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**ENVIRONMENTAL ASSESSMENT
MUNICIPAL ROAD REHABILITATION**

REPORT

**GEORGIA MUNICIPAL INFRASTRUCTURE AND IDP
HOUSING REHABILITATION PROJECT**

CONTRACT: AID-EDH-I-00-08-00027-00, TASK ORDER: AID-114-TO-11-00002

DCN: 2010-GEO-033

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DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government



25 February 2012

Mr. Bradley Carr
Water Irrigation and Infrastructure Advisor
Office of Economic Growth
US Agency for International Development
11 George Balanchine Street
Tbilisi, 0131
Georgia

Re: Environmental Assessment for Municipal Road Rehabilitation

Dear Mr. Carr:

This report is being submitted to you in accordance with the requirements of task order no. AID-114-TO-11-00002 of contract AID-EDH-I-00-08-00027-00. It provides Tetra Tech's Environmental Revised Environmental Assessment for Municipal Road Rehabilitation after responding to BEU comments and questions..

We look forward to your review and welcome your comments and suggestions.

Very truly yours,

A handwritten signature in black ink that reads 'Jeffrey W. Fredericks'. The signature is written in a cursive style and is positioned to the left of a vertical line.

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ABBREVIATIONS AND ACRONYMS

ARWR	Actual Renewable Water Resources
BEO	USAID Europe and Eurasia Bureau Environmental Officer
CFR	Code of Federal Regulations
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMMP	Environmental Mitigation and Monitoring Plan
EPI	Economic Prosperity Initiative (USAID Project)
ESS	Environmental Scoping Statement
Geo	Geo Ltd
GMIP	Municipal Infrastructure And IDP Housing Rehabilitation Project (the project)
GoG	Government of Georgia
IDP	Internally Displaced Persons
IRWR	Internal Renewable Water Resources
KAV	Kavgiprotransi-Mg Ltd
M&E	Monitoring and Evaluation
M&M	Mitigation and Monitoring
MDF	Municipal Development Fund
MEO	USAID/Georgia Mission Environmental Officer
MLHSA	Ministry of Labor Health and Social Affairs
MRA	Ministry of Refugee Affairs
MRDI	Ministry of Regional Development and Infrastructure
NEO	New Economic Opportunities (USAID Project)
NGO	Non-Government Organization
PMP	Performance Monitoring Plan
SOW	Scope of Work
TBD	To Be Determined
TOCOTR	USAID Task Order Cognizant Technical Officer
Tt	Tetra Tech EM Inc.
USAID	United States Agency For International Development
USG	U.S. Government
WB	World Bank

1. Summary

The Government of Georgia (GoG) identified municipal roads as a priority targets for USAID technical assistance. Five municipalities impacted by the 2008 conflict were identified by the GoG as priority targets for USAID technical assistance under GMIP Component 1. The municipalities - Gori, Mtskheta, Oni, Kareli, and Dusheti – submitted up to three infrastructure rehabilitation proposals for GMIP financial assistance. Each project was expected to show evidence of civic participation, impact on significant municipal population, contribution to economic growth or greater efficiency, government commitment to maintain rehabilitated infrastructure and potential leverage of other donor funding. The selected project covers road repair, sidewalks and drainage works.

The projects involve rehabilitation of asphalt-concrete pavements and drainage systems. The roads service the municipalities, including IDP cottage settlements. Under GMIP Component 1, USAID will invest up to \$9.5 million on municipal rehabilitation and expects to benefit 270,000 people, which includes about 24,000 IDPs.

1.1 Description of the Project

The five selected municipalities identified road segments for rehabilitation based on costs and benefits, selecting the highest priority road segments within individual road projects that would meet performance targets. Only existing roads will be rehabilitated; no new roads will be constructed. Projects are summarized for each municipality as follows:

- Gori Municipality selected 26 streets with a total length of 8.7 kilometers for road rehabilitation.
- Mtskheta Municipality selected 32 roads with a total length of 10.3 kilometers for road rehabilitation.
- Oni Municipality selected 8 streets with a total length of 3.2 kilometers for rehabilitation.
- Kareli Municipality selected 12.3 kilometers of internal roads at Sagolasheni Dvani for rehabilitation.
- Dusheti Municipality selected 3.1 kilometers along eight internal road segments for rehabilitation.

Each municipal road project also includes curbs, new sidewalks, and improved drainage systems. Curbs will be concrete with the base course arranged using macadam 10cm (0-40mm) and the pavement will be an asphalt-concrete hot mix, thickness 3 cm. Sidewalks will also be rehabilitated at typical widths for the area. Drainage improvements will include rehabilitation of open channels, constructing closed concrete reinforcement collectors, and/or replacement of damaged concrete reinforcement pipes or culverts.

The following equipment will be used: grader, excavator, drum roller, vibrating roller, pneumatic roller, asphalt paver, crane, bulldozer, loader, concrete plant, dumpers (6), compressors (2), and

breaking hammers (4). The cross profile, road bed and plan of the street will remain unchanged. Use of special road materials (e.g., basalt, cobblestones, porous asphalt and alike) is discussed in the EA along with reuse of existing subsurface and pavement materials.

1.2 Project Context

GMIP addresses needs resulting from Georgia's August 2008 conflict with Russia and the global economic downturn that has challenged Georgia's economic stability. These needs have placed a severe strain on Georgia's national budget and its ability to finance core investments in critical regional development initiatives like municipal roads. Many years of decline in the quality, coverage and maintenance of roads have dramatically reduced Georgia's quality of life in rural areas and constrained private sector growth. Such degradation and instances of conflict-related damage have resulted in significant constraints to the productive capacity and quality of life of thousands of Georgians.

1.3 Summary of 22 CFR 216 Requirements, IEE Summary, Scoping Process

USAID's environmental regulations (22 Code of Federal Regulations 216 or Reg. 216) establish the conditions and procedures for environmental review. These procedures apply to new projects, programs, or activities authorized by USAID. Reg. 216 establishes a process for the review of environmental and social impacts; and ensures that projects that are undertaken as part of programs funded under USAID are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and as required by the legislation are not likely to cause a significant environmental, health or safety hazard.

The Initial Environmental Examination (IEE) for GMIP was drafted and approved by the Europe and Eurasia Bureau Environmental Officer (BEO) on June 23, 2010 (DCN: 2010-GEO-033). Pursuant to Reg. 216 and the IEE's Positive Determination for Component 2, an Environmental Assessment (EA) is required. This EA was prepared to comply with the Positive Determination and is meant to ensure that environmental consequences and their significance are known and clearly identified prior to the approval of the final design and start of construction [216.3 (a) (4)].

LTD KAV and Tetra Tech led the scoping process for the municipal road rehabilitation EA. The team identified, reviewed, and prioritized environmental issues. An initial public stakeholder scoping meeting was held on July 5, 2011 in Dusheti. The Scoping Statement was approved by the USAID/Europe & Eurasia Bureau Environmental Officer (BEO).

1.4 Major Conclusions

The EA Team used the potential significant concerns identified in the Environmental Scoping Statement (ESS) and analyzed them in the EA. Further investigation during the EA identified one additional concern for further analysis. The concerns evaluated in detail in the EA are shown below:

- Impacts to threatened, endangered and protected species (TES); disruption of sensitive habitats (including amphibian crossings in Oni (and possibly Mtskheta), red-listed juniper

species along roads, and other sites where protected birds, bats, amphibians and reptiles may use habitats along roads).

- Impacts to wetlands and other natural resources; disturbance or threat to important ecological habitats (including riparian habitats along roads in Kareli).
- Impacts to cultural and historic resources including cultural or historic chance finds.
- Impacts of changes in water quality, sediment loads; deterioration of downstream water and impacts on downstream users; pollutants include hydrocarbons, suspended solids, possible toxics.
- Cumulative impacts of road rehabilitation activities.
- Added by EA Team: Temporary or permanent land expropriation.

In addition to these significant effects, the EA Team identified best practices for a range of potential concerns that were noted in the ESS. These concerns were eliminated from further consideration in the EA because they did not require any further assessment; the ESS stated that best practices exist that would mitigate impacts.

The EA Team developed mitigations (including best practices) to address impacts associated with construction activities, road rehabilitation, disposal of old/damaged asphalt and road subsurface materials, disposal of damaged sidewalks and drainage collectors/pipes. Mitigations also address socio-economic and public health and safety concerns, road operation and maintenance including road ruts, potholes and clogged drains, increased traffic, impacts to TES and cultural/historic resources and municipal road maintenance programs.

EMMPs were developed for road rehabilitation (Table 6.1) and operation and maintenance of municipal roads (Table 6.2). EMMPs include the identified environmental impacts, individual mitigation measures, monitoring indicators, monitoring/reporting frequency and responsible party for oversight of EMMP implementation. EMMPs mitigate the following identified environmental impacts during construction and road rehabilitation:

- **Impacts** to Threatened, Endangered & Protected Species (TES); disruption of sensitive habitats (including amphibian crossings in Oni (and possibly Mtskheta), red-listed juniper species along roads, and other sites where protected birds, bats, amphibians and reptiles may use habitats along roads).
- **Impacts** to wetlands and other natural resources; disturbance or threat to important ecological habitats (including riparian habitats along roads in Kareli).
- **Impacts** to Cultural and Historic Resources including cultural or historic chance finds.
- **Construction Camp Damage** to Local Habitats and Depletion of Local Fauna/Flora. Impacts from Lack of Environmentally Sound Facilities or Poor Sanitation at

Construction Camp Facilities. Impacts from Lack of Management of Construction Areas, Equipment and Materials Storage.

- Community **Impacts** from Introduction of Alcohol and Other Socially Destructive Substances via Construction Crews.
- **Impacts** from Lack of Control of Stormwater runoff during Road Rehabilitation. Impacts from Removal and Disposal of Old/Damaged Asphalt, Road Subsurface Materials, Sidewalks, Drainage Collectors/Pipes. Impacts from Removal and Disposal of Damaged/Broken Concrete Panels and Slabs.
- **Impacts** on Roads from Transporting New Road Materials, Concrete and Asphalt, Drainage Collectors/Pipes and Impacts from Transporting Waste Materials for Disposal.
- **Impacts** from Improper Extraction of Road Materials (quarry and gravel pits and barrow pits).
- **Impacts** from Road Rehabilitation (Add Compaction of Roadbed and Addition of Materials for Subsurface Layers and Pavement. Impacts from Rehabilitation of Sidewalks and Drainage Collectors/Pipes
- Noise, Odor and Visual Quality **Impacts**. Socio-economic Impacts. Public Health and Safety Impacts.

EMMPs mitigate the following identified environmental impacts during operation and maintenance of municipal roads:

- **Impacts** to Threatened, Endangered & Protected Species (TES).
- **Impacts** from Road Ruts, Potholes, Mud-holes and Washboarding.
- **Impacts** from Clogged Drainage Collectors/Pipes, Standing Water and Water Pools.
- Road Improvements Increase **Traffic** and Vehicle Speed, Higher Accident Rates.
- Water, Soil and Other Environmental **Impacts** due to Weak Municipal Road Maintenance Programs.

1.5 Areas of Controversy and Issues to be Resolved

The EA Team did not identify any remaining areas of controversy, nor issues that need to be resolved.

2. Underlying Purpose and Need to Which Proposed Action is Responding

2.1 Project Description

Five municipalities impacted by the 2008 conflict were identified by the GoG as priority targets for USAID technical assistance under GMIP Component 1. The municipalities - Gori, Mtskheta, Oni, Kareli, and Dusheti – were invited to submit up to three infrastructure rehabilitation proposals for GMIP financial assistance. Each project was expected to show evidence of civic participation, impact on significant municipal population, contribution to economic growth or greater efficiency, government commitment to maintain rehabilitated infrastructure and potential leverage of other donor funding. The project proposals covered road and bridge repair and drainage works. Five priority road rehabilitation projects were chosen for GMIP funding, one in each of the five municipalities. The five municipal road projects are covered in this EA. The projects involve rehabilitation of asphalt-concrete pavements and drainage systems. The roads service the municipalities, including IDP cottage settlements. Under GMIP Component 1, USAID will invest up to \$9.5 million on municipal rehabilitation and expects to benefit 270,000 people, which includes about 24,000 IDPs.

2.2 Purpose and Need for the Proposed Action

GMIP addresses needs resulting from Georgia's August 2008 conflict with Russia and the global economic downturn that has challenged Georgia's economic stability. These needs have placed a severe strain on Georgia's national budget and its ability to finance core investments in critical regional development initiatives such as road rehabilitation. Many years of decline in the maintenance of roads have dramatically reduced Georgia's quality of life and constrained private sector growth. This degradation has constrained productive capacity and quality of life of thousands of Georgians. GMIP Component 1, Rehabilitation of Municipal Roads, will repair infrastructure that Georgians rely on for jobs and income generation.

The major purpose of this project is to improve the infrastructure in five selected municipalities - Gori, Mtskheta, Oni, Kareli, and Dusheti. These infrastructure rehabilitation projects will contribute to economic growth of the municipalities and improve the social condition of the local population including IDPs. Projects were chosen based on potential for high impact and benefits. For example, Mtskheta and Oni are important for tourist activities and both municipalities have high unemployment. USAID and GMIP expect road rehabilitation to not only improve traffic flow and encourage more tourism, but also to lead to more diversified employment opportunities for the local population.

The target roads need to be rehabilitated because the asphalt-concrete pavement of the streets is damaged (pits and settlement are common); the road pavement is fragmented, and in many places the sand and gravel layers are exposed. Most of the streets do not have drainage systems and during precipitation events the water flows on the carriageway and washes out the asphalt-concrete layer to the sand and gravel layers. The water flows through the amortized channel into

the underground collector. The large volume of water cannot pass through the collector and nearby yards flood. Collectors and drainage pipes and culverts need to be rehabilitated.

2.3 Status of Environmental Compliance Documentation

2.3.1 Summary of 22 CFR 216 Requirements and the IEE for GMIP Component 1

USAID's environmental regulations (22 Code of Federal Regulations 216 or Reg. 216) establish the conditions and procedures for environmental review. These procedures apply to new projects, programs, or activities authorized by USAID. Reg. 216 establishes a process for the review of environmental and social impacts; and ensures that projects that are undertaken as part of programs funded under USAID are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and as required by the legislation are not likely to cause a significant environmental, health or safety hazard.

The Initial Environmental Examination (IEE) for GMIP was approved by the Europe and Eurasia Bureau Environmental Officer (BEO) on June 23, 2010 (DCN: 2010-GEO-033). Pursuant to Reg. 216 and the IEE's Positive Determination for Component 1, an Environmental Assessment (EA) is required. An EA is meant to ensure that environmental consequences and their significance are known and clearly identified prior to the approval of the final design and start of construction [216.3 (a) (4)].

2.3.2 Environmental Scoping Statement

The Scoping Team consisted of LTD KAV and Tetra Tech. The team identified, reviewed, and prioritized environmental issues. This was accomplished through the following three tasks:

- Identifying and reviewing existing environmental information and studies related to GMIP- Component 1;
- Carrying out site investigations to ascertain any additional environmental issues; and
- Obtaining stakeholder input in an organized meeting to ensure that significant environmental and social issues were identified for evaluation in the EA.

The Team held a public stakeholder scoping meeting on July 5, 2011 in Dusheti. The purpose of the meeting was to provide information and get local citizens' views of the proposed action. Twenty-four people attended the meeting. The Scoping Team also visited representative project sites and coordinated with other GMIP staff who had visited and documented conditions at all sites.

The Scoping Statement discussed the comments received during the scoping process. The Scoping Team identified potential significant environmental and social issues for consideration in the EA; eliminated issues considered not to be significant; and identified alternatives for consideration in the EA. The EA Team felt that through the site visits, document review, and the scoping meeting, all potential concerns were identified, and an additional stakeholder meeting was not expected to identify any outstanding significant issues for analysis in this EA.

2.3.3 Stakeholder Engagement and Host Government Consultation

GMIP was designed in close coordination with the GoG. GMIP's local partner is the GoG's MDF. As part of feasibility studies, GMIP staff visited all municipal road rehabilitation sites and met with stakeholders. GMIP has collaborated with stakeholders as part of the design process to ensure the design is socially and culturally acceptable. GMIP will continue to hold regular consultations through design and construction activities and up to hand over to the GoG.

2.3.4 Host Country Environmental Context

The projects covered by this EA, rehabilitation of municipal roads, do not require an Environmental Impact Permit (EIP) or State Ecological Examination under Georgian legislation. Local permits are required, as shown in the table below:

Table 2-1: Local Permits Required for Road Rehabilitation

<i>Permit Type</i>	<i>Comments</i>
Building/Construction	Local permits required
Source Material Extraction	
Waste Disposal	
Wastewater Discharge	
Air	
Water Use	
Historical or Cultural Preservation	
Wetlands or Waterbodies	Water law and riverbank protection may be applicable
Threatened or Endangered Species	Unlikely
Other	

3. Alternatives Including the Proposed Action

This chapter provides a discussion of the “Project Alternatives” followed by a comparison of the alternatives based on potential significant environmental impacts as identified in the ESS and as modified by the EA Team. The EA Team used the alternatives developed by the Scoping Team; no additional feasible alternatives were identified during the EA preparation process.

