SWECO

# ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

Autonomous Republic of Ajara, Georgia

Ajara Solid Waste Management Project

Support to the Project Implementation Unit, Engineering Design Services and Contract Supervision
State Procurement N 272

ASSIGNMENT NUMBER 1989230000


**Stockholm/Batumi** 2015-06-19

**Environmental and Social Impact Assessment (ESIA)**

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|---|---|
| Client: | Ministry of Finance and Economy of the Autonomous Republic of Ajara |
| Project: | Consulting Services for Ajara Solid Waste Management Project; Support to the Project Implementation Unit, Engineering Design Services and Construction Supervision, State Procurement N 272 |
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## Abbreviations

| | |
|---|---|
| CH4 | Methane |
| CO2 | Carbon dioxide |
| EBRD | European Bank for Reconstruction and Development |
| EHS | Environmental health and safety |
| ESAP | Environmental and Social Action Plan |
| ESIA | Environmental and Social Impact Assessment |
| EU | European Union |
| GDP | Gross Domestic Product |
| GEOSTAT | Georgian State bureau of Statistics |
| GHG | Greenhouse Gas (e.g. methane, carbon dioxide and other gases) |
| Ha | Hectare |
| HH | Households |
| HR | Human ressources |
| Km | kilometer |
| R/LRF | Resettlement/Livelihood Restauration Framework |
| M | meter |
| MIS | Management Information System |
| MoFE | Ministry of Finance and Economy of Ajara |
| NCG | Nordic Consulting Group |
| NDI | National Democracy Institute |
| OHS | Occupational Health and safety |
| OPM | Oxford Policy Management |
| PAP | Project affected people |
| PR | Performance Requirement |
| RAP | Resettlement Action Plan |
| SEP | Stakeholder Engagement Plan |
| SWC | Solid Waste Company |
| SWM | Solid Waste Management |
| ToR | Terms of Reference |

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# 1 Introduction

This document presents the results of the Environmental and Social Impact Assessment (ESIA) for the Ajara Solid Waste Management (SWM) Project.

The Environmental and Social Impact Assessment (ESIA) is prepared in accordance with the Contract for the provision of Consulting Services for Ajara Solid Waste Management Project; Support to the Project Implementation Unit, Engineering Design Services and Construction Supervision, signed between the Ministry of Finance and Economy of the Autonomous Republic of Ajara and Sweco International on 17th December 2013.

A frist draft of the ESIA for the project was submitted to the Client and to EBRD on 3rd July, 2013. Thereafter, the Client decided to change the suggested project site to the site in Tsetkhlauri. After signing a new Contract in December 2013, the work with the ESIA for the project has proceeded.

Sweco has prepared the ESIA in accordance with EBRD Performance Requirements[1], Georgian legislation, EU Directives and Sida's environmental policy documents[2].

## 1.1 Project Objectives

The overall objective for the investment is to improve the Solid Waste Management (SWM) in the coastal zone in Ajara.

Concrete objectives are to:

- construct and operate a new sanitary landfill facility, compliant for non-hazardous waste with the EC Directive 99/31/EC[3] and
- close down and remediate three non-compliant landfills to the extent of available funds.

## 1.2 Methodology of ESIA

The first stage in the international ESIA process involves 'screening' or categorisation of the Project in line with the expected environmental risks. The Landfill Project in Tsetskhlauri has been categorised as Category A, i.e. is subject to a comprehensive ESIA process.

The following stage, scoping, is documented in the Scoping report (see Annex 1).

Key elements of impact assessment include:

- ✓ To identify and assess environmental and social impacts and issues, both adverse and beneficial, associated with the project;

[1] http://www.ebrd.com/environment/e-manual/e31ebrd-performance-requirements.html
[2] http://sidaenvironmenthelpdesk.se/georgia-environmental-and-climate-change-policy-brief-2009/

[3] Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste

- ✓ To adopt measures to avoid, or where avoidance is not possible, minimize, mitigate, or offset/compensate for adverse impacts on workers, affected communities, and the environment;
- ✓ To identify and, where feasible, use opportunities to improve environmental and social performance; and
- ✓ To promote improved environmental and social performance through a dynamic process of performance monitoring and evaluation.

Where standards for evaluating the permissible impacts were not available for grading of impacts, the significance has been evaluated taking into account the magnitude of the impact and the value or sensitivity of the affected resource or receptor.

The magnitude of impacts was assessed based on the combination of a number of factors such as nature of the impacts, their scale, duration or frequency.

The value or sensitivity of a resource or receptor has been evaluated taking into account its local, regional, national and global designation, its importance to the local or wider community, its ecosystem function or its economic value.

The physical, environmental and socio-economic feasibility of the future landfill site was assessed in two stages (see the attached Site Assessment Report): Rapid Assessment and Detailed Field Surveys. The Rapid Assessment compared the exclusion criteria with the characteristics of the potential location of the landfill site while the Detailed Field Survey included geodesic, geotechnical, geological, hydrological, hydrogeological, land ownership and land use investigations. The preliminary layout of cells and facilities was also created.

Primary sources of information include:

- Interviews with Ministry of Finance and Economy of Ajara
- Interviews with Directorate for Environmental Protection of Ajara
- Workshop at Ministry of Finance and Economy on resettlement and economic displacement,with Resettlement/Livelihood Restauration Framework (R/LRF) consultant, incl. Minister of Finance and Economy of Ajara, representatives of the municipality of Batumi, representatives of the districts of Kobuleti and Khelvachauri.
- Interviews with people living on or on the boarder to Batumi landfill and within sanitary zone
- Interview with representative of Tsetskhlauri community (450 households HH)
- Interviews with waste pickers at Batumi and Kobuleti landfills
- Interviews with people living near at Kobuleti landfill
- Interview with Ministry of Health of Ajara

Secondary information, include:

- Health statistics from the Public Center of health
- Reports from WYG consultant on future Hygiene LtD company set-up
- Population and socio-economic statistics from websites
- Maps from Sweco, adjusted by Ministry of Finance and Economy of Ajara
- Gender study 2010, OPM[4]
- Feasibility Study, Site Assessment[5]
- *Preliminary Design*[6] made by the Consultant.

The 3 latter studies have included inter alia assessment of waste amounts dumped on the non-sanitary landfills in Batumi and Kobuleti and the waste streams composition as well as a weighing campaign to identify the density and composition of the waste. Field investigations covered topographical surveys of the existing Batumi and Kobuleti temporary and Kobuleti Abandoned landfills and planned Tsetskhlauri landfill. Geological, hydrological, hydrogeological and archaeological surveys, as well as surveys of flora and fauna, have also been carried out for the planned landfill in Tsetskhlauri.

## 1.3 Presentation of report

The ESIA briefly describes the existing physical, environmental and socio-economic conditions of the current landfills as well as genereal socio-economic baseline information (chapter 2).

Appraisal of the environmental and social situation is described according to each finding. Potential impacts and suggested mitigation measures follows each area.

A *no-project* alternative is compared with the potential outcomes of the Project in case it will be executed. The *no-project* alternative for this ESIA is the present situation, i.e. no measures for environmental improvements are taken.

Compliance with the EBRD PRs is presented after baseline analysis.

The ESIA document also includes the following documents: :

- Environmental and Social Action Plan (ESAP)
- Stakeholder Engagement Plan (SEP)
- Non-Technical Summary (NTS)

[4] Oxford Policy Management: Georgia: Adjara Solid Waste Management Project Gender analysis and mainstreaming, January 2010
[5] Sweco: Site Assessment Report for The New Landfill Situated at Tsetskhlauri, Adjara, Georgia, August 2012
[6] Sweco: Preliminary Design Report, February 2013

# 2 General information about Georgia and project area

## 2.1 Republic of Ajara

The Autonomous Republic of Ajara (further “Ajara” or “ARA” or “Adjara”) is located by the Black Sea in southwest Georgia and covers 2 900 km$^2$ (Figure 1).


*Figure 1 Location of Ajara in Georgia*

Ajara is characterised by a densely populated coastal zone while other areas can be sparsely populated and unoccupied. The latter ones are mountainous areas, which are the prevailing terrain type in Ajara.

The waste management in the area is an increasing problem as the population expands, tourism develops and economy grows in the coastal zone. Detailed indicators of the development trends are given in the *Feasibility Study*[7].

The primary project objective is to build an EU compliant sanitary landfill facility in Tsetskhlauri and to close down three inadequate landfills in Batumi and Kobuleti (both abandoned and temporary ones). The locations of new and old landfills are shown in Figure 2. The new landfill to be built in Tsetskhlauri will first serve the City of Batumi, the nearby resort Kobuleti and coastal zone and stripes along the main road in Khelvachauri. The collection area will be further extended in the future.

[7] Sweco: Feasibility Study and Project Preparation, November 2008.

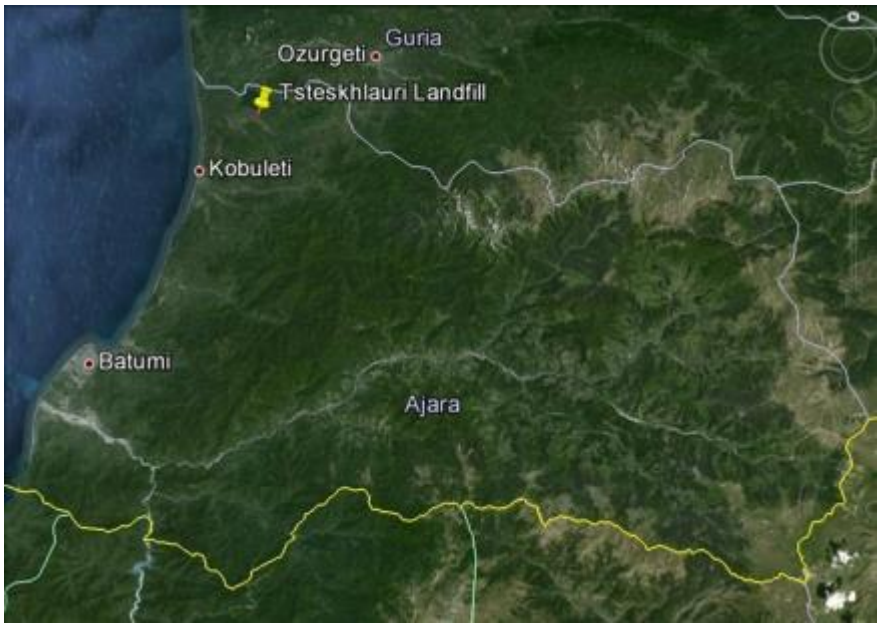



*Figure 2 Locations of the new landfill in Tsetskhlauri and cities in Batumi and Kobuleti (Google,2012)*


*Figure 3 Non-sanitary landfill areas in Batumi (left) and Kobuleti (right) (Google, 2012)*

## 2.2 General socio-economic environment

The socio-economic information included in the following paragraph has been included mainly to give an idea of the challenges facing the potential affected population at Batumi and Kobuleti landfills (waste pickers and people living near on on the landfills) as well as farmers in Tsetskhlauri affected by the new landfill and what the project need to take into account especially in relation to potential economic displacement and resettlement. This includes information on employment/unemployment, Incomes from farming, legal/economic protection of spouses in land ownership issues.

General salary statistics on gender wage gaps has been incuded, keeping this in mind for staffing, promotion and equal opportunities for Hygiena Ltd.

### 2.2.1 Demography

The population grew steadily while Georgia was part of the Soviet Union with a peak of 5.5 million in 1992 just after Soviet collaps. Thereafter the population dropped to 4.5 million in 2005. This table represents the total population, including the separatist regions of Abkhazia and South Ossetia, whose population in 2005 was estimated at 178,000 and 49,200, respectively. Without Abkhazia and South Osetia, the population in the regions controlled by the central government of Georgia was 4,321,500 in 2005 and 4,382,100 in 2008.[8]

*Table 1 Demography , Georgia*

| | 1 Average population (x 1000) | 2 Live births | 3 Deaths | 4 Natural change | 5 Crude birth rate (per 1000) | 6 Crude death rate (per 1000) | 7 Natural change (per 1000) | 8 Fertility rates |
|---|---|---|---|---|---|---|---|---|
| 2013 | 4 483 | 57 878 | 48 553 | 9 325 | 12.9 | 10.8 | 2.1 | 1.73 |

Life expectancy at birth is 74.5 years for all, 70.2 for men and 78.6 for women (2012 est).[9] According to the 2002 census, the population of Ajara is 376,016. The population in Ajara was assessed to 394,200 people in 1st January 2013. The Adjarians (Ajars) are an ethnographic group of the Georgian people who speak a group of local dialects known collectively as Adjarian. The written language is Georgian.

### 2.2.2 Economic Development

Georgia has made substantial economic gains since 2000, achieving robust GDP (Gross domestic product) growth and curtailing inflation. GDP growth, spurred by gains in the industrial and service sectors, remained in the 9–12% range in 2005–07.

*Table 2 GDP in Georgia*

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|
| GDP at current prices, mil. GEL | 19074.9 | 17986.0 | 20743.4 | 24344.0 | 26167.3 | 26847.4 |
| GDP at constant 2003 prices, mil. GEL | 12555.3 | 12085.5 | 1235.0 | 13757.2 | 14637.7 | 15123.7 |
| GDP real growth, percent | 2.6 | -3.7 | 6.2 | 7.2 | 6.4 | 3.3 |
| GDP deflator, percent | 9.4 | -2.0 | 8.6 | 9.5 | 1.0 | -0.7 |
| GDP per capita (at current prices), USD | 2921.1 | 2455.2 | 2623.0 | 3230.7 | 3523.4 | 3599.6 |
| GDP at current prices, mil. USD | 12800.5 | 10767.1 | 11636.5 | 14438.5 | 15846.8 | 16139.9 |

[8] http://en.wikipedia.org/wiki/Demographics_of_Georgia_%28country%29 - cite_note-7
[9] CIA world Factbook

### 2.2.3 Income levels

Average montly pay for urban areas/capita was 276 GEL/month in 2013, and 216 GEL/month in rural areas, the gap has been incrasing since 2006.

*Table 3 Avarage monthly incomes in Georgia*

| | 2006 | 2007 | 2008 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|
| Average Monthly Incomes of the Total Population (Million GEL) | 353.2 | 387.5 | 426.8 | 544.7 | 575.4 | 649.2 | 711.1 | 808.8 | 906.9 |
| Average Monthly Incomes per Household | 346.7 | 385.3 | 422.5 | 540.3 | 569.2 | 651.2 | 705.9 | 788.4 | 887.2 |
| Average Monthly Incomes per Capita (GEL) | 92.3 | 102.6 | 115.2 | 147.2 | 154.5 | 178.6 | 195.2 | 218.4 | 246. |

Statistics on individual incomes from farming in Ajara region has not been found by the consultant. GeoStat (the statistical bureau of Georgia) estimates agriculture to 53% of total employment while the sector contributes only 9% to GDP. Georgia's Agriculture value added per worker in 2012 was 2,500$/annually (e.g. Armenia, $8,300; Azerbaijan, $1,085; Austria, $33,200).

Statiscs varies from different sources, but is can be concluded that a majority of farmers (more than 90%) are subsistence farmers, producing mainly for own consumption[10] owning a standard size land plot of 1.2ha or less. Number of livestock per average household is also limited at less than 3 heads on average[11], This information seems to fit well into what was observed n Ajara region by the Consultant.

According to the agriculture census. In 2005, there were more than 700,000 agriculture holdings in Georgia, from which more than 99% were then classified as family farms, with an average of 2.3 plots per farm / holding.

Exact size of plots varies, but between 0.4-0.8 ha/plot would seem a reasonable estimate from the sources.[12] Different numbers of plots on the 32 ha etimated for the Tsetskhlauri landfill would consequently be around 60-80 plots.

[10] Chairwoman Nino Zambakhidze of Georgian Farmers Association http://media.wix.com/ugd/d13db4_5b4067dc9be84104a14920ffdaee56c5.pdf
[11] Georgian Farms Association Annual report 2014
[12] Including Geostat (2014 est.) and from ENPI, Assessment of the agriculture and rural development sectors in the Eastern Partnership countries (from 2012)

From the resettlment study from 2012 for the Kobuleti bypass road the following was reported in relation to incomes:

*Table 4 Avarage monthly household income against number of sources*

| Number of sources of Income | AH | % of AHs | Average annual income (GEL) |
|---|---|---|---|
| Single source | 14 | 14 | 9567 |
| Double Source | 39 | 38 | 13568 |
| Three + sources | 49 | 48 | 16920 |
| **Total** | **102** | **100** | |
| Source:DMS/AP Census (Detail Design Consultant). | | | |

### 2.2.4 Income distribution

GEOSTAT also states that from 1999 to 2012 the average nominal monthly income of an employed woman was 54% of that of an employed man, with the difference of 40% in average salaries of women and men in all sectors of economy[13]. Additionally, the households that are headed by men have higher income: in 2012, the income of such households was 32.7% more than those headed by women. The latest calculations on gender wage gap in Georgia carried out by GEOSTAT with the refined methodology and technical assistance of UN Women (2014) also showed that there are significant differences in wages between men and women, and the difference largely increases when adjusting for education, age, marital status, number of children under six years of age, occupations, and regions: Overall, the gender wage gap is estimated to be 34.8%. There are also differences by region and education level. The gender wage gap is about 33.5% in urban areas versus 34.5% in rural areas[14].

### 2.2.5 Unemployment

Officially some 16% are unemployed in Georgia. According to the public opinion poll conducted by the National Democratic Institute (NDI) in 2014, employment and the economy continue to be among the major concerns for Georgians, with 63% of the surveyed population stating unemployment, and 32% stating poverty as their top priority issues. Moreover 67% consider themselves unemployed. Aaccording to the International Monetary Fund (IMF), in 2013, only 32% of the whole labour force was formally employed, more than half was self-employed, the rate of unemployment constituted 15%. I n 2014 the official unemployment rate decreased to 13.7%[13]. According to the study prepared by Assisting Communities Together (ACT) under the UN Programme “To Enhance Gender Equality in Georgia”, unemployment level is higher in women (75%) as compared to men (59%).

[13] GEOSTAT

[14] Miluka, 2014

### 2.2.6 Remittances

Growing steadily since 2003, in 2011 remittances amounted to almost $1.3 billion, which is about 8.8% of Georgia's total GDP. In addition to this, as the bulk of remittance inflows are denominated in US dollars, they represent a major source of foreign exchange and thus are significant in financing Georgia's trade deficit.

### 2.2.7 Religion

After the fall of the Soviet Union Georgia had a re-Christianisation. Sunni Muslims communities exist in Ajara, mainly in the Khulo district. According to the 2006 estimates by the Department of Statistics of Ajara, 63% are Georgian Orthodox Christians, and 30% Muslim. The remaining are Armenian Christians (2.3%), Roman Catholics (0.2%), and others (6%).

### 2.2.8 Gender Equality

In 2012, Georgia had a Gender Inequality Index value of 0.438, ranking it 81 among 148 countries; in 2013, Global Gender Gap Index ranked Georgia 86 out of 136 countries. However, according to the Global Gender Gap Report 2013, Georgia held 64th place among 136 countries in 'Economic Participation and Opportunity' for women. In 1993, Georgia ratified the Equal Remuneration Convention, 1951 (No 100). In 1994, the country acceded to the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW[15]). In 2010, the Gender equality law was passed, providing for the establishment of a "national women's machinery, the enhancement of women's security, equality in the labor market and the strengthening of women's political participation" (Educators and Scientists Free Trade Union of Georgia, 2010).

The Gender Equality law (http://www.civilinlaw.org/Project/p1150.pdf) provides all the basic guarantees for women, among which are equal rights in labour market and equal opportunities in economic life, as well as equal rights for both spouses. However, in the latter case, as 2006 CEDAW shadow report notes, marriages are increasingly being conducted solely in churches, that is, they are not registered, and such marriages do not protect women from unequal consequences as the marriages are not recognized by the law (Meskhi et al., 2006), which impact e.g. on access to rights in case of divorse and heritage (and consequenty also for compensation of loss of property and income made on that property).

The Consultant expects that men, in general, will be the ones with their names on the registrered land and property and consequently more likely to be compensated financially, where this is to taking place.

[15] Georgia has no registered reservations to the CEDAW

# 3 Institutional set-up – Hygiena Ltd.

The project implementation will be executed by the company Hygiena Ltd, which will be formed and owned by the Ministry of Finance and Economy of Ajara. However, as Hygiena Ltd is not yet operational (no staff has been employed as of April 2015), the Ministry of Finance and Eonomy of Ajara is considered the Client and the Project Owner.

To ensure compliance with the Performance Requirements of the EBRD, it is essential that the Ministry of Finance and Economy (MoFE) arranges a proper organizational set-up for Hygiena Ltd, with qualified and sufficient staffing. MoFE will also have an important role as the owner of the company, providing directives and follow-up.

## 3.1 Environmental and social appraisal and management

The specification of the PR in the EBRD policy focuses on:

- "…successful and efficient environmental and social management system is a dynamic, continuous process, initiated and supported by management, and involves meaningful communication between the client, its workers, and the local communities affected by the project or the client company. It requires a methodical systems approach comprising planning, implementing, reviewing and reacting to outcomes in a structured way with the aim of achieving a continuous improvement in performance".

