fed with snow, rain and ground waters with the latter being the most important. The water regime of the river in natural conditions is characterized by spring floods (presently, the river runoff is regulated by Sioni Water Reservoir), autumn and summer freshets and stable winter low-water periods. Spring runoff is 40% of the annual river runoff, summer runoff is 31%, and autumn runoff is 17%. In some years, autumn runoff depends on the abundance of atmospheric precipitations and may increase to the summer runoff. Winter runoff is 12% of the annual runoff.

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[65] Source: Produced for IEE by TA-6648 GEO Environmental Consultants
[66] TA-6648 GEO consultants – Water balance Report
[67] Global Water Sustainability Program. 2011. Rapid Assessment of the Rioni and Alazani-Iori River Basins http://dpanther.fiu.edu/sobek/FIGW000021/00001
[68] Tsitelashvili, N. et al. 2020. Hydrological Report on the River Iori. https://sabuko.org/wp-content/uploads/2021/01/HYDROLOGICAL-REPORT-ON-THE-RIVER-IORI_ENG.pdf
[69] Rehabilitation of the Zemo Samgori Irrigation System (Ref. ORIO13/GE/01), Water Resources and Climate Assessment, Georgian Amelioration, Tbilisi, 2016

148. Sioni Water Reserve, commissioned in 1964 had a designed capacity of 325,000,000m^3 with recorded volumes ranging from 790,000 m^3 to 311,230,000 m^3. On a yearly basis, March has the lowest storage (before the peak of the spring rains) and July has the highest (after the rains). There is an average inflow of 321,000,000 m^3/year[70]. Water flows from the reservoir range between 197,000,000m^3/year to 575,000,000 m^3/year between 2000 and 2020[71], averaging at 322,000,000 m^3/year.

149. Flowing from the Sioni Reservoir, the Iori river passes other headworks, notably Paldo Headworks for the Zemo Samgori Irrigation Area. Apart from this, additional water intake on the river Iori was constructed nearby the village Tskharostavi from which Iormughanlo, Kazlar, Didi Manavi, Chailuri, Badiauri, etc. lands are irrigated.

150. The flows between Kvemo Samgori and Zemo Samgori vary, with 46% of the water on average being directed to Zemo Samgori through. This split is regulated and based on the water flow from Sioni.

151. The split of water between the left and right canals at the Kvemo Samgori headworks is mostly equal.

152. Commonly, the GA ensures 10% is reserved for environmental flow, though this is not regulated and is based on old soviet era practices. Return flow from the irrigation systems is also not known.

153. Iori continues to flow down into Dalis Mta (or Dali Mountain) Reservoir was constructed for irrigation purposes with a total water volume of 140,000,000m^3. [72]

154. The annual flow of the Iori River to the border with Azerbaijan was 805,000,000 m^3, at this point the Iori is called the Gabirri and in <50km enters the Mingechevir Reservoir.[73]

155. Below, the table is given with internal annual distribution (sorted by months) of the average annual flow of Iori river 75%s supply.

Table 19: Water Distribution through Iori River

Month	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	
In the River	3.66	3.85	6.86	22.1	25.0	20.6	9.62	7.07	6.01	6.18	4.99	4.06	10.0
Ecological	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Reservoir m^3/s	1.16	1.35	4.36	19.6	22.5	18.1	7.12	4.57	3.51	3.68	2.49	1.56	7.50
Reservoir mln/m^3	3.11	3.27	11.68	50.80	60.26	46.92	19.07	12.24	9.10	9.86	6.45	4.18	235.94

156. **River Chailuri** heads on the south-eastern slope of Gombori Ridge, at 1435 m asl. It flows into the Iori River from its left side. The length of the river is 29.6 km and the area of its

[70] Tsitelashvili, N. et al. 2020. Hydrological Report on the River Iori. https://sabuko.org/wp-content/uploads/2021/01/HYDROLOGICAL-REPORT-ON-THE-RIVER-IORI_ENG.pdf
[71] TA-6648 GEO consultants – Water Balance Report
[72] https://dtda.ge/en/dali-mountain-water-reservoir/
[73] EUWI+, 2019. EUWI+: Thematic summary Kura Upstream of Mingachevir Reservoir River basin.

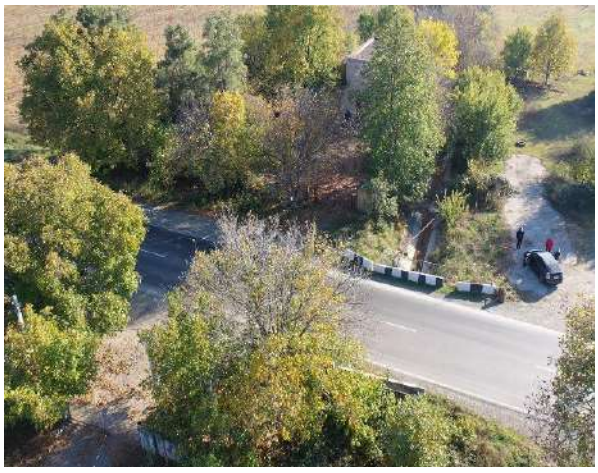
basin is 167 km². The river is alimented with rain, snow and underground waters. Floods on the river are common in spring.

157. **River Lakbe** basin is divided into mountainous and plain zones. The mountainous zone of the basin covers the south-eastern slopes of the Tsiv-Gombori ridge, while the lower zone is located north of Iori Plateau, on the left bank of the river Iori. The lower part of the river is almost dry for most of the year. The river is mainly alimented with snow and rain waters. The water regime of the river is characterized by minor spring floods and low-water periods in other seasons of the year.

158. The rivers Lakbe and Chailuri cross Lower Samgori's main channel. The Chailuri River runs through the underground gallery of Samgori's main channel (Figure 17), while at the crossing point with Lakbe, the river itself flows through the underground channel (Figure 18).

Figure 17: Crossings of Chailuri River and Kvemo Samgori Main Canal[74]

Figure 18: The Crossing of Lakbe River and Kvemo Samgori Main Canal[75]



159. **Groundwater**. The Iori River Basin is one of the richest underground water resource basins in Georgia. According to the information of the National Environment Agency in 2017 and 2020, the groundwater debit remained at a stable level in the wells being monitored and the temperature, chemical composition, total mineralization, and microbiological indicators of monitored groundwater have changed insignificantly and were mostly within the permissible level.

160. Groundwater is not fed by the surface water resources until further downstream.[76]

6. Land use

161. The total area of Sagarejo Municipality is 155,369 ha[77], with 94,371 ha of agricultural lands and 42,065 ha of forests. Arable land covers 29386 hectares, perennial crops cover 5275 hectares, 1407 hectares of mowing land, 42065 hectares of forest, 56884 hectares of pastureland and 1430 hectares of land underlying dwellings.

[74] Clipped from Drone images - https://www.youtube.com/channel/UCDOCEmr4IrILIYOW6pT-TlA/videos
[75] Clipped from Drone images - https://www.youtube.com/channel/UCDOCEmr4IrILIYOW6pT-TlA/videos
[76] Melikadze, et al. 2015. Evaluation of recharge origin of groundwater in the Alazani-Iori basins.
[77] National Statistics Office of Georgia

162. From the Landowner's survey[78], the majority crop in the Kvemo Samgori Irrigation scheme is grapes, with 60% of landowners growing grapes, followed by cereals at 38% and fruit trees at 7%. However, cereal is the most grown crop by area with 44% followed by vine which is grown on 35% of the sampled area. Within the project area, agricultural land is becoming fragmented and small, with an average of 2.17ha per plot. Landowners were not full-time farmers, around 60% reported that they have other sources of income than farming.

163. For Area 1, 51.5% of crops are vines, maize is 32.0%, nuts (walnuts and almonds) 3.7%, Fruit (Peaches, apricot and watermelon) 2.1%, Vegetables (cucumber, alfalfa, potatoes and tomatoes) 2.0%, Sunflowers 0.1%, fish 0.1% and the remaining 6.7% is mixed. Cattle-breeding and poultry-raising are also important branches of the municipality.

164. There are no residential buildings in Area 1 and there are no residential buildings along the route of the main canal. The slopes above the tunnels are partially forested and the open canals have mixed land use beside them including access roads, agriculture, wooded areas and grasslands.

165. According to the local authorities, the agricultural land fund of the Municipality, arable lands, in particular, has not been reduced in the last decade. However, agricultural lands are being degraded due to salination, erosion and overgrazing.

B. Social and Economic

166. The project corridor runs across the territories of Sagarejo and Gurjaani Municipalities of the Kakheti region. The administrative center of Sagarejo Municipality is the city of Sagarejo. Gurjaani Municipality is the geographical center of Kakheti.

167. There are 9 settlements near the project area, including one city and eight villages, in particular: the city of Sagarejo (საგარეჯო), villages Antoki (ანთოკი), Tokhliauri (თოხლიაური), Manavi (მანავი), Kakabeti (კაკაბეთი), Verkhviani (ვერხვიანი), Badiauri (ბადიაური), Paldo (პალდო), Kandaura (ქვემო ყანდაურა), Chailuri (ჩაილური), Mzisguili (მზისგული), Shibliani (შიბლიანი) and Kachreti (კაჭრეთი), see Figure 19.

[78] Source: TA-6648 GEO consultants

Figure 19: Settlements Adjacent to the Project Area[79]

1. Demographics

168. As of January 2022, the population of the Sagarejo Municipality was 52,300[80]. For the settlement nearby Sagarejo the populations are as follows (based on the 2014 census):

- C. Sagarejo – 10,871;
- Vill. Antoki – 73;
- Vill. Tokhliauri – 983;
- Vill. Manavi – 2,769;
- Vill. Kakabeti – 2,771 (2014);
- Vill. Verkhviani – 495;
- Vill. Badiauri – 1,286;
- Vill. Paldo – 18;
- Vill. Kachreti – 1,958;
- Vill. Mzisguli – 578;
- Vill. Kandaura – 1,039;
- Vill. Chailuri – 890;
- Vill. Shibliani – 456.

169. The population growth rate is very low, on average the annual growth rate between 2015 and 2021 was 0.13%, which equates to an increase of about 400 people. The majority

[79] Source: Produced for IEE by TA-6648 GEO Environmental Consultants
[80] National Statistics Office of Georgia

of the population lives within rural areas, with a low than average population density (27.2 people per km^2), and there is a small increase in the number of people living in urban areas.

2. Economy

170. The economy within the area is predominantly agricultural, tourism, services and trade and a large proportion of production is in agricultural products with grain crops (12%) and viniculture (15%). The commercial turnover within the region was GEL 239,900,000 ($82,583,452) in 2020, which is showing a yearly growth from the GEL 78,500,000 ($27,022,930) in 2014. [81]

171. Employment within the region is 44.3% (about 57% employees). Salaries have increased since 2014, are the average monthly, GEL 1,074.20 per month in 2020 ($369.78), is higher than the average salary within the Kakheti region. Labour Indices are included in Table 20.

Table 20: Labour Indices[82]

Index	Kakheti
Total: 15+ population	247.0
Labour force (active population)	122.2
Employed	109.5
Hired	57.1
Self-employed	52.4
Doubtful	0.0
Unemployed	12.7
Population beyond the labour force	124.8
Unemployment rate, per cent	10.4%
Level of the labour force participation (activity), per cent	49.5%
Employment rate, per cent	44.3%

3. Infrastructure

172. Roads and Transport: The S5 route, also name as Tbilisi-Bakurtsikhe and Kakheti Highway[83], runs to the north of the project following and crossing the main canal. This serves as one of two main routes that connects Georgia and Azerbaijan. This road is in the process of being upgraded[84], with Tbilisi Bypass to Sagarejo being funded by the Government of Georgia and Sagarejo to Badiauri being funded by the World Bank. The roads which cross the project area are mainly dirt roads for farming access.

173. There is a train line which runs through the project area, connecting to Sagarejo and a number of the other villages within or nearby the project area. This line runs from Tbilisi to Sagarejo, after Sagarejo the line branches with one line running to Dedoplis Tskaro and another to Gurjaani and the line between Telavi and Tsnori.

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[81] National Statistics Office of Georgia
[82] Data from: National Statistics Office of Georgia
[83] https://www.matsne.gov.ge/ka/document/view/2375985?publication=0 and google maps
[84] http://www.georoad.ge/?lang=geo&act=project&func=menu&uid=1653036687

174. Water and Energy: Most of Georgia has 100% access to electricity, 97.3% access to drinking water supply (66.4% access to managed water supply) and 85.8% access to sanitation facilities[85]. In urban areas, access to these services is higher than compared to rural areas.

4. Landowners Survey.

175. Generally findings of consultation undertaken as part of this project, but not specific to the environmental assessment activities found:

- Most landowners were not full-time farmers, with 60% reporting having other income sources
- A high amount of fragmentations
- 55% reported that their land had access to irrigation
- 69% are contracted to the GA (84% of the total area), however, 14% of the area is without irrigation
- 88% of the land is cultivated per plot. Irrigation there is a slight downward trend from around 61% irrigation of the area in 2018 and 2019 to 58% in 2020
- The amount of area a landowner irrigated differs significantly between the sectors: where in sector 1 (closest to headworks) around 68% to 71% of the areas were irrigated, in sector 3 (farthest from headworks only 33% to 34% were irrigated. Not irrigated areas are most common in sector 3 (37%).
- The majority crop in the irrigation scheme is Grapes (60% of landowners), followed by cereals at 38% and fruit trees at 7%. However, cereal is the most grown crop by area with 44% followed by vine which is grown on 35% of the sampled area.
- About 75% of the vine is sold and 52% of the cereal is sold and about 40% use the cereal for livestock.
- Livestock ownership is 28%, and only a small amount of landowners are exclusively livestock farmers.
- Over 71% are using surface irrigation
- Over 70% of the water used for irrigation is taken from canals, less than 1% is from ponds or rivers and one respondent used a private well.
- 67% to 69% of the required water was delivered, this varies between 100% to 0%.
- For uncultivated land, the main reason was a lack of water supply (60%), other sources of income (24%) and lack of equipment and high input costs (both 7%).
- Farmers reported that they lost 16.9% of their income due to inadequate water supply
- The majority of landowners saying that they would invest in new irrigation equipment would choose drip irrigation (80%).
- The majority of landowners (over 59%) would be willing to pay more for water if the supply would become more reliable.
- The early stages of the resettlement activities found that the local population were generally positive about the project

C. Cultural Resources

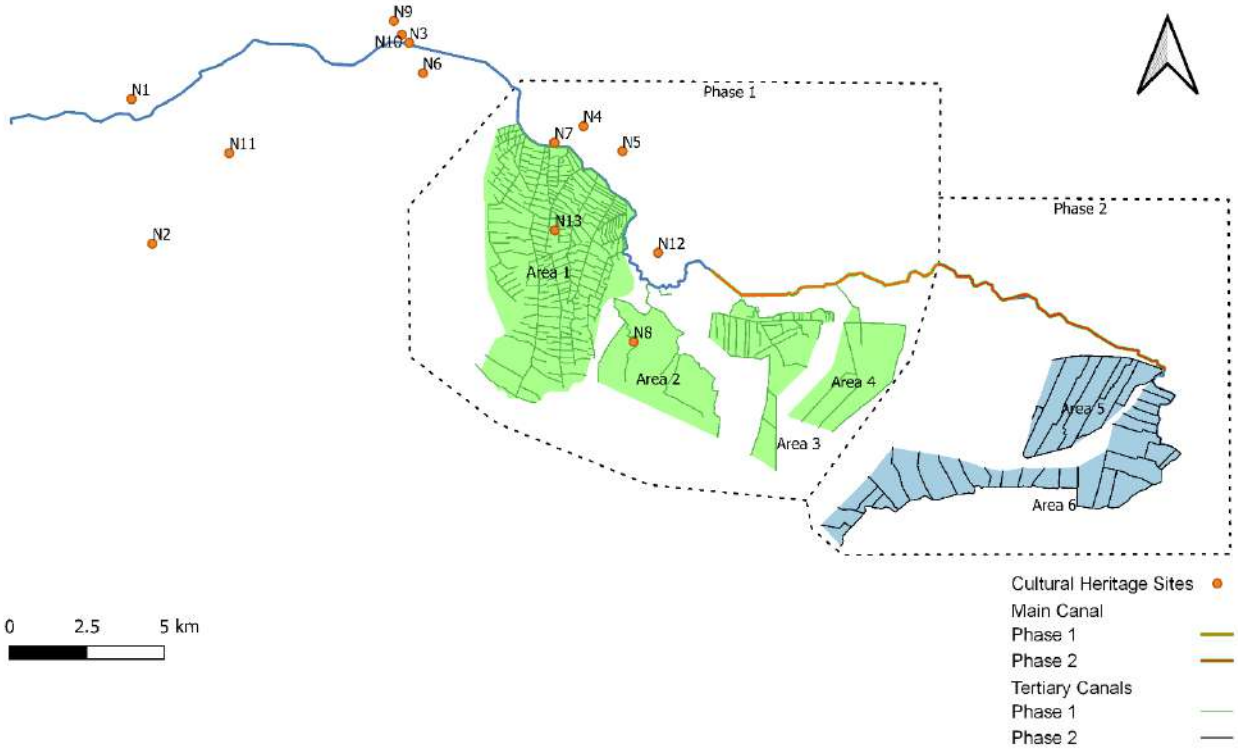
176. Sagarejo Municipality is an area with high historical activities, with traces of life within the region dating back to 2 BC. During the 500s, some of the area was part of the David Gareji monastery estates, after which the city Sagarejo was named after. Sagarejo is of strategic importance and an economic centre throughout the Middle Ages and afterwards, as a transit

[85] Source: WB (n.d.) Data Bank. https://databank.worldbank.org/source/world-development-indicators Accessed: 27th June 2022

trade road from Tbilisi and Kakheti and a Tskvari-Gza road used for taking sheep to pasture in the summer[86].

177. There are several cultural, historical and archaeologically important sites as well as objects found within the region and generally a high chance of 'chance finds'. The cultural and archaeologically are shown in Figure 20 and described below.

Figure 20: Location of Cultural Heritage sites[87]



178. **N1 – Kustapa Settlement –** the settlement on the hill "Kustapa" is to the south of Sagarejo and on the left bank of the river Tvaltkheva and is of Late Bronze and Early Iron Age. This was accidentally found in 1955 when erecting a high-voltage tower. The site of a former settlement is located on a high hill with a flattened crest, which is surrounded by a terrace;

179. **N2 – Lapriani Settlement –** South of Sagarejo, stone mortar-and-grinder and stone inventory made from black porous stone and dating back to 5-6 BC were found. These belonged to the Iori-Alazani Farming Cultural Age.

180. **N3 – Medieval Burial Grounds** – early medieval burial grounds of Kazarashvilis plot accidentally found during land works in 2016;

181. **N4 – Avazasgori Settlement –** former settlement in Avazasgori, which is damaged. The slopes of the hill are intensely washed away. The monument was studied by (Kakheti Archaeological Expedition). Fragments of stone hand grinders and pottery were found in the settlement;

182. **N5 – Sabadurisgori Settlement –** former settlement in Sabadurisgori was studied by KAE (Kakheti Archaeological Expedition). The settlement is located on a high, conical hill,

[86] https://www.sagarejo.gov.ge/ge/istoria and Annex 3: Cultural report
[87] Source: Produced for IEE by TA-6648 GEO Environmental Consultants

which has a flattened crest and is surrounded by a wide terrace. Insert of a silica hammer and fragments of clay pottery decorated with furrowed concentric strips made of the mix of clay and coarse sand and burned to grey-brownish colour were collected in the excavated ground;

183. **N6 – Natlismtsemeli Church –** former Church of John the Baptist is an archaeological and architectural monument in Turi site, on the right side of Tbilisi-Gurjaani Road. There were remains two buildings on the east and west axis survived. It was decided to build a new church on the site of the old building in the east, and in 2011, clean-up works were carried out to identify the remnants of the old church, no church remnants were found during the excavations. By considering the excavated material, the building is presumably dated to the late Middle Ages;

184. **N7 – Chailuri (Niakhura) Fortress –** Chailuri Fortress is the defensive and residential fortress of the 17th century. The Chailuri Fortress, named Niakhura Fortress in the sources, is one of the most important examples of the late medieval Georgian defensive system where in addition to housing the inhabitants of the local nobleman the population was sheltered during the enemy invasion. The castle has the status of a cultural heritage immovable monument (Order of the Minister of Culture and Monument Protection of Georgia No.3/133 dated from 30/03/2006), see Figure 21;

185. **N8 – Gorasamarkhi Burial Place –** This archaeological site is located south of the village Badiauri and is dated from the Late Bronze Age. The accidentally discovered burial ground was studied by Kakheti Archaeological Expedition. A bronze shield and two-pronged pitchforks were found in the tomb.

186. **N9 - Manavi Castle –** Overlooking the Iori Plateau and project area, the ruins of an old castle and conical towers are seen on the mountain top. The fortress is believed to have been built in the unification era of Georgia, i.e. at the turn of the 7th Century.

187. **N10 – Manavi St. Virgin Church –** the domed church, 15 km east of village Manavi, is built in a Kuppelhalle style by Ekvtime, the head of the Davit Gareji Monastery of John the Baptist, where Archimandrite Ekvtime served from 1774 to 1798. The Manavi Church was built during the same period (1794). The Church was restored in 2008;

188. **N11 – Meligor Tower -** the Tower has a square plan with round lugs in all corners. The Tower is built entirely with cobblestones and lime mortar and likely had three floors. Its upper floor should have been open, finished with battlements. There is an obelisk near the Tower erected by the Tsarist Russian government in 1901, on the occasion of the 100th anniversary of its victory in the Niakhura (Kakabeti) battle. The Russian inscription on the obelisk is missing;

189. **N12 – Teleti Church of St. George –** an architectural monument north of village Badiauri, in the environs of the site of ancient village Taraki, about 1 km in the forest. It is dated from the Late Middle Ages. It is a hall church, see Figure 24.

190. **N13 – Nameless Tower –** called local Nameless Tower (no official name found), the monument is badly damaged, with only its east and north walls surviving. Other walls are ruined to the ground. The Castle/Tower is built of cobblestones and lime mortar. Its walls are finished with plaster. The outer walls have some fragments of bricks, see Figure 23;

Figure 21: "Chailuri" ("Niakhura") Fortress[88]

Figure 22: Gorasamarkhi[89]

Figure 23: Nameless Tower[90]

Figure 24: Teleti Church of St. George[91]

191. There are key cultural traditions held within the region, Garejoba is a popular public holiday in Sagarejo held on periodically on 16th May at Chichkhaturi Tower, Berikaoba is an old tradition held in the village of Didi Chailuri in early spring each year, Goglaoba held in the village of Patardzeuli dedicated to Gogla and Vajaoba held in the village of Kochbaani dedicated to the memory of Vazha-Pshavela.

D. Environmental Quality

1. Air Quality and Noise

192. As can be seen from the data obtained, the noise level for the period of the day, in five measurement location are lower than the permissible noise norm established by the legislation of Georgia. Exceedance of the noise norm is recorded only at one point (at location N6), located in the village of Kachreti.

193. The noise excess recorded at point N6 of the measurement is 57.2 dBA. It should be noted that there are no noise barriers (fence, gate, natural cover, etc.) between point N6 and the noise source (traffic), therefore noise is less reducible.

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[88] https://georgiantravelguide.com/en/chailuris-niakhuras-tsikhe
[89] Source: TA-6648 GEO consultants
[90] Source: TA-6648 GEO consultants
[91] Source: TA-6648 GEO consultants

194. During the measurement period, the noise level exceeded the night noise norm established by the legislation of Georgia at points N4, N5 and N6. Noise excess at points N4 and N5 is negligible, ranging from 0.5 to 0.7 dBA.

195. The vibration results observed during the study are lower than the reference values of DIN 4150-3. The higher level recorded by the vibration device is 0.41 mm/s. In all other cases, the vibration level is significantly lower.

196. As can be seen from the obtained data, the concentration of harmful substances in the atmospheric air, except for solid dust particles, is low compared to the standards established by the legislation of Georgia and the WHO. Excess concentrations are observed only with PM2.5, with the greatest excess which is 32 (µg/m3).

Table 21: Result of measurements Noise dBA

Standard		Standard Value	Measurement Results											
			N1 Loc.		N2 Loc.		N3 Loc.		N4 Loc.		N5 Loc.		N6 Loc.	
			Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Norm of Georgian legislation (Adjacent to Residential house)	Day	55	50.1	36.8	54.5	44.4	46.3	40.1	52.2	45.5	53.7	45.7	57.2	49.5
	Night	45												
Norm of Georgian legislation (Commercial)	Day - Night	60												

Parameter	Standard		Standard Value	Measurement Results
Vibration mm/sc	DIN 4150-3 Standard		5	0.41
Solid particles (µg/m3)	Standard	PM10	50	48
		PM2.5	25	32
Nitrogen dioxide (µg/m3)	Standard		200	159
Ground - level ozone (µg/m3)	Standard		120	24
Volatile organic compounds (µg/m3)	Standard		1000	115
Carbon monoxide (mg/m3)	Standard		10	1.47

2. Water Quality

197. There are two water quality monitoring stations along the Iori River, at Sartichala Sasadilo, which are upstream of the project. This makes it hard to establish the water quality baseline92. It is known that there is a high level of suspended sediments in the Iori River from quarry activities upstream. Instrumental measurements of the concentration of suspended particles in the Iori River were accomplished. The mentioned quarries started working at 7:00 am, and instrumental measurements were carried out both, at 6:00 am and 10:00 pm.

Figure 25: Suspended Solids Measurements[93]

198. As the detailed measurements showed, as the aforementioned quarries and processing plants start working, the amount of suspended particles in the River increases almost 5 or 6 times. The amount of suspended particles in water samples taken at 6 am was about 15 NTU (Nephlometric Turbidity Units), while after the mentioned plants started working, the amount of suspended particles in the water was 75 NTU on average.

199. The relationship between NTU and suspended solids is as follows: 1 mg/l (ppm) is equivalent to 3 NTU. Accordingly, every litre of water taken from the river Iori contains 23 mg of suspended particles. Accordingly, 9m^3 of water taken from the Iori River every second contains 0.2 kg of suspended particles which means that a minimum of 1700-1800 kg of suspended particles gets into the irrigation system every day making about 30m^3 a month across the whole irrigation system.

200. Based on a 2020 study of water characteristics of the Iori river[94] (samples taken upstream of the project area) biological oxygen demand, nitrates, phosphates, chlorides, lead zinc, and copper did not exceed the maximum allowable concentrations. The main source of nutrient runoff is agriculture, sewage and stormwater.

201. There is a high than the allowable value of manganese at Sartichala and there are heavy metals present within the river but in permissible forms.

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92 Water monitoring at selected locations based on the SSEMP shall be carried out by the contractor prior to the start of civil works at site. A map of the sample locations shall be prepared and included in the updated IEE.

93 Source: TA-6648 GEO consultants

94 Ketevan, K. (2020) Monitoring of The Chemical Composition of Iori River. Periódico Tchê Química. 17:35 346 – 353 http://www.deboni.he.com.br/arquivos_jornal/2020/35/31_KETE_pgs_346_353.pdf

202. There is a relatively high level of ammonium, although still below national permissible levels, ranging from 0.016 to 1.672 mg N/l, from untreated wastewater, mainly sewage.

203. Poor agricultural practices have led to diffused pollution; within the Alazani and Iori River Basins (part of Mtkvari/Kura Basins)[95] 895 km^2, with the potential for up to 1,250 km^2 is affected by diffuse agricultural pollution.

Table 22: Baseline Water Monitoring and Compliance Status (Lori River)

Parameter	Location	Compliance with National Standards	Remarks
Suspended Solids	Upstream	Yes	
Suspended Solids	Downstream	No	High due to quarry activities upstream
biological oxygen demand	Upstream	Yes	
nitrates	Upstream	Yes	
phosphates	Upstream	Yes	
chlorides	Upstream	Yes	
lead	Upstream	Yes	
zinc	Upstream	Yes	
copper	Upstream	Yes	

Source: TRTA study; Upstream water monitoring stations at Sartichala and Sasadilo

E. Biological Environment

1. Protected areas

a. Mariamjvari Strict Nature Reserve

204. Mariamjvari Strict Nature Reserve includes Mariamjvari Reserve (1022.5 ha), Korughi Managed Reserve (1716 ha) and Iori Nature Reserve (2126.8 ha). Mariamjvari Strict Nature Reserve is a unique object of conservation and study of the forms of Caucasian/hook pine (*Pinus sosnowsky nakia*) common in the Caucasus. The pines in the Reserve area are located on the southern slopes of Tsiv-Gombori Ridge, where they show favourable renewal trends on rocky and stony soils and are recognized as the means reinforcing rock talus.

i. Mariamjvari Reserve

205. Mariamjvari Reserve was designated with the aim to protect and preserve the pristine landscapes of Sosnovsky pine, which is the Caucasian relics and the rare hearth of the formation of this timber species, having no analogue not only in Georgia but also abroad. In

[95] EU Water Initiative for Eastern Partnership (2020) Georgia: Factsheet Alazani-Iori in brief

Mariamjvari Reserve, in terms of arid and semi-arid habitats (ecotopes), there are 9 main types of pine and oak-pine forests identified (Z. Tiginashvili 2006). In Mariamjvari Reserve, in terms of arid and semi-arid habitats (ecotopes), there are 9 main types of pine and oak-pine forests identified (Z. Tiginashvili 2006):

- The III-Bonitet pine forests grow at 900-1400 m asl and are presented by the following forest types: Pine Forest with fescue (*Pinetum festucosum*); Pine Forest with verbena (*Pinetum cytisusum*); Pine Forest with juniper undergrowth (*Pinetum juniperosum*).
- The IV-Bonitet pine trees are found at 850-1500 m asl, which are distinguished by the variety and abundance of indicative grass cover or undergrowth of forest types. The same bonitet presents pure pine forests, as well as oak-pine and pine-oak subformations, with the following types: Pine Forest with poosum (*Pinetum poosum*); Pine Forest with soft rush (*P. Caricosum*); gramineous herb pine forest (*P. gromineto-mixtoherbosum*); gramineous herb pine and oak forest (*Quercetum mixtoherbosum-Pineto-Quercetum mixtoherbosum*); oak-pine forest with fescue (*Querceto-Pinetum festucosum*).
- The V-Bonitet oak-pine and pine forests grow at 900-1400 m asl. Due to the low soil productivity, poor grass cover and scarce undergrowth, only two types of forest were identified in this forest: oak-pine forest with oriental hornbeam undergrowth (*Querceto-Pinetum carpinuletum*) and dry pine forest (*Pinetum siccum*).

206. Thus, the types of Mariamjvari pine forests are diversified in terms of dry and arid habitats. They differ from each other with grove composition, frequency, undergrowth, grass cover, soil productivity (bonitet) and other taxonomic indices. Consequently, the typological characteristics of the forest ecosystems of the given ecotopes are as follows: climatic (light, heat, dependence on moisture, etc.), edaphic (soil depth, moisture, fertility, etc.), orographic (relief, slope exposure, slope gradient, altitude, above sea level, etc.) and other factors evidence the biological diversity of the pine forest types in the area.

207. Mariamjvari is about 9.5km from the closest point of Area 1 and 17.9km from the Pk. 313 + 40 (start of Phase 1) Main Canal.

ii. Korughi Managed Reserve

208. The purpose of the Reserve was to protect and preserve the floodplain forest that survived on the banks of the Iori River. The forests of Korughi Managed Reserve are located along the river as narrow strips on both sides of the Iori, on its first and second terraces. Area 1 is adjacent to Korughi Nature Reserve, see Figure 26 and Figure 27.

Figure 26: Korughi Protected Area[96]

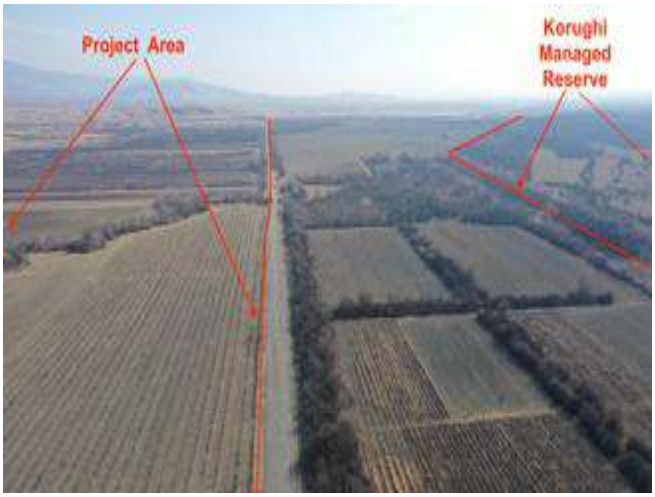


Figure 27: Hunting Office in the Buffer Zone[97]

209. The main forest species are elongated oak, aspen (abele, black poplar), field elm, willow, and secondary forest-forming species: wild pear, shamrock and cherry plum. Noteworthy bushes are hawthorn, blackthorn, oleaster, Christ's thorn, sea-buckthorn, barberry, European privet, Warty Spindle Tree, Gaiter-tree, Salt cedar, Dog-rose and others. These forests are also characterized by twining plants: greenbrier, traveller's joy, etc., which together with blackberries form impassable thickets, offering favourable conditions for fauna representatives to find shelters and/or propagate.

210. In lower wetlands, common reed, reed and Cusick's sedge are common, while in high dry areas, bottle-brush, Wood bluegrass, wheat-grass, wheat-grass, Saxifraga juniperifolia, etc. are common, also forming a refuge for ornithofauna representatives.

211. The forests of the Reserve have the function of soil protection and river flow regulation, especially during floods. They reduce erosive processes, moderate the distribution of atmospheric precipitations and thus contribute to the stability of groundwater yields and river water regimes. The following types of forest groups are found in the Korughi Reserve:

- Oak forests. This group is dominated by greyish oak, with 0.4 or higher density. The grown individuals are of medium or low density. Oak and elm grown trees are the most common. These groves are the best shelter for animals and birds.
- Mixed floodplain forests. This group includes groves dominated by poplar, black alder, willow and elm, with mainly oak and aspen shoots and grown individuals, which are quite strong and can be viewed as reliable. Undergrowth: hawthorn, cornelian cherry, gaiter-tree, warty spindle tree, wild privet, blackthorn, oleaster and blackberry. The most common plants are cat briar, traveller's joy and ivy.
- Open stands. This group includes groves with 0.4 or less density. They are dominated by crayish oak, elm, poplar, and willow. Growing plants are poorly developed and grow as few individuals in the area. In the undergrowth, there are red and black hawthorn, oleaster, and dog-rose.
- Bushes. The following species dominate oleaster, hawthorn, dog-rose, blackberry, and Christ's thorn. Gramineous plants common reed grass of grassy plants are common

[96] Source: TA-6648 GEO consultants
[97] Source: TA-6648 GEO consultants

here. This type forms a favourable habitat and shelter for hares, redlegs, and black francolins

212. This reserve is also used for hunting.

iii. Iori Nature Reserve

213. The main objectives of Iori Nature Reserves are the protection, maintenance and reproduction of the flora and fauna of unique Tugai-type forests (Iori). Iori Nature Reserve is 9km downstream.

b. Special Protected Bird Areas in Georgia

214. The candidate site for a special bird protection area SPA 5 David Gareji is located within the boundaries of the Municipality, which is about 14 km away from the project area. The common endangered species in the project area are the saker falcon (*Falco cherrug*), Eastern imperial eagle (*Aquila heliaca*), griffon vulture (*Gyps fulvus*), Egyptian vulture (*Neophron percnopterus*) and Ruddy shelduck (*Tadorna ferruginea*). Saker falcon is on the Red List of Georgia as Critically Endangered (CR). Other species are classified on the Red List as vulnerable (VU). Saker falcon and Egyptian vulture are on the IUCN Red List of Threatened Species (EN), while the Eastern imperial eagle is enlisted as Vulnerable (VU).

2. Project Area

a. Important Habitat

215. Although the project area is an agricultural landscape, so-called sensitive habitats have been still identified during the study. Such habitats are mainly presented by windbreaks, which include poplar, honey locust, ash, black Locust, aspen, etc. Such windbreaks are nesting habitats for various birds. So, the impact on windbreaks should be minimized during the works.

Figure 28: Windbreak zone within the project area[98]

Figure 29: Nest of Black-billed Magpie in Windbreak zone[99]

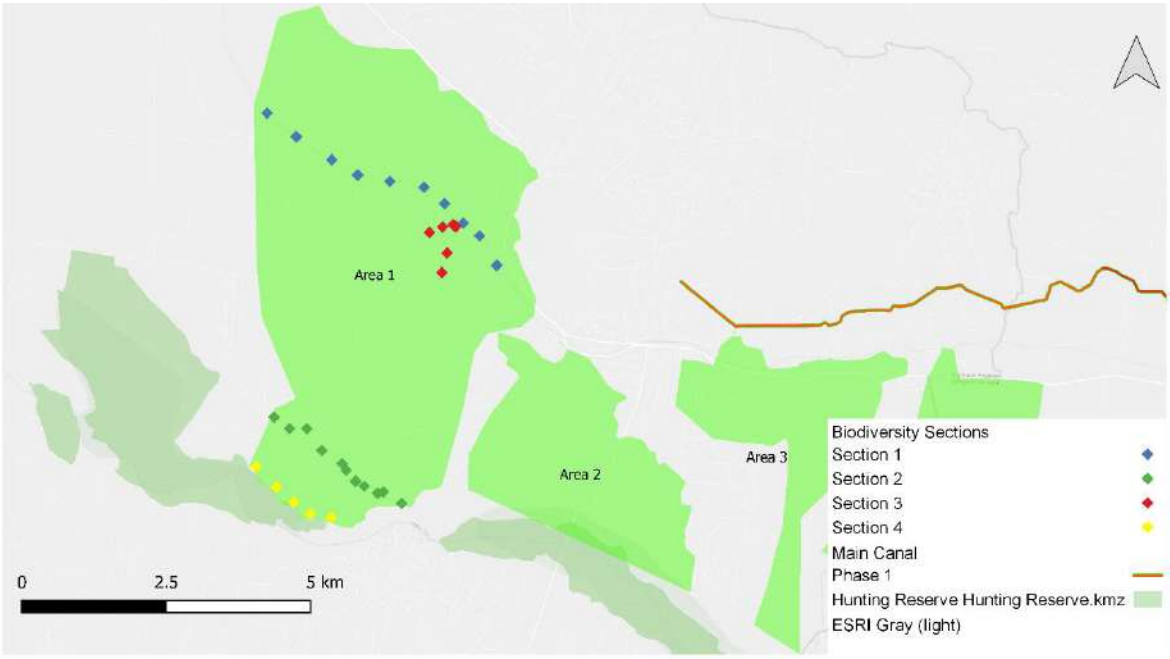
[98] Source: TA-6648 GEO Biodiversity Study
[99] Source: TA-6648 GEO Biodiversity Study

b. Flora

216. The project has been split into 4 sections, see Figure 30:

- Section 1 - there is degraded roadside landscaping and private land plots. The private land plots are presented by vineyards, orchards, annual and perennial crops, etc. The project area does not cover natural habitats and is represented by an agricultural landscape actively used by the population. Along the given section of the project area, the following Red-Listed species may be under the impact: common walnut (Juglans regia).
- Section 2 - there are degraded floodplain forest vegetation fragments and private land plots. The private land plots are presented by vineyards, orchards, annual and perennial crops, etc. Along the given section, the following Red-Listed species may be under the impact: common walnut (Juglans regia), Grayish oak (Quercus pedunculiflora C.Koch).
- Section 3 - there is degraded roadside landscaping and private land plots. The private land plots are presented by vineyards, orchards, annual and perennial crops, etc. Along the given section of the project area, the following Red-Listed species may be under the impact: common walnut (Juglans regia).
- Section 4 - there are degraded floodplain forest vegetation fragments and private land plots. The private land plots are presented by vineyards, orchards, annual and perennial crops, etc. Along the given section of the project area, the following Red-Listed species may be under the impact: common walnut (Juglans regia), Grayish oak (Quercus pedunculiflora C.Koch), Georgian weeping Pear (Pyrus georgica); Georgian elm (Ulmus georgica); and Georgian barberry (Berberis iberica).

Figure 30: Sections of the Biodiversity Survey[100]



217. Along the main canal, the surrounding area between sections 1 and 16 is forested (mostly open wooded areas, fragmented by local tracks) and the canal itself is experiencing a

[100] Source: Produced for IEE by TA-6648 GEO Environmental Consultants

large amount of encroachment from vegetation. From section 16, the surrounding areas become more agricultural. The work will be limited to the area which is already modified.

c. Fauna

i. Mammals

218. The generic composition of the mammals common in the project area is mainly represented by species typical to steppes and floodplains. The following species of small mammals are found in the project area: hamster (*Cricetus cricetus*), levant mole (*Talpa levantis*), mouse (*Apodemus mystacinus*), Robert's snow vole (*Chionimys roberti*), house mouse (*Apodemus mystacinus*), Robert's snow vole (*Chionimys roberti*), field mouse (*Mus musculus*), brown rat (*Rattus norvegicus*), Southern white-breasted hedgehog (*Erinaceus concolor*), etc. The impact on small mammals by farmers is great because the various pesticides they use destroy harmful rodents.

219. Large mammals use this area for migration and finding food, although they cannot use it for long-term habitation. Of large mammals, only jackal (*Canis aureus*) excrements were found during the field study. However, during the survey, the local farmers confirmed the presence of jackals, foxes and rarely wolves in the area.

220. Wild boar may be present in the project area, especially in its southern part, as this section borders the Korughi Managed Reserve floodplain forest, where the wild boar live. During the study, hare (*Lepus europeus*) was seen in the project area.

221. The Iori River is located near the project area, which is a potential otter habitat. This section was thoroughly visualized during the study to detect the signs of otters (burrows, traces, excrements, etc.). However, none of them was observed.

222. No species found during site visits were protected or vulnerable under IUCN or RLG classification, however, in literature the following are potentially present:

- Caucasian squirrel (*Sciurus anomalus*) – listed as Vulnerable under RLG
- Otter (*Lutra lutra*) – Near Threatened under IUCN and Vulnerable under RLG
- Brown Bear (*Ursus arctos*) – Endangered under RLG
- Eurasian lynx (*Lynx lynx*) – Critically Endangered under RLG
- Deer (*Cervus elaphus*) – Critically Endangered under RLG
- Chamois (Rupicapra rupicapra) – Endangered under RLG
- Mediterranean horseshoe bat (*Rhynolophus euryale*) – Near Threatened under IUCN and Vulnerable under RLG
- Western barbastelle (*Barbastella barbastellus*) – Near Threatened under IUCN and Vulnerable under RLG

ii. Birds

223. The project area is a steppe-type agricultural landscape, with diversified ornithofauna in and around it. Consequently, there are no large birds of prey or birds associated with the aquatic environment in the project area. The project area is mainly inhabited by the following bird species: Passerines, Eurasian hoopoes, Columbidae, Chionidae, and other members of the family.

224. There were 28 species of birds identified during the site visits, of these the following are protected or vulnerable:

- Atlas Long-legged Buzzard (*Buteo rufinus*) – Vulnerable under RLG – Protected under Bern Convention
- Turtle Dove (*Streptopelia turtur*) – Vulnerable under IUCN
- Eurasian sparrowhawk (*Accipiter nisus*) – Protected under Bern Convention
- Common kestrel (*Falco tinnunculus*) – Protected under Bern Convention
- Common cuckoo (*Cuculus canorus*) – Protected under Bern Convention
- Eurasian hoopoe (*Upupa epops*) – Protected under Bern Convention
- Barn Swallow (*Hirundo rustica*) – Protected under Bern Convention
- Common house martin (*Delichon urbicum*) – Protected under Bern Convention
- White Wagtail (*Motacilla alba*) – Protected under Bern Convention
- Yellow Wagtail (*Motacilla flava*) – Protected under Bern Convention
- Common Blackbird (*Turdus merula*) – Protected under Bern Convention
- Mistle Thrush (*Turdus viscivorus*) – Protected under Bern Convention

iii. Reptiles and Amphibians

225. Seven species of reptiles and four species of amphibians are found in the project area, of these, the following are protected or vulnerable:

- Spur-thighed tortoise (*Testudo graeca*) – Vulnerable under IUCN and RLG – Protected under the Bern Convention. Small, fragmented area around the windbreaks.

iv. Fish

226. There are no reservoirs immediately in the project area where fish can be found. River Iori is near the project area. Consequently, the representatives of ichthyofauna common in the Iori River basin may be found near the project area.

227. During the study, Kura loach (*Oxynoemacheilus brandtii*) was caught in the Iori River. According to the results of the survey with local fishermen, the following fish species are common in the Iori River near the project area: Luciobarbus mursa (*Luciobarbus mursa*), Kura chub (*Squalius agdamicus*), Khramulya (*Capoeta capoeta*), South caucasian gudgeon (*Romanogobio macropterus*), Bulatmai barbel (*Luciobarbus capito*).

228. Under literature there are eight species are noted within the Iori River. None are listed as threatened under IUCN, all have not been evaluated under RLG.

V. METHODS, APPROACHES AND EVALUATION CRITERIA USED TO ASSESS THE ENVIRONMENTAL IMPACT

229. The principal goal of the evaluation of the environmental impact is to identify the type and significance of the impact of the planned activity on the physical, biological and social environment. This must become the basis for developing relevant mitigation measures. To achieve this, it is necessary to identify the criteria so that results are comparable through calculations and other methods. The comparison difference (quantitative change) allows for identifying the value of the expected impact (scale, limits of propagation).

230. Following the requirements of the legislation of Georgia and the characteristics of the planned activities, the following types of environmental impact were considered:

(i) Impact on the physical environment – the probability of atmospheric air quality deterioration, noise and vibration propagation, risks of changing the qualitative state of water and soil environment, violation of the stability of the geological state, and visual-landscape impact.
(ii) Impact on the biological environment – the generic and quantitative decrease of flora and tree-and-vegetation cover, disturbance of the animal world, deterioration of their habitats and probability of immediate impact.
(iii) Changes in social-economic conditions of the urban zone under the impact, both positive and negative.
(iv) Possible negative impact on historical and archaeological monuments.

231. The evaluation criteria for each of the above-listed impacts were identified by an individual approach, e.g.:

(i) The emissions and noise propagation in the atmospheric air were calculated based on the relevant methodical and normative documents. The expected changes in the design points were identified as the most unfavourable conditions. During the calculations, the background state in the pr area was taken into account. The gained results were compared to the normative documents effective in Georgia.
(ii) The value of the impact on the qualitative state of the water and soil environment was evaluated by considering the distance from the surface waters and the specificity of the technical procedures used during the construction process.
(iii) The methods of visual-landscape assessment are based on the landscape value and existing situation of the active site.
(iv) In evaluating the impact on the geological environment, the existing engineering-geological conditions and analysis of the measures necessary for the construction works are important.
(v) The approach used in evaluating the impact on the biological environment envisages the comparison of the background state and forecasted change resulting from the project implementation.
(vi) In evaluating the impact on the social-economic environment, attention was paid to various aspects, with the positive impact being the most important.
(vii) The method to evaluate the negative impact on historical and archaeological monuments envisages the identification of the probability of their damage or destruction by considering the specifics of their location.

232. All kinds of impacts were classified with a 3-point system, in particular:

(i) **Significant (high) impact** – impacts that cannot be effectively mitigated, causing a high level of residual impacts and a high probability of dissatisfaction amongst the population.
(ii) **Moderate impact** – impacts that can be effectively mitigated and the impact brought to an admissible level.
(iii) **Insignificant (low) impact** – impacts effects lead to a limited quantitative or qualitative change in the environment and do not cause public dissatisfaction

233. It should be noted that some kinds of impact are not expected and there is no need for mitigation measures.

234. To assess the values of some of the impacts, it is also important to assess the duration of impact and evaluate how swiftly a natural object can be restored either to its original state or a state nearly similar to the original one, after the sources of impact are eliminated.

235. Impact Assessment Criteria are included in Annex 2.

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Introduction

236. The environmental impact is assessed for different project phases: the pre-construction, construction and operation phases of the Irrigation systems rehabilitation project. Initial screening and identification of potential impacts were conducted using ADB's rapid environmental assessment (REA) checklist (Annex 1). The study team visited the proposed project sites and nearby areas to identify the potential impacts (both positive and negative), met stakeholders and conducted meetings, brainstorming sessions, field examinations, and data gathering. The succeeding paragraphs provide the potential negative impacts for pre-construction, construction, and operation and maintenance phases. Avoidance and mitigation measures are also discussed to ensure potential negative impacts are insignificant, site-specific and can be managed using established internationally accepted practices. In particular, the following aspects were taken into account:

(i) Project specifics, engineering solutions and technological approaches used during the construction and operation processes.
(ii) The existing state of the natural and social environment of the corridor was selected for the planned activity.
(iii) Criteria were developed in advance to assess the expected impact on each environmental object.

Pre-Construction Impacts

276. Location, Engineering and Design Issues. The project is not located in any eco-sensitive areas. There is no major bottleneck along the existing alignment. As a result, minimal acquisition of any land is required. Impact on private and community structure is not there. The project design has considered all major preconstruction impacts and taken avoidance measures at an early stage of planning to have minimal impact due to location.

277. The rehabilitation of existing canals will require the need to cut vegetation / trees along the project alignment. This will inevitably have some impact and this matter is discussed in the following sections. As part of the engineering design, the following principles are implemented during detailed design, or the appropriate adjustments shall be made on site during the construction phase.

(i) **Alignment:** The canal rehabilitation works will follow the fixed alignment, however for distribution lines, alignment will be determined to avoid / minimize land acquisition, impact on structures, impact on water bodies, archaeological/cultural sites, interference with water sources, shifting of existing utilities etc.
(ii) **Water bodies:** rehabilitation works shall be planned to ensure that the water bodies do not get impacted during construction.
(iii) **Tree Cutting:** Planning to ensure that the tree cutting is restricted to a minimum.
(iv) **Construction material Sourcing:** Quarrying is not required, and construction material will be sourced from existing licensed suppliers.
(v) **Dust and air pollution:** Spoil and Waste disposal sites and temporary construction material and equipment storage areas shall be sited away from habited areas;
(vi) **Noise and Vibration:** While the habitat near the main canal project site is minimal, time regulation for construction near sensitive receptors in the distribution network areas shall be maintained.

(vii) **Construction Camp and Waste Disposal:** No such facility shall be sited near any water bodies, forest area, and settlements; and
(viii) **Natural Hazards:** The project area is not located in a high seismic zone or high-risk zone from natural hazards perspective.

278. Various impacts associated with the pre-construction phase are summarized in the table below.

Table 23: Type of Potential Impacts at Pre-Construction

S.No.	Environmental Issue	Measures to be taken
1	Distribution line Alignment	Final alignment should be determined to minimize land acquisition and the impact on people, biodiversity and to avoid unfavourable geological condition and cultural relics.
2	Spoil / sediment disposal	Designated areas / low lying areas shall be identified in advance to ensure that the sediment disposal is adequately carried out.
3	Dust and air pollution	Dust and air pollution shall be avoided. Waste disposal sites and construction material storage sites should be identified – keeping in mind environmental issues such as dust generation and noise pollution.
4	Cultural heritage	Any archaeological sites/remains identified along the alignment should be intimated to Archeological authorities prior to construction.

(i) Construction camps, related contractor's facilities, will be established and be in environmentally sound and socially safe areas. These should be located at least 500m away from settlements;
(ii) Living accommodation and ancillary facilities should be erected and maintained to standards and scales approved by the Engineer-in-Charge; and
(iii) Toilets and urinals should be provided in accessible places away from the Hot mix plant and mixing yard.

279. Various impacts expected in the project implementation and operation phases are summarised in Table 24 and described below. This section shall be updated as needed during the final detailed design stage and if any changes that occur before construction. Good international practices on safeguards should be enforced. The WB Environmental, Social and Health Guidelines, ADB guidelines and direction and national legislation shall be followed.

Table 24: Project Impacts

	Construction Phase	Operation phase
Impact on ambient air quality	Low	
Noise and vibration	Low	
Risks of floods and climate change		Positive
Landscape and visual impact	Low	
Impact on river water quality	Low	Low
Impact on soil quality	Medium	Low
Impact on geological environment	Low	
Impact on flora and fauna	Medium	
Impact on traffic flows	Low	
Impact on the social-economic environment	Medium	Positive
Impact on historical-cultural and archaeological monuments	Medium	
Impacts due to sediment storage / disposal	Medium	
Impact related with asbestos storage / disposal due to chance find / presence of asbestos pipes	Medium	

B. Project Zone of Influence and Sensitive Receptors

280. The project zone of influence is the area that could potentially be affected by the project. Within this zone of influence that there are several sensitive receptors, and it's important to make sure that these receptors have appropriate mitigation measures in place. Based on this the sensitive receptors for this project are as follows.

281. The project area is mostly agricultural and therefore the works may cause resettlement and loss of access as well as impact crops during construction.

282. The main sensitive receptors are the protected areas and cultural sites. Area 1 is located adjacent to Korughi Managed Reserve and Iori Managed Reserves and there is about a 100m buffer between the protected areas and the project sites. Although the landscape is modified there is still evidence of important species and habitats.

283. There are two cultural sites in or bordering Area 1 and a few more sites within the vicinity of both the Area and the Main Canal that will need consideration.

284. The irrigation system takes water from the Iori River which is a transboundary river feeding into the Kura River and any potential impact on water quality can also cause transboundary impacts. However, impacts from this project on downstream users are unlikely as the project will not increase water take.

C. Positive Impacts and Benefits

285. The overall project will improve water management and sustainable agriculture through a range of environmental, social and economic benefits. This includes:

(i) More equitable management of water resources

(ii) Reduction in water loss, currently almost half the water is lost[101], see Figure 31.
(iii) More water is available for irrigation without increasing the water taken from the Iori River
(iv) Increase in area of land that can be irrigated
(v) Improvements in water monitoring and understanding of the flow and use across the system
(vi) Improvements in the capacity of MEPA and GA to manage the system
(vii) Increasing awareness and capacity of sustainable water use amongst users; this will also likely reduce fertiliser and pesticide run-off
(viii) Increasing climate resilience
(ix) Improvements in agricultural outputs, productivity and income
(x) Support moving to a more sustainable financial management
(xi) Less land is needed for the modernised system
(xii) Less artificial infrastructure visible from cultural important sites
(xiii) Harder for illegal/unofficial water users, as harder to abstract and easier to monitor
(xiv) Improve water usage and reduce water loss
(xv) Improvement of local connectivity though repairs of bridges over the canal.

Figure 31: Leakages due to damaged system

D. Construction Impacts

1. Biodiversity

286. A summary of the biodiversity impacts is shown in the following table:

[101] Kakheti Regional Amelioration Office of Georgia

Table 25: Biodiversity Impact

Impact category	Construction / Operation phase	Impact direction	Geographical distribution	Initial value	Duration	Reversibility	Mitigation efficiency	Final impact rating
Reduction of the vegetation cover and loss of habitats	Construction phase	Negative	Local	Average, Low	Long-term	Reversible	Average, Low	Low
	Operation phase	Insignificant / not expected	-	-	-	-	-	Low
Direct impact on animal species	Construction phase	Negative	Regional	Low	Long-term	Reversible	Low	Low
	Exploitation phase	Negative	Regional	Low	Long-term	Reversible	Low	Low

287. Generally, throughout the project mitigation measure should be undertaken and supervised to ensure:

- Visual control of the construction site to identify the Georgian Red-Listed species.
- Carrying out observations to identify the impact on species.
- Monitoring their condition and, if necessary, developing relevant conclusions and recommendations.

288. These activities shall be carried out both, on the working sites and in the surrounding areas. The study will envisage regular visual inspections of the area and, if necessary, its additional studies.

a. Impact on Flora

289. A significant impact on the vegetation cover is expected it will be necessary to clear the construction site of the vegetation cover.

