ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT (ESIA) /ENVIRONMENTAL REVIEW

AND ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN (ESMP)

Title of Applicant Project: **Development of vocational dual method education in railway sector & improvement of the railway labor market**

Applicant Name: Railway Transport College

Funding Period:

Resource Levels (US$): _____

Report Prepared by: Name: **Date:**

MCA-Georgia Clearance of ESIA:

Contracting Officer's Technical Representative:_____ Date: _____

MCA-Georgia Environmental Officer: _____ Date: _____

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I. Environmental and Social Impact Assessment Report/ Environmental Review

Executive Summary

The Industry-led Skills and Workforce Development (ISWD) Project is being implemented under the Millennium Challenge Corporation (MCC) Second Compact, which aims to improve the linkage between market-demanded skills and the supply of Georgians with technical skills relevant to the local economy in the fields of Engineering, Science and Technology (STEM). The project has been designed to favour establishing new or expanding/improving existing training programs; meet industry needs; strengthen TVET provider practices by identifying, strengthening, documenting, disseminating, and promoting uptake of best practices across the sector; as well as strengthening national policy with respect to industry engagement in the Georgian TVET sector.

Following to invitation to provide proposal for Programme Improvement Competitive Grants (CPIG) issued under the project, Georgian Railways (Railway Transport College) expressed its interest in participation in the contest. Georgian Railways (GR), Georgian Technical University (GTU) and Ministry of Education and Science (MoES) has entered into memorandum of understanding related to the Project. Roles and contributions of the mentioned institution under the proposal have been set. MoES transferred building for RTC in the free of charge, permanent ownership of the RTC, whereas GR contributes *3,539,450* GEL to RTC for the purposes of financing implementation of rehabilitation works.

Assessment of impact on impact on biophysical and social environment expected during rehabilitation (demolition/construction) and partly, during operation of the RTC has been carried out. Site visit (walkover of the site), study of geological, hydrogeological conditions and stability of the structure have been carried out. Technical project – developed.

In the course of assessment background status of the project area was reviewed. Presence of any sensitive recipients - checked. Potential risks and impacts have been screened. Impact of the planned activities on air, soil, vegetation and fauna, visual impact, possible nuisance to local residents and other impacts considered worth to pay attention to have been evaluated. Mitigation measures and recommendations of best practice have been formulated. Ranking on impacts (including residual) – done.

Assessment enables to conclude that the planned development will not have significant negative impact on biophysical and social environment. All expected impacts are manageable and can be controlled/reduced by proper organisation of works and implementation of mitigation measures. Most of the impacts are ranked as low or negligible.

RTC will provide equal possibilities of employment and education irrespective to gender, ethnicity, political and/or religious denominational membership. The College will offer high quality professional education according to national and international standards, prepare qualified professionals in railway industry enhance skills and capabilities of existing employees and create environment for their carrier opportunities.

1. Introduction

The Industry-led Skills and Workforce Development (ISWD) Project is being implemented under the Millennium Challenge Corporation (MCC) Second Compact, which aims to improve the linkage between market-demanded skills and the supply of Georgians with technical skills relevant to the local economy in the fields of Engineering, Science and Technology (STEM).

The project has been designed to favour establishing new or expanding/improving existing training programs; meet industry needs; strengthen TVET provider practices by identifying, strengthening, documenting, disseminating, and promoting uptake of best practices across the sector; as well as strengthening national policy with respect to industry engagement in the Georgian TVET sector.

The analysis of the current situation, study of problems, and identification of needs in the vocational education sector took place during the first stage (2013-14). The Millennium Challenge Compact between the USA and Georgia was signed on 26 July 2013 to assist Georgia in addressing a major constraint to economic growth by supporting strategic investments in general education, TVET and higher education to strengthen quality, with an emphasis on science, technology, engineering, and mathematics (STEM) education and on skills development. The Government of Georgia has created the Millennium Challenge Account - Georgia (MCA-Georgia) to oversee, manage, and implement the Compact.

The ISWD Project is a $16 million project under the Compact. The ISWDPM has 4 main components:

- Programme Improvement Competitive Grants;
- Strengthening TVET Provider Practice;
- Strengthening TVET Sector Policy;
- Annual TVET Conference.

The Grant Scheme under the ISWD comprises two sub-components: Programme Improvement Competitive Grants (PICG) and the Strengthening of the TVET Provider Practice.

In 2015 interested institutions companies, educational establishments such as universities and public or private schools, professional organisations and non-governmental organisations were invited to provide proposals for Programme Improvement Competitive Grants (CPIG).

Railway Transport College founded by Georgian Railways participated in the contest and was shortlisted for second round of full application submission for provision of vocational education to employees of Georgian Railways and youth interested in the employment in the sector.

Partnership with Founding Partners of RTC - On December 31, 2014 – Georgian Railways (GR), Georgian Technical University (GTU) and Ministry of Education and Science (MoES) has entered into memorandum of understanding related to the Project, which was then followed by execution of agreement on September 7, 2015, which sets out Founding Partners' undertakings regarding contribution to the RTC and the Project specifically. In the frame of the above-mentioned agreement the Founding Partners established RTC on September 9, 2015.

In accordance with existing partnership arrangements the MoES ensures:

- Transfer of the building required for normal operation of RTC in the free of charge, permanent ownership of the RTC;
- Provision of educational vouchers for students of RTC;
- Financing 50% of administrative/overhead cost required for normal operation of the RTC.

The GR provides:

- Contribution of up to *3,539,450* GEL to RTC for the purposes of financing implementation of rehabilitation works;
- Financing 50% of administrative/overhead costs required for normal operation of the RTC;

The GTU undertakes:

- Provision of free of charge services related to (i) evaluation of the current condition of the building required for normal operation of RTC, and (ii) elaboration of rehabilitation plan and budget.
- Contribution of intellectual asset to the RTC, by ensuring involvement of duly qualified/experienced lecturers of GTU in the teaching/training process to be carried out by RTC.

Partnership with DB International GmbH / DB Training

In September 2015 the RTC entered into Memorandum of Understanding with DB International GmbH (DBI) in the frame of which the parties agreed:

- To join their activities in form of consultancy services of DBI/DB Training;
- To determine the details of their cooperation based on service proposals by DBI to RTC followed by a separate agreements;
- To cooperate in order to define structure, financing and sequence of activities, which shall find reflection in separate agreements to be entered by the parties.

In the frame of the above MoU DBI has submitted preliminary proposal to the RTC, which identifies general steps/activities to be undertaken in order to structure the Project and provides preliminary estimates of the costs required for procurement of respective assets and services. Consequently, the partnership agreement between RTC and DBI was signed in November 2015.

Partnership with Iowa State University - GTU and RTC have entered into preliminary partnership arrangement with Iowa State University, in the frame of which the University offers two part training of trainers program to create a group of OSHA-certified trainers to work in 1) general industry, including transportation and 2) construction industry sectors. Besides offering the beginning and advanced OSH training programs for these sectors, the ISU occupational safety and health experts will provide follow-up mentoring during the training offered to others. Also, the ISU team will assist with recruitment, organization of the training and mentoring/evaluation as trainees offer the occupational safety training to others in Georgia.

2. Project Rationale

RTC was established in 2015. The founders are Grail, GTU and Ministry of Education and Science of Georgia (the Ministry). The college was established to develop and offer high quality professional education according to national and international standards and prepare qualified professionals in railway industry. It also envisages creation of the environment for their career opportunities. More specifically, RTC's main goal is threefold:

(i) To provide vocational training to current employees of Grail and other industry participants and initial vocational education/training to young talents interested in employment in railway industry and as a result create new generation of human resources for the railway industry, reduce average age of Grail operational staff and enhance skills and capabilities of existing employees;

(ii) To reduce level of unemployment and subsequently improve socio-economic conditions in Georgian regions, by providing free of charge education/training and employment opportunities to vulnerable population of Georgia.

(iii) To increase level of health and safety and environmental protection, by reducing chances of derailment, spillage of hazardous liquids and other railway accidents caused by operational staff and raise awareness of working conditions required for successful operations;

To strengthen and develop its operations, RTC has set up partnership with DBI and ISU for the purposes of the Project. The overall objective of the project is **Development of rail vocational education system in Georgia to meet industry workforce demand.** In order to reach the envisaged overall objective the project targets two specific objectives and has identified the sets of expected results corresponding to each of the objectives.

Specific Objective 1: Establish dual vocational education programs to create a generation of qualified workforce for the railway industry;

Specific Objective 2: Provide access to railway vocational education programs and job opportunities in railway industry to target groups in target regions;

As of today, there is an obvious demand on railway technical specialists, especially considering planned ambitious Georgian railway projects. The college aims to address industry workforce needs through number of vocational education opportunities. The Project envisages establishing 8 dual modular education programs of level 4 and 5. RTC and its partners: DBI and ISU actions are mobilized to provide modular education/training based on the dual study methods to following functional groups of employees/potential employees of railway undertakings: (i) Track repairer; (ii) Electrical mechanic; (iii) Rolling stock mechanic; (iv) Rail car maintenance mechanic; (v) Rail carrier; (vi) Signalization, centralization and blocking mechanic; (vii) locomotive driver; and (viii) Testing inspector.

Expected results under Specific Objective 1 focus on setting up and developing overall teaching approach and environment for proposed 8 modular programs. In supplement to this, expected results of the Specific Objective 2 ensure proper operations and access to RTC programs through pilot process of selected modules of each 8 programs and introduce RTC to wider public and stakeholders nationally and internationally. The expected results are as follows:

- Eight nationally authorized/accredited vocational dual modular programs developed in railway studies;
- Study infrastructure and environment is created in accordance to national authorization and accreditation standards;
- Health, safety and environment standards mainstreamed on organizational and program levels;
- RTC is fully prepared for teaching activities;
- Outreach and networking strategy developed and implemented;

Proposed project is extremely relevant to the specific as well as crosscutting objectives of the PICG:

- The Project envisages innovative methodologies (dual education method) and is the first attempt to establish industry led vocational education/training institution in Georgia.
- It is a clear and evident example of public private partnership because it is structured with active involvement of the state of Georgia represented by the Ministry, higher educational institution – GTU and the key player in the Georgian railway industry - Grail, which is non-budgetary legal entity orientated on generation of profit, as well as, close partnership with DBI and ISU.
- Considering the innovative approach and methodology to be exercised in the event of successful implementation of the Project, it may become a success story and a leading example for other industries to elaborate and strive to successful implementation of other TVET programs and become the first step towards the TVET reform which is required for development of technical/engineering industries in Georgia.
- Besides, though indirectly, but still, the Project may positively impact environmental protection activities as enhancement of skills/capabilities of current operational staff and recruitment of duly qualified TVET graduates shall assist in mitigation of railway accidents and subsequent negative impact on environment.
- Graduates from RTC TVET programs shall by all means be attractive human resource base not only for the stakeholders of the Project, but also for other technical/engineering companies, listed in EY research and owners of private railway infrastructure, thus implementation of the Project shall enhance employability of graduates and their newly obtained skills, capabilities and qualification might cause increase of their salaries.

Facilities allocated for the project need rehabilitation. This report describes impact on environment during demolition, construction of the project premises; lists measures for avoidance, reduction, mitigation and/or compensation of impacts; describes environmental and social management and monitoring plan for various stages throughout the life cycle of the project.

3. Scoping

On the scoping stage appropriate spatial and temporal scopes for the assessment, suitable survey and research methodologies were defined. Its purpose of this exercise was to focus the assessment on key issues and eliminate certain activities from the full impact assessment process based on their limited potential to result in discernable impacts. To arrive at a conclusion to 'scope out' an activity/event, a mixture of expert scientific judgement based on prior experience of similar activities and events and, in some instances, scoping level quantification/numerical analysis was used.

Taking into account sitting of the project and scope of the project activites the following issues were excluded from consideration:

Impact excluded from consideration	Grounds for exclusion
Demolition/construction	
Impact on protected areas	Protected areas are not available within the project impact zone
Impact on archaeological and cultural heritage	Taking into account location of the site, scope of planned activities no impact on historic/cultural monuments is expected.
Hazardous geodynamic processes	With consideration of the type of works and characteristics of the worksite trigerring of hazardous geodynamic processes is not expected.
Impact on water (surface and subsurface)	The site is located at a distance to the surface water bodies. With consideration of the scopeof works impact on ground water is not expected.
Impact on infrastructure/utilities	Impact on the road infrastructure and traffic flows during dismantling/construction may be insignificant. There will be not a lot of offsite traffic. Project related traffic will not have impact on road cover. Impact on other instrastructure/utilitis (water, gas, power supply) will not occur.
Operation	
Impact on protected areas	Protected areas are not available within the project impact zone
impact on archaeological and cultural heritage	The project will not have impact on any historic/cultural monuments
Hazardous geodynamic processes	With consideration of the type of works and characteristics of the worksite trigerring of hazardous geodynamic processes is not expected.
Impact on surface water	The site is located at a distance to the surface water bodies.
Impact on ground water	Educational process does not imply any activity capable to affect ground water.
Impact on vegetation	Educational process does not imply any activity capable to affect vegetation.
Impact on infrastructure	Educational process does not imply any activity capable to affect infrastructure.

4. Stakeholder Consultations

Both primary and secondary stakeholders have been identified. The following definition of primary and secondary stakeholders was used.

- Primary stakeholders are the people or groups that stand to be directly affected, either positively or negatively, by an effort or the actions.
- Secondary stakeholders: any person, group or organisation with interest in the outcome of the project.

Broadly speaking, stakeholders are individuals or groups who:

- are affected or likely to be affected directly or indirectly by the project (affected parties) or;
- may have an interest in the project (interested parties). They include individuals or groups that may be affected by the project (or themselves affect the project) or perceive themselves to be affected by the Project;
- have the potential to influence project outcomes or company operations.

A list of the stakeholders of the project include:

- local community within the project area – population of the residential area adjacent to the project site that may be affected by dust, noise and increased traffic related to rehabilitation/construction works;
- contractor (demolition-construction stage) - when identified;
- employees of the Georgian Railways and other industry participants interested in improvement of professional skills and/or interested in mastering new skills;
- youth interested in employment in railway industry and as a result create new generation of human resources for the railway industry;
- Marabda-Kartsakhi LLC
- Georgian Technical University
- DB International GmbH / DB Training and Iowa State University
- Ministry of Education and Science and
- Other government institutions.

Description of the main stakeholders is given below:

- The Georgian Railways (GR) is, by statute, Georgia's only railway operator providing freight and passenger services and owning and operating the tracks, stations and other infrastructure and rolling stock comprising Georgia's entire national railway system. The Company's mainline rail network is thus a link in and the shortest route from the Caspian Sea and Central Asia to the Black Sea and the Mediterranean basin. Currently number of Grail employees is to 12670.
- Marabda-Kartsakhi LLC, another railway operator entering Georgian railway corridor in 2016, owing its infrastructure and rolling stock which shall own and operate railway line connecting Azerbaijan to Turkey though Georgia (Caspian to Mediterranean basins). This line has the need of qualified workforce for its operations, development of Georgian railway transportation business, and for the growth of Georgian economy through increased international trade.
- The MoES is the governmental agency/ministry that promotes acquisition and development of vocational knowledge and skills necessary for social success and self-realization of young talent. The ministry and the agencies under its supervision ensure development of the content of the Vocational Education and Training through setting occupational standards that reflect both local market and educational needs and international standards, such as ISCED. Development and popularisation of the TVET has become the priority of the MoES and has largely shaped its international partnership frameworks.
- Georgian Technical University - GTU is one of the Georgian higher educational institutions oriented on development of engineering and technical sciences. GTU houses the vocation education component and has been the main provider of the workforce to the GR as well as other companies that are in need of specialists, such as Tbilisi Metro, and others.
- State of Georgia is a crucial stakeholder, as well as a beneficiary of the proposed project. Enhancement of business operations efficiency and subsequently increase of profitability margins of state-owned railway entities will positively affect growth of Georgian economy. The proposed project will be the key contributor to recruitment of highly qualified operational staff and increase in reliability of business operations in this regard.
- Population interested in the field that may get opportunity to master/improve new skills.
- Population nearest to the site, potentially affected by emissions, noise and increased traffic during demolition/rehabilitation and construction works.

The stakeholder identification has been done based on the criteria given below:

Dependence:	**Stakeholders who can be directly or indirectly affected by the company activities**
Influence:	Stakeholders who are able to influence the project progress
Partnership:	Stakeholders who have a potential for building mutually advantageous partnerships and long-term relationships
Expressed interest:	Stakeholders who expressed an interest in the project

Project related information will be disclosed in several ways:

- via the internet (publication of reports, email),
- in printed form (reports, letters, leaflets);
- in person in face-to-face meetings and
- via telephone conversations.

Disseminating information through website on continuous basis will be used to facilitate the efficient communication of information about the project.

Rehabilitation-construction stage. Contractor will be obliged to develop Grievance mechanism. The mechanism will be communicated to stakeholders. Liaison Officer (CLO) will be nominated to deal with grievances, if any, during rehabilitation-construction. Contact information will be indicated on the banner installed at the entrance of the site. The comments received from stakeholders by mail and hotline, and/or via the community liaison officer will be recorded in a special logbook; reviewed and addressed by CLO. Official replies will be also provided to those comments whose authors have specified their contact details.

Feedback channels will include: comment boxes to gather feedback in written form; web-based mechanisms that can gather feedback from all stakeholders. Communication/feedback channels will be email, phone and post. In order to effectively manage, respond to, and benefit from stakeholder's feedback, all comments/feedback will be documented, forwarded to the relevant people within the team; responses provided where needed.

The process will be supervised by Georgian Railways. Described procedure will enable tracking of the issue to ensure that all issues are proactively addressed.

Operation of educational institution (Railway Transport College). Meetings with key stakeholders will be organized according to agreed schedule. Information on the training possibilities, terms and conditions will be published on internet. Key stakeholders will be kept informed about all aspects of the project. Meeting and reporting will be compliant with internal management procedures.

5. Policy, legal and administrative framework

5.1. National regulations

According to the national environmental regulations demolition/rehabilitation and construction of educational facilities do not required environmental impact permit. However, in order to ensure compliance with environmental standards, the planned activities must be implemented with due regard to environmental laws and regulations currently in force in Georgia.

Georgian legislation comprises the Constitution, environmental laws, international agreements, subordinate legislation, normative acts, presidential orders and governmental decrees, ministerial orders, instructions and regulations. Along with the national regulations Georgia is signatory of a number of international conventions, including those related to environmental protection (see Section 5.3). The list of main environmental laws is given in Table 1.

Table 1 Environmental laws and regulations

Adopted	Law / Regulation	Final version
1994	Law on Soil Protection	14/06/2011
1996	Law on System of Protected Areas	27/09/2013
1996	Law on Environmental Protection	06/09/2013
1996	Law on Subsoil	21/03/2014
1997	Law on Wildlife	06/09/2013
1997	Law on Water	06/09/2013
1999	Low on Atmospheric Air Protection	05/02/2014
1999	Law on Compensation of Damage from Hazardous Substances	06/06/2003
2003	Law on Red List and Red Book of Georgia	06/09/2013

2003	Law on Conservation of Soil and Restoration-amelioration of Soil	19/04/2013
2005	Law on Licences and Permits	20/02/2014
2007	Law on Ecological Expertise	25/03/2013
2007	Law on Environmental Impact Permit	06/02/2014
2013	Government regulations (#424, dated 31 December, 2013) on Topsoil Removal, Storage, Use and Recultivation	n/a
2015	Waste Code	26.12. 2014

Laws and regulations related to social aspects and ownership rights applicable to the project are presented in the table below.