The alternatives considered are: the Proposed Action (Alternative 1); Restructured Roads Program (Alternative 2); and No Action (Alternative 3).

3.1 Description of Project Alternatives

Reasonable alternatives are defined (by the U.S. National Environmental Policy Act) as those alternatives that meet the project purpose and need and address significant issues. This section describes the alternative actions that meet the project’s purpose and need. The major purpose of this project, as stated above, is to improve infrastructure in five selected municipalities - Gori, Mtskheta, Oni, Kareli and Dusheti. The project need is to rehabilitate infrastructure that will contribute to economic growth of the municipality and improve the social condition of the local population including IDPs.

This section describes three alternatives that meet the project’s purpose and need: Alternatives 1, 2, and 3 are considered feasible. Municipalities have already evaluated needs and submitted their best selection of roads based on available funds and municipal needs. Alternative 4 (No Action) is included to help evaluate the comparative merits of the alternatives.

3.1.1 Alternative 1 – Proposed Action

The five selected municipal road projects were developed at the local level. Each municipality identified several road segments that were candidates for rehabilitation. They conducted an analysis that considered costs and benefits, and municipalities then selected the highest priority road segments within individual road projects that would meet cost targets. These were recommended for funding. Only existing roads will be rehabilitated; no new roads will be constructed. Information on each municipality is summarized below:

Gori Municipality

- 26 streets with a total length of 8.7 kilometers will be rehabilitated.
- Gori Municipality has selected internal roads of Gori for rehabilitation with the intention that this will promote the economic growth of the municipality and improve the social condition of the population.
- The project will rehabilitate the existing asphalt-concrete pavement of the streets of Gori which have exceeded their project life; the streets are full of potholes.

Mtskheta Municipality

- 32 roads with a total length of 10.3 kilometers will be rehabilitated.
- Mtskheta Municipality selected internal roads of Mtskheta for rehabilitation with the intention that the rehabilitated infrastructure will promote economic growth of the municipality and improve the social condition of the population.
- The project will rehabilitate the existing asphalt-concrete pavement of the streets of Mtskheta. Their project life has been exceeded and they are full of potholes.

Oni Municipality

- Eight streets with a total length of 3.2 kilometers will be rehabilitated.
- Oni Municipality selected internal roads of Oni for rehabilitation with the intention that the rehabilitated infrastructure will promote economic growth of the municipality and improve the social condition of the population.

Kareli Municipality

- 12.3 kilometers of internal roads will be rehabilitated at Sagolasheni Dvani.
- The rehabilitated infrastructure is expected to promote economic growth of the municipality and improve the social condition of the population.
- The cross profile, road bed and plan of the streets remain unchanged.
- The project includes a carriageway of 5 meters width and road shoulders of sand and gravel mix of one meter width.

Dusheti Municipality

- 3.1 kilometers along eight internal road segments will be rehabilitated.
- Road rehabilitation is expected to increase economic growth of the municipality and improve social conditions of the population.
- The existing asphalt-concrete pavement will be rehabilitated. They have exceeded their project life and they are full of potholes.

The final recommended road projects involve four types of road pavement improvements (alternative road materials will be considered as well). Each municipal project involves one or more of these improvement types:

Road Improvement Type I

- Damaged asphalt-concrete pavement is fully removed;
- Removed asphalt-concrete pavement will be crushed and recycled for relaying as an aggregate base;
- Leveling layer of sand and gravel mix, thickness 8 cm on hard base (stone base or compacted), leveling layer of sand, thickness 15 cm on sandy base;
- Base course - crushed aggregates 0-40 mm, thickness 8 cm;

- Road Pavement – fine-grained asphalt-concrete hot mix – thickness 5 cm.

Road Improvement Type II

- 6-7 cm of asphalt-concrete pavement;
- Milling of the damaged asphalt-concrete pavement, mixing the milled materials with fractional macadam and providing a leveling layer 5 cm thick;
- Add binder course – coarse grained porous asphalt-concrete Mark II hot mix – 6 cm;
- Add wearing course – fine- grained dense asphalt-concrete hot mix – 4 cm;
- All roads will have improved drainage channels and/or raised curbs for sidewalks to ensure proper drainage.

Road Improvement Type III

- Add sub-base layer of clean sand and gravel (non-silty) mix, thickness 15 cm;
- Add base course – clean sand (non-silty) and cement (5%) mix, thickness 15 cm;
- Add pavement using local cobble-stone – average size 15 cm.
- Pavement structure includes arrangement of a concrete reinforcement belt.

Road Improvement Type IV

- Pit-hole repair of existing asphalt-concrete layers using pneumatic hammers and Bitumen;
- Filling pits with fine-grained dense asphalt-concrete hot mix;
- Arrangement of leveling layer with fine-grained porous asphalt-concrete hot mix – thickness 2 cm;
- Add wearing course – fine-grained dense asphalt-concrete hot mix - thickness 4 cm.

Each municipal road project also includes curbs, new sidewalks, and improved drainage systems. Curbs will be concrete with the base course arranged using macadam 10cm (0-40mm) and the pavement will be a fine grained asphalt-concrete hot mix, thickness 3 cm. Sidewalks will also be rehabilitated at typical widths for the area. Drainage improvements will include rehabilitation of open channels, constructing closed concrete reinforcement collectors, and/or replacement of damaged concrete reinforcement pipes or culverts.

The following equipment will be used: grader, excavator, drum roller, vibrating roller, pneumatic roller, asphalt paver, crane, bulldozer, loader, concrete plant, dumpers (6), compressors (2), and breaking hammers (4). The cross profile, road bed and plan of the street will remain unchanged. Use of special road materials (e.g., basalt, cobblestones, porous asphalt and alike) will be considered in the EA along with reuse of existing subsurface and pavement materials.

3.1.2 Alternative 2– Restructured Roads Program

In this alternative, fewer road segments are improved and road improvements will meet higher standards. This alternative emphasizes quality of road improvement over quantity.

Municipalities would use the highest quality pavement types, sidewalks that fully meet pedestrian needs, and drainage systems that address higher rainfall event projections.

The EA Team reviewed this alternative with the GMIP Steering Committee during the EA preparation phase. The Committee indicated that the municipalities had flexibility during initial the project development period and that their priority road segments took road quality standards into consideration along with local needs, number of beneficiaries and costs. They thought that if municipalities were offered this alternative, there would be little difference in the road segments recommended for GMIP funding.

3.1.3 Alternative 3 – No Action Alternative

The No Action Alternative means that USAID will not support the rehabilitation projects and therefore, tourism revenue and other investment may be lost, and economic growth would be reduced. This alternative provides a benchmark against which the action alternatives may be evaluated.

Under the No Action Alternative, the target road rehabilitation projects would not be implemented. The expectation that improved roads would bring tourists and other investment would not materialize. The employment opportunities that are expected as an indirect effect of road rehabilitation are intended to significantly benefit IDPs in collective centers near the municipalities. Without road rehabilitation, these employment opportunities will be lost, and IDPs will continue to find it difficult to improve their living conditions. This could contribute to conflict among IDPs and between IDPs and the local communities since IDPs will be unable to integrate into the larger communities.

3.2 Alternatives Eliminated from Analysis and Rationale for Eliminating Alternatives

The EA Team eliminated the cash transfer alternative that was proposed during the scoping process. After further consideration during the EA phase, the EA Team did not think this alternative had any significant benefits. It would not improve road selection, maintenance or address any significant impact. More information on this alternative is provided below.

Cash Transfer Program Alternative: The Cash Transfer Alternative would provide cash to municipalities, providing them a choice in the selection of infrastructure improvement. This program would involve a pre-set amount for direct payment, and the municipalities would be required to submit invoices to show the cash transfer was used for the purposes intended. Municipalities would choose their own contractors, oversight of their work would be minimal, and they would not be held to the strict standards that GMIP is held to.

The EA Team reviewed this alternative with the GMIP Steering Committee during the EA preparation phase. The Committee indicated that the municipalities were not pressured to accept any road segments and they should already have an “ownership” of the infrastructure improvements. The Committee thought that the municipalities would meet their responsibility

for the maintenance of the road improvements and that there would be little difference in the road segments recommended for GMIP funding. The EA Team did not expect any improved maintenance with this alternative and they expressed concern about the lack of benefits associated with this alternative. The alternative did not address any significant environmental or social impact.

3.3 Comparison of Environmental Impacts of Program Alternatives

As required by 22 CFR 216.6(c)(3), Table 3.1 shows, in comparative form, impacts of the proposed GMIP road rehabilitation and its feasible alternatives. As stated in USAID’s Environmental Procedures, this section is meant to sharpen the issues, illustrate the comparative merits of each alternative, and provide a clear basis for choice among the options. Section 5, Environmental Consequences, provides the analytic basis of the alternatives comparison.

Potential environmental issues (Table 3.1, column 1) are from the Scoping Statement.

Table 3.1: Comparison of Alternatives

(+2) highly positive effect/beneficial; (+1) positive/beneficial; (-2) significant negative effect/highly detrimental; (-1) negative effect/detrimental; (0) remains the same (i.e., no effect or same rate of change versus gets progressively worse or better)

Potential environmental issues (identified in the Scoping Statement + added by EA Team)	Alternative 1: Proposed Action (without mitigation)		Alternative 2: Restructured Roads Program		Alternative 3: No Action	Alternative 1 with mitigation	
	Const	Oper	Const	Oper		Constr	Oper
1. Impacts to threatened, endangered and protected species (TES) and disruption to sensitive ecological habitats.	-1	-1	0	0	0	0	0
2. Impacts to wetlands and other natural resources; disturbance or threat to important ecological habitats.	-1	-1	0	0	-1	0	0
3. Impacts to cultural resources	-1	+1	0	0	-1	0	+1
4. Impacts of changes in water quality, sediment loads; deterioration of downstream water and impacts on downstream users; pollutants include hydrocarbons, suspended solids, possible toxics.	0	0	0	0	0	0	+1
5. The EA needs to consider the cumulative impacts of road rehabilitation and other infrastructure activities.	0	+1	0	+1	-1	0	+1
6. Temporary or permanent expropriation of private property to rehabilitate the road.	-1	-1	0	0	0	0	0

3.4 Discussion & Ranking of Alternatives with Respect to Significance of Environmental Impacts of Alternatives

Alternative 2 would focus on quality over quantity and segments of the road where particular impacts may occur (habitat, expropriation) could be avoided and the funds would then be directed to higher quality roads. However, the potential impacts of Alternative 1 to habitat and private property, as well as to cultural resources and water quality are minor (as described in Section 5), and are easily mitigated with best practices. Negative cumulative impacts are

expected under the No Action Alternative since the municipalities would be expected to try to attract and accept more environmentally damaging industries (rather than tourism and agriculture) to provide jobs for their citizens.

4. Affected Environment

This chapter provides a brief description of the human and natural environment in the five municipalities (Gori, Mtskheta, Oni, Kareli and Dusheti) that are a focus of the GMIP road rehabilitation component. It focuses on the *affected environment* in the municipalities, and describes, the current conditions, including cultural, land uses, soils, geology, biodiversity, and water. As stated in 22 CFR 216, the “affected environment” should be succinctly described and the focus should be on the areas “to be affected or created by the alternatives under consideration. The descriptions shall be no longer than is necessary to understand the effects of the alternatives.” In line with this, the baseline description of the affected environment sets the benchmark for the evaluation of the impacts of the proposed action and its alternatives in Chapter 5.

Appendix 8.3 contains detailed site reports of each proposed road segment. These reports show GPS points of the road, the structures, vegetation, and other artifacts adjacent to each road segment, and they include maps and engineering plans. The reports illustrate in detail the nature of the affected environment.

4.1 Population Characteristics

Five municipalities (Gori, Mtskheta, Oni, Kareli, and Dusheti) are participating in this component of GMIP. They are located in the Imereti Region and the Samegrelo-Zemo Svaneti Region.

4.1.1 Population

The population of Imereti Region is 700,400 people, approximately 16% of the population of the country. Population density is 107 people per square km. About 46% of the population lives in towns and the remaining 54% in villages. The majority of the population is ethnic Georgian; the distribution is as follows: 98.5% is Georgian, 0.7% is Russian, 0.3% is Armenian, and 0.5% is other nationalities.

The population of Samegrelo-Zemo Svaneti Region is 464,100, about 11% of the country’s population. Population density is 63 people per square km. The landscape changes from lowland to mountainous, and the population density varies accordingly, from 36 to 180 people per square km. About 40% of the population lives in towns and 60% in villages. Approximately 99.3% of the population is Georgian, 0.4% is Russian, 0.1% is Abkhazian, and 0.2%, other nationalities.

4.1.2 Economy

Gori Municipality provides a representative profile of the economic sectors of the project area: agriculture (20.2%), processing (4.8%), industry (14.8%), construction (5.6%), trade (12.1%),

transport and communications (12.4%), public/governance (16.6%), education (5.0%), health (2.7%), and other services (5.8%). The Gross Domestic Product (GDP) of Gori municipality is 1.68% of the GDP of Georgia, a small fraction of the national GDP; the annual per capita income is 2080 GEL.

4.1.3 Public Health

The public health system in Georgia is centralized. Ambulances and hospitals are concentrated in large cities, and small outpatient clinics are available in most villages. The GoG is currently focusing on developing improved health care facilities in all regions. In Gori Municipality, residents are served by hospitals, clinics and ambulance and emergency services. There are private health facilities as well as a military hospital. Almost all community centers have basic ambulance services.

4.2 Natural and Cultural Heritage

4.2.1 Historical and Cultural Heritage

There are numerous monuments of cultural and historic heritage in the municipalities: stone-built castles, towers, churches and settlement ruins. Most of the heritage assets are churches and monasteries that are owned by the Patriarchy of Georgia in accordance with the Constitutional Concordat between the Georgian Orthodox Church and the State. There are also many privately-owned dwelling houses that have been awarded the formal status of a monument of cultural heritage. All other monuments are owned by the State. Cultural and historical resources are described below for each municipality.

4.2.2 Protected Areas

Approximately 8% of the country is under protected area status (Chemonics International, 2000). Figure 4.1 below shows the network of protected areas in Georgia. The scoping exercise and this EA confirm the finding of the feasibility study that no protected areas, including national parks and state reserves, as well as other categories of protected forests, are located at or in the immediate vicinity of the project sites (There are no protected areas in the “affected environment.”)

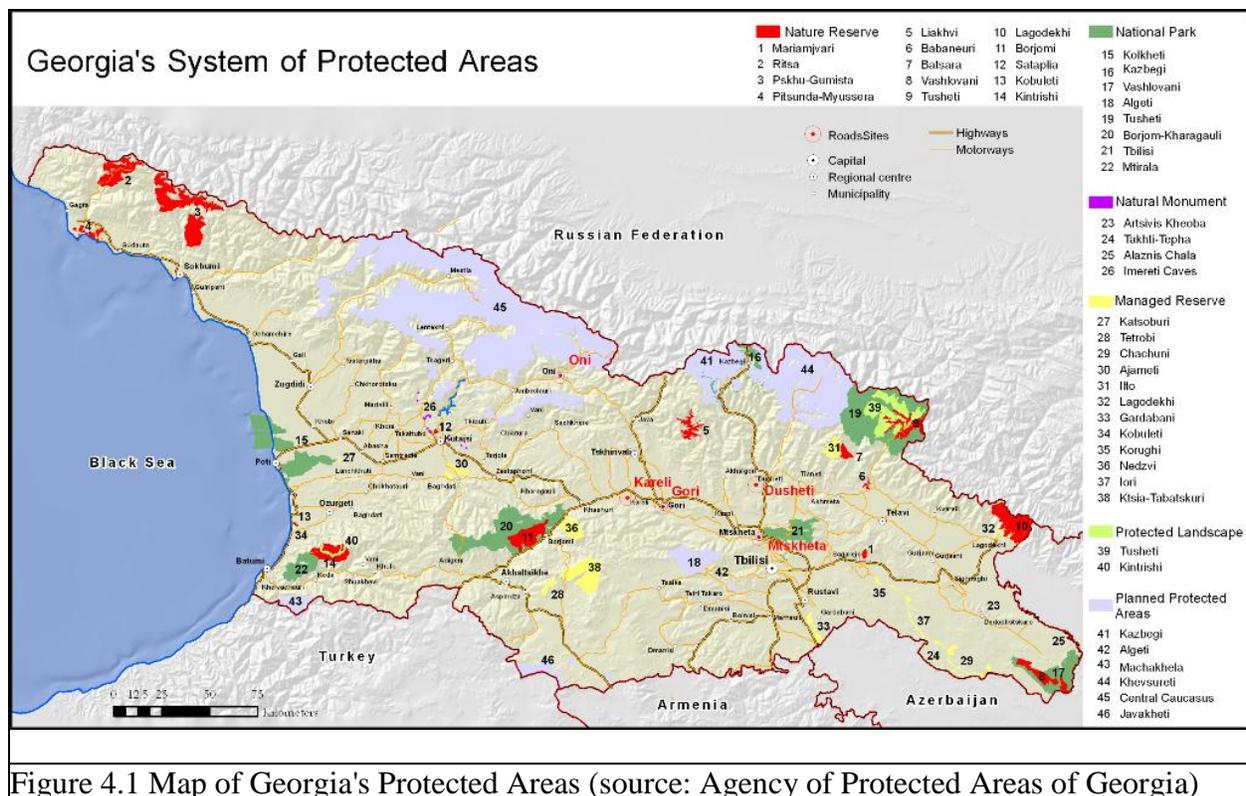


Figure 4.1 Map of Georgia's Protected Areas (source: Agency of Protected Areas of Georgia)

4.3 Project Beneficiaries

In the five municipalities employment opportunities are limited. From a countrywide perspective, economic development has been uneven for the last decade. From 2004 to 2007, the country underwent rapid economic growth ranging between 5.9-12.3% per year. Some factors such as armed conflicts and global economic crises severely influenced the country. Post-conflict, growth plummeted to 2.3% in 2008 and -3.8% in 2009. Perhaps of more concern than actual numbers of employed, is that according to UNDP (HDR, 2010), over 62% of employment countrywide is ranked as “vulnerable,” or as unpaid family workers or self-employed. Approximately 17.4% of employed live on less than 1.25 US\$/day. Even these data are misleading for the five municipal areas. Most economic activity takes place in the capital city, Tbilisi. Gori, Mtskheta, Oni, Kareli and Dusheti have suffered more than Tbilisi in the economic downturn

Besides employment, socioeconomic status is also based on the availability and quality of private and public facilities. Municipal areas in the affected environment have continuous power supplies. However, problems with the power systems are common, such as powerline poles that are old and are knocked down during storms, causing power termination. In general, the affected populations have access to education and, as mentioned above, to public health care facilities.