A systematic approach of this type requires:

- Documentation – policies, procedures, rules, guidance
- Implementation measures – training, equipment, supervision
- Monitoring – inspection, reporting, management appraisal and response to problems

## 3.2 Hygiene Ltd

Hyiene Ltd. which is yet to be established will have various roles to play: .

- Closure of the Batumi landfill
- Closure of the Kobuleti landfill
- Closure of the Kobuletii OLD landfill
- Construct the Tsetskhlauri landfill (procurement of services)
- Operate Tsetskhlauri landfill

MoFE has declared that that Hygiena's operations will be in line with the EBRD policy intentions and in line with relevant EU directives. This will include, *inter alia,* measures to ensure workers health and safety, as well as minimizing the risk of unwanted behavior amongst staff or other users of the landfill. It is the responsibility of MoFE to see to that Hygiena Ltd from the on-set operates in a manner so that waste pickers are avoided. This will require the following policies and procedures, that are not yet in place:

## 3.3 Policies, Documentation, Emergency Planning and Preparedness

- Environmental Policy:
    - There is no environmental policy formally documented by the company

- National laws and regulations are expected to be executed by the company, but how is currently not clear.
- No documentation on environmental incidents are expected to be part of the Management Information Syestem (MIS).

- Health and Safety Policy:
  - There is no policy on health and safety currently foreseen,
  - National laws and regulations (e.g. National labour law) are expected to be executed by the company, but no policy or OHS exists yet,
  - Internal labour and workers health regulations do not yet exist.

- Fire and emergency procedures
  - Internal fire and emergency procedures do not yet exist or system for documentation. The WYG consultant, is in process of developing a Management Information System (MIS) that potentially includes these issues.

- General
  - No emergency planning nor emergency preparedness exists.

# 4 Existing SWM Situation in Ajara

As mentioned above, the total population in the Autonomous Republic of Ajara was 394 200 people in 2013 and around 80% of the total population lives within the project's target area, which includes municipalities of Batumi, Kobuleti and Khelvachauri[16] (Table 1). The waste collection services as well as the disposal are provided by the Sandasuptaveba Ltd. that is owned by Batumi Municipality.

*Table 5 Population with SWM services from Municipality owned waste management company (Sandasuptaveba Ltd).*

| Municipality | Population 2013 | Population 2006 | Population with SWM services 2006 | Assumed future extension of waste collection |
|---|---|---|---|---|
| Batumi | 160 000 | 125 700 | 125 700 | 160 000 |
| Kobuleti District | 92 900 | 90 900 | 30 000 | 40 000 + |
| Khelvachauri District | 62 100 | 94 000 | 20 000 | 30 000 + |
| Total | 315 000 | 310 600 | 175 700 | 230 000 + |

## 4.1 Waste Amounts and Types

In order to obtain improved data for waste amounts a one-week weighing campaign for waste disposed at Batumi landfill was carried out in March 2008 as input data for the *Feasibility Study*.

First the waste volumes on the trucks were estimated and then the loaded trucks were weighted. Since, the weights of the empty trucks were known, the weight of the waste bulks on the trucks was simply accounted. The unit weights of waste masses (ton/$m^3$) on the trucks were received by using the following expression .

$UG = G * V^{-1}$ where UG = unit weight of waste mass on a truck, G = weight of the waste mass and V = the volume of waste mass on a truck.

By averaging the measurement results, it was calculated that the waste density in the compacting vehicles was 314 kg/$m^3$ and in non-compacting vehicles 230 kg/$m^3$. Taking into account that roughly 80 % of all incoming waste was disposed by compacting vehicles the overall average density for all incoming waste into the landfill in Batumi was set to 300 kg/$m^3$.

Additional compacting of the waste volumes will be carried out in each landfill cell by a compactor or dozer (there are several brands on the market, e.g. Caterpillar, Vandel, Bomag Fayat Group). The final density can be expected to reach 700-1200 kg/$m^3$.

[16] The official population number has been changed during the recent years because of the administrative changes in the territorial management. However, the number recorded in 2006 has been kept in this report in order to derive unite and standard waste amount being relative to the population number.

Based on the recorded number of trucks entering the landfill in Batumi and in Kobuleti, the incoming waste amount to these landfills in year 2007 was estimated as 34 000 and 8 000 tons respectively, providing an annual total of 42 000 tons. The yearly distribution of waste amounts, in tons, disposed each month in the existing Kobuleti and Batumi landfills in 2007 are shown in Figure 4.


*Figure 4 Monthly waste amounts disposed at landfills in Batumi and Kobuleti (2007).*

The peak months for waste generation are the summer period, mainly July-August, due to the tourist season.

For the coming years, from 2014 - 2015, it has been estimated by the Client that the waste amounts will increase to 65 000 tonnes/year from Batumi and 10 000 tonnes/year from Kobuleti, with a total waste volume of approximately 75 000 tonnes annually. This is mainly due to increased population in combination with a larger geographical area of households from which the waste will be collected.

The household waste is the dominating waste type by far, over 95% of the total weight. Only minor amounts of construction waste were disposed at the non-compliant landfills. In addition, the Sandasuptaveba Ltd. disposes street sweepings, beach cleaning waste, snow, and dead animals, but these types of wastes are estimated at a few per cent of the total amount only.

An above indicated increase of the population in combination with possible improved living standards will result in an increase of the waste amounts estimated to 3% per year over the next 30 year.

The requested total cell area at the new landfill in Tsetskhlauri is estimated to 11,5 hectares, with a height of 15 meters and will accommodate the solid waste amount of 1,4 $Mm^3$, transported from the target area to the new site..

Within “Ajara Solid Waste Management Project”, for the construction of solid waste landfill in the village Tsetskhlauri, municipality of Kobuleti, the 2007-2010 years’ information of waste amounts was used as a basis for the primary research. However, during 2011-2013 the volume of solid waste collected in the Autonomous Republic of Ajara has

sharply increased from 50 000 to 70 000 tons per annum. Reason behind this change is the unified system of collection of solid waste from the population of whole administrative area of Ajara. Moreover, in the near future, volume of solid waste supplied to the new landfill is expected to rise gradually to 75 000 tons per annum. Exploitation period of the landfill is 21-35 years (35 years in case of strengthening the waste recycling sector).

## 4.2 Existing Non-compliant Landfills in Ajara

There are seven larger non-compliant landfills in Ajara in operation today (two in Kobuleti, hence only six sites is marked on the map), March 2014 (Figure 6). Three of them are within the Project area, and they will be targeted in the current ESIA based on the effective ToR:

- Operating non-compliant landfill in Batumi,
- Temporally operating non-compliant landfill in Kobuleti and
- Abandoned landfill in Kobuleti

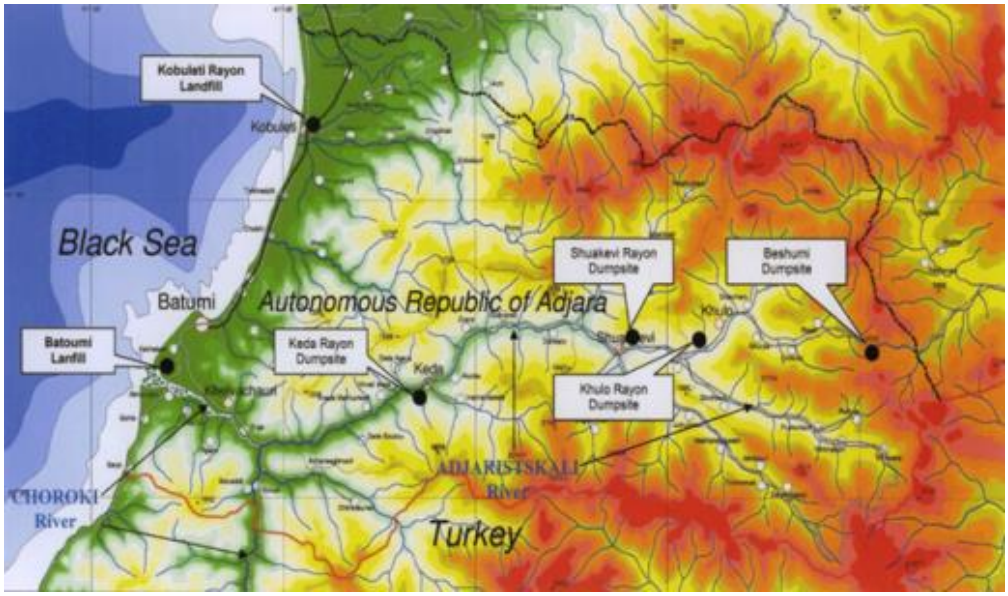



*Figure 5 Existing non-compliant landfills in Ajara*

## 4.3 Public Health

Health statistics were provided by the Center of Health of Ajara (in Batumi). Statistics disaggregated by sex and/or age did not exist. Parasites, generally observed in relation to waste mismanagement include, but is not limited to: Enterobiasis, Ascariasis and Lambliosis. Both Enterobiasis and Ascariasis can cause diahrrea. No Lambliosis, has been reported in Batumi and Kobuleti.

No typhoid cases have been registrered in the area during the reporting period. Hepatitis A was 1 in Batumi and 6 in Kobuleti in 2014 out of a total 20 cases reported for Ajara. Population in Batumi and Kobuleti corresponds to app. 53% of the Ajarian population, but almost 70% of all diarrhea cases reported in Ajara were from Kobuleti and Batumi. Either this indicates higher indices in Batumi and Kobuleti or it is an indication of underreporting

in other parts of Ajara. As the above diseases might be caused by improper waste management practices, the mitigation measures presented in Chapter 10 should be implemented to prevent any adverse impact on public health.

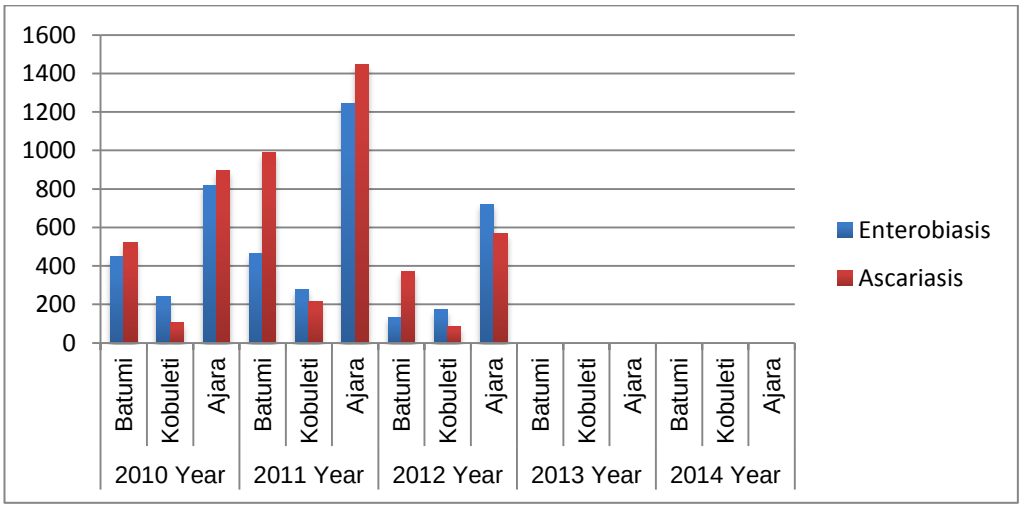



*Figure 6 Parasitic diseases associated with solid waste.*

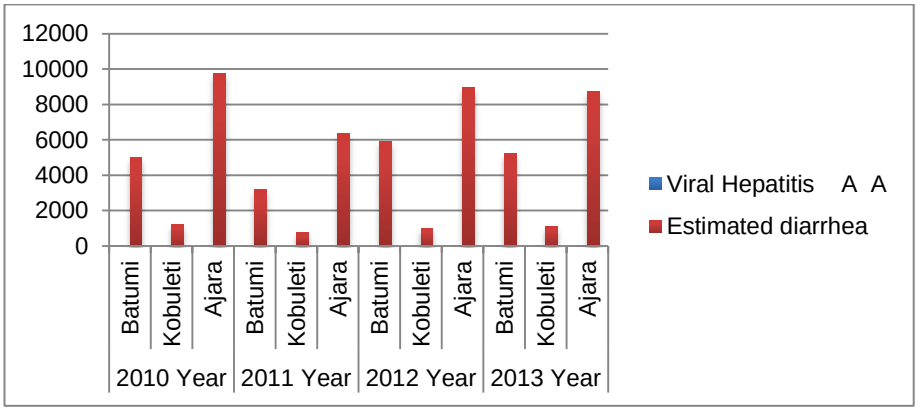



*Figure 7 Viral diseases associated with solid waste.*

Mitigation and potential impacts are presented in chapter 10.

## 4.4 Batumi Non-compliant Landfill

The Batumi landfill covers an area of 19 ha and is situated in the alluvial river bed about 10 km south of the Batumi city centre, between the Batumi airport, the Chorokhi River and the Black Sea shoreline (Figure 3).

The disposal of waste started in 1965, and the exploitation time period covers 49 years and the height of waste is at some places around 10-12 meters. There is only one positive measure that was implemented during many years of disposal of waste at the Batumi site. A massive shore-line reinforcement was built along the Chorokhi River in 2011 to protect the landfill against eroding of the waste masses during floods. This protection replaced the earlier build reinforcement that collapsed.

There is a long list of arguments for closing the landfill in Batumi and the major ones are mentioned below.

From the start of disposal, the intention was to use the site as a temporary landfill, although waste is still deposited at the site daily. The landfill is neither properly designed nor sanctioned, and is therefore lacking in any measures to prevent damage to the environment and people's health.

There is a control point at the landfill entry for recording of incoming trucks. When the consultant visited the landfill in April 2013 it was found that the earlier poor landfill management was de facto missing, i.e. no control of incoming wastes was made, no covering practice was implemented and the trucks dumped the wastes arbitrarily within but also outside the landfill area. The situation revealed total lack of any management and control over the situation. The area is unfenced and unguarded, therefore a large number of animals is feeding from the organic wastes at the site (Figure 11). The site visit in February 2014 proved that weighting and recording of the trucks was resumed but control of waste tipping and any temporary covering of the waste were not performed.

### 4.4.1 Waste pickers and settlements at or near Batumi

The SIA team visited the Batumi landfill on the 29th of March 2015 and carried out 6 individual interviews. 5 with waste pickers visiting (but not living on the site) and talked to another 3, who did not wish to be formally interviewed, but gave comments. And another waste picker who was living on the actual landfill. The team also visited 9 shelters that are grouped together centrally on the Northern part of Batui landfill, where 1 man was interviewed. In addition, the staff employed by "Sundasuptaveba Ltd" (company owned by the municipality that is also collecting the waste), weighing the waste trucks as they pass the entrance, was interviewed.

Another visit was made on the 31st of March 2015, interviewing a man who had settled at the South part of Batumi landfill, who was farming a small piece of land, as well as a owner of a house and land with additional shelters on the Eastern boarder to the Northern part of the landfill. All interviewed were men, only one woman seen, who was not interested in talking with the team.

The interviewed waste pickers estimated that between 50-70 waste pickers are working at Batumi landfill. Of these 3-4 were reported to be women that worked regularly on the landfill site. All interviewed said that none of their spouses or children were engaged.

The officer weighing the trucks as they come in estimated the number of waste pickers to be around 15 in winter and 50 in summer period. Other information is pointing at even more waste pickers as there are rumours that Uzbek waste pickers are being brought by a Russian company to pick waste during summer period (information not feasible to verify). The total number is, consequently difficult to estimate, without carrying out a sensus.

The 9 shelters located at the center in the Northern part were reported to contain some 15-20 people living all year round and approximately 10 people were only using their shelters to change clothes or stay for short periods. How short these periods were, was not clear. The shelters are very rudimentary e.g. roofs and walls are plastic covers, with

no electricity, heating or water. The man interviewed there had two children (age 3 and 6) and a wife living with him (occasionally staying/occasionally going to their own village).

A dirt road goes to the shelters from the main landfill road going through the area. Between the shelters is a scale to weigh the plastic and metals. Who placed it there or who owned the scale was not known.

*Figure 8 Shelters at the Center of the Northern part of the landfill*

All interviewed reported to pick metals and plastics only. The plastic is generally sold to an uncorfirmed company at 0.15-0.20 GEL/kilo17. Metals are sometimes taken to Batumi directly by waste pickers themselves, were it is sold to metal shops also at 0.15-0.20 GEL/kilo. Generally cobber and iron is being gathered. Interviews have indicated that the buyer is a Russian company, however this has not been possible to confirm.

Average income a day was reported to be everything from 15-40 GEL/Day. But, in average, people reported 20 GEL on a 'good day'. All waste pickers reported to be picking every day.

The interviewed all reported that they were sole providers of their families, and that neither spouses, nor children were picking waste. Average household size of the interviewed were (4+4+8+5+4+4)/6= 4.83 people. Taking into account the average earnings, each family member would have app. 1.82 USD/day, the days waste is being picked. Compared to overall socio-economic figures on employment, waste pickers can make almost twice (up to estimated 560 GEL/month) as much as employed people in rural areas (246 GEL/month).

The respondents not living on the landfill, were living in Batumi or nearby villages. They came by car or by mini-buss and had a distance of 30-60 minutes. The men said they often drove together.None of these were without housing. The interviewed (3 men) had been picking waste at Batumi landfill for: 3, 10, 18, of the people who did not want to participate in the interview, but who did express viewpoints: one man would not say, and the two remaining cited thet had worked there for 3 and 15 years. Only one reported to have a higher education, but all had their children in school. Only the one with higher education seemed to have tried to get a job at the hospital, whereas none of the others

[17] 1 GEL=0.44 USD and 20 GEL = 8.8 USD. If working 28 days a month = 246.4 USD/month (Exchange rate on the 29/3-2015).

interviewed could see themselves in other positions. Various said they would be willing to travel the distance to Tsetskhlauri landfill if jobs would be available, but they had not been offered any positions. The age of the interviewed men were between 30-50, one older. The woman that was seen, but not interviewed was assessed to be around 30.Only one of the respondents said he had an understanding of the hygienic risks he was taking (medical education), half of the interviewed wore gloves. The three men watching, but not wanting to be interviewed had no gloves. All used sticks to go through the waste.

In addition, 2-3 house-like buildings were on a piece of land, that also have partial fencing, at he boarder to the Norther part of Batumi landfill. In addition to these rudimentary wooden/plastic/metal buildings, some 7-8 shelter of plastic, cloths and wood were seen. The man who claimed ownership, reported he lived there with his mother. In addition, some 15-20 waste pickers were reported to stay in the plastic shelters in periods, if these should be classified as permanent or not will have to be confirmed by a resettlement sensus.

The landowner had lived on the land for 25-30 years. He claimed to be using some 6.5 ha mainly for his cattle, of which he had 25. In addition, he had poultry on the farm. He made approximately 2000 GEL/month. He did not pick waste, but he was aware of the informal settlements and of the waste pickers. It was also reported that he had installed electricity and had a well for water, but did not have gas.

He had not talked to any from government side since app. 8-10 years ago, when he was offered another plot (of app 1 ha), that he had not accepted. He is not interested to be resettled somewhere else and worried about the process in relation to the closure of the landfill.

*Figure 9 Houses and shelters at the Eastern boarder to the Northern part of Batumi landfill*

In the West bottom of the Southern part of the landfill a small wooden/metal shelter was found (green), using the land just below the shelter. A man of app 35 lived here. His grandfather had been using the small plot below the shelter since 2010 and he had now taken over the farming. He moved in app 3 months ago to the shelter and had invested in 14 cows with a credit from the bank (credit of app. 5000 GEL) to be pad back within 4

years. He did not report an income, as he had just bought the cows. The land plot was used for growing potatoes and vegetables to himself, but was not enough to sell from. He had had a job until recently at the waste company ‘Sever’, but was now unemployed, and had lost his house in an ownership dispute. He did not pick waste. He did not report to be paying for staying at the landfill and would stay as long as it would be feasible for him. He had no documentation on user rights on the land. As regards information on the closure of the landfill, he said he was positive to the closure and understood that the land would be covered with soil, but he had not met with any officials or received any public information about the closure.

A second shelter was also observed, but owner was not present.

Batumi landfill is not equipped with any environmental protection system and therefore the leachate is directly drained into the Chorokhi River. The Chorokhi River’s delta, a valuable ecosystem, is located within a two-km radius from the site. Landfill fires burst out regularly and produce massive smog that creates great problem for the nearby located international airport as well as for the residence areas around.