Table 2. List of social and land ownership laws relevant to the project

Year	Law / Regulation	Final version
1997	Civil Code of Georgia	01/07/2015
1999	Law on Rules for Expropriation of Property for Public Needs	06/09/2013
2000	Law on Construction Activities	24/09/2013
2007	Law on Cultural Heritage	26/12/2014
2007	Law on Public Health	13/12/2013
2010	Law on State Property	08/07/2015

5.2. Other regulations

The following environmental regulations have been used in/for the needs of the survey.

- Technical regulations – on Topsoil removal storage, use and recultivation – approved by resolution (#424) of the government of Georgia, 2013
- Technical regulations – on Protection of atmospheric air in unfavourable meteorological conditions - approved by resolution #8 of the government of Georgia. 2014
- Technical regulations – on Method for development of inventory of stationary sources of atmospheric air pollution – approved by resolution #42 of the government of Georgia, 2014
- Environmental technical regulations – approved by resolution #17 of the government of Georgia, 2014
- Technical regulations – on Method for calculation of damage to environment – approved by resolution #54 of the government of Georgia, 2014
- Technical regulations – on Drinking water, approved by resolution #58 of the government of Georgia, 2014
- SNIP 2.03.01-84 Concrete and reinforced concrete constructions
- Construction norms and rules – Aseismic construction (PN 01.01-09), 2009

5.3. International environmental conventions ratified by Georgia

List of key conventions on air quality and climate change, biodiversity and protection of ecology and habitats, cultural heritage, public consultation and waste management and their status in Georgia are listed below:

Table 3. List of international conventions

Ratification in Georgia	Document
1993	Geneva Convention concerning Employment Policy
1993	Discrimination (Employment and Occupation) Convention
1993	Employment Policy Convention
1994	UN Framework Convention on Climate Change (UNFCCC)
1994	Rio Convention on Biological Diversity
1996	Montreal Protocol on Substances that Deplete the Ozone Layer (and its London, Copenhagen, Montreal and Beijing Amendments) 2000. 2011
1996	Vienna Convention for the Protection of the Ozone Layer

1996	Geneva Convention concerning Minimum Age for Admission to Employment
1996	Equal Remuneration Convention
1996	Abolition of Forced Labour Convention
1997	ILO Social Policy (Basic Aims and Standards) Convention
1997	Forced Labour Convention
1997	Freedom of Association and Protection of the Right to Organise Convention
1997	Social Policy (Basic Aims and Standards) Convention
1999	Kyoto Protocol to UNFCCC
1999	Employment Service Convention
1999	European Convention for the Protection of Human Rights and Fundamental Freedoms
2000	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (CMS)
2000	Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters
2003	Labour Relations (Public Service) Convention
2008	Convention on the Conservation of European Wildlife and Natural Habitats (Bern)
2010	European Landscape Convention

5.4. MCC Environmental Policies and Procedures

MCC‟s Environmental Policy and EIA procedures are laid down in the „Millennium Challenge Corporation Environmental Guidelines‟ of August 26, 2010. The purpose of these guidelines is (i) to establish a process for the review of environmental and social impacts; (ii) to ensure that projects that are undertaken as part of programmes, funded under Millennium Challenge Compacts, with eligible countries, are environmentally sound; (iii) are designed to operate in compliance with applicable regulatory requirements, and, (iv) as required by the legislation establishing MCC, are not likely to cause a significant environmental, health or safety hazard.

The Millennium Challenge Corporation ("MCC") recognizes that the pursuit of sustainable economic growth and a healthy environment are necessarily related. These guidelines set forth the process for the review of environmental and social impacts [1] to ensure that the projects undertaken as part of programs funded under Millennium Challenge Compacts with eligible countries ("Compacts") are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and, as required by the legislation establishing MCC, are not likely to cause a significant environmental, health, or safety hazard. [2]

MCC is committed to program design that reflects the results of public participation in host countries during all phases of the program, integrating governmental interests with those of private business and civil society. In this spirit, MCC will work to ensure that the preparation of Environmental and Social Impact Assessments will include consultation with affected parties and public disclosure of the associated documents.

Finally, MCC is committed to the principle of host-country ownership of a Compact, including host-country responsibility for measures to mitigate adverse environmental and social impacts. A Compact project is expected to comply with host-country laws, regulations and standards, as well as requirements by which the host country is bound under international agreements.

With consideration of the scale of works required for rehabilitation - construction and location of the building significant environmental and/or social impact is not expected to be the case. Operation of the college does not imply the use of any hazardous materials or processes. With consideration of project categorization (4.2 Determination of Project Category) the project can be ascribed to Category C.

The projects MCC finances under a compact will be developed and implemented in a manner consistent with the environmental and social performance standards set forth in the Performance Standards on Environmental and Social Sustainability of the International Finance Corporation, as amended from time to

time (IFC Performance Standards). Consistent with MCC's principle of country ownership, the host country is responsible for managing environmental and social risks and impacts consistent with the requirements of the IFC Performance Standards.

6. Project Description

For the needs of the vocational education project rehabilitation of building and infrastructure of former Industrial College allocated for the project is planned.

Total area of the property is 43847 m^2, including 2119 m^2 of land and 5433,67 m^2 occupied by buildings. The building subject to rehabilitation includes three sections: central block (17x62m) and extensions – cinema-conference hall and gum (22.5x12.6 m). The buildings are separated with aseismic seam.

Foundation of the main building represents a strip structure. Bearing walls of the zero floor are built of concrete blocks (40x80x240cm), the walls of the floors I to IV are of silicate bricks. Inserted floors are arranged of 22 cm thick hollow slabs.

Survey have not reveal the use of hazardous materials in construction. Respectively generation of hazardous waste during demolition is not expected. The status of transformer house located next to the building is satisfactory. Rehabilitation of transformer house is not planned. No traces of pollution with spilled oil/fuel have been registered. Clean up and remediation is not required.

Water supply and heating system is in decay. Wooden window frames are damaged. Drain pipes are missing.

Technical evaluation of the structures testify that the status of concrete and reinforced concrete elements, inserted floors, stairwells, bearing walls of the basement and first floor of the main block are satisfactory. The bearing walls of the upper floors and the walls of extensions are damaged.

The depth of foundation of the main block and extension are at different levels. Foundation of the main building is 1.1m deeper compared to that of extensions which is violation of standard. Other violations of Construction norms and rules have also been registered.

Rehabilitation works imply certain amount of demolition works, in particular:

- Dismantling of silicate brick walls and partitions;
- Removal of facing plaster from internal and external walls;
- Demolition of r/c internal floors and the roof;
- Demolition of wooden doors, wooden window frames and metal staircase;
- Removal of parquetry, wooden floors and flooring tiles;
- Removal of internal piping;
- Demolition of r/c stairs of the entrance.

Figure 1. Views of exterior of the building

The volume of demolition works is described below:

Table 4.

Floor 0		
walls (100mm thick)	24.5m^2; volume 2.5m^3	Material – silicate bricks
walls (120mm thick)	34.3m^2; volume 4.2m^3	
walls (150mm thick)	15.1m^2; volume 2.3m^3	
walls (250mm thick)	51.2 m^2; volume 12.8m^3	
walls (450mm thick)	5.93 m^2; volume 2.6 m^3	
parquet	801m^2	
concrete cover	285m^2	
tiles	323m^2	
plastering of internal stairs	2045.44m^2	
Floor 1		
walls (110mm thick)	11.7m^2; volume 1.3m^3	Material – silicate bricks
walls (120mm thick)	17.2m^2; volume 2.1m^3	
walls (130mm thick)	19.5m^2; volume 2.5m^3	
walls (140mm thick)	26.62m^2; volume 3.75m^3	
walls (150mm thick)	103.8m^2; volume 15.57m^3	
walls (300mm thick)	9.5m^2; volume 2.8m^3	
walls (400mm thick)	22.1m^2; volume 8.8m^3	
walls (450mm thick)	5.3m^2; volume 1.97m^3	
walls (500mm thick)	190m^2; volume 95m^3	
walls (520mm thick)	33.35m^2; volume 17.34m^3	
walls (570mm thick)	290m^2; volume 165m^3	
walls (820mm thick)	60m^2; volume 49.5m^3	
wooden stage	35.4m^3	
parquet	1097m^2	
wooden floors	295 m^2	
tiles	295m^2	
plastering of internal stairs	1756.38m^2	
Floor 2		
walls (110mm thick)	2.9m^2; volume 0.29m^3	Material – silicate bricks
walls (120mm thick)	71.9m^2; volume 8.62m^3	
walls (150mm thick)	56.1m^2; volume 8.4m^3	
r/c roofing slabs	442.2 m^3	
parquet	771m^2	
tiles	53m^2	
plastering of internal stairs	1541.85m^2	
Floor 3		
walls (110mm thick)	2.9m^2; volume 0.29m^3	Material – silicate bricks
walls (120mm thick)	52.3m^2; volume 6.3m^3	
walls (150mm thick)	29.2m^2; volume 4.38m^3	

walls (200mm thick)	31.1m^2; volume 6.5m^3	Material – silicate bricks
walls (400mm thick)	3.75m^2; volume 1.58m^3	
walls (410mm thick)	5.91m^2; volume 2.42m^3	
parquet	770m^2	
tiles	56m^2	
plastering of internal stairs	1527.56m^2	
Floor 4		
walls (110mm thick)	53.7m^2; volume 6.44m^3	Material – silicate bricks
walls (410mm thick)	3.75m^2; volume 1.54m^3	
walls (200mm thick)	31.1m^2; volume 6.5m^3	
parquet	850m^2	
tiles	16m^2	
plastering of internal stairs	1633.56m^2	
r/c roofing slabs	121.2 m^2	

Works before the start of demolition works will include

- Development of demolition schedules.
- Obtaining permits for disposal of construction and general waste
- Informing surrounding residents about the schedule and duration of demolition activities
- Installation of banner with project info and contact details
- Disconnection of utility service - cutting and capping utility lines or by rerouting them
- Installing barriers for site protection (whether and where appropriate)
- Scheduling and planning for transportation of debris not coinciding with peak traffic movement.

The key steps during demolition will be as follows:

- Everything (furniture, equipment, if any, etc.) will be removed from all interior surfaces
- All interior doors and windows will be removed
- All plaster from walls and ceilings will be removed - manually as well as mechanically.
- All ferrous, aluminium, and copper metal will be separated and recycled.
- All of the reusable material will be collected for reuse/recycling purpose.
- The debris materials for dispose will be collected and removed to Gldani landfill.

Demolition will be followed by construction works. According to the project these will include construction of the main building, arrangement of parking lot for 40 cars east to the main building and boiler house (24.740m^2) in the upper right corner of the parking lot; arrangement of fence around the stadium and general fence around the total area; installation of ventilation and heating systems. Road from Access 1 to the stadium and from the Access 2 to the parking lot will be ameliorated.

Rehabilitation-construction activities will include limited amount of earth- and concrete works; window frames and doors will be installed; plastering, painting and facing of internal and external walls of the building will be implemented. Water supply, sewerage, fire-fighting, gas and power supply will be arranged. The building will be connected to the central water, sewage gas and power systems. In addition to mentioned above, where appropriate hydro insulation will be provided, exterior lighting will be arranged. According to the project existing infrastructure will be upgraded/repaired. Total number of lighting poles will amount 20 units. Foundation pit located north to the building (labour 3m deep) will be filled up and levelled.

The length of the metal fence around the stadium area will be 277.1 running metre; the total length of the fencing around the site - 1213.5 running m; 4,900.47m2 of the area will be stone-paved; asphalt pavement will be rehabilitated on 1,843.67m2. After completion of works 1,147.64m2 (including 4,801.96m2) of the area will be seeded with grass.

Removal of trees is not planned. With consideration of the scale of construction works amount of machinery on the site will be limited. Most of works will be implemented manually.

Material: gravel, sand, cement mortar, concrete (M-7.5; M-100; M-350; B-25), metal rods, artificial granite tiles, gypsum, water-based paint, oil paint, galvanized metal sheets, basalt slabs, asphalt/asphalt-concrete, bitumen.

Materials will be purchased from licenced providers/producers.

Works will start end of February. Duration of works 8 months.

7. Analysis of Alternatives

Sitting alternative. Alternative locations have not been considered. As mentioned above MoES ensured transfer of the building for operation of the RTC in free of charge permanent ownership of the College.

No action (without project) alternative. The need for the project (vocational education) is described in Section 2 -Project Rationale. Assessment of the structural stability of the building revealed necessity for rehabilitation of the building and amelioration of adjacent area. Therefore, no action (using the premises as they are at the moment) alternative has not been considered as safe and reasonable. Financing of rehabilitation works will be provided by Georgian Railways.

Technology of demolition works. Different methods of demolition have been considered. The option included: demolition by hand; demolition by pusher arm; demolition by deliberate collapse; demolition by wire rope pulling; demolition using grapples and shears; demolition using high/long-reach demolition excavators; demolition with the ball and demolition by explosion or implosion. The methods differ in duration – demolition by hand and by explosion/implosion being the most lengthy and fastest respectively. Demolition, irrespective to the method applied, result in dust, and debris. Other impacts include noise, emissions, vibration to adjoining structures/buildings. With consideration of location, in any case the magnitude of impacts on residents will not be high. Final decision of the method will be made by contractor identified through tender. In general, top-down methods are applicable for most sites, particularly for those situated in busy urban areas. Other mechanical methods applied from the outside of a building may be suitable for projects that have sufficient clear spaces. Prior to commencement of work the plan will be developed and agreed.

8. Environmental and Social Baseline Data

8.1. Location

The project site is located in Gldani district, Tbilisi. (Address: Temka, XI microregion, II quarter, block A.) Total area of the land plot is 43847m^2. Facilities currently available on the site include: five-storey main building with two smaller extensions, transformer house and the stadium area. The building used to be used by educational institution (Industrial technical school).

The site is accessible from the Akvsent Isakian street via asphalt road from the west (Access 1), and gravel road running along boundary of the site – from the north (Access 2). The site is in about 229m from Tbilisi Sea. The nearest residents are in 104-206m from the main building. The church is across the street in 67m. (Indicated distances are craw fly). Tbilisi protected area is in about 6km from the site.
The landform of the areas east (photo 2), west (photo 4, 5) and north-east (photo 1) to the building is almost flat with exception of a hollow excavated for construction of the hall of residence (hostel) north (photo 6) to the building.

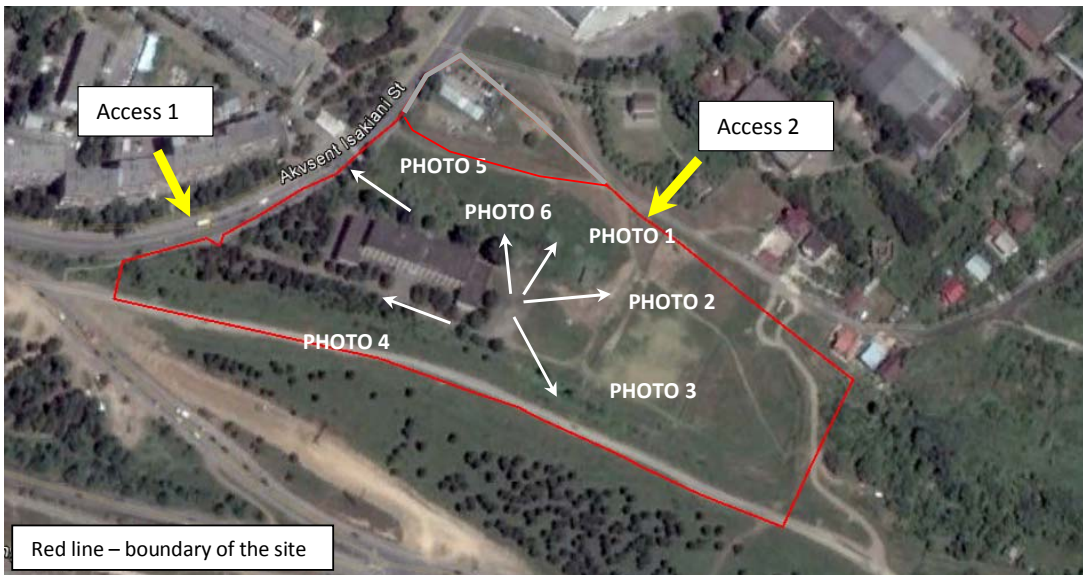


Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 5

Photo 6

Figure 2. Boundaries of the site and indication and views of the site

Figure 3. Location of the site

8.2. Climate

The climate of Tbilisi and its surroundings is moderately continental, characterized by hot, dry summer and mild winter. Orographically the area lies at the eastern end of the Adjara-Trialeti fold system. North-west and east winds determined by local mesorelief prevail. Maximum wind speed may in Tbilisi reach 30 m/sec and more. According to Construction Climatology wind speed in the project area may reach 37m/sec. The lowest winds generally occur in November and December. The average annual temperature is in 10-12C range. The average annual relative humidity is 66-67%, and annual precipitation is 550-635mm, with the maximum in May-June and minimum in August-September. The daily level of precipitation is 142-147mm. Intense rains (heavy showers) are frequent in Tbilisi; the maximum intensity of 2 mm/min is anticipated twice a year in May-June. Snow cover may be formed as early as December and melt in March-April. The depth of snow cover is 10cm on average but may reach 30-40 cm. The annual humidity balance is negative. West and north-west winds prevail on the target territory during almost whole year. (Additional information is given in Annex 1)

8.3. Air quality

In accordance with the Law on Public Health, environmental quality standards and norms are set by Decrees No. 297/N dated 16.08.2001 of the Minister of Labour, Health and Social Affairs of Georgia (including the changes made to it by further decrees of the Minister Nos. 38/N of 02.24.2003, 251/N of 09.15.1006, 351/N of 12.17.2007). Atmospheric air quality standards (level of hazardous pollution) are also defined by the Decree of the Minister of Environment Protection and Natural Resources (#89, 23 October 2001) on approval of the rule for calculation of index of pollution of atmospheric air with hazardous pollutants.

The main polluting sources in urban areas are considered to be motor vehicles and construction works. The vast majority (90%) of pollutants emitted into the air arise from transport. The motor transport sector is the main cause of the country's emissions of nitrogen oxides (NOx) and sulphur dioxide (SO_2). Age of the vehicles and often poor quality of automotive fuel contribute to the high levels of vehicle emissions. Growing number of cars is aggravating situation.