290. The following Red-Listed species may be under the impact of the project area or impact zone: Common walnut (Juglans regia), Grayish oak Quercus pedunculiflora C.Koch; endemic species: Georgian weeping Pear (Pyrus georgica); Georgian elm (Ulmus georgica); Georgian barberry (Berberis iberica). Consequently, attention must be paid to them both, in the construction and operation phases.

291. Currently, 51 trees over 30cm in diameter will need to be removed to maintain the canal and ensure safe working.

292. It is recommended to minimize the impact on biodiversity and when it is impossible to avoid environmental damage, the damage shall be compensated according to the compensation program with its goal to restore the equivalents to the lost habitats.

293. The mitigation measures for the impacts on the vegetation cover and the habitat unity are as follows:

- Minimise vegetation removal
- The trees and shrubs of high conservation value (including mature trees) will be marked and, where possible, preserved or re-planted – this process should be managed for a replantation plan.
- The borders of the construction corridor and traffic routes are to be identified accurately to avoid excess damage to the vegetation cover.
- Prior to the onset of the construction works, instructing the personnel about the protection of the vegetation cover.
- Permanent monitoring is necessary to evaluate the success of the activities and identify the need for corrective measures.
- The landscape restoration is to be done with the original plant species, in accordance with their original content and rule of distribution.
- For the temporarily lost habitats, the plan for vegetation cover restoration and management must be developed on its own, as this kind of impact can be mitigated.
- If environmental damage is inevitable, the damage will be compensated according to the forest compensation program.
- As for cutting down the Red-Listed plant species in the project construction corridor, the measures to maintain them are necessary, and in lieu of the damaged trees, compensation plantings shall be provided.

- Removal of the protected species from the environment must be done in line with the requirements of sub-clause f), clause 1, Article 24 of the “Georgian law on the Red List and Red Book”, in agreement with the Ministry of Environment and Agriculture of Georgia.

b. Impact on Fauna

294. Studies in the project corridor showed that the generic composition of the animals living in the project area is rather poor. Virtually, there is no natural habitat in the project corridor. Therefore, damage to animal shelters will not be of a large scale. However, certain animal species when searching for food, as well as during breeding, may enter the construction area and be under various impacts.

295. Due to the fact that the project area is an agricultural landscape, the likelihood of the presence of habitats for large mammals there is minimal and thereby minimising the impact of disturbance (machines, special equipment, farmers’ active movement across the area). However, their presence in the project area in the construction or operation phase is not excluded.

296. In addition, the presence of large carnivorous birds, such as griffon vulture, Bearded Vulture-Eagle, Egyptian vulture and cinereous vulture, is also minimal. The Iori River, as a potential otter habitat and its occurrence near the project area, cannot be excluded. There are no construction works planned immediately on the river. Therefore, even in the presence of otters, the disturbing factors will be minimal and temporary.

297. In the construction phase, damage can be inflicted on species that are present during their breeding season, or constantly being directly in the construction corridor, in shelters (ponds, stone piles, shrubs, etc.) (birds, amphibians, reptiles or small mammals).

298. Removal of the vegetation will also remove habitat, shelter and food. It can also increase wind, decrease slope stability (along the Main Canal), and remove natural barriers to noise and visual impacts on the local communities.

299. Within some of the tunnels on the main canal, bats have been reported by those visiting the sites and this needs to be investigated before work is started. Works could cause disturbance to the bats if they are in the roost in the tunnels at the time.

300. Considering the above-mentioned and the specifics of the planned activities, the negative impacts on the animal species common in the construction area can be as follows:

- Habitat loss/fragmentation is expected (for instance in the shrubs growing in the windbreaks or on the adjacent plots as a result of cutting down trees and shrubs, etc.). The main receptors will be small mammals, birds, and reptiles;
- As a result of cutting down the trees and during the earthworks, the nesting sites of certain species may be destroyed. The main receptors can be birds.
- The trees and shrubs of high conservation value (including mature trees) will be marked and, where possible, preserved or re-planted – this process should be managed for a Replanting Plan.
- Inconvenience due to the increased traffic, presence of people and lighting may increase.
- Noise and vibration, as well as emissions of dust and other harmful substances into the ambient air will increase in the construction phase. Almost all species living in the corridor will be affected.

- Trenches made during the earthworks will pose a certain risk to small mammals, as they may fall into the trenches, injuring themselves or dying. More sensitive to such impacts are amphibians, reptiles, and small mammals (moles, forest mice, water shrews, etc.).
- The trees on certain sites of the project area will be cut down, and the trees used by the birds or bats as shelters may be among them.

301. Overall, the impact on fauna in the construction phase can be assessed as low. With proper mitigation measures and permanent monitoring, it is possible to further reduce the impact on terrestrial animals. The following mitigation measures must be paid particular attention to in the construction and operation phases:

- All trees to cut down on the sites should be thoroughly visualized before the construction starts, and any identified animal shelters should be notified in writing to the Ministry of Environmental Protection and Agriculture of Georgia, with further actions to take in accordance with the Georgian Law on the Red List and the Red Book of Georgia and the Law of Georgia on Wildlife.
- The duration of the works can cause disturbance to and frighten animals should be as minimal as possible.
- It is prohibited to dump or spill waste in an uncontrollable manner during construction works to avoid environmental pollution.
- None of the breeding areas should be damaged without proper study and permission of relevant experts (the studies have evidenced a higher probability of small nests of so-called garden birds and small mammal shelters within the impact zone). The working crews should be instructed against killing fauna representatives. Rather, they must be allowed to escape from the area during works. In extreme cases, their disturbance should be limited to giving the animals a corridor to escape.

c. Fish Fauna

302. There are no rivers, lakes, artificial fish farms or other objects with standing water in them in the project area. Therefore, the implementation of the project will not have a direct long-term impact on ichthyofauna. The mechanical impact on ichthyofauna will be temporary, during the construction of small irrigation channels to discharge so-called unused waters back to the river. The project also will not increase the water abstraction from the Iori River of the system, therefore having no impact on the environmental available flow.

303. In the construction phase, there is a certain risk of getting various waste or harmful substances into the water which will be harmful not only to the representatives of ichthyofauna but also to all species living in the water. See water and pollution for mitigation measures that respond to this risk.

d. Protected Area

304. The project site runs adjacent to Korughi Protected Area, a hunting reserve and reserve protecting the floodplain forests. The proximity of the works to the site has the potential to cause disturbance and disruption to the protected area. To reduce the project's impact on the protected area, it is necessary to implement the following additional mitigation measures:

- Dismantling of the existing channels and concrete pipes should be prohibited during high northern winds and good dust management should be enforced.
- A floristic study by the construction contractor should be accomplished in the buffer zone, and additional mitigation measures should be developed if nests are found.

- The environmental specialist of the construction contractor should have permanent contact with the administration of the protected area, as well as with the management of the hunting office situated in the buffer zone.
- A biodiversity specialist should be employed on an intermittent basis to manage and ensure no impact on the protected area
- Monitor noise and the content of harmful substances in the air (especially PM 2.5 and PM 10) more intensely near the borders of the protected area.

2. Disturbance or damage of cultural sites

305. Despite the area has a high number of culturally important sites. Below will outline any potential impacts for each cultural site likely to be impacted:

306. N7 – Chailuri (Niakhura) Fortress – This is on a hill that overlooks the project area and is about 120m north of secondary canals within Area 1 (separated by part of the main canal that will not be rehabilitated as part of this project). This is an important site in terms of history and tourism. Works will not cause damage to the site when using standard construction practices. However, there is a chance that this area will be disturbed through temporary impacts such as noise, dust, vibration, visual changes and traffic.

307. N9 - Manavi Castle – Overlooking the project area, is an important historical and tourist site. However, its distance will only be impacted due to visual changes.

308. N12 – Teleti Church of St. George – located on a hill that is surrounded on three sides by the main canal (not part of the modernisation works) it overlooks the project areas and is close to Areas 1 (1km). However, its distance will only be impacted due to visual changes.

309. N13 – Nameless Tower – this is located within Area 1 and is not located in an irrigated area. As per the preliminary design, PVC pipes are planned to lay under the ground 80 m from the existing tower, and the existing channels located 150 m from the monument are planned to dismantle. The physical condition of the tower is very poor, with stones permanently falling from the tower.

310. This will be affected by temporary impacts such as noise, dust, vibration, visual changes and traffic. Generally, visual impacts will be limited and temporary. After the works, returning the site to its original condition will prevent any visual impacts. On top of this with secondary canals being replaced with pipelines, the visual impact will be less than before the rehabilitation.

Figure 32: Satellite Image of Nameless Tower

Green lines = Secondary Canals.
Source: Google Maps.

Figure 33: Nameless Tower Poor Condition

311. Mitigation measures;

- To give a recommendation to the group working on the final design of the project to maximally distance the underground irrigation pipe buffer from the existing cultural heritage monument.
- During the works within 200m of the Nameless Tower, any pipes should be left in the ground, use of heavy equipment[102] should be limited with manual processing prioritised and a cultural person should be temporarily employed to oversee this section of the works and to monitor the condition of the tower.
- During the construction or dismantling works near the monument, permanent instrumental measurements of vibration should be provided at the monument.
- The existing tower should be additionally studied by relevant specialists, and the maximum permissible level of vibration should be identified. Following the physical condition of the tower, the internationally accepted maximum level of vibration, i.e. 2.5 mm/s, may be too high for this tower and accelerate the damage to the tower (as we already mentioned, stones are permanently falling from the tower).
- The movement of heavy machinery along the local road running adjacent to the tower should be prohibited in the construction phase (see Figure 6.4).
- The Construction Contractor should develop the bypass route before the construction works start.
- Consultation and public engagement need to occur periodically throughout the project

3. Chance finds

312. This area has a high number of historical sites, including accidental (i.e. chance find) discoveries. This, however, means that the risk of chance finds within the area is high, especially during the excavation activities.

313. For any chance finds, works are legally required to stop immediately. Contact will need to be made with the Ministry of Culture, Sports and Youth to set up a way forward. Chance finds procedures need to be in place and should be managed by the cultural specialist. A

[102] In this regard heavy equipment mainly refers to machinery, such as an Excavator.

cultural specialist should be employed on an intermittent basis throughout construction because of this risk.

4. Natural Disaster

314. The main canal is in an area of medium risk for landslides, however, with no further excavations or cutting into the slopes, the chances that the project will destabilise the slope are low. Works are limited to the existing infrastructure.

5. Noise, dust, light and emissions

315. Any construction activity is accompanied by increased noise, emissions and dust levels in the project area compared to the baseline levels. As per the current state, the baseline zone is in the territory of agricultural plots of fields, and there are neither industrial nor infrastructural units found in the area, whose operation would deteriorate the air quality. The nearest source of noise, dust and emissions is the Tbilisi-Bakurtsikhe Highway located in the northern part of the project area.

316. The main source of noise, dust and emissions in the construction phase will be heavy construction machinery, as well as the construction camps. The location of the camps is not known at the given stage. After the detailed design is complete and the location(s) of the camps is (are) identified, the current IEE document must be updated.

317. Dust concentration in the air in the project area will be high following the existing infrastructure. The surface of both the access roads to the main channel and secondary channels is ground which leads to dust generation, especially on hot days. Besides, as the equipment is used, the ground roads produce more noise and vibration than asphalt or concrete ones.

318. Based on the results, the values of noise, vibration and harmful substances in the air are within the admissible norms at all sites. Only in the northern part of the project area, close to the road, the noise levels have increased slightly getting close to the admissible level.

Table 26: Location of monitoring sites[103]

319. As for the 20-15-minute-long noise measurements within the project area (Figure 6.1, points 3, 4 and 5), the obtained noise levels did not exceed 45 dB even during the day (the legally admissible norm is 55 dB).

320. Lighting around construction camps (locations to be decided) and around works at nighttime or in dark (tunnels) areas has the potential to cause disturbance to communities and wildlife.

321. The following mitigation measures should be implemented within the whole project area:

- The movement of heavy machinery should be prohibited during non-working hours.
- Machine engine idling should be limited to the extent possible.
- The technical condition of the exploited vehicles will be constantly monitored.
- The method of covering trucks with tarpaulins during the transportation of construction materials and waste should be adhered to.
- Observance of traffic speed limits and proper management of dusty materials is needed to reduce dust propagation. An efficient way to reduce dust emissions can be periodic watering of the traffic routes in dry weather.
- Construction transportation routes set up
- Appropriate management of material and waste
- In times of high winds, extra care is required and works that will cause a disturbance of loose material should be halted until more favourable conditions.
- Monitoring of the noise, vibration and dust near the protected area and vibrations within 100m of the cultural sites.

[103] Source: Produced for IEE by TA-6648 GEO Environmental Consultants

- Avoid lighting works sites and camps when not in use, unless vital for security. When necessary for security, ensure that the direction of the light is focused at the site (away from communities and natural habitats)

6. Impact on Soil Quality

322. Laying pipeline and canal rehabilitation will involve the removal of the soil, and if poorly managed can lead to runoff and erosion, causing a loss in productive farmland, water pollution and sedimentation. Topsoil needs to be protected, about 82,947m^3 will need to be removed in order to lay the pipes.

323. The works should not involve any long-term storage of the material and the works of digging, laying the pipes and backfilling can be done quickly and thereby minimising the impact on the soil. Where topsoil needs to be stored, appropriate transportation, siting of storage and appropriate drainage are needed. After completion of the construction works, pre-excavated topsoil shall be used for the restoration of the damaged areas and to improve productivity.

324. Modernisation works will also include the removal of sedimentation, the storage of this sedimentation will need to also ensure that siting and storage prevent runoff and pollution and sedimentation of natural water courses.

325. Over 4,810m^3 of sedimentation and a predicted 50,424m^3 of soil from Area 1 will require disposal. An appropriate location will need to be established prior to work.

326. To avoid soil contamination, sound construction equipment shall be used. The fuel tank should be placed in areas protected by berms and embankments to prevent spills in case of necessity. Spills should be immediately contained and cleaned up from absorbent material. Accidentally contaminated ground/soil shall be removed and disposed of as soon as possible. After the completion of the construction works, recultivation of the area and restoration of sanitary conditions will reduce the probability of impact on soil quality and stability.

327. Mitigation measures during earthworks will include the implementation of the measures to prevent soil damage and erosion, and maintain humus fertility and its quality, namely:

- After the completion of the construction, the previously removed topsoil should be used to restore the damaged areas and improve fertility
- The transport and equipment routes must be strictly followed.
- Topsoil removal and storage should be done separately from other materials, on a pre-selected site protected from surface runoff and covered until backfilling or disposal.
- Digging and backfilling of trenches should be done as quickly as possible
- Temporary water-diversion channels should be provided along the perimeter of the topsoil piles
- In the case of long-term storage of topsoil, its care should also be planned to ensure its fertility is protected.
- Unfaulty construction techniques should be used to avoid soil contamination
- The fuel tank should be placed in an area protected by berms or earth fills to stop accidental spills as necessary.
- Accidental spills should be contained and cleaned up immediately using absorbent materials.
- The ground/soil contaminated accidentally during the construction should be cut and removed as soon as possible.

- After the completion of the construction, the reclamation of the territories and the restoration of sanitary conditions will reduce the probability of impact on soil quality and stability.

7. Impact on Water Quality

328. Pollution of water resources is a risk from any construction activities, particularly around drainage, irrigation open channels or rivers/streams. Particularly from eroded soil during digging, laying and backfilling of tranches, any dismantling of the existing systems, site clearing and cleaning of the existing system.

329. Pollution in the construction and operation phases may also occur from (i) oil spills/leakages from the equipment, vehicles or other machinery operating in the project areas; (ii) improper management of domestic waters, operation of faulty systems of their drainage/discharge or collection; (iii) improper management of the construction materials and waste causing runoff into water resources.

330. Overall, this impact is temporary and mitigatable; to protect water resources the following mitigation measures should be in place:

- Control of the good technical state of the construction equipment to prevent the leakage of fuel and oils;
- Equipping the fuelling stations with a hermetic body and secondary protective casing;
- Use of technically non-faulty construction equipment and vehicles;
- All equipment running on fuel shall be placed in a secondary tank. The volume of the secondary tank must be at least 110% of the fuel volume used by the equipment.
- Control over the separate collection and timely removal of construction and household waste,
- Control of wastewater used to clean and rehabilitate the canals.
- Control of the state of collection and removal of domestic and faecal waters.
- Control over the compliance with the rules of storage and use of oil products and oils and providing anti-spill kits on job sites.
- Installation of oil products and oil storage facilities at least 100 m away from water bodies.
- Conducting training for the Construction Contractor and Client’s personnel.
- Development and implementation of the emergency response plan envisaging emergency actions for such cases of pollution as leaks and spills. The given plan will be updated periodically, incidents will be analysed, and additional preventive measures will be included in it.
- Staff briefing before and after the construction works, once every six months.
- Develop a camp management plan and ensure it covers any risk of pollution.

8. Waste Management

331. There will be a lot of construction waste produced as part of the construction works and domestic waste from the workers. This will include concrete, rubble, soil, dredged sediment, encroached vegetation and soil. Depending on the final design, there may be waste from any channels or pipes from Area 1 that will require disposal.

332. This waste has the potential to pollute the soil and water if incorrectly managed. This can include polluting the soils, canals and eventually the Iori River, which is transboundary.

333. As such the following mitigation practices are required:

- Good siting and storage of materials and soil to prevent run-off
- Waste management plan outlining each type of waste that will be produced and how it will be safely stored, how its transported, and where and how it's disposed of.
- All waste removed from sites as part of site clean up
- Reuse and recycling of waste as much as possible
- Appropriate storage and transportation of waste
- Good international practices in regard to waste disposal
- Portable or constructed toilets with storage must be provided on-site for construction workers if services are not available locally, and must be emptied in an appropriate manner
- Appropriate disposal of wastewater
- Develop a waste management plan and ensure an appropriate person is responsible for waste management in the construction contractor.

334. As part of Georgian legislation, a named person from the contract will need to be responsible for waste management.

9. Visual-Landscape Impacts

335. Impacts on the local landscape are related to the preparatory and construction works, during which the vegetation cover will be removed, trenches dug, material spoil heaps present, etc. When evaluating the impact on the landscape, the value and degree of naturalness of the area in question, and the area of the specific type of landscape to damage should be considered.

336. The visual-landscape impacts in the construction phase are expected around any construction camps. As already mentioned, at this stage, the territory of the project camp is not specified. However, the visual impact of the camp is temporary, as after the construction, the camp will be dismantled, and the area will be fully restored.

337. The night lighting of the camp will be another reason for a significant negative impact in the construction phase, and therefore, it will be necessary to implement efficient mitigation measures.

338. By considering the above-mentioned, it should be said that the construction works will not cause pressure on the unique type of landscape. Rather, a part of the landscape established under the anthropogenic impact will be worked on, the analogue of which can be found in the surrounding area of several hundred hectares.

339. The impacts on the visual and landscape are temporary as they can be restored after the works, through several mitigation measures:

- Fencing the perimeter of the construction camp.
- Minimizing the area of impact of the construction works and associated zones to the extent possible.
- Backfilling, reinforcing and compacting all excavated trenches as soon as possible; levelling surfaces and slopes, and if necessary, using the slope stabilization method.
- Proper management of waste and materials, adhering to the sanitary conditions, and timely waste removal from the territory.
- Proper planning and control of night lighting in the working areas to avoid bright illumination and light pollution. Light propagation in the surrounding area should be

limited as much as possible, especially in the direction of the Korughi Protected Area, other protected areas and the sky.
- Strictly following the vehicle and machinery travelling routes.
- After completion of the construction works, conducting restoration works in the temporarily used areas.

10. Loss of Access, Encroachment and Resettlement of Farmland

340. Resettlement is an issue for Area 1. According to the preliminary design, the project will affect 1,243 plots of land covering 173,000m^3, most of which are privately owned. 65-70% of the affected plots are planted with perennial crops (mainly vineyards). In some cases, it may involve the removal of on-farm irrigation systems and affect auxiliary structures, which are used for agricultural purposes (shed, etc.) and power transmission towers. Local livestock also uses open channels to drink.

341. The project will not affect residential houses, as most of the said land plots are used for agricultural purposes. All plots in Area 1 have access roads, however, these are mostly dirt tracks which are used for agricultural machinery and may not all be appropriate for heavy machinery. Until detailed design, the extent of this issue is unclear.

342. As such a LARP has been produced and resettlement surveys are being undertaken to understand the extent. Some of the work can also cause a temporary loss of access to land which would affect crop growing that year. On top of this works within the area could impact crop growth. For these cases, affected parties need to be consulted and disruption to their access will need to be limited as much as possible.

343. Resettlement will be limited as much as feasible, consultation will occur periodically, and appropriate compensation measures will be provided to unavoidable resettlement. These issues and mitigation measures will be more clearly highlighted within the LARP and resettlement documents.

344. As part of this communities will need to be regularly engaged and this should be outlined through Community Awareness and Participation Plan.

11. Health and Safety

345. Construction may cause noise, vibration, water and air emissions, handle heavy materials, vehicle and machinery hazards, falls, water and similar hazards. The will be a variety of risks throughout the project and typical for any construction project of this kind.

346. There is also a risk to the public from vehicles travelling to and from the site and from entry to the site (whether authorised or unauthorised).

347. An increase in the number of workers within an area will always bring the potential for negative social interactions with the community and the risk of transmitting diseases (communicable and sexually transmitted diseases). This level of risk will be linked to if and where any construction camps are located.

348. For this good international practice will be enforced and the following mitigation measures will include:

- Access and use of PPE and first aid equipment

- Health and Safety Plan, including first aid, emergency procedures, training, PPE, labelling and more will be developed and implemented throughout the project
- Accident recording and reporting system maintained until handover to the GA
- Sanitary facilities provided to the workers
- Safe areas for breaks provided
- Training and awareness of health and safety measures among workers
- Person(s) on site that are fully trained in first aid
- Clear demarcation and preventing access to unauthorised personnel
- Good international practices for water, air, noise, vibration and dust management.
- Community Awareness and Participation Plan and GRM – will support community engagement to identify and manage any issues.

12. Traffic

349. During construction, there will be a higher than normal amount of traffic along the main Tbilisi-Bakurtsikhe Highway and smaller roads to access the construction area. As per the preliminary design, the movement of heavy equipment is mainly expected during the transportation of the construction materials, excavation of trenches and subsequent backfilling of trenches; besides, the movement of heavy machinery across the project area is expected during the disassembly of the existing concrete open channels and their transportation to the landfill.

350. The project may need to install traffic control measures which would cause disruption to those travelling along the route. This will unlikely be needed along the Tbilisi-Bakurtsikhe Highway however, this is likely that the roads will be partially or fully blocked at points during the works.

351. A detailed traffic management plan will need to be in place before works starts. This should detail traffic management procedures such as routes, timings, speed limitations and vehicle maintenance to prevent the impacts above. The traffic management plan will need to be agreed upon with the local police department.

352. If access roads will be closed, then the surrounding landowners will need to be notified in a timely manner prior to the works closing; including details of the time closed, where exactly and the GRM.

13. Asbestos

353. There is meant to be 140m of asbestos pipe across the project and prior to detailed design, the extent of the risks within Area 1 is unclear. Old pipes are currently planned to be left in the ground, which will minimise any disturbance.

354. The asbestos containing pipe (~25m long) from the outlet in Main Canal is generally in good condition. However, for the cleaning of the outlet or if pipes require removal, asbestos becomes a risk.

355. If this work cannot avoid the disposal of old pipes or disturbance of existing pipes then:

- An asbestos specialist should be contracted prior to construction works;
- An asbestos management plan should be developed, outlining health and safety measures and waste management measures needed to ensure the safe management of the material.

E. Operational Impact

356. There will be no permanent source of noise, vibration or harmful substance emission in the operation phase.

1. Health and safety risks to the community

357. For the main canal, there is always a risk of people falling in and injured or drowning in the water. This was a risk before the project, during construction and operation. This needs to be managed to minimise this risk.

2. Temporary Impacts during Maintenance and Repairs

358. In the project operation phase, an impact on the water resources, soil, visual landscape, emissions, dust, noise and vibration is possible only during the rehabilitation and repair works. The given impact will be local and short.

359. There is a high amount of suspended sediment within the river originating upstream from two burrow pits, during operation, the canal will need to be occasionally cleaned and the pipe may need to be flushed as part of general maintenance. This will likely exacerbate the issue of high suspended sediments. When this occurs, one alternative is to time the works to ensure that it will not increase the suspended sediments above legal limits and will prevent impacts on downstream biodiversity.

360. Without flushing, the pipes will be blocked by suspended sediment which will require removal and disposal. Waste from sediments needs to be safely and legally disposed of.

361. General good construction practices are required, with good health and safety practices and appropriate management of material and waste including considerate transportation, covering of loose material, separate storage for waste etc.

3. Climate Change and Natural Disaster

362. Replacing canals with pipes reduce evapotranspiration, which may have effects on the local weather.

363. Changes to precipitation, snowfall, glaciers and snow and glacier melt change the availability of water within the Iori. . The water availability is expected to worsen after 2040 at the same time water demand is expected to increase. Glacier meltdown until 2160 will yield abundant waters and may present problems in terms of erosion and floods in irrigation infrastructure, waterways and drainage outlets. This may also lead to insufficient environmental flow which is important to biodiversity and can lower the water quality within the river basin.

364. This project was designed with climate resilience in mind however these risks are some that GA should be aware of.

4. Induced impacts

365. The project can cause induced impacts from improvements of the system and expansion of the area irrigated. This includes

- Soil and water pollution from increased fertiliser and other agricultural chemicals use results in an increase in the risk of soil contamination and water pollution from fertilizers and pesticides. This is caused by a lack of awareness among farmers regarding the use of pesticides and fertilizers. Georgia on average uses 152.96 kg per ha which is 57th highest in pesticide.
- Increase groundwater levels in the project area from excessive irrigation and if water leaks occur.
- Inefficient water uses and increasing demand for water.
- Replacing open channels with pipes provides wildlife with less drinking water within the project area.

366. To mitigate this, as part of any training to farmers, under Output 3 and any future training provided to the farmers by the GA, if appropriate, should incorporate sustainable use of water and appropriate use of fertilizer and pesticides.

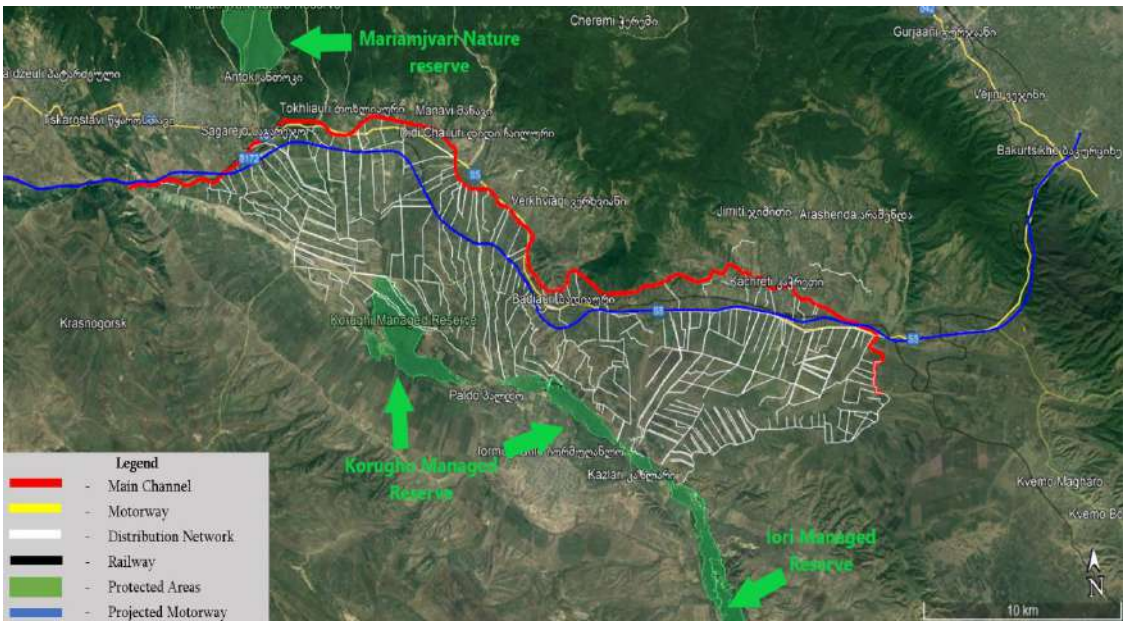
367. There is also a risk of conversion of land to agriculture as farmers would be drawn to a well-running irrigation system. This may, in turn, may lead to the conversion of the existing forests to use the lands for agricultural use. However, it should be noted that most of the land is already agricultural, with windbreaks and trees running along boundaries, which limits this issue.

F. Cumulative Impact

1. Tbilisi-Sagarejo-Bakurtsikhe Rehabilitation

368. On the territory of Lower Samgori Irrigation Channel of Samgori Irrigation System, the Roads Department of Georgia plans to rehabilitate/build the existing Tbilisi-Sagarejo-Bakurtsikhe roads nearly at the same time. The project road buffer virtually crosses the project zone of the Lower Samgori irrigation channels of the Samgori irrigation system (Figure 34).

Figure 34: Tbilisi-Bakurtsikhe Road Section in Kvemo Samgori[104]



[104] Source: Produced for IEE by TA-6648 GEO Environmental Consultants

369. An environmental impact assessment (EIA)[105] was prepared within the scope of the Tbilisi-Bakurtsikhe Road rehabilitation project (part of the Kakheti Connectivity Improvement Project). This document is approved by the Ministry of Environment Protection and Agriculture of Georgia, as well as by the European Investment Bank.

370. Consequently, the rehabilitation of Lower Samgori irrigation channels of the Samgori irrigation system and the implementation of the Tbilisi-Bakurtsikhe Road project are planned around the same time.

371. Road construction can also cause noise, vibration, dust, traffic congestion and air pollution impacts. Package 1 - Main Canal does not cross or enter into the buffer zone of the main road, with the closest distance between the canal and the road being about 700m. The northern border of Area 1 borders/crosses this road, together the noise, vibration, dust and air pollution of works could lead to an unacceptable risk, particularly the closest village, Badiauri (~450m from Area 1 and the road runs through it).

372. The road project could also cause access issues to our project as the road may be closed, and this could impact the timings of our work. Good coordination and communication will be important to prevent this.

2. Environmental Flow

373. There are many demands on the Iori river's water resources, the key demands are Paldo headworks for the Zemo Samgori irrigation system, the Kvemo Samgori irrigation system, Dalis Mta Reservior and the environmental flow. All works associated with this project will not increase water take, however, if the water resources within the Iori river decrease due to climate change or increased demand for Zemo then a high percentage may be required for environmental flow. This should continue to be centrally managed.

[105] Executive Summary of the Environmental and Social Impact Assessment (ESIA) for Construction and Operation of the Sagarejo-Bakurtsikhe Highway section

VII. ANALYSIS OF ALTERNATIVES

374. One of the objectives of an IEE is to investigate alternatives to the Project. In relation to a proposed activity, “alternatives” means different ways of meeting the general purposes and requirements of the proposed activity. The following section provides an assessment of alternative alignments as well as the ‘No-Project’ alternative.

375. An environmental and social expert was engaged in the development of the preliminary design right from the outset. Consequently, several alternatives were considered prior to the development of the preliminary design, namely: (i) ‘No Project’ Alternative; (ii) project selection, and (iii) design. As this is existing infrastructure there are limited options for different or new alignments that are feasible alternatives.

A. ‘No Project’ Alternative

376. Effective irrigation and drainage services are vital components of vibrant Georgian agriculture. In the 1980s, nearly half a million hectares of Georgian farmland was equipped for irrigation. Today irrigated area has shrunk to less than a fifth of that, and the actually irrigated area in 2015 was only 43,000 hectares. Alongside that shrinkage, agricultural production and productivity have fallen dramatically. Between 2000 and 2010, the production of annual crops declined by 44%, while the output of perennial crops fell by 10%. With a handful of exceptions, yields for major crops are well below those of neighbouring countries.

377. Currently, the Kvemo Samgori irrigation system is in need of modernisation; water is being inequitably distributed and the system has high water loss. This is due to issues with operation and maintenance. In 2020, the total area of signed contracts with the GA for the Kvemo Samgori Left Main Canal System was 2,227.15 (15.5% of the area of the Left Main Canal).

378. This issue is and will be exacerbated by climate change's effects on the water resources available within the area. Without the project, the system will further deteriorate having a negative effect on agriculture within the area. The project has several advantages listed below:

(i) Modernisation of the irrigation systems is a priority for the Government of Georgia and is envisaged by the ADB Country Partnership Strategy document: "Georgia, 2019–2023 - Developing Caucasus’s Gateway to the World”.
(ii) Improve equitably water distribution
(iii) High water loss within the current system
(iv) Without repairs and/or modernisation part of the system in part will fail
(v) With other parts of the system rehabilitated separate from the project, without this project previous activities can be seen as lost investments
(vi) The project is being designed to be climate-resilient.
(vii) Improved understanding of the water and the irrigated area will lead to improved monitoring, operation and maintenance.
(viii) The project generally supports the GA plan to move to a tariff based on water used will lead to improvement in sustainable water use and a fairer financial system.
(ix) More equitable distribution and better monitoring will also be able to identify areas of excessive water use, and the related fertilisers and pesticide runoff that can be caused and as such this can support the prevention of this issue.

379. This in general is affecting the agricultural output, productivity and income. Most farming households cannot rely on the income from their farms, as seen by the high number

that need second jobs, this is an issue regarding the sustainability of farming within the region. More efficient systems and equitable distribution of water will help improve the socio-economic situation by leading to a greater area being covered by the same amount of water taken and increasing the agricultural output per water used.

B. Project Selection

380. The ideas were selected based on what will provide the greatest benefit well ensuring no excessive impacts on protected areas and cultural resources. The area close to the headway has already been rehabilitated and therefore was ruled out early on. It was also decided that no work would be undertaken within the protected areas that border the project. This was to prevent any unacceptable impacts on biodiversity.

381. The subject selection also considered the location of cultural resources. The cultural site in Area 1 is not part of the net irrigation area, the secondary and tertiary canals currently are located close to the sites. Impacts should be mitigated, with no residual or permanent impacts on them. The design will consider the asset to ensure that they will not impact these two sites.

C. Design

1. Area 1 - Channel v Pipes

382. The existing main channels and secondary channels are open channels, concrete channels are above the ground. Two alternatives were considered in the preliminary design phase: (i) the rehabilitation and/or restoration of the existing above-ground concrete channels, and (ii) the replacement of the secondary concrete channels with PVC pipes to lay 1.5 m deep in the ground.

383. Open channels are easier to repair, rehabilitate and clean and provide a water source for fauna. Removal of the canals will also create a lot of waste.

384. The pipeline will lead to less water loss from both evapotranspiration and fewer illegal connections, improves the ease of the control of the water and monitoring, less land footprint, no risk of injury from the community or fauna falling in, and more easily be routed along preferable routes (less resettlement, more ease at avoiding of cultural and environmental features), not limited by terrain, avoids fragmentation of land and less of visual footprint. This will also reduce the issue of encroachment that is currently affecting the canals, as vegetation has taken over and badly damaged part of the current system which reduces the efficiency of the system.

385. Overall, pipes were selected due to the water efficiency benefits they bring.

VIII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

386. One of the main goals of the IEE is to facilitate the participation of all stakeholders and local communities at all stages of the project cycle: from the pre-construction phase and construction activities to its operation. In this regard, public consultations were held in Sagarejo to capture the stakeholders' opinions about the project, and agree on the project activities.

387. Initial consultations with stakeholders have been undertaken, meeting with representatives of the community. After the draft IEE has been disclosed and during the development of Area 1's detailed design, public consultation should be undertaken.

A. Initial Consultations

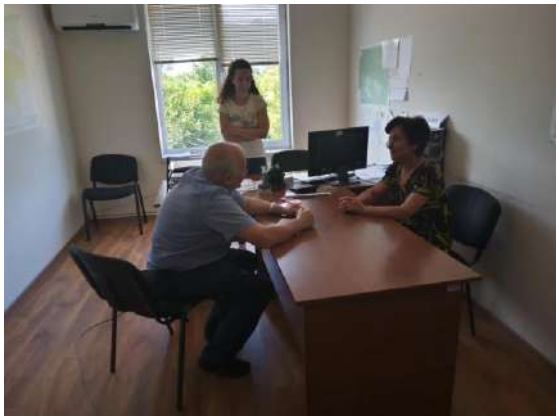
388. Aiming at organizing an information campaign within the scope of the Kvemo Samgori Left Main Canal Irrigation Scheme, the Consultant's social group prepared an information leaflet.

389. Prior to the onset of the information campaign, the concerned parties and legal and private entities were identified on whom project implementation would or could have a positive or negative impact. The concerned parties were represented by the representatives of the local authorities, non-governmental sector and local population, who live or run businesses in the project zone or adjacent to it. The local population along the given project area section ran both, legal and illegal businesses receiving certain profits.

390. In June 2022, the Consultant's social group met with the representatives of both, non-governmental and governmental local self-government authorities. The goal of the meeting was to communicate the details, goals and objectives of the planned project to the representatives of the local authorities and learn about their views and expectations in respect of the project.

391. Meetings were held with Mr Paata Asratashvili, the Mayor of the city of Sagarejo, Mr Alex Gilashvili, the First Mayor deputy, Mr Rostom Bakradze, the Head of the Department of City Hall Infrastructure and Spatial Planning and Mr Nikoloz Digmelashvili, the Head of the Coordination Department of local Mayor Attorney (See Figure 35).

Figure 35: Meetings at Sagarejo Municipality and Georgian Amelioration Sagaredjo Office



392. At the meetings, the representatives of the local self-governing bodies showed full support for the project. In their opinion, this project will promote the development of the region, will support agriculture, which is one of the leading branches in the region and will help increase the budget consequently. All these benefits will have a positive impact on the youth of the region and will reduce migration, which is one of the major problems of Sagerejo and Gurjaani municipalities today.

393. In addition, the representatives of the self-governing bodies stated their wish to engage the local population in the construction works to the extent possible. At the project planning and implementation stages, in their opinion, major attention must be paid to the following issues:

- The expected negative project impact on the population must be studied in detail and a fair compensation plan must be developed.
- To the extent possible, the population must be informed about the current project and the population must be given a clear understanding of the advantages of the project.
- The local workers must be employed to the extent possible at the project implementation stage.
- The women's wishes and expectations are desirable to study on their own at the project implementation stage.

394. As per the primary plan developed by the Consultant during the implementation of the information campaign, the meetings were to be held in the villages, which were to be crossed by the project area or where the project area is located near a village or a settled area. After the meetings, it was decided that the information campaign would be given on a larger scale and the information would be disseminated among more people, particularly among the women living in the region. It was also decided to try and find additional ways to receive information from them.

395. Within the prepared information campaign, the Consultation Company held some additional meetings in the villages and settled areas adjacent o the project zone. Within the scope of the said campaign, not only the population was informed about the planned activities, but information about the population's opinions and wishes was gathered as well. Going forward, a stakeholder engagement plan (SEP) shall be developed and implemented by MEPA prior to the start of civil works. MEPA shall ensure that the SEP includes the most effective methods to disseminate project information and it is gender inclusive and tailored to the needs of the disadvantaged and vulnerable.

396. As per the information gathered as a result of the held information campaign, the following mitigation measures and recommendations were developed related to social issues within the scope of the project.

397. Regarding the employment of the local staff, the following requirements are to be envisaged in the contract to be concluded with the construction Contractor: (i) in case of equal qualification, advantage should be given to the local staff for employment purposes within the scope of the project, and (ii) 70% of the non-qualified labour should be the local staff.

398. The population has a great desire to have irrigation water supplied to their homes. At this stage, they use drinking water for irrigation, which is associated with large costs;

B. Future Public Consultation

1. Requirements

399. It is one of the main principles of ADB SPS, 2009 to carry out meaningful consultation with affected people and facilitate their informed participation. It defines meaningful consultation as “a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender-inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision makings, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues”. For category B subprojects under CSISDP, at least one consultation shall be conducted when the draft IEEs have been prepared, to inform stakeholders about the project, its potential impacts and likely mitigation.

2. Objectives of Consultations

400. Stakeholder engagement (including consultation and the disclosure of information) is a key element of project planning, development, and implementation. Effective stakeholder engagement assists good design, builds strong relationships with local communities, and reduces the potential for delays through the early identification of issues to be addressed as a project progresses. The objectives of these consultations are:

- To inform and educate the common public, especially potentially impacted communities/ individuals and stakeholders about the proposed project activities;
- To familiarize the people with technical, environmental, social, and economic issues of the project for better understanding;
- To solicit the opinion of the affected communities/ individuals on environmental issues and assess the significance of impacts due to the proposed development;
- To foster cooperation among the staff of MEPA and the PIU, the communities, and the stakeholders to achieve a cordial working relationship for the smooth implementation of the project;
- To identify the environmental issues relating to the bridge and approach roads construction work;
- Assess the views of the beneficiary communities and their willingness to participate in the project in a bottom-up planning and decision-making process;
- To secure people’s inputs in respect of project planning, selection of mitigation measures, and monitoring strategies; and

- To ensure the lessening of public resistance to change by providing them with a platform in the decision-making process.

3. Methodology used for Consultations

401. The MEPA are committed to transparent and respectful dialogue with stakeholders throughout the lifecycle of the project. The approach to stakeholder engagement adopted by the IA should be in line with Good International Industry Practice for IEE and should ensure that all stakeholders with an interest in the Project have been identified and consulted.

402. Stakeholder engagement should include:

- The provision of relevant, timely, and accessible information to stakeholders in a culturally appropriate and understandable format;
- Consultation with stakeholders on their opinions, concerns, preferences and perceived gains and risks with respect to the project planning and implementation, including the design and proposed management and mitigation measures to reduce potential impacts and to enhance possible benefits; and
- A grievance mechanism to guide the response and resolution process for stakeholder concerns or grievances.

403. The stakeholder engagement approach should be focused on:

- National and good international practice requirements for public consultation and disclosure that the company will conform to;
- Identifying project stakeholders;
- Strategy, format, and timetable for consultation and information disclosure from the design phase through to the operation phase;
- The PIU's resources and management structure for developing and implementing the stakeholder engagement activities;
- Grievance mechanism(s) for stakeholders; and
- Means of reporting on consultation and disclosure activities.

404. **Resources and responsibilities.** The PIU will take overall responsibility for consultation with all stakeholders in relation to the Project and will use available resources to ensure that all consultation activities are conducted to the appropriate standard. However, the design consultants safeguarding team should organise the public consultation before the final design and incorporate comments into the final IEE and the construction contractor leads any meetings required during construction.

405. **Monitoring and reporting.** It is important to monitor stakeholder engagement to ensure that consultation and disclosure efforts are effective, and in particular that stakeholders have been meaningfully consulted throughout the process. Monitoring will include:

- monitoring consultation activities conducted with government authorities and non-governmental stakeholders;
- monitoring the effectiveness of the engagement processes in managing impacts and expectations by tracking feedback received from engagement activities and recording and tracking commitments made to stakeholders; and
- monitoring any grievances received and their resolution.

406. The stakeholder engagement process will be revised and updated as needed and appropriate during the construction phase of the project.

C. Information Disclosure

407. According to ADB SPS 2009 requirements, environmental information on the project will be disclosed as follows:

- the domestic EIA reports are available for review on the IA/PIU's website. The electronic copies of the mentioned reports will remain in the public domain up to the completion of the construction phase.
- this current IEE will be disclosed on ADB's website prior to Management's consideration of the financing requests for the Project. Any further updates to the IEE will also be disclosed.
- Hard copies of the project IEE report will be made available upon request; and
- during implementation, semi-annual monitoring reports on compliance with the IEE and EMP will be disclosed on ADB's website.

408. With regards to information disclosure, ADB is committed to working with IA (GA) to ensure that relevant information (whether positive or negative) about social and environmental safeguard issues is made available in a timely manner, in an accessible place, and in a form and language(s) understandable to affected people and other stakeholders, including the general public, so they can provide meaningful inputs into project design and implementation.

409. In compliance with ADB's SPS (2009), the draft IEE will be provided for disclosure on the ADB, MEPA and (if possible) GA Websites (in the local language).

410. The IA will be responsible for notifying and informing the public of construction operations prior to construction works and publish an emergency response plan. During operation, information about any maintenance (location, type of maintenance required, etc.) will be communicated to the stakeholders by GA through established procedures.

411. Periodic Public information campaigns via different communication channels, to explain the project details to a wider population will be conducted in cooperation with local self-government bodies. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future plans. Prior to the start of construction, the PIU will issue notification on the start date of implementation in information banners placed at public places (pharmacies, public transport, markets, construction sites). A board showing the details of the project will be displayed at the construction site for the information of the public.

IX. GRIEVANCE REDRESS MECHANISM

412. A project specific grievance redress mechanism (GRM) will be established to receive, evaluate, and facilitate the resolution of AP's concerns, complaints, and grievances about the social and environmental performance at the level of the project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. A grievance redress mechanism (GRM) constitutes a formalized system of accepting, assessing and resolving/ addressing community feedback or complaints. It provides predictable, transparent, and credible processes to all parties, resulting in outcomes that are relatively low cost, fair, and effective. GRMs build on trust as an integral component and facilitate corrective action and pre-emptive engagement. They also set out a timeframe for the resolution of complaints. The GRM should be established and operated in compliance with Georgian legislation and ADB's Safeguard Policy Statement (SPS) 2009 requirements.

413. ADB's SPS requires the borrower/client to establish a GRM (Refer Annex 7 for a sample grievance registration form) to receive and facilitate the resolution of complaints related to the project. As per SPS 2009, the borrower/client is required to establish a mechanism to receive and facilitate the resolution of affected persons' concerns and grievances related to project impacts, paying particular attention to the impacts on vulnerable groups. The GRM should be scaled to the risks and adverse impacts of the project. It should address affected persons' concerns and complaints promptly, using an understandable and transparent process that is gender-responsive, culturally appropriate, and readily accessible to the affected persons at no cost and without retribution. The mechanism should not impede access to the country's judicial or administrative remedies. The borrower/client is required to inform the project-affected persons about the GRM.

414. At the national level, the Administrative Code of Georgia is the primary legislation defining the rules and procedures for grievance review and resolution. According to this law, the administrative body receiving officially lodged claims is obliged to review the claims, engage the claimant in the grievance review and resolution process, and make the final decision in the resolution of the claim/ complaint. Clause 181 defines the content and the grievance submission forms. In particular, the grievance package should include:

(i) Name of the administrative body to whom the complaints are addressed;
(ii) Name, address and contact details of the claimant;
(iii) Name of the administrative body, whose decisions or administrative acts are the subject of the complaint;
(iv) Name of the administrative act or decision, which is subject to complain
(v) Content of the claim;
(vi) The context and facts, based on which the complaint is substantiated; and
(vii) List of attachments.

415. Clauses 194 and 198 define the rules and procedures ensuring the participation of the claimants in the grievance review process. According to clause 202, the decision issued by the Administrative Body in relation to the reviewed claim has the status of the individual administrative legal act. The standard period given for the issuance of the decision in relation to the grievance is one month.

A. GRM, Grievance Redress Committee and Grievance Focal Persons.

416. The GRM consists of project-specific systems established at the municipal level and a regular system established at the PIU. The grievance redress committee (GRCE) will be

established at the municipal level as a project-specific instrument, functional for the whole period of the project implementation. The grievance redress commission (GRC) is formed as an informal structure within the PIU to ensure grievance review, resolution, and record.

417. A GRCE will be formed to administer project-specific grievances, exercise the grievance redress mechanism and handle grievances at Stage 1 of the GRM. The GRCE is the first-instance body to be established at the community level in each affected Municipality (village/community authority). The PIU through an environmental safeguards specialist of the PIC shall coordinate the GRCE formation. He/she will then be responsible for the coordination of GRC activities and organizing meetings (convener). In addition, GRCE shall comprise village Rtsmunebuli or his/her representative, representatives of appointed persons (APs), women APs and appropriate local NGOs to allow the voices of the affected communities to be heard and ensure a participatory decision-making process.

(i) The GRM is formed by the order of the head of PIU as a permanently functional structure, engaging personnel of the Implementing Agency (IA), in this case, the Ministry of Environmental Protection and Agriculture (MEPA), from all departments having regard to environmental safeguard and land acquisition and resettlement issues and complaint resolution. MEPA representative, PIU management representative and other relevant persons. The GRM is involved in Stage 2 of the grievance resolution process. The order shall also state that, if necessary, representatives of local authorities, NGOs, auditors, APs and any other persons or entities can be included in the Commission as its members.
(ii) GRCEs will be established at the community level with PIU order and the following composition: Environmental and social safeguards specialists of design and PIC, Gamgebeli – concerned Gamgeoba (village level), representatives of civil works contractor, NGO representative, APs representative, acting as grievance focal person (GFPs).

418. Environmental specialists of the PIC should coordinate the work of the Committee and at the same time, s/he is nominated as a contact person for collecting the grievances and handling the grievance log. The local authorities at the municipal level, contractors, as well as APs (through informal meetings), are informed about the contact person and his contact details are available in the offices of all mentioned stakeholders.

419. The PIC will assist the project-affected communities/villages identify local representatives to act as GFPs. The GFPs will be responsible for (i) acting as community representatives in formal meetings between the project team and the local community s/he represents; (ii) communicating the community members' grievances and concerns to the contractor during project implementation.

420. A pre-mobilization public consultation meeting will be convened by the PIU and will be attended by the GFPs, representatives of the contractor(s) and other interested parties (e.g., district-level representatives, NGOs, etc. The objectives of the meeting will be as follows:

(iii) Introduction of key personnel of each stakeholder including roles and responsibilities;
(iv) Presentation of project information of immediate concern to the communities by the contractor (timing and location of specific construction activities, design issues, access constraints etc.) This will include a summary of the EMP, its purpose and implementation arrangements;
(v) Establishment and clarification of the GRM to be implemented during project implementation including proactive public relations activities proposed by the project team ensures that communities are continually advised of project

progress and associated constraints throughout the project implementation period; and

(vi) Elicit and address the immediate concerns of the community based on the information provided above.

421. In the operational stage, complaints will be resolved at GRCE level.

B. Project Grievance Redressed Process

422. During the actual operationalization of the GRM, the process and communication flows will be centred with the GRM coordinator. The GRM coordinator will take initiative to be observant of any issue and will try to obtain information, which will be used in the subsequent GRM process stages. Under normal processing through the GRM, complaints undergo four major procedural stages as follows:

1. Stage I: Registration and Initial Assessment.

423. This is the entry point of complaint wherein the complainant can tell his or her side of the issue and be assured that his grievance will be seriously and expeditiously dealt with. The following are the tasks in this stage:

(i) **Receive Grievance:** This task will entail listening intently to the source of the complaint, filling out the complaint form and registering the complaint in a GRM registry book, and assigning a GRM reference number. The complainant or representative shall affix a signature and provide contact particulars on the complaint form. Important information shall be entered in the complaint form, which can be supplemented by additional documents. An example form is included in Annex 7.

(ii) **Obtain Comprehensive Information:** The GRM coordinator will mobilize some staff to obtain as much information as possible from the location where the complaint originated, the impact area and the outlying areas. Field information will be gathered using necessary survey methodologies, equipment and devices. Interviews shall be conducted directly from the field to have an actual appreciation of the nature of the complaint and to obtain other versions of the issue. It would be necessary to talk and discuss with as many people as possible who have direct and indirect knowledge of the problem. Photographs and videos shall be obtained, which can be used later in the analysis of the problem. Secondary backup information shall also be acquired to determine background information and cross-reference it with other sources of information.

(iii) **Screen and Assess:** After gathering all the available and obtainable information, the GRM coordinator with the support of the staff shall analyze the complaint and determine the admissible information. The team will render an opinion on whether the complaint is project related or not and provide justifications for such opinion. The findings shall be communicated to the complainant upon which, in case of disagreement, supplementary information may have to be provided by the complainant.

2. Stage II: Initial Resolution.

424. Based on the opinions of the screening and upon presentation of additional documentary evidence by the complainant, the GRM coordinator will direct the complaint to one of the following options:

(i) **Refer to appropriate authorities:** If the issue is not relevant to the project, the GRM coordinator will refer the issue to the appropriate competent office and explain to the complainant the reasons. S/he will advise the complainant on what to do and provide contact particulars to that appropriate office if available. Primarily, these can be the MOEPA, local authorities or the local court in the district or region that has jurisdiction on the issue. Also, if available and possible s/he can refer the complainant to some people who can be of good help (e.g., NGOs). After these steps, the matter will be considered closed and a resolution acceptance form will be issued for the acceptance and signature of the complainant. Relevant information regarding the resolved complaint shall be gathered and a cross entry shall be entered in the GRM registry book.

(ii) **Resolve within the project:** If the complaint is found to be project related, the contractor/s will be given a directive to resolve the matter. It would be necessary to have a meeting with the contractor/s' project manager regarding the issue. The meeting will entail the determination of the most preferred options, which will be part of the next stage of the GRM process.

(iii) **Reject the complaint with a clear explanation:** When in the opinion of the committee complaint is not project related, it is rejected and such a decision will be communicated to the complainant, after which the matter will be considered closed and all relevant information shall form part of the archived information.

3. Stage III: Selection of Approach and Strategy.

425. At this stage, the complaint will be accepted and agreed upon on the proper approach and strategy for its resolution. Depending on the gravity of the situation and the complaint the GRM has the following options:

426. **Contractor/s recommend solution:** In this approach, as in most cases, the contractor shall decide on the technical solution to the issue and implement the measure/s. This seems straightforward especially if this is within the scope and obligations of the contract. Some contractual issues may arise pertaining to cost and payment considerations, but this can be decided by the contractor. After the due decision is made on the division of scope and responsibility, the GRM coordinator will oversee the implementation of the resolution or measures and report to the PIU. The progress of the execution of works is documented with periodic reporting to PIU. The complainant is also apprised of the progress of the work for the better attainment of results and improved effectiveness of the measures.

427. **Complainant joint solution:** In some cases, the cooperation and collaborative effort of the complainant are necessary to provide some avenues to facilitate the devising of a solution. It is a good strategy to involve the complainant in the problem-solving process as it can generate cooperation.

428. **Third-party arbitration:** In complicated matters where the complainant is reluctant to work directly with the contractor, the complaint can be elevated for arbitration. This may not be an easy approach as the project will have to organize and set up an arbitrating party, perceived as impartial, to execute the process. Nevertheless, this can still be pursued if both the contractor and the complainant agree to use this approach.

429. **Local conflict resolution:** These may be through the local courts, the council of elders in the village, the appointed head of the local municipality, etc. Issues may be discussed through these avenues, and with the participation of the contractor, consensus can be arrived at for the benefit of those affected directly and indirectly.

4. Stage IV: Execution of Measures and Documentation.

430. At this stage, the agreed solution or measures are implemented by the contractor under the supervision of the PIC firm and tracked by the GRM coordinator for documentary purposes.

(i) **Execute solution:** The execution of the solution will entail the engagement of the contractor and his staff. Designs or schemes will be agreed upon and are to be checked by the staff as part of their facilitation tasks. Equipment and materials will be employed, and work will be performed by the contractor and supervised by the PIC.
(ii) **Document the progress:** The GRM coordinator will undertake full documentation of the work, and shall also include designs and schemes, costing, and photographs of the work (before, during and after), which will form part of the progress reporting and documentation archive of the GRM.