Communication in the target communities is through cellular networks. The population has access to TV programs of the Georgian Public Broadcaster and Rustavi-2. Satellite and cable

TV and Georgian radio broadcasting are also available in the target municipalities. National newspapers are available in the municipal centers. Municipal infrastructure needs, unemployment, and weak employment opportunities are key economic issues for these municipal populations.

4.4 Geographic Characteristics

Georgia is a mountainous country covering 70,000 km², situated between the south slope of the Caucasus Mountains, the east coast of the Black Sea, and the northern edge of the Turkish Anatolia plain. Georgia has one of the most varied topographies of the former Soviet republics. The country lies mostly in the Caucasus Mountains, and its northern boundary is partly defined by the Greater Caucasus range. The Lesser Caucasus range, which runs parallel to the Turkish and Armenian borders, and the Surami and Imereti ranges, which connect the Greater Caucasus and the Lesser Caucasus, create natural barriers that are partly responsible for cultural and linguistic differences among regions. Earthquakes and landslides in mountainous areas present a significant threat to life and property.

4.5 Environmental Baseline of Project Sites

The following sections provide information about the current environmental setting in the five selected municipalities - Gori, Mtskheta, Oni, Kareli and Dusheti. Road rehabilitation is proposed for existing roads in these municipalities within urban and peri-urban and other already disturbed areas. Below, the geology and soils, hydrology, and biodiversity (flora/fauna) are described for each municipality.

As mentioned, Appendix 8.3 contains the detailed site reports that show vegetation and general environmental characteristics of all road segments. Appendix 8.4 contains photographs from field visits made during the EA phase. The information below was gathered from the site reports, from other documentation as noted, and from field visits during the scoping process and the EA phase (including a biologist sub-contracted by GMIP to evaluate the sites for biodiversity value).

4.5.1 Affected Environment: Gori Municipality

Gori, at 700 meters above sea level (masl), is located in eastern Georgia on the Shida Kartli Plain. The Mtkvari river divides Gori into two parts. The main part of the city is located on the east side. Gori is bordered by Kaspi region in the east, Tsalka region in the south, Kareli region in the west and Samachablo in the north.

Population. The population of Gori Municipality (the entire district) as of January 1, 2010 was 143,100, including 51,200 living in Gori (town) and 91,900 living in rural areas. The share of the urban/rural population is therefore 35.5% / 64.7%. Average density of population is 62 persons per sq. km. Population of Gori Municipality is distributed among 21 Territorial Units, which include 96 villages. The largest territorial unit is the town of Gori.

Agriculture. Fruit production is common in the municipality. In 1990 there were approximately 18,000 hectares of orchards, with 140-150,000 tons of fruit produced annually, and with 50% of the income of the district coming from this sector. Key products are grain, canned products,

apple concentrates, alcoholic beverages, spirits, and fruits and vegetables. There are 26 enterprises registered in the municipality employing over 800 people. Total production value generated by these enterprises is approximately 41.6 million GEL. Some of the companies only work on a seasonal basis.

Geology and Soils. There are four main morphological parts in Gori: 1) Gori plain, occupying 39.7% of the territory with the inclination towards southeast. 2) The valley of Shua Mtkvari with wide terrace plains. 3) Kvernaki ridge, which is located 100-120 meters above the plain. 4) The northern slope of Trialeti Ridge, which is very close to Mtkvari Plain. Alluvial meadow carbonate and brown carbonate soils are found throughout the Gori plain.

Gori belongs to the fold system of the Lesser Caucasus Mountains and is characterized by plain relief constructed from Quaternary Age conglomerates, pebbles, sand, and loamy sand. The south part is constructed from paleogenic limestone and loam, while the northern part is constructed from neogenic loam and limestone. In the valley of Mtkvari river, brown soils and gray forest soils (of medium and thin thickness) are found. The land is productive and is typically used for agriculture.

Alluvial soils are found in the gorges of the rivers Didi Liakhvi, Patara Liakhvi, Mejuda, Ksani, Aragvi, Iori, Alazani, and others. In most of these gorges, alluvial carbonate soils are at the initial stage of development to the field soil. The alluvial soils of this type and old alluvial soils contain thick and medium-thick loam and are characterized by a low percent of humus.

Hydrology. The Gori area is crossed by the Mtkvari river (from east to west) and the Liakhvi river (from north to south). These rivers are sourced by rainfall runoff, snowmelt, and groundwater. The largest volume of water flow occurs in spring and the smallest flow in winter. The average flow of the Mtkvari near Gori is greater than $170 \text{ m}^3/\text{sec}$.

Biodiversity. In Gori, agriculture is the most common land use in the plain area. Since only existing roads will be rehabilitated, only vegetation next to the roads will be disturbed. The Gori engineering report (Appendix 8.3) shows the highly disturbed nature and the type of vegetation that exists along the roads.

Because of the dense human population, generally, there is little fauna that uses the Project area (the Project area is considered the affected environment, which is defined as the footprint of the roads and an area adjacent to the roads, the size of which, in part, depends on the type of vegetation, land use, and ownership.) Existing roads and channels traverse urban land, which does not support rich fauna. Some common bird and bat species can still be found in the Project area.

While the municipality is ecologically important (for example, the Mtkvari valleys between Tbilisi and Khashuri are important for bird migration because they provide routes for migration, while the river floodplains provide shelters and feeding areas for waterfowl and waders), in the urban/peri-urban environment of the affected area, wildlife is rarely found. No threatened or endangered species or other protected species are found in the affected environment. There are

no wetlands or sensitive habitats, including critical habitat of TES along and adjacent to the road segments. No protected areas are located in the “affected environment.”

In the wider region, various mammals may be found: chamois, bear, mole, marten, badger, forest cat, jackal, fox, marten, squirrel, and rabbit. But of these, only species adapted to living near human populations are found in the affected environment (i.e., squirrels and rabbits).

Cultural resources. In accordance with the Ministry of Culture and Monuments of Georgia, there are 136 registered monuments of cultural heritage in Gori Municipality, out of which 53 are located in the town of Gori. Of particular importance are the ancient rock-hewn town Uplistsikhe, Goris Tsikhe Castle, Gorijvari, and Erekle's Baths. Most of the heritage assets are churches and monasteries and therefore are owned by the Patriarchy of Georgia in accordance with the Constitutional Concordat between the Georgian Orthodox Church and the State.

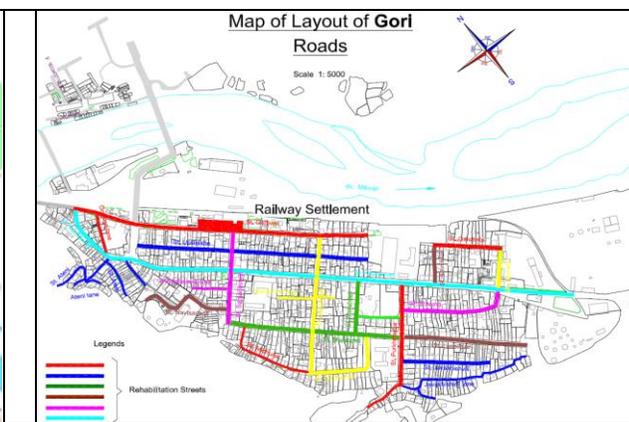
The following sites and monuments of cultural heritage are located in Gori (saunje.ge):

- Saint Mary Church;
- Khareba (Annunciation) Church;
- Holy Trinity Church;
- Iveria Holy Temple;
- Father Giorgi Mtatsmindeli Temple;
- Saint Nikolozhi Church;
- Saint Nino Church.



Goris Tsikhe Fortress

As can be seen from the maps below, the vast majority of road rehabilitation sites are located in the 'railway' district, i.e., in areas outside of where the cultural heritage monuments are found, although one main street (26th of May), which is part of the Project area (rehabilitation is planned), is visible from the central part of Gori.

	
<p>Distribution of heritage monuments in Gori (source: mygeorgia.ge)</p>	<p>Gori streets rehabilitation scheme ('railway' district) (source: Kav feasibility study)</p>

4.5.2 Affected Environment: Mtskheta Municipality

Location. Mtskheta is located in eastern Georgia on the Shida Kartli plain at 500-800 masl. It covers the right bank of Aragvi river and the left bank of Mtkvari river. Between the settled part of the town and the right bank of the Aragvi, there is vacant land of 0.4-0.45 km width. Mtskheta is the old capital of Georgia and is listed with UNESCO (see <http://whc.unesco.org/en/list/708>), therefore all activities in this city must be carefully planned in compliance with the international designation. Moreover UNESCO recently alerted the GoG that Mtskheta would be included on the Danger List (<http://whc.unesco.org/en/news/535>).

Population. The population of the municipality is approximately 64,000 in an area totaling 636.52 sq. km. There is one town (Mtskheta with population 7,700) and 63 villages in the municipality, which is made up of 25 self-government administrative units. During 2002-2009 the population declined slightly (0.9%), though after the 2008 conflict 10,400 IDPs were resettled to the district. The population (including IDPs, constituting 15.5% of total) currently is 56,900. The largest number of IDPs (6,145) is in the village Tserovani. Only 9,240 people are employed in the district, out of which 4,250 are self-employed.

Economy. The main economic sectors are agriculture and small entrepreneurship (tourism, trade/services). The main agricultural products are vegetables, gardening, fruits, animal husbandry, and wheat production. There are several large employers/businesses, producing beer and other beverages, glass and packaging, chocolate and pastry, milk and milk products, paper, meat, slaughterhouses, perfume, and detergents. The main energy facilities are Zahesi and Misaktsieli hydro-power plants. There is no shortage of electricity supply, and 60% of the population is covered by the natural gas supply network.

Geology and Soils. The territory of Mtskheta is composed of Miocene aged sediments and light gray quartz limestone. In the vertical cut of this horizon, there are clay and micro-conglomerates. Old Quaternary age alluvial soils and modern Quaternary age alluvial sediments are spread throughout. Old Quaternary age alluvial soils are represented by weakly cemented

conglomerates, rubbles and loam, and loamy-sand levels. The relief is inclined towards the south.

Hydrology. Mtskheta is located at the confluence of the Mtkvari (flowing east to west) and the Aragvi (flowing north to south). River Aragvi originates at the confluence of Tetri (white) and Shavi (black) Aragvi rivers near the village of Pasanauri and Zhinvali Reservoir.

Biodiversity. Agriculture is common on the plains. The vegetation along the road segments is disturbed with most of it in grass and shrub/brush with some trees. Many of the trees are ornamentals, having been planted in the town center and outskirts.

Fourteen species listed in the Red Data List of Georgia (2006) may be found within the Mtskheta municipality area. Thirty-five mammals can be found in the region. It is highly unlikely that protected mammal species will be found in the Project area (within the town) because of the small and heavily impacted area. However, one species (Mehylis' horseshoe bat - *Rhinolophus mehelyi*) may be found; this species uses the forested hills near the Project area and floodplain as a feeding ground. Brandt's hamster (*Mesocricetus brandti*) is another species that may be found in the proximity of the Project area.

The avifauna of the region consists of more than 145 species of birds, representing 17 orders. About 98 species of them nest in this area, 35 are migratory and 12 are wintering. In Mtskheta there are abundant populations of hawks (*Accipiter gentilis*). Nearby, on the territory of the Shio-Mgvime monastery, there are nesting places of birds of prey (listed in the national Red List), a colony of the Egyptian vulture *Neophron percnopterus*), solitary nests of long-legged buzzard (*Buteo rufinus*) and booted eagle (*Hieraetus pennatus*).

Within the municipality, there are 22 species of reptiles, including two tortoises (*Testudo graeca*, *Emys orbicularis*), nine lizards, and nine or ten (according to different authors) snakes. The only red-listed reptile whose habitat may overlap the Project area is the Mediterranean tortoise. It is found in open habitats along rivers. There are four amphibian species, but only the lake frog (*Rana ridibunda*) is found within Project area.

There are two red-listed Juniper species which may be found along river banks in the Project area.

Cultural Resources. The historic churches of Mtskheta, the ancient capital of Georgia, with its outstanding examples of medieval religious architecture, illustrate the high artistic and cultural level attained by the ancient kingdom of Georgia. Since 1994, they have been listed on the UNESCO World Heritage Site (<http://whc.unesco.org/en/list/708>) under the title, "Historical Monuments of Mtskheta."

The citadel (Armaztsikhe) of Great Mtskheta is located on the side of Bagineti mountain on the right bank of the Mtkvari. Excavations in the Armaztsikhevi valley have revealed many burials and structures from as early as the Neolithic. The Svetitskhoveli complex in the center of the town includes the 11th century cathedral. Opposite Svetitskhoveli on the top of the hill on the left bank of the Aragvi river is the Mtskhetis Jvari (Church of the Holy Rood from the end of the

6th century), the most sacred place in Georgia, where a cross was erected by St. Nino to replace heathen idols. The third important monument of Mtskheta is Samtavro (the Place of the Ruler) in the northern part of town, where legend has it that St. Nino lived. A small domed church was built in the 4th century. The main church of Samtavro was built in the early 11th century. The graves of Miriani, the Georgian king who adopted Christianity, and his wife are in the northwest corner of the church.

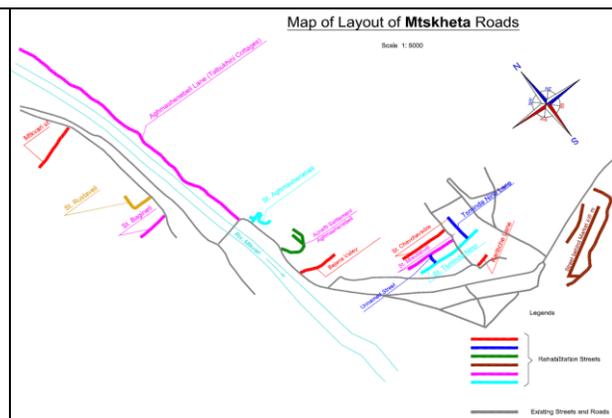
The World Heritage Committee, in 2009, inscribed the Historical Monuments of Mtskheta on the List of World Heritage in Danger because of concerns over their preservation (<http://whc.unesco.org/en/news/535>). The Committee requested Georgia to adopt an integrated management plan for the site and to address problems related to the serious deterioration of the stonework and frescoes at the site. Other issues of concern include the management of land near the churches, as well as the loss of authenticity due to work carried out in the buildings. Land use and redevelopment issues (including rehabilitation of roads) must therefore be managed with extreme care in this historic city.

The number of cultural heritage monuments located within Mtskheta municipality is 270, the following being the most prominent (source: http://economists.ge/photos_publ/05_11/93.pdf):

- The Great Mtskheta Archaeological Museum Reserve with its old quarters: Armaztsikhe castle, Bagineti, Kartli royal residence (I-V cc).
- Armaziskhevi residence of the Kartli Pitiakhshi (I-V cc, bath of IV c BC – IV c. AD)
- Bebris Tsikhe Castle – early medieval.
- Svetitskhoveli Ensemble with Cathedral built in 1010-1029.
- Samtavro Church, IX-XI cc, with Samtavro graveyard III millennia.
- Saint Nino Church – V-VI cc.
- Antioch of Mtskheta Church – V-VI cc.
- Mtskheta Jvari Church – VI-VII cc.
- Mtskheta Vault – I-II cc.
- Bridge of Pompeius.