Table 5. Substances, sources of emission and impact on human health

Substance	Source	Impact
Solid particulates (dust)	Source - fuel combustion (coal and oil), cement production. Consists of particulates of different sizes: PM10 - particles of aerodynamic diameter 10 micrometers and less; PM2.5 – particles of aerodynamic diameter 2.5 micrometers and less.	Inhaling may cause irritation of the respiratory tract (bronchial tubes, lungs). Can penetrate deep into the lungs and remain there for a long period. The smaller the particles, the deeper they penetrate and the more harmful they are.
Sulphur dioxide	Source - combustion of sulphur containing fuel.	Levels higher than the permissible irritate the upper airways of the respiratory tract. Harmful impacts on the nasopharynx and mucous membranes can occur.
Carbon monoxide	Source - incomplete combustion (motor vehicle exhaust); power plant emissions (those using oil and coal combustion), metallurgical industry.	Suppresses transportation of oxygen by blood.
Nitrogen dioxide and monoxide	Source - motor vehicle exhausts, emissions from power stations and the burning of solid waste.	At high concentrations in ambient air, can irritate the lower airways of the respiratory tract, especially the lung tissue.
Lead and lead-containing substances	Source - fuel combustion in motor vehicles (burning of leaded petrol); is also emitted from metallurgical plants.	Poisoning impact is revealed at molecular and cellular levels; impairs nervous, mental and physical development.
Ground-level ozone	Source - photo-chemical reaction between hydrocarbons, oxides of nitrogen and oxygen.	Affects human health, crops and vegetation. High levels - can damage the respiratory system

Table 6. Maximum permissible concentrations of harmful substances in ambient air

Substance	Maximum permissible concentrations, mg/m3		Concentration averaging period
	National legislation	WHO guidance value	
Particulate matter	0.5	-	30 min
	0.15	0.12	24 hr
Nitrogen dioxide	-	0.2	1 hr
	-	0.04	1 year
	0.04	-	24 hrs
	0.085	-	30 min
Sulphur dioxide	-	0.5	10 min
	-	-	1hr
	-	0.05	1 year
	0.05	0.02	1day
	0.5	-	30min
Carbon monoxide	-	100	10 min
	-	10	8 hr
	-	30	1 hr
	5	60	30 min
	3	-	1 day
Lead compounds	-	0.0005	1 year
	0.0003		1 day
	0.001		30 min
Ground level ozone	-	0.12	8hr
	0.03	-	1day
	0.16	-	30 min

As there are no factual measurements data available for the project site, baseline quality values set by regulations on calculation of maximum allowable and/or temporarily agreed emission limits are used as a guidance. The values are linked to population figure. In case of Tbilisi (1,118,035 according to 2014 census data) the values given in highlighted line are used.

Table 7. Guidance concentrations

Population, thou	Baseline concentration, mg/m3			
	Nitrogen dioxide	Sulphur dioxide	Carbon dioxide	Dust
250-125	0.03	0.05	1.5	0.2
125-50	0.015	0.05	0.8	0.15
50-10	0.008	0.02	0.4	0.1<10
<10	0	0	0	0

According official data (National Environmental Agency), dust, nitrogen dioxide and sulphur dioxide concentrations are above the maximum allowed level in Tbilisi. However, it should also be mentioned that situation differ by districts. According to An Integrated Environmental Assessment of State and Trends for Georgia's Capital City (2011) the level of air pollution in the project area is ranked as low to medium.

8.4. Noise

The allowable sound levels for residential and public buildings, as well as areas of residential development are specified by the by-law of Georgia on Approval of Qualitative Norms of the State of Environment in the form of Sanitary Norms (SN 2.2.4/2.1.8.000-00). According to the mentioned document the noise at the residential houses shall not exceed the allowable equivalent and maximum sound levels, i.e. the both normative requirements shall be met.

Table 8. Georgian allowable equivalent and maximum sound levels

Type of area	Equivalent sound level, dBA	Maximum sound level, dBA
Areas bordering residential houses, schools and other educational institutions		
7am-11pm	55	70
11pm-7am	45	60
Areas bordering hospitals		
7am-11pm	45	60
11pm-7am	35	50

Main source of noise in the project area is traffic related. Noise in the city exceeds the permissible limits during rush hours at certain main highways and streets. In some locations daytime noise often reaches 78 dB. The highest values are recorded in the city centre. Traffic flows in the project area are comparatively low. In compliance with information provided in An Integrated Environmental Assessment of State and Trends for Georgia's Capital City (2011) the level of background noise in the project area is low.

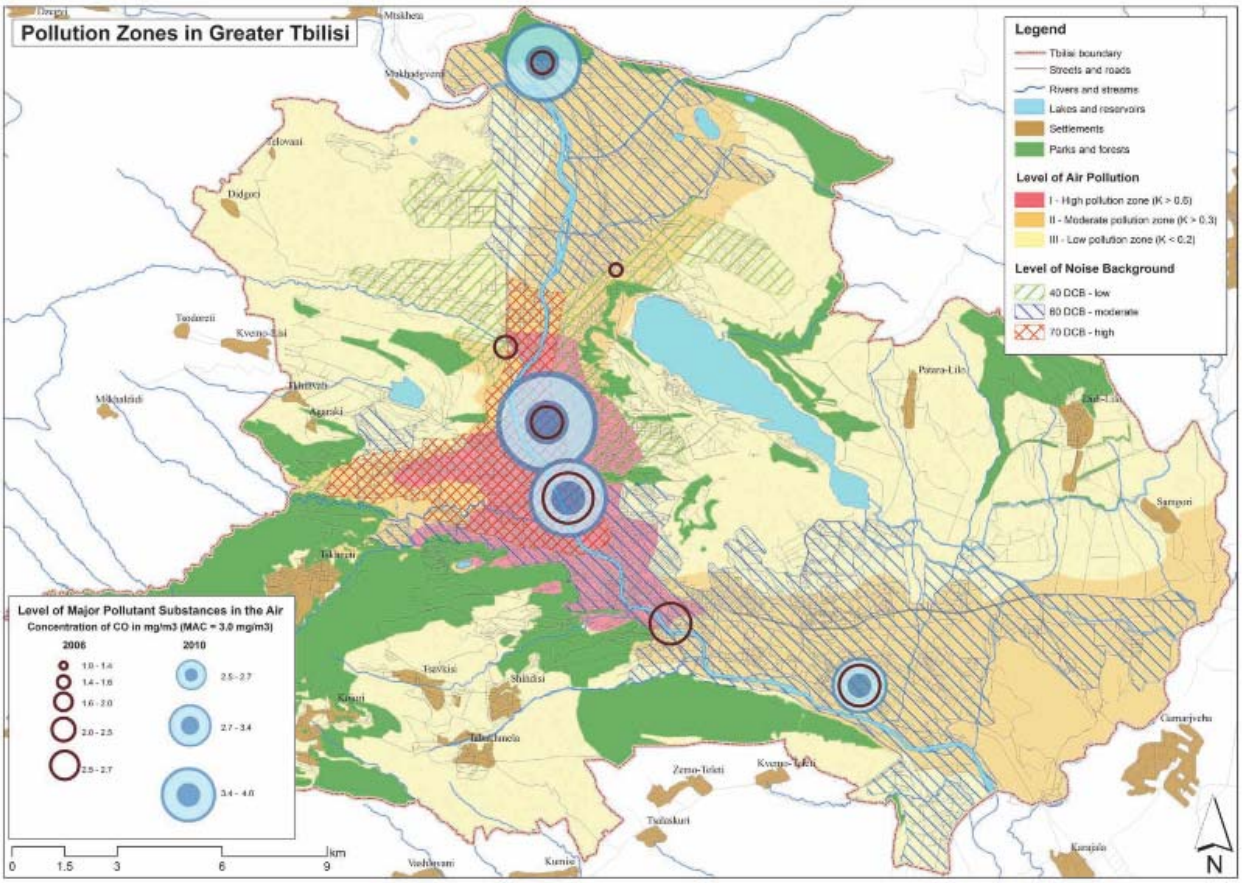


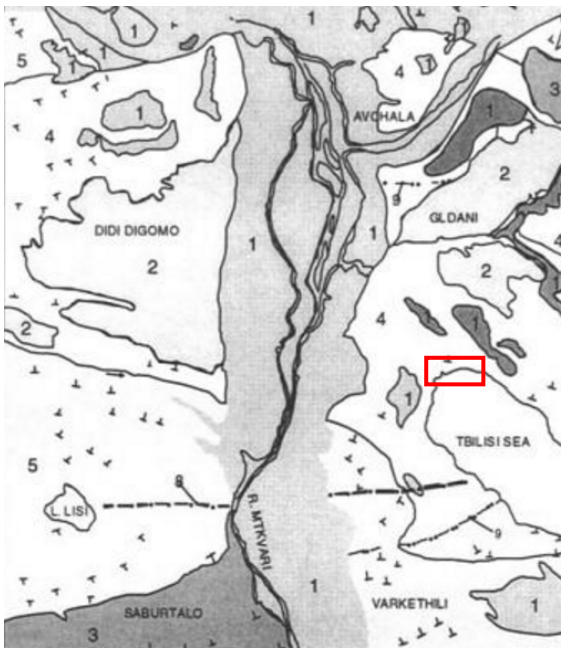
Figure 4. Pollution zones - air and noise pollution map

8.5. Geological conditions

The oldest geological formations in the area and the adjacent territories are the Lower Eocene sediments. The sea transgression took place in Lower Eocene. Formation of Adjara-Trialeti folded system led to intense deposition of coarse grained materials. The lithofacial character of the sediments in early Lower Eocene (Tbilisi layer) proves that the rise of the underwater Amlevi-Teleti zone influenced the sediments greatly. In Olygocene the terigenic materials brought from the north from the south-north the accumulation were being accumulated in the area. Materials brought from the Adjara-Trialeti folded system (from the south-north) dominates. Existence of the tufogenic materials is recorded in the profile of the Oligocene sediments. This points to strong volcanic processes at that time. In the Sakaraulo stage the terigenic materials - terrigenous and graywackle sandstones were substituted by quartz–feldspar, which can be explained by the increase of the land area built of crystalline rocks (at the place of the Great Caucasus).

Decrease of the fragmented materials brought from the north and its enrichment by the Pelaeocene and Eocene tuffogenic rocks in the sediments of the Sakaraulo horizon can be observed southward from the Ormoiani syncline. Along the southern wing of this syncline the sediments of the Sakaraulo horizon are mainly presented by the strong foliate layers of the quartz feldspar, and by clays - along its northern wing. Effusion rocks prevails in the sandstone composition. In the beginning of the Kotsakhuri stage (upper stage of Lower Miocene) within the study area sedimentation of clays had been taking place. By the end of the Kotsakhuri age the folding and sea regression connected with the Chokraki preorophase started. As a result of the tectogenesis the important part of the south-west territory of the area was freed from water. Accordingly the sand clays and the sand stones formed sediments in the upper part of the Kotsakhuri horizon. The regression started by the end of the Kotsakhuri period continued till the middle of the Chokraki and freed the arch part of the Norio– Khashmi anticline from water. As a result of the transgression started in the Upper Chokraki the land formed earlier had been covered by water only partially. During the Karaganal and Konkal periods the sea basin did not undergo any significant changes. The accumulation of mainly clay-carbonate sediments had been taking place on the bottom of the sea basin. As a result of rise of the separate areas of the sea basin that took place, the sea became shallow and the process of accumulation of coarse grained material (sand stones and micro conglomerates) started. The sediments accumulated during the Pliocene are found on the adjacent territories of the study area.

On the background of the immersion of the bottom of the sea basin, mainly the accumulation of the conglomerates, sandstones and clay materials was taking place. After the Pliocene the sea finally left the territory of the area. From Eocene to Pliocene the shrinking of folds influenced by the Georgian bed from the north and by the Artvin-Armenian bed from the south was taking place. As a result the folds of the northern periphery are inverted to the north – Georgian bed direction and the folds of the south periphery - to the south. The shrinking process was oriented from south to the east. A strong orophase that took place between the Pliocene and Post Pliocene led to the intense folding. Presumable, the meridian faults have been developed during this period. The tectonic movement continued in the Post-Pliocene (anthropogenic period) period and led to increased folding and development of faults. The sediments of the nonerosive river terraces indicate about the gradual rise of the folded system of the study area during the anthropogenic period.



1	Q^{al}_{1-4} Sediments of the Mtkvari Terrace-boulders, sands and loams
2	Q^{al}_{3-4} Deluvial-proluvial sediments – clays, loams, sandy loams, rock debris
3	Q_{3-4} Sediments of closed depression – lacustrine clays, sandy loams and sub-rounded material
4	$N^1_1+N^1_2$ Alternating clays, sandstones and argillites
5	$P_3+N^1_1$ Alternating gypsiferous sandstones and argillites
6	P^3_2 Alternating argillites and sandstones with flysch-like pattern
7	P^2_2 Volcanic tuff sandstones, tuff breccia with argillite sandstone strata

Figure 5. Geological map of Tbilisi

The project area is located on the left side of Khevdzmara, within transitional strip between Dzedzvi-Kalhata height and Avchala lowland. The area is slanting in North direction. Absolute elevation ranges from 480.5 to 484.5m. Tectonically the land plot is located on the south slope of Avchala syncline. The latter is composed of Lower Miocene, so called Kotsakhuri horizon – dark, blackish sub argillites with light grey

sandstone inter layers. Field surveys reveal the following: six layers have been identified: 1-introduced soil; 2- loam; 3-clay; 4-gravel; 5-strongly weathered sub-argillites and sandstones and 6-weakly weathered sub-argillites and sandstones.

8.6. Geohazards

Geo-dynamic processes are very active in Tbilisi and its surroundings. Special risk factors for gravitation landslides, mudflows, erosion and denudation processes are heavy engineering structures, misplaced construction and massive buildings and other infrastructure. There are about 60 landslide zones (locations) observed in Tbilisi, along with a total of 20 km' length of damaged slopes caused by intensive gravitation processes. According to the National Environmental Agency, an absolute majority of active landslides detected in the city are the result of inappropriate planning and construction of civil infrastructure and building blocks. Among other geodynamic processes mudflows that originate during heavy rainfalls in the dry ravines of the high hills surrounding the city should be mentioned. The total network of dry ravines in the Tbilisi area is very abundant and covers about 240 km in total length. Ravines and small rivers like Gldanula, Khevdzmara, etc. comprise an extreme danger of mud-flows.

On the project site (south to the stadium area) some minor traces of erosion are registered. Rehabilitation of protection wall (see Figure 6) is advisable.

Figure 6. Traces of erosion neat the project site

8.7. Seismicity

According to the seismic zoning scheme (Construction norms and rules – Aseismic construction (PN 01.01-09, approved by the Order #1-1/2284 of the Minister of Economic Development, dated 7 October 2009), seismicity of the project area is 8 (Richter scale). Maximum horizontal acceleration of seismic waves within the project zone are as follows: Tbilisi (in general) 0.17m/sec^2; vil Gldani 0.16 m/sec^2.

8.8. Radiation safety

Sources of human-made ionizing radiation can be found in Tbilisi and its surroundings. However, most of these sources are under strict control and do not pose a risk to human health or the environment. Background radiation values in the air, which have been regularly monitored by the National Environmental Agency (NEA) in the city are within the national norms. The national norm of exposure to ionizing radiation in Georgia is 60 micro-roentgen/hour, a level below which human health risk is considered to be minimal. The NEA measures radiation levels in Tbilisi every day.

8.9. Soil and landscape

Natural landscapes of these territories, which according to the paleobotanical data (Kvavadze, 1999) had been represented by hemixerophilous and partially arid forest massifs and fragments of bluestem steppes underwent the gradual anthropogenic transformation. The process of anthropogenic transformation of the

natural landscape was especially intensified after a large water reservoir Tbilisi Sea had been created to irrigate the lands of Samgori valley (1951).

The majority of the natural Samgori landscape has been transformed into cultural-agricultural lands (settlement territories). At present, the fragments of heavily modified natural landscapes can be found at certain locations which are not attractive for development.

Soil within Tbilisi depression is versatile. Diversity is predetermined by partitioned surface. In the most of the areas forest formations have been ousted by meadow vegetation. The landscape is transitional between the forest and the meadow. In the areas like Samgori valley, Soghanlughi meadow landscapes are well expressed. At higher elevations (Saguramo environs) forests are well preserved. In Tbilisi depression Cinnamonic, Meadow cinnamonic (chromic cambisols), Grey cinnamonic soils are met. Along with that Cambisols and gypsum containing soils are registered. Within the project site yellowish – brown delluvial-proluvial clays are registered.

8.10. Surface and ground water

Main surface water bodies in the project area include: Mtkvari River, Khevdzmara, Kvirikobis Khevi, Saaptre khevi, Gldani lake and Tbilisi Sea (Samgori reservoir)

Gldani Lake is relatively large lake, located in the northern part of the city, near Gldani village. The lake is about 900 m long and 300m wide. The Lake is mostly fed by precipitation and salt water springs. Distance from the site to the lake is 4.34km.

Tbilisi Sea (Samgori reservoir) plays important role in hydrological balance of the city and its surrounding area. Water table of the reservoir is 11.6 km^2; water volume - 308 million m^3, average depth - 26.6 m, watershed area - 38.0 km^2. The reservoir was built in the 1950s by filling up a natural depression of three smaller salt lakes located in the northeast part of the city with fresh waters diverted from the Iori River via the Zemo Samgori irrigation canal. Currently, the reservoir is used to regulate the irrigation system of the Samgori Valey, as well as for drinking water supply and recreational purposes. Distance from the site to the reservoir is 234m.

Mtkvari River belongs to the Caspian basin. The river rises on the slopes of Mount Kısırındağı in extreme eastern Turkey and cuts northward through the Lesser Caucasus range in a series of gorges with many rapids. Some distance after entering Georgia, the river swings eastward across the Kartli plain and takes a southeasterly course for the remainder of its length. The river crosses Tbilisi from North-West to South-East. The river finally enters the Caspian Sea by a delta. The Mtkvari is 1,364 km long and drains an area of 188,000 km^2. The river water is used for irrigation, power generation. The river is navigable upstream for 300 miles (480 km) as far as Yevlax, just south of Mingäçevir. High water is often observed in spring and early summer, low water – in winter. The tributaries of the Mtkvari, in the boundaries of Tbilisi, are: Dighmistskali, Vere and Tsavkisistskali from the right; Gldaniskhevi, Lochina - from the left. The bottom of the river gorge in the limits of the city ranges from 425m in Dighomi to 370m in Ortachala. Distance from the site to the Mtkvari river is around 3.36km.

Khevdzmara River originates from southern frontline mountains of Ialno at 920 meters and joins the Mtkvari river from the left. Average inclination 51.0‰, the catchment area is 19.5 km^2. The water regime of the river depends on floods in spring, inundations in summer-autumn period and constant droughts in winter. Distance to the site below 5km.

River Kvirikobiskhevi originates from the spring situated in about 500 m from the north-western part of Kashvetis Gori (1,096.0 m), at the height of 1005 meters, and joins Tbilisi water reservoir from 750 meters south-west of Zhinvali pipeline. Average inclination – 86.0‰, and the catchment area is 6.93 km^2. The depth of the flow is 0.2-0.3 m, velocity – 1.0-1.4 m/sec. The water regime of the river is characterized by spring high water, summer-fall floods and winter stable low waters.

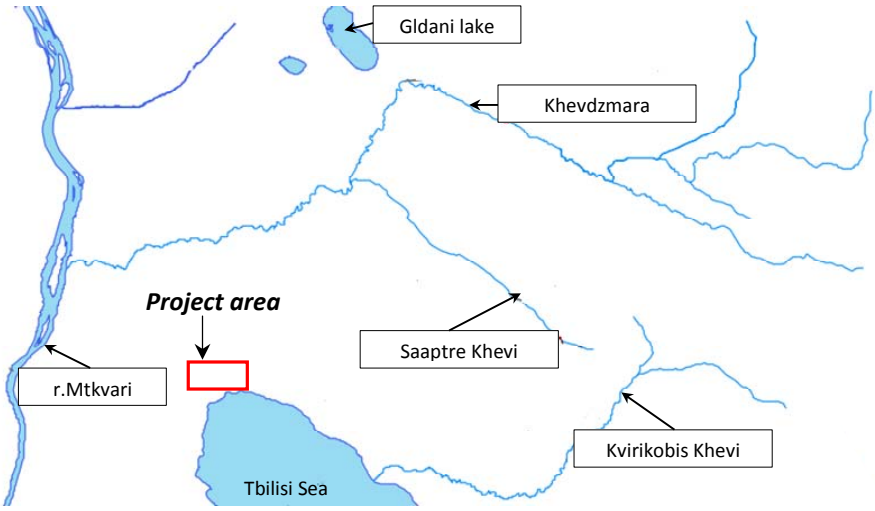


Figure 7. Surface water objects near the project site

Ground water. Clay rocks in the project area are weekly watered. According to the data of hydrogeological survey carried out in the project area water is tapped at 7m, whereas the stationary water level is 4m. Ground water is aggressive to concrete. Link between this water and the Sea

8.11. Protected Areas

The closest to the site protected area, Tbilisi National Park (23218.28 ha) is located in about 6 km from the site. The Park was created in 1973. It was established on the basis of the previously existing Saguramo Strict Nature Reserve founded in 1957. The area is located on southern slopes of Greater Caucasus Range Saguramo-Ialno ranges and their branches, which stretch latitudinal from river Mtkvari to river Iori, at an altitude of 600-1,700 above sea level. It includes districts of Saguramo, Gldani, Martkopi, Gulele and Gardabani.