*Figure 10 Waste pickers and grazing animals on the landfill in Batumi*

In summary, the landfill should be closed as soon as possible because of the poor conditions observed within and around the dumpsite. The current situation makes a final closure and coverage of the landfill site more complex and expensive than it was assessed when the Project started. This is due to increased waste amounts at the site and the waste being spread out at a larger area, but also due to the fact that a closure must take resettlement and economic displacement into account. If coverage is carried out today without resettlement, 9 households would loose access to their shelter, whereof some 20 people were using these permanently. Exactly how much time people stay in the shelters a year was not specified and such information is needed by a sensus to get exact information for the needed Resettlement Action Plan (RAP).

| Where | Dwelling or waste pickers | Number of people |
|---|---|---|
| Batumi – North Center | 9 dwellings | 15-20 |
| Batumi – Eastern border | 2/3 houses on boarder + app 8 dwellings | 2 + 15-20 |
| Batumi – South | 2 dwellings | 2 |
| Batumi – mainly Northern part | Waste pickers | Total estimated number 50-70 (include the people fro the dwellings as well as external people) |

*Figure* 11 Indication on number of people affected at Batumi landfill – preliminary figures

### 4.4.2 Closure of the landfill in Batumi

Closure of the landfill along the Chorokhi River is an urgent issue from an environmental and health pespective. However, terminating the disposal of waste will first be possible when the new landfill in Tsetskhlauri is put in operation and must immediately deal with resettlement and economic displacement issues. Please refer to the Resettlement/Livelihood Restauration Framework (R/LRF) prepared for the project.

The landfill along the Chorokhi River bed and estuary is a major environmental risk and its finale closure requests significant financial resources. The current financial allocation in the investment programme is not enough to cover the costs of a finale closure according to the EC Directive on landfills. This implies the need of a final cover consisting of, from below, a gas spreading layer, a sealing layer, a drainage layer preventing leachate to penetrate the sealing layer, a protective soil layer and finally a vegetation layer. However, protection measures should be undertaken and the best possible solutions within the given financial frames shall be guiding the design solution of the final cover and drainaige system according to the prevailing ToR.

The configuration and territorial extension of the landfill has been changed to such a degree that a new and detailed field survey has been requested. The Consultant has performed a new geodesic survey in February 2014 to define the actual extension and relief of the waste piles.

The following paragraphs highlight measures fitting into the available budget and describe their positive effects.

The objectives for closure of the landfill are to reduce or prevent

- spreading of wind-blown wastes
- generation of leachate water and its drainage into the surrounding water bodies
- landfill gas emission to the atmosphere
- spreading of odour
- the risk for fires and
- unhealthy informal recycling activities

The proposed measures will furthermore improve the view over the landscape.

It is proposed that procedures for covering are made at a robust and affordable level. Thus, the following measures are proposed:

- Excavation and reshaping of the waste into a limited area. The waste piles will be compacted to reduce the volume and future settlings. The surface slopes should allow efficient surface water run-off, but still not cause soil erosion.
- Application of a final cover on the waste consisting of a 1 m low-permeable soil. The soil shall be locally available to minimise transports. The upper portion of the soil cover, min. 10 cm, shall allow establishment of a vegetation cover.
- Establishment of a methane oxidising filter in the upper part of the reshaped landfill to reduce emissions of greenhouse gases to the atmosphere. By installation of such passive system future maintenance will be minimised.

As the non-compliant landfill is rather shallow and there have been frequent fires and large volumes of the wastes has been processed by animals and waste pickers it is difficult to predict the potential for gas extraction. It is possible to make a gas pumping test after covering the waste. It is estimated that the future gas production will be too low compared to the investment cost for the equipment, and instead a passive methane oxidising filter is proposed.

#### *4.4.2.1 Leachate*

The biodegradation process will continue to produce leachate after closure, and it cannot be easily collected as the landfill is located on gravel of the former beds of the Chorokhi Estuary, and lacking a leachate collection system in the bottom. The covering of the landfill will decrease the inflow of water from precipitation significantly, and hence decrease the leachate production. Although, it will not be possible to stop leachate generation completely since the covering layer never will be completely water tight. Most water will be redirected on the surface though. The vegetation cover will consume some part of the rainwater and will also help prevent erosion.

There is no water withdraw neither in the vicinity nor in the connected hydrogeological zone. This status quo should be kept even in the future.

In order to describe the generation of leachate and water balance over a landfill Figure 8 is shown as an illustration.

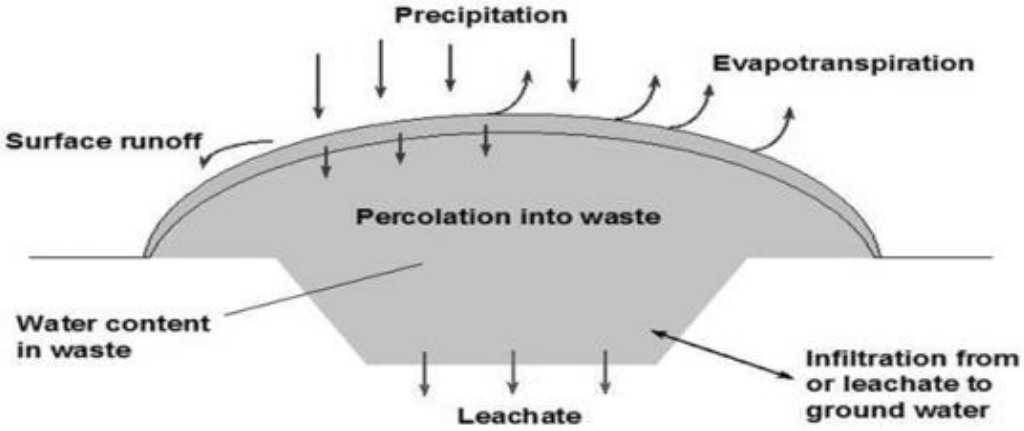



*Figure* 12 *Principal water balance over a sanitary landfill*

Assuming that the today's conditions correspond to a "limited soil cover", the water infiltration into the waste is approximately around 25% of the average annual precipitation. Building a single barrier cap with compacted low-permeable soil will reduce the infiltration to around 6% of the average annual precipitation amount in case the drain slope will be set at 15%. The quality of the vegetative cover is assumed as a fair growth of grass[18]. Since, the precipitation amount are very high in Ajara, the slope grade of the cover should be at least 5%, i.e. 1 (vertical) : 20 (horizontal) or even more steep. However, in the latter case, erosion protection measures should be applied.

An assessment of the leachate discharge from the landfill may be summarized as follows:

- A reduced amount of leachate from the landfill will also lower the amounts of polluting agents reaching the receiving water body; the Chorokvi River. Estimate give that the leachate amount will decrease by 75%.
- A proper cover of the landfill along with an establishment of a vegetation layer will limit the rainwater percolation in to the waste. The assumption made above may be found reasonable.
- This in turn will prolong the anaerobic processes going on inside the landfill. As a conclusion the so called methaneogenic phase is expected to last for an extended time. The impact on the leachate quality is by far the most interesting issue in this aspect as it will also provide a prolonged time with low discharge levels of especially heavy metals.
- The discharge levels of easily degradable organic compounds, experessed as $BOD_5$ will decrease to a very low level, as these organics will be transformed into methane due to microbiological activities;
- On the other side a high concentration of ammonia nitrogen will prevail in the leachate for an extended time.

[18] Estimates are based on www.epa.gov/reg3hscd/npl/PASFN0305521/fsr/Final_FS_Addendum(5-2-13).pdf

#### *4.4.2.2 Reduction of Social Impacts*

There is a number of issues that must be taken into account in relation to mitigating social risks at the closure of Batumi landfill:

- Waste pickers loosing income, please refer to the R/LRF under development for mitigation.
- Shelters removed as the landfill are at risk of not being covered, please refer to the R/LRF under development for mitigation.
- Company (allegedly 'Sever') that wil loose income, in whose interest it will be to ensure that waste picking will also be feasible in the future (if not at Batumi and Kobuleti, then at Tsetkhlauri). Social impacts must be mitigated by taking control of the sorting and selling of the waste at Hygiena Ltd.
- People farming on or on the boarder to the landfill. If land is covered with soil they will potentially benefit positively from the project as they will have a potential access to larger areas of grassing.
- The fact that Hygiena Ltd organizational chart has included waste pickers for Tsetkhlauri landfill as 'unemployed but authorized waste pickers' is an indication that the current social (and health) problem at Batumi and Kobuleti landfills risk being moved to Tsetskhlauri. Reducing this potential risk, requires another approach by Hygiena Ltd to waste picking. This would include zero tolerance to waste picking, support to wate pickers in accessing other income sources/social benefits for a transition period. Please also refer to R/LRF under development and RAP to be developed for more detailed mitigation measures.

#### *4.4.2.3 After Closure Monitoring*

The territory should be guarded after the closure to prevent unsanctioned dumping and waste picking in the area. The monitoring equipment should be also protected.

Environmental Monitoring Programme

An environmental monitoring programme shall be described and established during the design phase and necessary infrastructure, e.g. monitoring wells for groundwater, shall be part of the construction works. The programme shall include information on what type of monitoring shall take place, the frequency for sampling and the locations of sampling points.

The procedures for taking samples (random samples or integrated samples) and routines to follow to obtain representative samples (e.g. sampling order, washing of samplers, transports to laboratory etc.) shall be described.

Groundwater and Leachate Monitoring

It can certainly be assumed that the groundwater has been polluted in the impact area, since, there were noprotection measures implemented at the landfill. Since the waste hasn't been covered, abundant precipitation generated large volumes of leachate water.

For monitoring three piezometer pipes should be installed. One will be installed about 10 m from the landfill boundary to the south west and one on the same distance, but

north-east of the site. The third piezometer will be installed at the embankment of the Chorokvi River on a place where it is protected from any damages.

Water quality samples should be taken and analysed at least once per year, but preferably four times per year. It is also important to include discharge points at representative points on leachate percolating the receiving water body: Chorokvi River The Consultant is suggesting that Hygiena Ltd. performs the after-closure monitoring programme.

The water sampling should be structured as follows: for each day of sampling four samples are taken, for instance at 08.00 hours; 11.00 hours; 14.00 hours and at 17.00 hours. These four samples should be mixed and sent to an accredited laboratory for analysis. A proposed a relevant analysis program is presented in Annex 5.

The annually presentation should include maximum, median and min values. This program should be used also for the other two closing landfills; while, for the new sanitary landfill some special requirements on sampling are presented, see chapter 6.

The impacted groundwater resources are not used neither for drinking, sanitary, irrigation nor industrial purposes. However, the Choroki River Estuary is a Natural Resource therefore the status aquatic environment should be checked and followed up.

Landfill Gas Control

Today, there is frequent fires at the landfill in Batumi and there is from time to time a massive smog that can be seen from the nearby situated International Airport and from the airplanes landing and/or taking off.

Landfill gas emissions lead to serious environmental, hygiene and security problems. Landfill gas contain approximately forty to sixty percent methane, with the remainder being mostly carbon dioxide. Landfill gas also contains varying amounts of nitrogen and oxygen gas, water vapor, hydrogen sulphide, and other contaminants. Most of these other contaminants are known as "non-methane organic compounds" or NMOCs. Some inorganic contaminants, such as mercury, are also present in the gas of some landfills. The non-methane organic compounds usually make up less than one percent of landfill gas.

The expected greenhouse gas emissions (GHG) for both Batumi site as well as for Kobuleti abandoned and temporary was estimated in the *Feasibility Study* in 2007. The result is presented in Table 2 and 3 below.

*Table 6 GHG Emissions reduction at the landfill sites before and after investments by the Ajara SWM Project.*

| Landfill site | Current situation | GHG Emission Reduction after closure |
|---|---|---|
| Batumi | Waste from Batumi district | 20% GHG emission reduction due to methane oxidation |
| Kobuleti New | Waste from Kobuleti district | 20% GHG emission reduction due to methane oxidation |
| Kobuleti Old | No disposal | 20% GHG emission reduction due to methane oxidation |

*Table 7 GHG Emissions reduction at the landfill sites before and after investments in tons CO2 and CH4 per year*

| Landfill site | GHG Emission Reduction $CO_2$ (tons per year) | GHG Emission Reduction $CH_4$ (tons per year) |
|---|---|---|
| Batumi | 675 | 278 |
| Kobuleti New | 86 | 11 |
| Kobuleti Old | 203 | 92 |

Environmental Reporting

The results of the monitoring activities shall be reported according the Conclusions of Ecological Expertise.

## 4.5 Abandoned Non-compliant Landfill in Kobuleti

Solid household waste, construction waste and other wastes have been dumped along the road from the city of Kobuleti to the former aerodrome where the abandoned landfill is situated.

Waste has been disposed since 1961 and the site has been very intensively used before it was abandoned in 2007. The total landfill site occupies approximately 4 ha. The landfill area is a peat land with shallow groundwater table. The waste has gradually sunken into the peat and exceeds today only 1-2 m above the surrounding ground level. In the previous TACIS Project[19] drillings were made and waste thickness was estimated to a maximum of 12 m while the average was estimated to 8 m. Today, the waste is covered by grass and bushes.

The area is unfenced and some grazing animals can be found there but there is no activity of waste pickers since the landfill has been closed since more than 7 years. The landfill was closed because of the military airport situated in the neighbourhood. The landfill was simply abandoned and no remediation measures were implemented. One house exists on the landfill, but as the family does not live on waste picking, only positive effects are foreseen for this household.

The household (HH) has 3 members, they mainly grow crops for own use, reported to have no cattle, but had some additional income from a shop. The monthly income was reported to be approximately 210 GEL/month for the entire HH.

[19] Consortium Thalès E & C – SOGREAH – GKW Consult (TACIS BSIF): Solid Household Waste Management in the Republic of Adjara, June 2005

*Figure 13 House at old Kobuleti landfill (2015)*

There is no water withdraw neither in the vicinity nor in the connected hydrogeological zone. This status quo should be kept even in the future because the groundwater has been certainly polluted due to lack of any environmental measure implemented.

The specific in the case of this landfill is that it has sunk and most likely is still sinking in the peat. Compacting of the piles to a smaller area is therefore not a rational solution. The scattered wastes around the site should be collected and placed on the main landfill before it is adequately covered.

### 4.5.1 Closure of the abandoned landfill in Kobuleti

The Consultant has made a geodesic survey in February 2014 and the detailed covering will be designed based on this work.

In general, the following closure measures for Kobuleti are proposed:

- Application of a final cover on the waste consisting of a 1 m low-permeable soil. The soil shall be locally available to minimise transports. The upper portion of the soil cover, min. 10 cm, shall allow establishment of a vegetation cover.
- Establishment of a methane oxidising filter in the upper part of the reshaped landfill to reduce emissions of greenhouse gases to the atmosphere. By installation of such passive system future maintenance will be minimised.

*Figure 14 Abandoned Landfill in Kobuleti 2007 (just after usage was stopped) and picture from 2015*

The benefits of the closure/covering measures is the same as concerning the landfill in Batumi, reduction or prevention of

- spreading of wind-blown wastes
- generation of leachate water and its drainage into the surrounding water bodies
- landfill gas emission to the atmosphere
- spreading of odour
- the risk for fires.

The proposed measures will furthermore improve the view over the landscape.

#### *4.5.1.1 Leachate*

The today's conditions correspond to a "limited soil cover", where the water infiltration into the waste is approximately 25% of the average annual precipitation. Estimate give that the leachate amount will decrease by 75%.Building a single barrier cap with low-permeable soil can reduce the infiltration to around 6% of the average annual precipitation amount but will depend on drain slope. The quality of the vegetative cover is assumed as a fair growth of grass. Since, the precipitation are very high in Ajara, the slope grade of the covering should be at least 5% or more.

The expected effects on the aquatic environment around the closed landfill will in general become very similar to the ones described above, see chapter 2.3.1.1.

#### *4.5.1.2 After Closure Monitoring*

The territory should be overseen to prevent unsanctioned dumping.

Environmental Monitoring Programme

As for Batumi landfill, an environmental monitoring programme shall be described and established during the design phase and necessary infrastructure, e.g. monitoring wells for groundwater, shall be part of the construction works. The programme shall include information on what type of monitoring shall take place, the frequency for sampling and the locations of sampling points.

The procedures for taking samples (random samples or integrated samples) and routines to follow to obtain representative samples (e.g. sampling order, washing of samplers, transports to laboratory etc.) shall be described.

Groundwater and Leachate Monitoring

For monitoring, three piezometer pipes should be installed, upstreams and downstreams the landfill site. One will be installed approximately 10 m from the landfill boundary to the west, one on the same distance towards east and one close to the canal.

Water quality samples should be taken and analysed at least once per year per year, but preferably four times per year. It is accordingly important to include discharge points at representative points on leachate penetrating the receiving water body.

Annual presentation should include maximum, median and min values. The Consultant is suggesting that Hygiena Ltd. performs the after-closure monitoring programme.

Environmental Reporting

The results of the monitoring activities shall be reported according the Conclusions of Ecological Expertise.

## 4.6 Temporary Non-compliant Landfill in Kobuleti

Initially after the termination of the old “abandoned” landfill in Kobuleti, the wastes were transported to Batumi landfill, but later a temporary landfill was opened by Municipality of Kobuleti because of the high petrol expenses needed for transferring wastes to Batumi. Since, it was an *ad hoc* decision, there were neither environmental impact analysis done nor protection measures implemented before the dumping started at the temporary site. In turn, the temporary landfill today comprise a threat to the environment because it is placed on a wet area, close to a smaller water course and that is not protected by any means from the leachate waters, The negative social impact is also obvious because the landfill is close to dwelling areas and main transport lines.

When the *Feasibility Study* was implemented in 2007, the temporary landfill in Kobuleti was not more than 1 ha. However, the extension of the landfill has intensively grown during the recent years. Thus, the closure of this landfill has requested additional investigations.

The landfill is still intensively used, in turn, its configuration of the dumpsite is continuously changing. Based on a visual assessment, the extension of the waste pile can be close to 4 ha and the depth/height varies between 2 and 5 m.Therefore it was decided to make a geodesic survey in February 2014 which has been performed by Sweco.

The team visited Kobuleti landfill on the 31$^{st}$ of March 2015. Only two waste pickers were seen, as well as one weighing staff hired by the municipality, registering the waste trucks coming in. No shelters were seen. The weighing staff estimated that he would see approximately 5 people a day on the landfill, but that these could be different people. The R/LRF consultant team visiting Kobuleti landfill some days previously to this visit, observed more waste pickers, inclusing women (see R/LRF mission report).

One of the waste pickers did not want to speak with the team. The other explained that he lived just one (1) km from the landfill, where he had a small farm, with poultry, potatoes and other vegetables, but only to sustain their own needs. His household was made up of 3 people, with his wife (invalid) and one son, who occasionally went to Turkey to earn money as a driver at the tea plants. He had picked waste for app 7 years at Kobuleti landfill only. During winter we could make from 7-10 GEL/day, but during summer up to 50 GEL/day. He would not work everyday rather 2-3 times as week and when the weather was suitable. He did not pay anybody to access the waste. Although his knowledge about risks working with waste was limited he did wear gloves and used a stick, and tried to keep as clean as possible. He had not received any information about the closing of Kobuleti landfill, but knew it was planned for.

Three (3) families live at the entrance to the Kobuleti landfill. Representative of two (2) of the families were at home at the visit. They were both in the process of getting their plots registered. The plots would likely be registered in the name of the head of families (men)

according to the interviewed. The families had 7 and 5 members, slightly more female members than males. One of the families had an additional income with a son going to Turkey to work at the tea plants.

Plots with houses on were 2300m2 and 1000m2. They were asking for registration of 4 ha and 1 ha respectively, to cover their needs as users. They were both eager to get rid of the landfill, that they said they did not use (neither as waste pickers nor for cattle). Both interviewed famiies had not received any news from the authorities for a long period, they had no information about when the landfill would be closed or how it would affect them.

Indication of number of people affected at Kobuleti landfill – preliminary figures

| Where | Dwelling or waste pickers | Number of people |
|---|---|---|
| Kobuleti – at boarder | 3 houses | 10 |
| Kobuleti | Waste pickers | 10-15 |

### 4.6.1 Closure of the temporary landfill in Kobuleti

The Consultant has made a geodesic survey in February 2014 and the detailed covering will be designed based on this work.

In general, the following closure measures for Kobuleti are proposed in the same way as for Batumi landfill and Kobuleti “Abandoned” landfill:

- Excavation and reshaping of the waste on a limited area. The waste piles will be compacted to reduce the volume and future settlings. The surface slopes should allow efficient surface water run-off, but still not cause soil erosion.
- Application of a final cover on the waste consisting of a 1 m low-permeable soil. The soil shall be locally available to minimise transports. The upper portion of the soil cover, min. 10 cm, shall allow establishment of a vegetation cover.
- Establishment of a methane oxidising filter in the upper part of the reshaped landfill to reduce emissions of greenhouse gases to the atmosphere. By installation of such passive system future maintenance will be minimised.

The positive effects of the closure are identical with the conclusions made above for the abandoned landfill. The difference can be expected between these two cases in the alteration of leachate water pollution and in turn in the pollution load on the aquatic environment. The reason is for that is the age difference of the dumped waste masses. The expected effects on the aquatic environment around the closed landfill will in general become very similar to the ones described above, see chapter 2.3.1.1.