431. At this stage, the complainant may either be satisfied or not satisfied, and the issue persists. The following pathways ensure in each of the cases: If the issue is deemed to be resolved satisfactorily, the grievance is considered 'Resolved' and two more tasks are to be accomplished:

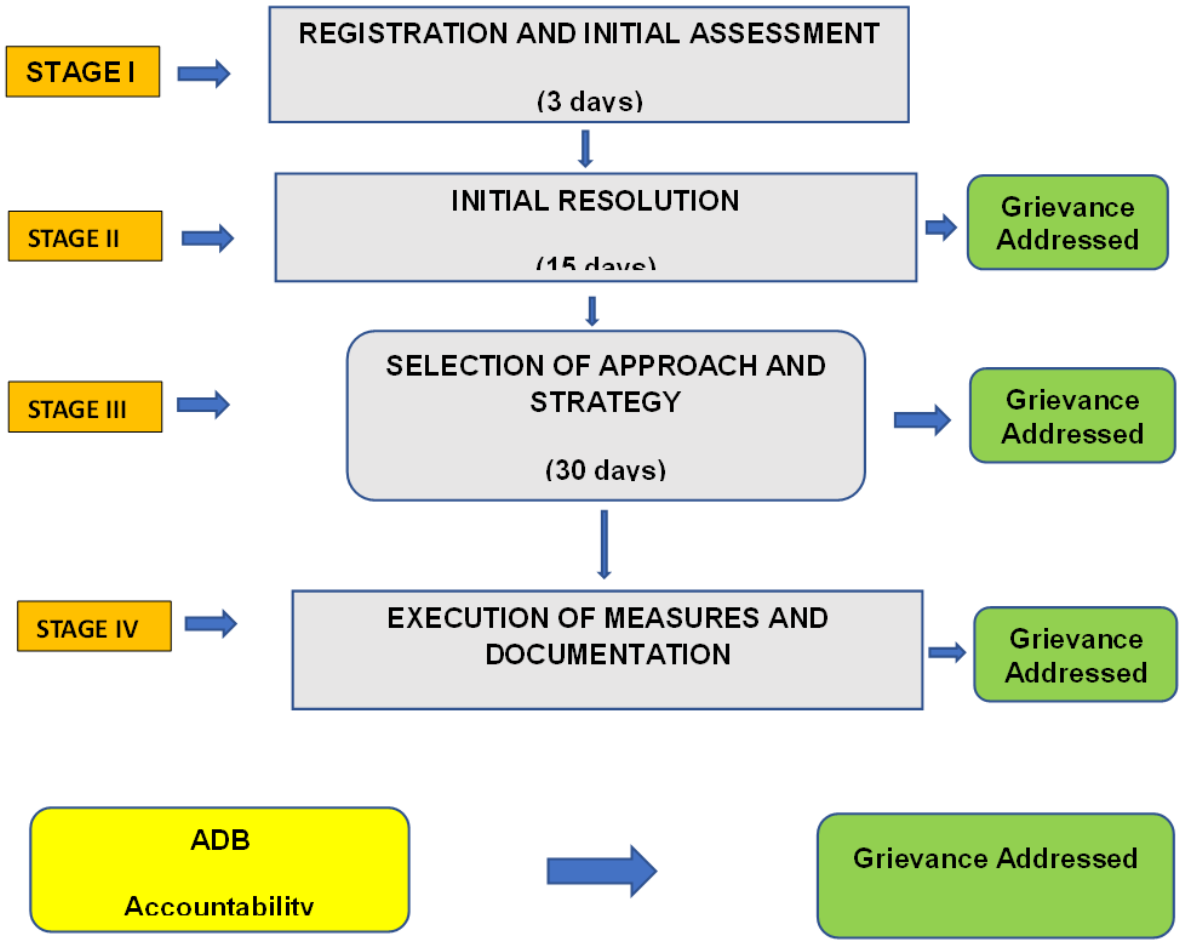
(i) **Completing the documentation:** The GRM coordinator will complete all documentation and ask the complainant to sign the resolution acceptance form that s/he was satisfied with the measures implemented.
(ii) **Recording acceptance:** In the end, the GRM coordinator will put an entry in the GRM registry book that the grievance is resolved.

432. In case the issue is not resolved, the complaint and grievance will follow another pathway entailing the following sub-tasks and then revert to Stage III to repeat the process:

(i) **Review the complaint:** The GRM coordinator will initiate a review and if necessary, request the group for a larger review. The purpose of this is to determine other underlying issues that led to the non-resolution of the complaint.
(ii) **Assign appropriate staff:** It may be necessary to appoint appropriate staff to assist in the process or even obtain outside assistance from some governmental offices. The GRM coordinator will seek out other staff who can contribute to the resolution of the issue.
(iii) **Formulate approach/ strategy options:** The GRM should also determine if the approach itself was the cause of the non-resolution of the issue. In this instance, the contractor may need to revisit the initial approach and further refine it or even change it entirely if required. During this internal sub-process, the GRM coordinator should be proactive in documenting every step, which will form part of the documentation and progress monitoring of the GRM process.

The PIU will be responsible for the GRM, with support from PIU, this includes the steps to address and record the grievance, records of meetings and reporting to ADB during Quarterly Reporting.

Figure 36. Flow Diagram GRM Mechanism



X. ENVIRONMENTAL MANAGEMENT PLAN FOR PACKAGE 1

433. Following the requirements of the SPS 2009, an important component of an IEE report is the environmental management plan (EMP). The goal of the EMP is to develop the mitigation and monitoring measures for the impacts identified within the scope of the IEE procedures to be used in practice by the project implementing agency - the MEPA, and thus, bring its activities into compliance with the environmental and social requirements envisaged by the national legislation as well as with the environmental and social policies of the international finance organizations.

434. The given EMP is based on the information given in the previous chapters, in particular, activity specifics, background properties of the natural and social environment of the working area and expected negative impacts during the activity and their propagation area. The EMP is drafted for different stages of activity, including preparatory works planning phases. The EMP is a live document, and it can be detailed immediately during the accomplishment of the activities following the monitoring outcomes or other practical terms. Any changes or corrections to this EMP will be done based on the formal agreement between MEPA and the ADB.

435. The EMP document will be incorporated in the work tender documents and the tender participants will have the possibility to specify their environmental protection duties in their proposals. After the onset of the construction works, the EMP will be part of the agreement between the client and the construction contractor, and it will be necessary to accomplish during the construction works.

A. Objectives

436. EMP provides a mechanism to address the adverse environmental impact of a project during its construction, accelerate project benefits, and introduce standards of good practice to be adopted for all project works. The objectives of the EMP are to:

(i) Define the responsibilities of the project proponents, contractors and PICs;
(ii) Facilitate the implementation of the mitigation measures identified in the IEE;
(iii) Define a monitoring mechanism and identify monitoring parameters;
(iv) Provide a procedure for timely action in the face of unanticipated environmental situations; and
(v) Identify training requirements at various levels.

437. This EMP is for Package 1 - Main Canal Ch 313+42 to Ch 397+00 - This main canal will need to be cleared, cleaned, repaired or replaced, cleaning, repairs of other structural units, improvements to the access road and repairs and improvements of overpasses and bridges. The main canal is 8358 m (Pk. 313 + 42 ÷ Pk. 397 + 00), comprising of 4,365m open canals, 10 tunnels (3,771m) and inverted siphons (168m).

B. Institutional Responsibilities

438. **Implementation arrangements.** MEPA is the executing agency responsible for overall guidance, strategic decisions, oversight of the implementation of the project, and financial management and administration. program procedures and guidelines.

439. The existing **MEPA PIU** is the implementation agency and will be responsible for the day-to-day implementation and needs to have sufficient capacity to manage and monitor environmental safeguards. The PIU will be responsible for overall compliance with ADB's

safeguard requirements and national environmental regulations and will ensure that the preparation, design, construction, implementation, operation and decommissioning of the projects and all project facilities comply with all applicable national laws and regulations relating to the environment, health and safety, environmental safeguards, and all measures, and requirements outlined in the EARF and IEEs, and any corrective or preventive actions outlined in the safeguards monitoring reports.

440. The PIU will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all environmental, health and safety, labour, social, gender, resettlement and similar provisions to manage impacts and to comply with ADB's SPS and national legislation. The PIU should ensure there is an appropriate budget for environmental safeguards implementation.

Safeguard Implementation Arrangement

441. **PIU**. The existing MEPA PIU is overseen by a Project Director with the CSISDP ADB Project Manager managing the project on a day-to-day basis. The PIU will be responsible for overall compliance with ADB's safeguard requirements and national environmental regulations and will ensure that the preparation, design, construction, and implementation of the projects and all project facilities comply with all applicable national laws and regulations relating to the environment, health and safety, environmental safeguards, and all measures, and requirements outlined in the EARF and IEEs, and any corrective or preventive actions outlined in the safeguards monitoring reports.

442. The PIU will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all environmental, health and safety, labour, social, gender, resettlement and similar provisions to manage impacts and to comply with ADB's SPS and national legislation. The PIU should ensure there is an appropriate budget for environmental safeguards implementation. The PIU will receive support from the Environmental Specialist of the PIC Team in the implementation of environmental related tasks at the field level.

443. The PIU will be responsible for the implementation of the Environmental management plan. PIU will undertake internal monitoring and supervision and record observations throughout the project period to ensure that the safeguards and mitigation measures are provided as intended. They will be responsible for (i) conducting briefings to contractors on safeguards requirements including GRM (ii) implementing and monitoring safeguards compliance activities, public relations activities, gender mainstreaming activities, and community participation activities; (iii) coordinating with district administration, PIC for land acquisition and resettlement aspects and addressing any problems and/or delays; (iv) monitoring physical progress on EMP implementation; and (v) organizing monthly meetings with the PIC safeguard support staffs to review the progress. The PIU will be supported by the PIC and by the Construction Contractors' Environmental Specialists.

444. The PIU already has an Environment Specialist. The PIU Environment Specialist will receive support from PIC consultant team / consultants in the implementation of environmental and social related tasks at the PIU level.

445. The PIU shall manage preparation/vetting design documents, tendering of contracts, implementation of resettlement, environmental management and gender action plans; setting and managing project performance monitoring systems, planning and managing implementation of training and capacity building as well as institutional strengthening activities besides preparing reports as per ADB requirements. The PIU will review the SSEMP, ensuring the correct implementation of the SSEMP, EMP and GRM, monitoring the environmental impacts and parameters, supporting the corrective actions and reporting process.

446. PIU will also provide any training that is required, during the pre-construction phase, during construction and at handover.

447. The PIU will support the handover to the GA and ensure that the GA understands the environmental requirements for the operation and maintenance phase.

448. The PIU may require . Additionally, a pool of experts would be required for intermittent support:

(i) Biodiversity Specialist – Intermittent
(ii) Waste Specialist – Intermittent
(iii) Cultural Specialist – Intermittent and short-term (during works within 100m of the Nameless Tower, or to support during chance finds).
(iv) Asbestos Specialist – Intermittent and short-term (during any works involving asbestos)

449. **Design Contractor.** The design contractor will produce or update the IEE and EMP as part of the detailed design phase and submit them to PIU and ADB. They shall employ an appropriate environmental specialist to ensure that the IEE is up to ADB standards and national requirements.

450. **Construction Contractor** The contractor will be required to provide the resources to comply with the contract provisions on environment, health and safety, the IEE, and applicable permits/clearances. The contractor shall appoint an Environment, Health and Safety (EHS) engineer who will be responsible on a day-to-day basis for (i) ensuring implementation of EMP, (ii) coordinating with the PIU environment staff; (iii) community liaison [[1]], consultations with interested/affected parties, and grievance redress; and (iv) documentation and reporting. The requirement of the EHS Supervisor will be included in the bid documents.

451. The Contractor will be required to submit to PIU for review and approval, a site-specific environmental management plan (SSEMP) including (i) proposed sites or locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) pre-works conditions of all sites and public assets/roads/utilities that will be used for the execution of works; (iii) specific mitigation measures following the approved EMP; (iv) monitoring program per SSEMP; (v) budget for SEMP implementation. No works can commence prior to the approval of SSEMP.

452. A copy of the EMP or approved SSEMP will be always kept on-site during the construction period. Non-compliance with, or any deviation from, the conditions set out in the EMP or SSEMP constitutes a failure in compliance and will require corrective actions. The EARF and the IEEs specify responsibilities in EMP implementation during the design, construction and O&M phases.

453. **GA**. The GA will be responsible for the operation of the irrigation system. They gave the responsibility to review the design documentation and provide recommendations. After project completion, GA will take over the responsibility for the operation and maintenance of the system. Including ensuring any repairs and any works follow good environmental practices and national legislation and supporting the sustainable use of the irrigation system. Figure 6 and Table 14 summarize the institutional responsibility of environmental safeguards implementation at all stages of the project.

[1] Reasonable size social outreach team (SOT) to be appointed by contractor to facilitate community liaison, consultations and R&R implementation (including resolution of grievances). Requirement of SOT will be included in bid document.

Table 27: Institutional Roles and Responsibilities for Environmental Safeguards Implementation for Package 1

Project Implementation Organization	Management Roles and Responsibilities
MEPA Executing agency	• Ensuring safeguards compliance.
PIU (MEPA) Implementing agencies	**Pre-Construction** • Timely, transparent procurement of works, services, equipment and materials in line with ADB procedures. • Preparation of plans, surveys, studies, detailed designs, capacity development activities, and workshops, as required. • Preparation of Kvemo Samgori areas' Final IEEs (including EMPs), and submission to ADB for clearance and disclosure. • Ensuring meaningful consultation during the preparation of IEEs. • Preparing environmental safeguards documents in accordance with national relevant regulations and ensuring their timely approval. • Disclosing environmental safeguards documents (including IEEs, EMPs and SAEMRs). • Ensuring the bidding documents of PIC and Construction Contractor include all tasks as described in the approved IEE and EMP. • Obtaining all necessary government permits and licenses, for all civil works. • Reviewing and clearing contractors' SSEMPs. • Ensuring that the SSEMPs contain health and safety management plans following international good practices and relevant national/local requirements. • Establishing a GRM. • Coordinating the conduct of technical studies **Construction** • Supervising civil works and reporting on progress. • Arranging annual project audits in accordance with ADB and national requirements. • On-the-job training of staff in implementing ADB guidelines and procedures and safeguards compliance, and efficient project management and scheduling. • Preparing and submitting to ADB quarterly, semi-annual and annual progress reports on both the physical and financial progress of project activities. • Carrying out public consultation during the implementation of Kvemo Samgori modernization. • Environmental monitoring and ensuring that construction activities are carried out following EMPs and SSEMPs and in an environmentally-sound and sustainable manner. • Ensuring corrective actions are implemented when necessary. • Preparing and submitting the Semi-Annual Environmental Monitoring Reports to the ADB for disclosure within 30 days of the end of monitoring periods until ADB's Project Completion Report is issued. • Disclosing relevant information from environmental safeguards documents (including the SAEMRs) to affected persons.

Project Implementation Organization	Management Roles and Responsibilities
	• Reporting in a timely manner to ADB any non-compliance or breach of ADB safeguard requirements. • Updating the IEEs in case of unanticipated impacts. • Ensuring that the GRM is operational to effectively handle the environmental and social concerns of affected persons.
GA Operation of the Irrigation System	**Pre-Construction** • Review feasibility and design documentation prepared by the PIU and provide comments and recommendations for revisions as required within a reasonable timeframe. • Assist the PIU in dealing with design organizations, contractors and other persons involved in the project in planning and implementation of Kvemo Samgori modernization works. • As required and within its authority, manage relations with Kvemo Samgori water users and land users. **Operation** • Upon completion of modernization works and after handing over the modernized facilities to the GA, confirm the obligation for the maintenance of those facilities. • Ensure following repairs and works follow good international practices and national legislation.
ADB (Financier)	• Guidance to MEPA (and the PIU) and GA throughout project implementation in accordance with the agreed implementation arrangements. • Review and approval of plans, schedules and detailed designs for project activities upon the submission by the PIU. • Review of all documents requiring ADB approval upon submission by the PIU. • Posting on the ADB website updated project information documents for public disclosure and safeguards documents in accordance with disclosure provisions of ADB's SPS, 2009. • Periodic loan review missions, a midterm review, and a project completion mission.
Design Contractor	**Pre-Construction** • Final detailed design for area 1, and updating the IEE and EMP in line with ADB's SPS.
Construction contractor	**Pre-Construction** • Ensure all legally required permits and clearances (including waivers) are obtained before work starts. • Develop the Site Specific EMP, waste management plan, traffic management plan, etc (listed below). **Construction** • Implementation of the EMP and SSEMP including mitigation measures and monitoring environmental parameters • Establish and maintain site records, incident recording and monitoring data • Assist in the GRM process

Project Implementation Organization	Management Roles and Responsibilities
	• Comply with non-compliance notifications and corrective action plans issued. • Produce monthly reports and monitoring reports plus incident/accident reporting.
Project implementation consultants (PIC)	**Pre-Construction** • Support PIU in the review of safeguarding documents. **Construction** • Oversee the construction contractor, including implementation of the EMP • Assist in monitoring and reporting • Providing training

C. Personnel Required

454. The PIU has a safeguards team which includes an environmental officer. , this position should be maintained until the end of the construction and hand over to the GA.

455. The design team for Package 2 will require an environmental specialist to lead the updates of the IEE and EMP, public consultations and ensure the incorporation of safeguards into the design. An asbestos specialist should be employed to develop an Asbestos Management Plan (dependent on the final design).

456. The construction contractor requires an environmental staff throughout the construction works. They would be responsible for mitigation, monitoring and any environmental reporting and would also be responsible for waste management (legal requirement). A full-time Health and Safety staff is also required.

457. The PIC requires an environmental specialist for the review of the safeguarding documents, throughout construction to support the PIU in supervision and support training. Additionally, a pool of experts would be required for intermittent support:

- Biodiversity Specialist – Intermittent
- Waste Specialist – Intermittent
- Asbestos Specialist – Intermittent and short-term (during any works involving asbestos)

458. All specialists should have appropriate qualifications and experience to ensure that the national requirements and ADB SPS can be met and ensure good environmental management and monitoring.

D. Mitigation and Monitoring Plan

459. Based on the assessment of impacts and risks, good practice under WB EHS Guidelines, and applicable national requirements the mitigation measures to manage and prevent adverse risks and impacts are included. This is followed by monitoring measures that are required to ensure that each measure manages the risk and identifies any issues.

460. PIU will monitor and measure the progress of EMP implementation. The monitoring activities will correspond with the project's risks and impacts. In addition to recording

information on the work and deviation of work components from the original scope, PIU, and PIC will undertake site inspections and document review to verify compliance with the EMP and progress toward the outcome.

- Prior to the commencement of the work, the contractor will submit a compliance report to PIU ensuring that all identified pre-construction environmental impact mitigation measures as detailed in the EMP will be undertaken. PIU with the assistance of the PO (environmental safeguard) and ESS of the PIC Consultant will review the report and thereafter PIU will allow the commencement of works.
- During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports submitted to the PIU and environmental specialist of PIC. They will review and advise contractors for corrective actions if necessary. A monthly report summarizing compliance and corrective measures taken will be prepared by PIU with the assistance of the environmental specialist of PIC and submitted to PIU.
- A quarterly report shall be prepared by PIC and PIU and submitted to PIU for review and further actions. The quarterly report shall include the Quarterly Progress Report checklist (refer to Appendix 12) to ensure completeness of safeguards requirements.
- Based on monthly and quarterly reports and measurements, PIC will draft a six-monthly report and submit to PIU for their review and further submission to ADB. Once concurrence from the ADB is received the report will be disclosed on the project website.
- ADB will review project performance against the MEPA and GOG commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system. ADB will monitor projects on an ongoing basis until a project completion report is issued. ADB will carry out the following monitoring actions to supervise project implementation:

  – conduct periodic site visits for projects with adverse environmental or social impacts;
  – conduct supervision missions with detailed review by ADB's safeguard Specialists /officers or consultants for projects with significant adverse social or environmental impacts;
  – review the periodic monitoring reports submitted by EAs to ensure that adverse impacts and risks are mitigated, as planned and agreed with ADB;
  – work with EAs to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to reestablish compliance as appropriate; and
  – prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.
- ADB's monitoring and supervision activities are carried out on an ongoing basis until a Project Completion Report (PCR) is issued. ADB issues a PCR within 1-2 years after the project is physically completed and in operation.

Table 28: Mitigation and Monitoring Plan for Package 1

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
Pre-Construction Activities								
Integration of safeguards related aspects into the bidding documents	Bidding documents are not responsive to safeguards related issues and the performance of the contractor is low	Include all safeguards related clauses and integrate IEE and EMP into the bidding documents	Procurement Officer	PIU	n/a	Bidding documents contain all necessary clauses related to safeguard issues; IEE and EMP are attached to the bidding documents and contractor is performing accordingly	Project start phase	Costs included in the procurement
Update IEE and EMP	Increase in the negative environmental and social impact	Updating Initial Environmental Examination and Environmental Management Plan	Design Contractor	PIU/PIC	All project sites	All plans are approved by PIU/Consultant or state organization.	Submitted with final detailed design.	25 000 – 30 000 USD

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
Preparation SSEMP	Increase the negative environmental and social impact	Preparation SSEMP	Construction contractor	PIU/PIC	All project sites	SSEMP106 approved by PIC	Before construction activities start	2000-5000
Informing stakeholders before starting the works	Unpreparedness of local communities; delays in the learning process	Informing stakeholders in advance of the start of the civil works	Construction contractor	PIU/ PIC	All project sites	At least 50% of interested persons are informed about the start of the project	10 days before construction activities start	Costs related to the dissemination of information
Construction Phase								
Emissions of harmful substances into the atmospheric air, propagation of dust, noise and vibration	Disturbing the local population, pollution of agricultural fields,	• The movement of heavy machinery should be prohibited during non-working hours. • Machine engine idling should be limited to the extent possible. • The technical condition of the exploited vehicles will be constantly monitored.	Construction contractor	PIU/ PIC	Construction Sites and Camps	Dust	Daily observations except if a problem is observed or complaint received where tests should be conducted	Costed by contractor and cost carried into contract

106 The SSEMP prepared by the contractor shall follow the requirements of ADB SPS and ensure that pollution prevention and control technologies and practices are consistent with international good practices such as World Bank / IFC EHS Standards.

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Covering trucks with tarpaulins during the transportation of construction materials and waste • Observance of traffic speed limits and proper management of dusty materials is needed to reduce dust propagation. • Water is sprayed periodically if construction activities are causing dust emissions • Construction transportation routes are set up and appropriate traffic management is adhered to. • Material handling and construction activities that could cause dust limited in high winds. • In times of high winds, extra care is required and works that will cause a disturbance of loose material should be halted until more favourable conditions. Avoid lighting works sites and camps when not in use, unless vital for security. When necessary for security, ensure that the				Noise	Daily observation except if a problem is observed or complaint received where tests should be conducted	
						Vibration: most sites	Daily observation except if a problem is observed or complaint received where tests should be conducted	

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		direction of the light is focused at the site (away from communities and natural habitats)						
Accessing the site, siting of spoil heaps, etc.	Impact on soil quality and erosion	• After the completion of the construction, the previously removed topsoil should be used to restore the damaged areas and improve fertility • Any topsoil removal and storage should be done separately from other materials, on a pre-selected site protected from surface runoff. • Unfaulty construction techniques should be used to avoid soil contamination • The fuel tank should be placed in an area protected by berms or earth fills to stop accidental spills as necessary. • Accidental spills should be contained and cleaned up immediately using absorbent materials. • The ground/soil contaminated accidentally during the construction	Construction contractor	PIU/ PIC	All project sites	Monitor management of soil to ensure runoff and contamination are prevented	During works	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		should be cut and removed as soon as possible. • After the completion of the construction, the reclamation of the territories and the restoration of sanitary conditions will reduce the probability of impact on soil quality and stability.						
Works, spoil site locations, construction camp, etc	Visual-Landscape Impacts	• Fencing the perimeter of the construction camp. • Minimizing the area of impact of the construction works and associated zones to the extent possible. • Backfilling, reinforcing and compacting all excavated trenches as soon as possible; levelling surfaces and slopes, and if necessary, using the slope stabilization method. • Proper management of waste and materials, adherence to the sanitary conditions, and timely waste removal from the territory. • Proper planning and control of night lighting in the working areas to avoid bright illumination and light pollution.	Construction contractor	PIU/ PIC	All project sites	Monitor visual mitigation measures implementation and compares the restored site after construction with the original condition	During and end of construction works	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Strictly following the vehicle and machinery travelling routes. • After completion of the construction works, all sites should be restored to their original condition or better.						
Movement of vehicles, equipment and materials, road closures for works	Loss of Access, Encroachment and Resettlement of Farmland	• Minimization of these risks through good design and construction practice • Consultation and engagement activities. This includes an community awareness and participation plan. • Effective management of the GRM • Implementation of the LARP • Providing appropriate resettlement in line with ADB SPS	Design and Construction contractor	PIU/ PIC	All project sites	Area resettled and the amount compensated.	Throughout LARP activities	Covered in LARP
Storing and transporting waste and material, clearing and cleaning the canal.	Impact on Water Quality	• Control of the good technical state of the construction equipment to prevent the leakage of fuel and oils; • Equipping the fueling stations with a hermetic body and secondary protective casing;	Construction contractor	PIU/ PIC	Iori River up and downstream of the project	pH, Diluted Oxygen, BOD, Cod, Total Nitrogen, Total Suspended Solids	Bi-annually	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Use of technically non-faulty construction equipment and vehicles; • All equipment running on fuel shall be placed in a secondary tank. The volume of the secondary tank must be at least 110% of the fuel volume used by the equipment. • Control over the separate collection and timely removal of construction and household waste, • Control of water drainage systems. • Control of the state of collection and removal of domestic and faecal waters. • Control over the compliance with the rules of storage and use of oil products and oils and providing anti-spill kits on job sites. • Installation of oil products and oil storage facilities at least 100 m away from water bodies. • Good maintenance of vehicles and machinery						

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Conducting training for the Construction Contractor and Client's personnel. • Development and implementation of the emergency response plan envisaging emergency actions for such cases of pollution as leaks and spills. The given plan will be updated periodically, incidents will be analyzed and additional preventive measures will be included in it. • Staff briefing before and after the construction works, once every six months.						
Dredging, waste from construction works and domestic waste from workers, excess soil	Waste Management	• Waste management plan outlining each type of waste that will be produced and how it will be safely stored, how its transported, and where and how it's disposed. • All waste removed from sites in a timely manner as part of site clean up • Reuse and recycling of waste as much as possible • Appropriate storage and transportation of waste.	Design and Construction contractors	PIU/ PIC	All project sites	Waste is safely stored, transported and disposed of in line with legal requirements Waste hierarchy is applied	Throughout the construction works	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Good international practices in regard to waste disposal • Waste should only be transferred and disposed of by certified contractors. • Appropriate disposal of wastewater • Littering by workers is prohibited and bins should be provided temporarily across working areas. • Waste management training for workers should be provided. • Portable or constructed toilets with storage must be provided on-site for construction workers if services are not available locally, and must be emptied in an appropriate manner						
Removal of old pipes, repair works of canal structures containing asbestos	Asbestos presents a health and safety risk	• An asbestos specialist should be contracted prior to construction works; • An asbestos management plan should be developed, outlining health and safety measures and waste management measures needed to ensure safe management of the material.	Design Consultants and Construction contractor	PIU/ PIC	All project sites	As set by the Asbestos Management Plan	Throughout any activity involving asbestos	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Training workers involved in this activity. • Asbestos waste needs to be disposed of at an appropriate, certified facility to ensure appropriate management of the material”)						
Movement of materials, waste, machinery, equipment and workers. Works may need to close access roads.	Traffic safety and congestion issues	• A traffic management plan should be set up and approved by the local police department. • Transportation routes and schedules defined • Any road closures require surrounding land owners to be notified in a timely manner. • The transport routes should avoid going within 150m of Nameless Tower and the protected area where alternatives are available. • Local speed limits complied to • Vehicles well maintained • Good vehicle loading practices should be followed • Lose material being transported is covered and appropriate wetting of	Construction contractor	PIU/ PIC	All project sites	Record any complaints, incidents or accidents relating to traffic. Ensure traffic management is being enforced.	Throughout works	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		wheels when necessary to prevent dust • Contractor is responsible for repairing any damage caused by the project construction activities • The local police department needs to be informed of any corrective actions caused by the poor traffic management						
All construction works	Biodiversity	• Visual control of the construction site to identify the Georgian Red-Listed species. • Carrying out observations to identify the impact on species. • Monitoring their condition and, if necessary, developing relevant conclusions and recommendations. • Siting of the construction site away from the protected areas and away from windbreaks. • The duration of the works causing a disturbance and frightening animals should be as minimal as possible.	Construction contractors	PIU/ PIC	All project sites	Observation surveys on protected species. Monitoring the condition of known species	Before construction, before removal of vegetation, periodically after removal of vegetation and post-construction.	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
Removal of vegetation encroaching the canals or accessing the work locations	Impacts on Flora	• Care is taken to minimise the impact on vegetation and minimise vegetation removal • The trees and shrubs of high conservation value will be marked and, where possible, preserved or re-planted. This will be managed under a Replanting plan. • Prior to the onset of the construction works, instructing the personnel about the protection of the vegetation cover. • The landscape restoration is to be done with the original plant species, in accordance with their original content and rule of distribution. • If Red-Listed plant species are in the construction area, damage or removal should be avoided. If unavoidable, compensation plantings shall be provided. • Removal of the protected species from the environment must be done in line with the requirements of sub-clause f), clause 1,	Construction contractors	PIU/ PIC	All project sites	Number of trees and type recorded. Replanting activities recorded Red list flora species recorded	Before vegetation is removed During site restoration activities Throughout	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		Article 24 of the "Georgian law on the Red List and Red Book", in agreement with the Ministry of Environment and Agriculture of Georgia. • All trees to be cut down should be thoroughly visualized before the construction starts, and any identified animal shelters should be notified in writing to the Ministry of Environmental Protection and Agriculture of Georgia, with further actions to take in accordance with the Georgian Law on the Red List and the Red Book of Georgia and the Law of Georgia on Wildlife.						
All construction activities	Health and Safety	• Access and use of PPE and first aid equipment • Health and Safety Plan, including first aid, emergency procedures, training, PPE, labelling and more will be developed and implemented throughout the project • Accident recording and reporting system	Construction contractors	PIU/ PIC	All project sites	Incidents and accident records Implementation of Health and Safety Plan Siting and condition of a construction camp	Throughout works	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Sanitary facilities provided to the workers • Safe areas for breaks provided • Training and awareness of health and safety measures and local social norms amongst the workers • Clear demarcation and prevent access to unauthorized personnel • Good international practices for water, air, noise, vibration and dust management • Encourage local recruitment • Clean drinking water is available to the workers. • Locate construction camps away from local towns and villages • Ensure all equipment and vehicles are in good working order				Training records		
Any excavation activities including digging trenches.	Chance finds	• Works should be paused at the location of the suspected chance find immediately • The site needs to be protected. • The Ministry of Culture, Sports and Youth need to be informed as soon as	Construction contractors	PIU/ PIC	All project sites	Records of chance finds	As found	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		possible in event of chance finds. • Work will only resume after the Ministry of Culture, Sports and Youths provides permission. • For workers working near river / water, adequate PPEs shall be provided and training on ensuring safety shall be imparted prior to start of work.						
Shutting off water supply during works	Interruption of irrigation water supply	• Coordinate with GA on timings • Inform the farmers of when and for how long with sufficient warning in advance	Construction contractors	PIU/ PIC	Areas where supply is disruption	Timing and dates of consultations Timing and dates of disruption	Before and during the timescale of water disruptions	Costed by contractor and cost carried into contract
Operations								
Throughout operations	Strengthening Capacity	• Training on EMP implementation, GRM and good international environmental practices for irrigation operation to PIU and GA	PIC	MEPA	n/a	Training Records	n/a	Costed by PIC and cost carried into contract
During repairs and maintenance	Temporary impacts on soil, water, air, noise, vibration,	• Same as construction. • Good maintenance and correct use of equipment and vehicles • Minimise vegetation removal	GA	MEPA	Any area of repairs	Noise and dust observations	Daily during works	GA

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
	waste, visual, etc.	• Appropriate materials and waste management to prevent pollution • Inform the water users if the irrigation system will be temporarily turned off or if their access to their land is disrupted • Resue topsoil • Appropriate management of waste						
Throughout operations	Induced impacts	• Farmers trained on good agricultural practices in relation to sustainable water use, soil health and appropriate fertiliser and pesticide use • Monitoring and management of water use, water loss and illegal connections.	PIC and GA	MEPA	n/a	Training Records	n/a	Costed by PIC and cost carried into contract
Throughout operations	Safety risk to communities	• Provide signs and where appropriate fences to avoid people from falling in • Follow regular maintenance schedules • Record incidents and accidents, and interpret the information	Construction contractors and GA	MEPA	n/a	Record of incidents and accidents	Throughout	Construction contractor's costs and GA
Other								

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
Any construction activities	Cumulative impacts from Tbilisi-Sagarejo-Bakurtsikhe Rehabilitation Project	• Coordination with Tbilisi-Sagarejo-Bakurtsikhe Rehabilitation Project to minimise cumulative impacts	Construction contractors	PIU	n/a	Records of communication	Before construction	n/a

- Note: Project implementation shall ensure adherence to the working hours as per the National and International labor requirements

E. Monitoring Plan

461. The monitoring will be used to monitor environmental impacts and to verify EMP implementation.

462. Detailed monitoring measures with technical details, including parameters to be measured, methods to be used, sampling locations that will signal the need for corrective actions; and monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and document the progress and results of mitigation are provided in below. All parameters should be monitored against standards outlined within Section III; in line with national legislation or WB EHS Guidelines, whichever is most stringent.

Table 29. Detailed Monitoring Measures for Package 1.

Item	Parameter	Frequency	Location	Action Level	Response Action Level Exceeded	Responsibility
Pre – Contraction stage						
include all safeguards related clauses and integrate IEE and EMP into the bidding documents	Environmental Issues	Once before the bid announcement	n/a	Environmental audit of bidding documents to ensure relevant sections of the EMP have been included	The bidding document shall reflect all environmental mitigation measurements	Construction Contractor
Preparation of Environmental Management Plans	Environmental Issues	Once before Contraction activities start	n/a	Compliance of the document with the requirements should be checked	The construction contractor will not be allowed to start the work	Construction Contractor
Preparation SSEMP	Environmental Issues	Once before Contraction activities start	n/a	Compliance of the document with the requirements should be checked	The construction contractor will not be allowed to start the work	Construction Contractor
Contraction Stage						
Ambient Air	Dust	Continual	Boundaries of the construction site	Instrumental measurement	Stop construction and develop additional mitigation measures	Construction Contractor
Ambient Air	Noise and vibration	Continual		Instrumental measurement	Stop construction and develop additional mitigation measures	Construction Contractor
Ambient Air	Emissions	Continual		Instrumental measurement	Stop construction and develop	Construction Contractor

Item	Parameter	Frequency	Location	Action Level	Response Action Level Exceeded	Responsibility
					additional mitigation measures	
Water Quality	Quality/ Contaminant concentrates	Monthly inspection	50m downstream of works	Guideline/license requirements (whichever is applicable) Impact Monitoring Compliance Monitoring	If contaminant concentrations/ license conditions are exceeded, review disposal options and decide on the most applicable. Report any accidences of license (if applicable) to issuing authority.	Construction Contractor
Waste Management Implications	Segregation, Storage and transport of wastes	Daily inspection	Waste collection, storage and disposal sites	Visual assessment during the Works; - Field inspection, - Report of waste volumes generated. - Report and record all leakages and spills - Impact Monitoring. - Compliance Monitoring	Solid waste recycled is 0 % of the movement of solids or liquid waste through the soil, rocks, water, and atmosphere.	Construction Contractor
Ground	Soil Monitoring and Erosion	Continual	Areas of soil removal and excavation.	Assess the adequacy of sedimentation/ environmental controls on-site Impact Monitoring	If controls have failed or are found inadequate, cease works immediately and repair to an acceptable standard	Construction Contractor

Item	Parameter	Frequency	Location	Action Level	Response Action Level Exceeded	Responsibility
Landscape and Visual	Surface treatment of temporary structures	Once the Completion of work	Construction areas after construction	Minimum disturbance of the original landscape. Impact Monitoring	Required to ensure the recommended mitigation measures are properly implemented	Construction Contractor
Operational Phase						
Water losses	Illegal connections	Once a Month	Intake and SCADA system	Visual Monitoring	Penalty subscription and connection interception	GA
System efficiency monitoring	Filling pipes with sediment	Once a month or In the event of a complaint		Visual monitoring	Eliminate the accident	GA
Conduct source water quality monitoring	As per the government regulations	1 sample from each section	TBC	Comparison with the base values and standards as per government regulations	Required to ensure the recommended mitigation measures are properly implemented.	GA

F. Environmental Documents and Records

463. The Construction Contractor and PIU are required to ensure all permits, clearances and waivers are collected. Prior to the onset of the construction works, the Construction Contractor will develop the following management plans and agree on them with the supervisor:

- Traffic management plan;
- Occupational Health and Safety Plan
- Waste Management Plan
- Replanting Plan
- Emergency response plan
- Community Awareness and Participation Plan
- Camp Management Plan

464. The contractor companies are also responsible for the preparation of Site Specific Environmental Management Plan based on the generic EMP. The plans shall be submitted to PIU by the contractor ten days before taking possession of any work site.

465. In addition, the Implementer (and the Construction Contractor on his errand) shall keep and use the following records in practice during the construction:

- Plan and schedule of the works;
- List of the machines and equipment needed for construction;
- Records related to the occurring environmental problems;
- Records about waste management;
- Written marking of the areas of waste disposal and waste transportation instructions issued by the local authority;
- Records about the supplies of necessary materials and their consumption;
- Complaints log books;
- Incident registration logs;
- Reports about the correction actions;
- Records of environmental monitoring;
- Logs of equipment control and technical maintenance;
- Reports about the personnel training.

G. Capacity Building

466. The capacity building programme should focus on ensuring the implementation of the mitigation and monitoring actions highlighted within the EMP, the GRM, stakeholder engagement and to meet national requirements, ADB's SPS and international good practices. The training programme below should support the awareness and implementation of the EMP and should be led by the PIC.

Table 30: Training Programme

Topic	Content	Attendees	Frequency
Pre-Construction Phase - Preparation	• EMP Content • Impacts • Mitigation • Monitoring • Reporting	MEPA and PIU	Half Day Course

	• GRM		
Construction Phase - Environmental Management	• National and ADB Requirements • EMP mitigation and monitoring measures • Good construction practices covering waste management, worker behaviour, traffic measures, biodiversity, etc. • GRM • Reporting Process	• MEPA and PIU • Construction Contractor's senior and safeguarding staff	1 day course before the start of works
	• Refreshing above • Update on progress		Every 6 months
Operational Phase - Environmental Management	• National and ADB Requirements • EMP mitigation and monitoring measures for operation • Good construction practices during operation	GA	1 day course as part of handover

H. EMP Costs

467. Most costs associated with the implementation of the EMP are a normal part of preparing the bid and contract documents and ensuring that proper environmental provisions are incorporated therein.

468. Table 31: The table lists the key proposed mitigation measures and the additional costs beyond what would normally be included in a project budget. The total is the US $178,500 so far, this is an estimate.

Table 31: Estimated Cost for Mitigation Measures and Monitoring

Action	**Number of Units / Unit cost (US$)**	**Cost estimate (US$)**	**Timing**	**Frequency and duration**
Habitat and fauna survey	One habitat and fauna survey: $1,500	$1,500	Preparation Phase	Pre-Construction Stage
HIV/AIDS Training	3 trainings x $1,000 per training	$3,000	Pre-construction phase and construction phase	Three times: Once during the pre-construction phase, and twice during the construction phase
Waste management	5 USD – collection, transportation and disposal 1 m ^{3}l	$30,000	Construction phase	Throughout dismantling of old channels or removal of sold pipe, removal of sedimentation and broken concrete and excess soil.

Action	Number of Units / Unit cost (US$)	Cost estimate (US$)	Timing	Frequency and duration
Habitat restoration	$5 seedlings (5-6 y/o) $1.5 seedlings (2-3 y/o) $10 seedlings (GEO Red List)	TBD*	Construction Phase	Once according to the Clearance, Replanting Plan, and as necessary during the construction phase
Environmental Staff (PIC)	Environmental and Social Officer: 24 months x $1,500 per month	$36,000	Construction Phase	Throughout the construction phase
	Health and Safety Specialist 24 months x $1,500 per month	$36,000	Construction Phase	Throughout the construction phase
	Pool of Specialists (Biodiversity, Cultural, Asbestos, etc)	To be determined	Construction Phase	Throughout the construction phase
Environmental Staff (Construction Contractor)	Environmental Specialist: 24 months x $1,500 per month	$36,000	Construction Phase	Throughout the construction phase
	Occupational Health and Safety Specialist: 24 months x $1,500 per month	$36,000	Construction Phase	Throughout the construction phase
Capacity Development Activities	Multiple training sessions and workshops	To be determined	Pre-construction phase and construction phase	Throughout project

I. Unanticipated Environmental or Social Impacts

469. If any unanticipated environmental or social impacts become apparent during project implementation, the operations department advises and requires the borrower/client to:

(i) Assess the significance of such unanticipated impacts;
(ii) Evaluate the options available to address them; and
(iii) Prepare or update the IEE.

470. ADB will help the borrower/client mobilize the resources required to mitigate any adverse unanticipated impacts or damage.

XI. ENVIRONMENTAL MANAGEMENT PLAN FOR PACKAGE 2

471. Following the requirements of the SPS 2009, an important component of an IEE report is the environmental management plan (EMP). The goal of the EMP is to develop the mitigation and monitoring measures for the impacts identified within the scope of the IEE procedures to be used in practice by the project implementing agency - the MEPA, and thus, bring its activities into compliance with the environmental and social requirements envisaged by the national legislation as well as with the environmental and social policies of the international finance organizations.

472. The given EMP is based on the information given in the previous chapters, in particular, activity specifics, background properties of the natural and social environment of the working area and expected negative impacts during the activity and their propagation area. The EMP is drafted for different stages of activity, including preparatory works planning phases. The EMP is a live document and it can be detailed immediately during the accomplishment of the activities following the monitoring outcomes or other practical terms. Any changes or corrections to this EMP will be done based on the formal agreement between MEPA and the ADB.

473. The EMP document will be incorporated in the work tender documents and the tender participants will have the possibility to specify their environmental protection duties in their proposals. After the onset of the construction works, the EMP will be part of the agreement between the client and the construction contractor and it will be necessary to accomplish during the construction works.

A. Objectives

474. EMP provides a mechanism to address the adverse environmental impact of a project during its construction, accelerate project benefits, and introduce standards of good practice to be adopted for all project works. The objectives of the EMP are to:

(iv) Define the responsibilities of the project proponents, contractors and PICs;
(v) Facilitate the implementation of the mitigation measures identified in the IEE;
(vi) Define a monitoring mechanism and identify monitoring parameters;
(vii) Provide a procedure for timely action in the face of unanticipated environmental situations; and
(viii) Identify training requirements at various levels.

475. This EMP is for Package 2 - Area 1 (GA distribution branches G23 to G33). Area 1 covers 2,946 ha. It is made up of G23, G24, G26, G27, G28, G29, G30, G31, and G33 distribution branches. The total length of this is 46.2km, with 34% being earth channels and 19% distributor pipes.

B. Institutional Responsibilities

476. **Implementation arrangements.** MEPA is the executing agency responsible for overall guidance, strategic decisions, oversight of the implementation of the project, and financial management and administration. program procedures and guidelines.

477. The existing **MEPA PIU** is the implementation agency and will be responsible for the day-to-day implementation and needs to have sufficient capacity to manage and monitor environmental safeguards. The PIU will be responsible for overall compliance with ADB's safeguard requirements and national environmental regulations and will ensure that the preparation, design, construction, implementation, operation and decommissioning of the

projects and all project facilities comply with all applicable national laws and regulations relating to the environment, health and safety, environmental safeguards, and all measures, and requirements outlined in the EARF and IEEs, and any corrective or preventive actions outlined in the safeguards monitoring reports.

478. The PIU will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all environmental, health and safety, labour, social, gender, resettlement and similar provisions to manage impacts and to comply with ADB's SPS and national legislation. The PIU should ensure there is an appropriate budget for environmental safeguards implementation.

Table 32. Institutional Roles and Responsibilities for Environmental Safeguards Implementation for Package 2

Project Implementation Organization	**Management Roles and Responsibilities**
MEPA Executing agency	• Ensuring safeguards compliance.
PIU (MEPA) Implementing agencies	**Pre-Construction** • Timely, transparent procurement of works, services, equipment and materials in line with ADB procedures. • Preparation of plans, surveys, studies, detailed designs, capacity development activities, and workshops, as required. • Preparation of Kvemo Samgori areas' Final IEEs (including EMPs), and submission to ADB for clearance and disclosure. • Ensuring meaningful consultation during the preparation of IEEs. • Preparing environmental safeguards documents in accordance with national relevant regulations and ensuring their timely approval. • Disclosing environmental safeguards documents (including IEEs, EMPs and SAEMRs). • Ensuring the bidding documents of PIC and Construction Contractor include all tasks as described in the approved IEE and EMP. • Obtaining all necessary government permits and licenses, for all civil works. • Reviewing and clearing contractors' SSEMPs. • Ensuring that the SSEMPs contain health and safety management plans following international good practices and relevant national/local requirements. • Establishing a GRM. • Coordinating the conduct of technical studies **Construction** • Supervising civil works and reporting on progress. • Arranging annual project audits in accordance with ADB and national requirements. • On-the-job training of staff in implementing ADB guidelines and procedures and safeguards compliance, and efficient project management and scheduling. • Preparing and submitting to ADB quarterly, semi-annual and annual progress reports on both the physical and financial progress of project activities.

Project Implementation Organization	Management Roles and Responsibilities
	• Carrying out public consultation during the implementation of Kvemo Samgori modernization. • Environmental monitoring and ensuring that construction activities are carried out following EMPs and SSEMPs and in an environmentally-sound and sustainable manner. • Ensuring corrective actions are implemented when necessary. • Preparing and submitting the Semi-Annual Environmental Monitoring Reports to the ADB for disclosure within 30 days of the end of monitoring periods until ADB's Project Completion Report is issued. • Disclosing relevant information from environmental safeguards documents (including the SAEMRs) to affected persons. • Reporting in a timely manner to ADB any non-compliance or breach of ADB safeguard requirements. • Updating the IEEs in case of unanticipated impacts. • Ensuring that the GRM is operational to effectively handle the environmental and social concerns of affected persons.
GA Operation of the Irrigation System	**Pre-Construction** • Review feasibility and design documentation prepared by the PIU and provide comments and recommendations for revisions as required within a reasonable timeframe. • Assist the PIU in dealing with design organizations, contractors and other persons involved in the project in planning and implementation of Kvemo Samgori modernization works. • As required and within its authority, manage relations with Kvemo Samgori water users and land users. **Operation** • Upon completion of modernization works and after handing over the modernized facilities to the GA, confirm the obligation for the maintenance of those facilities. • Ensure following repairs and works follow good international practices and national legislation.
ADB (Financier)	• Guidance to MEPA (and the PIU) and GA throughout project implementation in accordance with the agreed implementation arrangements. • Review and approval of plans, schedules and detailed designs for project activities upon the submission by the PIU. • Review of all documents requiring ADB approval upon submission by the PIU. • Posting on the ADB website updated project information documents for public disclosure and safeguards documents in accordance with disclosure provisions of ADB's SPS, 2009. • Periodic loan review missions, a midterm review, and a project completion mission.
Design Contractor	**Pre-Construction** • Final detailed design for area 1, and updating the IEE and EMP in line with ADB's SPS.
Construction contractor	**Pre-Construction**

Project Implementation Organization	Management Roles and Responsibilities
	• Ensure all legally required permits and clearances (including waivers) are obtained before works start. • Develop the Site Specific EMP, waste management plan, traffic management plan, etc (listed below). **Construction** • Implementation of the EMP and SSEMP including mitigation measures and monitoring environmental parameters • Establish and maintain site records, incident recording and monitoring data • Assist in the GRM process • Comply with non-compliance notifications and corrective action plans issued. • Produce monthly reports and monitoring reports plus incident/accident reporting.
Project implementation consultants (PIC)	**Pre-Construction** • Support PIU in the review of safeguarding documents. **Construction** • Oversee the construction contractor, including implementation of the EMP • Assist in monitoring and reporting • Providing training

C. Personnel Required

479. The PIU has a safeguarding team which includes an environmental specialist, this position should be maintained until the end of the construction and hand over to the GA.

480. The design team for Package 2 will require an environmental specialist to lead the updates of the IEE and EMP, public consultations and ensure the incorporation of safeguards into the design. An asbestos specialist should be employed to develop an Asbestos Management Plan (dependent on the final design).

481. The construction contractor requires an environmental specialist throughout the construction works. They would be responsible for mitigation, monitoring and any environmental reporting and would also be responsible for waste management (legal requirement). A full-time Health and Safety Specialist is also required.

482. The PIC requires an environmental specialist for the review of the safeguarding documents, throughout construction to support the PIU in supervision and support training. Additionally, a pool of experts would be required for intermittent support:

- Biodiversity Specialist – Intermittent
- Waste Specialist – Intermittent
- Cultural Specialist – Intermittent and short-term (during works within 100m of the Nameless Tower, or to support during chance finds).
- Asbestos Specialist – Intermittent and short-term (during any works involving asbestos)

483. All specialists should have appropriate qualifications and experience to ensure that the national requirements and ADB SPS can be met and ensure good environmental management and monitoring.

D. Mitigation and Monitoring Plan

484. Based on the assessment of impacts and risks, good practice under WB EHS Guidelines, and applicable national requirements the mitigation measures to manage and prevent adverse risks and impacts are included. This is followed by monitoring measures that are required to ensure that each measure manages the risk and identifies any issues.

Table 33 34: Mitigation and Monitoring Plan for Package 2

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
Pre-Construction Activities								
Integration of safeguards related aspects into the bidding documents	Bidding documents are not responsive to safeguards related issues and the performance of the contractor is low	Include all safeguards related clauses and integrate IEE and EMP into the bidding documents	Procurement Officer	PIU	n/a	Bidding documents contain all necessary clauses related to safeguard issues; IEE and EMP are attached to the bidding documents and contractor is performing accordingly	Project start phase	Costs included in the procurement
Update IEE and EMP	Increase in the negative environmental and social impact	Updating Initial Environmental Examination and Environmental Management Plan	Design Contractor	PIU/PIC	All project sites	All plans are approved by PIU/Consultant or state organization.	Submitted with final detailed design.	Costs included in consultants' costs
Preparation SSEMP	Increase the negative environmental	Preparation SSEMP	Construction contractor	PIU/PIC	All project sites	SSEMP approved by PIC	Before construction activities start	Cost included in

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
	and social impact							contractor's cost.
Informing stakeholders before starting the works	Unpreparedness of local communities; delays in the learning process	Informing stakeholders in advance of the start of the civil works	Construction contractor	PIU/ PIC	All project sites	At least 50% of interested persons are informed about the start of the project	10 days before construction activities start	Costs related to the dissemination of information
Construction Phase								
Emissions of harmful substances into the atmospheric air, propagation of dust, noise and vibration	Disturbing the local population, pollution of agricultural fields, Impact on cultural heritage monuments and protected areas	• The movement of heavy machinery should be prohibited during non-working hours. • Machine engine idling should be limited to the extent possible. • The technical condition of the exploited vehicles will be constantly monitored. • Covering trucks with tarpaulins during the transportation of construction materials and waste • Observance of traffic speed limits and proper management of dusty	Construction contractor	PIU/ PIC	Construction Sites and Camps	Dust	Daily observations except if a problem is observed or complaint received where tests should be conducted	Costed by contractor and cost carried into contract
						Noise	Daily observation except if a problem is observed or complaint received where	

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		materials is needed to reduce dust propagation. • Water is sprayed periodically if construction activities are causing dust emissions • Construction transportation routes are set up and appropriate traffic management is adhered to. • Material handling and construction activities that could cause dust limited in high winds. • In times of high winds, extra care is required and works that will cause a disturbance of loose material should be halted until more favourable conditions. • Monitoring of the noise, vibration and dust near the protected area and vibrations within 100m of the cultural sites. • Avoid lighting works sites and camps when not in use, unless vital for security. When necessary for security, ensure that the direction of the light is focused at the site (away					tests should be conducted Vibration: most sites Vibration: around Nameless tower,	Daily observation except if a problem is observed or complaint received where tests should be conducted Regular measurement during construction works near the tower	

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		from communities and natural habitats) • A floristic study should be accomplished in the buffer zone, and additional mitigation measures should be developed if nests are found; • The environmental specialist of the construction contractor should have permanent contact with the administration of the protected area as well as with the management of the hunting office situated in the buffer zone.						
Trench digging, accessing the site, siting of spoil heaps, etc.	Impact on soil quality and erosion	• After the completion of the construction, the previously removed topsoil should be used to restore the damaged areas and improve fertility • The transport and equipment routes must be strictly followed. • Topsoil removal and storage should be done separately from other materials, on a pre-selected site protected from surface runoff.	Construction contractor	PIU/ PIC	All project sites	Monitor management of soil to ensure runoff and contamination are prevented	During works	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Digging and backfilling of trenches should be done as quickly as possible • Temporary water-diversion channels should be provided along the perimeter of the topsoil piles • In the case of long-term storage of topsoil, its care should also be planned • Unfaulty construction techniques should be used to avoid soil contamination • The fuel tank should be placed in an area protected by berms or earth fills to stop accidental spills as necessary. • Accidental spills should be contained and cleaned up immediately using absorbent materials. • The ground/soil contaminated accidentally during the construction should be cut and removed as soon as possible. • After the completion of the construction, the reclamation of the territories and the restoration of sanitary						

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		conditions will reduce the probability of impact on soil quality and stability.						
Trench digging, spoil site locations, construction camp, etc	Visual-Landscape Impacts	• Fencing the perimeter of the construction camp. • Minimizing the area of impact of the construction works and associated zones to the extent possible. • Backfilling, reinforcing and compacting all excavated trenches as soon as possible; levelling surfaces and slopes, and if necessary, using the slope stabilization method. • Proper management of waste and materials, adherence to the sanitary conditions, and timely waste removal from the territory. • Proper planning and control of night lighting in the working areas to avoid bright illumination and light pollution. Light propagation in the surrounding area should be limited as much as possible, especially in the direction of the Korughi Protected Area, other protected areas and the sky	Construction contractor	PIU/ PIC	All project sites	Monitor visual mitigation measures implementation and compares the restored site after construction with the original condition	During and end of construction works	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		(the mentioned mitigating measure should be prioritized during the works in the southern part of the G27 area). • Strictly following the vehicle and machinery travelling routes. • After completion of the construction works, sites should be restored to their original condition or better.						
Siting of the trenches, movement of vehicles, equipment and materials, road closures for works	Loss of Access, Encroachment and Resettlement of Farmland	• Minimization of these risks through good design and construction practice • Consultation and engagement activities. This includes an community awareness and participation plan. • Effective management of the GRM • Implementation of the LARP • Providing appropriate resettlement in line with ADB SPS	Design and Construction contractor	PIU/ PIC	All project sites	Area resettled and the amount compensated.	Throughout LARP activities	Covered in LARP
Digging trenches, storing and transporting	Impact on Water Quality	• Control of the good technical state of the construction equipment to prevent the leakage of fuel and oils;	Construction contractor	PIU/ PIC	Iori River up and downstre	pH, Diluted Oxygen, BOD, Cod, Total Nitrogen, Total	Bi-annually	Costed by contractor and cost

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
waste and material, clearing and cleaning the canal.		• Equipping the fueling stations with a hermetic body and secondary protective casing; • Use of technically non-faulty construction equipment and vehicles; • All equipment running on fuel shall be placed in a secondary tank. The volume of the secondary tank must be at least 110% of the fuel volume used by the equipment. • Control over the separate collection and timely removal of construction and household waste, • Control of water drainage systems. • Control of the state of collection and removal of domestic and faecal waters. • Control over the compliance with the rules of storage and use of oil products and oils and providing anti-spill kits on job sites. • Installation of oil products and oil storage facilities at least 100 m away from water bodies.			am of the project	Suspended Solids		carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Good maintenance of vehicles and machinery • Conducting training for the Construction Contractor and Client's personnel. • Development and implementation of the emergency response plan envisaging emergency actions for such cases of pollution as leaks and spills. The given plan will be updated periodically, incidents will be analyzed and additional preventive measures will be included in it. • Staff briefing before and after the construction works, once every six months.						
Dredging, waste from construction works and domestic waste from workers, excess soil	Waste Management	• Waste management plan outlining each type of waste that will be produced and how it will be safely stored, how its transported, and where and how it's disposed. • All waste removed from sites in a timely manner as part of site clean up • Reuse and recycling of waste as much as possible	Design and Construction contractors	PIU/ PIC	All project sites	Waste is safely stored, transported and disposed of in line with legal requirements Waste hierarchy is applied	Throughout the construction works	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Appropriate storage and transportation of waste. • Good international practices in regard to waste disposal • Waste should only be transferred and disposed of by certified contractors. • Appropriate disposal of wastewater • Littering by workers is prohibited and bins should be provided temporarily across working areas. • Waste management training for workers should be provided. • Portable or constructed toilets with storage must be provided on-site for construction workers if services are not available locally, and must be emptied in an appropriate manner						
Removal of old pipes, repair works of canal structures containing asbestos	Asbestos presents a health and safety risk	• An asbestos specialist should be contracted prior to construction works; • An asbestos management plan should be developed, outlining health and safety measures and waste management measures	Design Consultants and Construction contractor	PIU/ PIC	All project sites	As set by the Asbestos Management Plan	Throughout any activity involving asbestos	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		needed to ensure safe management of the material. • Training workers involved in this activity.						
Movement of materials, waste, machinery, equipment and workers. Works may need to close access roads.	Traffic safety and congestion issues	• A traffic management plan should be set up and approved by the local police department. • Transportation routes and schedules defined • Any road closures require surrounding land owners to be notified in a timely manner. • The transport routes should avoid going within 150m of Nameless Tower and the protected area where alternatives are available. • Local speed limits complied to • Vehicles well maintained • Good vehicle loading practices should be followed • Lose material being transported is covered and appropriate wetting of wheels when necessary to prevent dust • Contractor is responsible for repairing any damage	Construction contractor	PIU/ PIC	All project sites	Record any complaints, incidents or accidents relating to traffic. Ensure traffic management is being enforced.	Throughout works	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		caused by the project construction activities • The local police department needs to be informed of any corrective actions caused by the poor traffic management						
All construction works	Biodiversity	• Visual control of the construction site to identify the Georgian Red-Listed species. • Carrying out observations to identify the impact on species. • Monitoring their condition and, if necessary, developing relevant conclusions and recommendations. • Monitoring of biodiversity should be maintained in Area 1 • Siting of the construction site away from the protected areas and away from windbreaks.	Construction contractors	PIU/ PIC	All project sites	Observation surveys on protected species. Monitoring the condition of known species	Before construction, before removal of vegetation, periodically after removal of vegetation and post-construction.	Costed by contractor and cost carried into contract
Removal of vegetation encroaching the canals or	Impacts on Flora	• Care is taken to minimise the impact on vegetation and minimise vegetation removal • Avoid removal of trees unless necessary	Construction contractors	PIU/ PIC	All project sites	Number of trees and type recorded.	Before vegetation is removed	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
accessing the work locations		• The trees and shrubs of high conservation value will be marked and, where possible, preserved or re-planted. This will be managed under a Replanting plan. • The borders of the construction corridor and traffic routes are to be identified accurately in order to avoid excess damage to the vegetation cover. • Prior to the onset of the construction works, instructing the personnel about the protection of the vegetation cover. • The landscape restoration is to be done with the original plant species, in accordance with their original content and rule of distribution. • For the temporarily lost habitats, the plan for vegetation cover restoration and management must be developed on its own, as this kind of impact can be mitigated. • As for cutting down the Red-Listed plant species in the				Replanting activities recorded Red list flora species recorded	During site restoration activities Throughout	

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		project construction corridor, the measures to maintain them are necessary, and in lieu of the damaged trees, compensation plantings shall be provided. • Removal of the protected species from the environment must be done in line with the requirements of sub-clause f), clause 1, Article 24 of the "Georgian law on the Red List and Red Book", in agreement with the Ministry of Environment and Agriculture of Georgia.						
Construction works within or near vegetation and near the protected area.	Impact on Fauna	• All trees to cut down on the sites should be thoroughly visualized before the construction starts, and any identified animal shelters should be notified in writing to the Ministry of Environmental Protection and Agriculture of Georgia, with further actions to take in accordance with the Georgian Law on the Red List and the Red Book of Georgia and the Law of Georgia on Wildlife.	Construction contractors	PIU/ PIC	All project sites	Monitoring of species present on-site and appropriate actions if fauna is found. For water and noise, vibration and dust see above	Periodically and before vegetation removal	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• The duration of the works causing a disturbance and frightening animals should be as minimal as possible. • It is prohibited to dump or spill waste in an uncontrollable manner during the construction works to avoid pollution. • None of the breeding areas should be damaged without proper study and permission of relevant experts (the studies have evidenced a higher probability of small nests of so-called garden birds and small mammal shelters within the impact zone). The working crews should be instructed against killing fauna representatives. Rather, they must be allowed to escape from the area during the works. In extreme cases, their disturbance should be limited to giving the animals a corridor to escape. • No untreated wastewater from the project should enter the river.						