The dendroflora of the Park is unique due to representation by Colchis species of the Tertiary period, such as: Black Sea holly *(Ilex colchica),* Persian ivy *(Hedera colchica)* and Pastuchov's ivy *(Hedera pastuchowii),* European cranberry bush *(Viburnum opulus)*, Butcher's Broom *(Ruscus ponticus),* Yew *(Taxus baccata),* Caucasian rhododendron *(Rhododendron caucasica),* etc. The species include Georgian oak, Oriental beech, Caucasian hornbeam, ordinary ash-trees, and Oriental hornbeam and crabapple trees. The fauna of the park is very diverse. The most widespread species include the Red fox *(Vulpes vulpes)* and Gray wolf *(Canis lupus)*; Beech marten *(Martes foina),* hare *(Lepus europaeus)* and weasel *(Mustela nivalis)*; such large animals as Roe deer *(Capreolus capreolus)* and famous Caucasian Red deer *(Cervus elaphus).* Prey lynx *(Lynx lynx)* and Brown bear *(Ursus arctos)* can also be met. Ornithofauna is represented by Eurasian jay, Blackbird and several species of woodpeckers, Sparrowhawk, Imperial eagle *(Aquila heliaca)*, Greater spotted eagle *(Aquila clanga)* and Levant sparrowhawk *(Accipiter brevipes)*. There are about 12 reptile species registered in the Park. Among the most widespread is the European legless lizard, as well as Grass snakes, Yellow-bellied racer and Smooth snake.

8.12. Vegetation

Tbilisi is located in the central floristic region of Transcaucasia. Flora of Tbilisi surroundings is similar to Eastern Mediterranean, Southwest Asian and Transcaucasian. In some areas Northern broadleaf and boreal forest floral species are also met. Rich diversity of plant associations (phytocenoses) in the outskirts of the city is due to particular geographic location of the city. The area features all types of terrain, typical for East Georgia. The most widespread are plants characteristic for semi-desert and steppe (plain), xerophyte shrubs, broadleaf forest and other vegetal species. Semi-desert vegetation is mostly prevalent on the left side of the River Mtkvari, round Tbilisi Sea, Jvari monastery, Kumisi Lake, vil.Gldani, Gardabani and Marneuli plains. Vegetation of Tbilisi's environs up to 700 m asl (including Tbilisi Sea area) are represented by steppe species, which has developed mostly after the degradation of mezophilic open forests. Its basic component is Bluestem (*Bothriochola ischaemum*) and Caucasian Bluestem (*Bothriochola caucasicus*). Meadow vegetation is secondary and is prevalent in the upper and lower mountain forest zones. At 500-

800 masl open dry forests are preserved. In some areas near Tbilisi hydrophilic and wetland vegetation can be also found. On the other hand it should also be mentioned that the green zone area within the city is very small compared to the built up-area.

The project area is a flat meadow (inclination 0-5^0); bordering with hilly area from the south. Vegetation is represented by Blackberry bushes (*Rubus*) and Common reed (*Phragmites communis*). The area is strongly altered, the structure is disturbed and floristically impoverished. Planted coniferous trees Black pine (*Pinus nigra*), Himalayan cedar (*Cedrus deodora*), Cypress (*Cupressus* sp.) and evergreen deciduous bushes such as European privet (*Ligustrum vulgare*), individual Poplar trees (*Populus nigra* and *Populus hybrida*) are registered.

Figure 8. Vegetation within the project area

In addition to the listed above visual observation of the area revealed presence of: Jerusalem thorn (*Paliurus spina-christi*), Iberian spirea (*Spiraea hypericifolia*), Smoke tree (*Cotinus coggygria*), Cherry plum (*Prunus divaricata*) and apricot (*Armeniaca vulgaris*). The tree species are concentrated around the building. Vegetation of the rest of the area is represented by grasses.

No protected species have been registered on the site.

8.13. Fauna

Vegetation of Tbilisi's environs has degraded significantly because of urbanization. This process resulted in reduction of fauna diversity. According to official data 302 species of birds were identified in Tbilisi and its surroundings, 10 species of frogs (amphibians), 25 species of reptiles, over 20 species of fish, and 20 species of mammals. Currently there are not more than 50 species of birds, including the Northern Goshawk, Eurasian Sparrowhawk, Kite, Shikra, a very rare Eastern Imperial Eagle, Owl, Hoopoe, Shorteared Owl and others. In the city Swifts, Barn swallows, House martins, Sparrows, Doves, Hooded crows, Rooks are registered; in parks and gardens one can meet Chaffinch, Oriole and Jay. During migration migrant birds, including the Crane, Heron, Common Greenshank, Swan etc. can be observed.
The following species of mammals are still found in city environs: Wolf (*Canis lupus*), Fox (*Vulpes vulpes*), Central Asian Stone Marten (*Martes foina*), Golden Jackal (*Canis aureus*), Wildcat (*Velissil vestris*), Rabbit (*Lepus europeus*), Squirrel (*Sciurus vulgaris*) and Transcaucasian Squirrel (*Sciurus anomalus*). The rodents are represented by Wood Mouse (*Sylvimus silvatcus*), Black Rat (*Rattus rattus*) and Domestic Mouse (*Mus musculus*). Around 800 species of butterflies, several species of spiders (*Dysdera azerbajdzhanica Charitonov, Rucinia grammica, Agelena orientalis, Thanatus atratus Simon, Thanatus formicinus, Xysticus cristatus*)

Ichthyofauna of the Tbilisi Sea and the water objects within the boundaries of Tbilisi includes:

- *Salmo trutta caspius morpha fario* (*Linnaeus, 1758)* – Georgian Red List, status: VU;
- *Sabanejewia aurata aurata (De Filippi, 1863*) – Georgian Red List, status: VU;
- *Leiciscus cephalus orientalis (Nordmann, 1840)* – Caucasian endemic;
- *Rutilus rutilus caspius (Yakovlev, 1870)* – Caucasian endemic;
- *Varicorinus capoeta (Guldenstadt, 1773)* – Caucasian endemic;
- *Barbus lacerta cyri De Filippi, 1865* – Caucasian endemic;
- *Barbus capito (Guldenstadt, 1773)* – Caucasian endemic;
- *Barbus mursa (Guldenstadt, 1773)* – Caucasian endemic;
- *Neogobius constructor (Nordmann, 1840)* – Caucasian endemic;
- *Alburnus filippi (Kessler, 1877)* – Caucasian endemic;
- *Nemachilus brandtii (Kessler, 1877)* – Caucasian endemic;
- *Salmo mykiss (Walbaum, 1792)* – introduced species;
- *Carassius carassius (Linnaeus, 1758)* – Invasive species;
- *Gobio persus (Gunther, 1899)*;
- *Chalcabrinus chalcoides (Guldenstadt, 1772)*;
- *Rhodeus sericeus amarus (Bloch, 1782)*;
- *Acanthalburnus microlepis (De Filippi, 1863*);
- *Alburnoides bipunctatus eichwladi (De Filippi, 1863);*
- *Cyprinus carpio (Linnaeus, 1758);*
- *Silurus glanis (Linnaeus, 1758)*.

Important areas for biodiversity in the project region include:

- The environs of Tbilisi and Tbilisi National Park are where the bats are found;
- The northern part of Gldani Lake presumably used for waterbirds during migration;
- Saaptrekhevi – Nesting area for birds of prey;
- Kvirikobiskhevi – Nesting area for birds of prey and other birds;
- Tbilisi Sea.

No protected species have been registered on the project site. Sensitivity and importance of the project site for biodiversity is low.

8.14. Socioeconomic data

According to the 2014 census data population of Tbilisi is 1,118,035. Compared to the previous census in 2002 3.4% increase is registered. Georgians account for 88% of total population in the project area. Other

ethnic groups are Armenians (4.3%), Russians (3%), Ossetian, Azeri, Yezidi, Abkhazian,Greek, Ukrainian accounting for less than 2% each. The gender ratio of population fully complies with the present gender balance in the country. The number of women outnumbers the number of men.

Unemployment rate in Georgia in 2014 reduced by 2.2 percent and reached 12.4%. In Tbilisi, where unemployment uses to be the highest compared to the regions it reduced by 6.6%. In Tbilisi, out of the employed population 79.6% is employed by different organizations, 20.3% - is self-employed. Employment distribution by size of enterprise and gender with indication of average salary is as given below:

Table 8. Number of employed and average salary by gender and the size of an enterprise

	Number of employed		Average monthly salary, GEL	
	Female	Male	Female	Male
Tbilisi	152279	219730	691.6	1080.9
Big	90095	145427	856.1	1245.8
Medium	22157	27703	608.6	906.9
Small	40026	46600	344.4	599.7

Unemployment rate varies by age groups. The trend observed in the capital mirrors that for the country in general.

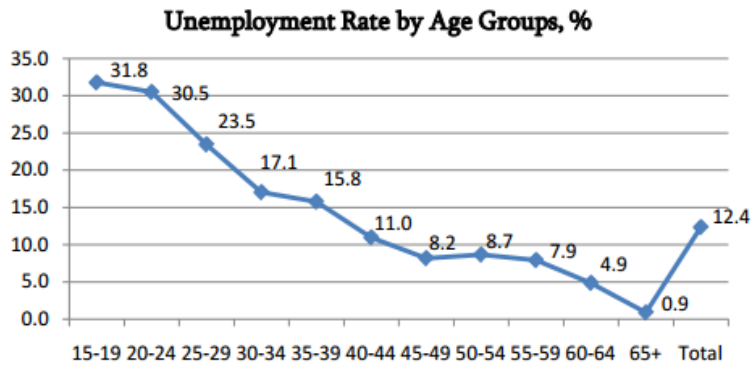


Figure 9. Unemployment rate by age group

Main cash income for population in the city are wages and pension/scholarships/ assistances. Average monthly income of population in Tbilisi (2014 data) and Georgia is shown below:

	Tbilisi	Georgia
Cash income and transfers (million GEL)	**287.1**	**785.5**
Wages	164.9	331.3
From self-employment	26.1	77.2
From selling agricultural production	1.9	71.7
Property income (leasing, interest on deposit etc.)	4.9	9.2
Pensions, scholarships, assistances	36.6	153.8
Remittances from abroad	11.0	36.7
Money received as gift	41.7	105.6
Non-cash income	**3.7**	**91.5**
Income, total	**290.8**	**877.0**
Other cash inflows	**31.8**	**124.5**
Property disposal	3.3	9.2
Borrowing and dissaving	28.5	115.2
Cash inflows, total	**318.9**	**909.9**
Cash and non-cash inflows, total	**322.6**	**1001.4**

Most of the cash is spent on food and tobacco (79 mil GEL). Cash consumption on fuel and electricity accounts for 29.3 million GEL, while around 28 million GEL is spent on healthcare.

In the project area residents with higher and complete secondary education are presented almost equally.

Infrastructure and recreation. Centralized water, sewage systems, gas and power supply are available. The status of the roads in the project area is good. The site is easily accessible for ambulance, fire brigade and passenger vehicles/trucks. Construction waste landfill is in around 6 km (crow fly from the site).

Figure 10. Location of construction waste landfill in Gldani

The closes healthcare facilities are shown in Figure 11.

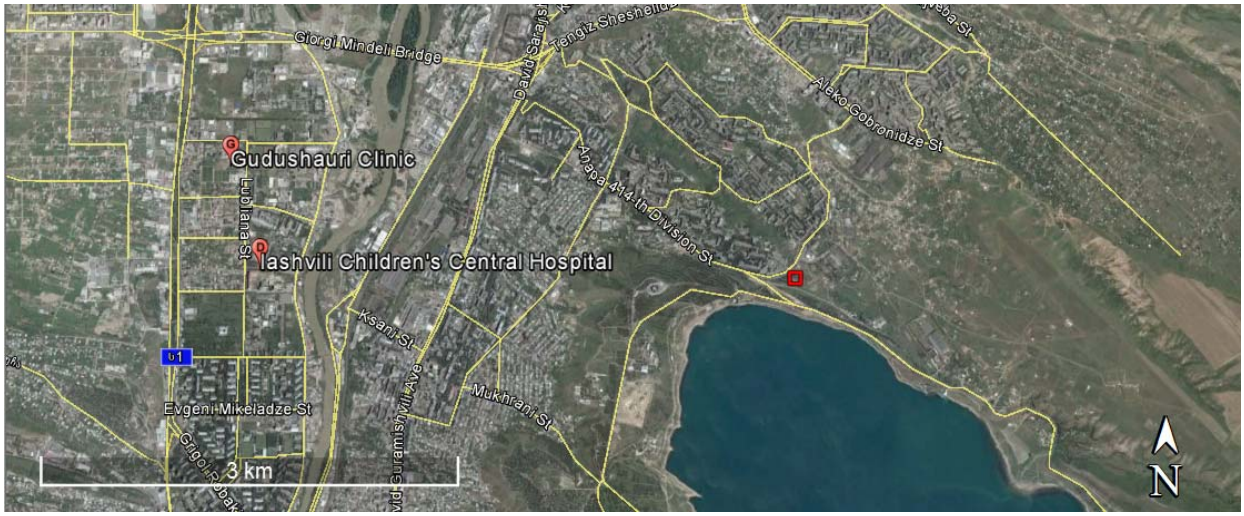


Figure 11. Nearest hospitals

In the project area there are three recreational sites worth to mentioned: Tbilisi Sea – the site intensively used by the residents of Tbilisi for recreation during summer times. The importance of the Tbilisi Sea and surrounding territories for tourism development is underlined in the plans of the Tbilisi Municipality; Gldani Lake, being used for fishing by the local population; Tbilisi National Park.

Cultural heritage and archaeology

Rehabilitation/construction works will be carried out on the site of already developed area. There is no evidence of any archaeological sites within the area of interest.

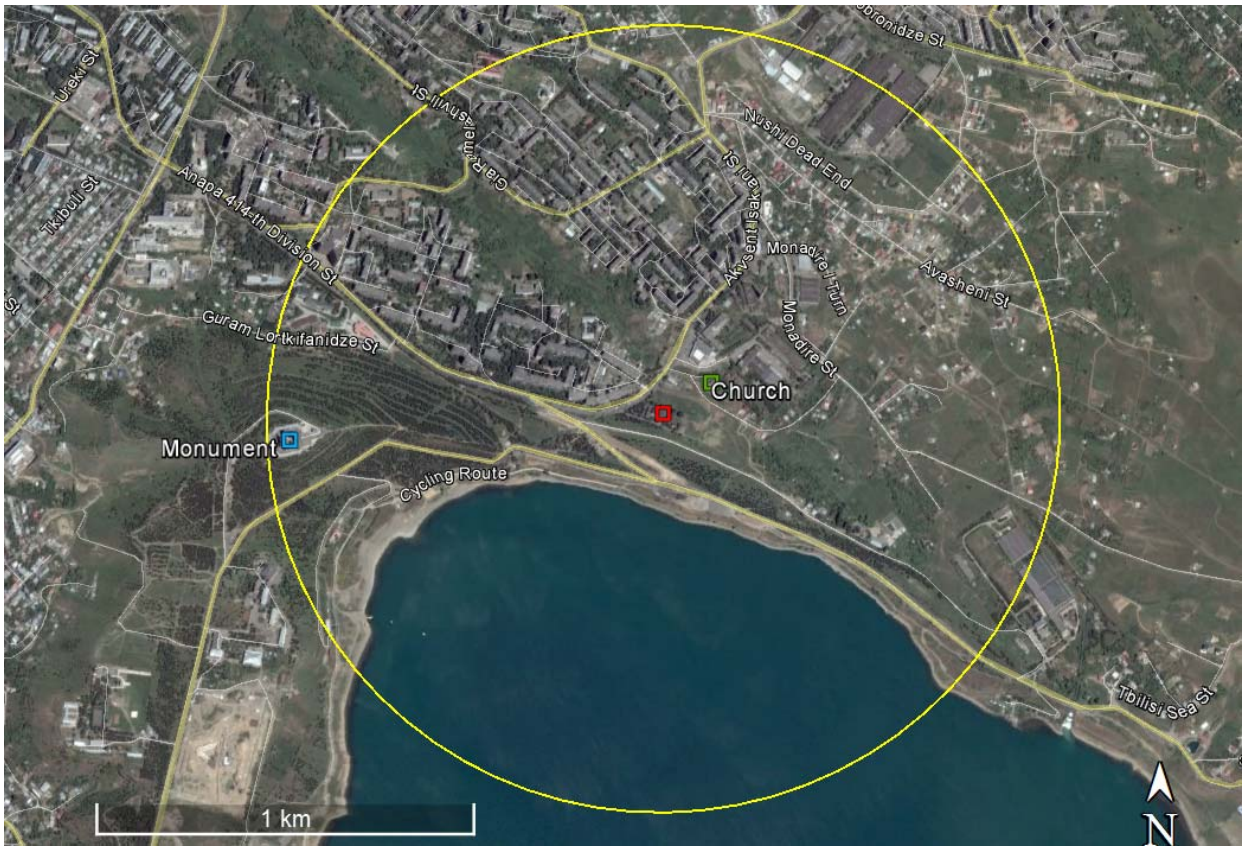


Figure 12. Cultural heritage site near the project area

The only monuments within 1.1km radius from the site are church located to the North and the Chronicle of Georgia monument – west to the project area.

9. Environmental and Social Impacts

The impacts may occur from initial work on-site through the construction period, operational period and to the final demolition when a building comes to an end of its life. Even though the construction period is comparatively shorter in relation to the other stages of a building's life, it has diverse significant impacts on the environment. Type of impacts expected during demolition and construction works are practically similar. These include: impacts related to noise and vibration, dust and air emissions (exhaust emissions from vehicles, machinery); possible impact on soil and water; direct and indirect impacts on vegetation and animals; disturbance of the residents due to hindered traffic, possible disruption of services (waste, gas, power supply), occupational health and safety risks.

Demolition. Demolition works have potential to affect environment and create health and safety risks. In general the key environmental and social impacts related to demolition works include

- Dust and emissions (during demolition, construction and transportation)
- Noise pollution and vibration (during demolition, construction and transportation)
- Impact of soil and vegetation
- Impact on water
- Disposal of demolished materials and other wastes
- Disturbance to pedestrians and motor traffic during transportation of waste/materials
- Disturbance to the existing public utilities infrastructures
- Possibility for temporary employment (positive impact)

With regard to Occupational Health and Safety demolition is considered to be one of the dangerous operations in construction. The risks and dangers related to process include:

- Injuries to workers due to the difficulty of accessing into or working inside a building which is under demolition.
- Falling of smaller objects or debris from the demolishing building.
- Falling of partially demolished structure.
- Collapse of unstable structure due to original structure being disturbed.
- Collapse of heavy demolition equipment due to inadequate support of the partially demolished structure.
- Collapse of the partially demolished structure due to the accommodation of large amount of uncleared debris.
- Congested site environment that easily cause damages to human workers, or to the third parties and their properties that are situated nearby the demo1ition site.