#### *4.6.1.1 Reduction of Social Impacts*

There are around 10-15 waste pickers occupied at the Kobuleti landfill. Concerning the social impacts of the closing of the landfill in Kobuleti the following is assessed:

- Households near the landfill are positive to closure, covering the landfill with soil will be positive for the households who will get additional potential grasing areas.
- One waste picker, reported to live 1 km from landfill will loose out on income. Other nearby affected people are likely to exist. A sensus to establish the exact number of affected waste pickers should be made as well as what kind of compensation should be offered (please refer to the R/LRF report and recommendations).
- Waste pickers from other areas will loose income and compensations likely needed (please refer to R/LRF)
- Company (allegedly 'Sever') that wil loose income, in whose interest it will be to ensure that waste picking will also be feasible in the future (if not at Batumi and Kobuleti, then at Tsetkhlauri). Social impacts must be mitigated by taking control of the sorting and selling of the waste.

#### *4.6.1.2 After Closure Monitoring*

The monitoring after closure shall be performed in the same way as for Batumi landfill and for Kobuleti "Abandoned" landfill.

# 5 Legal Requirements for a New Landfill

The project implementation has to comply with requirements of Georgian law, European environmental directives, EBRD´s requirements and Sida's environmental policy documents. A brief description of such requirements is presented below.

The project includes "green-field" investment (construction of a new sanitary landfill), which means that according to Georgian law and EBRD Performance Requirements an environmental and social impact assessment (ESIA) has to be carried out.

According to EBRD rules a 120-day public consultation period is required when the draft of ESIA should be publicly available and consultations with the residents and all other stakeholders should be arranged. The details of requirements are given in the *Scoping Report* already prepared in December 2012.

## 5.1 Georgian Regulations

### 5.1.1 Framework Legislation

Legislative requirements in the sphere of environmental protection are implemented through the Georgian framework law *"Law on Environmental Protection" (1996 with amendments)* and a set of specific laws developed on its basis.

The framework law regulates the legal context between the bodies of the state authority and the physical persons or legal entities (without any legal distinction) in the scope of environmental protection and in the use of nature in all Georgia. This law deals inter alia with licensing, standards and ESIA issues. According to the requirements set forth in this framework law, numerous rules and normative documents have been developed and adopted to regulate specific environmental issues in Georgia.

### 5.1.2 Georgian Regulations on Waste Management

The following acts of the Ministry of Labour, Health and Social Protection of Georgia define the waste management rules:

- Act on "Approval of arrangement of landfills for disposal of solid household wastes and adoption of sanitary rules and norms" 24 February, #36 (Georgian Legislative Messenger #17, 07.03.03);
- The act on "Approval of the rules of collection, storage and neutralization of the wastes of medical institutions" 16 August of 2001, 300 ("Georgian Legislative Messenger" N90 24/08/2001).

Furthermore, the Ministry of Environmental Protection and Natural Resources has issued:

- The Waste Management Code

### 5.1.3 Legislation Related to Environmental Permitting in Georgia

At present, the environmental permitting procedure in Georgia is set out in three laws:

(i) The Law on Licenses and Permits (2005);

(ii) The Law on Environmental Impact Permits (EIP), and

(iii) The Law on Ecological Examination (EE) 2008.

The Law on Licenses and Permits was adopted by Parliament of Georgia, on June 24, 2005. The new Law regulates legally organized activities posing certain threats to human life and health, and addresses specific state or public interests, including usage of state resources.

The Laws on Environmental Impact Permit and on Ecological Examination have been published on 14.12.2007 and entered in force on 01.01.2008. These new laws integrate all the amendments introduced in legislation of Georgia during recent years.

There is an obligation for applying so-called *"Preliminary Design Permit" (PDP)*. This application is to be submitted to the Inspection Authority to be issuing the construction permit.[20] The Permit Application included record form the land cadastre proving that the area is owned by the applicant and meant for landfill, layout and components of the future landfill, description of planned activity and an archaeological survey. The PDP application was prepared by the Consultant and submitted by the Landfill Company Hygiena Ltd. and permit was issued in May 2013 by Technical and Construction Inspection.

The Law of Georgia on Environmental Impact Permit determines the complete list of activities and projects subject to the ecological examination (clause 4 p.1) and the legal basis for public participation in the process of environmental assessment, ecological examination and decision making on issuance of an environmental impact permit.

According to Article 6, the developer is obliged to carry out public consultations concerning the ESIA before submitting it to an administrative body responsible for issuing a permit. A brief description of the Public Consultation and Disclosure requirements is provided later in this ESIA, while the detailed description is given in the Stakeholder Engagement Plan (SEP)[21].

Article 8 of "Environmental Impact Permit and on Ecological Examination" specifies the documents to be submitted to receive a permit:

(a) An ESIA drawn up under the standards specified by the legislation of Georgia (in 5 hard copies and 1 soft copy)

(b) A situation plan of the planned activity (with the indication of distances)

(c) Volume and types of the expected emissions (a technical report of inventory of the stationery sources of pollution and emitted/discharged harmful substances and project of maximum permissible concentrations of emitted/discharged harmful substances (in 4 copies))

(d) A brief description of the activity (as a non-technical summary)

(e) A statement about the confidential part of the submitted statement.

[20] The authority of issuing this permit was shifted several times between local and central level as well as between the organisations because of the governmental reorganisations.
[21] SWECO: Stakeholder Engagement Plan, December 2012

Certain amendments will be added to the ESIA during the *Public Consultation Period*, e.g.

- Emission limits from the landfill to the air and surface water,
- Estimation (modelling) of territorial spreading of landfill gases.

These parameters and estimations as well as the compliance with the requirements require further investigations and further progress in the detailed landfill design. In addition, the emission limits should undergo an approval process.

## 5.2 EU Waste Management Legislation

The single-most important EU regulation relevant to this project is the Council Directive 1999/31/EC on the landfill of waste, where the environmental standards for landfilling within the EU member states are defined. The Directive includes both technical standards required for individual landfills of different classes and demands on the member states regarding reducing amounts of waste to be disposed at landfills and time schedules for implementing the directive. The implementation of EU Directives are regulated through the Association Agreement between the European Union and Georgia, from 2014-08-30.

Below we present a series of other EU directives and documents concerning solid waste and landfilling, forming the legal base for the project:

- Directive 75 442/EEC on waste as amended by the framework Directive on waste (91/156 EEC) as further amended by Decision 2000/532/EC of 3 May 2000 and further amended by Commission Decisions 2001/1 18/EC, 2001/1 19/EC and 2001/573/EC amending list of wastes; The Directive addresses the member states and they shall bring into force laws, regulations and administrative provisions necessary to comply with the directive. In the national legislation and regulations some of the Directive regulations may/shall be specified in a more detailed manner.
- Directive 91/689/EEC of 12 December 1991 on hazardous waste as amended by Decision 2000 532 EC of 3 May 2000 and further amended by Commission Decisions 2001/1 18/EC, 200 1/1 19/EC and 2001/573/EC amending list of wastes;
- Amendment 85 467 to Council Directive 76/769 polychiorinated biphenyls and Pollychlorinated terphenyls (PCB/PCT);
- Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste;
- Directive 1 994 67/EC, Hazardous waste incineration;
- Directive 89/369/EEC on Municipal incinerators
- Directive 2008/1/EC concerning Integrated Pollution Prevention and Control (IPPC) replaced by Directive 2010/75/EU on Industrial Emissons. Directive 2008/1/EC replaced Council Directive 96/61/EC on the same subject, both commonly referred to as IPPC Directive.

The Project is also subject to the EU Industrial Emissions Directive and hence is required to meet EU Best Available Techniques (BAT).

A comprehensive summary presenting the compliance with these directives is given in the following paragraphs and Table 4.

The main EC demands on landfills (1999/31/EC) are listed in Table 4, together with comments concerning their compliance at the planned landfill in Tsetskhlauri.

*Table 8 Compliance of the planned landfill in Tsetskhlauri with EC Directive on the landfill of waste*

| **Demands, according to the EC Landfill Directive (Article)** | **Planned conditions at Tsetskhlauri Landfill** | **Comments regarding compliance** |
|---|---|---|
| Classes of Landfill<br>♦ Hazardous waste<br>♦ Non hazardous waste<br>♦ Inert waste<br>(Article 4) | Non Hazardous waste | Non hazardous waste demands apply to the landfill |
| Reduction of the amount of biodegradable waste going to landfills (75%, 50% and 35% of 1995 amounts within 5, 8 and 15 years after incorporating the directive into national legislation)<br>(Article 5) | Biodegradable waste will in the future be source separated and treated by composting at the site. Although today, 2015, there are no targets set to start sorting and there will be no area for composting at the start of the new facility[22]. | Introduction of source separation and composting will contribute to the legislative targets |
| Waste that may not be landfilled:<br>▪ Liquid waste,<br>▪ Explosive, corrosive, oxidising, flammable waste,<br>▪ Infectious hospital waste,<br>▪ Whole, used tyres,<br>Any other type of waste which does not fulfil the acceptance criteria in Annex II (Article 5) | None of these waste categories are to be accepted at the landfill | Through control of incoming waste the landfill will comply with the EC Directive |
| Only waste that has been subject to treatment may be landfilled (Article 6) | The new facility is prepared with a large area for sorting activites. The Ajara Government is further planning to install a sorting facility that will sort 100% of the incoming waste. The operation of the sorting facility will be issued in a separate environmental permit handled by MoFE (see further Chapter 6.1) | The landfill management will be BAT compliant[23]. |
| A landfill for non-hazardous waste may be used for: | In accordance with planned performance of the new plant. | The landfill will comply with the |

[22] According to the Association Agreement, a national strategy to reduce the amount of biodegradable municipal waste going to landfill will be developed within six years of the entry into force of the agreement.

[23] Provided that supporting management procedures are developed and implemented.

| | | |
|---|---|---|
| ♦ Municipal waste<br>♦ Non-hazardous waste of other origin, which fulfil the acceptance criteria,<br>♦ Stable, non reactive hazardous waste with leaching behaviour equivalent to non-hazardous waste<br>(Article 6) | | regulation |
| The landfill must have a permit issued by the competent authority, assuring that:<br>♦ Management is in the hand of a natural person who is technically competent,<br>♦ Necessary measures are taken to prevent accidents,<br>♦ Financial security is kept for maintenance and aftercare measures<br>♦ The project is in line with the relevant waste management plan<br>(Article 8) | The competent authorities have approved the plans for the landfill.<br>Permit according to Georgian law will be granted after completion of the ESIA process. | A permit for the new landfill will take into account the conditions mentioned in Article 8. |
| Cost of the landfill of waste should cover costs of closure and aftercare for a period of at least 30 years<br>(Article 10) | Calculations of new tipping fees will include provisions for aftercare measures | The new landfill will comply with this demand. |
| The following reception procedures must be respected:<br>♦ Waste documentation must be provided,<br>♦ Visual inspection of the waste at the entrance to verify conformity with documentation,<br>♦ Registration of quantities and characteristics of the waste deposited, indicating origin, date of delivery, producer or collector (municipal waste),<br>♦ A written acknowledgement of receipt of each delivery accepted on the site,<br>(Article 11) | Waste reception procedures will be established in the operational manuals for the landfill, in due time before opening the landfill | The demands will be complied with. |
| A control and monitoring programme shall be carried out,<br>Any significant, adverse environmental effect revealed shall be notified to the competent authority, together with a proposal for corrective measures,<br>Monitoring results shall be reported to the competent authority at least once a year,<br>Analysis shall be carried out by competent laboratories<br>(Article 12 and Annex 3) | A monitoring programme will be set up as a part of the Operational Manual of the landfill | The landfill will comply with the regulation |

| | | |
|---|---|---|
| For existing landfills a conditioning plan shall be presented to the competent authority within one year after the Directive has come into force through national legislation<br>(Article 14) | Not applicable (new landfill) | - |
| Location of a landfill must take into consideration requirements relating to;<br>♦ Distance to residential or recreation areas, waterways, agricultural or urban sites.<br>♦ Groundwater, coastal water and nature protection zones,<br>♦ Geological and hydrogeological conditions,<br>♦ Risk of flooding, landslides etc,<br>♦ Protection of nature or cultural patrimony in the area,<br>(Annex 1, p1) | The localisation factors have been considered during the site selection process. Nearest residential area is located at 500 m distance.<br>Extensive investigations have been carried out concerning geology, groundwater, stability, and risk of landslides and impact on the nature.<br>. | The landfill will comply with the regulation |
| Water control and leachate management:<br>♦ Prevent surface and groundwater from entering the landfilled waste,<br>♦ Collect contaminated water and leachate and treat it to appropriate standard required for their discharge.<br><br>(Annex 1, p2) | Surface water will be diverted from the landfill area.<br>Groundwater and leachate will be separated with the construction of a low permeability basal liner combined with a drainage layer.<br>Local treatment of leachate is planned. | The landfill will comply with the regulation |
| Protection of soil and water:<br>♦ The landfill base and sides shall consist of a mineral layer which satisfies the following permeability and thickness requirements for landfills for non hazardous waste:<br>♦ k<1.0 x $10^{-9}$ m/s and thickness > 1 meter<br>or equivalent protection through an artificially established geological barrier, not less than 0.5 meter.<br><br>(Annex 1, p3) | A composite basal liner will be constructed consisting of an artificial geological barrier and alow permeabilbity basal liner .<br>These composite design will consist of natural clay, bentonite and HDPE liner. | The landfill will comply with the regulation |
| Surface sealing as prescribed by the competent authority.<br>(Article 13) | A surface sealing consisting of a gas drainage layer, an “impermeable” mineral layer (< 50 l/$m^2$, year), a drainage layer and a top soil cover is proposed. | The landfill will comply with the regulation |
| Landfill gas shall be collected (and used or flared) from all landfills receiving biodegradable waste.<br>(Annex 1, p4) | Collection of landfill gas is included in the detailed plan for the landfill. | The landfill will comply with the regulation |
| Measures to minimise nuisances and hazards from: | Will be considered in the Operational Manual and in the | The landfill will comply with the |

| | | |
|---|---|---|
| ♦ emissions of odours and dust,<br>♦ wind-blown materials,<br>♦ noise and traffic<br>♦ birds, vermin and insects,<br>♦ formation of aerosols,<br>♦ fires<br>(Annex 1, p5) | specific operational procedures documentation for the new site. Localisation and layout of the site aims at a minimisation of nuisances. | regulation |
| Stability of deposited waste must be secured.<br>(Annex 1, p6) | Incoming waste will be controlled and compactors will be used to stabilise deposited waste. According to depositing plan inclination will be max 1:3. | The landfill will comply with the regulation |
| The landfill shall be secured to prevent free access to the site.<br>(Annex 1, p7) | The whole area will be surrounded by a protective wall and guarded 24 hours. | The landfill will comply with the regulation |
| Monitoring and control:<br>♦ leachate control (monthly),<br>♦ surface water (quarterly)<br>♦ groundwater (every six month)<br>Topography of the landfill (including settling behaviour) shall be measured yearly.<br>(Annex III) | Water monitoring and topographical measuring of the landfill are addressed in the operational manual. Supporting routines will be developed by Hygiena Ltd. | The landfill will comply with the regulation |

### 5.2.1 Conclusions on compliance between the EU Directives and conditions of planned Landfill in Tsetskhlauri

Planning of the new landfill has been taking the demands of the EC Directive on landfilling into account as well as EU Industrial Emissions Directive and BAT guidance.. It is therefore considered that the activities at the landfill will comply with the EC/EU Directive regulations. Detailed design of leachate, ground- and surface water protection, landfill gas collection etc. will carefully be considered. The daily operation will also follow the stipulations of the Directives and guidelines mentioned above.

## 5.3 EBRD Performance Requirements[24]

Bank-financed projects are expected to be designed and operated in compliance with good international practices relating to sustainable development. Compliance with the performance requirements are summaried in a table presented in the final part of this report. The PR table form the basis for the ESAP and the SEP, annexed to this report.

[24] www.ebrd.com/pages/about/principles/sustainability/requirements.shtml

# 6 Site Selection for the New Landfill

There were two site selection processes performed within the project. The first site in Chakvi was identified by TACIS project financed by Black Sea Environmental Facility Project. It was performed during the period 2005-2006. The second site selection procedure was performed 2012 after the Ajara Government decided to move the new landfill site from Chakvi to a more remote location where social, environmental, scenery and other implications were expected to be less perceived.

## 6.1 Description of the Site Selection made by EU TACIS Project

The first site selection study (2005) has been carried out with the objective of establishing a new sanitary landfill, compliant with the European Standard requirements but waste transportation costs should be low in order to have an affordable tariff level. The site was required to provide a storage volume covering the needs for landfilling capacity for the coastal region, including City of Batumi, Kobuleti and Khelvachauri for at least 30 years.

After a pre-selection process, six possible sites in Ajara coastal zone (Figure 10) were assessed from environmental point of view. The evaluation was based on 23 different criteria including natural conditions, proximity to dwellings and airports, surface and groundwater conditions, transportation conditions and possible volume of the landfill.

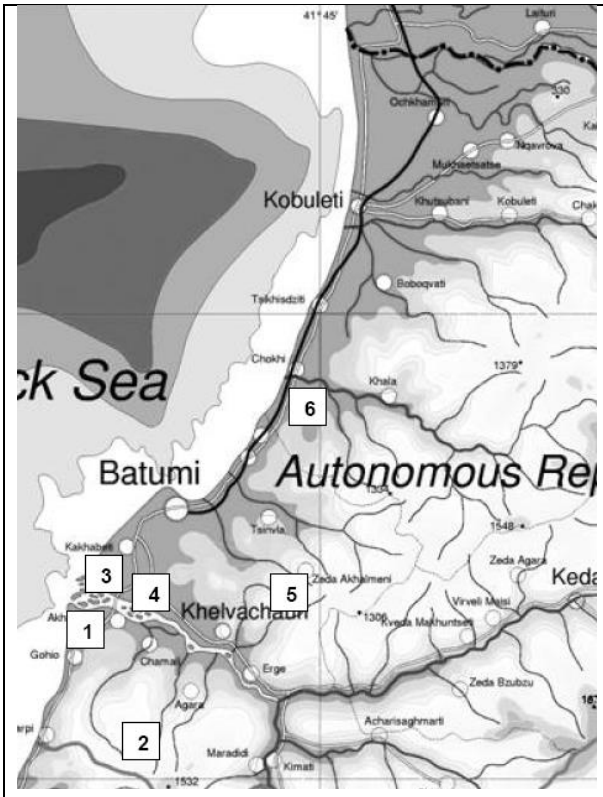
The final comparison followed a logic scheme including assessment of six main environmental and social parameters or sources of potential conflicts if a landfill should be established:

1. **Water** (situation in relation to rivers, springs and private wells),
2. **Housing and infrastructure** (distance to dwellings, visual exposure of the site),
3. **Tourism** (visual effect on scene, integration into the landscape),
4. **Geological conditions** (bedrock, soil properties, permeability, stability),
5. **Agriculture** (land use today, development plans),
6. **Accessibility** (distance to main roads, quality of access roads).

The conclusion and recommendation from the site selection procedure was that two of the sites could meet the requirements and be considered for the new landfill: *No 6, the Chakvi site (MicroRayon 7) and No 5, the Benze Field Area*. Finally, site in Chakvi was ranked as first because it prevailed in all of the six abovementioned main environmental parameters.

The Governmental Commission met on 22nd February 2005 to decide the location of a proper regional landfill site in Ajara. The decision was that the new EU comply sanitary landfill should be built in Chakvi. In turn, the marked area was recorded in the Ajara Land Cadastre.

Based on the State Committee decision the further investigations, studies, assessment and design works were focused on this site and the TACIS study was completed in 2006.




| No | Potential sites |
|---|---|
| 1 | Non-compliant landfill along the left side of Chorokhi river |
| 2 | Akhasopeli-Khlobcho Khelvachauri administration |
| 3 | Pool establishment territory of Kakhaberi alongside the existing landfill in Batumi |
| 4 | Industrial zone of Khelvachauri |
| 5 | Tea plantation areas, Salisbury State Establishment (i.e. Benze Field Area) |
| 6 | Micro Rayon 7 (Chakvi), The region near the new road tunnel |

*Figure 15 Pre-selected potential landfill site in Ajara coastal region*

## 6.2 Description of the Site Selection made by EBRD / Sida Project

The Support to the *Project Implementation Unit, Engineering Design Services and Contract Supervision* as well as the *Corporate Development projects* started in September 2010. The works were frozen in November 2011 when Ajara Government took the decision to relocate the new landfill site from Chakvi. The reasons for relocation were unexpectedly strong resistance from the residents in the neighbourhood, delineation of the new motorway (passing very close) and new territorial development plans in the coastal zone.

The identification of a new landfill site started in February 2012. Due to the constraints resulting from the development plans, population pattern, highway delineation, existing national parks, RAMSAR areas etc. there were only two new potential landfill locations left for further consideration. One of them was located in the vicinity of the currently functioning temporary landfill at Cholokvi village, in the plain behind Kobuleti. The second optional site was in the north part of Ajara on the plain near village Tsetskhlauri. The two sites are further descriibed below.