Distribution of heritage monuments in the central part of Great Mtskheta (mygeorgia.ge)



Central Mtskheta streets rehabilitation scheme (source: Kav feasibility study)

Historically, Mtskheta was settled in early and mid-bronze ages (III-II millennia BC). During the late bronze and early iron ages, it was quite densely populated settlement (II-I millennia BC) as evidenced by graveyards and ruins of Samtavro, Zemo Avchala, Tsitsamuri, Narekvavi, Tserovani, Nabaghrevi. In the early medieval period, intense construction of sacred sites began, including Saint Nino (IV) Jvari (585-604) and Antioch (VII-VIII) Churches. In the developed feudal period, large cathedrals were built: Svetitskhoveli (1010-1129), Samtavro (XI) and others. During this period, the settlement was mostly located in a triangular shaped space near the confluence of rivers Mtkvari and Aragvi. The combination of natural and cultural landscape is the outstanding feature of the area. The area has one to two story buildings dominated by Svetitskhoveli Cathedral. Jvari Monastery is situated on the mountain across the right bank of Mtkvari. The area is extremely rich in archeological findings from all periods of the history of this settlement.



Svetitskhoveli Cathedral Ensemble



Samtavro & St. Nino Churches and Bell Tower



Mtskheta Church of St. Barbare



Antioch of Mtskheta Monastery

(Source: mygeorgia.ge)

As indicated above, the entire settlement, including its historical parts, are undergoing extensive (and quite controversial) redevelopment activities aimed at enhancing its touristic potential. Restoration of infrastructure including houses, water and sewage networks and roads, has placed Mtskheta under the UNESCO List of World Heritage in Danger.

4.5.3 Affected Environment: Oni Municipality

Location. Oni municipality is located in the northeast part of Racha-Lechkhumi and Kvemo Svaneti region, along the border of Georgia. It is bordered by the Russian Federation in the north, Java municipality (Tskhinvali region) in the east, Ambrolauri and Lentekhi municipalities to the west, and Sachkhere municipality (Imereti region) in the south. Oni settlement proper is located on both sides of the Rioni river.

Population. The municipality has about 9,300 people; 3,070 of whom live in Oni, while the rest is distributed among 17 communities. The area of the municipality is 1,356 sq. km. The population is aging and numbers are declining.

Economy. The main economic sectors are agriculture, trade, and services. Oni is fast becoming attractive for tourists due to the potential for mountaineer tourism and alpinism. Other touristic attractions in the Municipality are mineral waters and the climate.

Hydrology. The Rioni river crosses the Oni region from east to west. Rioni is the longest river in west Georgia. The source of the river is located in the southern part of the Caucasus Mountain Ridge. The river flows to the Black Sea near Poti. The length of the river is approximately 327 km and the average inclination is 7.2%. The average height of the river is 1084 meters. The main tributaries of the Rioni are Jejora (30 km), Kvirila (140), Khanistskali (57 km), Tskhenistskali (176 km), Noghela (59 km), Tekhuri (101 km), Tsivi (60 km), Sakao, Lukhunistskali, Lajanuri, Koristskali, Sulori, Kumuri, Gubistskali, and Khevistskali. There are 370 tributaries with a total length of 720 km. The hydrological network of the basin is quite dense, especially the hydrological network on the left side of the bank.

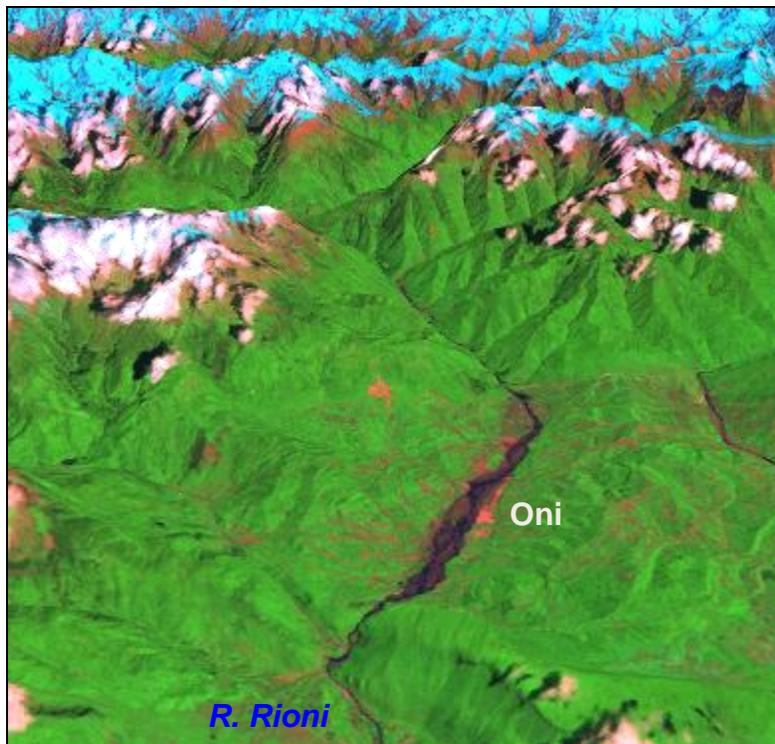


Figure 4.2: Satellite Image of Oni
(source: Landsat 5 TM, June 08, 2011)

Geology and Soils. The relief of Oni region is mountainous with intervening plains and river terraces. The plains are mainly from Quaternary age alluvial sands, loamy sand and limestone.

Tectonically the territory is a part of the Lesser Caucasus Mountainous fold system. There are various types of soils found in the region: weak gray forest and brown earth soils are found on the slopes of the mountains, while the tops of the mountains are covered by greensward and greensward–peaty mountain-meadow soils. Transitional black soils are found in the plains. The soil cover in the upper part of the section is stony. At some places stones of diameter 2 m can be found. The valley is box-shaped and winding. It is constructed from sand and pebbles and stones. In the Oni region greensward-carbonate soils are common. In the zone of deciduous and coniferous forests, weak gray forest soils are found, which are formed on rocks containing calcium carbonate. The zone of greensward-carbonate soils is characterized by erosion processes and landslides.

Biodiversity. Oni municipality has a rich diversity of plant species. Oni's variable climate, elevations, and soil conditions have produced a set of plant species that change with the elevation of the mountain (300-600 m). All Caucasian coniferous species (e.g., silver and green fir-tree, pine-tree and juniper) can be found in the area. However, as show in the Appendix 8.3 Engineering Report for Oni, the road traverses highly disturbed and urban/peri-urban type environments. Very little, good quality natural vegetation exists in the affected environment.

The fauna in Oni municipality is represented by species from mountainous areas as well as lowland fauna. Within the larger region of Oni, approximately 44 terrestrial mammal species are found, among them are wolf (*Canis lupus*), jackal (*Canis aureus*), fox (*Vulpes vulpes*), brown bear (*Ursus arctos*), badger (*Meles meles*), common marten (*Martes martes*), rock marten (*Martes foina*), wild cat (*Felis silvestris*), and roe-deer (*Capreolus capreolus*). However, due to the highly disturbed nature and the length of time the affected environment has been developed, very few wildlife species are found in the more urbanized areas of the municipality; only those species well-adapted to living near humans are found in the affected environment.

Bats (Order Chiroptera) are commonly found within the Project area. Typically, bats are highly vulnerable to environmental change. They are extremely restricted in finding shelters for their breeding colonies. Tree hollows, caves, and abandoned buildings may be used by bats for breeding and roosting. The EA Team directly observed 15 species of bats within the Project area and one additional species, the western barbastelle (*Barbastella barbastellus*), is expected to inhabit the Project area. Two species of Chiroptera, the Mediterranean (*Rhinolophus Euryale*) and Mehely's horseshoe bat (*Rhinolophus mehelyi*) are expected to inhabit the study area and are included in the Red List of Georgia and in the IUCN Red List under the category of “VU: Vulnerable.”

There are 243 bird species that may inhabit the Oni area. About 48 breeding bird species are classified as year-round residents and 53 species are migratory summer breeders. Considering all available data on bird conservation, important breeding habitat is uncommon in the Project area. Most birds found in the Project area are common, widely distributed, and numerous. The dominant group of breeding birds is small forest passerines. The larger Oni area also has breeding sites for the common buzzard (*Buteo buteo*) and the common kestrel (*Falco tinnunculus*), but breeding sites are unlikely to occur in the affected environment.

administrative center is the town of Kareli. The municipality encompasses one urban and 17 rural territorial units.

The Sagholasheni-Dvani proposed road section connects the following villages with the main national east-west highway: Sagholasheni, Tsveri, Breti (3,146 dwellers) under Breti Territorial Unit and Dirbi (3,019) and Takhtisdziri, Dvani (1,640) under Dvani Territorial Unit.

Economy and Agriculture. The main economic sectors in Kareli municipality are agriculture (48.9%) and light industry (49%). Main outputs of the local processing economy are sugar, apple concentrates, aggregate materials, wheat/milling, construction materials, cereals (12.6 tons in 2009), fruits (120 tons), vegetables (50 tons), milk and milk products, and meat. Kareli municipality's share of GDP is 1.35% and annual income per capita is 4,500 GEL.

At least three aggregate extraction sites are located in the municipality: near villages Agara, Ardeti and Bebnisi. A crushing and screening plant used to operate near Kareli on the bank of the Mtkvari. Approximately 40,000 cubic meters of gravel are stockpiled at the site, though processing facilities are not functioning any longer.

Sanitation. There are two approved waste dumps: a four hectare site in Kareli (near the mouth of Rivers Dzama and Mtkvari) and a one hectare site in Agara (in the Mtkvari floodplain). The waste sites are poorly organized and sited; locations are chosen by the villagers themselves, and no outside expertise is sought. Annual estimate of the generated waste in the municipality is 27,266 cubic meters and fee recovery for household waste is just 30%.

Geology and Soils. The relief of Kareli region is mountainous intersected by plains and river terraces. The region is mainly covered with plains developed from Quaternary age alluvial sands, loamy sand and limestone. Tectonically, the territory is part of the Lesser Caucasus mountainous fold system. Soils found in the region are weak gray forest and brown earth soils on the slopes of the mountains, while the tops of the mountains are covered with greensward and greensward-peaty mountain-meadow soils. Transitional black soils are found in the plains. The soils are productive and are primarily used for agricultural purposes.

Hydrology. The rivers of Kareli region are mainly fed by rain, groundwater, and snow. The rivers flow strongest in spring and weakest in winter. The Mtkvari river crosses the Kareli region in an east to west direction (with 20.5 km section stretching across the municipality). Other main rivers are Dzama (42 km) flowing into Mtkvari with the river source at Trialeti range; and from north to south are West Prone (21 km), Middle Prone (9km) and East Prone (16 km), all discharging into the Mtkvari.

Land and Forest Resources. Kareli district has 36,407 ha of agricultural lands: 17,802 ha are arable, 1,764 ha are mowed, 11,762.5 ha are for grazing, and 5,078.5 ha are used to grow perennial crops. Forests occupy some 23,400 hectares in Kareli district. The main tree species are oak, hornbeam, beech, fir, and pine. Typical forest wildlife is bear, deer, boar, rabbit, wolf, quail, and grouse.

Biodiversity. In the Sagholasheni-Dvani section of Kareli municipality, agriculture is the most common land cover. The natural vegetation cover is mainly degraded steppe vegetation with thorny bushes and scrub (phrygana and shibliak) e.g. *Paliurus spina-christi*; and foothill landscapes with hornbeam-oak forest. However, forest is quite degraded throughout the Project area, especially adjacent to the existing roads.

The affected environment is mainly represented by agricultural landscapes, which include orchards, arable/cultivated land and pastures. The existing roads and channels traverse arable land, which does not support rich fauna. The road segments also traverse areas where scrub/shrub and grasses are common (see Appendix 8.3 Engineering Report), as well as some large trees, many of which are ornamentals. Even in this highly disturbed environment, scrub/shrub and trees may provide songbird and raptor habitat as well as habitat for small mammals that are habituated to humans, such as squirrels and rabbits. Habitat of the Brandt's hamster (*Mesocricetus brandti*) and gray dwarf hamster (*Cricetulus migratorius*) are part of the affected environment, and these species may occur in the Project area. Available data on bats indicate that eight bat species may occur in the Project area.

Within the affected environment, on the plain, there are approximately 89 bird species. Among them 19 species are found in open landscape, 21 species in urban and rural settlements, 13 species related to riparian habitats, and about 30 species prefer bushes and forest edges. Twelve bird species out of thirty-five included in the Red List of Georgia may occur in the Project area. Most of them are migratory (6) or vagrant (2) visitors to area. One species, the Egyptian vulture, regularly feeds in the area, but the nearest known nest is out of the Project area on Kvernaki Ridge.

One reptile species on the Red List of Georgia, the Mediterranean tortoise, may occur in the Project area. Destroying places where the tortoises lay eggs will reduce population numbers in the region. Often such places are on the banks of channels and next to the roads.

One fish species on the Red List of Georgia (Golden spined loach, *Sabanejewia aurata*) may occur in the Project area. Spawning sites are sensitive to perturbations.

Cultural Resources. Kareli is rich in historic, archaeological, and cultural heritage monuments. Most are located in the River Dzama catchment, on the Trialeti slopes, including the well-known Kintsvisi Monastery Ensemble. Urbnisi is the known center of Georgian religious history. Several important monuments are located there, including Mother of God Church Ensemble of VII-IX c. period and Urbnisi Sioni Basilica (V-VI c.). None of the cultural or historical monuments are located in the Project area, but archaeological chance finds are, of course, possible.



Breti St. Giorgi Church and Nunnery, located close along the rehabilitation road in v. Breti

4.5.5 Affected Environment: Dusheti Municipality

Location. Dusheti is the administrative center of Dusheti Municipality. It is located in the east of Georgia at 900 masl elevation and belongs to Mtskheta-Mtianeti Administration Unit. It is bordered by Kazbegi Municipality and the Russian Federation to the north, Tianeti Municipality in the east, Akhalkgori Municipality in the west, and Mtskheta Municipality in the south. The region is characterized by mountainous relief. The cold season lasts for eight months.

Population. According to data from the National Statistics Service, as of January 2010, the population of Dusheti Municipality is 33,800 within a total area of 2,980 sq. km. In addition to the town of Dusheti, the municipality encompasses two settlements and 15 rural territorial units/villages.

Hydrology. Dushetiskhevi stream borders Dusheti settlement on the west. The source of the river is in the mountains and it flows into the Aragvi river. The length of the river is approximately 13 km, and its catchment area is about 36.3 km². A bridge on Bachana street crosses a stream that serves as an open sewer. The map in Figure 4.3 shows the Dushetiskhevi and its catchment and smaller tributary streams that cross the Dusheti area.

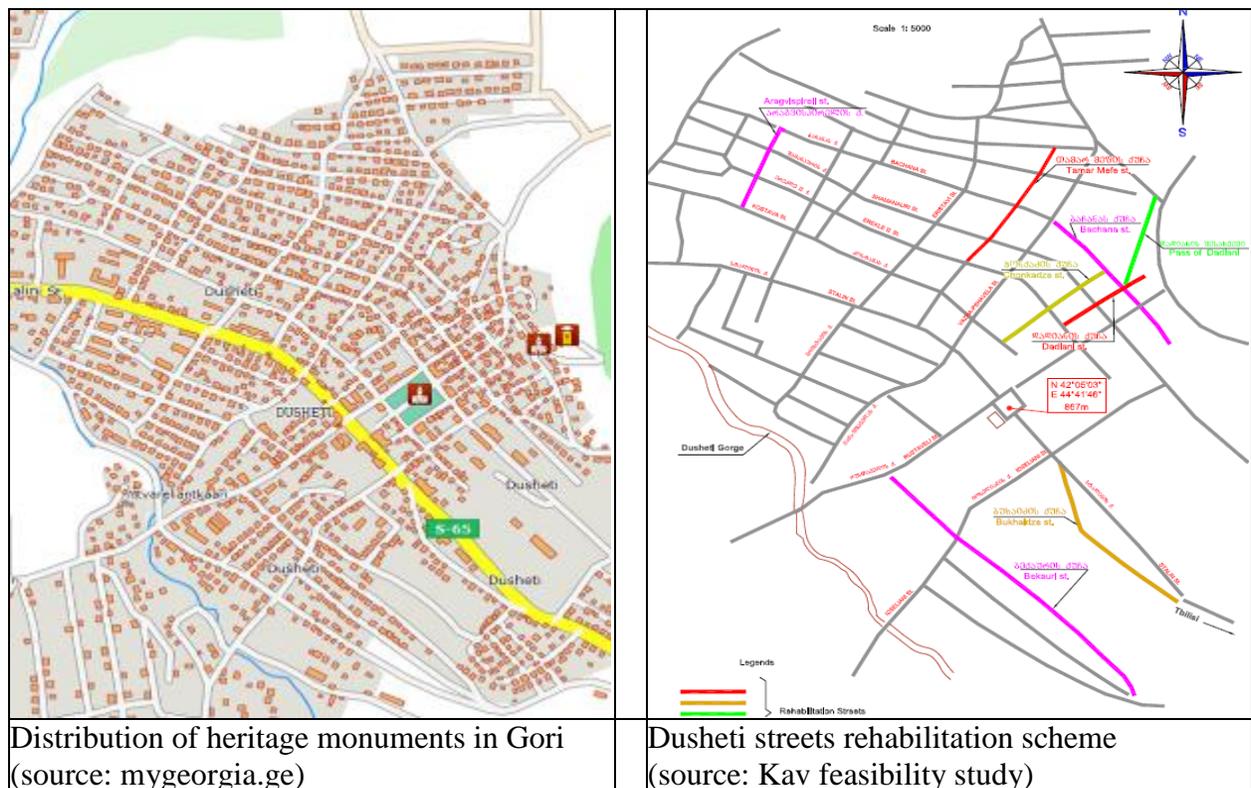


Figure 4.3: Map of Dusheti and Dushetiskhevi River Catchment (source: Landsat 5 TM, July 13, 2009)

Geology and soils. Alluvial meadow carbonate and brown carbonate soils are found across the Dusheti plain. Geologically the area belongs to the fold system of the Lesser Caucasus Mountain and is characterized by plain relief made up of Quaternary Age conglomerates, pebbles, sand, and loamy sand. The south part is made up of paleogenic limestone and loam, while the northern part is neogenic loam and limestone. Soils in Dusheti are mostly cinnamonic calcareous type. In the upstream mountainous parts, the soil type is predominantly brown forest weakly unsaturated (eutric cambisols) and in areas along the river gorges alluvial calcareous (calcaric fluvisols) soils dominate.