Description and assessment of impact on physical, biological and social environment, mitigation measures and ranking of residual impacts is given below.

9.1. Air emissions

The main air quality impacts that may arise during demolition and construction activities are:

- dust deposition, resulting in the soiling of surfaces;
- visible dust plumes, which are evidence of dust emissions;
- elevated PM10 concentrations, as a result of dust generating activities on site; and
- an increase in concentrations of airborne particles and nitrogen dioxide due to exhaust emissions from diesel powered vehicles and equipment used on site and vehicles accessing the site.

The most common impacts are dust soiling and increased ambient PM10 concentrations due to dust arising from activities on the site. Dust soiling will arise from the deposition of dust in all size fractions. There are other potential impacts, such as the release of heavy metals or other pollutants during the removal of contaminated soils.

Experience of assessing the exhaust emissions from on-site plant and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur.

The risk of dust emissions from a demolition/construction site causing loss of amenity and/or health or ecological impacts is related to:

- the activities being undertaken (demolition, number of vehicles and plant etc.);
- the duration of these activity;
- the size of the site;
- the meteorological conditions (wind speed, direction and rainfall);
- the proximity of receptors to the activities;
- the adequacy of the mitigation measures applied to reduce or eliminate dust; and
- the sensitivity of the receptors to dust.

The quantity of dust emitted from construction operations will be related to the area of land being worked, and the level of construction activity (nature, magnitude and duration).

Emissions from construction vehicles passing over unpaved ground can be particularly important. These will be related to the silt content of the soil, speed and weight of the vehicle, the soil moisture content, the distance covered and the frequency of vehicle movements.

The wind direction, wind speed and rainfall, at the time when a construction activity is taking place, will also influence whether there is likely to be a dust impact. Due to the variability of the weather, it is

impossible to predict what the weather conditions will be when specific construction activities are being undertaken.
Local wind speed and direction influences the dispersion of dust. This will depend on the frequency that the receptor is downwind and the distance of the receptors from the construction activities. Higher wind speeds will result in the highest potential for release of dust from a site. Buildings, structures and trees can also influence dispersion.

Adverse impacts can occur in any direction from a site. They are, however, more likely to occur downwind of the prevailing wind direction and/or close to the site. It should be noted that the 'prevailing' wind direction is usually the most frequent direction over a long period such as a year; whereas construction activity may occur over a period of weeks or months during which the most frequent wind direction might be quite different. The most frequent wind direction may also not be the direction from which the wind speeds are highest. The use of the prevailing wind direction in the assessment of risk is most useful, therefore, for construction projects of long duration.

Dust impacts are more likely to occur during drier periods, as rainfall acts as a natural dust suppressant. Impacts during the summer and winter months are generally different, and if it can be guaranteed that the construction will take place during a particular season, consideration could be given to using seasonal wind and rainfall data. This type of guarantee is not usual because the start of construction depends on many factors. Local conditions also need to be accounted for.

Topography and natural barriers will reduce airborne concentrations due to impaction. In addition, if the locality has a history of dust generating activities, a given level of additional dust may be more acceptable, i.e. more readily tolerated, than in a suburban residential area.

The project area is located in the urbanized zone. More impact is expected to happen during demolition. The magnitude of the impact will depend on selected method of demolition.

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling. This also involve leveling the site and landscaping.
Onsite and offsite traffic related impact on air quality is not expected to be high on either stage of the works.

Despite of comparatively small distance to the residential area with consideration of the scale and duration of the anticipated activities the nuisance to population related to the temporary deterioration of air quality will be limited in time, reversible, and is ranked as low. The magnitude of impact can be controlled and reduced through implementation of mitigation measures listed below.

Keeping in mind that the premises are intended for education establishment Impact on air quality on operation stage will be negligible. Air quality impact will be similar to that caused by ordinary residential block, school or university. Traffic related impacts are not expected to be high.

9.1.1. Impact Assessment

Taking into account the mentioned above the impact can be characterized as follows:

	Demolition/Construction	**Operation**
Character (positive/negative, direct /indirect);	Negative, Direct, Indirect	Negative
Magnitude (insignificant, low, medium, high or very high);	Low to medium	Low
Likelihood (low, medium or high risk);	High	Low
Impact area (working site, project area or region);	Working site	Working site
Duration (short-, mid- or long-term);	Short term	Short term
Reversibility (reversible/irreversible).	Reversible	Reversible
Severity	Low	Low

9.1.2. Mitigation Measures

To keep impact under control the following mitigation measures will be carried out.

On demolition and construction stage this includes:

- Ensuring proper technical state of maintenance of construction equipment and vehicles;
- Implementation of dust reduction measures in dry weather (e.g., construction sites and roads watering, protection of rules of bulk construction material storage and others);
- Providing a wheel-washing facility and ensure that it is used by all vehicles before leaving all sites;
- Covering all loose material with tarpaulins when transported off-site on trucks;
- Implementation of precautionary measures in order to avoid excessive dust emission during land works and materials loading-unloading (eg, restriction loading-unloading material dropping from a big height);
- Keeping to optimum speed of the vehicle movement;
- Undertaking daily on-site/offsite inspection to monitor dust;
- Increasing the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions;
- Ensuring all vehicles switch off engines when stationary – no idling vehicles.
- Erecting solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Enclosing site or specific operations where there is a high potential for dust production and the site is actives for an extensive period;
- Avoiding site runoff of water or mud;
- Keeping site fencing, barriers and scaffolding clean using wet methods;
- Avoiding bonfires and burning of waste materials;
- Ensuring sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Ensuring fine powder materials are delivered in enclosed tankers and stored so to prevent escape of material and overfilling during delivery;
- For smaller supplies of fine power materials ensuring bags are sealed after use and stored appropriately to prevent dust;
- Maximum preservation of vegetation on the site (that can act as natural barrier);
- Equipping employees with personal protection equipment (respirators);
- Briefing on the personnel in best practice;
- Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.

On operation stage mitigation measures are:

- Keeping area clean;
- Watering of potentially dust generating surfaces in dry weather;
- Maintenance of green barriers.

Residual Impact Assessment

Phase	Impact and Impact Sources	Impact Recipients	Residual impact characterisation

Demolition/Construction Phase	***Air emission of dust, combustion products, welding aerosols and other noxious matter*** – Dust sources – ground work, transportation, storage and handling of bulk building materials, and inert waste; – Sources of combustion products – operations requiring building and special machinery. These include ground work, transportation of building materials, construction works; – Sources of welding aerosols – installation of metal structures; – Sources of other pollutants – air emissions from chemicals (fuels, lubricants, paints, etc.) available at sites – nor likely to be the case	Population, Laborers, Biodiversity	As mentioned above the impact will be low. With mitigation measures in place significance of residual impact will be negligible
Operation stage	***Air emission of dust related to traffic*** ***Exhaust emissions from vehicles***	Population, Students, Staff Biodiversity	After mitigation significance of impact will be negligible

9.2. Noise and vibration

Demolition works, loading of waste, importation of materials operation and machinery on the site as well as offsite traffic and presence of people will lead to certain increase of the background noise. Industrial sources of noise close to the project site are not registered. The project area is located in the urban zone where the noise level, mainly traffic related, in the day time is quite high. Although, the baseline noise level is comparatively lower than in the city centre.

The magnitude of impact during demolition will depend on the method of works. Increased noise level may disturb residents of the houses/dwelling blocks located North-East and West to the project area and animal world.

It should be mentioned that the noise will attenuate with the distance. Keeping in mind that the modern double-glazed metal-plastic windows are capable to reduce external noise and the fact that demolition works will start in February when the windows used to be closed noise impact on the nearest residents is not expected to be high. Onsite and offsite traffic during demolition and construction will be limited. Respectively noise, in case the works are managed properly (see mitigation measures) will not be of a great nuisance.

Certain impact may be related to the offsite traffic (removal of waste, importation of materials). Project related intensity of the offsite travel will not be high. Therefore contribution of the project related traffic noise will be negligible. Impact will be managed by scheduling offsite movement to the off-peak time and implementation of mitigation measures listed below (see subsection 9.2.2.)

Noise during operation of RTC will be low.

9.2.1. Impact Assessment

Taking into account the mentioned above the impact can be characterized as follows:

	Demolition/Construction	**Operation**
Character (positive/negative, direct /indirect);	Negative, Direct	Negative
Magnitude (insignificant, low, medium, high or very high);	Medium	Low
Likelihood (low, medium or high risk);	High	Medium to low
Impact area (working site, project area or region);	Project site	Project site

Duration (short-, mid- or long-term);	Short term	Short term
Reversibility (reversible/irreversible).	Reversible	Reversible
Severity	Low	Low

9.2.2. Mitigation Measures

Noise mitigation measures include:

- Provision of proper technical maintenance of machinery/equipment. Plant shall be maintained in good working order so that extraneous noise from mechanical vibration, creaking etc. is kept to a minimum;
- Fitting vehicles and mechanical plant used for the purpose of the works with effective exhaust silencers;
- Preservation of vegetation acting as a natural noise barrier;
- Installation barriers (e.g. acoustic sheds or partitions) to reduce noise whether practicable;
- Implementation of noise generating works in daytime. Strict keeping to the works schedule;
- Ensuring all vehicles switch off engines when stationary – no idling vehicles. Machines in intermittent use should be shut down or throttled down to a minimum when not in use;
- Fitting compressors with properly lined and sealed acoustic covers which should be kept closed whenever in use;
- Fitting pneumatic percussive tools with mufflers or silencers of the type recommended by the manufacturers;
- Giving preference to equipment which breaks concrete, brickwork or masonry by bending or bursting or "nibbling" to percussive tools where practicable;
- If required, where practicable, rotary drills/bursters activated by hydraulic or electrical power will be used for excavating hard or extrusive material;
- If required, equipment powered by electricity will be used in preference to equipment powered by internal combustion engine or locally generated electricity;
- If used and wherever practicable noise emitting machinery which is required to run continuously shall be housed in a suitable acoustically lined enclosure;
- Care should be taken to reduce noise when loading or unloading vehicles;
- Training/briefing of the personnel in best practice;
- Equipping employees with personal protection equipment (earphones/earmuffs);
- Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.

9.2.3. Residual Impact Assessment

Phase	Impact and Impact Sources	Impact Recipients	Residual impact characterisation
Demolition/Construction Phase	***Noise emission*** – Noise from machinery and special equipment used during various demolition/ construction works, – Noise during loading/ unloading operations; – Traffic noise during waste and material transportation	Population, labourers, wildlife	With mitigation measures in place significance of residual impact will be low to negligible
Operation stage	***Noise emission*** – Noise related to traffic	Population in neighboring area, wildlife	No mitigation measures are planned. Impact/ residual impact is ranked as negligible

9.3. Soil

Dismantling/construction works may affect quality of soil in the project area. Impact may be due to

ramming, loss/damage of topsoil, deterioration of soil quality caused by spilled fuel/oil from vehicles and/or construction machinery and/or caused by littering and poor management of demolition waste and materials. (General recommendations regarding the management of topsoil are given in Annex 2)

Topsoil from the areas where earthworks are planned and the areas where the topsoil can be affected will be removed and temporarily stored until reuse during recultivation. Topsoil will also be stripped from the 'surface' of excavated pit north to the building. The pit will be filled up with excavated subsoil and covered with topsoil layer. Topsoil storage site will be protected from scattering by wind or washing away by surface runoff.

Stability of soil is not likely to be violated. Volume of earthworks is rather limited. The slopes, in particular those where traces of erosion are visible, are out of the active works area. Vegetation on the slopes will be preserved, which means that increase of erosion because of the project activities is not expected. Protection was arranged along the slope next to the stadium area will be rehabilitated.

Impact of soil during operation may occur if fuel/oil spilled in the parking area is washed off by the surface runoff. This is not likely to happen, unless any accident occurs. Respectively impact on ground water is not expected.

Dust generated during demolition/construction can deposit on foliage. Dust removed from the leaves during the rainfall can rapidly leach chemicals contained in dust into the soil.

Impacts during demolition/construction and operation can be reduced by keeping to best practice and implementation of mitigation measures (see Section 9.3.2.)

9.3.1. Impact Assessment

Taking into account the mentioned above the impact can be characterized as follows:

	Demolition/Construction	**Operation**
Character (positive/negative, direct /indirect);	Negative, Direct/indirect	Negative, Direct/indirect
Magnitude (insignificant, low, medium, high or very high);	Low	Low
Likelihood (low, medium or high risk);	Medium to low	Low
Impact area (working site, project area or region);	Project site	Working site
Duration (short-, mid- or long-term);	Short term	Short term
Reversibility (reversible/irreversible).	Reversible	Reversible
Severity	Low	Low

9.3.2. Mitigation Measures

The following environmental requirements/mitigation measures will be taken into account by the building contractor, in order to prevent damage/pollution of the soil. The measures will include:

- Minimized ground clearance;
- Removal of the fertile soil layer (topsoil) and temporary disposal on the pre-selected areas;
- Separate storage of subsoil and topsoil to preserve the quality of the fertile soil layer;
- Maximum preservation of vegetation;
- Strict protection of the working site borders, to avoid possible contamination of the "neighbouring" areas, fertile soil layer damage and soil ramming;
- Proper technical state of maintenance of machinery, in order to prevent soil pollution with fuel/oil spill;
- Proper waste management and housekeeping;
- Proper management of wastewater (car wash, runoff) - arrangement wheel wash site;
- In case of fuel/oil spill, localization of the spilled material and immediate cleaning of the contaminated area;
- Equipping the site with spill response kits (adsorbents, shovels, etc.). [In case of large spill, which is not likely to be the case, contaminated soil shall be stripped and removed by the licensed contractor for remediation];

- Training of the staff on environmental and safety issues, before starting the work;
- Removal of temporary facilities, waste and surplus material and recultivation of the sites after completion of the construction works;
- Amelioration/recultivation of disturbed sites

With consideration of the likelihood and magnitude of impact during operation, no mitigation measures except for proper clean-up of the area are set.

9.3.3. Residual Impact Assessment

Phase	Impact and Impact Sources	Impact Recipients	Residual impact characterisation
Demolition/ Construction Phase	**Loss/damage of fertile soil layer** – Impact caused by movement of vehicles and construction equipment (ramming)	Local population, vegetation, wildlife	With mitigation measures in place significance of residual impact will be low to negligible
	Contamination of soil – Oil/fuel, other chemical spills; pollution with waste	Vegetation, ground water	
Operation stage	***Soil contamination*** – Pollution with oil/fuel – Pollution with waste	Vegetation, groundwater, animals	No mitigation measures are set. Impact/residual impact is low

9.4. Vegetation

Removal of trees (direct impact) is not planned. The boundaries of the operation ground will be defined prior to commencement of works and strictly kept to. Trees and vegetation available on the site will be preserved.

Dust from demolition and construction sites deposited on vegetation may create ecological stress within the local plant community. During long dry periods dust can coat plant foliage adversely affecting photosynthesis and other biological functions.

Keeping in mind duration of demolition/construction activities the plant communities near short-term works are likely to recover within a year of the dust soiling stress ceasing. Cement dust deposited on leaves can increase the surface alkalinity, which in turn can hydrolyse lipid and wax components, penetrate the cuticle, and denature proteins, finally causing the leaf to wilt. Limestone dust coating of lichen has been shown to damage its photosynthetic apparatus. These types of damage over a long period have the potential to change plant community structure and function.

With consideration of the scale and duration of works impact of this scale is not expected.

After completion of construction disturbed areas within the project site will be cleaned up reculivated.

Impact on vegetation during operation will not be the case.

9.4.1. Impact Assessment

Taking into account the mentioned above the impact can be characterized as follows:

	Demolition/Construction	Operation
Character (positive/negative, direct /indirect);	Negative, Direct	Impact is not expected
Magnitude (insignificant, low, medium, high or very high);	Low	
Likelihood (low, medium or high risk);	Medium	
Impact area (working site, project area or region);	Working site	
Duration (short-, mid- or long-term);	Short term	
Reversibility (reversible/irreversible).	Reversible	

Severity	Low	

9.4.2. Mitigation Measures

Measures for management and avoidance/mitigation of impact will include:

- Strict observance of traffic routes (prohibition of shortcuts) and border or camps/construction areas in order to minimize risk of excessive damaging of vegetation cover;
- Fencing of the trees to avoid indeliberate mechanical damage during demolition;
- Prohibition of placing inert waste and materials within the critical root zone;
- Implementation of dust suppression measures and measured identified for soil and air protection (see relevant sections of the document);
- Briefing personnel about the need for protecting of vegetation before commencement of works.
- Removal of waste/surplus material and temporary facilities (if any), cleaning up and recultivation of disturbed sites.

9.4.3. Residual Impact Assessment

Residual impact on construction and operation stages can be ranked as low to negligible.

9.5. Fauna

The project site is located in urban zone. The onsite fauna is represented by birds, insects and rodents (mice, rats). Stray dog and cats were registered during the site visit. Visual observation does not reveal presence of nests of burrows within the direct impact zone of the project. The animals potentially occurring in the area are accustomed to the noise of the city, therefore the project related impact will not be significant. Noise during demolition and construction will cause temporary disturbance of fauna.
Noise level will be ranging from detection[1] to avoidance[2] level.

Construction works might affect animal biodiversity as follows:

- Traffic may lead to collision/injury;
- Loss of vegetation may indirectly affect wildlife;
- Dust may affect feeding base for vertebrate and invertebrate species;
- Trenches pose risk to small animals. They might fall into the trench and get injured;
- Disturbance due to the presence of people and machinery .

Duration of impact will be linked to duration of works.

No specific impact during operation is expected.

9.5.1. Impact Assessment

Taking into account the mentioned above the impact can be characterized as follows:

	Demolition/Construction	Operation
Character (positive/negative, direct /indirect);	Negative, Direct/Indirect	Impact is not expected
Magnitude (insignificant, low, medium, high or very high);	Low to medium	
Likelihood (low, medium or high risk);	Medium	
Impact area (working site, project area or region);	Working site	
Duration (short-, mid- or long-term);	Short term	
Reversibility (reversible/irreversible).	Reversible	
Severity	Low	

9.5.2. Mitigation Measures

Following mitigation measures must be conducted in order to minimize impact on fauna, namely:

- Preservation of vegetation;

[1.] detection level – the noise level that the species would normally be able to detect in a quiet state
[2] avoidance level – the noise level at which the species would start to exhibit active avoidance behaviour, such as running away, in order to avoid the noise.

- Selection of optimal traffic speed to reduce direct impact possibility (accident);
- Implementation of measures in order to reduce dust during execution of the works;
- Implementation of measure for noise and vibration reduction during demolition/construction;
- Pits, trenches and other must be protected to prevent fall of animals. Long boards or logs must be launched into trenches and pits, so that small animals could get out. Trenches must be inspected before filling them with soil;
- Implementation of soil and vegetation impact mitigation measures listed in respective sections of the document;
- Instruction of personnel before commencement of the works.