### 6.2.1 Cholokvi

*Figure 16 Temporary dumping site at village Cholokvi in Kobuleti Municipality*

The total area for a landfill at Cholokvi village would have been approximately 15 ha. The area is flat and the main land use is grazing of cattle. The soil has previously been drained by a system of ditches to allow farming activities and there were several traces of ploughing although perhaps not in recent time. The open drainage system is in poor shape because of the lack of maintenance. The ground has been terraced with some 30 m of cultivated areas between minor ditches or depressions to facilitate surface water runoff to major ditches. In the lower wet locations vegetation well suited for establishment of wetlands for polishing of treated leachate was growing.

The ground surface was covered by clayey soils and no peat was observed. The high clay content in the surface indicates low permeability and thus, a good protection for the groundwater. The low permeability of the soil was also indicated by ponding of water in many spots.

The groundwater table was estimated as shallow, but the water level in one major stream passing through the site was 2-3 m below the ground surface, which indicates that there may be a possibility to lower the groundwater table, if needed.

The main stream was roughly estimated to be 2 m wide, 0.5 m deep and with a speed of 0.5 m/s, indicating a flow of 0.5 $m^3$/s.

The new highway being under construction was on a distance of couple of hundreds of meters from the site.

### 6.2.2 Tsetskhlauri

The second optional site was in the north part of Ajara on the plain near village Tsetskhlauri. The site was thouroughly investigated in a survey hereinafter referred to as “site assessment”. The site assessment included a preliminary judgement of the potential landfill site: visual site recognition and interviews with the local population concerning land use and water logging, inventory in the land cadastre, processing available maps, preliminary geological survey, common site visits with the Steering Committee as well as with representatives of Batumi and Kobuleti Municipalities. The detailed site assessment covered geodesic survey (creating digital elevation model, DEM), geological survey including drillings and excavations, preparing layout of the landfill components and preparation of map (coordinates) for landfill registration..

The site is located on a distance about 6 km from the Black Sea shore-line, 10 km from City Kobuleti and about 45 km to City Batumi.

The size of investigated area has a size about 40 ha and it is situated in the west outskirts of village Tsetskhlauri eastward from the regional town Kobuleti.

The area for the proposed landfill area in Tsetskhlauri is located within the administrative district of Kobuleti Municipality. The closest settlements are villages (Figure 13)

- Tsetskhlauri in South-East direction on a distance of 1 km
- Jikhanjuri in East direction on a distance of 600 m
- Ochkhmahuri in West direction more than 1.9 km.

The area was registered under different real estate units but all land lots belonged to the State and were recorded as such in the Land Cadastre.

During the Soviet time, i.e. before 1990, a cattle farm was built in the north-west part of the potential landfill area. This complex was destroyed during the unstable social and political situation arising after the USSR's break-up. There are only concrete silo pits and blocks left on the territory. Another part of the area was used for tea-plantation. Today, the great part of the studied area is used for grazing while a smaller part for provisional maize growing.

The vegetation is sparse, meagre grass while in deeper areas (outside of the landfill site) where the groundwater table is closer to the surface bushes are densely grown. There is lower wet location with dense vegetation adjacent to the northern border of the landfill site (Figure 16). Forested area can be found to the East and North from the landfill site. The Ajarian Environmental Department confirmed that no protected species were found on the territory.

A large part of the area is composed by laterite clay of secondary sedimentation with high density and bearing capacity.

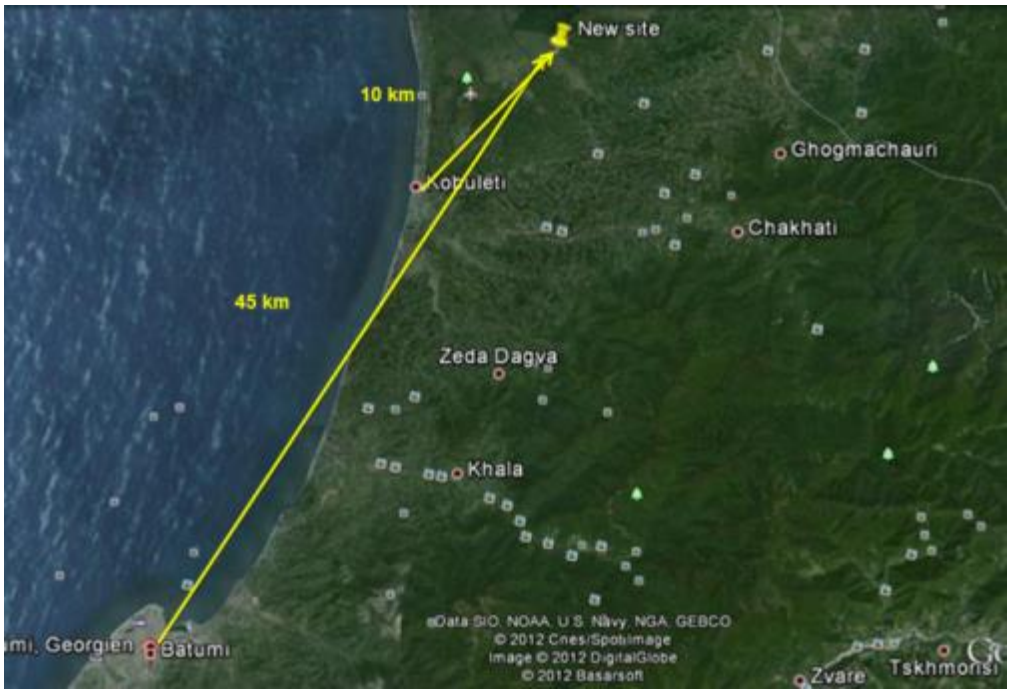



*Figure 17 Distances between landfill site in Tsetskhlauri vs. Kobuleti and Batumi – as the crow flies (Google 2012)*

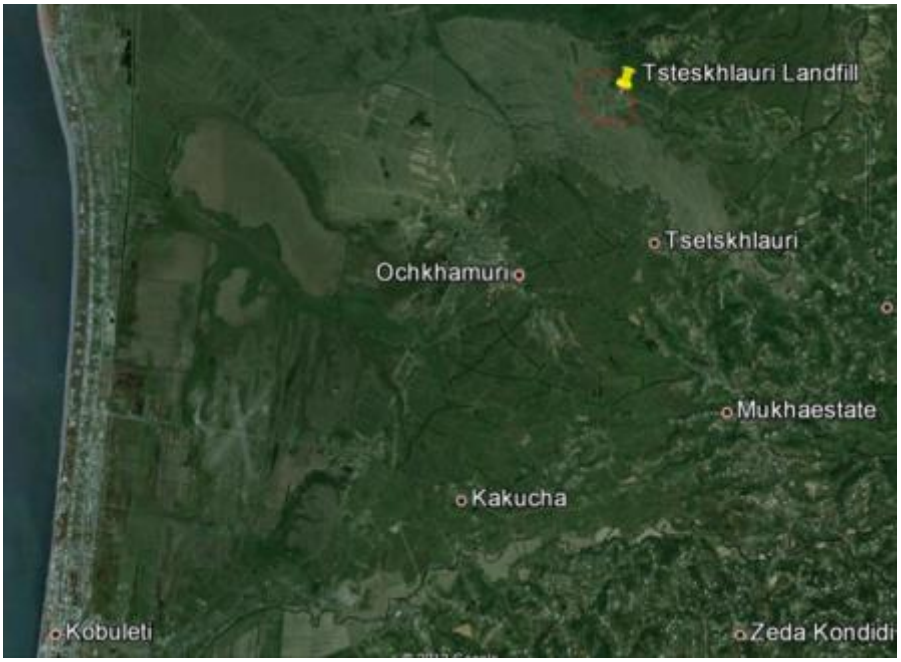



*Figure 18 Settlements around Landfill in Tsetskhlauri (Google 2012)*

*Figure 19 Ruins of the cattle farm (left) and silo pit (right) located at the north-west side of the landfill area in Tsetskhlauri*

### 6.2.3 Site selection

Vicinity to settlements and RAMSAR site indicated that the Cholokvi site was not suitable for landfill.

The Tsetskhlauri site was selected to be the more preferable site of the two alternatives for constructing a new landfill, both from technical and environmental perspective. A more detailed investigation commenced to confirm the initial findings and to get more information about the site, the “Rapid Assessment”, see below.

## 6.3 Rapid Assessment of the Landfill Site in Tsetskhlauri

The first visual surveys were made in in February-March 2012 and readily available information was studied in order to make a preliminary assessment for suitability of “Tsetskhlauri Plain” for landfill establishment. In parallel, the landownership and land use issues were clarified. Some drillings and sampling were made for preliminary identification of the local geotechnical and conditions as well as geological, groundwater and surface water conditions. In addition, the local conditions of geomorphology, geology, hydrogeology and geotechnical have been put into a regional context, which was necessary to obtain full understanding of important features of the site.

The landfill site has to meet a long series of geotechnical criteria and be acceptable by the public. The exclusion criteria for the site selection and the characteristics of the Tsetskhlauri-site are given in Table 5 below.

*Table 9 Exclusion criteria for site selection and corresponding characteristics of the planned landfill site in Tsetskhlauri*

| **Social criteria** | |
|---|---|
| Excluding factors for building landfill | Corresponding characteristics of Tsetskhlauri site |
| Religious area or cemetery within 500 m radius around landfill area. | Neither in the landfill nor within the impacted area |
| Plantation intensively calculated within 500 m radius around landfill area. | Neither in the landfill nor within the impacted area |
| There should not be houses within 500 m radius around landfill area. | There are two resident houses within the border of the cadastral area and there are seven houses on the border of the 500 meter sanitary zone, further described in Chapter 8.11. The responsibility of the resettlement of the residents lies with the Government of Ajara and will be described in the Resettlement Action Framework. |
| Paved roads within 200 m radius around landfill area | Neither in the landfill nor within the impacted area |
| Historical place within 500 m radius around landfill area. | Neither in the landfill nor within the impacted area (Archaeological survey was done and expertize submitted.) |
| Touristic place within 1000 m radius around landfill area | Neither in the landfill nor within the impacted area |
| Geological criteria | |
| Special geological zone within 300 m radius around landfill area | Neither in the landfill nor within the impacted area |
| Karst zone within 300 m radius around landfill area.[25] | Neither in the landfill nor within the impacted area |
| Criteria of natural heritage and ecology | |
| Forest reserves within 300 m radius around landfill area. | Only beyond the impacted zone |
| Nature parks, protected areas within 1000 m radius around landfill area | Kobuleti Protected Areas include Kobuleti Strict Nature Reserve and Kobuleti Managed Nature reserve. Both are located between Ochkhamuri and the coastal zone, i.e. the distance is not less than 3 km to the nearest reserve border. |
| Water reservoirs | Neither in the landfill nor within the impacted area |

[25] Rain water quickly moves through the karst (geological) layer into the deeper ground therefore karst regions are not suitable for landfill establishment.

| | |
|---|---|
| **River radius around landfill area within 300 m radius around landfill area** | **There is a creek crossing the marked landfill territory; that will be removed from the landfill area and protected by embankments from leachate and surface waters from the landfill (no fish habitation in the creek)** |
| Criteria of safety and health | |
| Water intake area | There is one deep artesian well adjacent to the landfill border that supplies water to a household. The landfill will be constructed with a liner as not to impact the groundwater quality The well will be inside the landfill area, and not available to people. However, a new well will be drilled on further distance from the landfill. The existing well could be used as technological water source for the landfill and monitoring of the water quality. |
| Distance from airports within = 3 - 5 km radius around landfill area | Distance to the Meria Airport more than 10 km. |

Within a *rapid assessment* the Client and Consultant's specialists made a series of field visits in Tsetskhlauri for site recognition and taking some interviews with people living and working around the location. Existing road connections, infrastructure such as power lines, water supply sources, gas for heating of buildings and boiling water were preliminarily checked. Potential impacts on settlements, land use, historical heritage, and protected areas were also considered. The interviews with local people also revealed whether any inundations have happened on the Tsetskhlauri Plain during the past.

The rapid assessment proved that landfill location did not violate the major requirements but minor deviations were observed. Thus the *Rapid Site Assessment* found the place suitable for landfill construction and operation. However, it was noted that the new site would cause longer transport distances from Batumi in comparison to previous location at Chakvi, and therefore the new location results in higher transport costs. It could be also assumed that a transfer stations between Batumi and Tsetskhlauri should be built.

# 7 Detailed description of the selected site in Tsetskhlauri

## 7.1 Detailed Site Assessment Works in Tsetskhlauri

Since, the major pre-conditions for an EU compliant landfill were fulfilled; the detailed field surveys and laboratory tests could start to further investigate the suitability of the site for landfill establishment.

The Consultant's investigations focused on

- surveying of physical-geographical conditions;
- investigating of the land ownership;
- assessing of the investment costs of constructing the landfill;
- estimating of the operational costs of the company running the landfill;
- deriving of tariff levels in case landfill would be constructed and operated in Tsetskhlauri;
- preliminary assessment of the public acceptance.

The surveillance works (Table 6) were subsequently performed. The results of works were immediately evaluated after a survey had been completed. The works would not have continued if any of the criteria had not fulfilled the compulsory requirements.

In the first stage, the Consultant investigated the technical conditions for the new landfill site in a broader area in Tsetskhlauri. It included collection of information about topography, climate conditions, geology, groundwater, hydrology, architectural and historical heritage, flora and fauna, landownership and accessibility to infrastructures.

The next stage of site assessment comprised the geo-referenced marking of the boarder of the potential landfill area. These areas were investigated within rapid assessments. The finale location was set in May 2012 and detailed investigations were made and finalized.

The assessment of socio-economic conditions was confined to the landownership, resettlement, nuisances, health and safety issues.

*Table 10 Works performed for site assessment*

| No. | Activities | Investigated objects | Investigations |
|---|---|---|---|
| Information collection and processing | | | |
| 1. | General informa-tion | Site visits with the Client and specialists. Visual assessments. Interviews with people living and working around the location. | Road connections, infrastructure, available power lines, water supply sources, gas for heating of buildings and boiling water, settlements around the site, land use, water inundations of any historical heritage, protected areas. |
| 2. | Maps | Collection of available maps: topographic, land cadastre, transport lines, development plans, geology, hydro-morphology, soil, hydrogeology, protected areas. | Defining the boarder of the landfill and coverage of sanitary zone, assessing/defining the area (boarder) of the landfill, preliminary assessment of the feasibility of construction and operating of an EU-comply sanitary landfill. |

| | | | |
|---|---|---|---|
| 3. | Soil proper-ties | Studying soil maps, taking samples and lab analysis. | Properties of soil layers, depth to bedrock, natural moisture content, and degree of water saturation strata. |
| 4. | Hydro-logy | Collecting hydrographical maps, hydro-meteorological data. | Estimating the flood risks, defining suitable recipient for leachate waters from the landfill, requested drainage capacities. |
| 5. | Seismi-city | Seismologic expertise. | Seismic risk level for defining the outlay, profiles of dumping cells and waste piles. |
| 6. | Infra-structure | Necessary infrastructure for construction and operation of landfill: roads, water, power lines, gas pipes (for heating the buildings and boiling water). | Access to infrastructure is needed for construction and especially for operation of a sanitary landfill. |
| 7. | Social impacts | Checking land ownership and potential resettlement needs, risks for health impacts for the population and potential livelihood losses | Identifying the feasibility of establishing the landfill, i.e. to reveal whether the solution of resettlement issues is feasible or not. |
| Field surveys - will be started in case Entries 1-6 did not came over any obstacle/s that made the construction ineffectual. | | | |
| 8. | Geodesy / GIS | Geodesic measurement for preparing geo-referenced digital elevation map (DEM). | DEM for layout of cells and service objects, assessing the water passes and drainage needs, defining the landfill bottom construction, aligning the transport roads within the landfill area etc. |
| 9. | Geology | Drilling pipes, sampling of cores, lab analysis. | Estimating of the geological characteristics: the hydraulic conductivity, water content, grain size distribution, grain size distribution for defining the design parameters. |
| 10. | Ground-water | Installation of groundwater observation pipes, pumping groundwater; ground sampling and analysis. | Drilling wells for revealing of aquifer properties and groundwater regime. Assessing the groundwater vulnerability and planning measures for its protection. |
| Summing up and reporting | | | |
| 11. | Concise assess-ment of the suitability of site | Summary of the most important geotechnical information, hydrogeology and environmental impact assessment. | Answering whether the new site has the potential for use as an EU-complient landfill. |
| 12. | General layout of the landfill and service objects | Make a decision about preliminary position of the landfill cells, leachate treatment plant, roads weighbridge, storage facilities service objects etc. | Develop general layout together with the Customer to avoid misunderstandings in the later project phases. |
| 13. | Cost estimates | Investment costs of the main components should be estimated. Operational costs should be re-estimated and new | Ground works, excavations, bottom construction, buildings, roads, leachate collection and treatment should be budgeted and the total amount should be compared |

| | | | |
|---|---|---|---|
| | | tariff levels derived. | with the values derived for the landfill in Chakvi. The new operational costs should be given based on the increased transport distances in turn mew tariff levels should be estimated. |
| 14. | Reporting | The work descriptions and their outcomes should be compiled in a standalone document. | The brief description of works and their outcomes should be given in the main document while the measurements, lab analysis results, observations etc. should be placed in the annexes. |

## 7.2 Maps and marking of the landfill area

The available maps were older topographical and administrative maps scanned from paper, maps saved from Google and maps extracted from land register and highway design. These maps were used for the preliminary marking of the landfill area.

Unfortunately, fixed official geodesic point was not found neither within the landfill area nor in the vicinity. Therefore the Consultant has built four stationary points and defined their geo-referenced coordinates by GPS equipment (Figure 15). One of the stationary points installed by the Consultant within the future landfill area.

*Figure 20 One of the stationary points installed by the Consultant within the future landfill area*

The marking process requested close cooperation between the Client, Land Register Office, Construction Department of Municipality and the Consultant. The marking of the planned landfill territory and the obligatory surrounding 500-meter sanitary zone should have been harmonized with the social, environmental and land cadastre conditions. The territorial development plans and ideas also affected the marking procedure. The contour line of the landfill were visually marked in the field and also signed on the maps. The location was evaluated from technical, environmental and resettlement points of view. Then the borders were modified in order to accommodate all possible requirements. All these works included acts such as:

- the landfill area was marked at the Land Cadastre Office in Batumi;
- the Consultant determined the coordinates of fix points in the potential landfill area in order to ensure geo-referenced mapping (these points were meld in concrete and saved for the future works);

- the Consultant marked the border of the landfill area by signs in the field and rapidly assessed the suitability of the zone for establishing EU-comply sanitary landfill;
- the Consultant proposed modifying the site boundaries in order to fit to the technical requirements and marked the suggested area;
- Client representatives checked the modified area in the field and suggested their own modifications striving after minimal resettlement needs and minimal insight from the highway being under construction;
- Consultant evaluated the new area and put forward own modifications and marked the new contour line again;
- Client representatives checked the new boarders of the landfill and those were moved again.

This cycle was repeated four times including coordinate actions such as identify-, boarder line markings, geodesic and rapid geological surveys. The versions are shown in Figure 16; Determination of the potential landfill borders and 6 drilling points (marked with green colour). The main considerations during circling of the site location were as follows:

- maximal distance to the dwellings;
- minimum resettlement needs;
- landfill cells placed on higher elevations to avoid flooding /water logging;
- minimize the needs for ground filling;
- favourable elevation conditions to avoid leachate water pumping and ensure effective drainage from the cells;
- having filling material (clay) within the landfill area to avoid looking after external quarry;
- excluding areas with groundwater levels close to the ground surface;
- avoiding any potential conflicts with other existing or planned land uses;
- acceptable delineation of the access road to the highway.

Finally, the size of geodetically mapped area was more than 40 ha. Leica Flexline TS06 theodolite was used for geodesic measurements. The results were downloaded into AutoCAD System for further processing and creating digital terrain model (DEM). The DEM provided all necessary spatial information for the Site Assessment as well as for the preliminary landfill layout (Figure 21), see Annex 3. The preliminary layout was further specified in the Preliminary Design Report.