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
All construction works in the Southern section of Area 1	Impacts on the Protected Area	• In times of high winds, extra care is required and works that will cause a disturbance of loose material should be halted until more favourable conditions. • A floristic study should be accomplished in the buffer zone, and additional mitigation measures should be developed if nests are found. • The environmental specialist of the construction contractor should have permanent contact with the administration of the protected area, as well as with the management of the hunting office situated in the buffer zone • Biodiversity specialist should be employed on an intermittent basis to manage and ensure no impact on the protected area • Monitor noise and the content of harmful substances in the air (especially PM 2.5 and PM 10) more intensely near the	Construction contractors	PIU/ PIC	Southern section of Area 1:	Floristic study in the buffer zone For water and noise, vibration and dust see above	Before construction	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		borders of the protected area.						
All construction activities	Health and Safety	• Access and use of PPE and first aid equipment • Health and Safety Plan, including first aid, emergency procedures, training, PPE, labelling and more will be developed and implemented throughout the project • Accident recording and reporting system • Sanitary facilities provided to the workers • Safe areas for breaks provided • Training and awareness of health and safety measures and local social norms amongst the workers • Clear demarcation and prevent access to unauthorized personnel • Good international practices for water, air, noise, vibration and dust management • Encourage local recruitment • Clean drinking water is available to the workers.	Construction contractors	PIU/ PIC	All project sites	Incidents and accident records Implementation of Health and Safety Plan Siting and condition of a construction camp Training records	Throughout works	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Locate construction camps away from local towns and villages • Ensure all equipment and vehicles are in good working order						
Any construction activities	Impacts on Cultural Resources	• Risks to Nameless Tower and Chailuri fortress should be minimised through good design • During the dismantling works, heavy equipment should be minimised as much as possible. • During works near the cultural sites, permanent instrumental measurements of vibration should be provided at the monument. • The works around the cultural sites should be monitored by a cultural specialist. • The movement of heavy machinery along the local road running adjacent to the tower should be prohibited in the construction phase • The Construction Contractor should develop the bypass route before the construction works start.	Construction contractors	PIU/ PIC	All areas around Nameless Tower.	For noise, dust and vibration see above Monitoring the condition of Nameless Tower	During any works around the tower	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Consultation and public engagement needs to occur periodically throughout the project						
Any excavation activities including digging trenches.	Chance finds	• A Cultural Specialist should develop and inform the contractor of more detailed procedures for chance finds before excavations. • Works should be paused at the location of the suspected chance find immediately • The site needs to be protected. • The Ministry of Culture, Sports and Youth need to be informed as soon as possible in event of chance finds. • Work will only resume after the Ministry of Culture, Sports and Youths provides permission.	Construction contractors	PIU/ PIC	All project sites	Records of chance finds	As found	Costed by contractor and cost carried into contract
Shutting off water supply during works	Interruption of irrigation water supply	• Coordinate with GA on timings • Inform the farmers of when and for how long with sufficient warning in advance	Construction contractors	PIU/ PIC	Areas where supply is disruption	Timing and dates of consultations Timing and dates of disruption	Before and during the timescale of water disruptions	Costed by contractor and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
Operations								
Throughout operations	Strengthening Capacity	• Training on EMP implementation, GRM and good international environmental practices for irrigation operation to PIU and GA	PIC	MEPA	n/a	Training Records	n/a	Costed by PIC and cost carried into contract
During repairs and maintenance	Temporary impacts on soil, water, air, noise, vibration, waste, visual, etc.	• Same as construction. • Good maintenance and correct use of equipment and vehicles • Minimise vegetation removal • Appropriate materials and waste management to prevent pollution • Inform the water users if the irrigation system will be temporarily turned off or if their access to their land is disrupted • Resue topsoil • Appropriate management of waste • Ensure cultural resources are protected	GA	MEPA	Any area of repairs Around Nameless Tower	Noise and dust observations Vibration monitoring tests	Daily during works During temporary works	GA
Throughout operations	Induced impacts	• Farmers trained on good agricultural practices in relation to sustainable water use, soil health and appropriate fertiliser and pesticide use	PIC and GA	MEPA	n/a	Training Records	n/a	Costed by PIC and cost carried into contract

Project Activity/ Item	Potential Risks and Impacts	Mitigation			Monitoring			Related Costs
		Mitigation Measures	Institutional responsibility		Location	Indicators	Implementation Schedule	
			Implementation	Supervision				
		• Monitoring and management of water use, water loss and illegal connections.						
Throughout operations	Safety risk to communities	• Provide signs and where appropriate fences to avoid people from falling in • Follow regular maintenance schedules • Record incidents and accidents, and interpret the information	Construction contractors and GA	MEPA	n/a	Record of incidents and accidents	Throughout	Construction contractor's costs and GA
Other								
Any construction activities	Cumulative impacts from Tbilisi-Sagarejo-Bakurtsikhe Rehabilitation Project	• Coordination with Tbilisi-Sagarejo-Bakurtsikhe Rehabilitation Project to minimise cumulative impacts	Construction contractors	PIU	n/a	Records of communication	Before construction	n/a

Note: The costs are indicative and might increase during project implementation, as needed, to meet the ADB SPS 2009 requirements and applicable Government rules and regulations.

E. Monitoring Plan

485. The monitoring will be used to monitor environmental impacts and to verify EMP implementation.

486. Detailed monitoring measures with technical details, including parameters to be measured, methods to be used, sampling locations that will signal the need for corrective actions; and monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and document the progress and results of mitigation are provided in below. All parameters should be monitored against standards outlined within Section III; in line with national legislation or WB EHS Guidelines, whichever is most stringent.

Table 34. Detailed Monitoring Measures for Package 2

Item	Parameter	Frequency	Location	Action Level	Response Action Level Exceeded	Responsibility
Pre – Contraction stage						
include all safeguards related clauses and integrate IEE and EMP into the bidding documents	Environmental Issues	Once before the bid announcement	n/a	Environmental audit of bidding documents to ensure relevant sections of the EMP have been included	The bidding document shall reflect all environmental mitigation measurements	Construction Contractor
Preparation of Environmental Management Plans	Environmental Issues	Once before Contraction activities start	n/a	Compliance of the document with the requirements should be checked	The construction contractor will not be allowed to start the work	Construction Contractor
Preparation SSEMP	Environmental Issues	Once before Contraction activities start	n/a	Compliance of the document with the requirements should be checked	The construction contractor will not be allowed to start the work	Construction Contractor
Contraction Stage						
Ambient Air	Dust	Continual	Boundaries of the construction site and sensitive receptors <150 meters	Instrumental measurement	Stop construction and develop additional mitigation measures	Construction Contractor
Ambient Air	Noise and vibration	Continual		Instrumental measurement	Stop construction and develop additional mitigation measures	Construction Contractor
Ambient Air	Emissions	Continual		Instrumental measurement	Stop construction and develop	Construction Contractor

Item	Parameter	Frequency	Location	Action Level	Response Action Level Exceeded	Responsibility
					additional mitigation measures	
Water Quality	Quality/ Contaminant concentrates	Monthly inspection	50m downstream of works	Guideline/license requirements (whichever is applicable) Impact Monitoring Compliance Monitoring	If contaminant concentrations/ license conditions are exceeded, review disposal options and decide on the most applicable. Report any accidences of license (if applicable) to issuing authority.	Construction Contractor
Waste Management Implications	Segregation, Storage and transport of wastes	Daily inspection	Waste collection, storage and disposal sites	Visual assessment during the Works; - Field inspection, - Report of waste volumes generated. - Report and record all leakages and spills - Impact Monitoring. - Compliance Monitoring	Solid waste recycled is 0 % of the movement of solids or liquid waste through the soil, rocks, water, and atmosphere.	Construction Contractor
Ground	Soil Monitoring and Erosion	Continual	Areas of soil removal and excavation.	Assess the adequacy of sedimentation/ environmental controls on-site Impact Monitoring	If controls have failed or are found inadequate, cease works immediately and repair to an acceptable standard	Construction Contractor

Item	Parameter	Frequency	Location	Action Level	Response Action Level Exceeded	Responsibility
Ecological Resources	Fauna and Flora	Continual	Within 150m of the border.	Minimal ecological impacts Impact Monitoring	Required to ensure the recommended mitigation measures are properly implemented.	Construction Contractor
Landscape and Visual	Surface treatment of temporary structures	Once the Completion of work	Construction areas after construction	Minimum disturbance of the original landscape. Impact Monitoring	Required to ensure the recommended mitigation measures are properly implemented	Construction Contractor
Operational Phase						
Water losses	Illegal connections	Once a Month	Intake and SCADA system	Visual Monitoring	Penalty subscription and connection interception	GA
System efficiency monitoring	Filling pipes with sediment	Once a month or In the event of a complaint		Visual monitoring	Eliminate the accident	GA
Conduct source water quality monitoring	As per the government regulations	1 sample from each section	TBC	Comparison with the base values and standards as per government regulations	Required to ensure the recommended mitigation measures are properly implemented.	GA

F. Environmental Documents and Records

487. The Construction Contractor and PIU are required to ensure all permits, clearances and waivers are collected. Prior to the onset of the construction works, the Construction Contractor will develop the following management plans and agree on them with the supervisor:

- Traffic management plan;
- Occupational Health and Safety Plan
- Waste Management Plan
- Replanting Plan
- Emergency response plan
- Community Awareness and Participation Plan
- Camp Management Plan
- Asbestos Management Plan (depending on risk and final design)

488. The contractor companies are also responsible for the preparation of Site Specific Environmental Management Plan based on the generic EMP. The plans shall be submitted to PIU by the contractor ten days before taking possession of any work site.

489. In addition, the Implementer (and the Construction Contractor on his errand) shall keep and use the following records in practice during the construction:

- Plan and schedule of the works;
- List of the machines and equipment needed for construction;
- Records related to the occurring environmental problems;
- Records about waste management;
- Written marking of the areas of waste disposal and waste transportation instructions issued by the local authority;
- Records about the supplies of necessary materials and their consumption;
- Complaints log books;
- Incident registration logs;
- Reports about the correction actions;
- Records of environmental monitoring;
- Logs of equipment control and technical maintenance;
- Reports about the personnel training.

G. Capacity Building

490. The capacity building programme should focus on ensuring the implementation of the mitigation and monitoring actions highlighted within the EMP, the GRM, stakeholder engagement and to meet national requirements, ADB's SPS and international good practices. The training programme below should support the awareness and implementation of the EMP and should be led by the PIC.

Table 3535: Training Programme

Topic	Content	Attendees	Frequency
Pre-Construction Phase - Preparation	• EMP Content • Impacts • Mitigation • Monitoring • Reporting	MEPA and PIU	Half Day Course

	• GRM		
Construction Phase - Environmental Management	• National and ADB Requirements • EMP mitigation and monitoring measures • Good construction practices covering waste management, worker behaviour, traffic measures, biodiversity, etc. • GRM • Reporting Process	• MEPA and PIU • Construction Contractor's senior and safeguarding staff	1 day course before the start of works
	• Refreshing above • Update on progress		Every 6 months
Operational Phase - Environmental Management	• National and ADB Requirements • EMP mitigation and monitoring measures for operation • Good construction practices during operation	GA	1 day course as part of handover

H. EMP Costs

491. Most costs associated with the implementation of the EMP are a normal part of preparing the bid and contract documents and ensuring that proper environmental provisions are incorporated therein.

492. Table 31: The table below ists the key proposed mitigation measures and the additional costs beyond what would normally be included in a project budget. The total is the $178,500 so far, this is an estimate.

Table 3636: Estimated Cost for Mitigation Measures and Monitoring

Action	Number of Units / Unit cost (US$)	Cost estimate (US$)	Timing	Frequency and duration
Habitat and fauna survey	One habitat and fauna survey: $1,500	$1,500	Preparation Phase	Pre-Construction Stage
HIV/AIDS Training	3 trainings x $1,000 per training	$3,000	Pre-construction phase and construction phase	Three times: Once during the pre-construction phase, and twice during the construction phase
Waste management	5 USD – collection, transportation and disposal 1 m ^{3}l	$30,000	Construction phase	Throughout dismantling of old channels or removal of sold pipe, removal of sedimentation and broken concrete and excess soil.
Habitat restoration	$5 seedlings (5-6 y/o) $1.5 seedlings (2-3 y/o)	TBD*	Construction Phase	Once according to the Clearance, Replanting Plan, and as

Action	Number of Units / Unit cost (US$)	Cost estimate (US$)	Timing	Frequency and duration
	$10 seedlings (GEO Red List)			necessary during the construction phase
Environmental Staff (PIC)	Environmental and Social Officer: 24 months x $1,500 per month	$36,000	Construction Phase	Throughout the construction phase
	Health and Safety Specialist 24 months x $1,500 per month	$36,000	Construction Phase	Throughout the construction phase
	Pool of Specialists (Biodiversity, Cultural, Asbestos, etc)	To be determined	Construction Phase	Throughout the construction phase
Environmental Staff (Construction Contractor)	Environmental Specialist: 24 months x $1,500 per month	$36,000	Construction Phase	Throughout the construction phase
	Occupational Health and Safety Specialist: 24 months x $1,500 per month	$36,000	Construction Phase	Throughout the construction phase
Capacity Development Activities	Multiple training sessions and workshops	To be determined	Pre-construction phase and construction phase	Throughout project

I. Unanticipated Environmental or Social Impacts

493. If any unanticipated environmental or social impacts become apparent during project implementation, the operations department advises and requires the borrower/client to:

(ix) Assess the significance of such unanticipated impacts;
(x) Evaluate the options available to address them; and
(xi) Prepare or update the IEE.

494. ADB will help the borrower/client mobilize the resources required to mitigate any adverse unanticipated impacts or damage.

XII. CONCLUSIONS AND RECOMMENDATIONS

495. The proposed Climate Smart Irrigation Sector Development Project Output 2 has been categorized as Category 'B'. This is based on the fact that the project site is not located in any environmentally sensitive areas and near densely populated areas and heavy with developmental activities. The project would provide numerous socio-economic benefits with mostly temporary and mitigatable impacts on the environment. This is the IEE and EMPs covering Packages 1 and 2. Without the project, the system will further deteriorate leaving the area without irrigation water.

496. As a great part of the existing system is damaged, the irrigation system uses excess water and not all plots receive irrigation water currently. Even though following the rehabilitation, the area served by the rehabilitated irrigation system will sharply increase, according to all calculations, the amount of water the irrigation system will take from the Iori River will not change. It may be said that the Project will not have an impact on the villages in the lower reaches of the Iori River and on the Mingechauri Reservoir in Azerbaijan.

497. The environmental impacts attributable to the project pertain more during construction stage. In the construction phase, the environmental impact is expected during the movement of construction equipment, trench excavation and PVC pipes installation, as well as during the repairs and rehabilitation of the Main Canal.

498. The amount of suspended particles is high in the Iori River water supplying the Lower Samgori irrigation system. This may lead to certain difficulties in the operation phase, namely: the underground PVC pipes could be blocked also triggering additional costs and leading to the faulty operation of the irrigation system.

499. The following sensitive receptors that the project may affect are noteworthy: (i) the agricultural fields in the project area; (ii) the Korughi Protected Area south of the project area; (iii) the tower in the project area, which is on the list of cultural heritage.

500. According to the preliminary design, the project will affect 1243 plots of land, most of which are privately owned. The project will not affect residential houses, as most of the said land plots are used for agricultural purposes. However, on several plots, the project will affect auxiliary structures, which are used for agricultural purposes (water pump, shed, etc.) and power transmission towers.

501. The project will drastically improve the social conditions of the local population. During the social survey, 100% of the population welcomes and supports the project.

502. There is another infrastructural project underway in the project area of the Lower Samgori irrigation system the Roads Department is implementing the construction/rehabilitation of the existing Tbilisi-Bakurtsikhe Road section. This road crosses our project area. Therefore, there may be a cumulative impact in the given project area.

503. The project will not have transboundary impacts. Although the Iori River is transboundary, in the project implementation phase, following the preliminary design of the project, the risk of pollution of the Iori River is very low. Besides, in the operation phase, no additional water intake is planned from the river.

504. There is a potential risk that the project will have the following induced impacts, in particular: (i) as the region suffers from a lack of irrigation water, the areas of the agricultural fields may increase following the project implementation, perhaps at the expense of cutting

down the existing forests; (ii) the number of processing and transportation companies may increase in the area what will increase the risk of the environmental impact; (iii) as the areas of the agricultural land increase, the use of pesticides and fertilizers in the area will increase as well. In the case of improper use of pesticides and fertilizers, the risk of soil pollution will increase, while in the long term, the risk of Iori river pollution will increase as well.

505. Based on the above-given conclusions, the following recommendations were developed within the project:

- After developing the project's detailed design, it is necessary to update the existing IEE version;
- The IEE document must be an integral part of the contract signed with the construction contractor, and the construction contractor must undertake to fulfil the requirements of the said document;
- The construction contractor must have the appropriate human and infrastructural resources to fully realize the mitigation measures and conditions of the IEE;
- Prior to the onset of the construction, the construction contractor should prepare a Site-Specific Environmental Management Plan (SSEMP) and all environmental management plans given in the submitted IEE report. The building company must start the construction activities only after the said plans are agreed upon with the project implementing agency and the supervisor;
- An Environmental Specialist should be employed by the PIU to ensure that they can effectively manage the safeguard implementation, by the design consultations to be able to update the IEE, the Construction Contractor to appropriately implement the IEE and the Project PICs to be able to supervise the activities and provide support to the GA and PIU.
- Cultural specialist, biodiversity specialists and potentially an asbestos specialist (depending on design) will be required to update the IEE and during construction works to implement the EMP.
- Before the construction starts, the preparation plans, which must be agreed with other organizations by the construction contractor under the requirements of the national legislation, must be agreed according to the effective legal requirements;
- At the detailed design stage, it is desirable to change the locations of the secondary pipes in such a way as to minimize the number of privately owned affected land plots and to avoid impact on auxiliary buildings and existing infrastructure.
- When developing the detailed project plan, the construction contractor should discuss and consider the construction schedule of the second Tbilisi-Bakurtsikhe Road construction/rehabilitation infrastructural project in the project area, as well as the locations of camps and quarries to avoid the risk of cumulative impact.
- The project’s grievance redressal mechanism will provide the stakeholders with a platform for redressal of their grievances, and describes the informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance.In the operational phase, it is desirable to develop and realize the training project for the local farmers to improve their skills in the use of pesticides and fertilizers.
- It is also desirable to plan the project for water meter installation for the existing irrigation systems, which will most likely further reduce the water discharge taken from the Iori River.
- During Area 1 final design, the safety of the community should be considered regarding leaving any open channels. If it may lead to the local community or wildlife falling in and potentially causing injury then these need to be removed and be filled with appropriate material and the site left in a safe state.
- Within the detailed design of Area 1, locating and designing small artificial reservoirs to provide drinking water for livestock and wildlife in order to minimise socio-economic

impacts and biodiversity impacts from the change from channels to pipes. Concentrating on areas currently in use by livestock, along known migration routes or at concentration points for wildlife.

- Output 3 and future training provided to the farmers by the GA, should incorporate sustainable use of water and appropriate use of fertilizer and pesticides where appropriate.

ANNEXES

ANNEX 1: RAPID ENVIRONMENTAL ASSESSMENT CHECKLIST

Rapid Environmental Assessment (REA) Checklist

Country/Project Title:	**Georgia, TA-6648 GEO: Climate Smart Irrigation Sector**
Investment Title:	**Modernization of the Kvemo Samgori Left Main Canal**
Sector Division:	**Irrigation**
Date:	**12.04.2022**

Screening Questions	Yes	No	Remarks
A. Investment Siting Is the Investment area adjacent to or within any of the following environmentally sensitive areas?	**Yes**		The project area, which is divided into 6 areas in view of biodiversity, is in a sensitive area (according to the information received from the Integrated Biodiversity Assessment Tool (IBAT)). The first area is separated from Iori Managed Reserve only by a local ground road. The second area is also separated from Korughi Managed Reserve by a local ground road.
▪ Protected area	**Yes**		As mentioned, the project area does not intersect with the protected area. Iori and Korughi Protected Areas are located 10-15 meters from the project area. At this stage, no preliminary design has been developed for the second section, and the scale of the rehabilitation works or the methods and schedule of the necessary works are not known either. Consequently, at the given stage the level of expected impact on the protected area is not specified. According to the preliminary design, a number of secondary pipes will be installed underground in the vicinity of the protected areas.
▪ Wetland		**No**	

Screening Questions	Yes	No	Remarks
▪ Mangrove		**No**	
▪ Estuarine		**No**	
▪ Buffer zone of protected area	**Yes**		A 1.7-km-long southern portion of the first section of the project area follows Iori Managed Reserve. These areas are divided by a local ground road. Iori Managed Reserve (belonging to Category IV of The World Conservation Union). It is located quite close to the secondary channels.
▪ Special area for protecting biodiversity	**Yes**		As per the information taken from the Integrated Biodiversity Assessment Tool (IBAT), the project area is in a sensitive zone in view of biodiversity.
B. Potential Environmental Impacts Will the Investment cause…			
▪ Loss of precious ecological values (e.g. result of encroachment into forests/swamplands or historical/cultural buildings/areas, disruption of hydrology of natural waterways, regional flooding, and drainage hazards)?	**Yes**		After the design changes, no cultural heritage sites are included in the project area. It should be noted that the project area, especially its first and second sections, is located in a region rich in cultural heritage resources. Consequently, there is a possibility of the presence of artefacts in the ground during the installation phase of the secondary irrigation pipes.
▪ Conflicts in water supply rights and related social conflicts?		**No**	The project plans the modernization of the existing irrigation system.
▪ Impediments to the movements of people and animals?		**No**	Mainly the existing irrigation systems will be rehabilitated within the scope of the project. This will not cause impediments to the movements of people and animals. As for the additional secondary channels envisaged under the project, as per the preliminary information, they will be installed under the ground with pipes.
▪ Potential ecological problems due to increased soil erosion and siltation, leading to decreased stream capacity?		**No**	

Screening Questions	Yes	No	Remarks
▪ Insufficient drainage leading to salinity intrusion?		**No**	
▪ Overpumping of groundwater, leading to salinization and ground subsidence?		**No**	In the operation phase, the project will use only surface waters for irrigation purposes.
▪ Impairment of downstream water quality and therefore, impairment of downstream beneficial uses of water?		**No**	
▪ Dislocation or involuntary resettlement of people?		**No**	
▪ Disproportionate impacts on the poor, women and children, Indigenous Peoples, or other vulnerable groups?		**No**	
▪ Potential social conflicts arising from land tenure and land use issues?		**No**	
▪ Soil erosion before compaction and lining of canals?		**No**	
▪ Noise from construction equipment?		**No**	As per the preliminary design, it is not expected to use a large number of techniques on one construction site. Consequently, the noise level will be within the set standard of 250-300m from the construction sites. The rehabilitation areas are mainly located on agricultural lands. The irrigation systems in the populated areas are laid under the ground.
▪ Dust during construction?	**Yes**		The access roads to both, the main and the secondary channels are covered with a ground layer. Consequently, dust generation is expected during the movement of the equipment in the construction phase.
▪ Waterlogging and soil salinization due to inadequate drainage and farm management?		**No**	
▪ Leaching of soil nutrients and changes in soil characteristics due to excessive application of irrigation water?		**No**	
▪ Reduction of downstream water supply during peak seasons?		**No**	

Screening Questions	Yes	No	Remarks
▪ Soil pollution, polluted farm runoff and groundwater, and public health risks due to excessive application of fertilizers and pesticides?	**yes**		A certain amount of ground in the project area is used as agricultural land. There are also forest massifs in the project area. As the Kakheti region has historically suffered from a water deficit, following the rehabilitation and modernization of the irrigation channels, the number of agricultural lands in the project area may increase at the expense of the forest massifs. This will also contribute to the increase in the use of pesticides and fertilizers which may result in soil contamination.
▪ Soil erosion (furrow, surface)?		**No**	
▪ Scouring of canals?	**Yes**		
▪ Clogging of canals by sediments?	**Yes**		There are several construction material (sand/gravel) mining enterprises in the upper part of the headworks of the Samgori irrigation system in the riverbed of the Iori River. Following the operation of these plants, the amount of suspended particles in the water of the Iori River increases drastically. Consequently, blocking of the irrigation system with sediment is expected.
▪ Clogging of canals by weeds?		**No**	
▪ Seawater intrusion into downstream freshwater systems?		**No**	
▪ Introduction of increase in incidence of waterborne or water related diseases?		**No**	
▪ Dangers to a safe and healthy working environment due to physical, chemical, and biological hazards during construction and operation?	**Yes**		As per the design, at the given stage it is known that the project envisages dismantling 160-m-long (First area) asbestos-containing pipelines. After the preliminary design is developed, the number of asbestos-containing materials may be found greater.
▪ Large population influx during construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		**No**	
▪ Social conflicts if workers from other regions or countries are hired?		**No**	

Screening Questions	Yes	No	Remarks
▪ Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel, and other chemicals during construction and operation?		**No**	
▪ Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the investment (e.g., irrigation dams) are accessible to members of the affected community or where their failure could result in injury to the community throughout construction, operation, and decommissioning?		**No**	

Category A (EIA)	X Category B (IEE)	Category C
Projects that are likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An EIA is required.	Project with potential negative environmental impacts that are less adverse than those of Category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases, mitigation measures can be designed more readily than for category A projects. An IEE is required.	Projects that are likely to have minimal or no adverse environmental impacts. No. environmental assessment is required although environmental implications need to be reviewed.
REMARKS: The present document is based on a conceptual design. Much of the information at the given stage is gathered based on interviews with the designers. As the preliminary design is developed and we are able to specify the possible degree and extent of the environmental impact, certain changes may become necessary to make to the checklist.		

ANNEX 2: ASSESSMENT CRITERIA

Table 37: Atmospheric Air quality – Impact assessment criteria

Kind of Impact	Assessment criteria		
	Significant (high) impact	**Average impact**	**Insignificant (low) impact**
Distribution of combustion products	The maximum permissible concentration share of pollutant concentrations in the 500 m zone and the boundary of the settlement exceeds 1, with other sensitive receptors (hospital, recreational zone, etc.) greater than or close to 0.8. The impact is long-lasting or permanent. The dissatisfaction of the population is inevitable.	The maximum permissible concentration share of concentrations of contaminants with sensitive receptors (hospital, recreational area, etc.) is less than 0.8. Exceeding the 500 m zone at the boundary of the settlement and the settlement may occur only in isolated cases (technological malfunction), although the impact will be temporary and easily eliminated.	The maximum permissible concentration share of pollutant concentrations at the reference points is less than 0.8. Slight deterioration of ambient air quality is expected. The dissatisfaction of the population is not expected.
Dust spread	The maximum permissible concentration share of inorganic or organic dust concentrations at the 500 m zone and the boundary of the settlement exceeds 1, with other sensitive receptors (hospital, recreational zone, etc.) greater than or close to 0.8. The impact is long-lasting, and population dissatisfaction is inevitable.	Exceedances of dust maximum permissible concentration at reporting points are less likely. Noticeable dusting can occur only in isolated cases (traffic, windy weather). However, the impact is manageable and the dissatisfaction of the population with the mitigation measures is not expected.	A slight increase in dust distribution is expected, even only during traffic and windy weather. Impacts are manageable under standard mitigation measures.
Spread of odour	In the direction of the populated area and sensitive receptors (hospital, recreation area, etc.) the unpleasant odour spreads constantly or in windy weather. The dissatisfaction of the population is inevitable.	Under the conditions of protection of technological processes, the spread of unpleasant odours in the direction of the populated area and sensitive receptors (hospital, recreational area, etc.) is minimal. The dissatisfaction of the population is not expected.	There is no risk of spreading an unpleasant odour in the direction of the populated area and sensitive receptors. An unpleasant odour spreads only in the vicinity of the object.

Condition in the working area (combustion products, dust, odour)	Work is unbearable. The use of air traps and other protective equipment is ineffective.	Combustion products, dust or odours are applied to the work area. However, it is permissible to work under appropriate protective equipment and other measures (e.g. shortening the duration of work, etc.).	The ambient air quality of the working area is satisfactory. There is no need to use protective equipment.

Table 38: Noise and vibration propagation – Impact Assessment Criteria

Kind of Impact	**Assessment criteria**		
	Significant (high) impact	**Average impact**	**Insignificant (low) impact**
Noise propagation	Noise levels at the border of the settled area exceed 55 dBA during the day and 45 dBA at night or exceed 50 dBA during the day and 40dBA at night at sensitive receptors. Excess noise levels are intense. Population dissatisfaction is inevitable.	Noise levels at the border of the settled area little exceed 55 dBA during the day and 45 dBA at night; however, the impact is expected only in some cases or is temporal. The noise levels at the sensitive receptors are admissible; however, additional preventive measures are recommended.	The noise background levels have deteriorated a bit near the settled areas or sensitive receptors. In any case, no levels more than the admissible levels are expected. It is sufficient to take standard mitigation measures.
Vibration	Due to the use of heavy techniques and other methods, vibration spreads to great distances. Damage or destruction is probable of buildings and premises, monuments of cultural heritage or disturbance of geological stability.	Vibration does not spread too far places, or the impact is short-term. The probability of damage to buildings and premises, monuments of cultural heritage or disturbance of geological stabilities is very little. Minor and periodic discomfort is expected.	Vibration propagates only in the working zone. No damage to buildings and premises, monuments of cultural heritage or disturbance of geological stability is expected. No additional mitigation measures are needed.
Condition of the working area (noise and vibration)	It is impossible to work. Using earplugs or other protective equipment is less inefficient. It is necessary to change the service staff frequently.	Noise and vibration are a nuisance in the working area, but working is possible provided the relevant protective equipment is used or other measures are taken (e.g. cutting the working hours and the like).	The noise and vibration levels in the working zone are not high. No PPE is needed, or if needed only for short periods. An 8-hour-long working day is permitted.

Table 39: Assessment criteria of the expected impact on water

Kind of Impact	Assessment criteria		
	Significant (high) impact	**Average impact**	**Insignificant (low) impact**
Changed flow rate of the surface waters	Under the project impact, the natural river flow rate is strongly changed (either for the year or temporarily); it is difficult to maintain the present state of the water ecosystem. Other water-consuming unit has limited access to water, or due to the increased water flow, the risk of developing hazardous hydrological events has increased.	Under the project impact, the natural river flow rate was reduced to 70% (either for the year or temporarily); however, the water ecosystem is mostly maintained. The access to another water-consuming unit to water has not changed, or Under the project impact, the natural river flow rate increased to 110%. The risks of developing hazardous – hydrological events are possible to eliminate by using relevant protective measures.	Under the project impact, the natural river flow rate was reduced to 70% (either for the year or temporarily). The access of another water-consuming unit to water has not changed, or the unit is not used for other purposes. The river flow rate will not increase under the impact of the project.
Deterioration of the surface water quality, origination of the sewage	Fishing or drinking-and-industrial water object is under the impact, or A significant amount of sewage is expected. Despite building the treatment plant, there is a probability of discharging the excessively polluted waters, or the probability of emergencies is high. Due to the near location of the water body, the solid remains and liquid mass can enter the water body.	An industrial-household water unit is under the impact. Sewage originated; however, at the expense of relevant preventive measures (arranging the duly efficient treatment plant, etc.) it is possible to maintain the qualitative state of the surface water. The existing quality may be changed a bit which will have a minor impact on the water biodiversity, or the probability of emergencies occurring is not high. In such a case, the distances are so great that the risks of the polluting substances flowing into the water are minimal.	There are no surface waters near the water object. Therefore, there is only the possibility of indirect impact, which is not major. No sewage is expected to originate, or the small amount of liquid remains can be managed by using methods safe for the water environment (e.g. by an evaporating pond, recycling the liquid remains, etc.).
Groundwater pollution	The activity implies using the methods creating the	The activity implies using the methods creating certain	The risks of groundwater pollution

	risks of excess pollution of the ground waters (e.g. burying the materials containing polluted substances, etc.); mitigation measures are less efficient, or the probability of emergencies occurring is quite likely with the infiltration of large amounts of oil products or other polluting substances into the ground layers.	risks of pollution of the ground waters; however, using the mitigation measures is efficient and significantly reduces the risks, or there is a probability of emergencies occurring; however, relevant preventive measures are taken.	are associated with unforeseen cases only (minor oil product leakages from technique or equipment and the like.). No large amounts of liquid polluting substances are stored or used in the area threatening the ground waters in case of accidents.
Impact on the flow rate of the ground waters, changed infiltration properties of the grounds	The activity envisages arranging deep engineering facilities, with which it is possible to cross the underground water-bearing infrastructure. As a result, the outflows of the underground waters may decrease, or The activity envisages using large land areas/cutting down the forests which will deteriorate the ground infiltration properties. This may reduce the intensity of the underground water alimentation with the atmospheric precipitations.	The activity does not envisage arranging deep engineering facilities, and in addition, there are no particularly significant water-bearing horizons spreading on the territory. Despite this, the cultivation of land areas or the used building and exploitation methods may have a certain impact on the outflows of less valuable springs.	By considering the small project area, used building and exploitation methods and existing hydro-geological conditions, the impact on the flow rate of the underground waters will be minor. No impact on either drinking or industrial water is expected.

Table 40:Assessment criteria of the expected impact on the soil

Kind of Impact	**Assessment criteria**		
	Significant (high) impact	**Average impact**	**Insignificant (low) impact**
Damage and erosion of	The project envisages using over 12,5 ha of agricultural plots or other	The project envisages using less than 12,5 ha of agricultural plots or other	The project envisages using less than 12,5 ha of non-agricultural plots or other land areas less

the fertile soil layer	land areas highly valuable in respect of fertility, or the methods used during the building and exploitation promote the activation of the soil erosion processes over significant areas.	land areas valuable in respect of fertility, or the area to manage is more than 12,5 ha, but this is not agricultural land or is not otherwise valuable, or The methods used during the building and exploitation promote the activation of the soil erosion processes in some areas, but they can be prevented by using the relevant mitigation measures.	valuable in respect of fertility. Provided the fertile soil layer is duly managed, the impact will be minimal. No erosion beyond the used perimeter is expected.
Soil/ground pollution	Due to the methods used during the building and exploitation, the risks of polluting the fertile layer of the agricultural land of any area (exceeding maximum permissible concentration) are quite high or virtually inevitable or the probability of developing such emergencies leading to the pollution of over 100 m^2 area or over the depth of 0,3 m of soil and ground is quite high.	Due to the methods used during the building and exploitation, there are risks of polluting the less valuable surface layer of land (exceeding the maximum permissible concentration) or there is a probability of developing such emergencies leading to the pollution of less than 100 m^2 area or less than the depth of 0,3 m of soil and ground.	Only minor local pollution of soil/ground is expected, mostly in unforeseen cases. The technology of local cleaning the polluted soil can be used.

Table 41: Assessment criteria of the expected impact on the geological environment

Kind of Impact	**Assessment criteria**		
	Significant (high) impact	**Average impact**	**Insignificant (low) impact**
Violation of the stability of the geological environment under the project impact, activation of	The project is planned to implement in the relief with the III degree of complexity in engineering-geological respect. During the earthworks, the probability of activation of such hazardous	The project is planned to implement in the relief with the II degree of complexity in engineering-geological respect. During the earthworks or in the operating phase, the probability of activation of hazardous geodynamic	The project is planned to implement with favourable relief. No significant resources to build protective structures are needed. Only local, minor erosive processes may develop.

hazardous processes	geodynamic processes, such as landslide, rock fall, mudflow, etc. exists, or the risks of activation of the same processes exist in the operation phase of the object (hydro-technical facilities, tunnels, etc. can be considered as such objects). It is necessary to build the protective facilities of complex structures or to make corrections to the project.	processes. However, provided the protective measures in terms of simple-structure facilities these can be prevented.	
Impact of the existing engineering-geological conditions on the project facilities	The engineering-geological properties of the grounds are not favourable needing building deep foundations to establish the facilities on the cliffy rocks, or hazardous geodynamic processes threaten the stability of the object. It is necessary to build the protective facilities of complex structures or to make certain corrections to the project.	The engineering-geological properties of the grounds allow the founding of the object but under certain conditions. The degree of the environment (ground and ground waters) aggressiveness to the reinforced concrete is satisfactory, or hazardous geodynamic processes pose a certain threat to the object's stability; however, the risk may be eliminated by taking protective measures of a simple structure.	The object is not a facility of a complex structure. The engineering-geological properties of the territory-constituent grounds are satisfactory. Consequently, there is no need for either deep foundations or significant measures to protect the engineering facilities.

Table 42: Assessment criteria of the expected impact on the biological environment

Kind of Impact	**Assessment criteria**		
	Significant (high) impact	**Average impact**	**Insignificant (low) impact**
Generic and quantitative changes in the vegetation cover	The project implementation will lead to the destruction of the endemic or Red-Listed species or	Following the project implementation, the risks of direct or indirect impacts on the endemic or Red-Listed species are minimal or	Following the project implementation, there is no risk of impact on the endemic or Red-Listed species. Only the destruction of the homogenous low-value

	the project implementation will lead to the use of the forested area of over 1 ha or there is a risk for invasive kinds to spread	the project implementation will lead to the use of a forested area of less than 1 ha	vegetation cover is expected. There is no risk for invasive species to spread.
Deterioration of the animal habitats, habitat loss or fragmentation	The project implementation will lead to the destruction, reduction or fragmentation of the area of the endemic and Red-Listed animal species or certain species may be reduced or certain populations may disappear in the project implementation area or an object is a linear object creating a kind of barrier for migrating animals or there is a risk for invasive kinds to spread.	Following the project implementation, the impact on the endemic or Red-Listed species is less likely. The area of such living organisms with no ability to migrate to long distances may decrease, or quantitative changes in certain species are expected in the project implementation area, but their destruction is not likely.	The project area is under anthropogenic impact and is not a shelter for animal species. Only the animals adapted to human activity live in the area with high ecological valency. The object is not a barrier hampering the migrating animals.
Immediate impact on fauna species	Due to the project implementation, there are some cases of animal perishing (including endemic or Red-Listed species) during the year, or increased probability of poaching.	Due to the project implementation, there are few cases of animal perishing (fewer valuable species) during the year	Perish of the animal species is less likely. The impact is short-term. The probability of increased poaching is minimal.
Direct or indirect impacts on the protected areas	Due to the small distance and following the methods used at the building and exploitation stages, there are risks of long-term direct or	Following the methods used at the building and exploitation stages, there is a risk of indirect impact on the protected area, but the impact is not long.	Due to the great distance, an impact on the protected area is less likely.

	indirect impacts on the territory.		

Table 43: Assessment criteria of the expected impact on the visual-landscape environment

Kind of Impact	Assessment criteria		
	Significant (high) impact	**Average impact**	**Insignificant (low) impact**
Landscape impact	The project implementation is planned within the limits of the rare and high-value landscapes, or the landscape and its components are intact and have a high degree of naturalness.	The project implementation is planned within the limits of a regional or local landscape. or the landscape and its components are partially transformed due to human actions. They have an average degree of naturalness.	The project implementation is planned within the limits of a low-value landscape, which can be substituted, or the landscape and its components are quite devastated due to man's economic activity.
Visual changes	The project area is easily seen from many locations. Implementation of the activity will have a significant impact on the visual effect for the local people or tourists.	The project area is seen from some observation points as having no tourist value.	The project area is almost invisible. The building and exploitation will have a minimal impact on the visual effect for the local people or tourists.

Table 44: Assessment criteria of the expected impact on the social environment

Kind of Impact	Assessment criteria		
	Significant (high) impact	**Average impact**	**Insignificant (low) impact**
Positive impact			
Increased budgetary flows	Increased central budgetary flows	Increased budgetary flows	Increased central budgetary flows
Employment and growing income of the population	The possibility to hire 70% of the workforce from the local population or The possibility to hire 40% of the workforce from local rural residents	A total of 30 to 100 people have employment opportunities. Or Local villagers from 10 to 30 people have employment opportunities.	10 persons employment opportunity.

	or the possibility to hire 20% of the workforce from the local population in the high-mountain villages.	Or Highland status of rural residents few employment opportunities.	
Improvement of transport infrastructure	Improvement of the technical state of the international, state and regional roads, high probability of distress of transport intensity.	Improvement of the technical state of the roads in some or high-mountainous villages and easy transportation.	Simplified rehabilitation of rural roads and transportation
Other social-economic benefit	At a country, regional or municipal level, or for several high-mountainous villages: Improved waste management conditions. Improved water supply and drainage conditions. Improved power supply and gas supply conditions. Improved accessibility to other kinds of resources.	For several or high-mountainous villages: Improved waste management conditions. Improved water supply and drainage conditions. Improved power supply and gas supply conditions. Improved accessibility to other kinds of resources.	Only some families (homesteads) receive various social-economic benefits.
Negative impact			
Resettlement, need to use private property	One of several cases of physical resettlement, or over 10 cases of economic resettlement, or one or several cases of economic resettlement in a high-mountainous village	Up to 10 cases of economic resettlement. Provided the compensation measures are taken, no population dissatisfaction is expected	No physical or economic resettlement is expected. Temporal use of privately owned land plots and units may be needed, with the relevant compensation measures planned.

Deterioration of transport infrastructure	Deterioration of the technical condition of the international, state and regional roads, a significant increase in transport intensity.	Deterioration of the technical condition of the roads in some or high-mountainous villages or significant increase in vehicle movement; however, the impact is temporal.	No deterioration of local roads or significant increase in transport intensity is not expected.
Other negative social-economic effects	At a country, regional or municipal level, or for several high-mountainous villages: Deteriorated waste management conditions and landfill overload. Deteriorated water supply and drainage conditions or overloaded relevant systems Limited accessibility to other resources.	For several or high-mountainous villages: Deteriorated waste management conditions and landfill overload. Deteriorated water supply and drainage conditions or overloaded relevant systems Limited accessibility to other resources.	For several families Deteriorated waste management conditions and landfill overload. Deteriorated water supply and drainage conditions or overloaded relevant systems Limited accessibility to other resources. However, the problem can be solved by searching for alternative routes.

Table 45: Assessment criteria of the expected impact on the historical-cultural monuments

Kind of Impact	**Assessment criteria**		
	Significant (high) impact	**Average impact**	**Insignificant (low) impact**
Damage to the historical-cultural monuments	Due to the small distance and following the methods used in the building and exploitation phases, there is a probability of damaging the monuments of the international or local historical-cultural heritage.	Due to the small distance and following the methods used in the building and exploitation phases, there is a probability of damaging the monuments of the local historical-cultural heritage.	Due to the great distance, the probability of damaging the monuments of historical-cultural heritage is less likely.

Unforeseen damage to the archaeological monuments	Following the historical designation of the project area, there is a probability of the late identification of the archaeological monuments.	The area is quite anthropogenic. Therefore, identification of the recent archaeological monuments is less likely.

ANNEX 3: CULTURAL RESOURCES REPORT

Rehabilitation of the Left Main Canal of Kvemo Samgori Irrigation System

Cultural Heritage Survey Report

Tbilisi, 2022

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Table of Contents

1. Introduction

Generally, archeological monuments, artifacts and features provide a key source to study much of the history of human development and a significant role in the historical study. Cultural resources can be used to understand how people lived, political and social situation, their beliefs and more. The historical information that the physical cultural resources provide is of value to society today.

Cultural resources are often also important to the communities the resource belongs to, potentially representing parts of traditions, beliefs or ancestry. They are also valued for their tourism potential.

2. Survey Methodology

A full cultural study was undertaken by a cultural specialist for a similar project for all the key cultural sites near the project – this includes site visits, inspections of the area and an archeological survey. This report was developed by the cultural specialist based on his prior visit to the site for this project. The site has not been visited for this specific project.

3. Information about the study area

Sagarejo Municipality is located in the foothills of the south-western slope of Gombori Ridge, on the bank of the Tvaltkhevi River, on Tbilisi-Gurjaani Road, 700 m asl, 58 km from Tbilisi by rail and 48 km by road.

Sagarejo Municipality is bordered by Gurjaani Municipality from the east, Gardabani Municipality from the west, and Tianeti and Telavi Municipalities from the north. The southern boundary of Sagarejo Municipality borders the Republic of Azerbaijan.

Name Sagarejo derives from the common name of the estate of Davitgareja Monastery – Sagarejo (literally, 'For Gareja").

According to archeological data, the traces of human life in the territory of the city of Sagarejo date back to II BC.

Sagarejo is the municipality in Kakheti region in East Georgia. From the first half of the VI century, some villages of Gare Kakheti were feudal estates of Gareji, the largest monastic center. Over time, Gare Kakheti was called Sagarejo, or Gareji country, and the historical sources from the XV c. refer to it by this name.

As per the written sources, the earlier name of the city of Sagarejo was "Tvali", sometimes called as "Tvalni", "Tval-Sagarejo" or "Sagarejo".

"Tvali", as the name of the village, is used in historical documents since the XIX century. Name "Tvalni" (plural of "Tvali") means that there were some villages in the area, as evidenced by many materials' cultural monuments inter alia. However, there are no visible borders between these villages today. Name "Sagarejo" originated in the mid-XV century. At first, this name was used to denote the villages and estates owned by Gareja Monasteries.

Sagarejo was an important strategic and economic center throughout the Middle Ages and afterwards. The transit trade road from Tbilisi to Kakheti ran across Sagarejo. One branch of

road “Tskvari Gza” on the back also ran across Sagarejo, by which the Pshavi, Ertso-Tianeti and Tushi people used to take sheep from Shirak to summer pastures.

At the beginning of the XX century, 800 or 900 families lived in Sagarejo, with the majority of Georgians and 70 Armenian families. There was a regular traffic between Tbilisi and Sagarejo. The village streets were winding making a dense network. There was a market, a medical school, a two - class school and a private parish school in the region. The people were engaged in field crop cultivation and viticulture.

Sagarejo Municipality has two grape micro-zones, with the grape varieties of a special origin: Khashmi Saperavi and Manavis Mtsvane. Village Manavi is famous for its Churchkhela. Village Udabno is famous for Sulguni with special taste properties, and Gombori village is famous with its dairy products (Dambalkhacho).

4. Archeological sites

The project area is a constituent part of the currently operating main road in Kakheti region. It starts from Village Manavi, continues until the end the village Mzisguli.

The buffer zone of the project area was an active residential part of Georgia's history from almost palaeolithic until the 19th century. So, it is natural that the existence of a number of historic and archaeological objects has been confirmed and may be confirmed in the future. Stationary archaeological works have not been performed in the Kakheti area interesting for us, except for a rare exception. In this area until the present the most known monuments have been discovered by accidental findings, some of which are followed by recovering the archaeological works or by surface surveys, that’s why the boundaries of spreading of each archaeological site are unspecified that makes difficult the protection of such places.

According to the visual study of this buffer zone performed by Archaeologists and considering the accidental findings or archaeological works performed by the research organizations of various states on this territory from the second half of the 20th century the historical and archaeological report of the buffer zone is as follows:

- An archaeological object - settlement on the hill “Kustapa” of the Late Bronze and Early Iron Age is in the study area, to the south at a distance of 2 km from Sagarejo, on the left bank of the river Tvaltkheva which was found in 1955 during investigation. The monument was found accidentally when erecting a high-voltage tower. The site of a former settlement is located on the high hill with a flattened crest, which is surrounded by a terrace;
- Another important archeological center was discovered in site “Lapriani”, south of Sagarejo, where te archaeologists found a stone mortar-and-grinder and stone inventory. These items are made of black porous stone and date back to the V-IV BC. These farming items should belong to the Iori-Alazani Farming Cultural Age;
- On the territory of the village of Manavi, we know archaeological objects - early medieval burial grounds of Kazarashvilis plot accidentally found during land works in 2016;
- The site of former settlement in Avazasgori, which is damaged. The slopes of the hill are intensely washed away. The monument was studied by(Kakheti Archeological Expedition (headed by K. Pitskhelauri). Fragments of stone hand grinders and pottery were found in the settlement;

- The site of former settlement in Sabadurisgori was studied by KAE (Kakheti Archeological Expedition). The settlement is located on a high, conical hill, which has a flattened crest and is surrounded by a wide terrace. Insert of a silica hammer and fragments of clay pottery decorated with furrowed concentric strips made of the mix of clay and coarse sand and burned to gray-brownish color were collected in the excavated ground;
- A former Church of John the Baptist is an archaeological and architectural monument in Turi site, on the right side of Tbilisi-Gurjaani Road. There were remains of two buildings on the east and west axes survived. As the local people wished it, it was decided to build a new church on the site of the old building in the east, and in 2011, clean-up works were carried out to identify the remnants of the old church. No church remnants were found during the excavations. A small part of quite a big building was found, with its outer rectangle of the plan showing three rooms. Cobblestones of equal sizes put in regular, evenly spaced rows were used as a building material. The fireplaces were entirely made of brick. The walls contain some fragments of bricks. By considering the excavated material, the building is presumably dated by the late Middle Ages;
- On the territory of the village of Chailuri to the south of the road in the buffer zone, there is the Chailuri Fortress which is the defensive and residential fortress of the 17th century. The Chailure Fortress, named as Niakhura Fortress in the sources, is a rectangular structure with circular and rectangular towers in the corners. The fortress was built on the rickshaw stone. The entrance is one - from the south. In the upper part of the wall, there are treadmill and tracks. The towers have several floors. The first floor is blind, while the second and the third floors are residential. The towers are ended by a combat balcony. Haircuts and narrow lights are on the walls of the towers. The ruins of various buildings are in the yard. The Niakhura Fortress is one of the most important examples of the late medieval Georgian defensive system where in addition to the housing of the inhabitants of the local nobleman the population was sheltered during the enemy invasion. The castle has a status of the cultural heritage immovable monument (Order of the Minister of Culture and Monument Protection of Georgia No.3/133 dated from 30/03/2006);
- Gorasamarkhi (burial place) in village Badiauri. This archeological site is located south of the village and is dated by the Late Bronze Age. The accidentally discovered burial ground was studied by Kakheti Archeological Expedition (headed by K. Pitskhelauri). A bronze shield and two-pronged pitchforks were found in the tomb, which are considered to have been brought from the tomb to the territory of Kakheti.