9.5.3. Residual Impact Assessment

Phase	Impact and Impact Sources	Impact Recipients	Residual impact characterisation
Construction/ Demolition Phase	***Impact on fauna, including:*** – Traffic related injury (direct impact) – Trenches and excavation – risk of injury – Construction machinery - disturbance related to noise; pollution of ambient air	Fauna species visiting the site	With mitigation measures in place significance of residual impact will be low to negligible
Operation Phase	No specific impact expected	Fauna species visiting the site	No impact is expected

9.6. Landscape visual

Demolition/construction work will have temporary negative visual impact.
After completion of works and amelioration of the site, visual impact will be positive.

9.6.1. Impact Assessment

Taking into account the mentioned above the impact can be characterized as follows:

	Demolition/Construction	Operation
Character (positive/negative, direct /indirect);	Negative, Direct	Positive impact
Magnitude (insignificant, low, medium, high or very high);	Low	Medium
Likelihood (low, medium or high risk);	High	High
Impact area (working site, project area or region);	Working site	Working site
Duration (short-, mid- or long-term);	Short term	Long term
Reversibility (reversible/irreversible).		
Severity	Low	Low

9.6.2. Mitigation Measures

Impact mitigation during demolition/construction can be mitigated by

- preservation of vegetation on the site;
- regular cleaning of the area;
- proper waste management (timely and regular removal of waste);
- reducing amount of material kept on site to reasonable optimum;
- management of storage;
- recultivation of all disturbed sites as soon as feasible.

9.6.3. Residual Impact Assessment

Phase	Impact and Impact Sources	Impact Recipients	Residual impact characterisation

Demolition/ Construction Phase	**Visual-landscape impact** – Demolition/construction site – Demolition debris – Material and waste storage area – Construction machinery and people on the site – Onsite and offsite traffic	Local residents, population	With mitigation measures in place significance of residual impact will be medium to low
Operation Phase	**New building and ameliorated site**		Positive impact

9.7. Waste

Demolition waste: Accumulation of hazardous waste during demolition is not expected. The waste stream will include:

Group	Description
	Non-Hazardous
17	**Construction and demolition waste**
170101 170102 170103 170201 170202 170203	Concrete Bricks Tiles and ceramic parts Wood Glass Plastic
1704 170402 170405 170405 170407 170411	Metals including: Aluminium Iron and steel Tin Mixed metals Cables free from oil, resin and other hazardous substances

According to an estimate most of generated waste will be unusable. Waste will be removed to special landfill in Gldani. To avoid accumulation on the site waste will be regularly removed from the project area.

Construction waste will include the waste streams mentioned above - waste and/or unusable inert material, packaging (paper, plastic, cardboard, glass, metal), etc

Other waste: The audit of the site revealed

- remains of chemical/reagents (The list of reagents with indication of amount is given in Annex 3).
- waste printed circuit boards, wires/cables (approximate volume 2.5m^3)and
- foam from sport pads (approximate volume 2.5m^3)

dumped in the building.

The waste is subject to removal.

Figure 13. Waste registered in the building

According to the List of Waste of Georgia the registered in the building includes:

Group	Description
Hazardous	
160506	Lab chemicals that contain or is composed of hazardous substances, including mixtures of lan substances
160507	Obsolete inorganic chemical substances that contaions of consist of hazardous substances
160508	Obsolete organic chemical substances that contain or are composed of hazardous substances
160215	Hazardous components removed from obsolete equipment
170410	Cables that containg oil, resin or other hazardous substances
Non-hazardous	
160509	Obsolete chemical substances that are not included in 160506, 160507 or 160508
160216	Components, removed from onsolete/waste equipment – not included in 160215
170411	Cable free from oil, resin and other hazardous substances

Garbage will be disposed to municipal landfill. Amount of food waste generated on the site will be negligible. Hazardous waste will be handed over to licenced contractor for utilization/disposal.

Main waste streams expected on operation stage will include: paper, food waste, printer cartridges, electrical waste, fluorescent bulbs. Recyclables will be collected separately, by type. For disposal of cartridges, damaged electrical waste and fluorescent bulbs agreements with authorized contractors will be signed.

9.7.1. Impact Assessment

Taking into account the mentioned above the impact can be characterized as follows:

	Demolition/Construction	Operation
Character (positive/negative, direct /indirect);	Negative, Direct	Negative
Magnitude (insignificant, low, medium, high or very high);	Medium	Low to medium
Likelihood (low, medium or high risk);	High	High
Impact area (working site, project area or region);	Working site	Working site
Duration (short-, mid- or long-term);	Short term	Long term
Reversibility (reversible/irreversible).	Reversible	Reversible
Severity	Low	Low

9.7.2. Mitigation Measures

On demolition/construction stage:

- Waste management plan will be developed and implemented;
- Scrap metal and wood waste, if reusable, will be disposed respectively;

- Blockage of passages and traffic ways with demolition debris will be avoided;
- Inert waste will be removed to the Gldani landfill. Frequency of removal will be adapted to generation rate;
- Hazardous waste (including chemical and electronic waste) will be removed by licenced contractor;
- Littering and fly tipping will be prohibited;
- Personnel will be trained in good practice.

On operation stage

- Agreement on disposal of garbage to municipal landfill will be signed with landfill operator;
- Waste bins will be provided;
- Recyclables will be collected separately and handed over to recyclers;
- Hazardous waste will be removed by licenced contractor.

9.7.3. Residual Impact Assessment

With mitigation measures in place significance of residual impact during construction and operation is ranked as low.

9.8. Occupational Health and Safety

Demolition, dismantling must be carefully planned and carried out in a way that prevents danger and risks listed below:

Falls from height	During demolition and dismantling, workers can be injured falling from edges, through openings, fragile surfaces and partially demolished floors.
Injury from falling materials	Workers can be injured by the premature and uncontrolled collapse of structures, and by flying debris.
Uncontrolled collapse	Workers can be injured by uncontrolled collapse of the structure/building
Risks from connected services	Risks related to gas, electricity
Traffic management	Risk of being hit by vehicles turning, slewing, or reversing.
Hazardous materials	Hazardous materials that should to be considered include dust, respirable crystalline silica (RCS); acids from industrial processes; paints; flammable liquids.
Noise	Frequent exposure to loud noise can permanently damage a person's hearing. Noise can also create a safety risk if it makes it difficult for workers to communicate effectively or stops them hearing warning signals.
Vibration	Vibrating hand tools used in demolition can cause hand-arm vibration syndrome (HAVS).
Fire	Fire is a risk where hot work (using any tools that generate spark, flame or heat) is being done.

Indirect impact on health is directly connected with failure of compliance with environmental (ambient air, soil) qualitative norms.

OHS impacts during operation – not expected. General safety requirement applicable to educational institution must be considered.

9.8.1. Impact Assessment

Taking into account the mentioned above the impact can be characterized as follows:

	Demolition/Construction
Character (positive/negative, direct /indirect);	Negative, Direct, Indirect
Magnitude (insignificant, low, medium, high or very high);	Low to Medium
Likelihood (low, medium or high risk);	High
Impact area (working site, project area or region);	Working site
Duration (short-, mid- or long-term);	Short term
Reversibility (reversible/irreversible).	
Severity	Low

9.8.2. Mitigation Measures

In order to prevent impact during demolition/construction safety rules relevant to the task specific hazard will be followed. Mitigation measures will include:

- The method statement for the demolition will be provided by contractor. The document should identify the sequence required to prevent accidental collapse of the structure
- Isolation or disconnecting gas, electricity, water services before demolition work. If this is not possible, pipes and cables must be labelled clearly, to make sure they are not disturbed;
- Establishing exclusion zones and hard-hat areas, clearly marked and with barriers or hoardings if necessary;
- Provision of personal protection equipment (PPE) and safety harnesses;
- Installation of warning signs- caution, restriction and directive sign-boards
- Restriction of unauthorised access to the work site;
- Observance of traffic speed in residential areas;
- Putting in place effective traffic management systems to avoid putting workers at risk of being hit by vehicles turning, slewing, or reversing.
- Availability of first aid kit - standard medical boxes must be located on the places especially dangerous for health on construction site;
- Availability of first fire fighting equipment, fire plan and escape routes;
- Briefing staff in OHS issues;
- Presence of H&S officer on the site;
- Instruction of personnel on health and safety rules;
- Strict keeping to working hours;
- Registration of accidents, incidents and near misses. Investigation of incidents in order to avoid them in the future.

9.8.3. Residual Impact Assessment

Range	Impact and Impact Sources	Impact Recipients	Residual impact characterisation
Demolition/ Construction Phase	***Health and safety risks:*** – Direct (eg.: accidents, power stroke, falling from heights, traumatism, injuries from construction techniques, etc); and – Indirect (emissions, increased acoustic background, climate change, contamination of water and soil).	Staff and local population	With mitigation measures in place significance of residual impact will be medium to low

9.9. Socioeconomic impacts

Demolition and construction works will be implemented by the company identified through tendering procedure. Creation of additional workplaces is not expected.

No demographic changes/migration is expected at any stage of the project.

Operation of the RTC will have positive effect - the college will offer high quality professional education according to national and international standards, prepare qualified professionals in railway industry enhance skills and capabilities of existing employees and create environment for their carrier opportunities.

RTC will provide equal possibilities of employment and education irrespective to gender, ethnicity, political and/or religious denominational membership.

10. Environmental and Social Management Plan

10.1. Environmental and Social Management Plan

Project Activity	Description of Potential Impact	Planned Mitigation Measures	Party Responsible for Mitigation	Party Responsible for Supervision	Cost of Mitigation Measure
DEMOLITION WORKS					
Demolition of walls s; removal of parquet, wooden floors, concrete cover, tiles, plastering, and r/c roofing slabs	Impact on air quality	• Ensuring proper technical state of maintenance of construction equipment and vehicles; • Implementation of dust reduction measures in dry weather ; • Undertaking daily on-site/offsite inspection to monitor dust; • Increasing the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; • Erecting solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. • Enclosing site or specific operations where there is a high potential for dust production and the site is actives for an extensive period; • Maximum preservation of vegetation on the site (that can act as natural barrier); • Equipping employees with personal protection equipment (respirators); • Briefing on the personnel in best practice; • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.
Demolition of walls s; removal of parquet, wooden floors, concrete cover, tiles, plastering, and r/c roofing slabs	Waste	• Regular timely removal of waste from the site (to construction waste landfill in Gldani). Frequency of removal will be adapted to generation rate; • Separation of reusable/recyclable material; • Inert waste will be removed to the Gldani landfill. • Personnel will be trained in good practice.	Contractor	RTC	Costs are envisaged in the project.

Demolition of walls; removal of parquet, wooden floors, concrete cover, tiles, plastering, and r/c roofing slabs	Noise	• Provision of proper technical maintenance of machinery/equipment. Plant shall be maintained in good working order so that extraneous noise from mechanical vibration, creaking etc. is kept to a minimum; • Fitting vehicles and mechanical plant used for the purpose of the works with effective exhaust silencers; • Preservation of vegetation acting as a natural noise barrier; • Installation barriers (e.g. acoustic sheds or partitions) to reduce noise whether practicable; • Implementation of noise generating works in daytime. Strict keeping to the works schedule; • Ensuring all vehicles switch off engines when stationary – no idling vehicles. Machines in intermittent use should be shut down or throttled down to a minimum when not in use; • Fitting compressors with properly lined and sealed acoustic covers which should be kept closed whenever in use; • Fitting pneumatic percussive tools with mufflers or silencers of the type recommended by the manufacturers; • Giving preference to equipment which breaks concrete, brickwork or masonry by bending or bursting or "nibbling" to percussive tools where practicable; • If required, where practicable, rotary drills/bursters activated by hydraulic or electrical power will be used for excavating hard or extrusive material; • If required, equipment powered by electricity will be used in preference to equipment powered by internal combustion engine or locally generated electricity; • If used and wherever practicable noise emitting machinery which is required to run continuously shall be housed in a suitable acoustically lined enclosure; • Care should be taken to reduce noise when loading or unloading vehicles; • Training/briefing of the personnel in best practice; • Equipping employees with personal protection equipment (earphones/earmuffs); • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.
Demolition of walls and partitions; removal of parquet, wooden floors, concrete cover, tiles, plastering, and r/c roofing slabs	Impact on soil	• Strict protection of the working site borders, to avoid possible contamination of the "neighbouring" areas, fertile soil layer damage and soil ramming; • Proper technical state of maintenance of machinery, in order to prevent soil pollution with fuel/oil spill; • Proper waste management and housekeeping; • Proper management of wastewater (car wash, runoff) - arrangement wheel wash site; • In case of fuel/oil spill, localization of the spilled material and immediate cleaning of the contaminated area; • Equipping the site with spill response kits (adsorbents, shovels, etc.). [In case of large spill, which is not likely to be the case, contaminated soil shall be stripped and removed by the licensed contractor for remediation]; • Training of the staff on environmental and safety issues, before starting the work; • Removal of temporary facilities, waste and surplus material and recultivation of the sites after completion of the construction works; • Amelioration/recultivation of disturbed sites	Contractor	RTC	Costs are envisaged in the project.

Demolition of walls and partitions; removal of parquet, wooden floors, concrete cover, tiles, plastering, and r/c roofing slabs	Impact on vegetation	• Fencing of the trees to avoid indeliberate mechanical damage during demolition; • Prohibition of placing inert waste and materials within the critical root zone; • Implementation of dust suppression measures and measured identified for soil and air protection (see relevant sections of the document); • Briefing personnel about the need for protecting of vegetation before commencement of works. • Removal of waste/surplus material and temporary facilities (if any), cleaning up and recultivation of disturbed sites.	Contractor	RTC	Costs are envisaged in the project.
Demolition of walls and partitions; removal of parquet, wooden floors, concrete cover, tiles, plastering, and r/c roofing slabs	Impact on fauna	• Preservation of vegetation; • Implementation of measures in order to reduce dust during execution of the works; • Implementation of measure for noise and vibration reduction during demolition/construction; • Pits, trenches and other must be protected to prevent fall of animals. Long boards or logs must be launched into trenches and pits, so that small animals could get out. Trenches must be inspected before filling them with soil; • Implementation of soil and vegetation impact mitigation measures listed in respective sections of the document; • Instruction of personnel before commencement of the works.	Contractor	RTC	Costs are envisaged in the project.
Demolition of walls and partitions; removal of parquet, wooden floors, concrete cover, tiles, plastering, and r/c roofing slabs	Visual	• preservation of vegetation on the site; • regular cleaning of the area; • proper waste management (timely and regular removal of waste); • reducing amount of material kept on site to reasonable optimum; • management of storage; • recultivation of all disturbed sites as soon as feasible.	Contractor	RTC	Costs are envisaged in the project.
Demolition of walls and partitions; removal of parquet, wooden floors, concrete cover, tiles, plastering, and r/c roofing slabs	OHS risks	• Isolation or disconnecting gas, electricity, water services before demolition work. If this is not possible, pipes and cables must be labelled clearly, to make sure they are not disturbed; • Establishing exclusion zones and hard-hat areas, clearly marked and with barriers or hoardings if necessary; • Provision of personal protection equipment (PPE) and safety harnesses; • Installation of warning signs- caution, restriction and directive sign-boards • Restriction of unauthorised access to the work site; • Availability of first aid kit - standard medical boxes must be located on the places especially dangerous for health on construction site; • Availability of first fire fighting equipment, fire plan and escape routes; • Briefing staff in OHS issues; • Presence of H&S officer on the site; • Instruction of personnel on health and safety rules; • Strict keeping to working hours; • Registration of accidents, incidents and near misses. Investigation of incidents in order to avoid them in the future.	Contractor	RTC	Costs are envisaged in the project.

Loading and transportation of waste	Impact on air quality	• Avoiding loading/dumping from high • Ensuring proper technical state of maintenance of construction equipment and vehicles; • Implementation of dust reduction measures in dry weather (eg, construction sites and roads watering, protection of rules of bulk construction material storage and others); • Providing a wheel-washing facility and ensure that it is used by all vehicles before leaving all sites; • Covering all loose material with tarpaulins when transported off-site on trucks; • Implementation of precautionary measures in order to avoid excessive dust emission during land works and materials loading-unloading (eg, restriction loading-unloading material dropping from a big height); • Keeping to optimum speed of the vehicle movement; • Undertaking daily on-site/offsite inspection to monitor dust; • Increasing the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; • Ensuring all vehicles switch off engines when stationary – no idling vehicles. • Maximum preservation of vegetation on the site (that can act as natural barrier); • Equipping employees with personal protection equipment (respirators); • Briefing on the personnel in best practice; • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.
Loading and transportation of waste	Noise	• Provision of proper technical maintenance of machinery/equipment. Plant shall be maintained in good working order so that extraneous noise from mechanical vibration, creaking etc. is kept to a minimum; • Fitting vehicles and mechanical plant used for the purpose of the works with effective exhaust silencers; • Preservation of vegetation acting as a natural noise barrier; • Installation barriers (e.g. acoustic sheds or partitions) to reduce noise whether practicable; • Implementation of noise generating works in daytime. Strict keeping to the works schedule; • Ensuring all vehicles switch off engines when stationary – no idling vehicles. Machines in intermittent use should be shut down or throttled down to a minimum when not in use; • Fitting compressors with properly lined and sealed acoustic covers which should be kept closed whenever in use; • Fitting pneumatic percussive tools with mufflers or silencers of the type recommended by the manufacturers; • Giving preference to equipment which breaks concrete, brickwork or masonry by bending or bursting or “nibbling” to percussive tools where practicable; • If required, where practicable, rotary drills/bursters activated by hydraulic or electrical power will be used for excavating hard or extrusive material; • If required, equipment powered by electricity will be used in preference to equipment powered by internal combustion engine or locally generated electricity; • If used and wherever practicable noise emitting machinery which is required to run continuously shall be housed in a suitable acoustically lined enclosure; • Care should be taken to reduce noise when loading or unloading vehicles; • Training/briefing of the personnel in best practice; • Equipping employees with personal protection equipment (earphones/earmuffs); • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.

Loading and transportation of waste	Impact on vegetation	• Strict observance of traffic routes (prohibition of shortcuts) and border or camps/construction areas in order to minimize risk of excessive damaging of vegetation cover; • Fencing of the trees to avoid indeliberate mechanical damage during demolition; • Prohibition of placing inert waste and materials within the critical root zone; • Implementation of dust suppression measures and measured identified for soil and air protection (see relevant sections of the document); • Briefing personnel about the need for protecting of vegetation before commencement of works. • Removal of waste/surplus material and temporary facilities (if any), cleaning up and recultivation of disturbed sites.	Contractor	RTC	Costs are envisaged in the project.
Loading and transportation of waste	Impact on fauna	• Preservation of vegetation; • Selection of optimal traffic speed to reduce direct impact possibility (accident); • Implementation of measures in order to reduce dust during execution of the works; • Implementation of measure for noise and vibration reduction during demolition/construction; • Pits, trenches and other must be protected to prevent fall of animals. Long boards or logs must be launched into trenches and pits, so that small animals could get out. Trenches must be inspected before filling them with soil; • Implementation of soil and vegetation impact mitigation measures listed in respective sections of the document; • Instruction of personnel before commencement of the works.	Contractor	RTC	Costs are envisaged in the project.
Onsite and offsite traffic	Impact on air quality	• Ensuring proper technical state of maintenance of construction equipment and vehicles; • Implementation of dust reduction measures in dry weather (eg, construction sites and roads watering, protection of rules of bulk construction material storage and others); • Providing a wheel-washing facility and ensure that it is used by all vehicles before leaving all sites; • Covering all loose material with tarpaulins when transported off-site on trucks; • Keeping to optimum speed of the vehicle movement; • Increasing the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; • Ensuring all vehicles switch off engines when stationary – no idling vehicles. • Enclosing site or specific operations where there is a high potential for dust production and the site is actives for an extensive period; • Briefing of the personnel in best practice; • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.