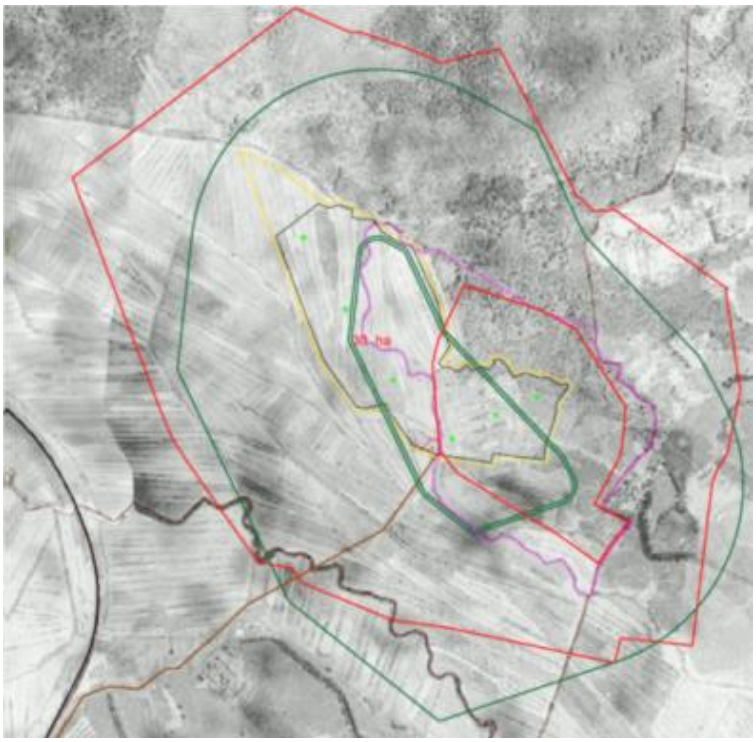


*Figure 21 Determination of the potential landfill borders and 6 drilling points (marked with green colour)*


*Figure 22 Locations and preliminary landfill layout in Tsetskhlauri*

## 7.3 Physical-geographical conditions of the landfill site in Tsetskhlauri

From the geomorphologic point of view the area is located in the furthest southern boundary of Kolkheti plain, between the rivers Ochkhamuri and Choloki, the relief is largely a plain that changes into plateau to a certain extent. The region (not the landfill area) is bordered by Tikeri Natural Reserve that is covered with trees and eucalyptus.

The land surface elevation of the landfill area rises from 29.5 m to 35.5 m above the sea level. The territory includes some hilly part (about 25% of the total landfill area). The landfill area can be divided into three zones based on elevations (Figure 20).

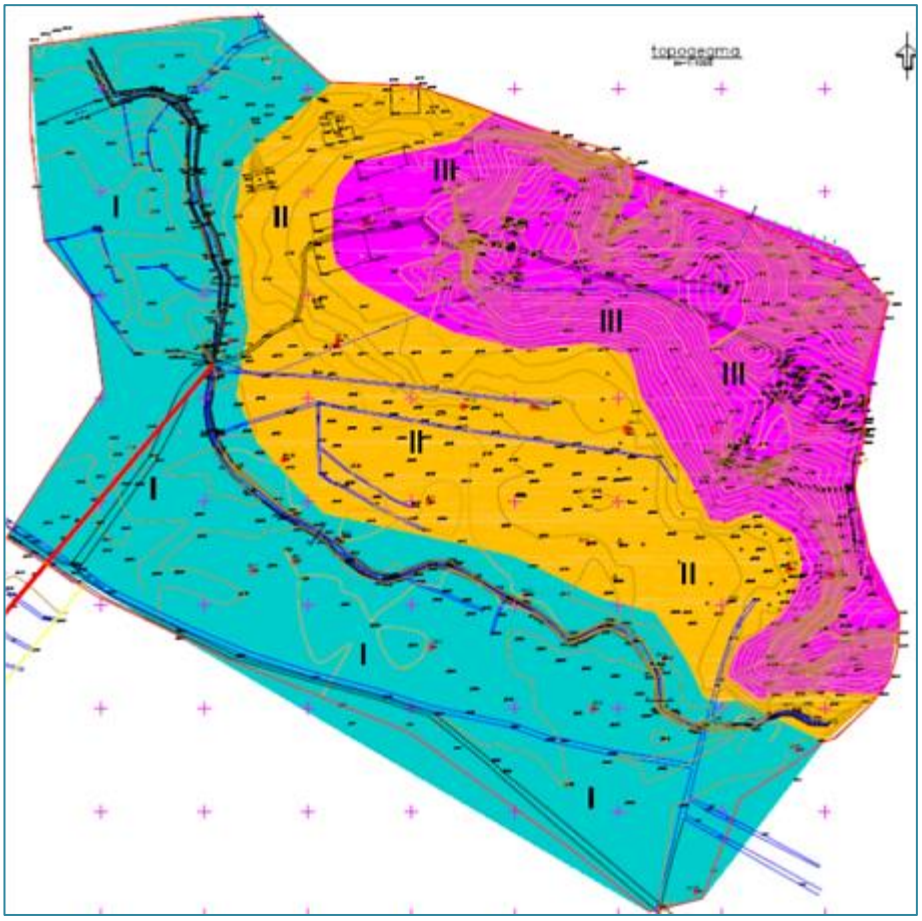



*Figure 23 Three zones of the new landfill area are identified based on elevations*

***Zone I*** is blue colored and follows the right bank of the unnamed stream / canal and is characterized by an even surface. The surface runoff is impeded here. The land from the hill foot to the railway line was previously drained by a system of open ditches to allow farming (Figure 19). Drain-ditches had depths of 0.5-1 m but are not maintained today. The ditches nowadays are partly filled up, their bottom is covered with thick layers of grass and therefore they only function partially. In the geological section of this zone, dark-grey, soft-plastic clay and loams dominate, both with 4% organics and low bearing capacity.

*Figure 24 Open drain ditches on the Tsetskhlauri Plateau (left: Google 2012)*

**Zone II** is yellow colored and situated on the right side of the creek and above mentioned geomorphological *Zone I*. The surface elevation varies between 28-30 m. There is no risk for flooding even here because the area is completely dry for the most part of the year.

Geological section of *Zone II* from the very surface is composed by laterite clay of secondary sedimentation with high density and bearing capacity.

**Zone III** is pink colored. The relief rises on the right of *Zone II*. The rise is first gradual but then more steep from the elevation 30.5 m. The area disposes mainly with laterite clay and also chemically weathered old alluvial gravel soils.

This part of the landfill area is going to serve as source of soil material for bottom preparation of the cells as well as for daily covering of the active landfill cell. The rest of the landfill area is flat.

The vegetation is sparse, meagre grass while in deeper areas (outside of the landfill site) where the groundwater table is closer to the surface bushes are densely grown. There is lower wet location with dense vegetation adjacent to the northern border of the landfill site (Figure 24). Forested area can be found to the East and North from the landfill site. The Ajarian Environmental Department confirmed that no protected species were found on the impacted territory.

*Figure 25 Lower part of the landfill area at the northern side with dense vegetation (in front) and forest (behind)*

The whole Georgian territory is located in an area with occasional seismic activities. The project site is located in seismic zone IV of the *Modified Mercalli Scale*[26] , i.e. felt by many indoors, few outdoors *(Equivalent Richter Magnitude = 4.0)*. In turn, the type, size and profile of the landfill cells should take into account the seismic risks. However, it should be noted that the landfill itself is regarded less sensitive to seismic activities compared to more complex structures.

## 7.4 Soil and geological survey

A geological survey was made to define soil and ground stratification, in other words to determine each stratum and their thicknesses. Drilling works were performed and core samples were sent to the laboratory to perform standard tests. The detailed information on the drilling positions, core samples, geological vertical and horizontal profiles and conclusions are given in the *Site Assessment Report*. This section presents a brief summary on the findings.

The assessment of soil sorts and their properties were first based on a visual survey as well as on available soil and land use maps. Then four preliminary drillings were made in parallel with the marking process to provide information for the final definition of the landfill boarder.

When the final contour line of the border was set  drillings, excavations, soil (disturbed and undisturbed) core sampling and laboratory analysis were made in order to define the stability / bearing capacity of the soil layers, vulnerability of aquifer, ability of soil to prevent seepage of leachate water into aquifers. Soil types were also assessed to decide their suitable for using at construction of the landfill and for covering the dump surface during the operation.

[26] http://www.geo.mtu.edu/UPSeis/Mercalli.html

The *site assessment* requested drilling of 23 boreholes on the potential landfill site. The boreholes were needed to take core samples from different depth in the ground and check the groundwater levels. The depth of the drillings varied between 5 and 10.4 m. The total drilling length was 161 m while the diameter of the wholes was 100 mm. The *xyz coordinates* of the wells were recorded.

The investigations targeted at revealing the geological information such as lithological content of soils, ground water levels and other necessary data. Based on soil characteristics identified in the boreholes, five longitudinal geologic-lithological profiles were drawn up in scale of 1:1000 in horizontal and 1:100 in vertical directions (see in *Site Assessment Report*).

Visual assessment and some in situ instrumental measurements were also performed before the soil samples were sent to a geotechnical laboratory in Tbilisi and to Sweco's laboratory in Stockholm. For the clayey soils angle of internal fraction (C) and rated compression resistance (R0) were defined on the site by Penetrometer and vane.

Disturbed structure of clayey soils were taken from holes 7; 8; 9 and 10 in order, in total 25 core samples and sent to the laboratories. Laboratory tests were of standard types and looked at inter alia plasticity, consistency and natural humidity.

Also four pits of 5 m depth were excavated and 11 soils samples of undisturbed structure were taken. Single-axis compression tests were made on these samples.

Water samples were taken from boreholes 1; 8 and 5 and also two samples were taken from *unnamed* creek (brook) passing through the future landfill site.

Based on these surveys the conclusions are as follows;

Concerning the bearing capacity of the soil two major questions were investigated, namely, the settlement and lateral stability of the ground layer under the load of the dump pile. The ultimate load criteria on the ground were 10 ton/$m^2$. Based on assessment by geological expertise, the weakest soil type would give a consolidation settlement approximately 40 cm at those places where this soil type occupies 8 m thick layer. This soil type is found in some vertical profiles of Zone III and Zone II though they are confined to a narrow stripe along the *unnamed* creek. However, the layer thickness seldom reaches 8 m. There is no settlement foreseen in Zone III.

The judgement of lateral stability can be proved by the experiences gained during the construction works in identical conditions in Ajara. Three- and four-store buildings were built on monolith concrete base. The consolidation settlement has been around 20 cm for 10 years and no lateral movement of soil was observed under the monolith[27].

The upper soil-plant layer of 20 cm depth should be removed and the area should be backfilled by clay and loam soil to the ground surface elevation of 28 m of sea level. The landfill ground should be compacted / compressed when the landfill bottom is being prepared. This work will further improve the ground stability and facilitate the protection of the soil waters.

[27] Statement of the Consultant's local geologist

Clay soils taken from higher parts (Zone III) of the landfill area can be used for backfilling, constructing levees around the cells and along the *unnamed* creek.

## 7.5 Climate

As it was mentioned above, Ajara is located in southwest Georgia. The western part of Ajara constitute of coastal zone of Black Sea where the landfill site will be constructed (Figure 1). The zone is defined as seaside damp subtropical climatic zone, which comprises whole West Georgia and extends to the Likhi mountain ridge. Climate of this zone is formed under influence of its location on the border between subtropical and moderate latitudes, circulation processes in the atmosphere and the orographic patterns. Due to the influence of the mountain ridges bordering from three sides, the damp, unstable air masses coming from the West – from the Black Sea, undergo convergence and then ascending flow up the west slopes of mountains. This causes the formation here of a damp climate, with big amount of precipitation almost any time of the year, against the background of high thermal regime.

The coastal zone is characterized by excessively humid subtropical climate. Relief of the considered region is broken and hilly. Mountain ridges are going down directly to the sea shore and preventing the intrusion of eastern cold air masses to the shore. In turn, the coastal zone is under the direct influence of the Black Sea.

The narrow coastal strip along the Black Sea in Ajara represents the Kakhaberi lowland, which comprises the extreme south-west part of the Kolkheti Lowland. Strong and warm air masses from the Mediterranean Sea are passing through Bosporus towards the east coast of the Black Sea and those warm up the Ajara coast considerably during the winter period. The average temperature in the coldest months (January and February) is around 4.8 $^{o}$C – 6.7 $^{o}$C. The average temperature in the warmest month (August) is 22.2 $^{o}$C – 23.1 $^{o}$C. Summer is not too hot in the region (especially in Kobuleti) due to breezes, rich vegetation and the large amount of precipitation.

However extreme temperatures can be measured: minimum of temperatures (-8 – -16 C) can take place in January when cold air masses intrude from north-east. The maximums are observed in August up to 40 – 42 $^{o}$C.

As it was already mentioned, Ajara coast is protected from the influence of east winds by mountain ridges covered by dense forests. In spite of this fact there is an obvious seasonal variation of wind directions. Here, the west winds (from the sea) dominate over the east (continental) winds everywhere, almost in every season.

Dominante wind directions

*Table 11 Dominate wind directions, Tsetkhlauri (percentage of time the wind blows from each direction)*

| North | N/E | East | S/E | South | S/W | West | N/W |
|---|---|---|---|---|---|---|---|
| 2 | 23 | 13 | 8 | 7 | 30 | 11 | 6 |

Wind rose for Tsetkhlauri. The wind rose diagram depicts the distribution of wind direction and speed at a location over a period of time. The length of each bar represents the percent of time the wind blows from that direction.

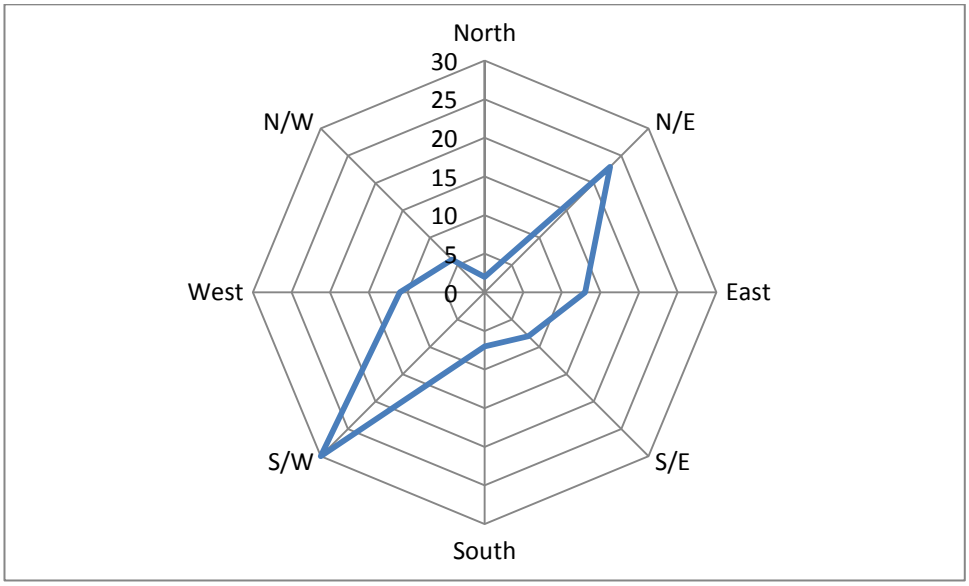



*Figure 26 Wind rose, Tsetkhlauri*

### Wind speed

*Table 12 wind speed, Tsetkhlauri*

| Month | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| m/sec | 2,7 | 3,1 | 3,0 | 2,8 | 2,6 | 2,5 | 2,6 | 2,4 | 2,3 | 2,4 | 2,5 | 2,5 | 2,6 |

Due to the relatively warm climate, precipitation in Ajara coast zone is mainly falling in form of rain. The annual amount of precipitation varies between 2,320 and 2,621 mm, i.e. very high which imposes special requirements on the design and technology of landfills in Ajara. Extreme precipitation events do not take place too frequently but such events have also a great influence on the regime of surface waters and therefore the landfill design should pay particular attention to them.

According to the report “Assistance to Georgia in meeting the commitments to the UN Framework Convention on Climate Change” global climate change will have a tendency to the extremes (floods, droughts). For Ajara it means increased rainstorms. Thus the drainage around the landfill as well as the leachate water treatment and disposal should be carefully considered during the landfill design works.

## 7.6 Biodiversity

The site is not considered sensitive from the biodiversity standpoint. The site could be classified as a grassland habitat, providing grazed areas scattered with smaller entities of bush and groups of trees. The habitat is typical for the Ajara landscape, and examples of fauna include small mammal species such as jackal (Canis aureus), fox (Vulpes vulpes), badger (Meles meles), hare (Lepus europeus), squirrel (Sciurus vulgaris), as well as reptiles and amphibians.

The landscape at the site was strongly transformed and impacted when the cattle farm was built and operated. However there is evidence that some of the mentioned species may occur at the site. In relation with the birds, common species like crows, seagulls and blackbirds could be observed at the site. The site is not used as a usual stop over site for the migrating birds, although occasional appearance of such species cannot be excluded. This may be more probable for short periods when some parts of the site could be covered by temporary ponds and providing stopover sites for waterfowls. There are no known species at the site that are included in IUCN Red List or that are under protection.

## 7.7 Hydrogeology

It is important to say that the ground water levels are not constant but vary seasonally and also depends on the climate cycles. The ground water levels are close to the surface in the plain areas of the landfill site. The groundwater level varies between 0.22-1.50 m in those parts of the territory where the land surface elevation is below 30 m asl (=above the see level). The ground water level is deeper in the higher zones of the landfill area. The depth was of 4.4 m in hole #20. The hole #14 was situated at 38.5 m asl. and here the groundwater level stayed below 5 m depth. Groundwater and leachate will be separated through a bottom sealing combined with a drainage layer.

Minor groundwater flow is directed to the *nameless* stream and to north-west direction. However, the subsurface flow is hindered by low filtration capacity of the soil.

There is a well in one of the house courtyards where the ground surface is at 40 m asl. The depth of the water level in the well was 9.83 m on 15th in April 2012 but the water has fully disappeared in a month (no water was seen in the well on 14th of May 2012). As the owner of the house explains, heavy rains fill the well up but it dries completely out during droughts.

Two artesian bore holes were drilled near the stream, in the north-west part of the territory in the 1980ies. The wells supplied the water to the animal farm. Pressure in the artesian well is enough to lift the water up to the ground surface. The depth of these wells based on the information received from the local people was 90-100 m. One of the holes is abandoned but some water is still spilling from it. The second well is used and a pump fills the water into a provisory metallic water tank. The water debit is constant according the local people and the quality is good for drinking water.

In summary, it can be concluded that both the vertical and horizontal water movement is very limited in the future landfill area in Tsetskhlauri and fact provides favourable conditions for landfill establishment. There were inserted groundwater lenses found during the drillings, however, they were isolated, thus, not created aquifer because the soils had very low filtration capacity. Beyond the measured low infiltration capacity, the missing hydraulic connection between the inserted water lenses and the creek is also an evidence for the lack of sizeable groundwater movement in the investigated ten-meter thick upper layer of the soil. The creek can dry out while the water lenses give the same water. i.e. are unchanged level in boreholes. Even in those boreholes, which are situated closest to the unnamed canal, i.e. the lenses could be drained into the canal bed if the hydraulic conductivity was higher.

## 7.8 Hydrology

The site is surrounded by a dug trench on the North - Northeast side, which is linked to a canal that later joins the River Choloki a few kilometers North of the site. On the South-Southeast side, another dug trench surrounds the site. This trench links to the river Ochkhamuri, around 300 m SouthWest of the site.

Main watercourse of the area is represented by a *nameless stream* that is a canal for collecting the drain waters. The water flows from south-east to north-west in a meandering river bed. The canal joins the River Choloki in a few kilometres away to the north. The recipient is the River Ochkhhamuri south of the site, which joins river Choloki close to the outflow in the sea, west of the position where the nameless stream joins Choloki.

The cross-section of the river-bed of the nameless stream is an erosive V-cut with a depth of 1.8-2.5 m and width of 4-8 m. Cross-section area varies between 5.5 and 10.5 $m^2$. The bottom of the stream bed is of easily eroding clay and loamy soils. There were seen some signs of fresh erosion, although this process appeared not to be intensive.

Surface runoff and groundwater supply the the stream. The depth of water in usual conditions is 20-40 cm. When droughts prevail then the water level decreases to or below 10 cm depth. Residents said that the canal practically dried entirely out during a two-month long drought in 2010. The consultant also observed that the discharge in the creek is changing quickly. The flow from 1 $m^3$/s assessed in April 2012 gradually decreased to 100 l/s or even below by the middle of May 2012.

The land surface of the site selected for the landfill has previously been terraced with slopes to the ditches to facilitate surface water runoff. The ditches are still clearly seen in Google maps taken in 2006, see Figure 15 above.

The ditches join some kind of collectors (Figure 24, right) and those deliver their waters to a larger nameless canal crossing the plain. A dirt road crosses the *nameless* canal. The conveyance capacity of the pipe in the crossing section (Figure 27, left) is less than the maximum discharges and therefore water sometimes flows over the crossing and inundates the pump station at the downstream edge of the crossing (Figure 27, right). The guard of the pump station showed the sign of inundation that was about 30 cm above the floor level. The Consultant found in April 2013 that the crossing over the canal was severely damaged by a recent non-professional dredging in the canal bed.

*Figure 27 A concrete pipe is installed in the nameless creek under the earth road (left). The pump station and an earth road creek over the nameless canal (right)*

The open drainage system and the collectors are in poor shape today because of the lack of maintenance. The drainage system around the future landfill should be restored to avoid the waterlogging.

The high density of ditches surface indicates on low permeability of soil because they provided the only means to lead away the excess waters from the land surface. The low permeability of the soil was also indicated by ponding of water in many spots after rainy periods which were observed by the Consultant during the field works.