Thus, several archaeological and historically active regions were found as a result of the scientific researchers, investigation or accidental findings of past years and our superficial study. Archaeological layers are not confirmed at this stage in other places of the buffer zone of the studied area. In the case of discovery of archaeological object during the works, according to the article 10 of the Law of Georgia “On Cultural Heritage,” the works should be terminated and the National Agency for Cultural Heritage Preservation of Georgia should be informed about this.

5. Monuments of cultural heritage

Gare Kakheti is rich in archeological monuments. There are numerous sites of ancient settlements found in Sagarejo, its surrounding areas and villages, while the discovered archeological materials confirm that Sagarejo was an ancient settlement with over 5000-year-long history, and people have lived on both banks of the River Tvaltkhevi, in Perdoubani, Kostape and in the environs of the river mouth since times immemorial.

Sagarejo Municipality has such important historical monuments as: Davit Gareja Monastic Complex, Ujarma Fortified city, Ninotsminda Nunnery, Khashmi Trinity Church, Katsreti Monastery, and Manavi, Chailuri, Khashmi and Patardzeuli Fortresses. These monuments date back to the V-XVIII cc.

There are following monuments of cultural heritage around the project area:

- Village Manavi on a rocky mountain slope is located near Sagarejo. There are ruins of an old castle and conical towers seen on the mountain top. The fortress was presumably built in the unification era of Georgia, i.e. on the turn of the XII century. “Manavi Fortress stood as an unshakeable tower and guard over tormented Georgia, taking upon itself numerous enemy attacks; a lot of Georgian blood was shed in Manavi Fortress”;
- Manavi Church of the Virgin Mary: the Church of the Nativity of the Virgin Mary in Manavi is one of the latest specimens of old Georgian domed churches of Kakheti Region, Sagarejo Municipality, 15 km east of village Manavi, on a mountain slope and is built in a Kuppelhalle style. The Church of the Mother of God in Manavi was built by Ekvtime, the head of the Davit Gareji Monastery of John the Baptist, where Archimandrite Ekvtime served from 1774 to 1798. The Manavi Church was built during the same period (1794) is. The Church was restored in 2008;
- Meligori Tower: the Tower has a square plan. From outside, in all four corners of the Tower, there are rounded lugs, gradually narrowing upwards. The Tower is built entirely with cobblestones and lime mortar. The Tower apparently had three floors. Its upper floor should have been open, finished with battlements. The floor cover was wooden. There is an obelisk near the Tower erected by the Tsarist Russian government in 1901, on the occasion of the 100th anniversary of its victory in the Niakhura (Kakabeti) battle. The Russian inscription on the obelisk is currently missing;
- Chailuri (Niakhura) Castle: Chailuri is located on Tbilisi - Gurjaani Road. The distance from the city of Sagarejo to village Didi Chailuri is 17 km, and it is 60 km from Tbilisi, 500 m left of the central highway. It is separated from Patara Chailuri by the Chailuri River. There is Tsivgombori Mountain north of it, the Iori River, vineyards and arable lands to the south, and Niakhura to the southeast, on the outskirts of the village. On the territory of the village of Chailuri to the south of the road in the buffer zone, there is the Chailuri Fortress which is the defensive and residential fortress of the 17th century. The Chailure Fortress, named as Niakhura Fortress in the sources, is a rectangular structure with circular and rectangular towers in the corners. The fortress was built on the rickshaw stone. The entrance is one - from the south. In the upper part of the wall, there are treadmill and tracks. The towers have several floors. The first floor is blind, while the second and the third floors are residential. The towers are ended by a combat balcony. Haircuts and narrow lights are on the walls of the towers. The ruins of various buildings are in the yard. The Nikhura Fortress is one of the most important examples of the late medieval Georgian defensive system where in addition to the housing of the inhabitants of the local nobleman the population was sheltered

during the enemy invasion. The castle has a status of the cultural heritage immovable monument (Order of the Minister of Culture and Monument Protection of Georgia No.3/133 dated from 30/03/2006);

- Fortress: the monument is badly damaged, with only its east and north walls survived. Other walls are ruined to the ground. The Fortress is built of cobblestones and lime mortar. Its walls are finished with plaster. The outer walls have some fragments of bricks. The floors are wooden;
- Teleti St. George Church; an architectural monument north of village Badiauri, in the environs of the site of ancient village Taraki, about 1 km in the forest. It is dated by the Late Middle Ages. It is a hall church.

6. Cultural traditions and feasts

Cultural traditions and holidays provide an insight into the cultural values of the people in the study area. Some of them represent ancient values and are important to consider when planning an archaeological survey. The characteristics of cultural traditions and holidays may have a positive impact on an archaeological study. Below we give the traditions and common festivals in the study area:

„Garejoba“

In the 1970-80s, public holiday “Garejoba” was very popular in Sagarejo, held annually in village Udabno of Sagarejo Municipality, at Chichkhaturi Tower near the Davit-Gareji Monastic Complex. The holiday has been celebrated only once since 1988, in 1997. 21 years later, in May 2018, the holiday was restored in the same place and in the same format as on May 16, 1976.

„Berikaoba“

Traditional old Georgian holiday “Berikaoba” is celebrated in village Didi Chailuri, Sagarejo Municipality. The men (Berikas) participate in the ritual of pagan times dressed in sheepskin, wearing different animal masks and clothes decorated with pieces of colored fabric. They walk in the village shaking the whips in their hands and whoo-whooping. The people get prepared for this day in a special manner: the families are welcoming the Berikas with gifts. Berikaoba is held every spring in Didi Chailuri, at the beginning of Lent, and is called the feast of fertility and the revival of nature.

„Goglaoba“

An evening dedicated to the memory of Gogla is held in village Patardzeuli. Local and invited guests read Gogla’s poems, and a concert with the participation of local performers is held.

„Vajaoba“

An evening dedicated to the memory of Vazha-Pshavela is held in village Kochbaani.

7. Location of the discovered monuments

Below we give the summary table showing the geographical coordinates of each monument described in the report.

Table 1: Geographical coordinates of the observed monuments

Monument number	Purpose of Monument	Name of Monument	Coordinates of Monument (WGS/UTM/Zone 38)	
			X	Y
N1	Archaeological	settlement on the hill "Kustapa"	528252	4617385
N2	Archaeological	„Lapriani"	528946	4612729
N3	Archaeological	early medieval burial grounds	537238	4619209
N4	Archaeological	"Avazasgori" settlement	542911	4616506
N5	Archaeological	"Sabadurisgori" settlement	544131	4615699
N6	Archaeological	Former Church "Natlismtsemeli"	537736	4618236
N7	Archaeological	"Chailuri" ("Niakhura") Fortress	541944	4615987
N8	Archaeological	"Gorasamarkhi"	544490	4609541
N9	cultural	Manavi Castle	536754	4619879
N10	cultural	Manavi St. Virgin church	537013	4619478
N11	cultural	Meligor Tower	531412	4615628
N12	cultural	"Chailuri" ("Niakhura") Fortress	541944	4615987
N13	cultural	Castle - Tower	541950	4613344
N14	cultural	Teleti Church of St. George	545284	4612430
N15	Managed Reserve	„Korugi Managed Reserve"	---	

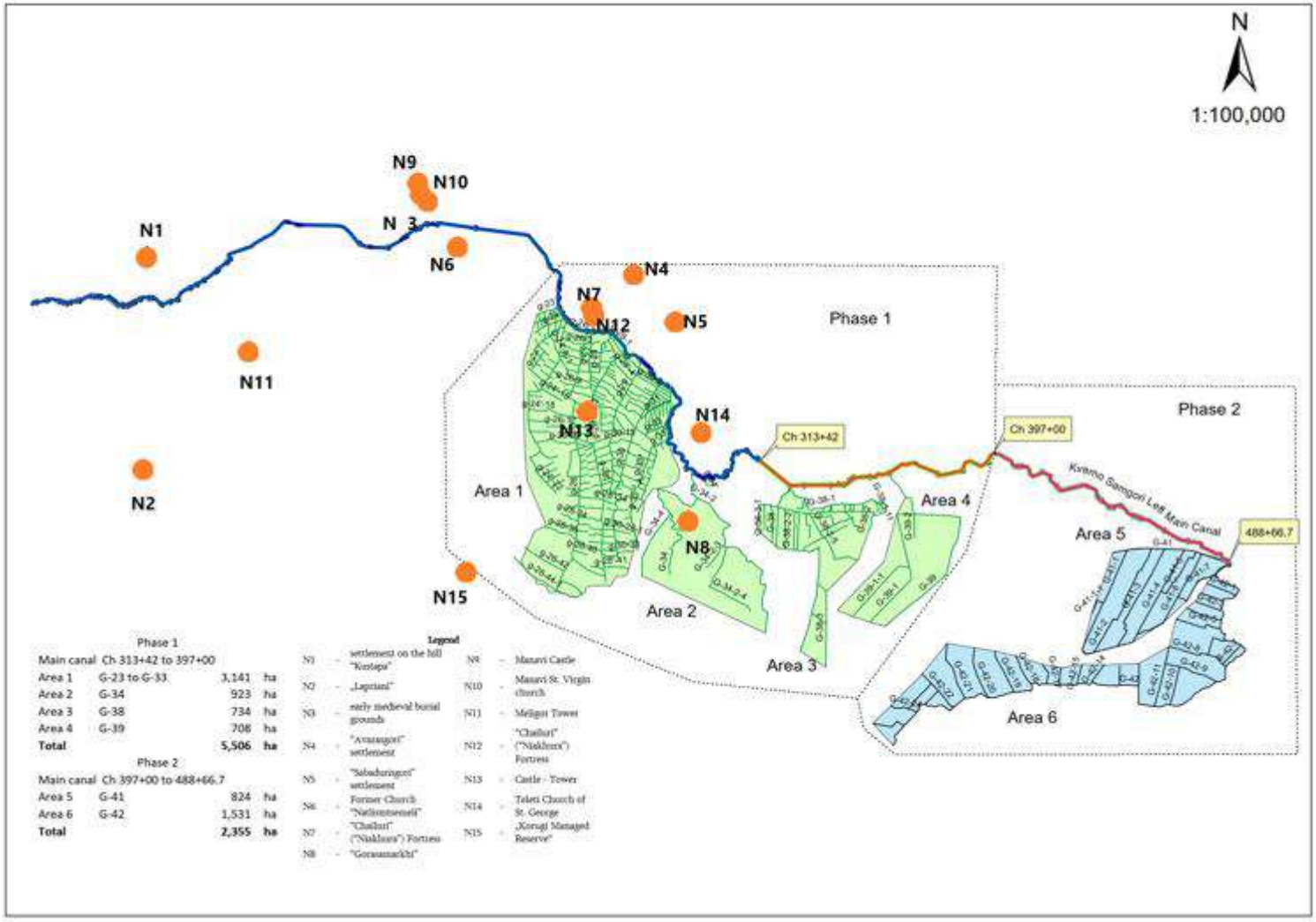
As the study results show, there are 1 archeological monument and 2 monuments of cultural heritage in the selected rehabilitation area, namely:

- N8 - “Gorasamarkhi” - Archaeological Site;
- N12 - “Chailuri” (“Niakhura”) Fortress - cultural Site;
- N13 - Castle - Tower - cultural Site.

Other monuments are some distance away from the project area. Most of the observed monuments are located near villages Manavi and Kakabeti.

Figure 1 below shows the location of the archaeological and cultural monuments in the study area. The following Figures show pictures of the monuments. The numbers of monuments are the same as the numbers given in Table 1.

Figure 1: Heritage sites located in the vicinity of the project area



N7 “Chailuri” (“Niakhura”) Fortress

N8 "Gorasamarkhi"

N9 Manavi Castle

N10 Manavi St. Virgin church

N11 Meligor Tower

N13 Castle - Tower

N14 Teleti Church of St. George

N15 „Korugi Managed Reserve“

ANNEX 4: ENVIRONMENTAL QUALITY REPORT

Rehabilitation of the Left Main Canal of Kvemo Samgori Irrigation System

Report of environmental qualitative characteristics measurements

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1. Principal terms. Definitions

Term		Definition
Acoustic noise	-	All kinds of continuous, uncomfortable and disturbing sounds, elastic oscillations and waves in the air, which occur as a result of the actions of natural or legal persons and create discomfort; they may have a negative impact on a person's health or social status.
Atmospheric air pollutants	-	Any substance emitted into the atmospheric air due to the human activity that has or may have a negative impact on human health and/or natural environment.
Vibration	-	Flexible oscillations and waves in a solid body
Sound	-	Mechanical (acoustic) oscillations perceived by a human hearing analyzer in 16 Hz - 20 kHz range.
Noise	-	Unfavorable sound, which creates discomfort, affects our auditory system and hampers the perception of desirable sounds.
Admissible noise level	-	The magnitude of the sound, which does not cause direct or indirect negative effects on a person, does not reduce his ability to work, does not negatively affect his feelings or mood, does not cause a substantial change in a functional system, which is sensitive to him.
Continuous noise	-	The sound measured by "Slow" time characteristic of the noise meter, which changes by no more than 5 dBA in time.
Intermittent noise	-	The sound measured by "Slow" time characteristic of the noise meter, which changes in time of no more than >5 dBA.
Background noise	-	Summary level of all signals, except the signals generated by the study source.
A weighting	-	The spectrum of noise sound frequency per ceptible for humanauditory system.
"TOR"	-	Terms of Reference.
"GA"	-	Georgian Amelioration.
„IFC"	-	International Finance Corporation.
"WHO"	-	World Health Organization.
"TRTA"	-	Transaction Technical Assistance.

2. Introduction

"Georgian Amelioration" LTD under the Ministry of Environmental Protection and Agriculture of Georgia continues arrangement of amelioration infrastructure in Sagarejo municipality. Irrigation system plays a crucial role in the agricultural development, therefore, agricultural development is unimaginable without irrigation of lands. Since 2014, significant funds have been spent from the state budget for rehabilitation of the irrigation infrastructure, as a result of which, 130000 hectares of land were irrigated.

"Georgian Amelioration" Ltd carries out rehabilitation works on the right and left main canals in Sagarejo municipality. The project envisages rehabilitation of the hydro-technical structures (gallery, culverts and their mechanical equipment, pipelines) of the left main channel.

"Landell Mills" has been contracted to provide Technical Assistance (TA) for the preparation of the Water Resources Sector Development Program (WRSDP), proposed for financing by the "Asian Development Bank" (ADB) through a policy - based loan and a project loan, under a Transaction Technical Assistance (TRTA) contract (TRTA 6648 GEO: Water Resources Sector Development Program [54014-001], Contract Number: 163767-S53880). The proposed program will (i) address policy, institutional, governance and management constraints in agriculture and the irrigation subsector; (ii) support the modernization of at least two irrigation schemes in eastern Georgia; and (iii) demonstrate innovative agricultural production systems and develop the capacity of farmers and farmer organizations. The program will contribute to economic growth and food security.

The "TRTA" will support the Government of Georgia through the Ministry of Environmental Protection and Agriculture (MEPA) and Georgian Amelioration (GA) to implement policy, legal, institutional and management reforms in agriculture, in particular irrigation, and modernize selected irrigation schemes through priority repairs to irrigation networks and the introduction of innovative on - farm irrigation and agricultural production technologies. As designed, "TRTA" activities include the development of indicative policy/legal/institutional actions with associated performance indicators and the preparation of feasibility studies for two schemes (Tbisi-Kumisi and Kvemo Samgori left main canal).

The total design command area of the Kvemo Samgori scheme is 14,225 ha, of which 12,930 ha is gravity fed. Given that there appears to be no plan to reinstate pumping on the remaining 1,295 ha and it is uncertain what "GA" intends for the 485 ha of the Bebera system, the total command area that may be considered for modernization is 12,445 ha. However, this is significantly higher than the area that "GA" indicated to the "TRTA" team is the maximum potential area for modernization of 8,000 ha during a site visit on 12 February 2021. "GA" also indicated that in 2020 the area that could potentially be irrigated was only 4,430 ha. The area actually irrigated from 2018 to 2020 was significantly lower. According to the "GA" irrigation contracts database analysis, the area contracted has fluctuated significantly over the last three years.

The “TRTA” team will also investigate and document in more detail (i) land use for irrigation based on diversified cropping, and farming systems using a combination of perennial and annual crops, (ii) the water demand for animal production (poultry, pigs, sheep and cattle), (iii) types of irrigation methods and systems in use, and (iv) constraints to and opportunities for adopting new technologies and practices.

3. Existing Conditions

As it was mentioned, the present project envisages the Rehabilitation of the Left Main Canal of Kvemo Samgori Irrigation System.

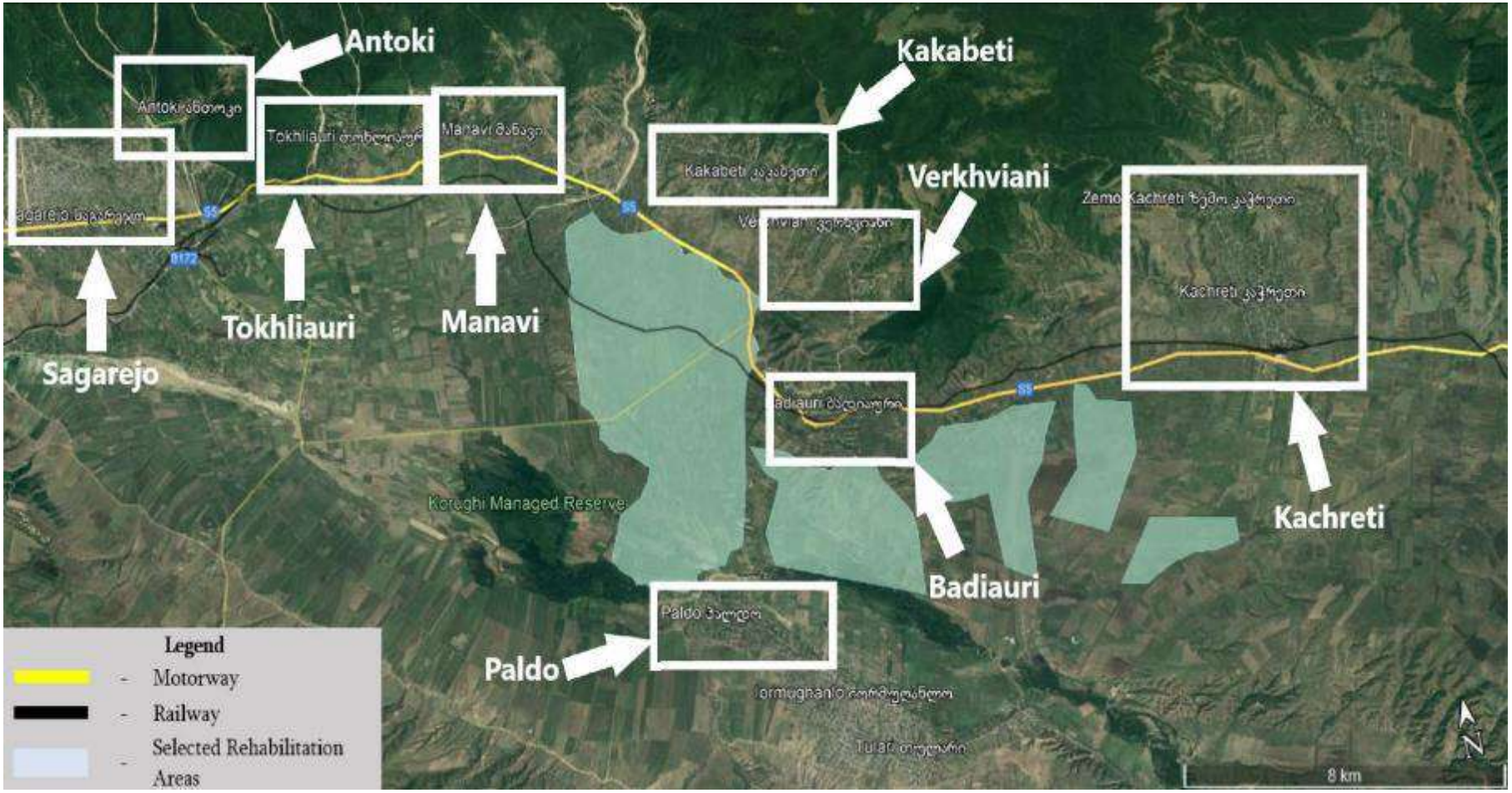
Following the disintegration of the Soviet Union, the agricultural sector was restructured. The Soviet era collective farm system was dismantled, with families receiving a plot of land of the same size, frequently in several different locations. This created a smallholder - based rural economy with hundreds of thousands of farmers owning approximately 1 ha of arable land. Due to a lack of government funds, a weak institutional framework, and little priority given to agricultural sector development, the extensive Georgian irrigation system, dating back to the Soviet era deteriorated substantially. Of the 550,000 ha of irrigation and drainage infrastructure in 1992, only 45,000 ha of irrigation and 16,000 ha of drainage was in use by 2013.

According to “GA”, the design command area of the Kvemo Samgori scheme is 14,225 ha, of which 12,445 ha is gravity fed and the remainder (1,780 ha) supplied from pumping. Adjacent to the main system is the Bebera system covering an area of 485 ha, which is also gravity fed. The total gravity-fed command area is therefore 12,930 ha. According to “GA”, as of 2021, apart from one pump station (Verkhviani) supplying an area of 30-35 ha, none of the pumps are operational and there are no plans to reinstate pumping as a source of irrigation.

Based on the current supply of water the potential irrigated area is estimated at 4,430 ha. In 2020, the total area contracted by “GA” with farmers in Kvemo Samgori was 2,227.2 ha, which was 13.7% lower than the area of 2,581.9 ha contracted in 2019. Based on a more detailed assessment of available water resources and assuming (i) better management of the releases from the Sioni reservoir, (ii) better coordination between the upstream Zemo Samgori scheme and the Kvemo Samgori scheme, and (iii) enhanced management of on-farm irrigation using state-of-the-art irrigation technology, it is estimated that a potential irrigated area of around 8,000 ha could be possible following modernization of the Kvemo Samgori scheme.

The adjacent settlements of the project area are: Sagarejo, Vill. Antoki, Vill. Tokhliauri, Vill. Manavi, Vill. Kakabeti, Vill. Verkhviani, Vill. Badiauri, Vill. Mzisguli, Vill. Kachreti.

Figure N3.1: Location of Projected Canal



Based on the agreement Representatives of the "Eco-Spectri"-'s Examination Laboratory performed instrumental measurements of noise levels, vibration levels and concentrations of major pollutants in ambient air at residential buildings adjacent to the project site.

4. Environmental qualitative characteristics

4.1 Noise - Introduction

Noise is any unwanted sounds or a combination of sounds of different frequencies and intensities that have an undesirable influence on a human body.

With its physics, noise is the mechanical oscillations of particles of an elastic environment (gas, liquid, organic matter) within the scope of a human auditory analyzer (16 Hz-20 kHz) arising under the influence of a certain force. At the same time, the sound is called regular periodic (sinusoidal) oscillations, and the noise is called an irregular set of sounds, non-periodic, random oscillation processes. Thus, from a hygienic point of view, noise is a combination of sounds of different frequencies and levels of sounds, which hampers the perception of useful audible signals (music, conversation, etc.) and triggers an unwanted, irritating effect on the human body. Noise is classified depending on the nature of spectrum and time characteristics.

4.2 Noise sources

Depending on the place of origin, the noise sources are classified as follows

- The main source of noise in the houses in the urban areas is mainly the traffic with the highest share in noise pollution. The number of cars, their speed, urban development and motor system are the main parameters that impact the noise distribution. Besides, a great share of heavy vehicles in the common car park is noteworthy;
- Engineering, technological and household equipment, as well as human activities are the internal noise sources in the houses;
- Sources related to human life activities, such as playing sports, cleaning the area, etc., within the framework of the micro-district (quarter);
- The external sources are industrial and energy infrastructure.

4.3 Time characteristics of noise

Depending on time characteristics, the following types of noise can be identified:

a) Permanent noise: with its sound level changing by no more than 5 dB during an 8-gour working day in the working zone or in the rooms of residential and public buildings, as measured by a "slow" time property of the noise meter;

b) Non-permanent noise: with its level during an 8-gour working day in the working zone, or during the working shift or on the territory of the settled areas changes by more than 5 dB, as measured by a “slow” time property of the noise meter.

Non-permanent noise is classified as:

b.1) Noise varying in time, with its sound level continuously changing in time;
b.2) Intermittent noise, with its sound level changing gradually (by 5 dB or more). Besides, the duration of intervals, during which the noise level is permanent, is 1 second and more;
b.3) Pulse noise, which is made up of several sound signals with the duration of less than 1 sec. besides, the sound levels as measured by relevant time characteristic “impulse” and “slow” differ by no less than 7 dB.

4.4 Vibration - Introduction

Vibration induced in buildings are a frequent concern in cities around the world. Commonly, complaints are made by homeowners, as heavy construction vehicles travel at various speeds on adjacent roads, resulting in annoying vibrations and possible structural damage. Passenger vehicles rarely produce perceptible vibrations to cause significant structural damage. Generally, traffic induced vibrations are caused by heavy vehicles. These vibrations are generated by road surface irregularities, namely: potholes, cracks, and uneven pavement joints. Dynamic interaction forces between the vehicle and pavement are created by these irregularities resulting in a generation of stress waves that travel through the adjacent soils.

Vibrations produce damaging stress waves that quickly reach building foundations, causing them to vibrate. Several factors may contribute to vibration levels, including: road condition, vehicle speed, vehicle weight, soil conditions, building characteristics, vehicle suspension system, season of the year, and distance between the structure and the road. When a large vehicle strikes an irregularity, an impact load, as well as an oscillating load due to the “axle hop” of the vehicle are generated. The impact load generates ground vibrations that are predominant at the natural vibration frequencies of the soil, whereas the axle hop generates vibrations at the hop frequency, which is a characteristic of the vehicle’s suspension system. Vibrations can be amplified if the natural frequency of the building coincides with the natural frequency of the soil.

Vibration sources such as construction activities and road traffic, are among the sources considered potentially dangerous to buildings and structures. In general, structural damages to buildings are extremely rare and are in general caused by other sources. Structural damages occur when the permissive levels of vibration are exceeded. Degrees of damage are methodologically defined and vary from those that do not affect the structural safety of the buildings but affect the value of assets – e.g. formation of cracks in the plaster, increase in existing cracks, damage of architectural elements etc.

4.5 Harmful substances in the atmospheric air - General

Atmospheric air pollution is currently a high environmental risk all over the world. Atmospheric air pollution is a major cause of death and morbidity on the global scale. In any country or region, the atmospheric air quality is not determined by one or two factors only. Rather, it is the result of a combination of several factors and depends on the scale and source of emission, weather conditions, landscape and human factor.

The atmospheric air in Georgia is polluted by emissions from vehicles, energy sector, agriculture and industrial facilities.

The main pollutant of the atmospheric air in urban areas is vehicles. 62-78% of nitrogen oxides (NOx) and carbon monoxide (CO) in the country is emitted in the road transport sector. The dynamics of emissions from this sector is increasing rapidly following the number of vehicles and amount of fuel consumed by them.

4.6 Main atmospheric pollutants

The major pollutants of the atmospheric air and the most frequently mentioned substances are: solid particles with the diameter of 10μm or less, solid particles with the diameter of 2.5μm or less (hereinafter, PM10 and PM2.5), nitrogen dioxide (NO2), ozone (O3) and carbon monoxide (CO).

With their origin, the main pollutants have the following properties:

– **PM10 and PM2,5:** The particles are mainly generated from natural and anthropogenic sources. They are classified as basic PM10 or basic PM2.5. The natural sources include sea salt, naturally emitted dust, flower dust, and volcanic ash; as for the anthropogenic sources, they include fuel combustion for energy generation, home heating and transport, industrial process and waste incineration, agriculture, as well as brake, tire and road wear, together with other types of anthropogenic dust. Black carbon is PM2.5. It is generated from an incomplete combustion of fuel. The main sources of black carbon emission are transport and home heating systems.

– **NO2:** The process of combustion is a major source of nitrogen oxides (NOx) that may be stationary or mobile. Nitrogen monoxide (NO) is the source of emission of the major portion of **NOx:** consequently, NO is oxidized to produce NO2; although some NO2 emissions occur directly. The proportion of NO2 in the vehicle exhaust (i.e. NO2 / NOx ratio) is significantly higher in diesel than in petrol vehicles because the post-exhaust systems increase NO oxidation what increases the direct emission of greater amounts of NO2.

– **CO:** Carbon dioxide (CO) is a toxic, odorless gas. Low concentrations of carbon dioxide are naturally found in the atmosphere from volcanic action and forest fires. CO is formed from partial oxidation of carbon-containing compounds when there is no sufficient oxygen to produce carbon dioxide. The principal source of external CO is combustion processes from transport and industrial activities.

– **O3:** Ground-level ozone is a pollutant that is quite harmful for human health, particularly for people with asthma. It damages crops, trees and other vegetation and is the main element of

smog. Ground-level ozone is not found in its natural form, but is formed by chemical reactions occurring as a result of interaction between the oxides of nitrogen (NOx) and volatile organic compounds (VOCs) and the sunlight. The main source of NOx and VOC are industrial plants, vehicle exhaust, gasoline vapors and chemical solvents. Following the dynamics of O3 reaction, the concentrations are highest in urban settlements.

– **VOC:** Volatile organic compounds (VOCs) are carbonic acid-containing gases and vapors. They evaporate easily at a room temperature. That is why they are called volatile. Many VOCs, such as benzene and formaldehyde, are highly toxic and can cause cancer and serious health problems. A VOC, such as butadiene participates in the generation of ground-level ozone. The severity of health problems much depends on the type of the volatile compound. The anthropogenic sources are: fuel production, distribution, and combustion processes. Vehicles are the major source of emissions due to evaporation, incomplete fuel combustion or biomass combustion.

5. Legislative Requirements

5.1 Noise

As per the state standards, the admissible noise levels are specified by Decree # 297/N of the Ministry of Health, Labor and Social Affairs of Georgia. This Decree sets both admissible noise levels and maximum admissible levels for different territories (State Registration Code 470.230.000.11.119.004.920).

The noise levels in the buildings and premises and adjoining areas are also regulated by Technical Regulation no. 398 of the Government of Georgia on August 15, 2017 "On the levels of acoustic noise in the rooms of the residential houses and public establishments and their accommodation areas". The given technical regulation, which is based on the requirements of the international standards (e.g. ISO 1996-1: 2003. "Acoustics, Description, measurement and assessment of environmental noise", Part 1: "Main assessment values and procedures"; ISO 1996-2: 2007"Acoustics, description and measurement of environmental noise", Part 2) sets the admissible levels of acoustic noise in the rooms of residential, buildings and buildings of public and in the settled areas to protect people against the unfavorable impact of noise.

The requirements of the Georgian and international legislations are identical except some minor changes.

Table 5.1.1: Georgian Standards for Noise Levels

Receptor	Time interval	Average admissible noise level (dB)	Maximum admissible noise level (dB)
Residential	7:00-23:00	55	70
Residential	23:00- 7:00	45	60
Commercial	24 hours	60	75

Table 5.1.2: IFC Noise Level Guidelines

Receptor	One hour Laeq (dB)	
	During the day 07.00-22.00	At night 22.00 – 07.00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

For the technical regulation purposes (expert assessment of noise level), the rated parameter of continuous noise is the sound level measured by noise meter LAdBA with scale A, and the equivalent sound level LAeqvdBA for non-continuous (variable) noise.

As per the given technical regulation, the admissible noise levels are given in table N5.1.3.

Table N5.1.3: Admissible levels of acoustic noise in the rooms of residential and public buildings and their settled areas

№	Purpose/use of area and premises	Allowable limits		
		LDay (dBA)		LNight (dBA)
		Day	Night	
1	Educational facilities and library halls	35	35	35
2	Medical facilities/chambers of medical institutions	40	40	40
3	Living quarters and dormitories	35	30	30
4	Hospital chambers	35	30	30
5	Hotel/motel rooms	40	35	35
6	Trading halls and reception facilities	55	55	55
7	Restaurant, bar, cafe halls	50	50	50
8	Theatre/concert halls and sacred premises	30	30	30
9	Sport halls and pools	55	55	55
10	Small offices (≤100m3) – working rooms and premises without office equipment	40	40	40
11	Big offices (≥100 m3) working rooms and premises without office equipment	45	45	45
12	Conference halls /meeting rooms	35	35	35
13	areas bordering with houses residential, medical establishments, social service and children facilities(<6 storey buildings)	50	45	40

№	Purpose/use of area and premises	Allowable limits		
		LDay (dBA)		LNight (dBA)
		Day	Night	
14	Areas bordering with houses residential, medical establishments, social service and children facilities(>6 storey buildings)	55	50	45
15	The areas bordering with hotels, trade, service, sport and public organizations	60	55	50

Note:

1. in case noise generated by indoor or outdoor sources is impulse or tonal, the limit must be 5dBA less than indicated in the table.

2. Acoustic noise limits given above are set for routine operation conditions of the 'space', i.e. windows and door are closed (exception – built-in ventilation canals), ventilation, air conditioning, lighting (in case available) are on; functional (baseline) noise (such as music, speech) not considered.

The results of noise measurements are documented in accordance with the rules established by the effective law. The noise level value of is calculated with 1 dBA accuracy, by considering generally accepted rounding of the value.

5.2 Vibration

DIN 4150-3 is the most widely applied standard internationally for measuring structural vibrations. The measurement procedure can be found in a similar form in other national standards, for example the Italian UNI 9916. The assessment parameter is the maximum value (Vi) of the three individual components (peak values) of vibration velocity at frequencies of 1 to 80 Hz.

The standard provides guide values for permissible vibration velocities for short time and sustained vibrations in three types of buildings.

Table 5.2.1: Guide values for transient vibration

Guide values for vibration velocity for analyzing the effects of transient vibration					
Building Type	Foundation Frequency of the Significant Vibration			Upper ceiling	
Frequency range	1 – 10 Hz	10 – 50 Hz	50 – 100 Hz	All frequencies	
Direction	X / Y / Z	X / Y / Z	X / Y / Z	X / Y	Z

Guide values for vibration velocity for analyzing the effects of transient vibration					
Building Type	Foundation Frequency of the Significant Vibration			Upper ceiling	
Reinforced or framed structures. Industrial and heavy commercial buildings	20 mm/s	20 – 40 mm/s	40 – 50 mm/s	40 mm/s	20 mm/s
Unreinforced or light framed structures/ Residential or light commercial type buildings	5 mm/s	5 – 15 mm/s	15 – 20 mm/s	15 mm/s	20 mm/s
Delicate, listed buildings e.g. historical monuments	3 mm/s	3 – 8 mm/s	8 – 10 mm/s	8 mm/s	20 mm/s

Table 5.2.2: Guide values for continuous vibration

Guide values for vibration velocity (v_i) for analyzing the effects of continuous vibration		
Building Type	Upper ceiling level, all Frequencies	
Direction	X / Y (horizontal)	Z (vertical)
Reinforced or framed structures industrial and heavy commercial buildings	10 mm/s	10 mm/s
Unreinforced or light framed structures, residential or light commercial type buildings	5 mm/s	10 mm/s
Delicate buildings, listed buildings e.g. historical monuments	2.5 mm/s	-

5.3 Atmospheric Air

The air quality standards in Georgia are regulated by the Law of Georgia "On Approving the Qualitative State of Environment". Table N5.3.1 below gives the atmospheric air quality standards of Georgia and World Health Organization (WHO).

Table N5.3.1: Atmospheric air quality standards of Georgia and World Health Organization

Pollutant	Period	Georgian Legislation norm (µg/m3)	WHO norm (µg/m3)
NO2	1 Year	-	40
	1 Hour	200	200
O3	8 Hour	120	100
CO	8 Hour	10	-
PM2.5	1 Year	-	10
	24 Hour	-	25
PM10	1 Year	-	20
	24 Hour	50	50

Pollutant	Period	Georgian Legislation norm (µg/m3)	WHO norm (µg/m3)
VOC	-	-	1000[1]

6. Used Measuring Devices

6.1 Noise

The consulting organization used the equipment of the Polish company "SVANTEK", "SVAN 971" series for measuring noise (Figure N6.1.1, N6.1.2).

SVAN 971 series Sound Level Meters by Polish Svantek are appliances with Class 1 IEC 61672-1:2013 accuracy, capable of storing up to 100000 records. SVAN 971 offers a wide range of results in all needed weighting filters (A, C, Z), as well as 1/1 and 1/3 Octave spectra. SVAN 971 Sound Level Meter allows gaining most resultant noise units: Lpeak, Lmax, Lmin, L, Leq, LE, Lden, LEPd, Ltm3, Ltm5, Leq statistics (Ln), expected Leq value (EX), standard Leq deviation (SD), measurement time and overload time % (OVL), etc. SVAN 971 software allows developing graphical, table or text results of the accomplished measurements. The noise meter can store the received signals in internal memory and describe each signal according to level and date stamp. The device has a wind protective cap reducing the impact of environmental conditions (wind, temperature) duringrecording). As per the International Finance Corporation, the noise level must be measured by using the 1st or 2nd class noise meter meeting the requirements of the guideline of the "International Electrotechnical Committee". Asper the same guideline, the noise monitoring is possible to provide with the aim to identify the existing background noise level of the environment adjacent to the design or existing facility or toexamine the noise level in the operation phase.

Figure N6.1.1: SVAN 971 Sound Level Meter

Figure N6.1.2: Organization-owned noise meter

Noise meter configurations during the study were:

[1] The value is the WHO recommendation, not a norm of the WHO.

- Noise measurement range: 30-130 dB;
- Noise meter response speed: Slow (1 second);
- Frequency weight: A.
- Type of mycrophone: 0.5" (12.7 mm.) el. Condensator.

6.2 Vibration

The VM40 is designed for measuring vibration in buildings, bridges, towers, pipelines and various other large structures. The measurements serve to prevent possible structural damage or disturbance to people. The VM40 contains a sensor, recording and evaluation electronics and an accumulator in its robust casing. It is especially suitable for autonomous operation over longer periods of time e.g. on construction sites.

Figure 6.2.1: Triaxial Vibration Monitor VM40A/B

The instrument contains three highly sensitive piezoelectric systems for vibration measurement of all three special dimensions. The signal processing is controlled by a microprocessor. The VM40 is operated via its seven keypad buttons and illuminated LCD display. The measurement data can be transferred to a PC via the USB interface. The instrument also has a port for connecting a charger and a relay output for the external signaling of vibration occurrences.

6.3 Air Measuring Device

The New Zealand based "Aeroqual Series 500 Portable Air Quality Monitor" is used to measure air. The air quality meter allows real-time monitoring of air pollutants. The device measures the concentrations of the following major pollutants in the air:

- Particulate Matters 10μm and 2.5μm (PM10, PM2.5);
- Nitrogen Dioxide (NO2);
- Carbon Monoxide (CO);
- Ozone (O3);
- Volatile Organic Compounds (VOC).

The pictures 6.3.1 - 6.3.2 - below shows the "Aeroqual Series 500 Portable Air Quality Monitor".

Figure 6.3.1: "Aeroqual Series 500 Portable Air Quality Monitor"

Figure 6.3.2.: "Aeroqual Series 500 Portable Air Quality Monitor"

The device has different sensors for each type of harmful substance. The device has the following types of sensors:

- Gas sensitive semi-conductor sensor (GSS);
- Gas sensitive electrochemical sensor (GSE);
- Laser Particle Counter (LPC);
- Photo Ionization Detector (PID).

During performing the measurement, the device records the average minute data of the obtained samples. According to Georgian legislation, measurements are made for each component within 20 minutes.

7. Conducted Measurement

The baseline measurements were performed on the area of the residential buildings adjacent to the project main canal. Before the onset of the study, the examination laboratory service of the

Consultation Company developed a study plan. The study of the project buffer revealed several sensitive areas, where it was advisable to carry out the measurements (namely villages Chailuri, Kakabeti, Badiauri, Mzisguli and Kachreti). For each measurement characteristic the measurement locations were selected, which are the nearest residential buildings adjacent to the project.

The measurement was performed from 2022/04/27 to 2022/04/28. The noise and vibration measurement were performed continuously for 24 hours. The measurements of the concentrations of major air pollutants were done for two hours in total, with a 20-minute periods for each substance (in line with Georgian Legislation).

The following sites were selected as measurement locations (see Figs. 7.1):

Noise Measurement	Vibration Measurement	Air Measurement
N1 - Vill. Chailuri	N1 - Vill. Badiauri	N1 - Vill. Mzisguli
N2 - Vill. Kakabeti		
N3 - Vill. Badiauri		
N4 - Vill. Badiauri		
N5 - Vill. Mzisguli		
N6 - Vill. Kachreti		

Figure N7.1: Measurement Locations

Below are the GPS coordinates of the measurement locations (WGS/UTM/Zone 38):

- Noise N1 - Chailuri - X 541950 Y 4616213;
- Noise N2 - Kakabeti - X 542973 Y 4615255;
- Noise N3 - Badiauri - X 545653 Y 4610516;
- Noise N4 - Badiauri - X 546068 Y 4610628;
- Noise N5 - Mzisguli - X 549226 Y 4610142;
- Noise N6 - Kachreti - X 551734 Y 4610202;
- Vibration - Badiauri - X 546058 Y 4610626;
- Air - Mzisguli - X 549228 Y 4610215.

The measurement process was not affected by any weather conditions (rain, wind). The air temperature during the measurements was as follows:

- 2022/04/27 - 22 °C - Relative humidity 44%.[2]
- 2022/04/28 - 21 °C - Relative humidity 42%.[3]

The concentration levels of noise, vibration and major air pollutants were measured in line with the requirements of Georgian Legislation and the methodology and procedures developed by the Company.

The baseline measurements were performed to identify the levels of noise, vibration and major air pollutants. The detailed data of the gained results are given in annexes:

- Annex N1: Photos of the conducted measurements;
- Annex N2: Noise measurement results;
- Annex N3: Graphical data for noise measurement;
- Annex N4: Vibration Measurement Results (Protocol);
- Annex N5: Air measurement results;
- Annex N6: Certificates of expert participating in the measurement;
- Annex N7: Device Calibration forms.

For the average values of the conducted measurements see in Table N7.1.

[2] Source - http://meteo.gov.ge/.

[3] Source - http://meteo.gov.ge/.

Table N7.1: Result of measurements

Measurement Parameter			Standard Value	Measurement Results											
				N1 Loc.		N2 Loc.		N3 Loc.		N4 Loc.		N5 Loc.		N6 Loc.	
				Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Noise dBA	Norm of Georgian legislation (Adjacent to Residential house)	Day	55	50.1	36.8	54.5	44.4	46.3	40.1	52.2	45.5	53.7	45.7	57.2	49.5
		Night	45												
	Norm of Georgian legislation (Commercial)	Day - Night	60												
Vibration mm/sc	DIN 4150-3 Standard	5		0.41											
Solid particles (µg/m3)	Standard	PM10	50	48											
		PM2.5	25	32											
Nitrogen dioxide (µg/m3)	Standard	200		159											
Ground - level ozone (µg/m3)	Standard	120		24											
Volatile organic compounds (µg/m3)	Standard	1000		115											
Carbon monoxide (mg/m3)	Standard	10		1.47											

As can be seen from the data obtained, the noise level for the period of the day, in five measurement location are lower than the permissible noise norm established by the legislation of Georgia. Exceedance of the noise norm is recorded only at one point (at location N6), located in the village of Kachreti.

The noise excess recorded at point N6 of the measurement is 57.2 dBA. It should be noted that there are no noise barriers (fence, gate, natural cover, etc.) between point N6 and the noise source (traffic), therefore noise is less reducable.

During the measurement period, the noise level exceeded the night noise norm established by the legislation of Georgia at points N4, N5 and N6. Noise excess at points N4 and N5 is negligible, ranging from 0.5 to 0.7 dBA.

The vibration results observed during the study are lower than the reference values of DIN 4150-3. The higher levels recorded by the vibration device is 0.41 mm/s. In all other cases the vibration level is significantly lower.

As can be seen from the obtained data, the concentration of harmful substances in the atmospheric air, except for solid dust particles, is low as compared to the standards established by the Legislation of Georgia and the WHO. Excess concentrations are observed only with PM2.5, with the greatest excess that is 32 (µg/m3).

Nitrogen dioxide concentration level in the air observed 159 (µg/m3).

Ground - level ozone concentration level in the air observed 24 (µg/m3).

Volatile organic compounds concentration level in the air observed 115 (µg/m3).

Carbon monoxide concentration level in the air observed 1.47 (mg/m3).

Persons responsible for the measurements:

Archil Revazishvili

LTD "Eco-Spectri"

Head of Examination Laboratory

Signature

David Kaviladze

LTD "Eco-Spectri"

Senior specialist of Environmental and Social issues

Signature

8. Conclusion

- Based on the agreement Representatives of the "Eco-Spectri"-'s Examination Laboratory performed instrumental measurements of noise levels, vibration levels and concentrations of major pollutants in ambient air at residential buildings adjacent to the project site;
- The baseline measurements were performed on the area of the residential buildings adjacent to the project main canal;
- The measurement was performed from 2022/04/27 to 2022/04/28;
- As can be seen from the data obtained, the noise level for the period of the day, in five measurement location are lower than the permissible noise norm established by the legislation of Georgia. Exceedance of the noise norm is recorded only at one point (at location N6), located in the village of Kachreti;
- The noise excess recorded at point N6 of the measurement is 57.2 dBA. It should be noted that there are no noise barriers (fence, gate, natural cover, etc.) between point N6 and the noise source (traffic), therefore noise is less reducable;
- During the measurement period, the noise level exceeded the night noise norm established by the legislation of Georgia at points N4, N5 and N6. Noise excess at points N4 and N5 is negligible, ranging from 0.5 to 0.7 dBA;
- The vibration results observed during the study are lower than the reference values of DIN 4150-3. The higher levels recorded by the vibration device is 0.41 mm/s. In all other cases the vibration level is significantly lower;
- As can be seen from the obtained data, the concentration of harmful substances in the atmospheric air, except for solid dust particles, is low as compared to the standards established by the Legislation of Georgia and the WHO. Excess concentrations are observed only with PM2.5, with the greatest excess that is 32 (μg/m3).;
- Nitrogen dioxide concentration level in the air observed 159 (μg/m3);
- Ground - level ozone concentration level in the air observed 24 (μg/m3);
- Volatile organic compounds concentration level in the air observed 115 (μg/m3);
- Carbon monoxide concentration level in the air observed 1.47 (mg/m3).

Annes N1: Photos

Figure: Noise measurement - Point N1	Figure: Noise measurement - Point N1
	
Figure: Noise measurement - Point N2	Figure: Noise measurement - Point N2
	
Figure: Noise measurement - Point N3	Figure: Noise measurement - Point N3
	
Figure: Noise measurement - Point N4	Figure: Noise measurement - Point N4
	
Figure: Noise measurement - Point N5	Figure: Noise measurement - Point N5

	
Figure: Noise measurement - Point N6	Figure: Noise measurement - Point N6
	
Figure: Vibration measurement - Point N2	Figure: Vibration measurement - Point N3
	
Figure: Air measurement	Figure: Air measurement
	

Annex N2: Noise Measurement Results

N1 Measurement		
Date	Location	Distance from noise source
27/04/2022 - 28/04/2022	Vill. Chailuri	50
N1 Measurement Result		
Average	Day (07:00-22:00)	Night (22:00-07:00)
	50,1	36,8
Hourly		
1	27/04/2022 - 12:00-13:00	49,1
2	27/04/2022 - 13:00-14:00	50
3	27/04/2022 - 14:00-15:00	49,1
4	27/04/2022 - 15:00-16:00	50,6
5	27/04/2022 - 16:00-17:00	51,2
6	27/04/2022 - 17:00-18:00	50,3
7	27/04/2022 - 18:00-19:00	50,3
8	27/04/2022 - 19:00-20:00	50,8
9	27/04/2022 - 20:00-21:00	48,5
10	27/04/2022 - 21:00-22:00	47,3
11	27/04/2022 - 22:00-23:00	39
12	27/04/2022 - 23:00-24:00	32
13	28/04/2022 - 00:00-01:00	31,7
14	28/04/2022 - 01:00-02:00	30,3
15	28/04/2022 - 02:00-03:00	30,9
16	28/04/2022 - 03:00-04:00	30,5
17	28/04/2022 - 04:00-05:00	33,4
18	28/04/2022 - 05:00-06:00	53,1
19	28/04/2022 - 06:00-07:00	50,5
20	28/04/2022 - 07:00-08:00	51,7
21	28/04/2022 - 08:00-09:00	51,1
22	28/04/2022 - 09:00-10:00	51,1
23	28/04/2022 - 10:00-11:00	51,3
24	28/04/2022 - 11:00-12:00	49,6

N2 Measurement		
Date	Location	Distance from noise source
27/04/2022 - 28/04/2022	Vill. Kakabeti	50
N2 Measurement Result		
Average	Day (07:00-22:00)	Night (22:00-07:00)
	54,5	44,4
Hourly		
1	27/04/2022 - 12:00-13:00	57,2
2	27/04/2022 - 13:00-14:00	55,9
3	27/04/2022 - 14:00-15:00	55,1
4	27/04/2022 - 15:00-16:00	55,2
5	27/04/2022 - 16:00-17:00	55,9
6	27/04/2022 - 17:00-18:00	55,8
7	27/04/2022 - 18:00-19:00	54,9
8	27/04/2022 - 19:00-20:00	54.4
9	27/04/2022 - 20:00-21:00	51,9
10	27/04/2022 - 21:00-22:00	49,3
11	27/04/2022 - 22:00-23:00	47,5
12	27/04/2022 - 23:00-24:00	46,1
13	28/04/2022 - 00:00-01:00	42
14	28/04/2022 - 01:00-02:00	40,9
15	28/04/2022 - 02:00-03:00	40,1
16	28/04/2022 - 03:00-04:00	38
17	28/04/2022 - 04:00-05:00	44,6
18	28/04/2022 - 05:00-06:00	48,6
19	28/04/2022 - 06:00-07:00	51,5
20	28/04/2022 - 07:00-08:00	53,2
21	28/04/2022 - 08:00-09:00	53,2
22	28/04/2022 - 09:00-10:00	54,6
23	28/04/2022 - 10:00-11:00	55,2
24	28/04/2022 - 11:00-12:00	55,9

N3 Measurement		
Date	Location	Distance from noise source
27/04/2022 - 28/04/2022	Vill. Badiauri	30
N3 Measurement Result		
Average	Day (07:00-22:00)	Night (22:00-07:00)
	46,3	40,1
Hourly		
1	27/04/2022 - 13:00-14:00	45,8
2	27/04/2022 - 14:00-15:00	44,9
3	27/04/2022 - 15:00-16:00	45,2
4	27/04/2022 - 16:00-17:00	46,3
5	27/04/2022 - 17:00-18:00	46,6
6	27/04/2022 - 18:00-19:00	45,7
7	27/04/2022 - 19:00-20:00	48,3
8	27/04/2022 - 20:00-21:00	46,4
9	27/04/2022 - 21:00-22:00	44,7
10	27/04/2022 - 22:00-23:00	41,4
11	27/04/2022 - 23:00-24:00	39,5
12	28/04/2022 - 00:00-01:00	38,4
13	28/04/2022 - 01:00-02:00	36,4
14	28/04/2022 - 02:00-03:00	37,4
15	28/04/2022 - 03:00-04:00	38,4
16	28/04/2022 - 04:00-05:00	38,4
17	28/04/2022 - 05:00-06:00	45,9
18	28/04/2022 - 06:00-07:00	45,1
19	28/04/2022 - 07:00-08:00	48,1
20	28/04/2022 - 08:00-09:00	47,8
21	28/04/2022 - 09:00-10:00	46,4
22	28/04/2022 - 10:00-11:00	47,1
23	28/04/2022 - 11:00-12:00	45,2
24	28/04/2022 - 12:00-13:00	46,1

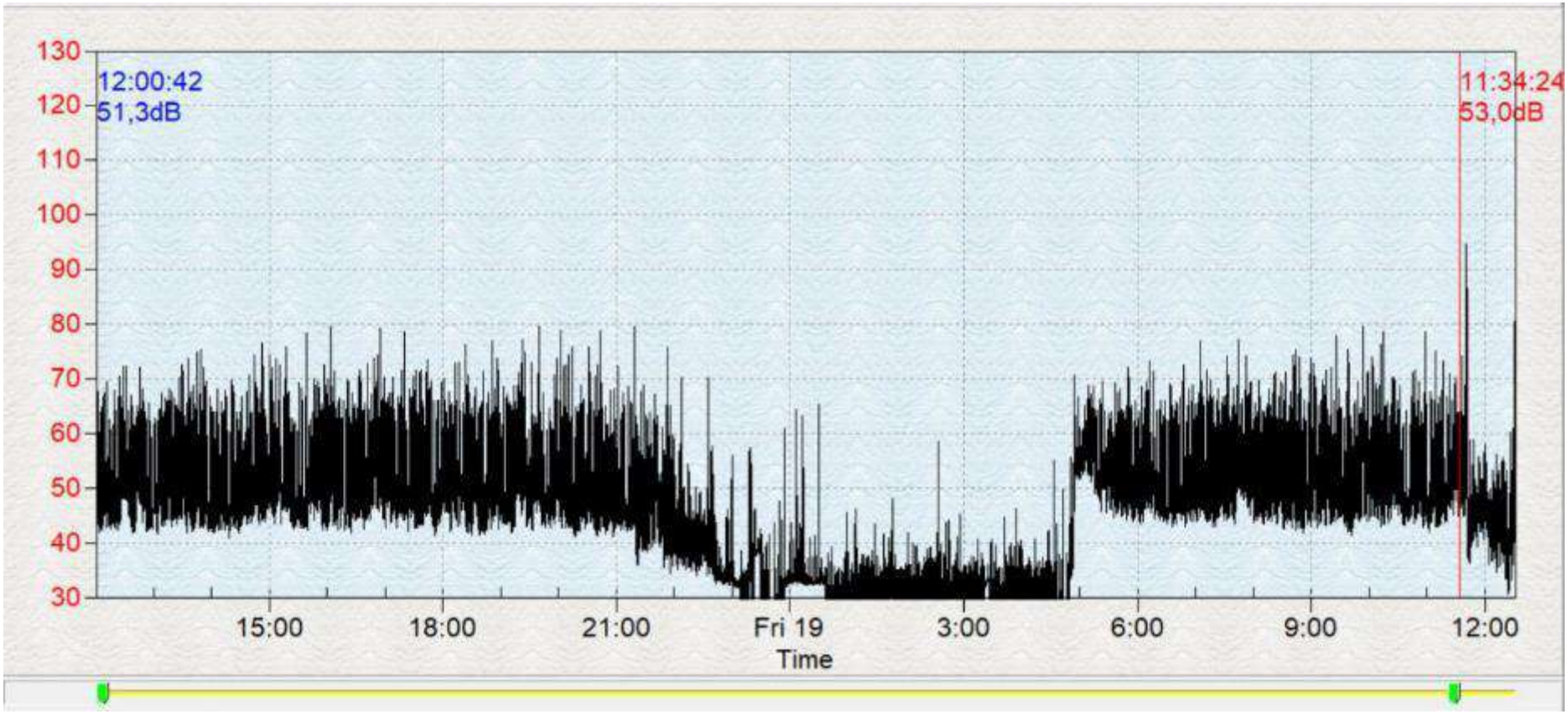
N4 Measurement		
Date	Location	Distance from noise source
27/04/2022 - 28/04/2022	Vill. Badiauri	30
N4 Measurement Result		
Average	Day (07:00-22:00)	Night (22:00-07:00)
	52,2	45,4
Hourly		
1	27/04/2022 - 13:00-14:00	52,7
2	27/04/2022 - 14:00-15:00	52,6
3	27/04/2022 - 15:00-16:00	51,8
4	27/04/2022 - 16:00-17:00	52
5	27/04/2022 - 17:00-18:00	53
6	27/04/2022 - 18:00-19:00	52,7
7	27/04/2022 - 19:00-20:00	51,6
8	27/04/2022 - 20:00-21:00	50,3
9	27/04/2022 - 21:00-22:00	48
10	27/04/2022 - 22:00-23:00	46,2
11	27/04/2022 - 23:00-24:00	45,1
12	28/04/2022 - 00:00-01:00	41
13	28/04/2022 - 01:00-02:00	41,3
14	28/04/2022 - 02:00-03:00	41,5
15	28/04/2022 - 03:00-04:00	40,1
16	28/04/2022 - 04:00-05:00	42,8
17	28/04/2022 - 05:00-06:00	55,3
18	28/04/2022 - 06:00-07:00	54,9
19	28/04/2022 - 07:00-08:00	54,4
20	28/04/2022 - 08:00-09:00	54,4
21	28/04/2022 - 09:00-10:00	52,6
22	28/04/2022 - 10:00-11:00	52,9
23	28/04/2022 - 11:00-12:00	52,6
24	28/04/2022 - 12:00-13:00	51,9