Onsite and offsite traffic	Noise	• Provision of proper technical maintenance of machinery/equipment. Plant shall be maintained in good working order so that extraneous noise from mechanical vibration, creaking etc. is kept to a minimum; • Preservation of vegetation acting as a natural noise barrier; • Installation barriers (e.g. acoustic sheds or partitions) to reduce noise whether practicable; • Strict keeping to the works schedule; • Ensuring all vehicles switch off engines when stationary – no idling vehicles. Machines in intermittent use should be shut down or throttled down to a minimum when not in use; • Training/briefing of the personnel in best practice; • Equipping employees with personal protection equipment (earphones/earmuffs); • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.
Onsite and offsite traffic	Impact on vegetation	• Strict observance of traffic routes (prohibition of shortcuts) and border or camps/construction areas in order to minimize risk of excessive damaging of vegetation cover; • Fencing of the trees to avoid indeliberate mechanical damage during demolition; • Implementation of dust suppression measures and measured identified for soil and air protection (see relevant sections of the document); • Briefing personnel about the need for protecting of vegetation before commencement of works.	Contractor	RTC	Costs are envisaged in the project.
Onsite and offsite traffic	Impact on fauna	• Preservation of vegetation; • Selection of optimal traffic speed to reduce direct impact possibility (accident); • Implementation of measures in order to reduce dust; • Instruction of personnel before commencement of the works.	Contractor	RTC	Costs are envisaged in the project.
Onsite and offsite traffic	Safety	• Installation of warning signs- caution, restriction and directive sign-boards • Restriction of unauthorised access to the work site; • Observance of traffic speed in residential areas; • Putting in place effective traffic management systems to avoid putting workers at risk of being hit by vehicles turning, slewing, or reversing. • Availability of first aid kit - standard medical boxes must be located on the places especially dangerous for health on construction site; • Availability of first fire fighting equipment, fire plan and escape routes; • Briefing staff in OHS issues; • Presence of H&S officer on the site; • Instruction of personnel on health and safety rules; • Strict keeping to working hours; • Registration of accidents, incidents and near misses. Investigation of incidents in order to avoid them in the future.	Contractor	RTC	Costs are envisaged in the project.
CONSTRUCTION WORKS					

Earthworks	Impact on air quality	• Implementation of dust reduction measures in dry weather (eg, construction sites and roads watering, protection of rules of bulk construction material storage and others); • Keeping to optimum speed of the vehicle movement; • Undertaking daily on-site/offsite inspection to monitor dust; • Increasing the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; • Erecting solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. • Enclosing site or specific operations where there is a high potential for dust production and the site is actives for an extensive period; • Maximum preservation of vegetation on the site (that can act as natural barrier); • Equipping employees with personal protection equipment (respirators); • Briefing on the personnel in best practice; • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.
Earthworks	Noise	• Provision of proper technical maintenance of machinery/equipment. Plant shall be maintained in good working order so that extraneous noise from mechanical vibration, creaking etc. is kept to a minimum; • Preservation of vegetation acting as a natural noise barrier; • Installation barriers (e.g. acoustic sheds or partitions) to reduce noise whether practicable; • Implementation of noise generating works in daytime. Strict keeping to the works schedule; • Ensuring all vehicles switch off engines when stationary – no idling vehicles. Machines in intermittent use should be shut down or throttled down to a minimum when not in use; • Training/briefing of the personnel in best practice; • Equipping employees with personal protection equipment (earphones/earmuffs); • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.
Earthworks	Impact on fauna	• Preservation of vegetation; • Selection of optimal traffic speed to reduce direct impact possibility (accident); • Implementation of measures in order to reduce dust during execution of the works; • Implementation of measure for noise and vibration reduction during demolition/construction; • Pits, trenches and other must be protected to prevent fall of animals. Long boards or logs must be launched into trenches and pits, so that small animals could get out. Trenches must be inspected before filling them with soil; • Implementation of soil impact mitigation measures ; • Briefing personnel before commencement of the works in good practice.	Contractor	RTC	Costs are envisaged in the project.
Earthworks	Impact on vegetation	• Fencing of the trees to avoid indeliberate mechanical damage during demolition; • Implementation of dust suppression measures and measured identified for soil and air protection (see relevant sections of the document); • Briefing personnel about the need for protecting of vegetation before commencement of works. • Removal of waste/surplus material and temporary facilities (if any), cleaning up and recultivation of disturbed sites.	Contractor	RTC	Costs are envisaged in the project.

Earthworks	Impact on soil	• Minimized ground clearance; • Removal of the fertile soil layer (topsoil) and temporary disposal on the pre-selected areas; • Separate storage of subsoil and topsoil to preserve the quality of the fertile soil layer; • Maximum preservation of vegetation; • Strict protection of the working site borders, to avoid possible contamination of the "neighbouring" areas, fertile soil layer damage and soil ramming; • Proper technical state of maintenance of machinery, in order to prevent soil pollution with fuel/oil spill; • Proper waste management and housekeeping; • Proper management of wastewater (car wash, runoff) ; • In case of fuel/oil spill, localization of the spilled material and immediate cleaning of the contaminated area; • Equipping the site with spill response kits (adsorbents, shovels, etc.). [In case of large spill, which is not likely to be the case, contaminated soil shall be stripped and removed by the licensed contractor for remediation]; • Training of the staff on environmental and safety issues, before starting the work; • Removal of temporary facilities, waste and surplus material and recultivation of the sites after completion of the construction works. Amelioration/recultivation of disturbed sites	Contractor	RTC	Costs are envisaged in the project.
Earthworks	Visual	• Preservation of vegetation on the site; • Regular cleaning of the area; • Proper waste management (timely and regular removal of waste); • Reducing amount of material kept on site to reasonable optimum; • Management of storage; • Recultivation of all disturbed sites as soon as feasible.	Contractor	RTC	Costs are envisaged in the project.
Onsite and offsite traffic	Impact on air quality	• Ensuring proper technical state of maintenance of construction equipment and vehicles; • Implementation of dust reduction measures in dry weather (eg, construction sites and roads watering, protection of rules of bulk construction material storage and others); • Providing a wheel-washing facility and ensure that it is used by all vehicles before leaving all sites; • Covering all loose material with tarpaulins when transported off-site on trucks; • Keeping to optimum speed of the vehicle movement; • Increasing the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; • Ensuring all vehicles switch off engines when stationary – no idling vehicles. • Enclosing site or specific operations where there is a high potential for dust production and the site is actives for an extensive period; • Briefing of the personnel in best practice; • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.

Onsite and offsite traffic	Noise	• Provision of proper technical maintenance of machinery/equipment. Plant shall be maintained in good working order so that extraneous noise from mechanical vibration, creaking etc. is kept to a minimum; • Preservation of vegetation acting as a natural noise barrier; • Installation barriers (e.g. acoustic sheds or partitions) to reduce noise whether practicable; • Strict keeping to the works schedule; • Ensuring all vehicles switch off engines when stationary – no idling vehicles. Machines in intermittent use should be shut down or throttled down to a minimum when not in use; • Training/briefing of the personnel in best practice; • Equipping employees with personal protection equipment (earphones/earmuffs); • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.
Onsite and offsite traffic	Impact on vegetation	• Strict observance of traffic routes (prohibition of shortcuts) and border or camps/construction areas in order to minimize risk of excessive damaging of vegetation cover; • Fencing of the trees to avoid indeliberate mechanical damage during demolition; • Implementation of dust suppression measures and measured identified for soil and air protection (see relevant sections of the document); • Briefing personnel about the need for protecting of vegetation before commencement of works.	Contractor	RTC	Costs are envisaged in the project.
Onsite and offsite traffic	Impact on fauna	• Preservation of vegetation; • Selection of optimal traffic speed to reduce direct impact possibility (accident); • Implementation of measures in order to reduce dust; • Instruction of personnel before commencement of the works.	Contractor	RTC	Costs are envisaged in the project.
Onsite and offsite traffic	Safety	• Installation of warning signs- caution, restriction and directive sign-boards • Restriction of unauthorised access to the work site; • Observance of traffic speed in residential areas; • Putting in place effective traffic management systems to avoid putting workers at risk of being hit by vehicles turning, slewing, or reversing. • Availability of first aid kit - standard medical boxes must be located on the places especially dangerous for health on construction site; • Availability of first fire fighting equipment, fire plan and escape routes; • Briefing staff in OHS issues; • Presence of H&S officer on the site; • Instruction of personnel on health and safety rules; • Strict keeping to working hours; • Registration of accidents, incidents and near misses. Investigation of incidents in order to avoid them in the future.	Contractor	RTC	Costs are envisaged in the project.

Unloading	Impact on air quality	• Restriction loading-unloading material dropping from a big height; • Equipping employees with personal protection equipment (respirators); • Briefing on the personnel in best practice	Contractor	RTC	Costs are envisaged in the project.
Material storage	Impact on air quality	• Implementation of precautionary measures in order to avoid excessive dust emission; • Undertaking daily on-site/offsite inspection to monitor dust; • Avoiding site runoff of water or mud; • Ensuring sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place; • Ensuring fine powder materials are stored so to prevent escape of material and overfilling during delivery; • For smaller supplies of fine power materials ensuring bags are sealed after use and stored appropriately to prevent dust; • Maximum preservation of vegetation on the site (that can act as natural barrier); • Briefing on the personnel in best practice	Contractor	RTC	Costs are envisaged in the project.
Material storage	Soil	• Strict protection of the working site borders, to avoid possible contamination of the “neighbouring” areas, fertile soil layer damage and soil ramming; • Diversion of water from the stockpile area; • Training of the staff on environmental and safety issues, before starting the work; • Removal of temporary facilities, waste and surplus material and recultivation of the sites after completion of the construction works; • Amelioration/recultivation of disturbed sites	Contractor	RTC	Costs are envisaged in the project.
Material storage	Impact on vegetation	• Strict observance of storage areas in order to minimize risk of excessive damaging of vegetation cover; • Prohibition of placing inert waste and materials within the critical root zone; • Implementation of dust suppression measures and measured identified for soil and air protection (see relevant sections of the document); • Briefing personnel about the need for protecting of vegetation before commencement of works. • Removal of waste/surplus material and temporary facilities (if any), cleaning up and recultivation of disturbed sites.	Contractor	RTC	Costs are envisaged in the project.
Material storage	Visual	• Preservation of vegetation on the site; • Planning material importation to reduce accumulation of large amount on the site	Contractor	RTC	Costs are envisaged in the project.

Material storage	Safety	• Selection of material storage site so to avoid blockage of traffic (pedestrian and vehicles)	Contractor	RTC	Costs are envisaged in the project.
Construction works, including arrangement of foundations and fencing	Impact on air quality	• Ensuring proper technical state of maintenance of construction equipment and vehicles; • Implementation of dust reduction measures in dry weather (eg, construction sites and roads watering, protection of rules of bulk construction material storage and others); • Undertaking daily on-site/offsite inspection to monitor dust; • Increasing the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; • Ensuring all vehicles switch off engines when stationary – no idling vehicles. • Erecting solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. • Enclosing site or specific operations where there is a high potential for dust production and the site is actives for an extensive period; • Keeping site fencing, barriers and scaffolding clean using wet methods; • Maximum preservation of vegetation on the site (that can act as natural barrier); • Briefing on the personnel in best practice; • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.
Construction works, including arrangement of foundations and fencing	Noise	• Provision of proper technical maintenance of machinery/equipment. Plant shall be maintained in good working order so that extraneous noise from mechanical vibration, creaking etc. is kept to a minimum; • Preservation of vegetation acting as a natural noise barrier; • Installation barriers (e.g. acoustic sheds or partitions) to reduce noise whether practicable; • Implementation of noise generating works in daytime. Strict keeping to the works schedule; • Ensuring all vehicles switch off engines when stationary – no idling vehicles. Machines in intermittent use should be shut down or throttled down to a minimum when not in use; • Training/briefing of the personnel in best practice; • Equipping employees with personal protection equipment (earphones/earmuffs); • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.
Construction works, including arrangement of foundations and fencing	Waste	• Timely removal of waste from the project area. Frequency of removal will be adapted to generation rate; • Littering and fly tipping will be prohibited; • Personnel will be trained in good waste management practice.	Contractor	RTC	Costs are envisaged in the project.

Construction works, including arrangement of foundations and fencing	Safety	• Establishing exclusion zones and hard-hat areas, clearly marked and with barriers or hoardings if necessary; • Provision of personal protection equipment (PPE) and safety harnesses; • Installation of warning signs- caution, restriction and directive sign-boards • Restriction of unauthorised access to the work site; • Availability of first aid kit - standard medical boxes must be located on the places especially dangerous for health on construction site; • Availability of first fire fighting equipment, fire plan and escape routes; • Briefing staff in OHS issues; • Presence of H&S officer on the site; • Instruction of personnel on health and safety rules; • Strict keeping to working hours; • Registration of accidents, incidents and near misses. Investigation of incidents in order to avoid them in the future; • Equipping employees with personal protection equipment (respirators)	Contractor	RTC	Costs are envisaged in the project.
AMELIORATION OF THE SITE					
Clean up and seeding/planting	Impact on air quality	• Ensuring proper technical state of maintenance of construction equipment and vehicles; • Implementation of dust reduction measures in dry weather (eg, watering); • Covering all loose waste/material with tarpaulins when transported off-site on trucks; • Implementation of precautionary measures in order to avoid excessive dust emission during loading-unloading (eg, restriction loading-unloading material dropping from a big height); • Keeping to optimum speed of the vehicle movement; • Undertaking daily on-site/offsite inspection to monitor dust; • Increasing the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; • Ensuring all vehicles switch off engines when stationary – no idling vehicles. • Avoiding bonfires and burning of waste materials; • Equipping employees with personal protection equipment (respirators); • Briefing on the personnel in best practice; • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken	Contractor	RTC	Costs are envisaged in the project.

Clean up and seeding/planting	Noise	• Provision of proper technical maintenance of machinery/equipment. Plant shall be maintained in good working order so that extraneous noise from mechanical vibration, creaking etc. is kept to a minimum; • Ensuring all vehicles switch off engines when stationary – no idling vehicles. Machines in intermittent use should be shut down or throttled down to a minimum when not in use; • Care should be taken to reduce noise when loading or unloading vehicles; • Training/briefing of the personnel in best practice; • Equipping employees with personal protection equipment (earphones/earmuffs) whether appropriate; • Recording/registration of complaints (if any) and appropriate action. Identification of cause(s), taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken.	Contractor	RTC	Costs are envisaged in the project.
Clean up and seeding/planting	Waste	• Collection and removal of waste from the site • Separate disposal of recyclables (if any) • Briefing personnel in good practice.	Contractor	RTC	Costs are envisaged in the project.
Clean up and seeding/planting	Visual	• Timely removal of waste from the area • Recultivation of all disturbed sites.	Contractor	RTC	Costs are envisaged in the project.
OPERATION					
Operation of RTC	Impact on air quality	• Keeping area clean; • Watering of potentially dust generating surfaces in dry weather; • Maintenance of green barriers.	RTC	RTC	No extra costs required

Operation of RTC	Waste	• Signing agreement on disposal of garbage with Tbilisi waste management utilities operator; • Provision of waste bins; • Recyclables will be collected separately and handed over to recyclers.	RTC	RTC	No extra costs required

10.2. Environmental and Social Monitoring Plan

Project Activity	Monitoring Parameter	Monitoring Objective	Location	Monitoring Methods	Monitoring Frequency	Responsible Party	Estimated Cost
Demolition works	Dust	Reduction of impact on vegetation, local residents, labourers, fauna	Project area	Visual monitoring	Daily, during demolition works	contractor	No extra costs
Demolition works	Noise	No complaints	Project area	Instrumental measurements	In case of complaints	contractor	No extra costs
Demolition works	Status of vegetation	Reduction of impact on vegetation and fauna. Preservation of noise and dust barrier. Reduction of visual impact	Project area	Walkover, visual monitoring	Weekly, during demolition works	contractor	No extra costs
Demolition works	Technical state of maintenance of vehicles and machinery	Reduction of impact on air, soil. Noise reduction	Project area	Visual monitoring, checking records	During demolition works	contractor	No extra costs
Demolition works	Availability and use of PPE	Reduction of impact on labourers	Project area	Visual monitoring	During demolition works, daily	contractor	No extra costs
Demolition works	Compliance with operation hours	Reduction of noise impact on local residents	Project area	Visual monitoring	During demolition works, daily	contractor	No extra costs
Demolition works	Compliance with waste removal schedule	Reduction of visual impact, avoidance of blockage of the pathways, improvement of safety during operation on the site	Project area	Visual monitoring	During demolition works, according to the waste removal schedule	contractor	No extra costs
Earthworks	Dust	Reduction of impact on vegetation, local residents, fauna	Excavation area	Visual monitoring	Daily, during earthworks	contractor	No extra costs
Earthworks	Compliance with operation hours	Reduction of noise impact on local residents	Excavation area	Visual monitoring	Daily, during earthworks	contractor	No extra costs
Earthworks	Status of vegetation	Preservation of efficient dust and noise barrier, Reduction of impact on fauna	Excavation area	Site walk-over, visual monitoring	During earthworks, depends on duration of	contractor	No extra costs

					works (weekly)		
Earthworks	Small animals entrapped in pits/trenches	Reduction of impact on fauna	Excavation area	Visual monitoring	Daily, during earthworks Prior to backfill	contractor	No extra costs
Construction works	Dust	Reduction of impact on vegetation, local residents, labourers, fauna	Project area	Visual monitoring	Daily, during construction works	contractor	No extra costs
Construction works	Noise	No complaints	Project area	Instrumental measurements	In case of complaints	contractor	No extra costs
Construction works	Status of vegetation	Reduction of impact on vegetation and fauna. Preservation of noise and dust barrier. Reduction of visual impact	Project area	Visual monitoring	Weekly, construction works	contractor	No extra costs
Construction works	Technical state of maintenance of vehicles and machinery	Reduction of impact on air, soil. Noise reduction	Project area	Visual monitoring, checking records	During construction works	contractor	No extra costs
Construction works	Availability and use of PPE	Reduction of impact on labourers	Project area	Visual monitoring	During construction works, daily	contractor	No extra costs
Construction works	Compliance with operation hours	Reduction of noise impact on local residents	Project area	Visual monitoring	During construction works, daily	contractor	No extra costs
Construction works	Compliance with waste removal schedule	Reduction of visual impact, avoidance of blockage of the pathways, improvement of safety during operation on the site	Project area	Visual monitoring	During construction works, according to the waste removal schedule	contractor	No extra costs
Loading and unloading	Loading/unloading height	Reduction of dust	Project area	Visual monitoring	During loading-unloading operation	contractor	No extra costs
Storage	Status of the stored material, topsoil/subsoil	Reduction of damage caused by runoff and/or wind, reduction/avoidance material lossl	Storage area within the boundaries of the project site	Visual monitoring	During demolition and construction works.	contractor	No extra costs
Onsite and offsite traffic	Keeping to working schedule	Reduction of noise impact on local residents	Project area	Visual monitoring	Throughout duration of the demolition/	contractor	No extra costs

					construction works		
Onsite and offsite traffic	Status of technical maintenance	Reduction of impact on air, soil. Noise reduction	Project area	Visual monitoring, checking records	Throughout duration of the demolition/ construction works	contractor	No extra costs
Operation	Status of the slope where traces of erosion are visible	Avoid erosion	Slope south to the building	Visual monitoring	After strong rain and snow events	contractor	No extra costs