## 7.9 Hydrological evaluation

There were no historical hydrological observations available to assess the flooding risk on the Tsetskhlauri Plateau. Therefore the Consultants interviewed the local people whether they have experienced flooding on the Tsetskhlauri Plateau in the past. As it was remembered only one case in 90-ies of the past century. After prolonged and intensive rainstorms some lowest parts of the Plateau were flooded for a short period. The low risk for floods may be confirmed by the fact that an animal farm with a large number of buildings and facilities would not have been constructed here if inundations occurred in the past. The inundation risk will further decrease because the landfill cells will be raised above the today's land surface.

The design of drainage of surface / storm and leachate water collection considered the above mentioned and targeted at

- leakage into the ground water aquifer should be prevented
- emission of untreated leachate water into the surface water should be strictly avoided
- saving as much as possible the hydro-geographic network and natural runoff conditions
- keeping maximum possible distance to the settlements
- minimizing the flood risk
- ensuring favourable collection of leachate and storm waters from the landfill area
- creating good treatment options for the leachate waters.

## 7.10 Landownership and land use

The total area between the villages Tsetskhlauri and Jikhanjuri to the highway / railway line is several hundred hectares. The Consultant has worked together with the Client and Ajara's Land Cadastre Department to identify precise cadastral maps and entitlements for the area where the landfill shall be placed.

Based on preliminary desk studies and site visits, the following findings have been made:

- The land between village Tsetskhlauri and highway / railway line is state owned (this information was given to the Consultant by Land Cadastre Office).
- The Consultant has not observed any fenced land parcels within the area during the site visits and field surveys.

- There are two private resident houses with gardens within the 500 m sanitary zone. Permanent residents live in one of them. The other house is used only during the warmer season of the year. The total number of affected people is approximately 10 persons. The situation shall be further assessed in the ressttlement action plan to be prepared by the local municipality.
- In addition to the residential houses above, there are a total of four private plots located souch that part of the land is partly within the sanitary zone of the landfill (i.e. within 500 m distance from the site). This was reaffirmed during the social impact visit in March 2015.
- Today, the area for the planned landfill is used mainly for grazing and partly for cultivation of maize.

It should be noted that according to Georgian legislation, no dwelling houses and agricultural land can be located within the 500 m sanitary protection zone around a landfill.

The border of the sanitary protection zone was defined by the aforementioned regulations as 500 m around the landfill. However, in case of the isolated dwelling houses the legal requirement is not so explicit. In principle, the restriction zone may be reduced. This may be done on the basis of environmental impact assessment, if it would be possible to demonstrate that the zone of negative landfill impact is less than 500 m. The specification of sanitary zone and what it can be used for can potentially impact on resettlement and economic displacement issues, please refer to R/LRF.

At a later stages of the ESIA process, the size of sanitary protection zone could be further specified based on the impact analysis (particularly, landfill emissions). Thus, the exact size of sanitary zone should be subject for analysis and *Georgian Ministry of Environmental Protection* (MoE) approves it during the Georgian ESIA process.

A visit was made to Tsetskhlauri of the social team on the 30th of March 2015 that generally confirms the findings made spring 2014. Interviews were carried out with affected people on the landfill, affected people within/just outside sanitary zone as well as with acting head of the villages in and around Tsetskhlauri.

The dirt road leading to the landfill had recently been improved by the Government of Ajara by the time of this visit, this also includes making trenches on both sides of the road. Crops have been harvested last season, mainly maize. Irrigation channels exist, but these have not been in used for a while and vegetation is covering most.

### 7.10.1 Affected people on landfill area

The plot which is closets to the landfill houses two related families. They have lived there for approximately 50 years. The plot is said to be 10,500 m3 (a bit more than 1 ha) and is registered under the ownership of the head of the family, who is a man (also the one interviewed). He lives there with his wife. His son and daughter in law, as well as two (2) grandchildren live on the same plot but in another house (in total 6 people, 3 female and 3 male).

In addition to the registered plot, the family uses another 2 ha, where they grow mainly nuts and potatoes. They also have fruit treesand one (1) cow. The land is mainly worked

by the interviewed person, but all family members help out as needed. The son owns a shop, where he and his wife also work. Annual turnover on the land is estimated to be between 25-35,000 GEL.

In the second family, the mother in law is said to be head of family. The daughter in law was interviewed. They have lived there for 17 years. The plot with the house is registered and is approximately 3 500 m3 and is registered in the name of the mother in law. One (1) ha is being used on the other side of the road as well as another 3,500 m3 located a bit further away. The family consists of 5 people (3 female and 2 male), 2 adults, 1 pensioner and 2 children). All work on the farm; the husband also works on the highway.

The family mainly grows vegetables and nuts and has some fruit trees. In addition, they have 5 cows. They estimate the annual turnover on the land to be approximately 15,000 GEL.

Both families confirmed they had been interviewed and some kind of questionnaire had been filled in by the Ministry. They give an impression of being supportive ofthe landfill. It is unclear, but likely, that the families have been promised something in return. Neither family said they had planted crops at the centre of the new landfill territory.

The 2012 resettlement survey conducted (please refer to chapter 2) for the Kobuleti bypass road indicated lower annual incomes per households, than indicated here. Estimation on agricultural earnings are therefore required to be carried out during the RAP.

### 7.10.2 Potentially affected people within/just outside sanitary zone

Seven (7) houses exist at an estimated 500 meters from the landfill, 4 of the plots with houses are believed to be within the sanitary zone according to maps produced in this report and confirmed by the social impact team as well as the R/LRF team.The villagers had made their own calculations and reached a result of 380 meters to the boarder of the new landfill. Communication on distance and sanitary zone area and what this entail for these people needs to be done.

The average size of the four interviewed households were (9+4+6+5)/4= 6 people, with slightly more males than females. Three (3) of these families had some kind of additional income, from jobs or by going to Turkey to work in the tea plats for seasonal work. The 4 interviewed families had plots with houses sized 2900 m2, 2500 m2, 3000 m2 and 3000 m2. The plots were all registered in the name of the head of the family, who were all men. Besides these plots that they all reported to have official papers on, but did not know wher the actual official registration was, also had unregistered land plots were vegetables/potatoes and especially nuts were grown. The sizes of these plots were reported to be 8000m2, 2000 m2, 1ha and 7000m2. The incomes on the land only were estimated to be app/annually: 12000, 30000 (had cattle), 15000 and 15000.

Average plot size of the interview people in Tsetkhlauri (minus the cattle farmer) was approximately 1 ha of unregistered land (user right). Averaged reported income per ha is estimated to be: 17 400 (leaving out the cattle farmer, as this person had significantly higher annual turnover/ha).

The 4 interviewed families did not feel they had been consulted and had not received sufficient information from the government. An inventory had been made by government officials last year, but since then the villagers had not received any new information.


*Figure 28 People interviewed at the 7 houses East of the Tsetkhlauri landfill areas.*

According to the acting representative of Tsetskhlauri approximately half of the community (450 HH in total), is said to be against the landfill. One demonstration was made in front of the Kobuleti municipality with approximately 70-80 people.

Key issues people are worried about are:

1. Can cattle graze within the sanitary zone
2. Potential smell
3. Impact on crops

Mitigation measure on social risks include, but is not limited to:

- information disclosure orally and in writing, ensuring women are present at these meetings and have equal access to information.
- Please refer to R/LRF (currently under development) and RAP (recommended)

## 7.11 Cultural heritage

A visit was made to the regional museum of Ajara on the 29th of March 2015. The visit revealed that findings have been made in Ajara region that dates back 300 000 years. Chance finds have been made mainly in Dmanisi (South-East Georgia), Gonio (Ajara, Khelvachauri region) and Pichvnari (Ajara, Kobuleti region).

Both chance finds (reported as accidental finds) and finds from excavations are placed at the museum.

Museum guide reported that the public as well as public/private organisations come in with chance finds and that they were paid for the artefacts that they founds. It was also the opinion of the museum staff that people in general had some sort of understanding that finds should be reported to the museum or the department for archaeology at the university.

The Department of Environmental Protection of Ajara has informed the Consultant that no objects considered as historical heritage found in the landfill functional or impacted area.. A stage 1 permit is being issued after recommendations by the Ministry of Culture who has made an ocular assessment.

Potential impact from construction work cannot be said to be without possibilities to do chance finds. Although museum report that knowledge is high among people in general about the need to preserve artefacts, there is a slight risk that the matter is not dealth with in a proper way during construction works.

It is therefore recommended to have a policy at place before work is started, e.g. at PIU level, that is shared with all workers, as well as with Hygiena Ltd. as soon as the company is made operational. All subcontracted consultants/companies should, in addition, be informed about chance find procedures and contracts should obligate precaution in relation to cultural heritage.

## 7.12 Access to infrastructure

The transport access by trucks from the village Tsetskhlauri to the future landfill site is not ensured today. The plan is that an access road will be built from the new highway passing to the landfill. The distance between the landfill and the new highway is approximately 1.1 km. It can be assumed that a temporary road for the construction period should be built or the current provisional road should be upgraded.

The Consultant recommends building a construction road to avoid heavy transport on the existing village road. The use of latter one would disturb the residents. The construction road can be built avoiding settlements and join the existing asphalted road between the villages.

The access road to be built is not considered to add any significant negative impacts on people's well-being or on the environment. The access road from the highway to the landfill would pass grassland and no residences are in the vicinity. In fact, the delineation of the access road is almost the same as the earth road used by the local people today for commuting between villages Ochkhmahuri and Tsetskhlauri. Road design will take traffic safety into consideration, including safety for pedestrians, donkey carts or cyclists. The new road will improve the communication options for the people living nearby.

The power sub-station from where the necessary electricity can be supplied is on a distance of 2 km. The gas pipe line is also within a reasonable distance, i.e. gas supply for heating and water boiling can be ensured. It can be firmly stated that neither negative environmental nor social impacts cannot be expected from the construction or operation of these two facilities because they would stretch over the areas where no settlements can be found.

Water supply of drinking purposes of the landfill will be ensured by a new artesian well to be installed. This well should also substitute the existing artesian well that provides water for some houses in the village. The existing well – after upgrading may be used for supplying industrial water for the landfill operation.

# 8 Layout of the new Landfill in Tsetskhlauri

The layout of the new EU-compliant sanitary landfill was defined by the objective of the Project given by design criteria and the physical-geographical conditions described above. The detailed layout and design conditions were given in the *Preliminary Design Report*.

## 8.1 Landfill Design Criteria

The basis for the design of the waste treatment facility including a sanitary landfill is the single-most important EU regulation relevant to this project, namely the Council Directive 1999/31/EC on the landfill of waste, where the environmental standards for landfilling within the EU member states are defined. The BAT guidance notes for the waste sector concerning landfill activities[28] is also important policy documents regarding the activities at the new waste facility.

The project does not include all aspects of pre-treatmen of waste. For example, the project does not address sorting at source (e.g. municipal initiatives to separate waste at its source), although such activities are being discussed in many municipalities in Georgia.

A certain pre-treatment of waste is however included in the project: all waste entering the site will be inspected and any waste that does not fall into the categories of non-hazardous waste will be removed. Such waste will be temporarily stored on site (at the sorting area) and will, as soon as possible, be transported to a proper treatment facility outside the site.

In addition to this, MoFE is preparing to eventually install a waste sorting facility on the site. This initiative will be handled in a separate process, and will require an additional permit (please also refer to section 6.1), and is not included in this project. The sorting area is however constructed so as to allow for a future sorting facility to fit.

The new sanitary landfill is considered to be a landfill for non-hazardous wastes. The waste facility will include relevant buildings, weigh-bridge, leachate collection and treatment system, sorting and storage facilities for recyclables and hazardous waste (if brought into the site) and vehicles necessary for the operation. A gas extraction system is also planned for installation after 3-5 years of operation.

One of the basic requests towards the new EU-compliant sanitary landfill is that the surface and groundwater resources as well as the soil and ground layers underneath the landfill and surroundings of the site should be protected from pollution from leachate containing substances that are potentially dangerous for the environment. Therefore the landfill bottom will consist of an impermeable sealing layer and drainage system for leachate water collection.

Based on the requirements, so-called *preliminary design drawings* were made and given in the *Preliminary Design Report*. The major components of the landfill site are described below.

[28] Final Draft BAT Guidance Note on Best Available Techniques for the Waste Sector: Landfill Activities, EPA, Ireland, 2011

## 8.2 Access Road

A new access road to the site will be constructed. This road will be located between the site and the new highway. The distance to the new highway being currently under construction is approximately 1.1 km.

The entrance point into the site is most likely to be at the western part of the site. However, it is yet not finally decided upon and will be further elaborated during the detailed design phase.

From social point of view, it can be noted that the access road is not going to stretch near to any settlements, i.e. no disturbances on residents are expected. Traffic safety will be considered when designing and building the road.

## 8.3 Control of Incoming Waste

As mentioned earlier, the new sanitary landfill will be designed for accepting non-hazardous household wastes. This means that only waste types eligible for disposal in a landfill for non-hazardous waste will be accepted at the site. According to Annex II in the EC Landfill Directive and hence the BAT guidance, waste acceptance criteria and procedures shall be developed and followed. According to the Directive and BAT, the general characterization and testing of waste must be based on the following three-level hierarchy;

- Level 1 Basic characterization: determination using standard analythical methods of the short and long-term leaching behavior and/or characteristic properties of the waste
- Level 2 Compliance testing: periodical testing by simpler standardized analysis methods to determine wheather a waste complies with permit conditions and/or specific reference criteria.
- Level 3 On-site verification: a rapid check method to confirm that a waste is the same as that which has been subject to compliance testing. It may merily consist of a visual inspection of a loaf of waste before and after unloading at the landfill site.

A particular type of waste must normally be characterized at Level 1 and pass appropriate criteria in order to be accepted on the site-specific list. The waste must at regular intervals be tested at Level 2 and pass the appropriate criteria. Each waste load arriving at the gate shall be subject to Level 3 verification.

For non-hazardous waste that is landfilled in a landfill for non-hazardous waste, and not co-landfilled with hazardous waste or asbestos, there is no acceptance criteria. This implies that the major fraction of the waste to be landfilled will not have to be tested according to the above procedure. For example, household waste does not have to be tested.

A weigh-bridge will be installed at the entrance and all waste and other material, e.g. for covering shall be registered. A system shall be established where all drivers submit a signed certificate of the waste type and the origin of the waste (waste transfer document). Waste is only accepted for disposal in accordance with the terms and conditions as laid down in the regulations mentioned above.  All wastes must be described in the

documentation accompanying the load. A computerized system is considered to be connected to the weighing station. The information that can be recorded is e.g. identification of load, weight and type of waste, etc. If the computer information includes codes for waste types and price list, charges to users can then be prepared from the weight records. In addition, the rate of filling and the compaction density can also be more easily monitored from weight records. The registration system will form the base for the invoicing. In the Operation manual and operational procedures for weighbridge procedure, waste inspection and waste rejection details are described on how to perform the work in steps to ensure that the regulations are followed. An example is shown in Figure 21.

*Figure 29 Illustration of a weigh-bridge including a registration system (note the camera on the top of the pole)*

## 8.4 Buildings

In addition to the weigh-bridge and registration office described above the site will also include the following buildings:

- Administration building incl. office space and washing facilities
- Workshop
- Hazardous waste storage
- Guard house

These are important components of any modern waste treatment facility and are illustrated in Figure 22.

The buildings will be design according the Georgian standard and the drawings and technical specifications should be approved by the authorities. The building should function with objectives to provide good hygiene and safe working conditions for the personnel; ensuring reliable administration and accountability,


*Figure 30 Entrance includes the gate, weighing station, administration building, staff building, security building*

## 8.5 Sorting and Recycling

A paved area with a concrete base and roof will be constructed for sorting of recyclable wastes. Included in this project are procedures for simple sorting, aiming at ensuring that no other waste than non-hazardous waste is being disposed of at the landfill.

As mentioned in Chapter 6.1, MoFE is planning to install a more advanced sorting facility, which will further enhance reuse and recycling of materials. The sorting facility will be handled in a separate permitting process and is not included in this project.

This section now describes the sorting activites included this project, i.e. the sorting activities that will take place up to the date when a more advance sorting facility has been installed.

The area shall include one part for sorting and one part for temporary storage of recyclables and bulky waste until transported to the end-user. Sorting of bulky waste and heavy items is proposed to be carried out with a machine having a gripping/picking device. Initially this sorting could be performed manually, i.e. by hand due to the fact that the amount of bulky waste is not estimated to be a major fraction and that it is less expensive to hire additional sorting personnel. However, the health protection requirements of the personnel should be strictly followed.

Any hazardous waste mixed-up in the municipal waste will be sorted out and stored in containers at the site until it is transported to a destruction plant outside the landfill site. The sorting personnel should be trained in recognizing and handling hazardous waste. Hazardous waste such paint, motor oil, prescription drugs, cleaner, batteries, pesticides etc. will be stored separately in different boxes, within a container with a lock until transported to a treatment facility.

## 8.6 Sanitary Landfill Cells

The landfill will be constructed according to EC directive on landfilling for a non-hazardous waste landfill. The area for the landfill cells and available total volume are estimated to approximately 11,5 hectares and 1.4 $Mm^3$, respectively.

Within “Ajara Solid Waste Management Project”, for the construction of solid waste landfill in the village Tsetskhlauri, municipality of Kobuleti, consultant company SWECO has used the 2007-2010 years’ information about the amount of waste for the primary research. However, during 2011-2013 the volume of solid waste collected in the Autonomous Republic of Ajara has sharply increased from 50 000 to 70 000 tons per annum. Reason behind this change is the unified system of collection of solid waste from the population of whole administrative area of Ajara. Moreover, in the near future volume of solid waste supplied to the new landfill is expected to rise gradually to 75 000 tons per annum. Exploitation period of the landfill is 21-35 years (35 years in case of strengthening the waste recycling sector). The total cell area is 11,5 hectares with the height of 15 meters.

The landfill bottom construction will consist of an impermeable sealing layer consisting of stone powder, bentonite and HDPE liner below a drainage layer for collection of leachate. A proposed general design of the landfill bottom is shown in Figure 31. This type of bottom construction will minimise the contamination risk of groundwater and soil layers underneath.

In order to prevent a potential outflow/inflow of surface waters a drainage system will be constructed.

The waste will be disposed in cells to minimise the open waste surface to the atmosphere and surrounding environment at all times. Step by step as the waste pile reach the final height, an intermediate cover will be applied to allow diversion of the surface runoff and reduce the generation of leachate.

Covering of the waste will be made at three different levels such as daily, intermediate and final.

The daily cover shall be applied at the end of each day and consist of minimum 5 cm of soil or other suitable material. The concept is to reduce the open exposure of the organic matter causing fault odour and risk for littering of light waste, such as plastics or papers. Another important aspect is to minimise flies, birds, rats etc. feeding from the waste.

The intermediate cover will consist of approximately 50 cm of low permeable soil to divert the non-polluted surface water runoff outside the waste cell. This type of cover shall be applied for surface not used for disposal for some six months. It shall specifically be applied in areas before the gas wells are installed. By application of this impermeable layer it will be possible to introduce a sub-pressure system for extraction of the landfill gas without intrusion of oxygen into the waste body.

The final cover will be applied after the landfill volume has been completely filled up. The cover will be in accordance with pertinent existing regulations at the prevailing time, but should as a minimum be planned according to the EC directive on landfilling. A proposed design of the final top cover, in accordance with the EC directive for landfills, is shown in Figure 32.

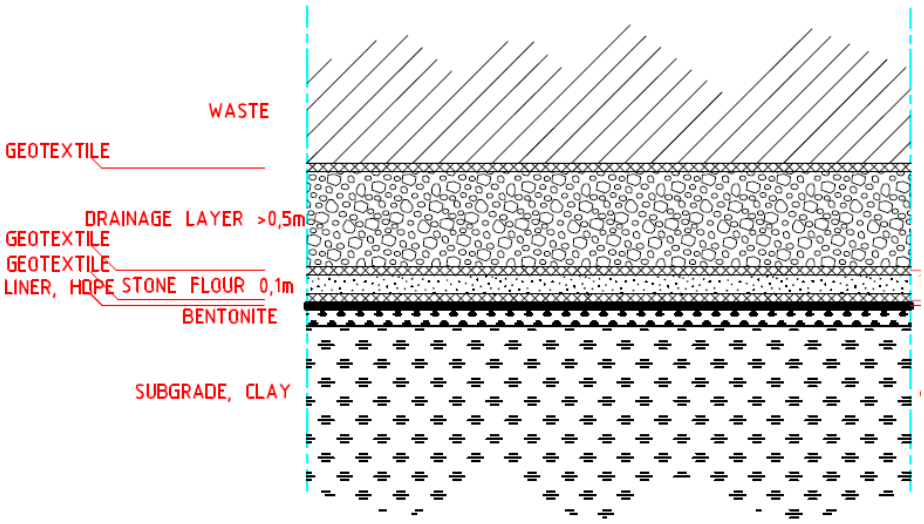



*Figure 31 Illustration of the bottom cover for the sanitary landfill cells*

Each cell of the waste pile shall gradually be filled up to the planned final elevation. The surface shall be given a slope of maximum 1:3 (vertical: horizontal) to allow reasonable working conditions during operation as well as for applying the final cover during the closure of the site. The maximum slope is also adapted to reduce the risk for erosion.