Biodiversity. The flora of Dusheti region is diverse. Cultural plants are spread across the plain areas. Of natural plants, sub-alpine meadows and deciduous forest are most common. Fauna that live in the region includes East Caucasian tur (*Capra cylindricornis*) (endemic to the Caucasus), chamois, bear, mole, marten, badger, wild cat, jackal, fox, marten, squirrel, and hare. Birds include several species: birds of prey - hawks, griffons (vulture), falcons and endemic to Caucasus Caucasian Black Grouse (*Tetrao mlokosiewiczzi*) and the Caucasian Snowcock (*Tetraogallus caucasicus*). Due to the populated semi-urban setting, wildlife is not normally found in the affected environment. No threatened or endangered species are expected to inhabit the affected environment.

Cultural Resources. There are cultural heritage objects in Dusheti (St. Giorgi basilica as well as the church in the central part of the settlement), but as shown on the maps below, the affected area does not encompass these historic monuments.



4.6 Policy, Legal, Regulatory and Permitting Requirements

A number of Georgian laws and regulations exist related to environment, social, labor, land, cultural heritage, and other technical issues, which are relevant to this EA.

The Constitution of Georgia sets general regulating principles of environment protection. Namely, Article 37, Clause 3 states that all citizens have the right to live in a healthy environment and use natural and cultural surroundings. In addition, citizens are obliged to protect the natural and cultural surroundings. Below is a list of the principle environmental, social, health care, cultural heritage, and technical laws and regulations.

Table 4.1: Principle Laws and Regulations Relevant to the Proposed Project

Year	Law / Regulation
	Environment
1994	on Soil Protection
1996	on System of Protected Areas
1996	on Protection of Environment
1996	on Mineral Resources
1997	on Wildlife
1997	on Water
1998	on Hazardous Chemicals
1999	on Protection of Ambient Air
1999	Forestry Code of Georgia
1999	on Compensation of Damage from Hazardous Substances
2000	on Regulation and Engineering Protection of Coastline and River Banks of Georgia
2005	on Red List and Red Book of Georgia
2006	on Licenses and Permits
2007	on Status of Protected Areas
2007	on Ecological Examination
2007	on Service of Environmental Protection
2007	on Environmental Impact Permit
2002	Regulation on Environmental Impact Assessment (approved by the Order No. 59 of the Minister of Environment.
	Cultural Heritage
2007	Law on Cultural Heritage
	Social, health and labor issues
2007	Law on Public Health
1997	Law of Georgia on Health Care
2006	Labor Code of Georgia
1997	Law on Professional Unions
	Land ownership and land take

1997	The Civil Code of Georgia
1997	The Civil Procedural Code of Georgia
1996	The Law of Georgia on Ownership of Agricultural Land
2010	Law on State Owned Property
2007	Law of Georgia on Entitlement of Ownership Rights to Lands Possessed (Employed) by Physical and Legal Persons of Private Law
1999	The Law on Rules for Expropriation of Ownership for Necessary Public Need
2007	Law on Replacement Cost Reimbursement and Compensation for the Use of Agricultural Land for Non-Agricultural Purposes
2007	Presidential Decree #525 on Rules for Entitlement of Ownership Rights to Lands Possessed (Employed) by Physical and Legal Persons of Private Law and Approval of Ownership Certificate Format

The environmental permitting system in Georgia is regulated by the Law on Environmental Impact Permit, Law on Licenses and Permits, Law on Ecological Assessment, and Law on Licenses and Permits. These laws are described in the section on Relevant and Applicable Permitting Requirements, below.

Law of Georgia on Protection of Environment

This law regulates the legal relationship between the bodies of the state authority and the physical/legal persons regarding environmental protection and use of natural resources on Georgian territory, and defines responsibilities of state institutions. The law gives major principles for environmental management, licensing, standards, EIA, and related issues and describes different aspects of the protection of ecosystems, protected areas, and biodiversity.

Law of Georgia on Natural Resources

The law defines the status of natural resources, describes their use, and sets out the types of licenses and rights and obligations of the users. The law sets responsibilities to preserve lands from contamination and ensures conformity of agricultural activities with relevant legal requirements. It describes economic principles for consumption of natural resources.

Law of Georgia on Soil Protection

The law aims at ensuring preservation of soil integrity and improving its fertility. It defines obligations and responsibilities of land users and the state regarding provision of soil protection conditions and ecologically safe production. The law sets the maximum permissible concentrations of hazardous matter in soil. It also restricts the use of fertile soil for non-agricultural purposes; execution of any activity without stripping and preserving topsoil; open quarry processing without subsequent re-vegetation of the site; terracing without preliminary survey of the area and approved design; overgrazing; wood cutting; damage of soil protection facilities; any activity that would degrade soil quality (e.g., unauthorized chemicals/fertilizers, etc.).

Law of Georgia on Protection of Atmospheric Air

The law regulates protection of atmospheric air from adverse anthropogenic impact within the whole Georgian territory (Part I, Chapter I, Article 1.1). Adverse anthropogenic impact is any

human-caused effect on atmospheric air causing or capable of causing negative impacts on human health and the environment (Part II, Chapter IV, Article II.I).

Law of Georgia on System of Protected Areas

The law sets out the categories of protected areas (including national parks, state reserves, managed reserves, etc.) and defines activities allowed in their boundaries.

Law of Georgia on Water

The law regulates protection and consumption of surface and groundwater, commercial water production, protection of aquatic life, fauna, flora, forest, land and other natural resources. Consistent with the legislation, water within the territory of Georgia is under state ownership.

Law on Rules for Expropriation of Ownership for Necessary Public Needs

The state has the constitutional power to seize any property by means of expropriation for projects of imminent public necessity. The expropriator has to make every reasonable effort to acquire property by negotiation and is required to value the property in accordance with the fair market value before negotiations.

Law on Replacement Cost Reimbursement and Compensation for the Use of Agricultural Land for Non-Agricultural Purposes

The law specifies requirements for a land replacement fee (based on location and quality of land) to compensate the government and private landowners/ land users for property loss, plus lost profits by the beneficiary as a result of allocation of agricultural land for nonagricultural purposes.

Labor Code of Georgia

The code regulates labor relations between all workers and employees in Georgia. It supports the realization of human rights and freedoms through fair reimbursement and the creation of safe and healthy working conditions.

4.6.1 International Standards and Best Practices

International standards that may apply to the project include the ILO core labor standards on:

- Forced labor (C105)
- Child Labor (C182)
- Discrimination (C111)
- Freedom of Association and the Right to Organize (C 87)
- Equal Remuneration (C100)
- Minimum Age (C138)

Georgia is a party to the following environmental conventions and treaties, not all of which will be relevant to the project:

- Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitat
- UN Rio de Janeiro Convention on Biological Diversity
- Convention on Migratory Species
- Paris Convention on the Protection of World Culture and Natural Heritage
- Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters
- European Archaeological Heritage Convention
- European Convention on Protection of the Archaeological Heritage (Lavallette, 1992 – 01 – 16) – Georgia joined the convention on February 23, 2000, pursuant to Decree # 158; and
- European Convention on Protection of the Archaeological Heritage (Granada, 1985-10-03) – Georgia joined the convention on February 23, 2000, pursuant to Decree # 157.

4.6.2 Relevant and Applicable Permitting Requirements

In Georgia, projects requiring ecological examination are mainly regulated by the following laws:

Law of Georgia on Environmental Impact Permit

The Law on Environmental Impact Permit contains the list of activities subject to EIA and the related procedures and regulations governing the issuance of environmental impact permits (EIP). Road rehabilitation project does not require an EIP and/or State Ecological Expertise (SEE) under the Georgian legislation, since in accordance with the Article 4 of the Law of Georgia on Environmental Impact Permits, road rehabilitation is not listed as a type of project subjected to EIP or SEE. Setting norms for maximum permissible levels of air and water emissions specifically for the project is not required either. According to current legislation, water and air emissions during rehabilitation and operation of the project facilities should therefore comply with the existing norms established by the Technical Regulations of the Environmental Protection (Order of the Minister of Environment Protection No. 745, dated 13.11.2008).

Law of Georgia on Ecological Examination

This law makes ecological examination an obligatory step to issue the environmental impact permit or construction permit for certain types of activities.

Law of Georgia on Licenses and Permits

The law regulates the issuance of licenses or permits, gives an exhaustive list of licenses and permits, and sets the rules for issuing, amending, and cancelling permits. The law defines three principles for issuance of the license:

- “One-window” principle – meaning that a licensing administrative body shall ensure the approval of additional licensing conditions by the other administrative bodies.
- “Silence gives consent” – licensing administrative body is obliged to make a decision in due course after the submission of the application. Otherwise, if a decision is not made in the determined time period the license is deemed issued.

- “Umbrella principle” – the holder of the general license is not obliged to apply for specialized licenses.

NB: Recent changes introduced into the legislation (Law on Governance, March, 2011) concerning the environment protection and natural resources had significant impact on redistribution of governmental functions, transferring many responsibilities from the Ministry of Environment towards the Ministry of Energy and Natural Resources (forestry, inspectorates, natural resources use including fisheries and game), Ministry of Economy and Sustainable Development (licensing), Ministry of Regional Development and Infrastructure (regulation and investment in river bank protection and hydrological infrastructure), Ministry of Agriculture (regulating pesticides and fertilizers).

5. Environmental Consequences

5.1 Environmental Impacts of the Proposed Action and Alternatives

The Road Rehabilitation Environmental Scoping Statement (ESS) provided a framework for analyzing the potentially significant social and environmental impacts. The ESS listed the concerns that were generated from document review, scoping meetings, and site visits. The concerns were categorized into potentially significant social and environmental issues for further analysis in the EA. The ESS also identified the additional information needed to adequately analyze the issue for the EA.

This chapter evaluates the potentially significant social and environmental issues identified by the Scoping Team, as revised by the EA Team (see below, Section 5.1.1, Concern 6).

5.1.1 Direct & Indirect Effects and their Significance

Social & Environmental Concern	Potentially significant issue	EA Requirements/ Work Tasks
1. Impact to Threatened, Endangered & Protected Species (TES); disruption of sensitive habitats (including amphibian crossings in Oni (and possibly Mtskheta), red-listed juniper species along roads, and other sites where protected birds, bats, amphibians and reptiles may use habitats along roads).	Rehabilitation, including construction and operation phases, could impact TES and sensitive ecological habitats. This could occur through direct impacts (workers may disrupt habitats without oversight) or it may occur indirectly through habitat alterations due to road rehabilitation. Short and long-term impacts are possible.	Identify presence of TES and/or habitat; identify other important habitats; determine possible short and long-term habitat alterations.

As discussed in Section 4, the five road rehabilitation projects (Alternative 1, the Proposed Action) are located in already disturbed areas, most of which are urban/peri-urban, and most are considered highly disturbed, providing poor quality and very little wildlife habitat. In general, vegetation is not extensive along the proposed roads. Where vegetation exists, it is highly disturbed and provides little of its original ecosystem functions. This is well illustrated in the photographs in the Site Reports in Appendix 8.3.

As described in Section 4, the affected environment in Gori and Dusheti is degraded, it has been heavily impacted by human populations over a long period of time, and TES, endemics, and other protected and sensitive species will not be affected by Alternatives 1, 2, or 3.

However, some of the municipalities have a few areas that may be exceptions, where good habitat exists that may be valuable to protected and other sensitive species. Alternative 1 road segments in Kareli Municipality may provide habitat for wildlife that is accustomed to living near human populations (squirrels and rabbits); the Mediterranean tortoise may also be found there, and may be affected by Alternative 1; and a red-listed fish (spiny loach) may be affected by increased erosion and sediment load from construction activities (if erosion control measures are inadequate). In addition, in Kareli, red-listed birds could be affected by Alternative 1—if road rehabilitation requires that trees be cut or if shrub/brush used by these birds is cut. Alternatives 2 and 3 may have less adverse impacts on wildlife than Alternative 1. Mitigation is needed for Alternative 1 to minimize potential significant impacts. (See below, Section 5.4.)

Mtskheta may also have some areas that are exceptions; bats, the Mediterranean tortoise, and the lake frog may inhabit areas near the proposed road rehabilitation (Alternative 1). In Mtskheta, two red-listed Juniper species are found along the road, and road rehabilitation (Alternative 1) could destroy these plants. Along the proposed roads in Oni there also may be some areas rich in wildlife, especially bats and amphibians. Of particular note, in Oni the proposed action may cross amphibian migration routes. In these cases, Alternative 2 and possibly Alternative 3 would have less impact than the proposed action. Alternative 2 would minimize the number of road segments rehabilitated (and maximize quality) and thereby could avoid the segments of concern. Alternative 3 would mean the road continues to deteriorate, traffic is slowed and vehicles may avoid these segments of concern in favor of roads in better shape. However, the No Action Alternative could also mean that vehicles use alternate routes (those in better shape) that may be in areas more heavily used by wildlife (including amphibians during migration) or it could mean that vehicles cut their own paths through adjacent areas used by wildlife (such as wetlands to which amphibians are migrating). Mitigation is needed for Alternative 1 to minimize potential significant impacts. (See below, Section 5.4.)

Long-term impacts may occur if traffic (numbers and/or speed) markedly increases under Alternatives 1 and 2; wildlife populations could easily be affected—and could be decimated from vehicle accidents. As mentioned, this is of particular concern in Oni Municipality, where frogs and toads crossing the road during migration requires mitigation. Alternative 2 could avoid these areas (mainly in Oni Municipality) where amphibians typically cross. Alternative 2 could also avoid areas of concern in Mtskheta Municipality, where tortoises and frogs may be affected by vehicle accidents.

In general, populations of birds and small and large mammals may also be affected by increased traffic numbers and increased speed; some of these animals may be protected or sensitive species, however, many are not. Alternatives 1 and 2 could both have adverse impacts that are typical of any road rehabilitation activity where traffic and speeds may increase. Alternative 2 would be unable to avoid all possible impacts to wildlife from increased traffic and speed (mainly since birds and mammals are very mobile, and Alternative 2, even if it minimizes the number of roads to be rehabilitated would still result in more collisions with wildlife such as birds and mammals than No Action). The No Action Alternative would mean that speeds and traffic along the target roads remains low, and collisions with wildlife would be less likely. Mitigation is needed for Alternative 1 to minimize potential significant impacts. (See below, Section 5.4.)

Mitigation for construction camp impacts is described in the EMMP (Section 6); given the extent of already built up areas in these municipalities, potential impacts from construction camp siting can be easily mitigated. Construction camp operations (solid and liquid waste, hunting and fishing, and social impacts) are also easily mitigated with best practices, as proposed in the EMMP.

Construction phase impacts on TES may occur from habitat degradation (indirect effect), as described below (impact #2). As opposed to direct impacts such as killing TES, these indirect effects are more likely to occur during construction than direct effects on TES.