N5 Measurement		
Date	Location	Distance from noise source
27/04/2022 - 28/04/2022	Vill. Mzisguli	50
N5 Measurement Result		
Hourly	Day (07:00-22:00)	Night (22:00-07:00)
	53,7	45,7
Hourly		
1	27/04/2022 - 13:00-14:00	53,4
2	27/04/2022 - 14:00-15:00	53,6
3	27/04/2022 - 15:00-16:00	54,9
4	27/04/2022 - 16:00-17:00	54,3
5	27/04/2022 - 17:00-18:00	56,1
6	27/04/2022 - 18:00-19:00	55,4
7	27/04/2022 - 19:00-20:00	53,5
8	27/04/2022 - 20:00-21:00	53,2
9	27/04/2022 - 21:00-22:00	50,2
10	27/04/2022 - 22:00-23:00	47,7
11	27/04/2022 - 23:00-24:00	45,8
12	28/04/2022 - 00:00-01:00	42,5
13	28/04/2022 - 01:00-02:00	42,6
14	28/04/2022 - 02:00-03:00	39,5
15	28/04/2022 - 03:00-04:00	40,4
16	28/04/2022 - 04:00-05:00	45
17	28/04/2022 - 05:00-06:00	55,9
18	28/04/2022 - 06:00-07:00	52,1
19	28/04/2022 - 07:00-08:00	52,5
20	28/04/2022 - 08:00-09:00	55,1
21	28/04/2022 - 09:00-10:00	51,9
22	28/04/2022 - 10:00-11:00	54,9
23	28/04/2022 - 11:00-12:00	53,5
24	28/04/2022 - 12:00-13:00	52,8

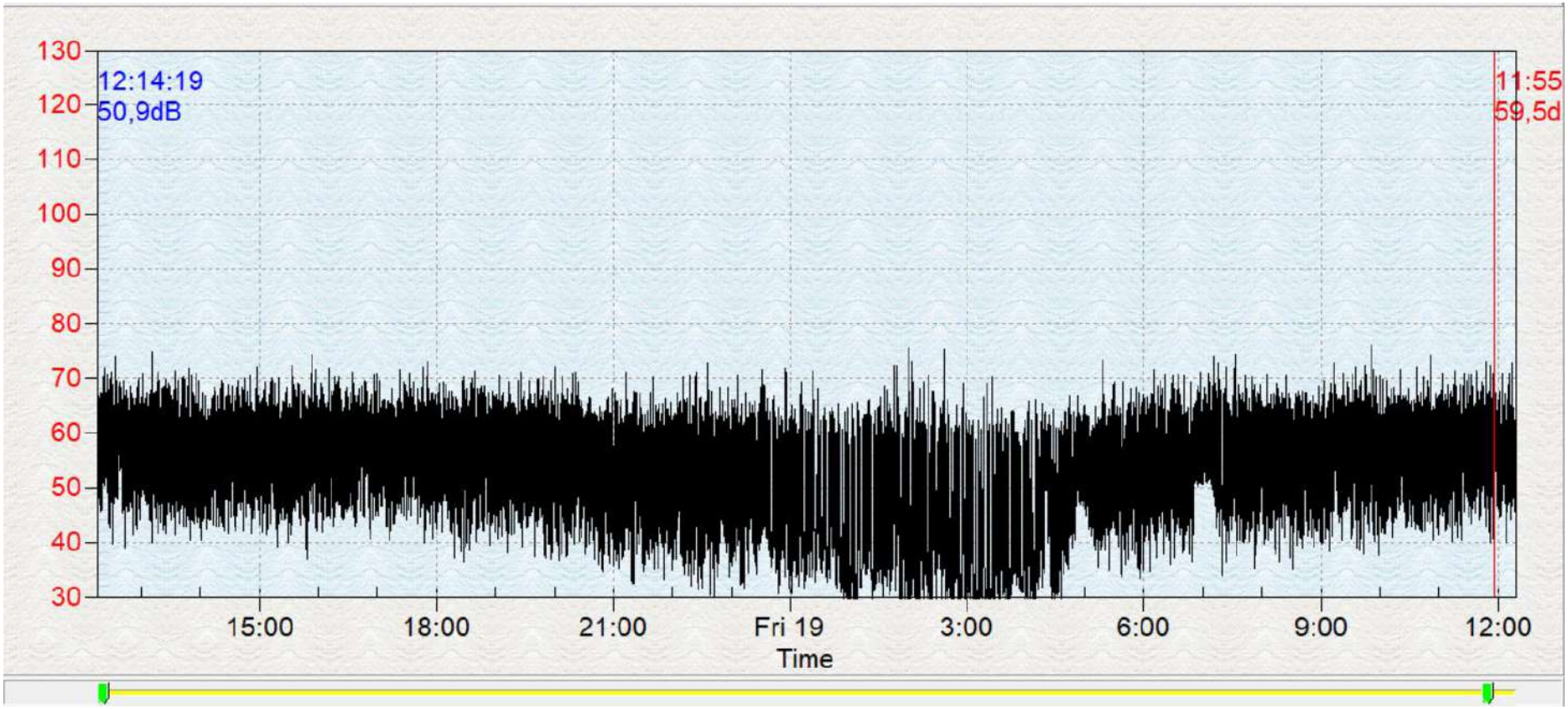
N6 Measurement		
Date	Location	Distance from noise source
27/04/2022 - 28/04/2022	Vill. Kachreti	30
N6 Measurement Result		
Average	Day (07:00-22:00)	Night (22:00-07:00)
	57,2	49,5
Hourly		
1	27/04/2022 - 13:00-14:00	57,8
2	27/04/2022 - 14:00-15:00	57,1
3	27/04/2022 - 15:00-16:00	56,7
4	27/04/2022 - 16:00-17:00	56,8
5	27/04/2022 - 17:00-18:00	56,7
6	27/04/2022 - 18:00-19:00	57,2
7	27/04/2022 - 19:00-20:00	56,4
8	27/04/2022 - 20:00-21:00	55,3
9	27/04/2022 - 21:00-22:00	52,9
10	27/04/2022 - 22:00-23:00	54,6
11	27/04/2022 - 23:00-24:00	49,1
12	28/04/2022 - 00:00-01:00	50,3
13	28/04/2022 - 01:00-02:00	46,7
14	28/04/2022 - 02:00-03:00	46
15	28/04/2022 - 03:00-04:00	44,6
16	28/04/2022 - 04:00-05:00	47,2
17	28/04/2022 - 05:00-06:00	50,9
18	28/04/2022 - 06:00-07:00	55,7
19	28/04/2022 - 07:00-08:00	57,7
20	28/04/2022 - 08:00-09:00	58,9
21	28/04/2022 - 09:00-10:00	59,5
22	28/04/2022 - 10:00-11:00	58,3
23	28/04/2022 - 11:00-12:00	57,9
24	28/04/2022 - 12:00-13:00	58,3

Annex N3: Graphical data for noise measurement

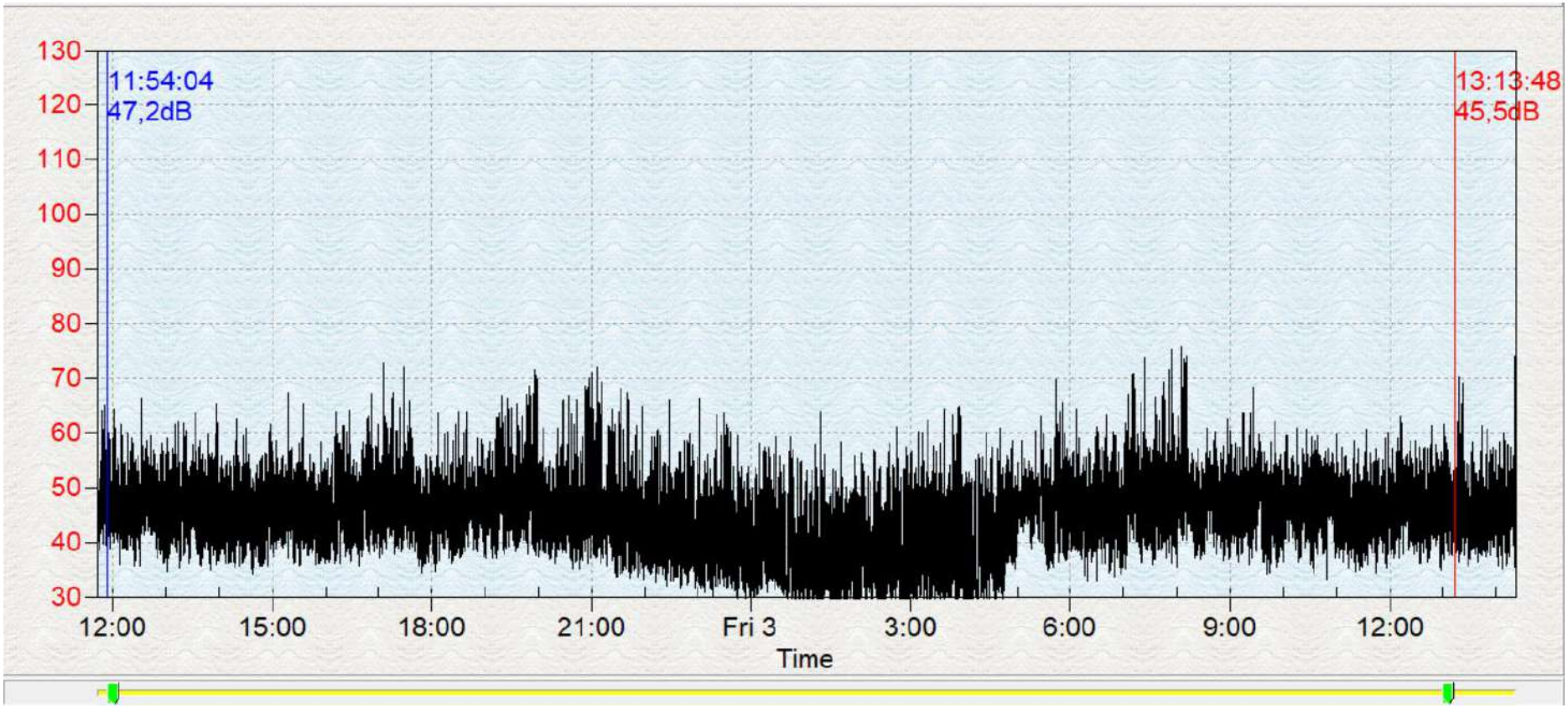
Graphical data for noise measurement- N1 Location



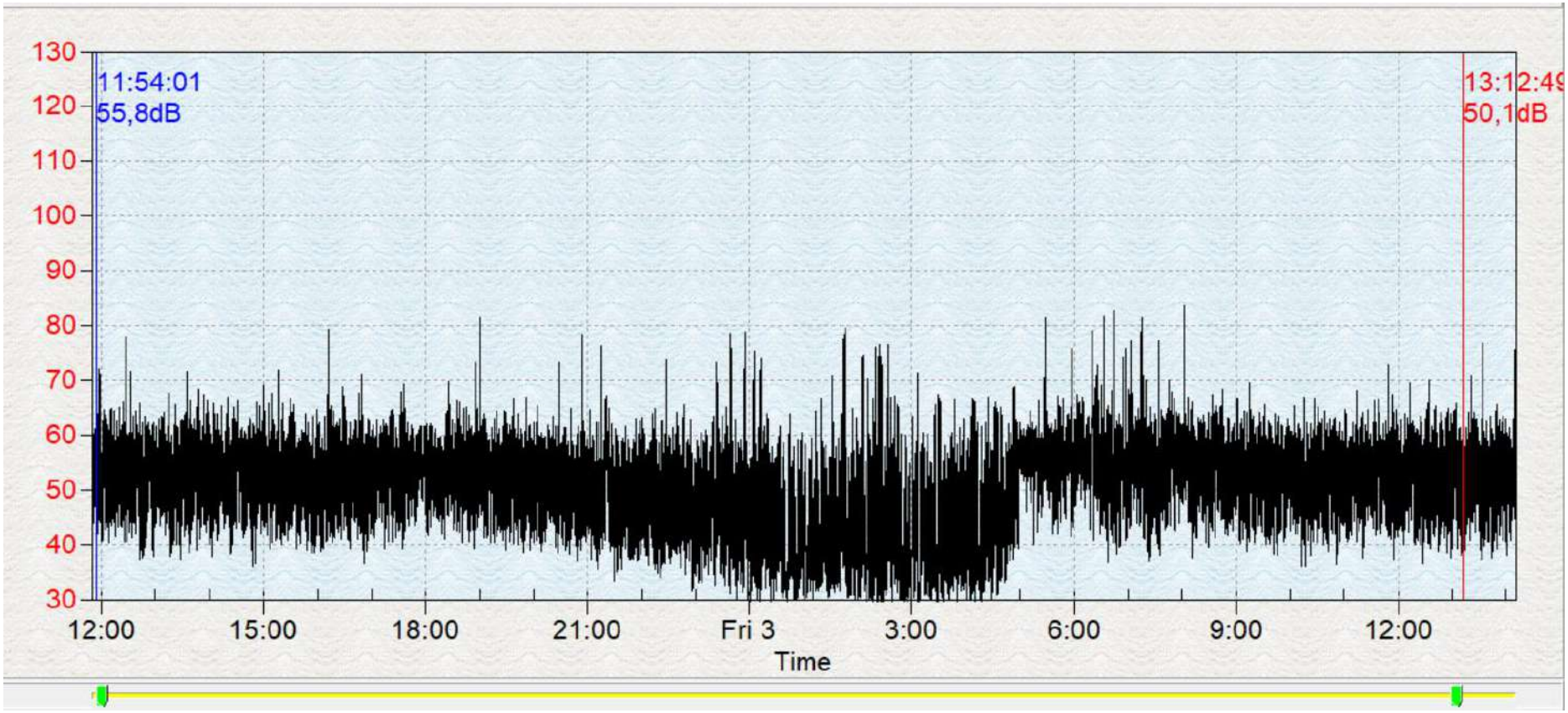
Graphical data for noise measurement- N2 Location



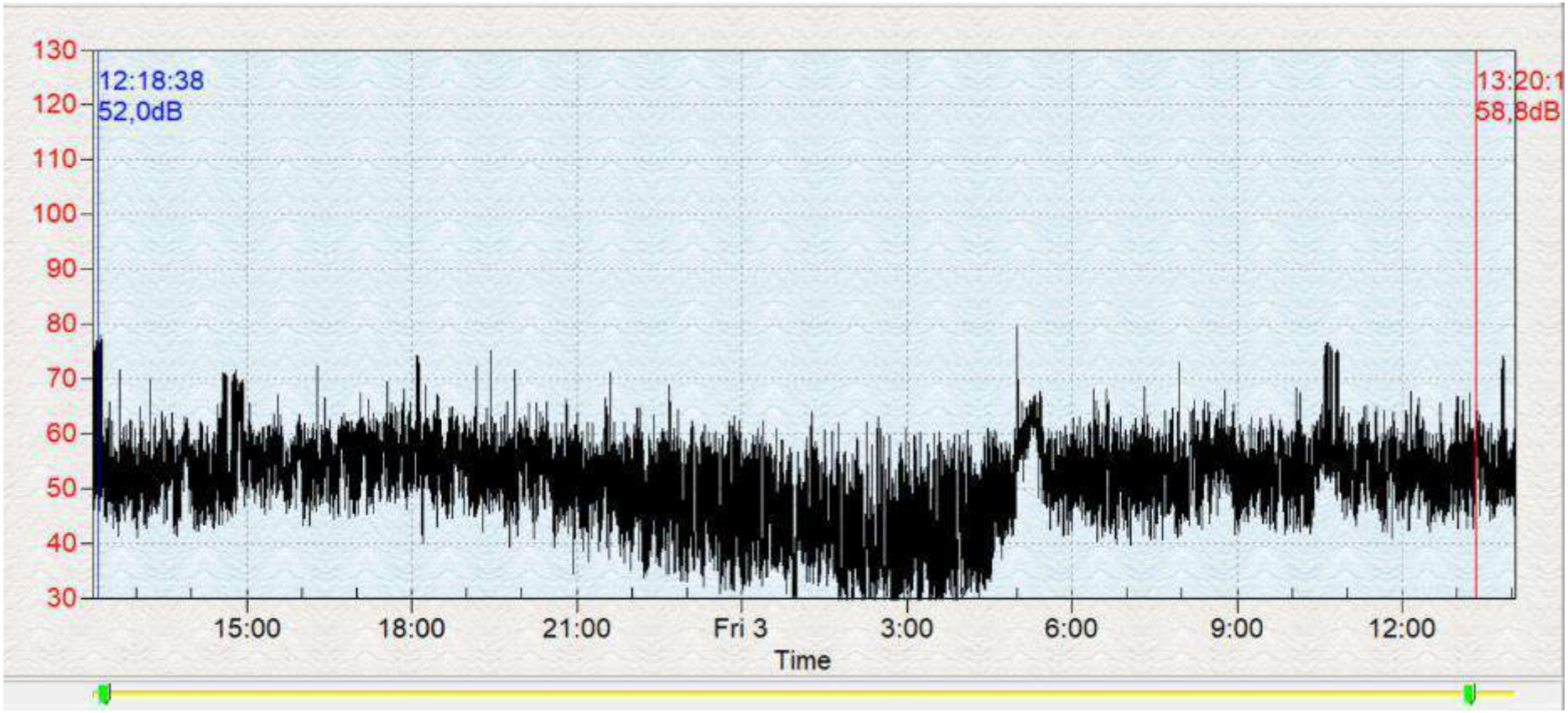
Graphical data for noise measurement- N3 Location



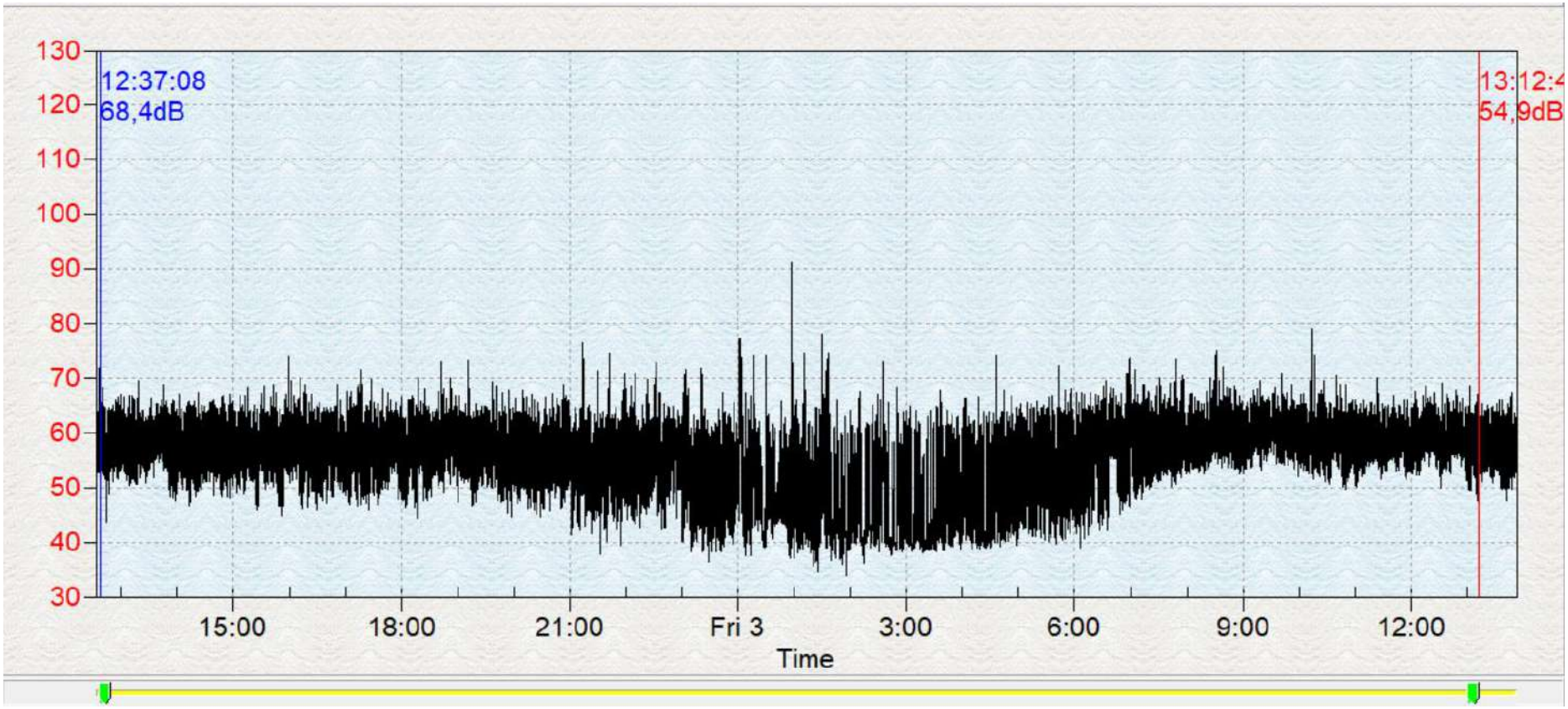
Graphical data for noise measurement- N4 Location



Graphical data for noise measurement- N5 Location

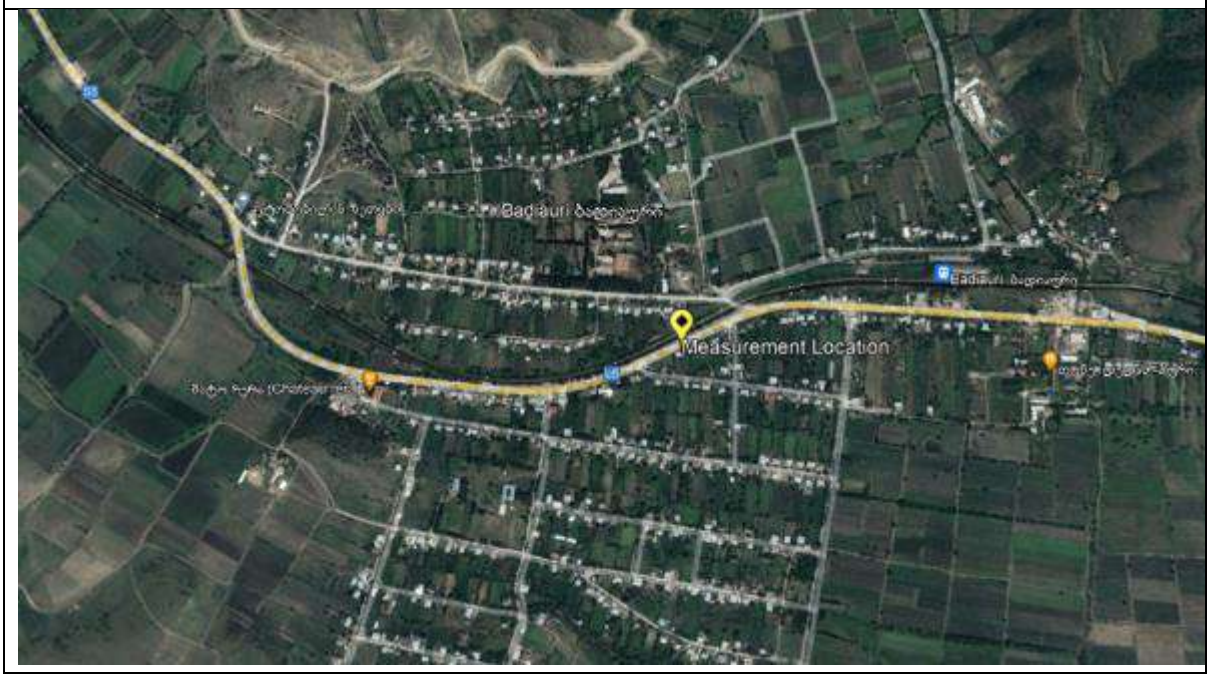


Graphical data for noise measurement- N6 Location

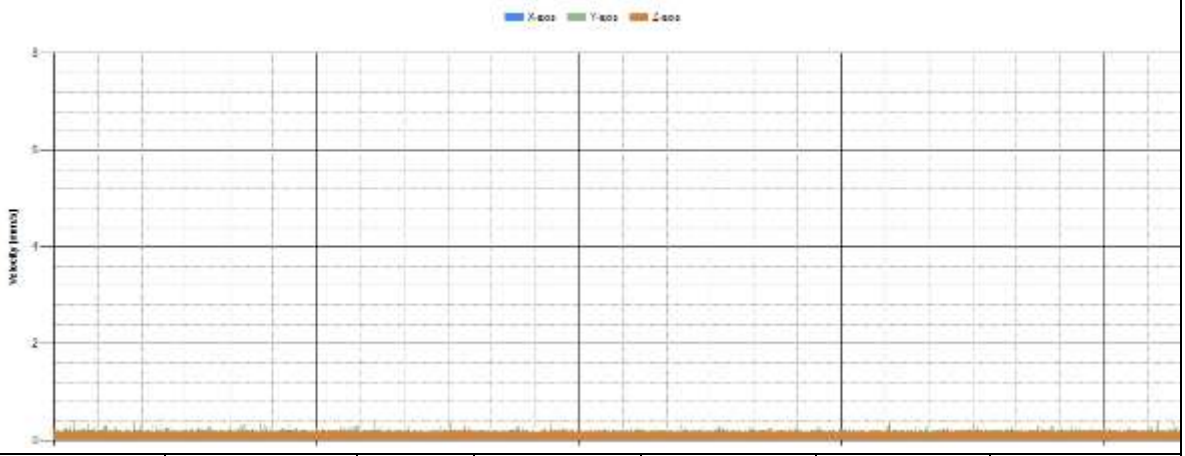


Annex N4: Vibration Measurement Results (Protocol)

Measurement protocol N1	
1. General	
1.1 Person in charge	Archil Revazishvili - Head of the Examination Lab
1.2 Measurement period	27.04.2022 11:58:40 - 28.04.2022 14:12:24
2. Kind of vibration	
2.1 Excitation	Motorway Traffic
2.2 Operating conditions	Medium intensity traffic
3. Structure	
3.1 Name and address	Vill. Badiauri
3.2 Classification	Residential building room. Closed space
3.3 Description	Residential building. According to DIN 4150-3, N2 categories of buildings (residential and similar buildings)
4. Location and position	
4.1 Source of vibration	



Measurement protocol N1	
	
5. Environmental conditions	Closed space; The smooth surface of the ground.
6. Subjective observations	The vibration of the working specifics does't affect on the general condition
7. Measuring chain	Triaxial Vibration Meter VM40B Serial number: 180665 Calibration Date: June 2021 Measurement method: DIN 4150-3 Settings: short res. found.: Frequency range: 1-80 Hz Trigger mode: 060s + events Measurement processing and report generation done with VM40MDB software.
8. Measurement result	
8.1 Event chart	

Measurement protocol N1						
						
Date	Time	X-axis	Y-axis	Z-Axis	Unit	Trigger event
27.04.2022	12:00 - 13:00	0,17	0,20	0,18	mm/s	(T)
27.04.2022	13:00 - 14:00	0,17	0,20	0,18	mm/s	(T)
27.04.2022	14:00 -15:00	0,18	0,20	0,18	mm/s	(T)
27.04.2022	15:00 - 16:00	0,17	0,20	0,18	mm/s	(T)
27.04.2022	16:00 - 17:00	0,18	0,21	0,18	mm/s	(T)
27.04.2022	17:00 - 18:00	0,17	0,19	0,19	mm/s	(T)
27.04.2022	18:00 - 19:00	0,17	0,20	0,18	mm/s	(T)
27.04.2022	19:00 - 20:00	0,17	0,19	0,18	mm/s	(T)
27.04.2022	20:00 - 21:00	0,17	0,19	0,18	mm/s	(T)
27.04.2022	21:00 - 22:00	0,17	0,19	0,19	mm/s	(T)
27.04.2022	22:00 - 23:00	0,17	0,19	0,18	mm/s	(T)
27.04.2022	23:00 - 24:00	0,17	0,19	0,19	mm/s	(T)
28.04.2022	00:00 - 01:00	0,16	0,18	0,18	mm/s	(T)
28.04.2022	01:00 - 02:00	0,16	0,19	0,18	mm/s	(T)
28.04.2022	02:00 - 03:00	0,17	0,19	0,18	mm/s	(T)
28.04.2022	03:00 - 04:00	0,17	0,19	0,18	mm/s	(T)
28.04.2022	04:00 - 05:00	0,16	0,19	0,18	mm/s	(T)
28.04.2022	05:00 - 06:00	0,17	0,18	0,18	mm/s	(T)
28.04.2022	06:00 - 07:00	0,16	0,19	0,18	mm/s	(T)
28.04.2022	07:00 - 08:00	0,18	0,19	0,18	mm/s	(T)
28.04.2022	08:00 - 09:00	0,17	0,19	0,18	mm/s	(T)
28.04.2022	09:00 - 10:00	0,17	0,19	0,18	mm/s	(T)
28.04.2022	10:00 - 11:00	0,17	0,20	0,18	mm/s	(T)
28.04.2022	11:00 - 12:00	0,17	0,19	0,19	mm/s	(T)
9. Evaluation			Generated vibration does not affect the overall condition			
10. Signs						

Measurement protocol N1	
Signature	Archil Revazishvili 

Annex N5: Results of measurements of major air pollutants

Index	Date Time	Monitor ID	Location ID	CO (µg/m3)	NO2 (µg/m3)	O3 (µg/m3)	PM10 (µg/m3)	PM2,5 (µg/m3)	VOC (µg/m3)
1	27 Apr 2022 14:23	1	1				81	56	
2	27 Apr 2022 14:24	1	1				60	50	
3	27 Apr 2022 14:25	1	1				59	41	
4	27 Apr 2022 14:26	1	1				54	43	
5	27 Apr 2022 14:27	1	1				52	42	
6	27 Apr 2022 14:28	1	1				41	33	
7	27 Apr 2022 14:29	1	1				42	32	
8	27 Apr 2022 14:30	1	1				48	32	
9	27 Apr 2022 14:31	1	1				39	30	
10	27 Apr 2022 14:32	1	1				45	29	
11	27 Apr 2022 14:33	1	1				45	25	
12	27 Apr 2022 14:34	1	1				43	25	
13	27 Apr 2022 14:35	1	1				60	35	
14	27 Apr 2022 14:36	1	1				48	33	
15	27 Apr 2022 14:37	1	1				43	32	
16	27 Apr 2022 14:38	1	1				47	27	
17	27 Apr 2022 14:39	1	1				29	22	
18	27 Apr 2022 14:40	1	1				39	20	
19	27 Apr 2022 14:41	1	1				48	22	
20	27 Apr 2022 14:42	1	1				40	22	
21	27 Apr 2022 14:47	1	1			3			
22	27 Apr 2022 14:48	1	1			7			
23	27 Apr 2022 14:49	1	1			17			
24	27 Apr 2022 14:50	1	1			21			
25	27 Apr 2022 14:51	1	1			24			

Index	Date Time	Monitor ID	Location ID	CO (µg/m3)	NO2 (µg/m3)	O3 (µg/m3)	PM10 (µg/m3)	PM2,5 (µg/m3)	VOC (µg/m3)
26	27 Apr 2022 14:52	1	1			28			
27	27 Apr 2022 14:53	1	1			33			
28	27 Apr 2022 14:54	1	1			28			
29	27 Apr 2022 14:55	1	1			21			
30	27 Apr 2022 14:56	1	1			26			
31	27 Apr 2022 14:57	1	1			29			
32	27 Apr 2022 14:58	1	1			31			
33	27 Apr 2022 14:59	1	1			31			
34	27 Apr 2022 15:00	1	1			26			
35	27 Apr 2022 15:01	1	1			38			
36	27 Apr 2022 15:06	1	1		161				
37	27 Apr 2022 15:07	1	1		166				
38	27 Apr 2022 15:08	1	1		166				
39	27 Apr 2022 15:09	1	1		164				
40	27 Apr 2022 15:10	1	1		166				
41	27 Apr 2022 15:11	1	1		164				
42	27 Apr 2022 15:12	1	1		168				
43	27 Apr 2022 15:13	1	1		162				
44	27 Apr 2022 15:14	1	1		157				
45	27 Apr 2022 15:15	1	1		157				
46	27 Apr 2022 15:16	1	1		155				
47	27 Apr 2022 15:17	1	1		161				
48	27 Apr 2022 15:18	1	1		155				
49	27 Apr 2022 15:19	1	1		151				
50	27 Apr 2022 15:20	1	1		155				
51	27 Apr 2022 15:21	1	1		153				
52	27 Apr 2022 15:22	1	1		151				
53	27 Apr 2022 15:23	1	1		155				

Index	Date Time	Monitor ID	Location ID	CO (µg/m3)	NO2 (µg/m3)	O3 (µg/m3)	PM10 (µg/m3)	PM2,5 (µg/m3)	VOC (µg/m3)
54	27 Apr 2022 15:24	1	1		149				
55	27 Apr 2022 15:29	1	1						315
56	27 Apr 2022 15:30	1	1						225
57	27 Apr 2022 15:31	1	1						180
58	27 Apr 2022 15:32	1	1						158
59	27 Apr 2022 15:33	1	1						135
60	27 Apr 2022 15:34	1	1						113
61	27 Apr 2022 15:35	1	1						113
62	27 Apr 2022 15:36	1	1						113
63	27 Apr 2022 15:37	1	1						90
64	27 Apr 2022 15:38	1	1						90
65	27 Apr 2022 15:39	1	1						90
66	27 Apr 2022 15:40	1	1						113
67	27 Apr 2022 15:41	1	1						90
68	27 Apr 2022 15:42	1	1						68
69	27 Apr 2022 15:43	1	1						68
70	27 Apr 2022 15:44	1	1						68
71	27 Apr 2022 15:45	1	1						68
72	27 Apr 2022 15:46	1	1						68
73	27 Apr 2022 15:47	1	1						68
74	27 Apr 2022 15:48	1	1						68
75	27 Apr 2022 15:53	1	1	2,5					
76	27 Apr 2022 15:54	1	1	1,3					
77	27 Apr 2022 15:55	1	1	1,8					
78	27 Apr 2022 15:56	1	1	0,8					
79	27 Apr 2022 15:57	1	1	2,6					
80	27 Apr 2022 15:58	1	1	0,3					
81	27 Apr 2022 15:59	1	1	0,5					

Index	Date Time	Monitor ID	Location ID	CO (µg/m3)	NO2 (µg/m3)	O3 (µg/m3)	PM10 (µg/m3)	PM2,5 (µg/m3)	VOC (µg/m3)
82	27 Apr 2022 16:00	1	1	2,8					
83	27 Apr 2022 16:01	1	1	1,4					
84	27 Apr 2022 16:02	1	1	1,1					
85	27 Apr 2022 16:03	1	1	1,1					
86	27 Apr 2022 16:04	1	1	2,4					
87	27 Apr 2022 16:05	1	1	2,2					
88	27 Apr 2022 16:06	1	1	0,6					
89	27 Apr 2022 16:07	1	1	0,4					
90	27 Apr 2022 16:08	1	1	1,1					
91	27 Apr 2022 16:09	1	1	2,4					
92	27 Apr 2022 16:10	1	1	2,9					
93	27 Apr 2022 16:11	1	1	0,4					
94	27 Apr 2022 16:12	1	1	0,8					
20 min. Average				**1,47**	**159**	**24**	**48**	**32**	**115**

Annex N6: Certificates of expert participating in the measurement

ISO 9001:2015 - Quality Management System Auditor Certificate
Archil Revazishvili

ISO 14001:2015 - Environmental Management System Lead Auditor Certificate
Archil Revazishvili

ISO 9001:2015 - Quality Management System Auditor Certificate

David Kaviladze

ISO 14001:2015 - Environmental Management System Lead Auditor Certificate

David Kaviladze

GCERTI Certificate of Attainment

GCERTI Certificate of Attainment

G-CERTI SYSTEM SERVICE

G-CERTI hereby certifies that

David Kaviladze

Has successfully completed the

ISO 14001:2015

Auditor / Lead Auditor Training Course
which meets the training requirements of the Exemplar Global
and has been as competent

Exemplar Global- AU :	Management Systems Auditing / 26 Jul 2019 (in accordance with ISO19011:2018)
Exemplar Global- TL :	Leading Management Systems Auditing Teams / 27 Jul 2019
Exemplar Global- EM :	Enviromental Management Systems / 29 Jul 2019

Examination Date : 29 Jul 2019
Issue Date : 23 Aug 2019
Certificate Number : GCTP-1900-1381

Chief Executive
IK, Choi

The course conforms to the principles and practice of audits of Management Systems for compliance with standards. This certificate is valid for three years from the date of the examination of the course for the purpose of GCERTI.

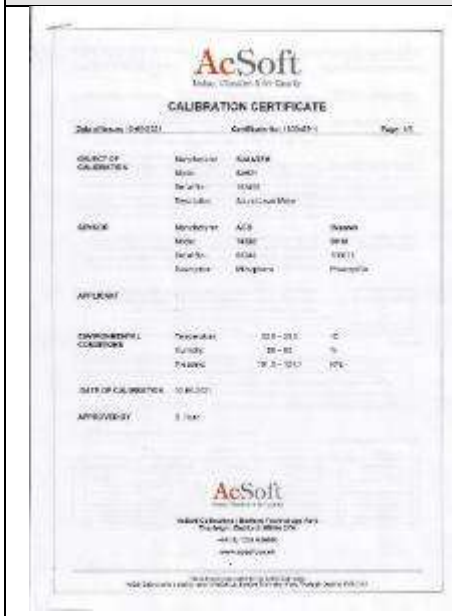
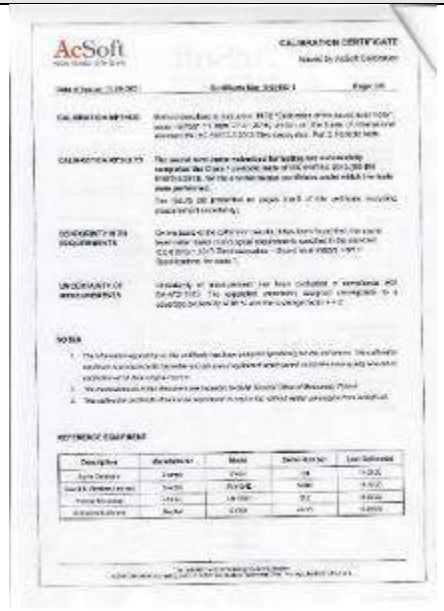
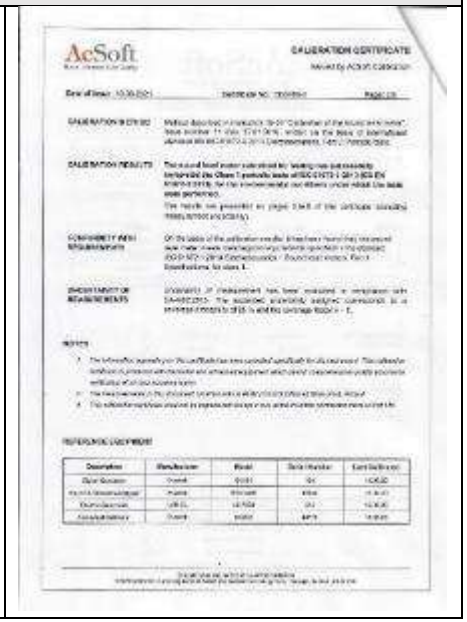
This certificate remains the property of GCERTI and this certificate is recognized by Exemplar Global.

Exemplar Global

G-CERTI SYSTEM SERVICE

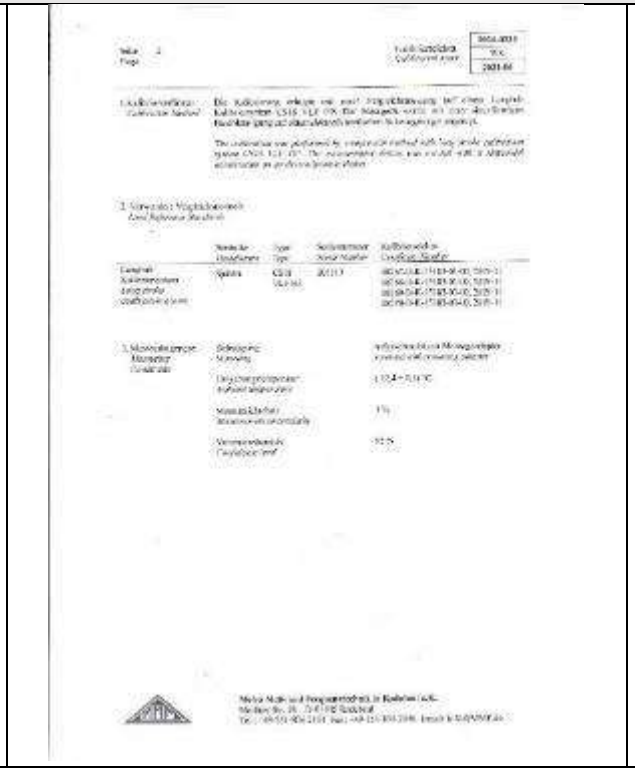
G-CERTI / 15F, 88, Eunpyeong-ro, Eunpyeong-gu, Seoul, Korea/ www.gcerti.com

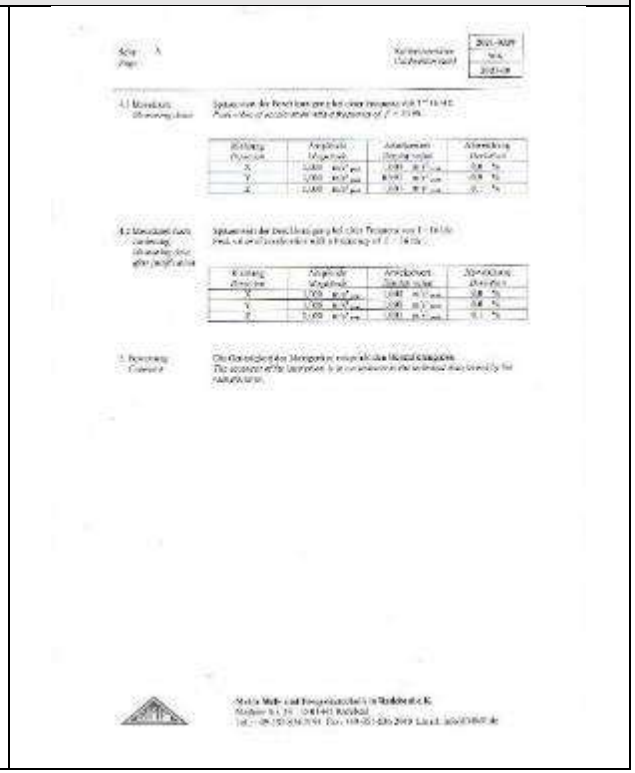
Annex N7: Calibration certificates for measuring Devices

Sound Level Meter N1		Sound Level Meter N2	
			

Vibration Measurement Device

Kalibrierschein in Anlehnung an DIN EN ISO 10012
Calibration Certificate with reference to ISO 10012





Air quality Measurement Device				
PM 10 - 2,5	VOC	CO	NO2	O3
				

ANNEX 5: SOCIO-ECONOMIC REPORT

Rehabilitation of the Left Main Canal of Kvemo Samgori Irrigation System

Socio - Economic Survey Report

Tbilisi

2022 Y.

"Eco- Spectri" Ltd
7 Chavchavadze Ave, ent II, room 4 Tbilisi 0179, Georgia.
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Table of Contents

1. Introduction

Socio - Economics is the social science that studies how economic activity affects and is shaped by social processes. In general it analyzes how modern societies progress, stagnate, or regress because of their local or regional economy, or the global economy. Societies are divided into three groups: social, cultural and economic. It also refers to the ways that social and economic factors influence the economy.

Social economics is a branch of economics and a social science that focuses on the relationship between social behavior and economics. The theories of social economics often consider factors that are outside the focus of mainstream economics, including the effect of the environment and ecology on consumption and wealth.

Social economics is primarily concerned with the interplay between social processes and economic activity within a society. Social economics may attempt to explain how a particular social group or socioeconomic class behaves within a society, including their actions as consumers.

Different socioeconomic classes may have different priorities regarding how they direct their funds. A socioeconomic class is a group of people with similar characteristics. These characteristics can include social and economic standing, level of education, current profession, and ethnic background or heritage.

Certain goods or services may be unavailable to specific socioeconomic classes based on their ability to afford them (as a result of their income). These goods or services can include access to more advanced or complete medical care, educational opportunities, and the ability to buy food that meets specific nutritional guidelines.

Socioeconomic system at the regional level refers to the way social and economic factors influence one another in local communities and households. These systems have a significant impact on the environment through deforestation, pollution, natural disasters, and energy production and use. Through telecoupled systems, these interactions can lead to global impact. Local economies, food insecurity, and environmental hazards are all negative effects that are a direct outcome of socioeconomic systems.

Deforestation, natural disasters, pollution, and energy consumption explicitly exhibit how human and natural systems are integrated systems. They are influenced by government policies and contextual factors which often have a more negative impact on the environment. Human interactions with the environment create a domino effect. These socioeconomic systems are all interconnected and produce effects from the local level, all the way up to the global level.

An individual's socioeconomic status can significantly impact their educational attainment and financial security. For example, an individual from an affluent social class will likely have a greater opportunity to achieve higher education and may be expected to pursue such a goal by peers and other members of their class. Completing higher education is more likely to increase their income potential, as well as provide opportunities to interact with people of similar or more advanced social standing and build beneficial social networks.

2. Survey Methodology

Socio - Economic survey tools are designed to collect information as a means of improving understanding of local resource management systems, resource use and the relative importance of resources for households and villages. Surveys also provide information on interaction with the government decision-making systems and community perceptions of trends and priority issues. Knowledge about community-based institutions, which is also obtained, and their roles in the sustainable use and conservation of natural resources, helps to facilitate or reinforce a consensus on land tenure and rights for the region, now and in the future.

Different tools (surveys, discussions, interviews) are used to obtain different types of information from different groups of informants. For example, household surveys can be used to gather information on age, gender, education, income sources (agriculture, forest and employment), perceptions of change in land use and access to forest resources. By contrast, understanding of the functions (governance and institutional) of the village, development, broader issues on access to land, population growth, social conditions and constraints can be gained through focus group discussions and interviews with key informants.

The research was mostly used quantitative methods and include qualitative information and analysis wherever possible. The Objective was to Estimate the change in the income, source of income, asset ownership, incidence, depth and severity of poverty, with associated social characteristics of the (households) in targeted district.

Key Indicators were Demographic information (age, education status, health status, work status of household members) and e.t.c.

The extent of analysis and use of the data collected will depend on the survey objectives and expected end uses. For collaborative land use planning, the survey results will provide, first, a robust baseline of socio-economic factors related to land resources and their use; and second, detailed insight into the community institutions, their relationship with land use planners (e.g. government bodies) and any potential areas of conflict. Together, this information can be used to develop collaborative land use decision-making tools.

Most of the information given in the study was obtained from relevant sources of the National Statistics Office of Georgia. National Statistics Office of Georgia, the legal entity of public law, carries out its activities independently. It is an institution established to produce the statistics and disseminate the statistical information according to the Georgian legislation. National Statistics Office of Georgia is established by the Law of Georgia, dd 11 December 2009, on Official Statistics.

The National Statistics Office of Georgia updates its data on a regular basis what makes it possible to get the latest information. The data of Geostat offer much information about the research topic, e.g., demographic status, male and female ratio, principal economic activity of the population, types of economic activity, etc.

The study also uses the materials from various literary sources (official sources of Sagarejo Municipality, newspaper and scientific materials, studies of different periods, etc.).

3. Basic Information about the study area

3.1 General

Sagarejo Municipality is located in the foothills of the south-western slope of Gombori Ridge, on the bank of the Tvaltkhevi River, on Tbilisi-Gurjaani Road, 700 m asl, 58 km from Tbilisi by rail and 48 km by road. Sagarejo Municipality is bordered by Gurjaani Municipality from the east, Gardabani Municipality from the west, and Tianeti and Telavi Municipalities from the north. The southern boundary of Sagarejo Municipality borders the Republic of Azerbaijan.

The administrative center of Sagarejo Municipality is the city of Sagarejo, 58 km east of Tbilisi and 772 m above sea level. The territory of the municipality covers 1553.69 sq. km. The relief is characterized by a mountainous plateau crossed by the Iori River. The northern part of the municipality is located on the foothills of Tsiv - Gombori and is mainly covered with forests - shrubs, its southern and south - eastern parts are forested, while the northern part is forested. The climate here is temperate continental, with precipitation ranging from 500 to 700 millimeters. The highest peak is the mountain "Tsivi" (1991 meters above sea level).

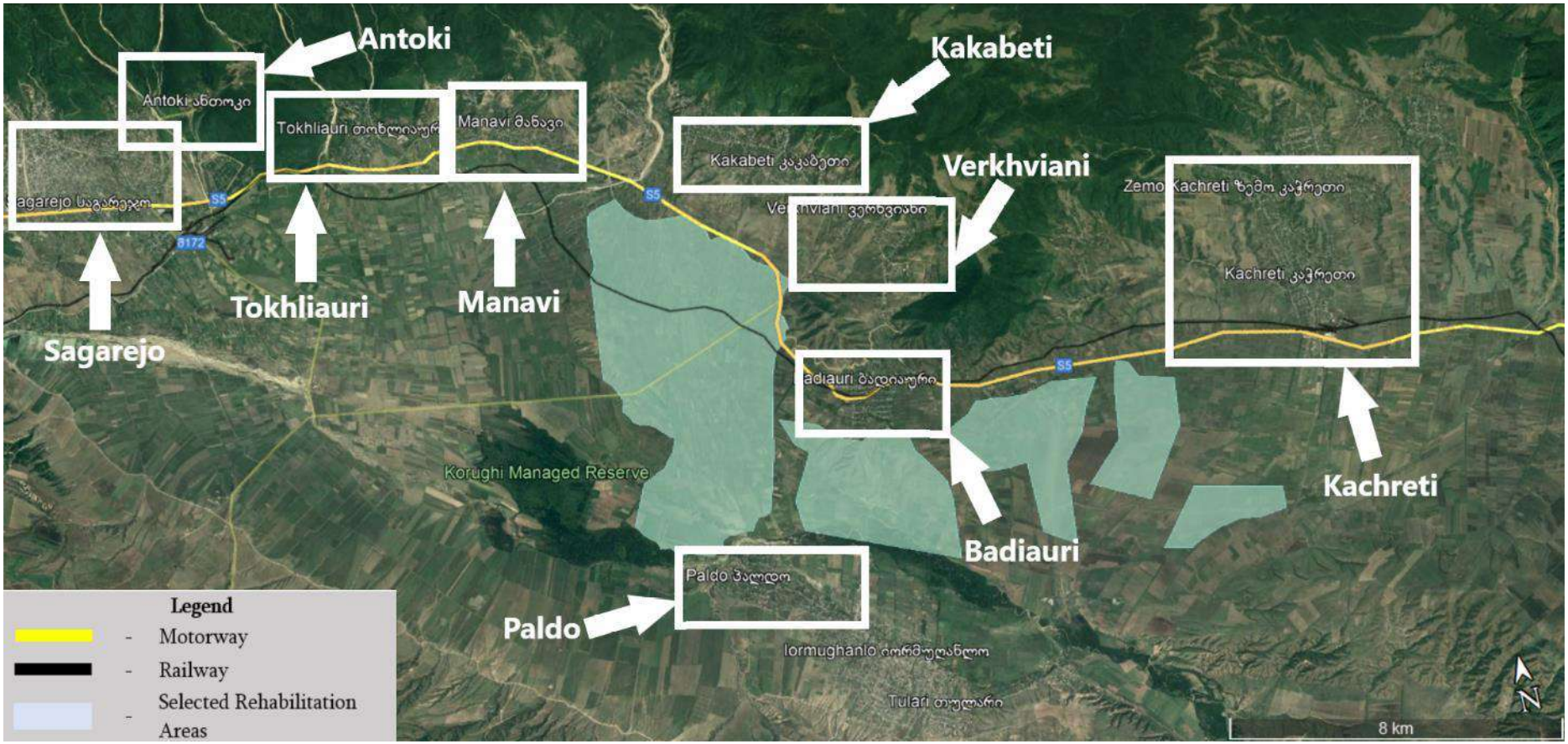
Figure N1: Flag of the Municipality

Figure N2: Coat of arms of the Municipality

There are 9 settlements near the project area, including one city and eight villages, in particular: the city of Sagarejo, villages Antok, Tokhliauri, Manavi, Kakabeti, Verkhviani, Badiauri, Paldo and Kachreti.

Figure N3 below shows the project area and its surrounding settlements.

Figure N3: Settlements adjacent to the project area



3.2 History

Name Sagarejo derives from the common name of the estate of Davitgareja Monastery – Sagarejo (literally, 'For Gareja").

According to archeological data, the traces of human life in the territory of the city of Sagarejo date back to II BC.

As per the written sources, the earlier name of the city of Sagarejo was "Tvali", sometimes called as "Tvalni", "Tval-Sagarejo" or "Sagarejo".

"Tvali", as the name of the village, is used in historical documents since the XIX century. Name "Tvalni" (plural of "Tvali") means that there were some villages in the area, as evidenced by many material cultural monuments inter alia. However, there are no visible borders between these villages today. Name "Sagarejo" originated in the mid-XV century. At first, this name was used to denote the villages and estates owned by Gareja Monasteries.

Sagarejo was an important strategic and economic center throughout the Middle Ages and afterwards. The transit trade road from Tbilisi to Kakheti ran across Sagarejo. One branch of road "Tskvari Gza" on the back also ran across Sagarejo, by which the Pshavi, Ertso-Tianeti and Tushi people used to take sheep from Shirak to summer pastures.

At the beginning of the XX century, 800 or 900 families lived in Sagarejo, with the majority of Georgians and 70 Armenian families. There was a regular traffic between Tbilisi and Sagarejo. The village streets were winding making a dense network. There was a market, a medical school, a two - class school and a private parish school in the region. The people were engaged in field crop cultivation and viticulture.

Until 1917, the territory of the present-day Sagarejo Municipality was a part of Tbilisi Uyezd of Tbilisi Province. As per the administrative-territorial division of the Georgian SSR of 1921, it was still a part of Tbilisi Uyezd, while in 1929, it was made a part of Tbilisi District and named Gare Kakheti. It has been an independent region since 1930. By the resolution of October 27, 1933, Gare Kakheti Region was called Sagarejo Region. It has been Sagarejo Municipality since 2006.

3.3 Administrative arrangement

Sagarejo Municipality is a group of settlements with its administrative boundaries and administrative center - the city of Sagarejo. Sagarejo Municipality has an elected representative body (Sakrebulo) and executive body (City Hall), registered population and has its own property, budget and revenues. The Municipality is a legal entity of public law. The Sakrebulo and Mayor of Sagarejo Municipality are elected for the term of 4 years. The last elections in Sagarejo Municipality were held in 2021.