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ANNEX 1. Climate conditions

Air temperature

#	Location (Tbilisi)	Air temperature, ^{0}C																			Period with average monthly T<8^{0}C		Aver.temperature at 13:00	
		Average monthly												Average annula	Abs.min	Abs.max.	Aver.max. hottest month	5 day average, coldest month	Average coldest day	Average, coldest period				
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII								Duration, days	Average T	Coldest month	Hottest month
51	Avchala	0.6	2.2	5.9	11.4	16.8	20.7	24.1	24.2	19.5	13.8	7.4	2.5	12.4	-24	40	30.3	-8	-11	0.7	145	3.4	3.1	28.4
52	Airport	0.4	1.9	5.7	11.2	16.6	20.5	24.0	24.1	19.4	13.7	7.3	2.5	12.3	-23	40	30.5	-9	-12	0.3	139	3.0	3.4	28.7
53	Botanical garden	1.3	2.9	6.8	11.9	17.1	20.6	23.7	23.5	19.3	13.8	7.8	3.1	12.8	-22	40	29.9	-7	-10	1.2	131	3.6	4.0	27.6
54	Gldani	0.1	1.7	5.4	10.9	16.3	20.2	23.6	23.8	19.2	13.2	7.1	2.4	12.0	-25	40	29.9	-8	-12	0.2	143	3.1	2.5	27.5
55	Didi Dighomi	0.8	1.9	6.3	11.7	17.1	21.0	24.0	24.8	19.5	13.6	7.5	2.7	12.6	-24	40	30.0	-8	-12	0.6	140	3.5	3.4	28.8
56	Didube	0.7	2.4	6.3	11.7	17.1	20.9	24.3	24.4	19.6	13.8	7.5	2.7	12.6	-24	40	30.0	-8	-12	0.6	140	3.5	3.4	28.9
57	Dighomi	0.7	2.3	6.2	11.6	17.0	20.8	24.2	24.4	19.5	13.8	7.4	2.5	12.3	-23	40	30.2	-8	-11	0.6	146	4.1	3.2	28.7
58	Vake	0.5	2.1	5.9	11.4	16.7	20.6	24.1	24.2	19.4	13.7	7.4	2.5	12.4	-23	40	30.3	-8	-11	0.7	145	3.4	3.4	28.6
59	Varketili	-0.1	1.4	5.1	10.6	15.9	19.8	22.2	22.4	18.8	13.3	6.9	2.2	11.5	-24	40	30.0	-9	-12	-0.1	147	2.8	3.1	26.9
60	Lilo	0.2	1.7	5.5	11.2	16.5	20.3	23.8	23.9	19.3	13.5	6.9	2.3	12.1	-24	40	29.9	-9	-12	0.1	143	2.4	2.8	27.2
61	Mtastminda	-0.6	1.6	4.4	9.7	15.0	18.8	22.1	22.2	17.7	12.3	6.2	1.5	10.8	-24	38	27.9	-9	-12	-0.7	153	2.4	1.3	25.9
62	Observatory	1.0	2.8	6.7	12.1	17.4	21.1	24.4	24.2	19.6	13.8	7.8	3.1	12.7	-23	41	30.9	-7	-11	-0.8	131	3.3	3.7	29.1
63	Saburtalo	0.3	1.9	5.6	11.1	16.5	20.4	23.9	24.0	19.3	13.7	7.2	2.5	12.2	-23	40	30.5	-8	-12	0.2	143	4.8	2.9	27.9
64	Phonichala	0.8	2.6	6.5	11.8	17.3	21.1	24.4	24.6	19.6	13.8	7.6	2.8	12.7	-23	40	30.8	-8	-11	0.7	166	4.1	3.6	29.3
65	Grmaghele	0.1	1.7	5.4	10.9	16.2	20.1	23.6	23.8	19.0	13.1	7.0	2.3	11.9	-24	39	30.0	-8	-12	-0.1	143	3.1	2.5	27.5

Air temperature amplitude

#	Location (Tbilisi)	Average monthly, ^{0}C												Max monthly, ^{0}C											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
51	Avchala	8.0	8.0	10.0	10.5	11.0	11.5	11.5	12.0	11.0	10.5	8.5	8.0	21.0	19.0	20.5	20.6	21.5	18.0	18.9	20.3	21.2	20.4	19.0	18.5
52	Airport	7.8	8.1	9.5	10.3	10.6	11.2	11.5	11.7	10.3	9.7	7.8	7.9	21.3	19.0	20.5	20.6	21.5	18.0	18.9	20.3	22.0	20.4	19.0	18.7
53	Botanical garden	7.8	8.2	9.5	10.2	10.5	11.5	11.5	11.5	10.5	9.5	8.0	9.0	21.3	19.0	21.0	20.6	21.5	18.0	18.9	20.3	22.0	20.4	19.0	18.7
54	Gldani	6.5	7.0	8.2	9.2	9.6	10.7	11.1	11.5	10.0	9.2	7.2	7.0	21.3	19.0	21.0	20.6	21.0	18.0	18.9	20.3	22.0	20.4	19.0	18.7
55	Didi Dighomi	7.9	8.1	9.2	10.8	10.9	11.5	11.8	12.1	10.8	10.2	8.2	8.0	21.2	18.5	20.5	20.4	21.0	17.7	18.9	20.3	22.0	20.4	19.0	18.7
56	Didube	8.0	8.5	10.0	10.5	11.0	11.5	11.5	12.0	11.0	10.5	9.0	8.0	21.2	18.5	20.5	20.4	21.0	17.7	18.9	20.3	22.0	20.4	19.0	18.7
57	Dighomi	7.8	8.4	9.5	10.9	11.3	11.8	11.6	11.6	11.0	10.2	8.9	7.8	21.2	18.5	20.5	20.4	21.0	17.7	18.9	20.3	22.5	20.4	19.0	18.7
58	Vake	7.9	8.2	9.8	10.5	10.0	11.5	11.5	12.0	11.0	10.5	8.8	8.0	21.2	18.5	20.5	20.4	21.0	17.7	18.9	20.3	22.5	20.4	19.0	18.7
59	Varketili	7.8	8.1	9.4	10.5	10.6	11.1	11.5	11.6	10.5	9.7	7.9	7.9	21.0	18.5	20.0	20.4	21.0	17.7	18.9	20.3	22.5	20.4	19.0	18.7
60	Lilo	7.0	7.8	9.0	10.0	10.2	10.9	11.5	11.5	10.0	9.2	7.5	7.0	21.0	18.5	20.5	20.4	21.0	17.7	18.9	20.3	22.5	20.4	19.0	18.7

61	Mtastminda	6.1	6.9	8.2	9.1	9.5	10.3	10.8	10.4	9.0	8.0	6.4	6.1	17.4	18.2	19.5	20.4	20.8	21.6	22.1	21.7	20.3	19.4	17.7	17.4
62	Observatory	7.9	8.1	9.8	10.5	11.1	11.5	11.7	12.1	11.1	10.5	8.7	7.9	18.4	18.6	20.3	21.0	21.6	22.0	22.2	22.6	21.7	21.0	19.2	18.4
63	Saburtalo	7.9	8.2	10.0	10.5	10.6	11.1	11.5	11.6	10.5	9.7	7.9	8.0	18.5	18.8	20.6	21.1	21.2	21.7	22.1	22.2	21.1	20.3	18.5	18.5
64	Phonichala	7.9	8.2	9.8	10.5	11.1	11.5	11.6	12.0	11.0	10.5	8.8	8.0	18.4	18.7	20.3	21.0	21.6	22.0	22.1	22.3	21.5	21.0	19.3	18.5
65	Grmaghele	6.5	7.0	8.2	9.2	9.6	10.7	11.1	11.5	10.0	9.2	7.2	7.0	17.8	18.3	19.5	20.5	20.9	22.0	22.4	22.8	21.3	20.5	18.6	18.4

Relative air humidity

#	Location (Tbilisi)	Relative humidity, %													Mean relative humidity ar 13:00		Mean deaily amplityde of relateive humidity	
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Aver. year	Coldest month	Hotest month	Coldest month	Hotest month
51	Avchala	73	70	68	65	65	61	58	56	63	70	75	75	67	61	44	25	30
52	Airport	73	70	68	65	65	61	58	56	63	70	75	75	67	61	44	19	26
53	Botanical garden	72	70	67	65	65	61	58	56	63	70	75	75	67	61	44	20	25
54	Gldani	73	71	68	65	66	61	58	56	64	72	76	76	67	60	40	13	27
55	Didi Dighomi	73	70	66	62	64	60	56	57	64	73	77	76	66	60	40	20	30
56	Didube	73	69	66	62	64	60	56	57	64	73	77	76	66	60	40	25	30
57	Dighomi	73	69	66	62	64	60	56	57	64	73	77	76	66	60	40	25	30
58	Vake	73	69	66	62	64	60	56	57	64	73	76	76	66	60	40	25	30
59	Varketili	73	71	68	65	66	61	58	56	64	72	76	76	67	60	40	20	30
60	Lilo	74	72	68	66	66	62	60	56	64	72	76	76	67	65	45	21	25
61	Mtastminda	74	72	68	66	68	62	59	57	65	73	77	75	68	68	43	11	26
62	Observatory	73	69	66	62	64	60	56	57	64	73	77	76	66	39	39	25	35
63	Saburtalo	73	70	68	65	65	60	53	56	63	70	75	75	67	61	45	25	30
64	Phonichala	73	70	66	62	65	61	56	56	63	72	76	75	66	60	40	25	30
65	Grmaghele	73	71	68	65	66	61	58	56	64	72	76	76	67	60	40	13	27

Amount of precipitation

#	Location (Tbilisi)	Amount of precipitation per year, mm	Daily maximum, ∂∂
51	Avchala	570	147
52	Airport	540	145
53	Botanical garden	616	145
54	Gldani	550	147
55	Didi Dighomi	560	146
56	Didube	560	146
57	Dighomi	560	147
58	Vake	560	147
59	Varketili	550	143

60	Lilo	555	146
61	Mtastminda	635	154
62	Observatory	560	147
63	Saburtalo	560	147
64	Phonichala	550	142
65	Grmaghele	560	146

Snow cover

#	Location (Tbilisi)	Weight of the snow cover, kPa	Days with persistent snow cover
51	Avchala	0.50	14
52	Airport	0.50	14
53	Botanical garden	0.50	14
54	Gldani	0.50	15
55	Didi Dighomi	0.50	14
56	Didube	0.50	15
57	Dighomi	0.50	15
58	Vake	0.50	14
59	Varketili	0.50	14
61	Lilo	0.50	21
62	Mtastminda	0.50	14
63	Observatory	0.50	14
64	Saburtalo	0.50	14
65	Phonichala	0.50	15
60	Grmaghele	0.50	14

Wind characteristics

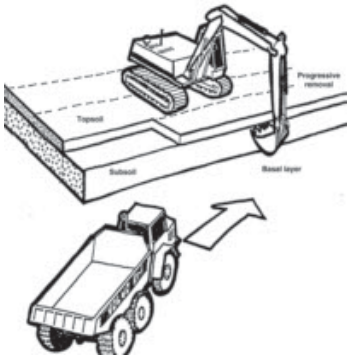
#	Location (Tbilisi)	Max. wind speed observed once in 1, 5, 10, .15, 20 years. m/sec				
		1	5	10	15	20
51	Avchala	28	33	35	36	37
52	Airport	33	41	45	47	48
53	Botanical garden	17	21	23	24	24
54	Gldani	28	33	35	36	37
55	Didi Dighomi	28	33	35	36	37
56	Didube	24	28	30	32	33
57	Dighomi	21	26	29	30	31
58	Vake	21	24	26	27	28
59	Varketili	28	33	35	36	37
60	Lilo	36	44	47	48	50
61	Mtastminda	21	23	27	28	29
62	Observatory	19	24	27	28	30
63	Saburtalo	28	33	35	36	37
64	Phonichala	24	28	30	32	33

65	Grmaghele	24	28	30	32	33

Soil freezing depth. cm

#	Location (Tbilisi)	Clay and clayey	Fine and dust sand sabulous clay	Coarse and medium grain sands	Lumpy soil
54	Gldani	0	0	0	0
59	Varketili	23	28	30	34
60	Lilo	19	23	25	28
61	Mtastminda	18	22	23	27

ANNEX 2. Topsoil and subsoil management recommendations



Topsoil must be removed prior to commencement of works until reintroduction during revegetation of disturbed sites,

Stripping should be undertaken by the excavator standing on the surface of the topsoil, digging the topsoil to its maximum depth and loading into site or off-site transport vehicles.

Appropriate equipment and work practices must be used to avoid adverse impact on the topsoil properties. Topsoil will normally be stripped to a thickness defined by depth below the surface and/or a distinct colour change. Mixing topsoil with subsoil must be avoided to reduce impact on quality and fertility of the topsoil.

Special attention is to be paid to topsoil storage. The way topsoil is handled (collected and stored) can also affect soil characteristics and reduce its revegetation value. For instance, reduction of oxygen content in the stockpiled topsoil reduces its quality; soil structure deteriorates if topsoil is collected when saturated or if the soil is compacted during handling.

Recommended universal practice for topsoil management applicable to all sites.

- Avoid stripping topsoil when it is saturated or when very dry.
- Stockpile must not exceed two metres in height
- Minimise handling of topsoil.
- Keep topsoils separate from overburden, gravel and other materials.
- Protect topsoil stockpiles from erosion.
- Avoid burying topsoil.
- Store topsoil above or beside the excavation, depending on which direction the deposit is being worked, to allow for easier respreading.
- Avoid long term stockpiling of topsoil by using it to rehabilitate worked out areas immediately.
- Locate topsoil stockpiles away from traffic, waterways and sources of pollution.
- Install drainage measures to allow drainage through or around large soil stockpiles.
- Grow vegetation on stockpiles (shrubs and grasses) – for long term stockpiles.
- Avoid driving on stockpiles and compaction. (Soil in a dry and non-plastic state is less prone to compaction, tends to retain a proportion of its structure.)

Good, reusable natural topsoil

Damaged, heavy clay natural topsoil

Stockpile heights of max 2m are commonly used for topsoil that can be stripped and stockpiled in a dry state. Stockpiles may need to be higher where storage space is limited. Management of dry non-plastic and wet plastic soil can be done as described below:

Site selection for topsoil and surplus soil disposal must be selected carefully. Recommendations for site selection are as follows:

- Avoid all wetland sites
- Avoid placing spoil on unstable slopes, where the added weight could trigger a land movement. Excessive loading of clay or silt soils could also trigger a failure.
- Use wide, stable locations (eg. rock pits, ridges, benches) as places to dispose of fill.
- Avoid locations where ground water emerges or a thick organic layer is present.
- Avoid sites of archaeological importance and the areas with endangered or threatened plant species.
- Consult biologist and archaeologist prior to and during the site selection

ANNEX 3. List of waste chemicals registered in the building

#		Qty, g or ml	#		Qty, g or ml
1	Barium chloride (standard titrimetric substance)	100	53	Benzene	300
2	Calcium Phosphate	300	54	Bismuth nitrate	50
3	Calcium carbonate	500	55	Bichromate titre	100
4	Acetic Acid	2000	56	Bromide blue	10
5	Chromic chloride	60	57	Bromphenol blue	10
6	Copper Oxide	50	58	Butanol -1	200
7	Copper Sulfate	250	60	Glycerin	100
8	Ferric Sulphate	300	61	Glucose	350
9	Ferric oxide	150	62	Sulfuric acid	400
10	Ferric Chloride	100	63	Sulfuric acid standard titrimetric substance	500
11	Ferrous Sulfate	100	64	D-glucose	5000
12	Potassium (metallic)	50	65	Diphenylcarbazide	10
13	Potassium carbonate	200	66	Dichloramine	10
14	Potassium dichromate	500	67	Mercury iodide	100
15	Potassium Chromate	600	68	Oil	200
16	Potassium phosphate tribasic	150	69	Thorium	20
17	Potassium chloride	1500	70	Iodine	200
18	Potassium bicarbonate	300	71	Potassium iodate (standard titrimetric substance)	100
19	Potassium nitrate	250	72	Potassium nitrate	300
20	Potassium hydroxide	400	73	Potassium permanganate	150
21	Magnesium chloride	150	74	Potassium permanganate solution	300
22	Magnesium sulfate anhydrous	1500	75	Potassium rhodanide	50
23	Manganese Dioxide	50	76	Potassium phosphate	250
24	Sodium carbonate monohydrate	3000	77	Potassium phtalanate	20
25	Disodium Carbonate monohydrate	150	78	Potassium fluoride	300
26	Sodium sulfite	300	79	Caprolactam	250
27	Sodium sulfate	350	80	Cobalt sulfate	100
28	Sodium sulfate anhydrous (standard titrimetric substance)	150	81	Sodium citrate	150
29	Sodium phosphate tribasic	350	82	Hydrochloric acid	500
30	Sodium chloride	4000	83	Methylorange (solution)	400
31	Sodium Bicarbonate	1500	84	Methylene blue	10
32	Sodium Bisulfate	100	85	Methylene green	10
33	Sodium Nitrate	500	86	Methylene red	100
34	Sodium hydroxide	300	87	Methylorange	50
35	Ammonium Nitrate	250	88	Oxalic acid	200
36	pH-buffer	350	89	Sodium borate	500
37	Petroleum (oil)	150	90	Sodium diethyldithiocarbonate	350
38	Asbestos plastic bottles	150	91	Sodium nitrate	500
39	Zirconyl nitrate.	25	92	Nitrobenzol	100
40	Alizarin red	10	93	Orthotolidine reagent	150
41	Aluminium metallic	200	94	Orthophosphoric acid	1000
42	Aluminum nitrate	250	95	Palmitic acid	250
43	Aluminum oxide	100	96	Peptone	400
44	Aminoacetophenole	10	97	Iron (powder)	100
45	Ammonium nitrate	250	98	Paint	150
46	Ammonium sulfate	450	99	Soda	1500
47	Ammonium chloride	500	100	Copper nitrate	100
48	Activated silica gel	300	101	Copper oxide	50
49	Active blue indicator	10	102	Stearic acid	500
50	Ethyl acetoacetate	300	103	Sulfanilic Acid (NH_2SO_3H).	400
51	Barium nitrate	50	104	Thymolphthalein	20
52	Barium chloride	250	105	Trilon B (stand.titrimetric substance)	400

#		Qty, g or ml	#		Qty, g or ml
106	Lead granulated	100	119	Chromium oxide	400
107	Lead acetate	150	120	Tartaric acid	500
108	Unknown	20	121	Carbamide	300
109	Unknown acid	100	122	Absorbed chemical ХПИ-2	500
110	Unknown liquid	200	123	Acetic acid	3500
111	Unknown liquid in the flask	150	124	Barion acetate	250
112	Unknown liquid in the flask	200	125	Butyl acetate	300
113	Phenyl red	50	126	Sodium acetate	250
114	Phenol	400	127	Copper acetate	200
115	Phosphoric acid	800	128	Red mercury	10
116	Fuchsin	50	129	Scarlet phosphoru	10
117	Chloramine B	100	130	Formic acid	300
118	Chrome dark blue	10	131	Hydroxylamine	50