Significance: In general, habitats are already degraded along the proposed routes. Where there are exceptions, mitigation such as retention of valuable/important trees, use of speed bumps and signage, use of adequate erosion control measures, especially on stream and river banks, and other best practices are available to avoid most impacts from Alternative 1. Alternative 2 may be an option where these best practices could not minimize impacts (Alternative 2 could avoid specific troublesome segments in specific municipalities such as in Oni, if other mitigation to protect amphibians is unavailable or inadequate, or in Mtskheta, where red-listed Juniper occurs, or if other protected species and their habitat is at risk from Alternative 1). Overall, mitigations are needed for Alternative 1 to minimize potential significant impacts. (See below, Section 5.4.)

Social & Environmental Concern	Potentially significant issue	EA Requirements/ Work Tasks
2. Impacts to wetlands and other natural resources; disturbance or threat to important ecological habitats (including riparian habitats along roads in Kareli).	Rehabilitation, including construction and operation phases, could impact wetlands and other habitats. There may be direct and indirect impacts. Short and long-term impacts are possible.	Determine existence and importance (function and quality) of key natural resources/vegetation types (wetlands and habitats of ecological importance); determine possible short and long-term habitat alterations and effects on the habitat.

During the EA phase, site visits confirmed that for all five road rehabilitation projects under the proposed action (Alternative 1) no wetlands are crossed by the existing roads; the proposed action will have no direct effects on wetlands. Direct impacts to wetlands are similar among all three options. Given the location of the Proposed Action in Gori and Kareli, no wetlands would be affected indirectly either.

There are wetlands in Mtskheta, Oni, and Dusheti, which may be *indirectly* affected by the proposed action. In these municipalities, wetlands are found near to the proposed roads (Alternative 1), and construction waste and erosion could affect quality of the wetland, could result in siltation and contamination, and could have long-term effects on habitat quality and ecosystem functions. As mentioned, Alternative 2 could avoid these road segments. However, typically, engineering best practices can minimize any potential construction phase impacts to wetlands. If best practices are applied (see EMMP), Alternatives 1 and 2 would both have

minimal impacts. The No Action Alternative, which means the roads continue to deteriorate, may have adverse effects on wetlands—siltation would increase, sections of the road could block water flow, and under the No Action Alternative, these effects could not be mitigated.

Besides wetlands, there is very little quality habitat in the “affected environment.” There are some trees that may be important for bats and birds, and the No Action Alternative would leave those standing; Alternative 2 could avoid them by avoiding those segments; and Alternative 1, could avoid cutting them during construction and operation/maintenance. Given that these are existing roads, there are no valuable trees in the roadbed.

In Kareli, riparian habitat lies adjacent to the road (Alternative 1) and various actions during the construction phase (temporary or permanent storage of material and stockpiling fill, fuel spills, driving through the habitat) could have detrimental effects. Alternative 2 could avoid this segment entirely. During operation and maintenance phase, Alternative 1 would not be likely to affect the habitat, but wildlife species that use this habitat may be affected by increased traffic and speeds. Mitigation is needed for Alternative 1 to minimize potential significant impacts. (See below, Section 5.4.)

Significance: There is very little quality habitat in the affected environment. A few important wetlands and some mature trees are exceptions, and during construction, easily implemented mitigation measures (erosion control, tree retention, minimizing brush cutting) can minimize any concerns over impacts to habitat. (See below, Section 5.4 for mitigations.) Depending on the importance of the riparian habitat in Kareli, Alternative 2 (avoidance) may be appropriate if mitigation measures are unable to minimize impacts.

Social & Environmental Concern	Potentially significant issue	EA Requirements/ Work Tasks
3. Impacts to cultural and historic resources including cultural or historic chance finds.	During the construction phase, cultural resources may be found, disturbed, and/or destroyed.	Identify cultural resources of importance in the vicinity of the projects and as appropriate for the specific resources, measures to remove or protect.

In Gori and Dusheti, the proposed rehabilitation (Alternative 1) is outside the area where cultural heritage monuments are located; in Mtskheta, Oni, and Kareli, proposed roads do not transect monuments, but the roads run nearby (the monuments could be considered part of the affected environment). However, none of the roads in Alternative 1 will directly affect monuments. Activities that could possibly indirectly impact monuments, such as noise, detours, vibration, and air quality would be minimal under Alternatives 1 and 2. Indirect and direct impacts to monuments would be non-existent under Alternative 3.

In all the target municipalities, it is possible to find archaeological and historical artifacts when ground is disturbed. This is as likely under Alternative 1 as it is under Alternative 2. Only in the No Action Alternative will there be no land disturbance, and therefore, no disturbance of artifacts—there would be no adverse effects on cultural artifacts. Potential adverse effects on artifacts from Alternatives 1 and 2 are easily mitigated. (See below, Section 5.4 and Section 6 EMMPs for mitigations.)

Significance: While all the target municipalities are rich in cultural resources, no direct impacts are expected on monuments. As a safeguard, collaboration and compliance with land use plans are already part of Alternative 1 and would be expected to minimize indirect impacts. Alternatives 1 and 2 equally could unearth artifacts during the construction phase, and mitigation/best practices can mitigate this concern. (See below, Section 5.4 for mitigations.)

Social & Environmental Concern	Potentially significant issue	EA Requirements/ Work Tasks
4. Impacts of changes in water quality, sediment loads; deterioration of downstream water and impacts on downstream users; pollutants include hydrocarbons, suspended solids, possible toxics.	Roads and drainage runoff may carry contaminants downstream to areas where they may concentrate (if flushing is inadequate) and/or to areas where they may cause significant damage to natural resources. This is mainly a long-term impact that is of concern during the operation phase.	Determine points of possible contamination (i.e., where changes to water quality or sediments impact downstream users).

Under Alternative 1, the road rehabilitation involves no major water crossings in any of the municipalities. There may be crossings of seasonal streams (in Mtskheta and Dusheti), but water quality and the habitat value of seasonal streams is poor. In Mtskheta the road runs along river banks (but there is no crossing of the river). Best practices (erosion control, care with heavy machinery so that no fuel spills occur) are needed to protect river banks and the river itself.

Alternative 1 will improve drainage on the roadways and it may also improve water quality of the streams by decreasing erosion, sedimentation, and cleaning the slopes. Alternative 2 could eliminate some segments and use higher quality drainage infrastructure. However, given the minimal ecological importance of the streams that will be crossed, and that they are not used for fisheries or other purposes, Alternative 1 drainage structures are expected to be adequate. There is no need to avoid the crossings as would be the case in Alternatives 2 and 3. In Alternative 3, the road would continue to deteriorate, and concrete and soil would continue to contaminate the streams that the road crosses.

Significance: Due to the quality of water in the streams that will be crossed, no significant environmental impacts are expected, and with best practices implemented during construction (Alternatives 1 or 2), water quality should improve. Along the river banks in Mtskheta, appropriate erosion control and other safeguards are needed, and with implementation of these, impacts will be minor.

Social & Environmental Concern	Potentially significant issue	EA Requirements/ Work Tasks
5. Cumulative impacts of road rehabilitation activities.	Cumulative impacts may result from the combination of past, present, proposed, and reasonably foreseeable actions. A cumulative effects analysis is part of this EA.	Identify the space, time, and assumptions to predict cumulative impacts.

Cumulative impact is defined by the US Council on Environmental Quality as:
...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

The municipalities have few if any new developments; most buildings are several decades old, and while some of the important historical sites have been restored they are reconstructed in line with their historical nature. Other developments planned for the municipalities are included in the Municipal Infrastructure Development Plans and they are mainly sewage, water lines, power lines, and communication lines.

Some of the existing projects that the road rehabilitation work will need to coordinate with are the Baku-Supsa high pressure pipeline crossing in Kareli, a water pipeline in Mtksheta, and water supply installation in Gori.

The proposed project (Alternative 1) and Alternative 2 may encourage investment in the municipalities—that is one of the aims of USAID support. Tourism investment is the most likely, and all investment would be required to comply with the infrastructure development plans for each municipality and with local norms for cultural and historical integrity. Given that cultural and historical tourism is one of the key drivers of the economy of these municipalities, these norms are strictly implemented. The other key economic driver, agriculture, would be expected to benefit under Alternatives 1 and 2. Tourism investment would bring in more tourists who would help raise income of agricultural producers in the regions, and this would encourage the continuation of the agricultural, semi-rural nature of the regions.

Significance: Cumulative impacts from Alternatives 1 and 2 would be the same, and they would have minor effects on the environment (minor adverse effects and minor benefits); whereas both alternatives are intended to have fairly significant economic impact. The No Action Alternative would have adverse effects on the economies of the municipalities—they would have difficulty competing for regional and international tourism, which is considered the main income generator other than agriculture. The No Action Alternative may have adverse effects on the environment since the municipalities may decide to try to attract more environmentally damaging industry in the interests of providing employment for their citizens. Cumulative impacts are not expected to be significant.

Social & Environmental	Potentially significant issue	EA Requirements/ Work Tasks
6. Added by the EA Team: temporary or permanent land expropriation.	During construction, private land may be temporarily expropriated during construction, or in some places, roads may be slightly widened and private land expropriated.	Identify locations where expropriation may occur.

As can be seen from the engineering reports, there are many areas along the road segments that back up to private property, including walls, houses, and shops. These may be affected by Alternatives 1 and 2 in a number of ways.

(1) During construction, noise, dust and other air pollutants would be increased temporarily. The low amount of traffic on most of these roads may slightly increase, but long-term impacts of noise and air pollution would be minor. Alternative 2 would avoid rehabilitating road segments that run adjacent to private property, thereby avoiding these temporary adverse effects (noise and air pollution); however given the large number of structures along the road, entirely avoiding residences and other privately owned property would be impossible, and probably would be unwarranted. The No Action Alternative would have no effect on the current level of noise or air pollution.

(2) During construction for Alternatives 1 and 2: (a) construction waste may be temporarily stored on private property that is located adjacent to the roads or (b) private property may be directly affected by the need to excavate beyond the current footprint. Both of these situations would involve temporary expropriation. Construction waste would be removed once the construction crew is finished with the road segment (as required by best practices which are included in the EMMP -Section 6 and which will be included in the Bill of Quantities (BOQ).) Excavations will be backfilled to original contour once construction is complete. Alternative 2, as above, would avoid some segments where private property is adjacent to the road, and thereby could avoid the most problematic segments for temporary expropriation. The No Action Alternative would entirely avoid the impact of temporary expropriation.

GMIP will comply with Georgia's *Law on Rules for Expropriation of Ownership for Necessary Public Needs*, in which the expropriator (USAID-GMIP) has to make every reasonable effort to acquire property by negotiation and is required to value the property in accordance with the fair market value before negotiations.

Significance: As long as there is compliance with the GoG law on expropriation, impacts of Alternatives 1 and 2 would be minor.

5.1.2 Issues eliminated from further evaluation

The ESS stated that the concerns in Table 5.1 required mitigation, but no additional investigation and analysis in the EA was needed. Best practices are widely available and can be easily applied to the GMIP Proposed Action; they are included in Section 6 EMMPs and they will be included in the Bill of Quantities (BOQ) as well. The EA Team included an additional concern (See below, Table 5.1, Concern 7) that requires best practices in the EMMP.

Table 5.1 Concerns that have been eliminated from further evaluation

Social & Environmental Concern	Reason for Elimination
1. Excavation, pavement removal, trenching, grading; removal of damaged drainage systems; offsite disposal of damaged pavement, sidewalk and drainage pipes/culverts; management of any contaminated concrete/waste arising from the road sites during construction needs careful, appropriate and well-defined planning and execution; disposal of excavated material; disposal of construction waste.	Information is sufficient to provide best practices to minimize this concern; BPs to be included in the bidding document. No additional investigation is needed.
2. Vegetation growth and sedimentation in drainage systems.	Information is sufficient to provide best practices to minimize this concern; BPs to be included in the bidding document. No additional investigation is needed.
3. Dust generation; pedestrian and traffic safety; health and safety	Sufficient information is available to develop BPs for inclusion in the bidding document. No additional investigation is needed.
4. Increased erosion and sedimentation during operation	Sufficient information is available to develop BPs to minimize this concern; BPs to be included in the bidding document. No additional investigation is needed.
5. Rehabilitation activities could degrade air quality, cause noise pollution, and leaks from machinery could pollute water and soils.	Sufficient information is available to develop best practices to minimize this concern; these to be included in the bidding document. No additional investigation is needed.
6. Construction camps could result in pollution of surface and groundwater if inadequate sanitary facilities are not provided; damage to habitats; cutting of trees if alternative fuel and building material is not provided; alter landscapes if the site is not returned to previous conditions; introduce alcohol and socially destructive practices via construction crews.	Sufficient information is available to develop BPs to minimize this concern; these to be included in the bidding document. No additional investigation is needed.
7. Added by the EA Team: Quarrying, gravel pits and borrow pits for road materials and fill may result in impacts, and if mitigation measures are not implemented, erosion, sedimentation, aesthetic impacts as well as landslides and loss of human life are possible. Transportation of new road materials, concrete and asphalt, drainage collectors/pipes and impacts from transporting waste materials for disposal may cause impacts to existing roads.	Sufficient information is available to develop BPs, and no additional investigation is needed.

5.1.3 Possible Conflicts between Proposed Action and Land Use

As mentioned, the proposed road rehabilitation will comply with Municipal Infrastructure Development Plans. This will help ensure that there are no conflicts between the proposed action and land use in the municipalities.

The municipalities are peri-urban/rural and they are economically focused on tourism and agriculture. The proposed action is in line with this—road rehabilitation is designed to encourage tourism, and by increasing job opportunities in the tourism sector and increasing revenue of those involved in related sectors, the general characteristics of these municipalities are expected to remain rural/peri-urban and agricultural.

5.1.4 Possible Conflicts between Proposed Action and Policies and Controls

As above, GMIP will coordinate with local authorities to ensure that the upgrades and rehabilitation comply with local concerns such as zoning, water use, agricultural land conversion, and others (see Chapter 4 for local government requirements).

5.2 Energy Requirements of Alternatives

Energy requirements of Alternatives 1 and 2 have similar energy requirements. Most of the energy requirements occur during construction since heavy machinery will be used during the construction phase. The maintenance phase will also require energy (equal for Alternatives 1 and 2), but this is expected to be minimal since most maintenance will occur manually with workers cleaning drainage systems. The No Action Alternative will require no energy use.

5.3 Irreversible and Irrecoverable Commitment of Resources

Alternative 1 may involve irreversible or irretrievable commitment of resources. Specifically, this could occur in Oni, and less likely in Mtskheta where amphibians cross the road during migration. In addition, the riparian habitat in Kareli may be highly sensitive and species that rely on it could be disturbed by construction and operation/maintenance. GMIP will implement all reasonable measures as advised by the biologist to be hired for the construction phase, and will take all efforts, as recommended, to minimize impacts. However, if mitigations do not provide adequate protection, Alternative 2 may be considered—avoid these segments in favor of other road improvements. No other irreversible or irretrievable commitment of resources is expected.

5.4 Means to Mitigate Adverse Environmental Impacts

Construction phase impacts can be mitigated by best practices (using erosion control especially when working in stream crossings and on riverbanks; ensuring stockpiled fill and equipment and material storage sites are located in areas away from ecologically important areas; protecting against fuel spills; retaining brush and trees; and implementation and monitoring of other practices described in the EMMP, Section 6.

Construction camp impacts are easily mitigated given the already disturbed nature of the general locations. Worker training can be used to identify and protect cultural or historic chance finds.

Best practices are available to address impacts from improper extraction of road materials as well as impacts from transporting new road materials, concrete and asphalt, drainage collectors/pipes and transporting waste materials for disposal.

Operation and maintenance phase impacts (other than those below) can be mitigated by commonly used best practices: erosion control along stream and river banks, signage, speed bumps, retention of brush and trees (unless they cause a human safety hazard or if mowing is needed to minimize vehicle collisions with wildlife).

As stated in Section 5.3, GMIP will implement all reasonable measures as advised by the biologist to be hired for the construction phase, and will take all efforts, as recommended, to minimize the following impacts:

- Amphibian crossings in Oni (and possibly Mtskheta);
- Riparian habitats along the road in Kareli;
- Red-listed juniper species along roads; and
- Other sites where protected birds, bats, amphibians and reptiles use habitats along roads.

A professional biologist will be included on the team to determine the possibility for mitigation of impacts to amphibians along migration routes; to determine the need for mitigation of possible impacts to riparian habitat in Kareli; to identify, during construction, the specific trees and other vegetation to retain (for birds and bats); to identify any important wetlands to protect (especially any seasonal concerns); and to monitor construction phase impacts and success of mitigation in minimizing construction phase impacts. If mitigations do not provide adequate protection, Alternative 2 may be considered—avoid these segments in favor of other road improvements.

GMIP compliance with the *Law on Rules for Expropriation* and with municipal land use plans should ensure that social and cultural impacts do not result.

6. Environmental Mitigation and Monitoring Plans

This chapter includes the EMMPs for road rehabilitation activities. Table 6.1 covers mitigation and monitoring measures for construction and rehabilitation of roads and Table 6.2 covers operation and maintenance of municipal roads.