The Municipality has 25 administrative units. Besides the city of Sagarejo, there are 48 settlements in the Municipality. The administrative center of the Municipality is the city of Sagarejo.

The territorial organs of the Municipality are: the city of Sagarejo and villages Gombori, Kochbaani, Ujarma, Khashmi, Patardzeuli, Tskarostavi, Ninotsminda, Giorgitsminda, Tokhliauri, Manavi, Didi Chailuri, Patara Chailuri, Kakabeti, Verkhviani, Kandaura, Badiauri, Mzisguli, Shibliani, Iormuganlo, Duzagrama, Lambalo, Tular, Sataple, Udabno and e.t.c.

3.4 Communications

The whole territory of the Municipality is a coverage zone of cellular communication companies: “MagtiCom”, “Geocell” and “Beeline”.

In addition, a communication company "Silknet" operates in Sagarejo. Internet connection is provided by the following internet providers: “Silknet”, “Delta Net”, “MagtiCom” and “Geocell”.

The whole territory of Sagarejo and villages Khashmi, Patardzeuli, Giorgitsminda, Ninotsminda, Tskarostavi, Tokhliauri, Manavi, Didi Chailuri, Patara Chailuri, Kakabeti, Verkhviani, Kandaura, Badiauri, Mzisguli, Iormughanlo, Duzagrama, Lambalo and Tulari is supplied with natural gas by “SOCAR”.

The electrical power is supplied to the Municipality by "Kakheti Energy Distribution" company.

The cleaning services of the territory of the Municipality are provided by company “Supta Munitsipaliteti 2018” Ltd. ("Clean Municipality 2018"). The administrative unit has a sanitary landfill in the countryside. The waste on the landfill is a mixed one, including household and construction waste. There are many illegal landfills in the Municipality, mostly in villages. Most villages do not have landfills and the population dumps the waste into the ravines. There is no practice of composting used in the Municipality. There are scrapping points in the city of Sagarejo, but there is no information available about the amount of collected waste.

3.5 Educational Institutions

The Municipality has 26 public schools, with 25 of them offering elementary, basic and secondary education (grades I-IX-XII), and one school offering the elementary and basic education (grades I-IX). 4 schools are in the territory of the city of Sagarejo.

There are 3 private educational institutions on the territory of the Municipality, with “Tamar Garejeli” Ltd. and “Georgian-French Lyceum of Patardzeuli” Ltd. offer the primary, basic, and secondary education, while "Ilia" Ltd., the Ilia Chavchavadze higher education institution in the city of Sagarejo offers secondary and vocational educational programs.

There are also 29 preschool establishments (kindergartens) and two extracurricular institutions in the Municipality: Sagarejo Youth House and the Georgian Language Learning Centre in village Duzagrama.

The city of Sagarejo also has N(N)LE Jemal Burjanadze Music School and an youth entertaining center.

There are three sports schools in Sagarejo Municipality, where teenagers are engaged in 9 different sports: Georgian wrestling, Sambo, Judo, Freestyle wrestling, football, rugby, chess, athletics and swimming. Sagarejo Municipality currently has 10 wrestling halls, 10 mini pitches and one standard sports ground. There are three recreation areas, a swimming pool and tennis courts in the Municipality.

4. Socio - Economic Information

4.1 Demographics

By January 1, 2022, the population of Sagarejo Municipality was 52,300 that is 16.9% of the total population of Kakheti. The population of Sagarejo has slightly increased (by about 100 people) for the last seven years. See Table N1 below for the dynamics of the population of Sagarejo Municipality for the last seven years.

Table N1: Dynamics of the population of Sagarejo Municipality

Year	2015	2016	2017	2018	2019	2020	2021
Sagarejo Municipality	51,9	52,1	52,1	52,3	52,2	52,2	52,3
Kakheti region	318,8	317,8	315,9	314,7	312,5	310,1	309,6

The population of the settlements near the study area is as follows:

- C. Sagerejo - 10 871 (2014);
- Vill. Antoki - 73 (2014);
- Vill. Tokhliauri - 983 (2014);
- Vill. Manavi - 2769 (2014);
- Vill. Kakabeti - 2771 (2014);
- Vill. Verkhviani - 495 (2014);
- Vill. Badiauri - 1286 (2014);
- Vill. Paldo - 18 (2014);
- Vill. Kachreti - 1958 (2014).

Table N2 gives the population in urban and rural settlements of Kakheti Region by 1 January 2022. As the Table shows, 77% of Kakhetians live in rural areas.

Table N2: Population by urban-rural settlements of Kakheti region

2020			2021		
Total	Urban settlement	Rural settlement	Total	Urban settlement	Rural settlement
310,1	70,7	239,4	309,6	70,9	238,6

Table N3 shows the population density of Kakheti per square kilometer.

Table N3: Population density of Kakheti per square kilometer

Region	2017	2018	2019	2020	2021

Kakheti	27,8	27,7	27,5	27,3	27,2

Table N4 shows the natural increase of population in Sagarejo Municipality. As the given data show, natural increase in Sagarejo Municipality for the last five years was positive, amounting making average 256 people a year.

Table N4: Natural increase of population

Municipality	2016	2017	2018	2019	2020
Sagarejo	286	333	235	262	162

4.2 Business Sector

The local economy of Sagarejo Municipality is mainly presented by agriculture, tourism, services and trade. By considering the turnover and incomes, the most perspective and fast-developing branches are tourism and agriculture. As per the statistical data, in 2019, there were 760 enterprises operating on the territory of the municipality, including 16 large, 36 medium and 708 small enterprises. Of them, 29 agricultural cooperatives operate in the municipality.

A large proportion of the production of Sagarejo Municipality is presented by agricultural products. The following branches of agriculture are well developed: crop growing making 12% of the total grain produced in the region and viticulture making 15% of the grapes grown in the region. The following grape varieties are most commonly grown: Rkatsiteli, Saperavi and Manavis Mtsvane. In this regard, the zones of villages Manavi and Khashmi are particularly worthwhile. Cattle-breeding and poultry-raising are also important branches of the municipality.

Kakheti region is an agricultural region, with viticulture as its main activity. There are some oil reserves in Sagarejo and Dedoplistskaro municipalities. In addition, recently, some important tourist facilities have been built and improved. Several small HPPs were also built on the southern slope of the Caucasioni of Kakheti.

Table N5 shows the turnover of the commercial sector registered in Sagarejo Municipality (in mln. GEL).

Table N5: Turnover of the commercial sector (in mln. GEL)

Year	2014	2015	2016	2017	2018	2019	2020
Sagarejo Municipality	78,5	87,6	127,0	178,7	166,3	219,3	239,9

As the data show, the turnover of business sector in 2020 increased 3 times since 2014.

Table N6 shows the value of products manufactured in Sagarejo Municipality.

Table N6: Value of products manufactured (mln. GEL)

Year	2014	2015	2016	2017	2018	2019	2020
Sagarejo Municipality	82,7	99,7	76,2	101,9	100,2	138,5	120,8

Table N7 shows the number of employees in Sagarejo Municipality.

Table N7: Number of employees

Year	2014	2015	2016	2017	2018	2019	2020
Sagarejo Municipality	1 751	2 341	2 540	2 323	2 575	2 641	1 860

Table N8 shows average monthly salary (in GEL) of employees in Sagarejo Municipality.

Table N8: Average monthly salary (in GEL) of employees

Year	2014	2015	2016	2017	2018	2019	2020
Sagarejo Municipality	603,1	644,7	670,6	713,9	942,0	965,8	1 074,2

As the data show, average monthly salary in 2020 increased 1.8 times since 2014 that is also higher the average monthly salary in Kakheti Region (832,7 GEL in 2020).

Table N9 shows the number of registered and operating businesses in Kakheti Region.

Table N9: Number of registered and operating businesses

Region	Registered entity	Active Entity
Kakheti	51321	12322

Table N10 shows the formation of businesses in Kakheti Region.

Table N10: Formation of businesses

Year	2014	2015	2016	2017	2018	2019	2020
Kakheti Region	1947	3126	2210	1925	1771	2288	2251

Table N11 shows the labor force indices in Kakheti Region (2020).

Table N11: Labor force indices (2020 y.)

Index	Kakheti
Total: 15+ population	247,0
Labor force (active population)	122,2
Employed	109,5
Hired	57,1
Self-employed	52,4
Doubtful	0,0
Unemployed	12,7
Population beyond the labor force	124,8
Unemployment rate, per cent	**10,4**
Level of the labor force participation (activity), per cent	**49,5**
Employment rate, per cent	**44,3**

As Table #11 shows, the unemployment rate in the Kakheti Region is 10,4%.

Manufacturing is moderately developed in Sagarejo Municipality. There are small poultry factories, wineries and small bakeries on the territory of the Municipality. Most of the enterprises have water meters installed. Some enterprises use energy - efficient machinery and equipment.

4.3 Education, Science and Culture

As already mentioned, there are 26 public schools in the territory of Sagarejo Municipality, with 25 of them offering elementary, basic and secondary education (grades I-IX-XII), and one school offering the elementary and basic education (grades I-IX). 4 schools are in the territory of the city of Sagarejo.

Table N12 gives the data about the public preschool and educational institutions in Sagarejo Municipality.

Table N12: Public preschool and educational institutions

2021/2022		
Number of preschools	Number of children involved (pupils)	Educator / Educator's assistant / Inclusive education special. Teacher
29	1 450	125

Table N13 gives the number of general educational schools in Kakheti Region by school types.

Table N13: General educational schools by school types

Region	Elementary (1-6)	Elementary-basic (1-9)	Elementary-basic-secondary (1-12)	Basic-secondary (7-12)	secondary (10-12)	Total
Kakheti	-	22	169	-	-	191

Table N14 gives the indices of vocational education in Kakheti Region by gender.

Table N14: Indices of vocational education in Kakheti Region by gender

Region	Educational institutions			Students			Graduates			Teachers		
	Total	Private	Public	Total	Woman	Man	Total	Woman	Man	Total	Woman	Man
Kakheti	4	1	3	560	251	309	378	151	227	179	128	51

Table N15 gives the number of higher education institutions in Kakheti Region.

Table N15: Number of higher education institutions

Region	State	Private
	2020/2021	2020/2021
Kakheti	1	2

Table N16 shows the number of libraries in Sagarejo Municipality.

Table N16: Number of libraries

Municipality	2017	2018
Sagarejo	1	4

Table N17 gives the main indicators of museums (museum associations) and museum - nature reserves in Kakheti Region.

Table N17: Indicators of museums (museum associations) and museum - nature reserves

Year	2016	2017	2018	2019	2020
Kakheti Region	Number of visitors, thousand people				
	182	242	286	315	64
	Number of exhibitions, units				
	90	103	125	135	76

4.4 Environmental Statistics

Table N18 gives the data on the forest fund in Kakheti Region by 2020.

Table N18: Forest fund in Kakheti Region (Thousand hectares)

Region	Forest fund area	From here covered with forest
Kakheti	288,3	268,1

Table N19: Timber obtained from forest cutting - forest volume (cubic meters)

Region	2016	2017	2018	2019	2020
Kakheti	121 773	132 067	97 051	94 698	69 632

Table N20 gives the data on detaining the pollutants generated by stationary sources of air pollution in Kakheti Region and their emission into the atmospheric air.

Table N20: Pollutants generated by stationary sources of air pollution in Kakheti Region and their emission into the atmospheric air (Thousand t.)

Region	Generated	Caught	Emitted
Kakheti	5,3	3,7	1,6

Table N21 gives the number of violations of environmental legislation recorded in Kakheti Region by the types.

Table N21: Number of violations of environmental legislation (2020 Y.)

Kakheti	Illegal tree logging	643
	Violation of timber transportation rules	406
	Violation of fishing rules	32
	Violation of hunting rules	25
	Violation of the technical regulations of sawmills	41
	Illegal mining	29
	Violation of the terms of mining license	...
	Violation of the atmospheric air legislation	66
	Violation of water legislation	11
	Violation of land legislation	11
	Pollution of the environment with waste	69
	Violation of the terms of permit/illegal activities	5
	Other violations	39

Table N22 gives the data on natural resource available in Sagarejo Municipality.

Table N22: Data on natural resource

Municipality	Resource	Unit	Quant.
Sagerjo	Plaster	T	1006326
	Mineral water (balneo healing)	m^3 / day	49
	Fresh water	m^3 / day	139000
	Porphyry breccia	m^3	9000000
	Brick clay	m^3	18228000

4.5 Agriculture

The total area of Sagarejo Municipality is 155,369 ha, with 94,371 ha of agricultural lands and 42,065 ha of forests.

The main sources of income of the population are: agriculture, trade, services with agricultural machinery and selling the timber. The municipal budget, including local revenues and equalization transfers, amounts to GEL 13,387,000. Under the Economic Development Plan of Sagarejo Municipality, the priority branch of the economy is agriculture. In addition, tourism can be developed based on forestry.

As the data of the Municipality Board (Gamgeoba) suggest, the natural disasters have threatened about 20 hectares of living areas 500 ha of arable land and 200 ha of river banks and floodplains for the last decade.

4.5.1 Land Use

Agriculture is the main economic activity in Sagarejo Municipality. The administrative unit has well - developed viticulture and cattle - breeding. Agricultural lands amount to 94,371 ha, including 29,575 ha of arable lands, 6,424 ha of orchards, and 58,372 ha of pastures. According to the local authorities, the agricultural land fund of the Municipality, arable lands in particular, has not been reduced for the last decade. However, agricultural lands are being degraded due to salination, erosion and overgrazing.

4.5.2 Vegetation

Vegetation - growing is a common activity in the administrative unit. However, much of the arable lands are uncultivated due to the lack or malfunctions of the agricultural machinery and lack of finances. Besides, recent years have been marked by a reduced harvest. A priority agricultural crop is vine with the yield of 4-7 t/ha, fruits yielding 5 t/ha, wheat yielding 1.5-3 t/ha, technical crops yielding 1-1.5 t/ha and vegetables yielding 15 t/ha. As per the locals, the reasons for the decreased yield are low - yielding seed material, insufficient irrigation and unfavorable weather conditions.

Approximately 60% of arable lands of the Municipality need irrigation. However, due to the lack and poor condition of the irrigation system, the irrigation is problematic, and water resources are insufficient as well. The Municipality mainly uses a canal (traditional) irrigation. People also use rainwater collection for household and farming activities, but this method is less common.

Approximately 300 ha of agricultural lands in the Municipality need drainage. The Municipality has a drainage system, but much of it is out of order and only small part of it provides adequate drainage.

4.5.3 Livestock

Cattle - breeding is one of the main sources of income for the population of the Municipality. The administrative unit has 58,372 ha of pastures. By 2012, the number of cattle owned by the locals was 35,000, showing an increase of 10,000 for the last 10 years. The local people are engaged in sheep - breeding as well. The number of sheep in the Municipality is 130,000 sheep showing an increase of 50,000. The cattle from other municipalities are not taken to the pastures of Sagarejo Municipality.

The meat productivity of cattle and sheep is stable; cattle milk production has increased to 36,000 t/year, and the sheep milk production is 1,800 t/year.

Average harvest from mowing lands varies from 9 - 10 to 17.8 cwt/ha. 90% of the mowing lands are used for grazing even after hay harvesting. The hay harvest is reduced due to overgrazing.

4.5.4 Projects and Services

Sagarejo Municipality has poorly developed agricultural services such as veterinary services and mechanization centers. The Municipality has an Agricultural Office. However, the non - governmental sector is mainly engaged in the spread of new agricultural technologies. For the last decade, the local government has not implemented any projects in agriculture. High - productive and drought-resistant crops are introduced and relevant consultations services are rendered within the scope of non - governmental projects.

4.5.5 Forest Resources

Sagarejo Municipality is rich in forest / timber resources. The total area covered with forest is 42 065 ha. Illegal forest cutting takes place in the territory of the Municipality. Mainly commercial, social and caring forest cutting takes place. Approximately 20 - 30% forests are cut illegally. High price of fuel has in last 10 years has resulted an increase in illegal logging.

4.5.6 Water Resources

Sagarejo Municipality has moderate surface and groundwater resources. However, no information about the estimated water resources is available in the Municipality. The ratio of surface and groundwater resources is 70/30.

The surface waters in the administrative unit are presented by the basins of the Iori River and its tributaries. The area of wetlands of the Municipality is 300 ha.

The Municipality has no operating hydrological station. As a result, there is no information about the changes in the hydrological parameters of surface and ground waters.

4.6 Tourism

Sagarejo municipality is distinguished by its beautiful, exotic nature and ancient historical-cultural monuments. The small lakes scattered on the abundant Iori Plateau, the forests of Mariamjvari Reserve or colorful deserts offer interesting routes. Especially popular is the colorful desert of Gareji, where the amazing landscape and unique, monastery complex carved in the rock, creating a wonderful harmony of nature and culture. There are many interesting monuments besides the David Gareji Monastery in Sagarejo, which tell us about Georgian culture and history, such as: Ujarma Fortress, Manavi Church of the Virgin Mary, Manavi Fortress, Chichkhituri Monastery, etc. There is a museum of local lore in the region, where you will find many interesting exhibits of different periods. Sagarejo is an excellent place for rest and relaxation.

Table N23 shows the distribution of average annual number and visits of resident visitors of Georgia aged >15 and their visits to the Kakheti Region.

Table N23: Average annual number and visits (Thousand)

Year	Kakheti

2015	87,4
2016	84,1
2017	73,3
2018	83,4
2019	90,2
2020	90,6

Table N24 shows the distribution of average monthly expenditures of the resident visitors of Georgia aged >15 and during their visits in the country by the cost categories in mln. GEL.

Table N24: Average monthly expenditures during visits (mln. GEL)

Year	placement	Food and drink	Shopping	Entertainment, recreation, cultural and sports events	Transport	Other	Total exp.
2015	4,5	36,4	35,9	1,7	22,9	26,0	**127,5**
2016	6,3	38,7	36,1	2,2	22,8	29,1	**135,2**
2017	5,6	33,4	41,9	1,8	25,3	28,0	**136,0**
2018	7,2	33,3	48,6	2,1	25,4	28,2	**144,8**
2019	6,9	37,6	50,8	2,5	28,0	27,8	**153,5**
2020	7,0	35,6	53,9	1,3	27,5	22,0	**147,1**

5. Local Economic Analysis

5.1 Analysis of Local Economic Structure

The local Economy of Sagarejo Municipality is mainly reresented by agriculture, tourism, services, and trade. In regard to turnover and income, the tourism and agriculture sectors are considered as the most promising and developing directions.

The volume of agriculture production in the Municipality has a significant share in agricultural production in the region. The following areas of agriculture are developed: Cereal production, which makes up 12% of the region's grains, viticulture - up to 15% of grapes produced in the region is from Sagarejo Municipality; Livestock and poultry are also important. Among the annual plant crops in Sagarejo Municipality mainly wheat, maize, barley and sunflower are sown. The soil of the Municipality is favorable for the cultivation of different grape varieties. The following grape varieties are spread: Rkatsiteli, Saperavi, Manavi Green, especially noteworthy Manavi village zone where the above mentioned unique vine variety comes from - Manavi Green, as well as Khashmi zone - famous for Saperavi grape. Among perennial crops besides the vineyard, almonds and so - called pistachio orchards have been actively cultivated in recent years, for which the soil and climatic conditions are favorable in Sagarejo Municipality. Currently the most efficient, growing, a local agricultural company in terms of size and annual turnover, is L.t.d. "City Loft" and L.t.d. "Udabno", which have invested approximately GEL 500 million in Sagarejo Municipality. Almond

production in the country will be increased by 70% with their efforts. The primary production of agricultural products in the closed ground is also important.

The amount of arable land and pastureland in the municipality creates good conditions for the development of livestock, sheep - breeding and pig - farming. The Municipality also has 4 slaughterhouses, 3 large and 20 small - scale poultry farming; the produced meat is provided to approximately 50% of the country's market, which distinguishes Sagarejo Municipality from other municipalitities in the region, as none of the municipalitities produce such amount of chicken. It is also worth noting that the eggs produced in these farms comprise 30% of the eggs produced countrywide.

According to local statistical data, in 2019 there was 760 operating enterprises in the municipality, including 16 large, 36 medium and 708 small enterprises. In addition, 29 agricultural cooperatives in the municipality.

A refrigeration system has been established within the state program within the municipal territory, which is targeted at both the local market and the capital city market.

Beekeeping is also present in Sagarejo municipality, for which there is a proper climate, though it is necessary to train specialists in the field and make additional investments in beekeeping.

In addition to agriculture, the tourism sector has been also developed significantly in recent years. The number of visitors has increased to 30% in the last three years; one of the influencing factors is the existence of David Gareji Monastery complex and the balneological resort of Ujarma (Iodine Bromian Waters), with tourist facilities developed around the area (55 enterpises), with wine tourism development, cultural heritage and abudance of natural - ethnographic monuments. Ujarma resort hosts up to 400 guests a month. In case of investment, more sanatoriums can be opened. Large - scale restoration of Ujarma Castle Town is currently underway with the initiative and financial support of the National Agency for cultural heritage preservation. The castle town restoration project is expected to be completed by 2022, which will significantly increase the number of visitors in Sagarejo Municipality.

Wine tourism is actively on the rise in Sagarejo municipality. Every year, 1.1 thousand tons of wine is processed in Sagarejo Municipality. This is a 40% increase over previous years. In Sagarejo the so - called "wine path" is signposted and marks Khasmi, Bride, Sagarejo, Tokhliauri, Kakabeti and Manavi villages. Currently, there are about 20 small, medium and large wine companies and family wine cellars whose products are exported annually to different countries. Apart from the locals, European winemakers also work in Sagarejo Municipality. One of the important steps forward in the development of wine culture and tourism will be organization of a "Wine Festival" featuring wine produced by large and small wine cellars and other spirits.

Hotel type services are provided by up to 14 small family - run hotels (guesthouses) with 120 beds daily. There are 265 small, 18 medium and 5 large businesses in trading.

5.2 Local Coopetarion and Networking

In terms of cooperation and partnership between business entities operating within the territory of Sagarejo Municipality, it should be noted that there is less experience and in many cases the business sector is also passive. There is some experience of structural cooperation in agriculture, for example with agricultural cooperatives in promoting their activities as well as in the field of tourism with Destination Management Organization (DMO) to raise awareness of the subjects involved in the tourism sector and enhance their skills. In addition, meetings with different donors and international organizations have shown through different activities, such as exchanging information, sharing experiences and initiating joint projects, that it is very important to have a vision / strategy that fosters such links.

It should be noted that lately, with the initiative of Sagarejo City Hall, regular meetings are held with the business sector, so - called forums, which are attended by representatives of the Municipality, business agriculture and the private sector. The abovementioned forum is a place to share business experiences with each other, raise problems and discuss their solutions. The cooperation with the representatives of the family wine cellars is almost formed to some extent, the Mayor of the Municipality and his representatives meet on a regular basis and some joint events are planned. These kinds of meetings between the municipality and the business sector make it possible to remove some barriers and facilitate communication, which is a major factor for strengthening the private sector.

5.3 Access to Finance

The existence and availability of financial resources are often a major problem for new or small businesses. Although, in the Municipality the information and Consultation Center of the Ministry of Environment and Agriculture of Georgia provides information to the business sector on projects and grants available in the field of agriculture, business sector involvement is still low and in many cases the information is insufficient. Also, the procedures for using state programs are somewhat bureaucratic, often time - consuming and the private sector prefers to operate the business with its limited resources. Banks and microfinance organizations in the Municipality provide loans to businesses and agrobusinesses upon submission of substantiated requests and necessary documentation. The contribution of the state is large in the agricultural loans issued by banks, which facilitates the development of agriculture.

5.4 Land and Infrastructure

One of the most important factors for the sustainable and inclusive development of the business sector is the appropriate environment, resources and conditions that ensure its effective operation. In terms of land resources, Sagarejo Municipality is one of the leading in the region, with the total agricultural area - 94382 ha. Arable land covers 29386 hectares, perennial crops cover 5275 hectares, 1407 hectares of mowing land, 42065 hectares of forest, 56884 hectares of pastureland and 1430 hectares of land underlying dwellings.

With the development of business in Sagarejo Municipality, the demand for buildings, land and infrastructure is increasing. For the past six years, the private sector has identified the need for micro - enterprise or individual entrepreneur space - 150000 ha. The Economic Department of the Sagarejo City Hall identifies the land on the territory of the Municipality, records the ownership of the unregistered land, inventories buildings and structures owned. Along with municipal property, there is also state - owned property and in the case of justified claims by the private sector, some property can be granted to the Municipality and allocated for the investor.

5.5 Regulatory and Institutional Framework

Despite the advances in business and simplified regulations in the country, meetings with the private sector and dialogue with them have revealed that there are still some administrative rules that the private sector cannot circumvent and completely hinder initiated business process. One of the major barriers between the private and public sectors is the lack of communication and free information exchange, which negatively impacts the private sector and business development. At the local level there is no institutional framework to deepen relationships between local businesses and the public sector. The most significant problem for the representatives of the private sector has been obtainment of the proof of land ownership that has been in their possession for decades but they do not have a document of ownership.

ANNEX 6: BIODIVERSITY REPORT

Pre-construction Biodiversity Study Report of Samgori Irrigation System Project Area

June, 2022

Table of Contents

1. Introduction

This document presents the preconstruction biodiversity study report of Samgori irrigation system project area. An inventory of flora and fauna representatives was provided and the habitats in the project area and the threats to them were assessed during the study period. The document describes the degree of impact on the representatives of flora and fauna biodiversity in case of the construction works. The Biodiversity Study was conducted in June of 2022.

2. Brief Description of the Project Area

The project area in question is located in Sagarejo Municipality, near villages Manavi, Didi Chailuri and Badiauri, with its southern border partially bordering the nationally protected area “The Korughi Managed Reserve”. The whole project area covers agricultural land plots with vineyards, orchards, annual and perennial agricultural crop land plots, etc. The project area does not cover natural habitats and is totally represented by agricultural landscape actively used by the population. All these factors make fauna representatives keep away from the area.

Project Area

3. Study Methods

3.1 Flora:

Prior to the fieldworks in the project area, literary sources were studied, and the results were used to develop the lists of flora representatives common in the vicinity of the project area. The Latin names of the plant species mentioned in the text were taken from the second edition of "Georgian Flora" (Volumes I-XIV 1987-1996; N. Ketskhoveli, A. Kharadze, R. Gagnidze); as well as the Nomenclature List of Plants (2005, R. Gagnidze) and the Botanical Dictionary (1991, Makashvili). The obtained information was thoroughly verified during the field study, thus revealing the flora representatives common in and around the project area. The same sources were used to identify the species and their taxonomically valid scientific names.

A field study was accomplished within the project area. The study mainly used a route method aiming at studying the background state of the plant species growing in the project area and the botanical survey of the area.

The main objective of the floristic survey was to identify the plant species, sensitive habitats and communities within the construction corridor that will be under the impact.
The floristic survey consisted of two components: 1) collection of detailed data about the generic diversity of the habitats common in the project corridors, and 2) field sampling of the plants growing in the corridors to obtain accurate information about the floristic diversity.

3.2 Fauna:

Prior to the fieldworks in the project area, literary sources were studied, and the results were used to develop the lists of flora representatives common in the vicinity of the project area (Muskhelishvili and Chkhikvadze, 2000; Bukhnikashvili & Kandaurov 2001; Arabuli, 2002; Kvavadze & Pataridze, 2002: Kankaviladze, 2002; 2002; Darchiashvili et al., 2004; Didmanidze, 2004; Arabuli et al., 2007; Kvavadze et al., 2008; Murvanidze et al., 2008; Pokryszko et al., 2011; Kutibidze, 1966). The obtained information was thoroughly verified during the field study, thus revealing the fauna representatives common in and around the project area. The same sources were used to identify the species and their taxonomically valid scientific names.
The study mainly used the route method. The given project corridor was divided into transects and all the encountering species were visually fixed and identified along the routes planned in advance. Signs of animal life were also identified, such as traces, excrements, holes/burrows, feathers, fur, etc. During the study, we used binoculars with 10X50 magnification, and we used the following field guides during the fieldworks: Mammals of Europe (Macdonald and Barrett 2001) ღა Birds of Europe (Svensson et al. 2010).

3.3 Study of Fish Fauna

Although there are no rivers, lakes, or artificial fish farms immediately in the project area, ichthyofauna study was still conducted. It should be noted that the Rivers Iori and Chailuri will be adjacent to the project corridor. The natural water discharge of the Chailuri River is little in summer and often, it completely dries up, and its bed is filled with water only following abundant rainfalls. As for the river Iori, fishing was done immediately in it and the facts of fishing were also registered during the study, following which the fishermen were interviewed. During the field survey, the caught fish samples were photographed and returned to the river.

4. The Project and Adjacent Areas and Their Biodiversity

The given Report describes the following protected areas:

- National Protected Area.
  - ✓ Korughi Managed Reserve (IUCN Category IV)
- Protected Areas of International Importance
  - ✓ Emerald Network Site of Bern Convention, Mariamjvari (Site Code: GE0000020)
  - ✓ Important Ornitological Area (International Bird Area (IBA)SPA 5 David Gareji).

Protected areas across the world, including Georgia, play an important role in biodiversity conservation. In order to preserve biodiversity, it is important for a country to discharge its international obligations: Convention on Biological Diversity, the Convention on Migratory Species (CMS), the European Convention on Wildlife and Natural Habitats, so-called "Bern Convention". The Program of Work on Protected Areas (PoWPA), as well as one of the main instruments for the implementation of the Bern Convention, the Emerald Network, which is based on the Association Agreement signed between the EU and Georgia, are directly related to the biodiversity convention of the protected areas. This agreement also obliges Georgia to establish "Important Bird Areas", with their major part located in the existing or planned protected areas.

4.1 Mariamjvari Strict Nature Reserve

The administration of Mariamjvari Strict Nature Reserve includes: Mariamjvari Reserve (1022.5 ha), Korughi Managed Reserve (1716 ha) and Iori Nature Reserve (2126.8 ha).

Mariamjvari Strict Nature Reserve is a unique object of conservation and study of the forms of Caucasian/hook pine (*Pinus sosnowsky nakia*) common in the Caucasus. The pines in the Reserve area are located on the southern slopes of Tsiv-Gombori Ridge, where they show favorable renewal trends on rocky and stony soils and are recognized as the means reinforcing rock talus.

The pine forests on the site have always attracted the attention of scientists with their biological diversity and morphology of forming various forms.

Mariamjvari Reserve was designated with the aim to protect and preserve the pristine landscapes of Sosnovsky pine, which is the Caucasian relics and the rare hearth of the formation of this timber species, having no analogue not only in Georgia, but also abroad.

The main objectives of the Korughi and Iori Nature Reserves are the protection, maintenance and reproduction of the flora and fauna of unique floodplain forests (Korughi) and Tugai-type forests (Iori).

4.1.1 Plants

Mariamjvari Strict Nature Reserve is a part of East Georgia vegetation region. The western border of this region runs approximately along Tbilisi meridian and coincides with the eastern border of Eastern spruce propagation. To the south, the region is bordered by Bezobdali, Shaghdaghi and Morovadaghi Ridges, more precisely by the Tertera river Valley, where the eastern border of the beech forest runs across the Lesser Caucasus.

The northern boundary of this region runs across Tsiv-Gombori Ridge and the Gareja Mountains. To the east, the region extends to the confluence of the Alazani and Iori Rivers with the River Mtkvari (V. Gulisashvili, 1974). The territory of the Reserve is provisionally divided into three zones based on vertical zoning:

1. The lowest forest zone is at an altitude of 800-1000 m asl. This zone is represented by oak-hornbeam, brushwood and pine groves.
2. The middle forest zone is at an altitude of 1000-1500 m asl. Oak-hornbeam and pine groves commonly grown within this zone;
3. The upper zone spreads at an altitude of 1500-1800 m asl, with mainly beech forests, and pine forests growing in the areas of rock talus.

There is no sharp expression of the vertical belt of forests in the territory of the reserve. The main species of woody plants - pine extends from 800 meters to 1800 meters asl in the upper zone of the belt up to 1100-1800 meters (mainly primary groves), as well as in the lower, moderately warm zone of the belt up to 800-1000 meters. In many cases, pine forests are spread mainly in areas where conglomerates have been washed away by water, plateaus and huge outcrops have emerged

In the Mariamjvari State Reserve in the southern part of the Tsiv-Gombori Ridge, S. Kurdiani (1910) distinguished four forms of Sosnowski (hook) pines: Pyramidal (Pinus sosnowskyi Nakai var. Pyramidalis Kurd.); Compact (Pinus sosnowskyi Nakai var. Compacta Kurd.); Oval (Pinus sosnowskyi Nakai var. Ovalus Kurd.); and Umbrella (Pinus sosnowskyi Nakai var. Umbraculifera Kurd.). It is noteworthy that all pines develop similarly until 8-10 years and only after this age, they grow differently taking different forms, which proves that the polymorphism of this pine is not inherent and it is caused by air, soil, temperature, humidity, light and other environmental factors (S. Kurdiani, 1910).

In Mariamjvari Reserve, in terms of arid and semi-arid habitats (ecotopes), there are 9 main types of pine and oak-pine forests identified (Z. Tiginashvili 2006).

The III-Bonitet pine forests grow at 900-1400 m asl and are presented by the following forest types: Pine forest with fescue (Pinetum festucosum); Pine forest with verbena (Pinetum cytisusum); Pine forest with juniper undergrowth (Pinetum juniperosum).

The IV-Bonitet pine trees are found at 850-1500 m asl, which are distinguished by the variety and abundance of indicative grass cover or undergrowth of forest types. The same bonitet presents pure pine forests, as well as oak-pine and pine-oak subformations, with the following types: Pine forest with poosum (Pinetum poosum); Pine forest with soft rush (P. Caricosum); gramineous herb pine forest (P. gromineto-mixtoherbosum); gramineous herb pine and oak forest (Quercetum mixtoherbosum-Pineto-Quercetum mixtoherbosum); oak-pine forest with fescue (Querceto-Pinetum festucosum).

The V-Bonitet oak-pine and pine forests grow at 900-1400 m asl. Due to the low soil productivity, poor grass cover and scarce undergrowth, only two types of forest were identified in this forest:

oak-pine forest with oriental hornbeam undergrowth (Querceto-Pinetum carpinuletum) and dry pine forest (Pinetum siccum).

Thus, the types of Mariamjvari pine forests are diversified in terms of dry and arid habitat. They differ from each other with grove composition, frequency, undergrowth, grass cover, soil productivity (bonitet) and other taxonomic indices. Consequently, the typological characteristics of the forest ecosystems of the given ecotopes are as follows: climatic (light, heat, dependence on moisture, etc.), edaphic (soil depth, moisture, fertility, etc.), orographic (relief, slope exposure, slope gradient, altitude, above sea level, etc.) and other factors evidence the biological diversity of the pine forest types in the area.

4.2 National Protected Areas. Korughi Managed Reserve (IUCN Category IV)

The southern section of the project area borders the Protected Area of National Importance, the Korughi Reserve. The purpose of the Reserve was to protect and preserve the floodplain forest survived on the banks of the Iori River. The forests of Korughi Managed Reserve are located along the river as narrow strips on both sides of the Iori, on its first and second terraces. It borders the project area. According to the local conditions, the main forest-forming species are elongated oak, aspen (abele, black poplar), field elm, willow, and secondary forest-forming species: wild pear, shamrock and cherry plum. Noteworthy bushes are: hawthorn, blackthorn, oleaster, Christ's thorn, sea-buckthorn, barberry, European privet, Warty Spindle Tree, Gaiter-tree, Salt cedar, Dog-rose and others. These forests are also characterized by twining plants: greenbrier, traveller's joy, etc., which together with blackberries form impassable thickets, offering favorable conditions for fauna representatives to find shelters and/or propagate.

In lower wetlands, common reed, reed and Cusick's **sedge** are common, while in high dry areas, bottle-brush, Wood bluegrass, wheat-grass, wheat-grass, Saxifraga juniperifolia, etc. are common, also forming a refuge for ornithofauna representatives.

The forests of the Reserve have a function of soil protection and river flow regulation, especially during floods. They reduce erosive processes, moderate the distribution of atmospheric precipitations and thus contribute to the stability of groundwater yields and river water regimes. The following types of forest groups are found in the Korughi Reserve:

I**. Oak forests.** This group is dominated by Grayish oak, with 0.4 or higher density. The grown individuals are of medium or low density. Oak and elm grown trees are most common. The undergrowth has shrubs such as: red and black hawthorn, cornelian cherry, gaiter-tree, warty spindle tree, seaberry, blackberry, etc. with low or medium density. Twining plants are also widespread. These groves are the best shelter for animals and birds.

II. **Mixed floodplain forests.** This group includes groves dominated by poplar, black alder, willow and elm, with mainly oak and aspen shoots and grown individuals, which are quite strong and can be viewed as reliable. Undergrowth: hawthorn, cornelian cherry, gaiter-tree, warty spindle tree, wild privet, blackthorn, oleaster and blackberry. The most common plants are cat briar, traveller's joy and

ivy. There is tall herbaceous cover in the black alder and willow groves: Cusick's **sedge** and common reed.

III. **Open stands.** This group includes groves with 0.4 or less density. They are dominated by crayish oak, elm, poplar, and willow. Growing plants are poorly developed and grow as few individuals in the area. In the undergrowth, there are: red and black hawthorn, oleaster, and dog-rose. Twining plants are: cat briar, traveller's joy and ivy. The grass cover is well developed and is presented by gramineous plants, with tall herbs, such as common reed grass in some cases.

IV. Bushes. The following species dominate: oleaster, hawthorn, dog-rose, blackberry, and Christ's thorn. Gramineous plants ფა common reed grass of grassy plants are common here. This type forms a favorable habitat and shelter for hares, redlegs, and black francolins.

The Reserve has the following types of forests:

1. Oak forest with grass.
2. Oak forest with wheat grass.
3. Oak-elm forest with grass.
4. White poplar forest with gaiter-trees.
5. White poplar forest with carex bushes.
6. White poplar forest with false brome grass.

The grass cover is presented by fescue, Wood bluegrass brome grass, and common reed grass, and beard-grass at forest edges. The wheat grass is made up of carex bushes, brome grass and wood bluegrass.

List of plants and trees common in Korughi and Iori Managed Reserve

Ordinal #	Plant's English Name	Plant's Latin Name
1.	Grayish oak	Quercus pedunciflora
2.	Georgian oak	Querqus iberika
3.	White poplar	Populus alba
4.	Black poplar	Populus nigra
5.	Abele	Populus hibrida
6.	Field elm	Ulmus minori
7.	Wych elm	Ulmus scabra

8.	Black mulberry	Molus nigra
9.	Basket willow	Salix viminalis
10.	White willow	Salix alba
11.	Goat willow	Salix carpea
12.	Russian olive	Eleagnus angustifolia
13.	Common pear	Pirus caucasica
14.	Oriental hornbeam	Carpinus orientalis
15.	Wild pistachio tree (only in Iori Managed Reserve)	Pistacea mutika
16.	Stinking juniper (only in Iori Managed Reserve)	Juniperus foetidisimma
17.	Greek juniper (only in Iori Managed Reserve)	Juniperus excelza
18.	Persian juniper (only in Iori Managed Reserve)	Juniperus polikarpus
19.	Caucasian nettle tree	Celtis caucasica
20.	Eastern crabapple	Malus irientalis
21.	Tree of heaven	Ailantus altissima
22.	weeping Pear (only in Iori Managed Reserve)	Pirus salicifolia
23.	Damson	Prunus frutikoza
24.	Mandarin Chinese	Cygoia oblonga
25.	Seaberry	Hipophae ramnoides
26.	Blackthorn	Prunus spinoza
27.	Georgian Barberry	Berberis vulgaris
28.	Black hawthorn	Crataegus pentagina
29.	Red hawthorn	Crataegus cirfostila
30.	Common fig	Ficus cariea
31.	Pomegranate	Punika granatun
32.	Hubei grape	Vitis silvestris

33.	Honeysuckle	Lonicera iberika
34.	Meadowsweets	Spirala granata
35.	Blackberry	Pubus caucasicus
36.	Nitre bush	Nitraria schoberi
37.	Spannish broom	Ycnista sachokia
38.	Caucasian Astragal	Astragalus caucasicus
39.	Christ's thorn	Paliurus spina kristi
40.	Silkvine	Periploca gracea
41.	Cat briar	Smilax excelza
42.	Cherry plum	Prunus divaricata
43.	Medlar	Mespilus germanika
44.	meadowsweets	Spiraca crenata
45.	Dog-rose	Rosa canina
46.	Gaiter-tree	Thelicrania australis
47.	Buckthorn	Rhamnus pallasii
48.	Salt cedar	Tamaris ramosissima
49.	Warty Spindle Tree	Euonimus verrucosa
50.	Wild privet	Ligustrum vulgare
51.	Cornelian cherry	Cornus mas
52.	Caucasian honeysuckle	Lonicera caucasica Pall.

Red-Listed Species commonly growing in Mariamjvari State Reserve (Mariamjvari Reserve, Korughi and Iori Managed Reserves)

Georgian Name	Latin Name	Georgian Red List Status	IUCN Red List Status

Plants			
English Yew	*Taxus baccata*	Small fragmental area	VU
Caucasian oak	*Querqus macranthera*	Small fragmental area	VU
Grayish oak	*Quercus pedunculiflora*	Small fragmental area	VU
Caucasian wingnut	*Pterocarya pterocarpa*	Small fragmental area	VU
Wild pistachio tree	*Pistacia mutica*	Small fragmental area	VU
Common walnut	*Juglans regia*	Small fragmental area	VU

List of Endemic Timber Species of Caucasus commonly growing in Mariamjvari State Reserve (Mariamjvari Reserve, Korughi and Iori Managed Reserves)

Species		მარიამჯვრის ნაკრძალი	**Korughi Managed Reserve**	იორის აღკვეთილი
In Georgian	**In Latin**			
Georgian Barberry	*Berberis iberica*	**+**	**+**	**+**
Black alder	*Alnus barbata*	**+**	**+**	**+**
Transcaucasian birch	*Betula medwdiewii*	**+**	**-**	**-**
Nut	*Corylus avellana*	**+**	**+**	**-**
hawthorn	*Crataegus caucasu*	**+**	**+**	**+**
Common pear	*Pyrus caucasica*	**+**	**-**	**-**
weeping Pear	*Pyrus salicifolia*	**-**	**+**	**+**

4. 3 National Park Fauna

The National Park also has rich fauna. The following mammals are noteworthy: wolf (*Canis lupus)*, Jackal (*Canis aureus)*, *Red fox (Vulpes vulpes)*, jungle cat (*Felis chaus),* Eurasian lynx (*Lynx lynx*), hare (*Lepus europeus)*, European badger (*Meles meles)*, otter (*Lutra lutra*), wild boar (*Sus scrofa*), etc.

The following small mammals are noteworthy: small forest mouse (*Sylvamus uralensis*), steppe field mouse (*Sylvaemus fulvipectus*), Caucasus field mouse (*Sylvaemus ponticus*), House mouse (*Mus musculus*), ვოლის Mouse (*Mus macedonicus*), black rat (*Rattus rattus*).

The following birds are common in the area: Eastern imperial eagle - *Aquila heliaca*, Eurasian sparrowhawk - *Accipiter nisus,* Black-billed Magpie (*Pica pica*), hawk (*Falco peregrinus)*, ring-dove (Columba palumbus), European Turtle-dove (*Streptopelia turtur)*, Eurasian skylark (*Alauda arvensis)*, etc.
The following reptiles are amphibians should be noted: dice snake (Natrix tesselata), grass snake (*Natrix natrix)*, smooth snake (*Coronella austriaca)*, Dagestan blunt-nosed viper (*Vipera lebetina obtusa)*, Spur-thighed tortoise (*Testudo graeca)*, European green toad (*Bufo viridis)*, marsh frog (*Pelophylax ridibundus*), etc.

Fish fauna in the area: Wels catfish (*Silurus glanis)*, Luciobarbus mursa (*Luciobarbus mursa*,) common barbel (*Barbus barbus)*, Danube bleak (*Chalcalburnus chalcoides)*, Bulatmai barbel (*Barbus capito)*, gudgeon (*Gobio gobio*), etc.

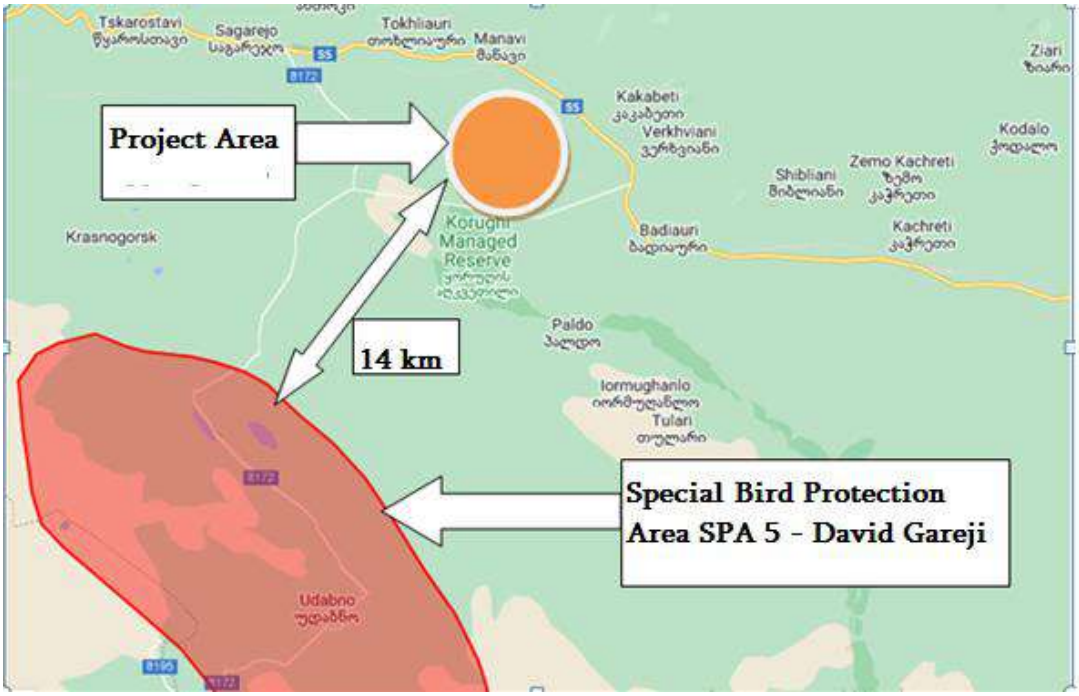
According to the National Biodiversity Strategy and Action Plan (NBSAP), protected areas should be at least 12% of the country what means that by 2030, the natural habitat degradation, biodiversity loss and endangered species will be reduced.

The total area of Korughi Managed Reserve is located among agricultural land plots, and the project area is an agricultural landscape as well. Consequently, the biodiversity of the project corridor is considered as the diversity adjacent to the protected area. However, the project implementation does not exclude indirect indirect impacts on the biodiversity of the protected area. Optimally developed mitigation measures may reduce this risk what will also have an impact on the biodiversity of the National Park and its surrounding area.

4.4 Special Protected Bird Areas in Georgia

According to Clause 5.5.1 of the 2018-2030 Strategy and Action Plan of the Parliament of Georgian Committee of Environment and Natural Resources, the country is working towards establishing “Important Bird Areas” (IBAs) what will be a great contribution to the conservation of the natural habitats and species.

Figure X. Plan of the project area and special protected bird areas



The project area does not include special bird protected areas. However, the candidate site for a special bird protection area SPA 5 David Gareji is located within the boundaries of the Municipality, which is about 14 km away from the project area. The common endangered species in the project area are: saker falcon (Falco cherrug), Eastern imperial eagle (Aquila heliaca), griffon vulture (Gyps fulvus), Egyptian vulture (Neophron percnopterus) and Ruddy shelduck (Tadorna ferruginea). Saker falcon is on the Red List of Georgia as Critically Endangered (CR). Other species are classified on the Red List as vulnerable (VU). Saker falcon and Egyptian vulture are on the IUCN Red List of Threatened Species (EN), while Eastern imperial eagle is enlisted as Vulnerable (VU).

4.5 „Emerald Network“

The main purpose of creating the Emerald Network was to preserve and protect habitats that are important for the conservation of many species. The habitats of the Emerald Network are particularly rich in species protected by the Bern Convention. Such areas are given the status of Areas of Special Conservation Interest (ASCI) and they are united in so-called "Emerald Network".

The project area does not directly border the Emerald Network site. However, Emerald Network site Mariamjvari - GE0000020 is in the territory of the municipality.

This Emerald Network site has two types of habitats protected by the Bern Convention: G1.6 Fagus woodland, and G1.A1 Quercus - Fraxinus - Carpinus betulus woodland on eutrophic and mesotrophic soils.

G1.6 Fagus woodland

Description

The forests dominated by *Fagus sylvatica* in Western and central Europe and dominated by *Fagus orientalis* and other beech species in Southeastern Europe and the Pontus region. The formation includes mixed beech-fir or beech-fir-spruce forests.

G1.A1 *Quercus - Fraxinus - Carpinus betulus* woodland on eutrophic and mesotrophic soils

Description

Atlantic, medio-European and eastern European forests dominated by Quercus robur or Quercus petraea, on eutrophic or mesotrophic soils, with usually ample and species-rich herb and shrub layers.

Species common for the Emerald Site habitats (as per Standard Data Sheet):

Group*	Code	Scientific Name	English Name
I	1060	*Lycaena dispar*	Large copper
I	1087	*Rosalia alpina*	Rosalia longicorn
I	1088	*Cerambyx cerdo*	Great capricorn beetle
A	1171	*Triturus karelinii*	Southern crested newt
R	1219	*Testudo graeca*	Spur-thighed tortoise
M	1303	*Rhinolophus hipposideros*	Lesser horseshoe bat
M	1304	*Rhinolophus ferrumequinum*	Greater horseshoe bat
M	1307	*Myotis blythii*	Lesser mouse-eared bat
M	1308	*Barbastella barbastellus*	Western barbastelle
M	1321	*Myotis emarginatus*	Geoffroy’s bat
M	1352	*Canis lupus*	Wolf
M	1354	*Ursus arctos*	Brown bear
B	A079	*Aegypius monachus*	Cinereous vulture
B	A379	*Emberiza hortulana*	Ortolan

B	A320	*Ficedula parva*	Red-breasted flycatcher
B	A078	*Gyps fulvus*	Griffon vulture
B	A339	*Lanius minor*	Lesser grey shrike
M	1361	*Lynx lynx*	Eurasian lynx
I	1930	*Agriades glandon aquilo*	Arctic blue
B	A072	*Pernis apivorus*	European honey buzzard
B	A073	*Milvus migrans*	Black kite
B	A246	*Lullula arborea*	Woodlark
B	A077	*Neophron percnopterus*	Egyptian vulture
B	A089	*Aquila pomarina*	Lesser spotted eagle
B	A092	*Hieraaetus pennatus*	Booted eagle
B	A103	*Falco peregrinus*	Peregrine falcon
B	A215	*Bubo bubo*	Eurasian eagle-owl
B	A307	*Sylvia nisoria*	Barred warbler
B	A338	*Lanius collurio*	Red-backed shrike

***Group:** B = Bird, I = Invertibrate, M = Mammal, P =Plant, R = reptile, A = Amphibian, F = Fish.

4.6 Fauna Species Common in the Project Area to Protect by the Bern Convention

***Testudo graeca* (Spur-thighed tortoise).** This species has been given the protected status as having a small fragmented area. The project area is its distribution area. During the field study, more than one individual of spur-thighed tortoise were seen.

The project implementation will not have a high negative impact on the turtle population, as they mainly live near the windbreaks where no channel is planned to lay under the project.

Testudo graeca- in Project Area

5. Flora

5.1 Present State

The main goal of the floristic study in the given area was to determine the generic plant composition in the project area, identify sensitive habitats, determine the possible impact on plant diversity in the construction and operation phases, and develop relevant mitigation measures. Particular attention is given to the species protected by the legislation of Georgia and international covenants (Red-Listed species and other species with conservation status).

The project area mainly presents an agricultural landscape. With its sensitivity, the area was divided into 4 main sections and it is given in the map.

1. Along this section of the **study area** (X 539872 Y 4614731; X 540378 Y 4614326; X 540994 Y 4613926; X 541439 Y 4613664; X 541999 Y 4613553; X 542588 Y 44613450; X 542944 Y 4613169; X 543266 Y 4612833; X 543547 Y 4612614; X 543846 Y 4612106), there is a degraded roadside landsaping and private land plots. The private land plots are presented by vineyards, orchards, annual and perrenial agricultural crops, etc. The project area does not cover natural habitats and is totally represented by agricultural landscape actively used by the population.

The plants along the degraded roadside landscape is presented by: black mulberry (*Morus nigra);* white mulberry (*Morus alba);* field maple (*Acer campestre);* Caucasian Maple (*Acer laetum);* white willow (*Salix alba);* acacia (*Acacia dealbata);* common walnut (*Juglans regia);* cherry plum *(Prunus divaricata);* Siberian Apricot (*Prunus armeniaca);* fig (*Ficus carica);* apricot (*Prunus armeniaca);* oleaster *(Elaeagnus angustifolia);* black hawthorn (*Crataegus pentagyna);*

green broom (*Genista fasselata);* Christ's thorn (*Paliurus spinachrist);* blackthorn (*Prunus spinosa);* honey locust (*Gleditsia triacanthos);* dog-rose *(Rosa canina);* Persian buckthorn (*Rhamnus pallasii);* cornelian cherry (*Cornus mas);* gaiter-tree (*Swida iberica);* wild privet (*Ligustrum vulgare);* oleaster (*Elaeagnus angustifolia)* , etc.

Along the given section of the project area, the following Red-Listed species may be under the impact: common walnut (*Juglans regia).*

2. Along this section of the **study area** (X 539996 Y 4609479; X 540262 Y 4609285; X 540559 Y 4609285; X 540820 Y 4608905; X 541170 Y 4608684; X 541243 Y 4608565; X 541406 Y 4608376; X 541553 Y 4608290; X 541786 Y 4608166; X 541885 Y 4608189; X 542201 Y 4607992), there are degraded floodplain forest vegetation fragments and private land plots. The private land plots are presented by vineyards, orchards, annual and perrenial agricultural crops, etc.

The plants within the degraded floodplain forest vegetation fragments are as follows: Siberian Apricot (*Prunus armeniaca);* fig (*Ficus carica);* common walnut (*Juglans regia);* cherry plum

(Prunus divaricata); silver-leaf poplar (*Populus alba);* black poplar (*Populus nigra);* abele *(Populus hibrida);* red hawthorn (*Crataegus sanguinea);* black hawthorn (*Crataegus pentagyna);* coat willow (*Salix caprea);* white willow (*Salix alba);* box elder (*Acer negundo);* elb *(Ulmus foliacea),* black alder (*Alnus barbata)* field maple (*Acer campestre);* blackthorn (*Prunus spinosa);* cornelian cherry (*Cornus mas);* gaiter-tree (*Swida iberica);* wild privet (*Ligustrum vulgare);* oleaster (*Elaeagnus angustifolia).* Black alder and willow groves have tall herbs: soft rush *(Carex sp.)* and common reed grass (*Phragmits communis).*

Along the given section, the following Red-Listed species may be under the impact: common walnut (*Juglans regia)*, Grayish oak *Quercus pedunculiflora C.Koch*

3. Along this section of the **study area** (**X** 542683 **Y** 4612675; **X** 542907 **Y** 4612768; **X** 543093 **Y** 4612805; **X** 543140 **Y** 4612775; **X** 542987 **Y** 4612319; **X** 542894 **Y** 4611981), there is degraded roadside landscaping and private land plots. The private land plots are presented by vineyards, orchards, annual and perrenial agricultural crops, etc.