6.1 Environmental Mitigation and Monitoring Plans

The Table 6.1 EMMP addresses impacts associated with construction activities, road rehabilitation, disposal of old/damaged asphalt and road subsurface materials, disposal of damaged sidewalks and drainage collectors/pipes, extraction of road materials, socio-economic and public health and safety. The EMMP addresses impacts to TES and cultural and historic resources. The Table 6.2 EMMP covers road operation and maintenance including road ruts, potholes and clogged drains, increased traffic, impacts to TES and cultural/historic resources and municipal road maintenance programs.

Tables 6.1 and 6.2 provide the monitoring indicator(s), monitoring and reporting frequency and GMIP party responsible for monitoring. Monitoring is provided to ensure the effectiveness of mitigation measures. For TES and cultural/historic impacts monitoring, a report is included at the end of the construction period that recommends mitigation measures for use during the irrigation operational period to protect TES and cultural and historic resources.

For the activity, Rehabilitation of Municipal Roads in Gori, Dusheti, Mtsketa, Oni and Kareli, mitigations in Table 6.1 address the following identified environmental impacts:

- Impacts to Threatened, Endangered & Protected Species (TES); disruption of sensitive habitats (including amphibian crossings in Oni (and possibly Mtskheta), red-listed juniper species along roads, and other sites where protected birds, bats, amphibians and reptiles may use habitats along roads).
- Impacts to wetlands and other natural resources; disturbance or threat to important ecological habitats (including riparian habitats along roads in Kareli).
- Impacts to Cultural and Historic Resources including cultural or historic chance finds.
- Construction Camp Damage to Local Habitats and Depletion of Local Fauna/Flora.
- Impacts from Lack of Environmentally Sound Facilities or Poor Sanitation at Construction Camp Facilities.
- Impacts from Lack of Management of Construction Areas, Equipment and Materials Storage.

- Community Impacts from Introduction of Alcohol and Other Socially Destructive Substances via Construction Crews.
- Impacts from Lack of Control of Stormwater runoff during Road Rehabilitation.
- Impacts on Roads from Transporting New Road Materials, Concrete and Asphalt, Drainage Collectors/Pipes and Impacts from Transporting Waste Materials for Disposal.
- Impacts from Removal and Disposal of Old/Damaged Asphalt, Road Subsurface Materials, Sidewalks, Drainage Collectors/Pipes.
- Impacts from Improper Extraction of Road Materials (Quarry and Gravel Pits and Barrow Pits).
- Impacts from Road Rehabilitation (Add Compaction of Roadbed and Addition of Materials for Subsurface Layers and Pavement.
- Impacts from Rehabilitation of Sidewalks and Drainage Collectors/Pipes
- Noise, Odor and Visual Quality Impacts.
- Socio-economic Impacts.
- Public Health and Safety Impacts.

For the activity, Strengthening Operation and Maintenance of Municipal Roads, mitigations in Table 6.2 address the following identified environmental impacts:

- Impacts to Threatened, Endangered & Protected Species (TES).
- Impacts from Road Ruts, Potholes, Mud-holes and Washboarding.
- Impacts from Clogged Drainage Collectors/Pipes, Standing Water and Water Pools.
- Road Improvements Increase Traffic and Vehicle Speed, Higher Accident Rates.
- Water, Soil and Other Environmental Impacts due to Weak Municipal Road Maintenance Programs.

TABLE 6.1: Environmental Mitigation and Monitoring Plan for Road Rehabilitation

Activity	Identified Environmental Impacts	Are Impacts Potentially Significant?	Mitigation Measure(s)	Monitoring Indicator(s)	Monitoring and Reporting Frequency	Responsible Party(ies)
Rehabilitation of Municipal roads in Gori, Dusheti, Mtsketa, Oni and Kareli	Impact to Threatened, Endangered & Protected Species (TES); disruption of sensitive habitats (including amphibian crossings in Oni (and possibly Mtskheta), red-listed juniper species along roads, and other sites where protected birds, bats, amphibians and reptiles may use habitats along roads).	N	Use biologist experienced with TES and their habitat. Conduct survey of amphibian crossings in Oni (and possibly Mtskheta). Conduct surveys of red-listed juniper species along roads. Conduct additional survey of sites where protected birds, bats, amphibians and reptiles may use habitats along roads. Develop TES program to protect TES and habitats. Implement TES protection programs including worker training to identify and protect TES and habitats.	Conformance with TES Program Surveys by TES biologist. Inspections by TES biologist. Number of TES identified habitats protected Number of employees trained.	Survey reports for TES/habitat identification and protection Inspection at the start of the activity and at least monthly thereafter during construction TES protection report at end of construction, including mitigation measures for road operation & maintenance (O&M) period.	Requirements specified in contracts Periodic inspections by MDF and GMIP
	Impacts to wetlands and other natural resources; disturbance or threat to important ecological habitats (including riparian habitats along roads in Kareli).	N	Use biologist experienced with wetlands and ecological habitats. Conduct assessment of riparian habitats in Kareli. Develop program to protect Kareli habitats. Implement Kareli habitat protection programs including worker training to	Surveys and inspections by biologist. Number of habitats protected Number of employees trained Photo logs	Survey reports for protecting Kareli habitat. Inspections monthly during construction. Kareli habitat protection	Requirements specified in contracts Periodic inspections by MDF and GMIP

Activity	Identified Environmental Impacts	Are Impacts Potentially Significant?	Mitigation Measure(s)	Monitoring Indicator(s)	Monitoring and Reporting Frequency	Responsible Party(ies)
			identify and protect Kareli habitats.		report at end of construction, including mitigation measures for road O&M	
	Impacts to Cultural and Historic Resources including Cultural or Historic Chance Finds.	N	Establish and maintain a documented chance finds procedure and provide regular worker training to identify and protect cultural or historic chance finds.. Remove & dispose of old road materials to offsite disposal site that protects cultural and historic resource sites. Revegetate to protect cultural/historic site. Prevent erosion and changes to existing waterways.	Complaints by residents or members of cultural or historic site. Photo logs	Inspection at the start of the activity and at least monthly thereafter during construction	Requirements specified in contracts Periodic inspections by MDF and GMIP
	Construction camp damage to local habitats and depletion of local fauna/flora.	N	Choose or develop design standards for construction camps Analyze area for possible habitat or fauna/flora damage, select proper site for construction camp Keep camp size to minimum Explore off-site accommodation for crews Provide adequate quantity of food and cooking fuels	Conformance with design standards Complaints from nearby residents. Photo logs	Inspection at the start of the activity and at least monthly thereafter during construction phase; once during demobilization	Requirements specified in contracts Inspections by MDF and GMIP.

Activity	Identified Environmental Impacts	Are Impacts Potentially Significant?	Mitigation Measure(s)	Monitoring Indicator(s)	Monitoring and Reporting Frequency	Responsible Party(ies)
			Train workers to protect local habitat and local fauna/flora, create defined footpaths			
	Impacts from lack of environmentally sound facilities or poor sanitation at construction camp facilities (Soil and Water Contamination)	N	Choose or develop design standards for construction camps Provide sound temporary sanitation facilities (e.g., dry toilets or pit latrines, cleanup of food services, trash/waste collection bins Provide off-site housing for workers Use minimum camp size Remove and restore site after construction is completed	Conformance with design standards Complaints from nearby residents. Photo logs	Inspection at the start of the activity and at least monthly thereafter during construction phase; once during demobilization	Requirements specified in contracts Inspections by MDF and GMIP.
	Impacts from lack of management of construction areas, equipment and materials storage areas (Soil and Water Contamination)	N	Develop mobilization and demobilization plans Install fence and signs Set protocols for storage of materials and wastes Set protocols for equipment storage and maintenance Limit onsite equipment maintenance, require most maintenance offsite Store fuels and lubricants in safe place, provide spill protection, emergency response procedures Prevent dumping of hazardous materials Prevent dumping of other	Conformance with mobilization and demobilization plans, fuels and lubricant storage, and waste management protocols. Inspection of shipping manifests, landfill receipts, and photo logs Complaints from nearby residents Photo logs	Inspection at the start of the activity and at least monthly thereafter during construction	Requirements specified in contracts Inspections by MDF and GMIP.

Activity	Identified Environmental Impacts	Are Impacts Potentially Significant?	Mitigation Measure(s)	Monitoring Indicator(s)	Monitoring and Reporting Frequency	Responsible Party(ies)
			non-construction waste Remove and restore site after construction is completed			
	Community impacts from introduction of alcohol and other socially destructive substances via construction crews.	N	Prohibit alcohol and socially destructive substances in construction camps Use local or regional labor if possible Install signs and reminders that alcohol/substances are prohibited	Camp inspections Complaints from nearby residents	Monthly during construction	Requirements specified in contracts Inspections by MDF and GMIP
	Impacts from lack of control of stormwater runoff during road rehabilitation	N	Choose or develop design standards for road surface drainage, culvert installation, erosion control, revegetation, stream crossing, sensitive areas, steep slopes, etc. Develop a storm water and erosion control plans Install stormwater control barriers (hay bales, filters) to prevent erosion Restore site through replanting, reseeding and soil erosion measures (especially after old road materials removed)	Conformance with design standards and stormwater and erosion control plans Complaints from nearby residents Photo logs	Monthly during construction	Requirements specified in contracts Inspections by MDF and GMIP
	Impacts on roads from transporting new road materials, concrete and asphalt, drainage	N	Choose or develop design standards for material transport and storage Select transportation routes	Conformance with design standards including road	Monthly during construction	Requirements specified in contracts

Activity	Identified Environmental Impacts	Are Impacts Potentially Significant?	Mitigation Measure(s)	Monitoring Indicator(s)	Monitoring and Reporting Frequency	Responsible Party(ies)
	collectors/pipes and transporting waste materials for disposal.		(change routes) to minimize impacts on roads and local residents. Inspect roads along transportation routes. Restore damaged roads to original condition.	and transportation routes. Complaints from nearby residents.		Inspections by MDF and GMIP
	Impacts from removal and disposal of old/damaged asphalt, road subsurface materials, sidewalks, drainage collectors/pipes (Soil and Water Contamination)	N	Protect area next to channel berm. Use construction lines to mark construction zone. Provide dust control during extraction and disposal of spoil and sediment. Train workers to protect surrounding environment Materials stored onsite, protected from stormwater runoff or wind until transport for disposal Prevent soil erosion	Monitor waste quantity (kg (m3)) Inspection of roads Complaints from nearby residents Percentage of workers and supervisors with up-to-date training records Photo logs	Monthly during construction	Requirements specified in contracts Inspections by MDF and GMIP.
	Impacts from improper extraction of road materials (quarry and gravel pits and barrow pits)	N	Choose or develop design standards for material extraction Contractor prohibited from operating their own quarry or gravel pit Construction materials purchased from quarry providers with proven environmental protection programs and closure plans, no violations of environmental regulations	Certifications of selected quarries and gravel providers Inspection of suppliers Complaints from residents near quarries, gravel pits or barrow pits.	Once before contracting with quarries, gravel or earthen fill suppliers and monthly during construction	Requirements specified in contracts Inspections by MDF and GMIP

Activity	Identified Environmental Impacts	Are Impacts Potentially Significant?	Mitigation Measure(s)	Monitoring Indicator(s)	Monitoring and Reporting Frequency	Responsible Party(ies)
			Quarries, gravel pit and/or barrow pit operators have permits and stormwater management programs			
	Impacts from road rehabilitation (Add compaction of roadbed and addition of materials for subsurface layers and pavement)	N	Protect area next to road. Use construction lines to mark construction zone. Train workers to protect surrounding environment Minimize use of heavy machinery Restore site through replanting, reseeding and soil erosion measures Adhere to road design and engineering specs and follow best practices Use BMPs for maintenance and storage of equipment	Conformance with plans and BMPs Complaints from nearby residents. Percentage of workers and supervisors with up-to-date training records Photo logs	Monthly during construction	Requirements specified in contracts Periodic inspections by MDF and GMIP
	Impacts from rehabilitation of sidewalks and drainage collectors/pipes (Soil and Water Contamination)	N	Protect area next to area being improved Train workers to protect surrounding environment Prevent erosion and changes to existing waterways Minimize use of heavy machinery	Camp inspections Complaints from nearby residents Percentage of workers and supervisors with up-to-date training records Photo logs	Monthly during construction	Requirements specified in contracts Periodic inspections by MDF and GMIP
	Noise, Odor and Visual Quality Impacts	N	Schedule trucks carrying waste/construction materials to minimize local impacts. Minimize use of heavy	Visual inspections Complaints from users and nearby	Monthly during construction	Requirements specified in contracts

Activity	Identified Environmental Impacts	Are Impacts Potentially Significant?	Mitigation Measure(s)	Monitoring Indicator(s)	Monitoring and Reporting Frequency	Responsible Party(ies)
			equipment during early morning and nights	residents.		Periodic inspections by MDF and GMIP
	SocioEconomic Impacts	N	Hire local workers. Community public meetings to share mitigation information.	Number of local workers Number of public meetings.	One time during construction phase	Requirements specified in contracts Periodic inspections by MDF and GMIP
	Public Health and Safety Impacts	N	Documented safety procedures. Maintain regular worker safety training Provide workers with protective equipment (e.g., gloves, boots, eyewear). Manage construction traffic to protect children and the community. Signs clearly displayed Protect public from stored waste/construction materials or abandoned structures Document underground and surface utilities/structures	Conformance with safety procedures Percentage of workers and supervisors with up-to-date training records Number of accidents and injuries. Complaints from nearby residents	Inspection at the start of the activity and at least monthly thereafter during construction	Requirements specified in contracts Periodic inspections by MDF and GMIP

TABLE 6.2 Environmental Mitigation and Monitoring Plan for Road Operation and Maintenance

Activity	Identified Environmental Impacts	Are Impacts Potentially Significant?	Mitigation Measure(s)	Monitoring Indicator(s)	Monitoring and Reporting Frequency	Responsible Party(ies)
2) Strengthening operation and maintenance of municipal roads	Impacts to Threatened, Endangered & Protected Species (TES)	N	Implement mitigations in TES protection report prepared at end of construction period.	Number of TES identified Number of habitats protected Number of harmed/dead TES along rehabilitated roads	Quarterly in first year and annually after first year.	Requirements specified in contracts Periodic inspections by MDF
	Impacts to wetlands and riparian habitats along roads in Kareli	N	Implement mitigations in Kareli habitat protection report at end of construction period.	Number of wetlands and habitats protected. Number of Kareli habitat inspections.	Quarterly in first year and annually after first year.	Requirements specified in contracts Periodic inspections by MDF
	Impacts from road ruts, potholes, mud-holes, washboarding (Soil and water contamination)	N	Better routine maintenance of roads using high quality gravel and asphalt material Remove materials blocking roads Inspect roads for early identification of problems Provide worker training for improved maintenance and early identification of problems	Number of maintenance measures implemented Number of road inspections	Quarterly in first year and annually after first year.	Requirements specified in contracts Periodic inspections by MDF

Activity	Identified Environmental Impacts	Are Impacts Potentially Significant?	Mitigation Measure(s)	Monitoring Indicator(s)	Monitoring and Reporting Frequency	Responsible Party(ies)
	Impacts from clogged drainage collectors/pipes, standing water and water pools (potential disease vectors)	N	Better routine maintenance of culverts, drainage collectors/pipes, side channels/runoff (runoff ditches) Remove materials blocking drainage collectors/pipes/culverts Inspect drainage systems for early identification of problems Provide worker training for improved maintenance and early identification of problems	Number of maintenance measures implemented Number of drainage inspections	Quarterly in first year and annually after first year.	Requirements specified in contracts Periodic inspections by MDF and GMIP
	Road improvements increase traffic and vehicle speed, higher accident rates (Socioeconomic Impact)	N	Plan for, procure and equip rehabilitated roads with adequate traffic control signs and equipment Integrate safety features into engineering design (speed control signs, streetlights, pedestrian crossings, proper road markings)	Number of accidents Complaints from nearby residents	Quarterly in first year and annually after first year.	Requirements specified in contracts Periodic inspections by MDF
	Soil, Water and other Environmental Impacts due to weak Municipal Road Maintenance Programs	N	Strengthen municipal road maintenance programs (organize data collection, identify O&M problems throughout the municipal roads network and design solutions including better road operating guidance, preventive maintenance,	Number of municipalities participating in municipal maintenance strengthening Number of requests for assistance to	Quarterly in first year and annually after first year.	Leadership and periodic inspections by MDF with initial start-up support from GMIP

Activity	Identified Environmental Impacts	Are Impacts Potentially Significant?	Mitigation Measure(s)	Monitoring Indicator(s)	Monitoring and Reporting Frequency	Responsible Party(ies)
			program schedules and activities, training for stronger management systems for maintenance workers including use of “how-to” guides and information on best practices.	improve road maintenance Number of inspections Number of complaints from nearby residents		

7. LIST OF PREPARERS

Baseline data collection, field studies, alternatives analyses, impact assessment and development of EMMPs and completion of this EA was conducted by a specialized team of scientists and engineers from Tetra Tech. Backgrounds of principal members of the EA Team are highlighted below:

James Gallup, Ph.D., P.E., Team Leader and Environmental Engineer. Dr. Gallup is a senior environmental engineer with over 40 years of international experience, including projects in Georgia. He led a team that prepared a Programmatic Environmental Assessment (PEA) for the USAID AgVANTAGE Project implemented by ACDI/VOCA. He has provided direct technical support to the Europe and Eurasia Bureau Environmental Officer and he designed and implemented USAID's Global Environmental Pollution Prevention Project (EP3). Dr. Gallup, a registered professional engineer, earned his Ph.D. in Environmental Engineering from the University of Oklahoma. He holds a BS in Microbiology and MS in Environmental Engineering.