The plants within the degraded roadside landscaping are as follows: honey locust (*Gleditsia triacanthos);* acacia (*Acacia dealbata);* black mulberry (*Morus nigra);* white mulberry (*Morus alba);* field maple (*Acer campestre);* box elder (*Acer negundo);* elm *(Ulmus foliacea).* Siberian Apricot (*Prunus armeniaca);* fig (*Ficus carica);* common walnut (*Juglans regia);* apricot (*Prunus armeniaca);* cherry plum *(Prunus divaricata);* black poplar (*Populus nigra);* abele *(Populus hibrida);* oleaster *(Elaeagnus angustifolia);* goat willow (*Salix caprea);* white willow (*Salix alba);* blackthorn (*Prunus spinosa);* red hawthorn (*Crataegus sanguinea);* black hawthorn (*Crataegus pentagyna);* dog-rose *(Rosa canina).*

Along the given section of the project area, the following Red-Listed species may be under the impact: common walnut (*Juglans regia).*

4. Along this section of the **study area** (**X** 5539684 **Y** 4608630; **X** 5540033 **Y** 4608274; **X** 540338 **Y** 4608018; **X** 540622 **Y** 4607815; **X** 540984 **Y** 4607751), there are degraded floodplain forest vegetation fragments and private land plots. The private land plots are presented by vineyards, orchards, annual and perrenial agricultural crops, etc.

The plants within the degraded floodplain forest vegetation fragments are as follows: cherry plum *(Prunus divaricata);* silver-leaf poplar (*Populus alba);* black poplar (*Populus nigra);* Abele

(Populus hibrida); red hawthorn (*Crataegus sanguinea);* black hawthorn (*Crataegus pentagyna);* Goat willow (*Salix caprea);* white willow (*Salix alba);* common walnut (*Juglans regia);* box elder (*Acer negundo);* თელა *(Ulmus foliacea),* Black alder (*Alnus barbata)* field maple(*Acer campestre);* Blackthorn (*Prunus spinosa);* Cornelian cherry (*Cornus mas);* Siberian Apricot (*Prunus armeniaca);* fig (*Ficus carica);* gaiter-tree (*Swida iberica);* wild privet (*Ligustrum vulgare);* oleaster (*Elaeagnus angustifolia).* In the black alder and willow groves, there is tall herbaceous cover developed: Cusick's sedge *(Carex sp.)* and common reed (*Phragmits communis.).*

Along the given section of the project area, the following Red-Listed species may be under the impact: common walnut (*Juglans regia)*, Grayish oak *Quercus pedunculiflora C.Koch;* endemic species: Georgian weeping Pear (*Pyrus georgica*); Georgian elm (*Ulmus georgica*); Georgian barberry (*Berberis iberica)*

6. Fauna

Present State

The main purpose of the fauna study in this area was to determine the generic composition of animals on the study site, to identify sensitive areas for the habitant animals, to determine possible impacts on animal diversity in the construction and operation phases, and to develop mitigation measures. Particular attention is paid to the species protected by the legislation of Georgia and international covenants (the Red-Listed species and other species with conservation status).

6.1 Mammals

Although the project area is an agricultural landscape and the impact on mammals is very high, there are many species of mammals found in the project area. Large mammals use this area for migration and finding food, although they cannot use it for long-term habitation. The generic composition of the mammals common in the project area is mainly represented by species typical to steppes and floodplain. The following species of small mammals are found in the project area: hamster (*Cricetus cricetus*), levant mole (*Talpa levantis*), mouse (Apodemus mystacinus), Robert's snow vole (Chionimys roberti), house mouse (*Apodemus mystacinus*), Robert's snow vole (*Chionimys roberti),* house mouse (*Mus musculus)*, brown rat (*Rattus norvegicus),* Southern white-breasted hedgehog (*Erinaceus concolor*), etc. The impact on small mammals by farmers is great because the various pesticides they use destroys harmful *rodents.* Of large mammals, only jackal (*Canis aureus*) excrements was found during the field study. However, during survey, the local farmers confirmed the presence of Jackal, fox and rarely wolf in the area.

jackal (*Canis aureus*) excrements

Wild boar may be identified in the project area, especially in its southern part, as this section borders the Korughi Managed Reserve floodplain forest where the wild boar lives. During the study, hare (*Lepus europeus*) was seen in the project area. The existence of otter is not confirmed in the project area, as there is no aquatic ecosystem suitable for its existence: river, lake,

reservoir, fish farm, etc. However, near the project area, where the River Iori flows smoothly, there is a favorable habitat for otters.

Iori River (potential otter habitat) adjacent to the project area

During the survey, the vital signs of 8 mammal species were found in the project area

№	English Name	Latin Name	IUCN	RLG	Identified during the study
1	Levant Mole	*Talpa levantis*	LC		+
2	Mouse	*Apodemus mystacinus*	LC		+
3	Major's Pine Vole	*Terricola majori*			+
4	Robert's snow vole	*Chionimys roberti*	LC		+
5	House mouse	*Mus musculus*	LC		+
6	Brown rat	*Rattus norvegicus*	LC		+
7	Jackal	*Canis aureus*	LC		+
8	Southern white-breasted hedgehog	*Erinaceus concolor*	LC		+

Mammals common in and around the project area according to the literary data

№	English Name	Latin Name	IUCN	RLG	Literary Data
1	Levant Mole	*Talpa levantis*	LC		√
2	Caucasian mole	*Talpa caucasica*	LC		√
3	Caucasian Pygmy Shrew	*Sorex raddei*	LC		√
4	Caucasian Pygmy Shrew	*Sorex volnuchini*	LC		√
5	Red squirrel	*Sciurus vulagaris*	LC		√
6	Caucasian squirrel	*Sciurus anomalus*	LC	VU	√
7	European edible dormouse	*Glis glis*	LC		√
8	Forest mouse	*Apodemus sylvaticus*	LC		√
9	Small forest mouse	*Apodemus uralensis*	LC		√
10	Mouse	*Apodemus mystacinus*	LC		√
11	Jungle cat	*Felis chaus*			√
12	Major's Pine Vole	*Terricola majori*			√
13	Robert's snow vole	*Chionimys roberti*	LC		√
14	Daghestan pine vole	*Terricola daghestanicus*	LC		√
15	European water vole	*Arvicola terrestris*	LC		√
16	Steppe field mouse	*Sylvaemus fulvipectus*	LC		√
17	House mouse	*Mus musculus*	LC		√
18	Black rat	*Rattus rattus*	LC		√
19	Brown rat	*Rattus norvegicus*	LC		√
20	Güldenstädt's shrew	*Crocidura gueldenstaedtii*	LC		√
21	Transcaucasian water shrew	*Neomys teres*	LC		√
22	Sorex satunini Caucasian Shrew	*Sorex satunini*	LC		√
23	least weasel	*Mustela nivalis*	LC		√
24	Otter	*Lutra lutra*	NT	VU	√

Apodemus ura

25	European Pine Marten	*Martes martes*	LC		√
26	beech marten	*Martes foina*	LC		√
27	Fox	*Red fox (Vulpes vulpes)*	LC		√
28	Wolf	*Canis lupus*	LC		√
29	Jackal	*Canis aureus*	LC		
30	Bear	*Ursus arctos*	LC	EN	√
31	Wildcat	*Felis sylvestris*	LC		√
32	Eurasian lynx	*Lynx lynx*	LC	CR	√
33	Roe deer	*Capreolus capreolus*	LC		√
34	Deer	*Cervus elaphus*	LC	CR	√
35	Chamois	*Rupicapra rupicapra*	LC	EN	√
36	Wild boar	*Sus scrofa*	LC		√
37	Forest dormouse	*Dryomys nitedula*	LC		√
38	Southern white-breasted hedgehog	*Erinaceus concolor*	LC		√
39	Hare	*Lepus europeus*	LC		√
40	European badger	*Meles meles*	LC		√
41	greater horseshoe bat	*Rhinolophus ferrumequinum*	LC		√
42	lesser horseshoe bat	*Rhynolophus hipposideros*	LC		√
43	Mediterranean horseshoe bat	*Rhynolophus euryale*	NT	VU	√
44	lesser mouse-eared bat	*Myotis blythii*	LC		√
45	Brandt's bat	*Myotis brandtii*	LC		√
46	Natterer's bat	*Myotis nattereri*	LC		√
47	Whiskered bat	*Myotis mystacinus*	LC		√
48	Western barbastelle	*Barbastella barbastellus*	NT	VU	√
49	Brown long-eared bat	*Plecotus auritus*	LC		√

6.2 Bats

According to the literature, 14 bat species are common in and around the project area. Bat surveys were accomplished along the entire perimeter of the project road. All habitats (old abandoned buildings, old fortresses, hollow trees) were visually fixed, as they are a potential habitat for bats.

There are many large-diameter Common walnuts growing in the project area; there are Honey locusts and poplars growing in the windbreaks, but the study did not reveal any hollows in these trees. If it is necessary to cut any large-diameter trees in the construction phase, the presence of hollows should be visually inspected in details not to damage any bats present in them.

6.3 Birds

The project area is a steppe-type agricultural landscape, with diversified ornithofauna in and around it. Consequently, there are no large birds of prey or birds associated with the aquatic environment in the project area. The project area is mainly inhabited by the following bird species: Passerines, Eurasian hoopoes, Columbidae, Chionidae, and other members of the family.

As per the available literary sources, there are 136 bird species described in the study area and its surroundings.

The **birds** were mainly studied with the methods of visual observation and sound description. Along the transect along the project road, all encountered species were visually fixed and identified. Binoculars with 10X50 magnification were used during the study. The survey was carried out during the day.

List of birds observed in the study area during the field study

№	English Name	Latin Name	Migration seasons	IUCN	RLG	Bern Conv	Literary Data	Seen during the study
1	Eurasian sparrowhawk	Accipiter nisus	YR-R	LC		√	√	+
2	Atlas Long-legged Buzzard	Buteo rufinus	YR-R, M	LC	VU	√	√	+
3	Common kestrel	Falco tinnunculus	M	LC		√	√	+
4	Common wood pigeon	Columba palumbus	M	LC			√	+
5	Turtle Dove	Streptopelia turtur	BB,M	VU			√	+
6	Common cuckoo	Cuculus canorus	BB	LC		√	√	+
7	Tawny owl	Strix aluco	M	LC			√	+

8	Little owl	Athene noctua	YR-R	LC			√	+
9	Eurasian hoopoe	Upupa epops	M	LC		√	√	+
10	Bee-eater	Merops apiaster	BB, M	LC			√	+
11	Common Swift	Apus apus	BB	LC			√	+
12	Eurasian Skylark	Alauda arvensis	M	LC			√	+
13	Barn Swallow	Hirundo rustica	BB,M	LC		√	√	+
14	Common house martin	Delichon urbicum	YR-V	LC		√	√	+
15	White Wagtail	Motacilla alba	YR-R	LC		√	√	+
16	Yellow Wagtail	Motacilla flava	BB,M	LC		√	√	+
17	Common Blackbird	Turdus merula	YR-R	LC		√	√	+
18	Mistle Thrush	Turdus viscivorus	M	LC		√	√	+
19	Common starling	Sturnus vulgaris	YR-R, M	LC			√	+
20	European Robin	Erithacus rubecula	BB	LC		√	√	+
21	Great tit	Parus major	YR-R	LC		√	√	+
22	Common chaffinch	Fringilla coelebs	YR-R	LC			√	+
23	Eurasian Sparrow	Passer montanus	M	LC			√	+
24	House sparrow	Passer domesticus	YR-R	LC			√	+
25	Eurasian jay	Garrulus glandarius	YR-R	LC			√	+
26	Carrion crow	Corvus corone	YR-R	LC			√	+
27	Eurasian sparrowhawk	Pica pica	YR-R	LC			√	+
28	Eurasian golden oriole	Oriolus oriolus		LC			√	+

nest of the Eurasian Penduline Tit (*Remiz pendulinus)*

Eurasian hoopoe (*Upupa epops*

Carrion crow (C*orvus corone)*

Common ringed plover (*Charadrius hiaticula*)

Eurasian sparrowhawk (*Pica pica)*

Turtle Dove *Streptopelia turtur*

It should be noted that the project area is located at about 14-15 km from the Special Protected Bird Area (SPA 5 - David Gareji). Therefore, during the bird migration, much more species may occur in the area.

6.4 Reptiles and Amphibians

According to the field study results and literary data, 7 species of **reptiles** and 4 species of **amphibians** are found in the project area. The route method was mainly used during the study. During the study, 3 species of amphibians and 5 species of reptiles were seen.

According to the field study results and literary data, 7 species of **reptiles** and 4 species of **amphibians** are found in the project area. The route method was mainly used during the study. During the study, 3 species of amphibians and 5 species of reptiles were observed on the transect along the planned corridor. Of the reptiles, spur-thighed tortoise (Testudo graeca), which is protected by the Red List of Georgia and has VU status was observed. This species was observed during the study. The surroundings of the project area is the area of distribution of spur-thighed tortoise.

Table X. Reptiles and amphibians observed during the field study in and around the project area

№	English Name	Latin Name	IUCN	RLG	Literary Data	Seen during the study
1	Slow worm	*Angius fragilis*	NE	LC	√	+
2	Caucasus emerald lizard	*Lacerta strigata*	LC	NE	√	+
3	European Grass Snake	*Natrix natrix*	LC	LC	√	+
4	Smooth snake	*Coronella austriaca*	LC	LC	√	+
5	Spur-thighed tortoise	*Testudo graeca*	VU	VU	√	+
6	Eurasian Marsh Frog	*Pelophylax ridibundus*	LC		√	+
7	European Tree Frog	*Hyla arborea*	LC		√	+
8	Green toad	*Bufo viridis*	LC		√	+

Caucasus emerald lizard *(Lacerta strigata)*

Spur-thighed tortoise (*Testudo graeca*)

6.5 Fish Fauna

There are no reservoirs immediately in the project area where fish can be found. River Iori is near the project area. Consequently, the representatives of ichthyofauna common in the Iori River basin may be found near the project area.

During the study, Kura loach (*Oxynoemacheilus brandtii*) was caught in the Iori River. Besides, according to the results of the survey with local fishermen, the following fish species are common in the Iori River near the project area: Luciobarbus mursa *(Luciobarbus mursa)*, Kura chub (*Squalius agdamicus)*, Khramulya (*Capoeta capoeta)*, South caucasian gudgeon (*Romanogobio macropterus)*, Bulatmai barbel (*Luciobarbus capito).*

Fish fauna common near the project area and in the Iori River

№	English Name	Latin Name	IUCN	RLG
1	Barbel	*Barbus cyri*	NE	NE
2	South Caspian sprilin	*Alburnoides eichwaldii*	LC	NE
3	Kura bleak	*Alburnus filippii*	LC	NE
4	Kura loach	*Oxynoemacheilus brandtii*	LC	NE
5	Kura chub	*Squalius agdamicus*	NE	NE
6	Seven khramulya	*Capoeta capoeta*	LC	NE

7	Kura goby	*Ponticola cyrius*	LC	NE
8	Caucasian Spined Loach	*Cobitis saniae*	NE	NE

6.6 Sensitive habitats

Although the project area is an agricultural landscape, so-called sensitive habitats have been still identified during the study. Such habitats are mainly presented by windbreaks, which include poplar, honey locust, ash, black Locust, aspen, etc. Such windbreaks are a nesting habitat for various bords. So, the impact on windbreaks should be minimum during the works.

Windbreak zone in the project area

Nest of a Black-billed Magpie in the windbreak zone

A nest of the Eurasian Penduline Tit in the windbreak zone

Nest of a Black-billed Magpie in the windbreak

7. Impact on Flora

7.1 Construction Phase

During the design construction phase, a significant impact on the vegetation cover is expected, in particular, it will be necessary to clear the construction site off the vegetation cover. Therefore, in such a case, it is recommended to minimize the impact on biodiversity and when it is impossible to avoid environmental damage, the damage shall be compensated according to the compensation program with its goal to restore the equivalents to the lost habitats.

The compensation plan of restoration and cultivation must be developed by considering the existing surroundings. The supply of the genetic material needed for the restoration and cultivation program (seeds, cuttings, young plants) must be of a local origin to the extent possible. (The buildings and premises are needed to store the seeds and the seedlings must be grown in the greenhouses and planted in the restoration areas). The restoration and cultivation program must have long-term outcomes. Restoration, cultivation and further management of the territories must be done gradually, as they are isolated.

Such measures are necessary after the construction works are over, when the areas to restore are still at the project disposal.

Permanent monitoring is necessary to evaluate the success of the activities and identify the need for corrective measures.

The landscape restoration is necessary with the original plant species, in accordance with their original content and rule of distribution.

The trees and shrubs of high conservation value will be marked and, where possible, preserved or re-planted.

The following Red-Listed species may be under the impact of the project area or impact zone: Common walnut (*Juglans regia)*, Grayish oak *Quercus pedunculiflora C.Koch;* endemic species: Georgian weeping Pear (*Pyrus georgica*); Georgian elm (*Ulmus georgica*); Georgian barberry (*Berberis iberica).* Consequently, attention must be paid to them both, in the construction and operation phases.

The southern section of the project area borders the Korughi Managed Reserve of National Importance. Hence, the impact on it should be brought to minimum.

7.2 Operation phase

No direct impact on flora in the operation phase is expected. Indirect impact may be associated with the dust and exhaust caused by the traffic or impact of the polluted surface runoff. One of the main risks in the operation phase is the use of pesticides in irrigation waters in agriculture what will have a negative impact.

8. Impact on Fauna Diversity

8.1 Impact on Fish Fauna in the Construction

There are no rivers, lakes, artificial fish farms or other objects with standing water in them in the project area. Therefore, the implementation of the project will not have a direcr long-term impact on ichthyofauna.

The mechanical impact on ichthyofauna will be temporary, during the construction of small irrigation channels to discharge so-called unused waters back to the river.

The project does not envisage a change in the riverbed what would change the fish habitat.

In the construction phase, there is a certain risk of getting various waste or harmful substances into the water what will be harmful not only to the representatives of ichthyofauna, but also to all species living in the water.

8.1.1 Operation phase

One of the main risks in the operation phase is the agricultural use of pesticides in irrigation waters discharged into the river what will have a negative impact on all living organisms in the river.

8.2 Impact on Fauna. Constructin Phase

Zoological studies accomplished in the project corridor showed that the generic composition of the animals living in the project area is rather poor. Virtually, there is no natural habitat in the project corridor. Therefore, damage to animal shelters will not be of a large scale. However, certain animal species when searching for food, as well as during breeding, may enter the construction area and be under various impacts. Due to the fact that the project area is an agricultural landscape, the likelihood of the presence of habitats for large mammals there is minimal, as the impact of disturbing factors is very high (machines, special equipment, farmers' active movement across the area). Naturally, the given species prefer quieter sites with a minimum human impact. However, their presence in the project area in the construction or operation phase is not excluded.

In addition, due to the peculiarities of the area, the presence of such large carnivorous birds, as griffon vulture, Bearded Vulture-Eagle, Egyptian vulture and cinereous vulture, is also minimal.

As mentioned above, the Iori River is located near the project area, which is a potential otter habitat. This section was thoroughly visualized during the study to detect the signs of otter (burrow, traces, excrements, etc.). However, none of them were observed. Although no signs of

otter presence were identified during the study, its occurrence near the project area cannot be excluded. There are no construction works planned immediately on the river. Therefore, even in the presence of otter, the disturbing factors will be minimal and temporary.

In the construction phase, damage can be inflicted to species that are present during their breeding season, or constantly being directly in the construction corridor, in shelters (ponds, stone piles, shrubs, etc.) (birds, amphibians, reptiles or small mammals).

Considering the above-mentioned and the specifics of the planned activities, the negative impacts on the animal species common in the construction area can be as follows:

- Habitat loss/fragmentation is expected (for instance in the shrubs growing in the windbreaks or on the adjacent plots as a result of cutting down trees and shrubs, etc.). The main receptors will be small mammals, birds, and reptiles;
- As a result of cutting down the trees and during the earthworks, the nesting sites of certain species may be destroyed. The main receptors can be birds.
- Inconvenience due to the increased traffic, presence of people and lighting may increase.
- Noise and vibration, as well as emissions of dust and other harmful substances into the ambient air will increase in the construction phase. Almost all species living in the corridor will be affected.
- Trenches made during the earthworks will pose certain risk to small mammals, as they may fall into the trenches, injuring themselves or dying. More sensitive to such impacts are amphibians, reptiles, and small mammals (moles, forest mouse, water shrews, etc.).

Overall, the impact on fauna in the construction phase can be assessed as low. With proper mitigation measures and permanent monitoring, it is possible to further reduce the impact on terrestrial animals.

8.2.1 Operation phase

The main source of negative impacts during the construction works will be an increased traffic of special equipment. Although the animals living in the project corridor are accustomed to intense equipment operation, the proect oeprations will still cause additional inconvenience for them. Some animals may get injured or even die because of vehicle movement.

The shelters for reptiles and birds will be more or less destroyed. Therefore, the mitigation measures should be mainly aimed at reducing such risks.

9. Mitigation measures

It is planned to supervise the efficiency of the mitigation measures what means as follows:

- Visual control of the construction site in order to identify the Georgian Red-Listed species.
- Carrying out observations to identify the impact on species.
- Monitoring their condition and, if necessary, developing relevant conclusions and recommendations.

These activities shall be carried out both, on the working sites and in the surrounding areas. The study will envisage regular visual inspections of the area and, if necessary, its additional studies.

9.1 Mitigation Measures (Flora)

The mitigation measures for the impacts on the vegetation cover and the habitat unity are as follows:

- The borders of the construction corridor and traffic routes are to be identified accurately in order to avoid excess damage to the vegetation cover.
- Prior to the onset of the construction works, instructing the personnel about the protection of the vegetation cover.
- In order to protect the vegetation cover against damage, the Construction Contractor must observe the borders of the construction sites and the corridor. After the construction works are over, the area must be cleared and the removed topsoil must be returned to the site. This will be followed by a more or less restoration of the vegetation cover.
- The landscape restoration is to be done with the original plant species, in accordance with their original content and rule of distribution.
- The trees and bushes with hg conservation value will be marked and preserved or replanted where possible.
- For the temporarily lost habitats, the plan for the vegetation cover restoration and management must be developed on its own, as this kind of impact can be mitigated.
- If the environmental damage is inevitable, the damage will be compensated according to the forest compensation program.
- The plant species damaged during the construction works must be used in landscaping.
- As for cutting down the Red-Listed plant species in the project construction corridor, the measures to maintain them are necessary, and in lieu of the damaged trees, compensation plantings shall be provided.

- Removal of the protected species from the environment must be done in line with the requirements of sub-clause f), clause 1, Article 24 of the “Georgian law on the Red List and Red Book”, in agreement with the Ministry of Environment and Agriculture of Georgia.
- The vegetation cover must be monitored.

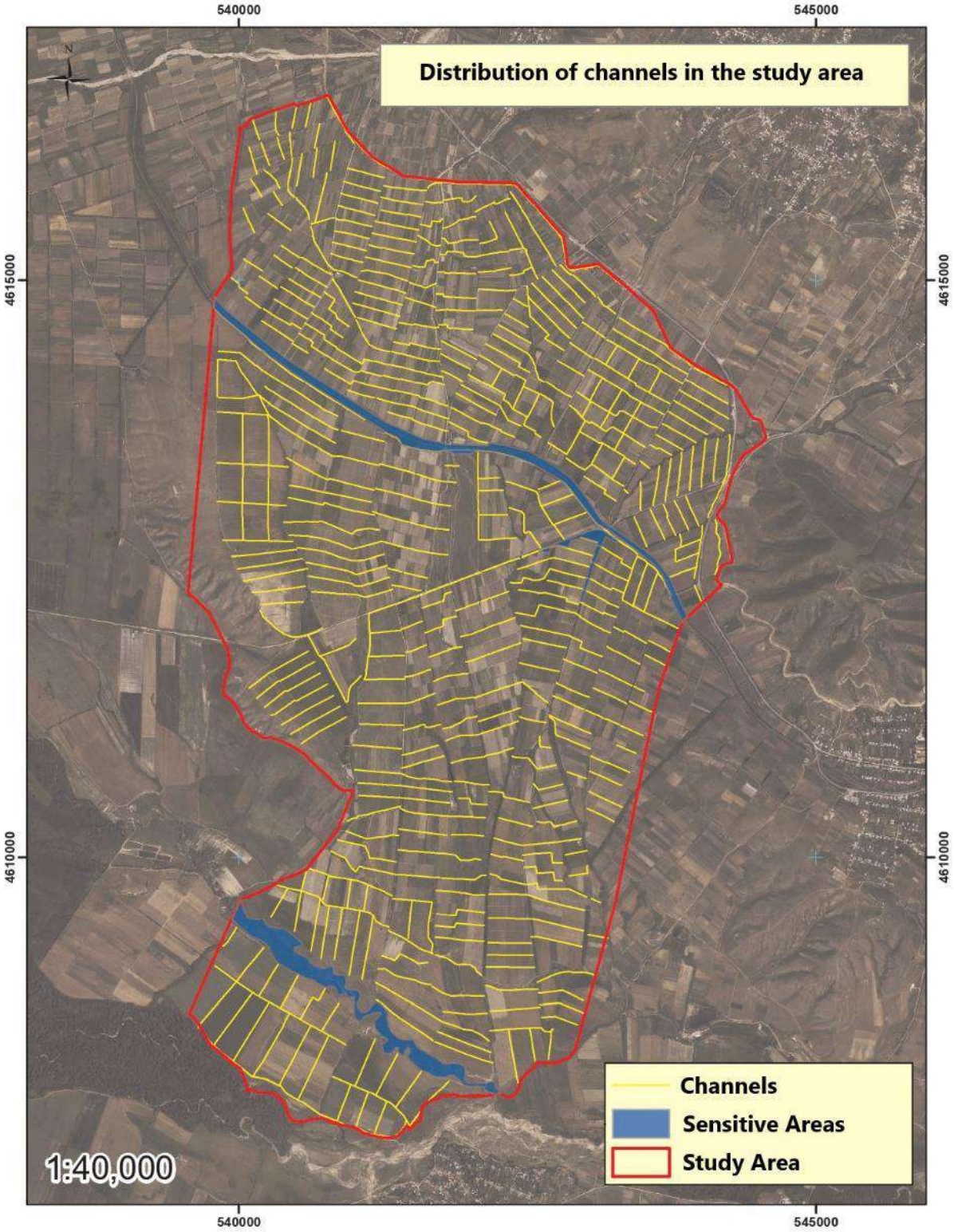
9.2 Additional Mitigation Measures for Fauna in the Construction and Operation Phases

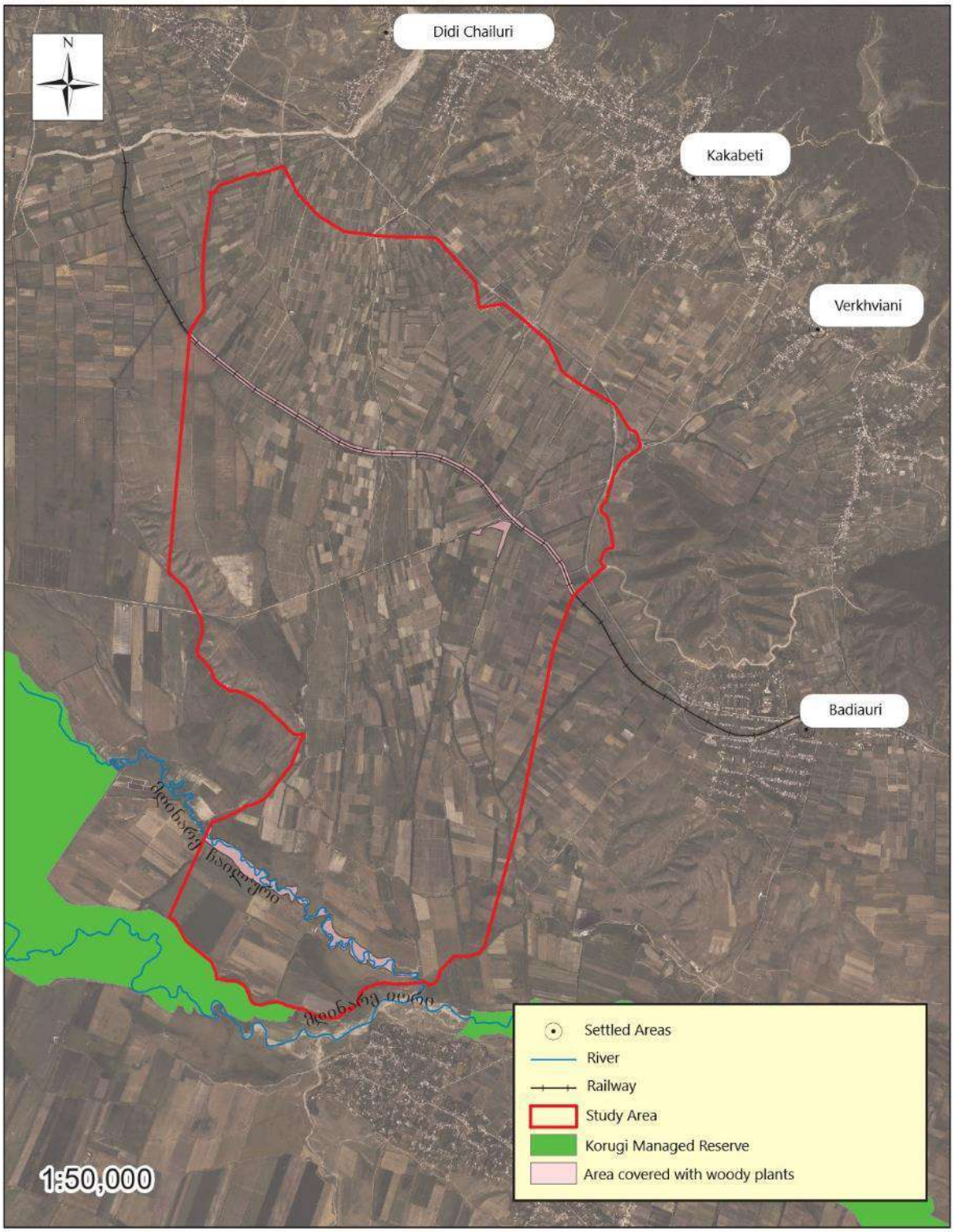
The trees on certain sites of the project area will be cut down, and the trees used by the birds or bats as shelters may be among them. All trees to cut down on the sites should be thoroughly visualized before the construction starts, and any identified animal shelters should be notified in writing to the Ministry of Environmental Protection and Agriculture of Georgia, with further actions to take in accordance with the Georgian Law on the Red List and the Red Book of Georgia and the Law of Georgia on Wildlife. In particular, any further actions (except in exceptional cases), which may reduce the population of endangered species, deteriorate their habitat and living conditions, are prohibited.

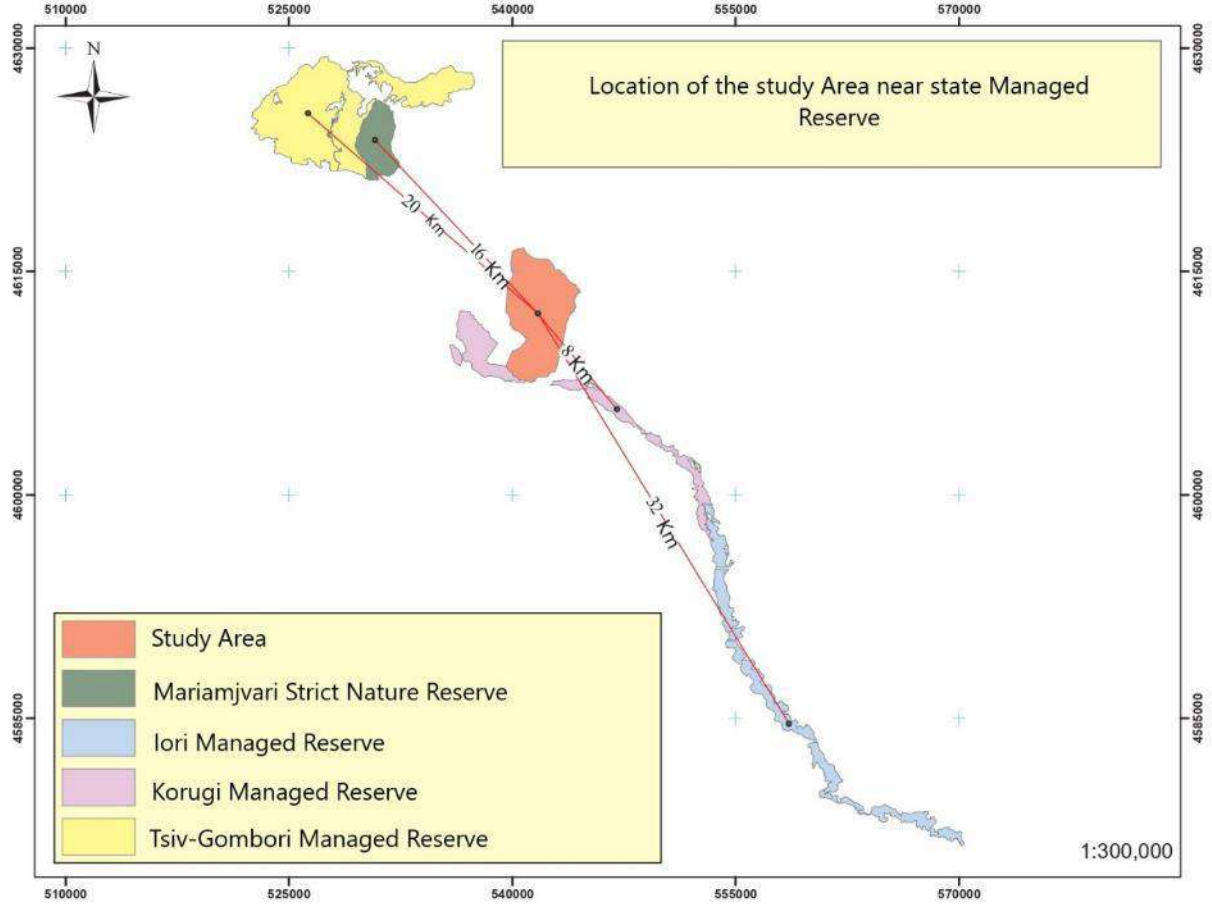
The following mitigation measures must be paid particular attention in the construction and operation phases:

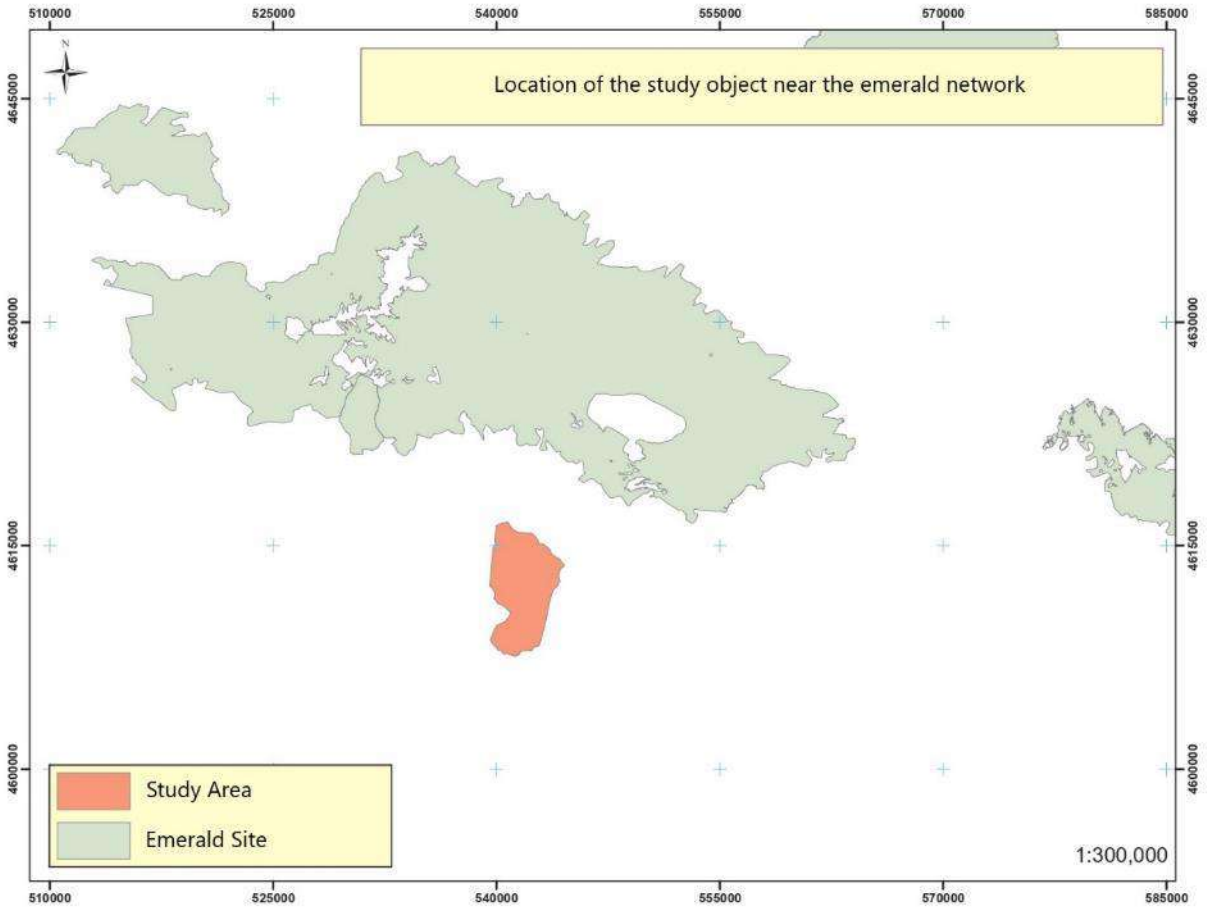
- The duration of the works causing animal disturbance and frightening should be as minimal as possible.
- It is prohibited to dump or spill the waste in an uncontrollable manner during the construction works to avoid the environment pollution.
- None of the breeding areas should be damaged without proper study and permission of relevant experts (the studies have evidenced a higher probability of small nests of so-called garden birds and small mammal shelters within the impact zone). The working crews should be instructed against killing fauna representatives. Rather, they must be allowed to escape from the area during the works. In extreme cases, their disturbance should be limited to giving the animals a corridor to escape.

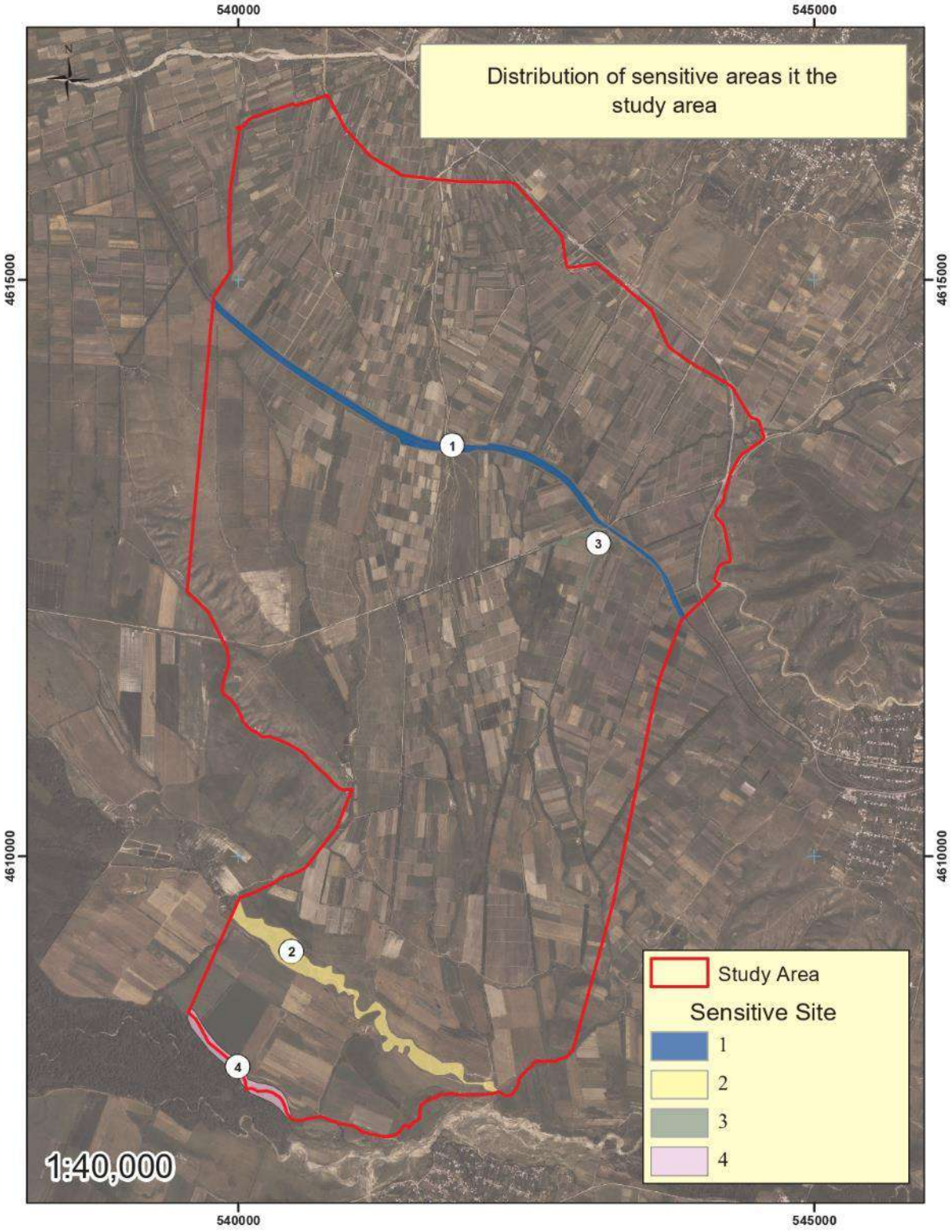
Annex 1


Distribution of channels in the study area
540000
545000
4615000
4610000
Channels
Sensitive Areas
Study Area
1:40,000


N
Didi Chailuri
Kakabeti
Verkhviani
Badiauri
Settled Areas
River
Railway
Study Area
Korugi Managed Reserve
Area covered with woody plants
1:50,000


Location of the study Area near state Managed Reserve
N
20 Km
16 Km
8 Km
32 Km
Study Area
Mariamjvari Strict Nature Reserve
Iori Managed Reserve
Korugi Managed Reserve
Tsiv-Gombori Managed Reserve
1:300,000
510000
525000
540000
555000
570000
4630000
4615000
4600000
4585000


Location of the study object near the emerald network
510000
525000
540000
555000
570000
585000
4645000
4630000
4615000
4600000
Study Area
Emerald Site
1:300,000


Distribution of sensitive areas it the study area
540000
545000
4615000
4610000
N
1
2
3
4
Study Area
Sensitive Site
1
2
3
4
1:40,000

Annex 2

Table: Summary table of the expected environmental impacts

Impact category	Construction phase/ Exploitation phase	Impact direction[1]	Geographical distribution of impact [2]	Initial value of impact[3]	Impact duration [4]	Reversibility of impact [5]	Mitigation efficiency[6]	Final impact rating [7]
Reduction of the vegetation cover and loss of habitats	Exploitation phase	Negative	Local	Average, Low	Long-term	Reversible	Average, Low	Low
	Exploitation phase	Insignificant or not expected	-	-	-	-	-	Low
Direct impact on animal species	Construction phase	Negative	Regional	Low	Long-term	Reversible	Low	Low
	Exploitation phase	Negative	Regional	Low	Long-term	Reversible	Low	Low

[1] Positive/Negative

[2] Local/Regional/Country-Specific

[3] Low/Average/High

[4] Short-Term/Long-Term

[5] Reversible/Irreversible

[6] Low/Average/High

[7] Low/Average/High

ANNEX 7: GRIEVANCE REGISTERING AND MONITORING FORMS

Complainant Information

Name	
Address	
Gender	
Type	e.g. Affected Persons
Contact Details:	
Telephone	
Email	
Preferred method of response	

Complaint Details

Mode of receiving grievance	(e.g. telephone)		
Date of Issue			
Location of issue			
Type of Problem			
Land Acquisition and resettlement			
Disruption to land access			
Disruption to Irrigation Water			
Construction Issues			
Other			
Description of Issue			
Description of Factors Causing Issues			
Past Action/s Taken by Complainant (if any)			
Person/Agency Responsible for the Issue			
MEAP		PIC	
PIU		Construction Contractor	
Affected Persons		GA	
ADB		Other (Specify)	

Focal Person Information

Name	
Position	
Organisation	

Type	e.g. Affected Persons
Contact Details:	
Telephone	
Email	
Preferred method of response	

Actions Taken

Action	Description	Name of Action Officer	Date
1			
2			
3			

Final Resolution

Completed By	
Signature	
Date	

ANNEX 8: RECORDS OF PUBLIC CONSULTATION

The following table is the suggested format for recording the minutes of the public consultations conducted for the project.

Date and Venue of Public Consultation	Number of attendees	Issues /concerns raised during the public consultation	Response of the EA/IA on how to address the issues and concerns

Attachments: Attendance sheets Photo documentation

ANNEX 9: SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT TEMPLATE

This template must be included as an Appendix in the IEE that will be prepared for the project. It can be adapted to the specific project as necessary.

Introduction

Overall project description and objectives

- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number	Roles
1. PIU				
2. PIU				
3. Consultants				

- Overall project and sub-project progress and status

- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/ List of Works	Contract Status (specify if under bidding or contract awarded)	Status of Implementation (Preliminary Design/ Detailed Design/On-going Construction/ Completed/ O&M)[1]	If On-going Construction	
				%Physical Progress	Expected Completion Date

Compliance status with National/State/Local statutory environmental requirements[2]

Package No.	Subproject Name	Statutory Environmental Requirements[3]	Status of Compliance[4]	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish[5]

Compliance Status With Environmental Loan Covenants

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

Compliance Status With The Environmental Management Plan (Refer To EMP Tables In Approved IEE/s)

- Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Package-wise IEE Documentation Status

Package Number	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No)	Remarks
	Not yet due (detailed design not yet completed)	Submitted to ADB (Provide Date of Submission)	Disclosed on project website (Provide Link)	Final IEE provided to Contractor/s (Yes/No)		

- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.

Package-wise Contractor/s' Nodal Persons for Environmental Safeguards

Package Name	Contractor	Nodal Person	Email Address	Contact Number

- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below

Summary of Environmental Monitoring Activities (for the Reporting Period)[6]

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						

Construction Phase						
Operational Phase						

Overall Compliance with CEMP/ EMP

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

Approach And Methodology For Environmental Monitoring Of The Project

- Briefly describe the approach and methodology used for environmental monitoring of each sub-project.

Monitoring Of Environmental Impacts On Project Surroundings (Ambient Air, Water Quality And Noise Levels)

- Discuss the general condition of surroundings at the project site, with consideration of the following, whichever are applicable:

- Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
- Identify if muddy water is escaping site boundaries or if muddy tracks are seen on adjacent roads.
- Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these are intact following heavy rain;
- Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area in the Appendix.
- Confirm spill kits on site and site procedure for handling emergencies.
- Identify any chemical stored on site and provide information on storage condition. Attach photograph.
- Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
- Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
- Provide information on barricades, signages, and on-site boards. Provide photographs in the Appendix.
- Indicate if there are any activities being under taken out of working hours and how that is being managed.

- Briefly discuss the basis for environmental parameters monitoring.
- Indicate type of environmental parameters to be monitored and identify the location.
- Indicate the method of monitoring and equipment used.
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements.

As a minimum the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Site No.	Date of Sampling	Site Location	Parameters (Monitoring Results)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Noise Quality Results

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Monitoring Results)	
			Day Time	Night Time

Grievance Redress Mechanism

- Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as Appendix Notification of the GRM (town-wise if applicable).

Complaints Received during the Reporting Period

- Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

Summary Of Key Issues and Remedial Actions

- Summary of follow up time-bound actions to be taken within a set timeframe.

Appendixes

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors

ANNEX 10: CHANCE FIND PROTOCOL

Introduction

The project town being a heritage town, there are possibility of any chance finds (artefacts) recovery during excavations. Contractors working at heritage towns must take additional care not to destroy or damage historic features during excavations. There may be many buried historic features in heritage towns such as – idols, toys, wells, ancient drains, remains of buildings, other walls, grain pits, etc. Every care must be made not to destroy these during excavations.

Excavator drivers need to be instructed to be aware of hitting buried features and that they must be investigated before continuing work. When features are encountered during mechanical excavation, work should stop and the piu/consultants engineers must be informed immediately so that they can be inspected at the first opportunity.

When historic features such as walls, brick constructions and other features are encountered during excavation the excavation must be stopped immediately and the piu/consultants must be informed immediately.
Contractors' instruction: As soon as contractor recovers any chance find during any excavation works for pipe laying, they should immediately inform PIU/Consultant present in town about the chance find recovery. Immediately stop the excavation activity near point of recovery. After PIU/consultants engineers come at site, contractor should follow cleaning and photography in supervision of PIU/Consultant engineers.

Cleaning

When a feature/chance find is discovered it must be defined by careful cleaning. Roots must be removed and dirt must be carefully cleaned away. The section or trench base should also be cleaned back for a little distance around the feature.

Record photography

When the feature is clean good photography should be taken – vertical and face-on shots and a few general shots of the feature, also showing its position in relation to surrounding features, buildings, etc. The photographed should be catalogued (date, location, direction of shot)

Drawn record

When features/chance finds are revealed a drawn record should also be made.

a. General location record – measuring its position and orientation within the protected site / in relation to surrounding structures

b. Record drawings – detail drawings made in plan and section/profile. The extent (edges) of the feature should be drawn and the level of the existing ground surface and the top and base of the feature should be recorded. These levels should be marked on the drawings. The drawings should include detail of the construction of the feature. Perspective sketches could also be made if necessary. Explanatory notes can also be put on the drawings.

Reporting finds

When finds are made these should be reported to PIU/Consultants. Photographs and record drawings should be sent.

Discovery of historic objects

When clearance and excavation takes place artifacts and historic objects are sometimes found. These should be recovered and kept in a safe place. The place of discovery should be recorded and each find given a number and tag tied to the find with the same number on it. A list of the finds should be kept (with the find No. And place of discovery and date of discovery recorded).

PIU/Consultants responsibility- PIU/Consultants should inform in written to the State Archaeological Department at the earliest with photographs and request to Archaeology Department to visit the site and hand over the chance finds to them.

ANNEX 11: SAMPLE CONSTRUCTION SITE CHECKLIST FOR EMP MONITORING

Project Name: CSISDP **Name of the Subproject:** **Contractor:**	**Yes (√) No (x)**
Monitoring Details: _____	
EHS supervisor appointed by contractor and available on site	
Construction site management plan (spoils, safety, material, schedule, equipment etc.,) prepared	
Traffic management plan prepared	
Dust is under control	
Excavated soil properly placed within minimum space	
Construction area is confined; no traffic/pedestrian entry observed	
Surplus soil/debris/waste is disposed without delay	
Construction material (sand/gravel/aggregate) brought to site as and when required only	
Tarpaulins used to cover sand and other loose material when transported by vehicles	
After unloading, wheels and undercarriage of vehicles cleaned prior to leaving the site	
No Asbestos Cement pipes disturbed/removed during excavation	
No chance finds encountered during excavation	
Work is planned in consultation with traffic police	
Work is not being conducted during heavy traffic	
Work at a stretch is completed within a day (excavation, pipe laying and backfilling)	

Pipe trenches are not kept open unduly	
Road is not completely closed; work is conducted on edge; at least one line is kept open	
Road is closed; alternative route provided and public is informed, information board provided	
Pedestrian access to houses is not blocked due to pipe laying	
Spaces left in between trenches for access	
Wooden planks/metal sheets provided across trench for pedestrian	
No public/unauthorized entry observed in work site	
Children safety measures (barricades, security) in place at work sites in residential areas	
Prior public information provided about the work, schedule and disturbances	
Caution/warning board provided on site	
Guards with red flag provided during work at busy roads	
Workers using appropriate PPE (boots, gloves, helmets, ear muffs etc.)	
Workers conducting or near heavy noise work is provided with ear muffs	
Contractor is following standard and safe construction practices	
Deep excavation is conducted with land slip/protection measures	
First aid facilities are available on site and workers informed	
Drinking water provided at the site	
Toilet facility provided at the site	
Separate toilet facility is provided for women workers	
Workers camps are maintained cleanly	
Adequate toilet and bath facilities provided	

Contractor employed local workers as far as possible	
Workers camp set up with the permission of PIU	
Adequate housing provided	
Sufficient water provided for drinking/washing/bath	
No noisy work is conducted in the nights	
Local people informed of noisy work	
No blasting activity conducted	
Pneumatic drills or other equipment creating vibration is not used near old/risky buildings	

ANNEX 12: QUARTERLY PROGRESS REPORT CHECKLIST

ENVIRONMENT SAFEGUARDS QPR CHECKLIST[7]

Activity	Yes / No	Remarks (If Answer Is **No**)
A. For subproject packages under bidding		
• IEEs cleared by ADB?		
• IEEs/EMPs included in the bidding documents?		
• Are there changes in the scope of work of the cleared IEEs?		
• Core labor standards and environment, health and safety (EHS) incorporated in Section 8 of the bid documents?		
• BOQ line item includes EMP requirements?		
• IEE disclosed in form and language understood by stakeholders and affected persons (APs)? •		
For subproject packages with contracts awarded (no works yet)		
• All statutory clearances/permits obtained?		
• Each contractor appointed EHS and/or safety officer?		
• Baseline regarding condition of roads, agricultural land and other infrastructure prior to start of transportation of materials and construction has been recorded?		
• Contractor has established tie-ups with local hospitals/clinics for emergencies onsite?		
• For DBO packages, detailed design completed and updated IEE submitted to ADB?		
• For civil works packages, site-specific EMP submitted to ADB?		
For subproject packages with contracts awarded and works on-going		
• Contractors have appointed EHS and/or safety officer onsite per subproject package?		

• Site-specific EMP posted onsite?		
• Contractors' records of accidents / incidents submitted to PIU on a monthly basis?		
• Contractors provided PIU with a notification/incident report of any accident(s) within 24 hours of its occurrence?		
• Reports of complaints/grievances reported monthly to PIU?		
• Records of information disclosure/consultations submitted by PIU to PIU monthly?		
• Records of site inspection by PIU submitted to PIU monthly?		

ANNEX 13: SUGGESTED ASBESTOS MANAGEMENT PLAN

- Background
- Project Description
- Regulatory Framework, Standards and Protocols
- Existing/Baseline Conditions
- Risk Assessment:
- Roles and Responsibilities
- Permissible Levels
- ACM Removal Protocol
- ACM Handling Protocols
- ACM Storage Protocols
- ACM Stabilization and Treatment
- List of Approved ACM Handlers and Disposal Facilities
- Health and Safety Protocols
- Training
- Emergency Response Plan & Chance Find Protocol
- Reporting and Monitoring

[1] If on-going construction, include %physical progress and expected date of completion

[2] All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as Appendix all clearance obtained during the reporting period. If already reported, specify in the “remarks” column.

[3] Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

[4] Specify if obtained, submitted and awaiting approval, application not yet submitted

[5] *Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.*

[6] Attach Laboratory Results and Sampling Map/Locations

[7] This checklist should provide the Project’s **general** compliance to environment safeguards during the reporting period. The indicators are aligned with project loan agreement, PAM, IEEs and ADB’s Sustainable Development Safeguards Division Safeguards project performance rating. The detailed environmental safeguards compliance status should be provided in the semi-annual environmental monitoring report.