Karen Menczer, Environmental Specialist. Ms. Menczer is an environmental specialist who has supported international development programs in Eastern Europe, Asia, Africa, Latin America and the Caribbean for more than 25 years. She has worked extensively with USAID, most recently preparing Reg 216 environmental documentation for the Georgia Power and Gas Transmission Project. Ms. Menczer worked towards her Ph.D. at the University of New Mexico and in Galapagos, Ecuador. She holds an MS in Ecology and a BS in Biology.

Mamuka Shaorshadze, Environmental Specialist. Mr. Shaorshadze has 12 years relevant experience, most recently as an environmental supervisor on two Millennium Challenge Georgia (MCG) fund infrastructure programs. He also served as an Environmental Field Officer for the Georgian Oil and Gas Corporation initiatives funded by the MCG. Mr. Shaorshadze earned his Bachelor's Degree in International Economics from Georgian Technical University.

Mamuka Gvilava, Ph.D., Environmental Specialist. Dr. Gvilava is an environmental specialist with fifteen years experience in field work, project management, policy and regional cooperation. He has experience with environmental and social impact assessment, remote sensing and green design. He served as national focal point to the Black Sea Commission and project director of the World Bank and GEF Coastal Zone Management Project. He has a Ph.D. in physics and math.

8. APPENDICES

Appendix 8.1: Details of Scoping Meetings (July 5, 2011)

Appendix 8.2: Summary of Impacts Identified for Municipal Road Rehabilitation Activities

Appendix 8.3: Photographs from Site Visits During the EA Phase

Appendix 8.4: Project Maps and Site Visit Engineering Reports (August/September 2011)

Appendix 8.1 Details of Scoping Meeting

This appendix provides the details of the Stakeholder Scoping Meeting held in Dusheti on July 5, 2011. The appendix includes meeting participants, speaker information and opinions, proposals and recommendations, photos, agenda and list of participants.

A. Meeting Participants

Representative of USAID: Giorgi Kokochashvili.

Representative of Municipal Development Fund of Georgia:

- Kartlos Gviniashvili
- Zurab Baratashvili.

Representative of Tetra Tech, Ltd:

- Jeffrey Fredericks;
- Ilia Eloshvili;
- Archil Lezhava;
- Mamuka Shaorshadze;

Representative of Kavgioprotransi-MG, Ltd:

- Kakhi Jashi – Director;
- Vazha Mirimanov – Chief Engineer;
- Vazha Kirmizov – Chief Specialist of Water Supply and Waste Water Projects;
- Nugzar Mirimanov – Chief Specialist of Road Projects
- Ilia Mtskhvetadze – Chief Environmentalist of the Project;

Representatives of local Executive Bodies:

- Tsaro Sadzaglishvili – Chairman of Dusheti Assembly
- Gia Natsvlishvili – Dusheti Assembly;
- Tamaz Akhalkatsi – Kareli Municipality;
- Gocha Nebieridze – Kareli Municipality;
- Iago Valishvili – Kareli Municipality;
- Hamlet Davrishelidze – Kareli Municipality;
- Kakha Lobzhanidze – Gori Municipality;
- Giorgi Shengelia – Gori Municipality;

Representatives of Population

- Nodar Kurtsikidze – C. Dusheti, Mtvareliant Settlement;
- Badri Tsotskolauri – C. Dusheti, Mtvareliant Settlement;
- Natela Verdzeuli – C. Dusheti, Mtvareliant Settlement;
- Ushangi Bezhanishvili – C. Dusheti, Mtvareliant Settlement;
- Omar Gogishvili – C. Dusheti, St. Ioseliani;
- Zina Zignesiani – C. Dusheti, Mtvareliant Settlement;
- Juli KashiaSvili – C. Dusheti, St. Parnavazi;
- Giorgi Tselashvili – C. Dusheti, St. Parnavazi;

- Tamaz Bulauri – Dusheti Autotransport Enterprise;
- Shota Kherkeladze – Dusheti Region
- Aleksii Narimanidze – C. Dusheti, Pensioner

B. Speaker Information and Opinions

The Chairman of Dusheti Assembly Tsaro Sadzaglishvili welcomed the participants and offered them to choose Mr. Kakhi Jashi as a chairman of the Meeting.

Mr. Kakhi Jashi introduced attendees with the general purposes of the project, emphasized the importance of the USAID activity and the importance of projects, reviewed the existing condition of the municipal infrastructure rehabilitation projects that are located in the five municipalities and thanked the attendants for participating in the meeting. He asked them to express their opinions and proposals and promised to consider their views in the scoping statement.

Mr. Nugzar Mirimanov presented technical-economic data regarding the rehabilitation of road and street pavement. Mr. Vazha Mirimanov mentioned two bridges built in violation of norms. The distance between the abutments is so small that stones, branches and solid materials cannot pass through the cut, resulting in flooding of nearby yards and houses.

Mr. Vazha Kirmizov reviewed the issues of rehabilitation water supply and waste water systems and arrangement of water meters. He emphasized the importance of rehabilitating the waste water system and drainage system in the railway settlement. Mr. Ilia Mtskhvetadze reviewed the existing ecological condition of the site, the information gained during the site investigations and the benefits both for population and for ecological condition.

In the final part, the speaker mentioned that the rehabilitation projects for the eight municipal infrastructure units were acceptable and, if the mitigation measures are considered during the project implementation, the public health and environment will not be in danger. In addition, the speaker emphasized the importance of improvement of social conditions. This will particularly reflected on the population of vil. Dvani and its nearby villages, on families settled nearby the Dusheti Gorge and on inhabitants of railway settlement.

After the presentation the participants expressed their remarks and views.

The opinion was expressed by:

Mr. Nodar Kurtsikidze mentioned that the rehabilitation of bridges arrangement of bank revetment structures is also necessary as the flood devastates the property of population and puts in danger their lives.

Mr. Tamaz Bulauri said, that there were not bridges before and the houses were not flooded as the population used inert materials taken by the water to construct buildings.

Mrs. Eter Totiauri mentioned that she does not know where to go when it rains as the water flows directly into her house.

Mr. Tamaz Akhalkatsi and Mr. Gocha Nebieridze mentioned the importance of rehabilitation of Sogolasheni-Dvani road as their population is separated from the rest of Georgia. He said that these villages may be left without population. The rehabilitation of the road is also necessary so that the population at the occupied territories will see how the rest of Georgia is being developed and express the willingness to live in Georgia.

Mr. Giorgi Shengelia mentioned that rehabilitation of waste water system in Railway Settlement and of road pavement in Gori will improve the social condition of population.

Mr. Kakha Lobzhanidze mentioned that the rehabilitation of water supply and waste water systems and arrangement of water meters will promote the rational use of water and water supply will improve for more inhabitants.

The Chairman summed up the results of the meeting, thanked the attendants for participation in the meeting and promised to consider all their proposals.

C. Proposals and Recommendations

№	Proposal Recommendation	Result	Remark
1.	Re-arrangement of two bridges over Dusheti Gorge and arrangement of bank revetment structures	Is considered in the Captioned Project	Only the selected projects will be implemented.
2.	Rehabilitation of Sogolasheni-Dvani motor road	Is considered in the Captioned Project	It will be rehabilitated in case it turns up between the selected projects. Otherwise it will be rehabilitated in the future in the scope of another project
3.	Rehabilitation of waste water system in Gori and arrangement of road pavement at Gori streets.	Is considered in the Captioned Project	It will be rehabilitated in case it turns up between the selected projects. Otherwise it will be rehabilitated in the future in the scope of another project
4.	Rehabilitation of water supply and waste water system in Gori and arrangement of water meters	Is considered in the Captioned Project	It will be rehabilitated in case it turns up between the selected projects. Otherwise it will be rehabilitated in the future in the scope of another project

D. Photos



Meeting in Dusheti



Meeting in Dusheti



Meeting in Dusheti



Meeting in Dusheti

E. Agenda

Stakeholder Meeting Organized for Municipal Project Recipients (July 2011)

Registration: from 9.30 to 10.00

Time	Subject	Reporter
10.00	Greeting	Chairman
10.15	Technical issues	Kakhi Jashi
10.35	Social and environmental issues	Ilia Mtskhvetadze
10.55	Discussion	Attendants
11.45	The final part of the meeting	Chairman

F. List of Participants

მუნიციპალური ინფრასტრუქტურის პროექტის კომპონენტებთან დაკავშირებით სახელადების წარმომადგენლებთან მოწყობილ შეხვედრაზე მონაწილეობა სია

ქ. დუშეთი

5 თებლის 2011 წ.

NN	გვარი, სახელი	ორგანიზაცია	საკონტაქტო ინფორმაცია (ტელეფონი, ელექტრონული ფოსტა)
1	ახალაძე თამარ	სახელმწიფო მსახურის დეპარტამენტი	599 53 37 44
2	ხუციშვილი ვახტანგ	სახელმწიფო მსახურის დეპარტამენტი	599 333 874
3	გუგუშვილი ივანე	სახელმწიფო მსახურის დეპარტამენტი	599-581486
4	ფარულაძე ქაიხოსრო	სახელმწიფო მსახურის დეპარტამენტი	599-58-61-46
5	მამუკაძე ივანე	სახელმწიფო მსახურის დეპარტამენტი	577 95 72 22
6	გაბრიელიანი ვახტანგ	სახელმწიფო მსახურის დეპარტამენტი	577 95 72 03
7	ილია დამიანიანი	Tetra tech	595364602
8	ქაბაძე გიორგი	Tetra tech Env. Specialist	595 11 60 71.
9	საბინა გიორგი	Tetra Tech GEO	
10	ქაბაძე თეონა	Tetra Tech	599 788 877.
11	საბინა ივანე	სსიპი სსიპი სსიპი - მგ	595 21 41 12
12	ფარულაძე მამუკა	სსიპი სსიპი სსიპი - მგ	593 19 12 63
13	ვახტანგაძე თეონა	სსიპი სსიპი სსიპი	593 63 03 59
14	ქაბაძე ნინო	სსიპი სსიპი სსიპი	2-79-09
15	გაბრიელიანი ივანე	სსიპი სსიპი სსიპი	555-22-18-24
16	გაბრიელიანი ივანე	სსიპი სსიპი სსიპი	593-63-06-50
17	ვახტანგაძე ვახტანგ	სსიპი სსიპი სსიპი	22-18-85
18	ვახტანგაძე ვახტანგ	სსიპი სსიპი სსიპი	22-13-38
19	გაბრიელიანი ივანე	სსიპი სსიპი სსიპი	593-59-79
20	ვახტანგაძე ვახტანგ	სსიპი სსიპი სსიპი	22-12-08
21	ვახტანგაძე ვახტანგ	სსიპი სსიპი სსიპი	22-13-38
22	ვახტანგაძე ვახტანგ	სსიპი სსიპი სსიპი	22-13-36

NN	გვარი, სახელი	ორგანიზაცია	საკონტაქტო ინფორმაცია (ტელეფონი, ელექტრონული ფოსტა)
23	გუგუშვილი ივანე	სსიპი სსიპი სსიპი	592630425
24	გაბრიელიანი ივანე	სსიპი სსიპი სსიპი	595531417

Appendix 8.2 Summary of Impacts Identified for Municipal Road Rehabilitation Activities

IMPACT (Description of effect) and occurrence (construction/operation)	Significance Determination Filter ¹				Are Consequences Significant? (Y) or (N) Positive impact (P)
	1 Subject of USAID or GoG Requirements ²	2 Subject of Community Concern	3 Pollution Prevention Potential ³	4 High Environmental Risk ⁴	
Receptor: Soils, Geology and Landscape					
Rehabilitation phase:					
Disturbance or threat to important ecological habitats, including protected ecosystems (e.g. national parks) and/or other sensitive areas (e.g. wetland)					N
Visual disturbance due to construction/rehabilitation activities					N
Contamination of soils due to accidental spill of fuel/oil and/or other technical liquids					N
Contamination of soil due to uncontrolled disposal of construction waste					N

¹ Place an “X” in the appropriate column 1, 2, 3, or 4. A single “X” (the first one determined) is all that is required for a determination of significance.

² Subject to USAID requirements or specifically relevant legislation, regulation, and/or permit requirements. This will likely include effects associated with activities if (1) environmental regulations specify controls and conditions, (2) information must be provided to authorities, and/or (3) there may be periodic inspections or enforcement actions taken by authorities.

³ Based on technical and business conditions, such as cost-effectiveness, has a high-potential for pollution prevention or resource-use reduction

⁴ Associated with potential impact to the environment from high environmental loading due to one or more of the following: scale, magnitude, probability, duration.

Land clearance activities (e.g. trench excavation) could generate some amount of the topsoil to be stored properly, handled and reused.					N
Operation/Maintenance Phase:					
Impact on soil is excluded					N/A
Receptor: water resources (surface and ground)					
Rehabilitation phase:					
Contamination of water due to accidental spill of fuel/oil and/or other technical liquids					N
Lack of on-site sanitary facilities for construction workers causing pollution to surface and groundwater					N
Pollution of surface water resources by constructed materials (removed soil cover and old concrete plates, concrete					N
Operation/Maintenance Phase:					
Impact on water is excluded					N/A
Receptor: air quality					
Rehabilitation phase:					
Emissions from construction machinery, may increase the level of emission in the air	X				Y
Removal of groundcover, borrow pits, and construction sites, creating conditions for airborne dust and particulates may increase the		X			Y

level of emission in the air and dust, especially under windy conditions.					
Operation/Maintenance Phase:					
After rehabilitation emission in the air will be decreased					P
Receptor: Biodiversity					
Construction/rehabilitation phase:					
Rehabilitation process may cause removal of vegetation cover, changes in land use pattern.					N
Operation/Maintenance Phase:					
No significant impact on vegetation cover during operation/maintenance					N
Socio-Economic- Community , public health, cultural and historical assets					
Community					
Construction/rehabilitation phase:					
Disturbance of local community due to construction machinery, traffic and/or possible removal activities		X			Y
Temporary employment opportunities in the construction activities (beneficial impact)					N
Operation/Maintenance Phase:					
Improvement of livelihoods, increase of quality agricultural lands. Development of					P

agriculture and income.					
Public Health					
rehabilitation phase:					
Inadequate management of temporary sanitation facilities for workers could cause negative impact on public health during	X		X		Y
Operation/Maintenance Phase:					
Improvement of living environment of local population					P
Archaeology and historical monuments					
Rehabilitation Phase:					
Impact on archeological and historical heritage					N
Operation/Maintenance Phase:					
During operation impact on archeological and historical monument not possible					N

Definitions Used in Determining Environmental Risk

Parameter	Rating Categories				
	1	2	3	4	5
Scale	Insignificant volume/quantity	Low volume/quantity	Medium volume/quantity	Medium volume/quantity	High volume/quantity
Severity	Minimal impact	Moderate impact but localized and readily containable	Moderate impact over multiple locations	Significant impact and/or regional	Extreme impact and/or potential for global impact
Probability	Very unlikely under any operating condition	Occurs during abnormal/emergency conditions. Probability anticipated and managed	Occurs during routine maintenance activities	Occurs during major maintenance activities	Occurring during normal operating conditions
Duration	Spike situation extremely short-term duration within one day	Less than one month	One to six months	Less than one year	Long-term duration greater than one year or continuous

Appendix 8.3 Photographs from Site Visits During the EA Phase

Gori EA Field Visit



Water supply pipeline installation.



View of streets after water pipeline construction.



Rehabilitation street cover before water works



Same street (reverse view) with new trenches



Construction workers.



Example of construction site



This street is part of the project



Typical undisturbed street



26th May street is in busy marketplace in most visible part of the town, close to Gori Fortress



View from the bridge over Didi Liakhvi, 26th May street follows the river meander.

Mtskheta EA Site Visit



Project road leads to the historic part of Mtskheta



This small section starts with local stream (piped along the road) and ends with stagnant sewage.



Red-listed Juniper species in the project area.



River bank near project area.

Oni EA Site Visit



Current state of street drainage



Some streets have almost no asphalt cover



Trees along road

Kareli EA Site Visit



High pressure oil pipeline crossing.



Gas pipeline crossing.



Breti St. Giorgi Church is about 40 m from project road.



Trees along project road.

Dusheti EA Site Visit



Trees along road.



Bridge on Bachana street.



Upslope and downslope views of erosion along project road.