The maximum slope will be applied as high as possible to utilise the available volume at an optimum. After reaching a certain elevation the surface will be given a gentle slope up to a ridge in the middle of the landfill allowing surface water runoff. The minimum slope shall be 1:20 to avoid future ponding of water on the top. Surface waters flowing towards the waste pile shall be diverted around the waste and thus, kept unpolluted. Once the whole volume has been completely filled up, a final cover will be applied according to valid regulations at that time.

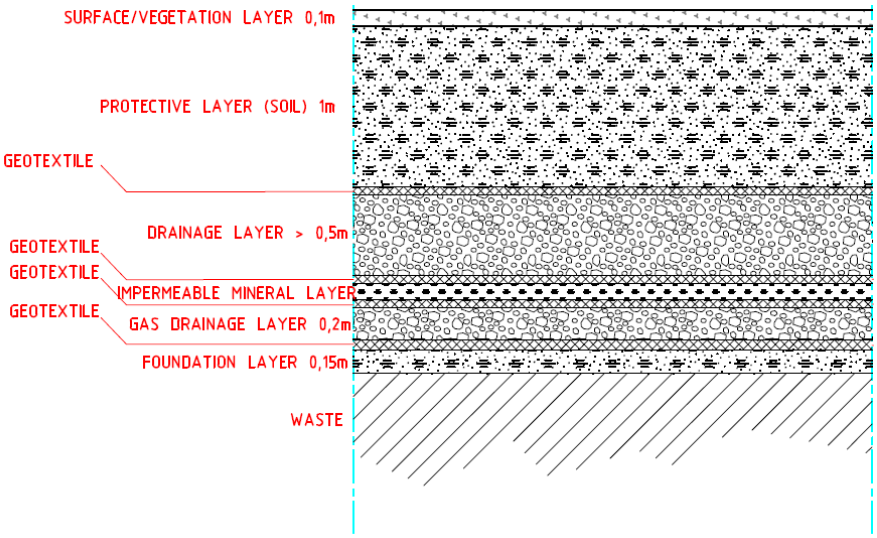



*Figure 32 Illustration of the final top cover*

## 8.7 Gas extraction from the landfill cells

An active landfill gas extraction system shall be installed at a proper time (3-5 years after start of operation) after full height has been reached in the active cell and an intermediate cover has been applied for the relevant part of the landfill, thus the risk for oxygen intrusion is avoided. The design of the gas system is in accordance with BAT and the operation of the system shall fulfill demands in gas safety regulations. The installation of the gas extraction system is a part of the Ajara Solid Waste Management (SWM) Project and investment budget.

The main components of the gas extraction system are (Figure 25, Principles for a gas extraction system):

- gas wells;
- gas collection pipes;
- gas regulation station;
- gas pumping station;
- condensate traps;
- gas motors;
- torch.

The basic concept is that perforated gas wells are installed into the waste pile after the corresponding area has been sealed with an impermeable intermediate cover. A sub-pressure to extract the gas will be arranged by blowing machines in the gas pumping station.

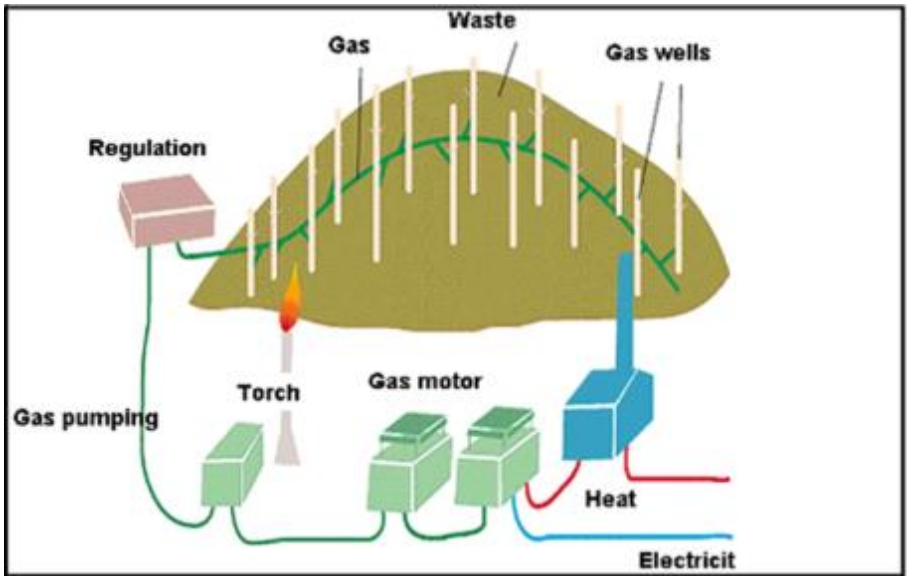



*Figure 33 Principles for a gas extraction system*

One alternative of gas elimination is the destruction of the landfill gas by incineration in an environmental-friendly torch allowing a high incineration temperature.

An additional concept commonly applied is to utilise the energy content in the gas for e.g. heating purposes or for industrial processes. For this project, it is proposed to convert the energy to electrical power by adding a gas motors to the system.

The Consultant has performed a calculation and assessment of gas potential and opportunities to extract landfill gas from Dyrnos dumpsite. The assessment has been carried out on the basis of the simulation program DeGas developed by the Consultant on advanced calculations of gas production in a landfill. The calculations are based in part on data collected over the waste composition, age, degradation conditions and landfill design.

DeGas calculates, based on annual statistics on waste composition and deposited quantities the landfill gas production at different times in a 100-year perspective. The program can be used to assess the current gas production in the landfill, and to make future projections. The result normally contributes to a greater understanding of the gas production in the landfill.

The key assumption in gas calculations is that the waste in the landfill is assumed to be homogeneous and porous. To obtain a value from the simulation as close to the true value as possible, the program takes into account that the waste consists of several fractions such as light weight, medium and slow degradable waste which is then weighed together.

By implementation of the data for Tsetskhlauri landfill, the total amount of landfill gas during the next 30 years, is estimated at more than 400 $Mm^3$. Based on experience from other landfills, a reasonable assumption is that around 70-80% can be collected by the gas extraction system and that would give a total volume of approximately 300 $Mm^3$ of landfill gas collected. To generate electricity, the gas must have a methane content of at least 40 percent, although the methane content in landfill gas is normally about 50 % or somewhat higher.

In average, this figure corresponds to an annual gas power of about 6 MW. When landfill gas is used for production of electricity and heat, approximately 1/3 of the fuel will be electricity and 2/3 will be heat. If a gas motor producing electricity is installed at the site, the corresponding potential electric power production with an average effect of 2 MW. The project includes installations that will allow for generated electricity to be used on the site, and also for excess electricity to be linked to the national grid[29].

An option for future improvement of the energy efficiency may be to arrange for the heat to be used for heating of buildings at the waste facility. The project currently does not include any such initiatives. .

Mitigation measures are presented in Chapter 8.1.1.

[29] As of yet, there is no no agreement in place with the grid operator or similar partner so as to allow for overproducetion of electricity to feed into the national grid. From a technical point, however, the installations will allow for such connection to be made.

## 8.8 Leachate Water

### 8.8.1 Leachate Types

As mentioned earlier in the report, leachate is generated through the percolation of rainwater through the waste and during the percolation the water gets polluted by contact with the solid waste layers. Generation of leachate is commonly reduced by covering the waste surface with suitable low-permeable material, both with daily cover, intermediate cover and eventually the final cover including an impermeable sealing layer will be applied.

Surface run-off on the waste pile is generated when the rainwater does not percolate into the waste, but just flows over the surface. The main part of this water does not get polluted, but a certain amount of surface water, which flows over uncovered waste, for instances waste temporarily stored at the sorting platform, can get polluted and will be treated together with the leachate.

The proposed leachate treatment will include the following flows:

- Leachate from the landfill;
- Surface run-off water, including polluted and non-polluted waters, from the sorting area[30].

All other non-polluted surface run-off is assumed to be collected and discharged separately through drainage system, thus will not reach the leachate treatment system.

### 8.8.2 Leachate Volumes

The design leachate flow values are estimated based on the design flow assumptions and given in Table 7, Leachate design flow rates.The rainfall on site is 3 000 mm/year, 325 mm/month (max month), and 80 mm/day (max day). Each cell will have a maximum surface area of 1 ha, assuming 12 cells. A new cell will be opened when the previous cell is about 75% full and partially covered.

*Table 13 Leachate design flow rates*

| **Average Design flow (1)** | **200 $m^3$/day** |
|---|---|
| Maximum Design flow (2) | 500 $m^3$/day |
| Maximum daily flow (3) | 1,200 $m^3$/day |

1. Assuming the average monthly rainfall over 18 days or a 13 mm/day rain event.
2. Assuming the maximum month rainfall over 10 days or a 32 mm/day rain event.
3. Assuming the annual maximum rainfall (statistical return of 63 of 100 years).

[30] The sorting area is described e.g. in Section 8.5. Activities at this area will initially include temporary storage and manual sorting, and later on a more advance sorting facility will be installed here. The permit procedure for the sorting facility will be handled separately by MoFE and is not part of this project.

### 8.8.3 Leachate Quality

The leachate from municipal solid waste (MSW) landfills contains dissolved organics (partly oxygen consuming, usually measured as BOD and COD), often high concentrations of nitrogen (mainly in the form of ammonium), rather high concentrations of chloride and of iron and manganese, but usually low concentrations of phosphorus and of heavy metals. The leachate may be toxic, due to the presence of ammonium-nitrogen ($NH_4$-N) and of heavy metals. The latter is usually not a big problem in leachate, while the ammonium content can be significant.

The composition of the leachate depends on the age of the landfill, particularly pH and the content of organic substances, with lower concentrations of organics and higher pH at higher age. The difference in leachate quality between a new and an old landfill depends on the different degradation phases of the organic waste.

The landfill will operate during a period of about 21-35 years (see section 8.6). During the first few years the waste can be considered as “new”; during the following years, the filling will gradually turn into an “old” landfill. This means that the leachate, during the main part of the operation period, will have properties corresponding to a mixture of a “new” and an “old” landfill. It is also expected that the leachate properties will change slowly during the whole operation period of the landfill.

As for the specific leachate composition at the new sanitary landfill site at Tsetskhlauri some considerations have been taken into account. By using the leachate composition based on empirical data the assumed leachate composition has been estimated. In Table 8 comprehensive data is presented.

*Table 14 Typical composition of leachates, from Swedish landfills; see further Annex 4.*

| Variable | Unit | Large landfill (old) | New landfill | Old landfills |
|---|---|---|---|---|
| pH | | 7.2 | 5 – 6 | 8 - 9 |
| Conductivity | mS/m | 543 | 50 – 1,400 | 50 – 1,400 |
| Alkalinity | mekv/l | n.a. | n.a. | n.a. |
| $Cl^-$ | mg/l | 920 | (5) -1,300 | 1,000- 6,000 |
| $BOD_7$ | mg/l | 27 | 150 – 2,000 | 10 - 800 |
| COD | mg/l | 480 | 1,000 – 30,000 | 500 – 4,000 |
| Total P | mg/l | 1.1 | < 24 | 0.1 – 4.0 |
| $NH_4$-N | mg/l | 240 | 150 - 560 | 80 - 370 |
| N-tot | mg/l | 330 | 800 | 100 - 400 |
| Suspended Solids | mg/l | 5 | n.a. | n.a. |

With respect to the leachate amounts and composition two different situations have been addressed, short term and long term. As a summary the short term and long term key pollutants entering a leachate treatment facility at the Tsetskhlauri, Ajara sanitary landfill are illustrated in three tables, see Annex 4.

This estimated leachate quality is based on experience data from other plants – i.e. they cannot be calculated. The values are assumed to occur when one or more cells are filled up. These values will be used for calculation of the design loads to the treatment plant. It should however be underlined that the presented values reflect a “young landfill”, operated only at a maximum of a couple of years, again further presented in Annex 4.

### 8.8.4 Leachate Collection

The leachate from the landfill will be collected in the drainage layer, 0.50 m thick, laid in the bottom of the landfill above the sealing layer. The bottom will have a slope following the natural slope of the terrain, thus flowing in a westerly direction. From the lowest point in the landfill bottom the leachate will be further transported in pipes to the equalisation pond, which is the first part of the leachate treatment unit described below.

### 8.8.5 Leachate Treatment

The leachate treatment of the sanitary landfill in Tsetskhlauri will be designed according to current principles for modern sanitary landfills and in compliance with the EU Landfill Directive (1999).

An assessment of the leachate treatment for the sanitary landfill in Tsetskhlauri is found in Annex 4 to this document. In the following the main issues are summarized:

The proposed treatment is a biological treatment, which has the main purpose of reducing the leachate’s content of organic matter. The treatment efficiency for BOD (biochemical oxygen demand) will be high, about 80 – 90 % or higher. The efficiency for COD

(chemical oxygen demand) will be more moderate, estimated at about 50 – 70 %, possibly towards 80 %. The efficiency for TOC (total organic carbon) is expected to be of the same order as for COD.

Sweco has evaluated three different biological treatment options presented in three reports:

- A compact advanced treatment model built on the SBR-techjnology (Sequencing Batch Reactor), presented in 2011;
- A “low technology” model based on a combination of natural pond system, whereof the first one was considered an anaerobic pond, followed by an aerobic pond and finally wetland system.
- The third one as presented in Annex 4 to this report is based on a so called Dual Power, Multi Cellular aerated lagoon system followed by a polishing step based on wetland system. This report is dated March 2014.

A comparison of these three systems has been done with the six different criteria and is presented in Annex 4. Based on these considerations the process recommended for Tsestkhlauri site is the Dual Power, Multi Cellular aerated lagoon system followed by a wetland for polishing, prior to discharge of the treated leachate.

The proposed process model is illustrated in Figure 26.

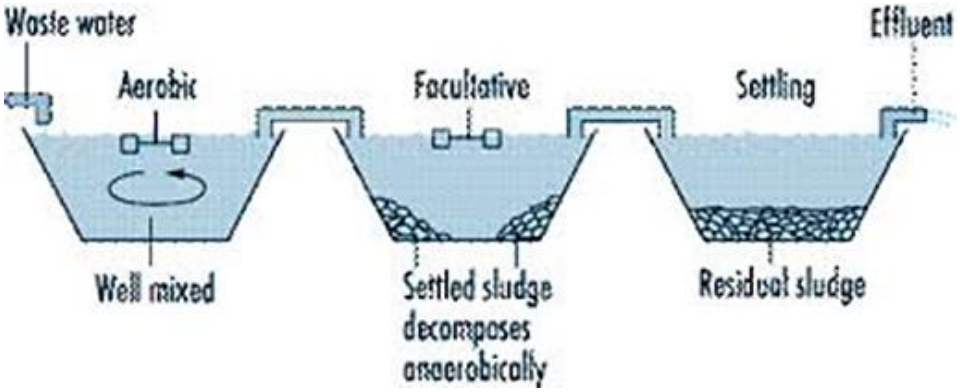



*Figure 34 Proposed process scheme for leachate treatment, based on a Dual Power, Multi Cellular aerated lagoon system for the Tsetskhlauri, Ajara Sanitary Landfil*
*In Figure 35 is shown as an example a typical aerated lagoon in operation.*

*Figure 35 View of an aerated lagoon with surface aerators installed for oxygen supply*

The following treatment results may be expected for the two phases; see Table 9 for the proposed system.

*Table 9 Estimated discharge quality in treated leachate from the Tsetskhlauri, Ajara Sanitary Landfill*

| Variable | Unit | Short term | Long term |
|---|---|---|---|
| Phase | | acidic | methane |
| Phase duration | Years | <2.0 | < 100 |
| Design flow | $m^3/d$ | 200 | 200 |
| $BOD_5$ | mg/l | < 5 | < 5 |
| COD [1)] | mg/l | < 120 | < 120 |
| N-tot | mg/l | < 15 | < 15 |
| $NH_4$-N | mg/l | < 2 | < 2 |
| P-tot | mg/l | < 0.4 | < 0.3 |

For the sampling of treated leachate the following conditions are suggested: the water sampling should be structured as follows; automatic sampling based on a timer should be taken at least once monthly during a 24 hour sampling time. The sample should be sent to an accredited laboratory for relevant analysis. Proposed analysis parameter to be performed on water from the landfill site at for the Tsetskhlauri, Ajara Sanitary Landfill is temperature, pH, alkalinity, conductivity, $BOD_5$,COD, TOC, SS, Ntot, NH4-N, Ptot, PO4-P, SO4, Cl, metals, Ca, Cr, Cu, Fe, Mn, Ni and Zn. Annual presentation should include maximum, mean, median and min values.

# 9 Disposal of the waste

The waste will be disposed in cells to minimise the open tipping face area at all times. In addition, exposure of organic material will be minimised and this will in turn reduce the amount of flies, birds, rats etc. Daily cover shall be applied to minimise wind-blown waste and odour to the surroundings. The source of soil material for daily cover is located north of the landfill, within the sanitary zone. The area disposes mainly with laterite clay and also chemically weathered old alluvial gravel soils.

Step by step as the placed waste reaches final height, an intermediate cover will be applied to allow diversion of the surface runoff and reduce the generation of leachate.

A gas extraction system shall be installed at a proper time after full height has been reached and an intermediate cover is applied for the relevant part of the landfill, thus the risk for oxygen intrusion is reduced. When the heating and electricity generation system is not in use, the gas will be flared off, to prevent the gas to be emitted to the atmosphere. However, as mentioned in previous chapters, an important part of this project is to utilise the energy in the gas for heating and electricity production, which it is assumed that there is a market for. The landfill gas extraction system will be installed in a progressive manner, following the tipping operation. When waste has been in place for 18-24month, it has reached anaerobic conditions, such that landill gas extraction is possible. It is therefore anticipated that the gas extraction system will be extended approximately every 2 years.

Each cell shall gradually be filled up to the planned final elevation. The final profile should be placed to a slope of maximum 1:3 (vertical : horizontal) to facilitate sufficient surface water run-off, to avoid erosion and to allow reasonable working conditions during operation as well as for applying the final cover during the closure of the site. The maximum slope is also adapted to reduce the risk for erosion and slips.

The maximum slope will be applied as high as possible to utilise the available volume at an optimum. After reaching a certain elevation the surface will be given a gentle slope up to a ridge in the middle of the landfill allowing surface water runoff. The minimum slope shall be 1:20.

Surface waters flowing towards the waste pile shall be diverted around the waste and thus, kept unpolluted.

Once a landfill  cell has been completely filled up a final capping will be applied according to valid regulations at that time and the EU requirements (EU Landfill Directive compliant). The final cover of the cells will be connected to each other so that the sealing layer is completely covering the whole landfill area.

The capping will be undertaken in a phased manner on a cell-by-cell basis as progressive tipping of the site continues. The final closure of the site will be described in a closure plan which forms part of the landfill management procedures (to be produced during the site construction and updated on a regular basis throughout the life of the site).

## 9.1 Hazardous Waste

There is one small incinerator handling infectious waste at the non-compliant landfill in Batumi and there is also a special vehicle for collection of such waste. The  incinerator may be relocated to Tsetskhlauri landfill site to the position as it is shown in the layout.

The operation of the incinerator would in such case be issued in a separate environmental permit handled by the Ministry of Environmental Protection of Ajara. The incinerator is not part of this project, although this project includes the preparation of an area where such an incinerator could possibly be located.

At the new Tsetskhlauri waste facility, if hazardous waste enters the site, it will be sorted out and stored at site until transported to a proper treatment facility outside the site. A ventilated 20-feet container with a lock for storage of hazardous waste will be available at the site. If there will be a greater need, there is room for several containers at the sorting area.

# 10 Potential Environmental Impacts and Mitigation Measures

The potential environmental impacts can be divided into two groups, i.e. Construction Phase and Operational Phase.

The main potential nuisances for the neighbourhood caused by a landfill are dust, odour and smoke from the site (in case of fire), birds, vermin, and rodents, littering, noises both from vehicles operating at the site and waste collection vehicles as well as aesthetic disturbances if the site is visible from the settlements.

The landfill location in Tsetskhlauri is assessed to be favourable for minimizing the potential risks and inconveniences for neighbouring residential areas both during the construction and operational phases. At the future landfill area there is two populated houses within the protection zone of 500 meters around the proposed landfill. Within the zone there is corn fields that is utilised by people living in the houses north of the landfill site.

The Consultant has prepared the general plan of the landfill considering that

- the emission of untreated leachate water into the surface water should be strictly avoided
- saving as much as possible of the hydro-geographic network
- keeping maximum possible distance to the Black Sea
- minimizing the flood risk

It should also be noted that the new sanitary landfill is urgently needed because the currently operated dumpsites are below all standards concerning the protection of human health and environment. Thus, their closures are mandatory.

## 10.1 Emissions to air

### 10.1.1 Dust

The problem with dust is connected to fine particulate impact and is generally associated with very fine waste types or very fine waste dust generated during the construction phase[31]. During the operation, dust can be a problem, especially during the warm summer period, during dry weather conditions. Typical examples of dust problems arising from the site are:

- vehicle movements
- plant operation
- building and construction work
- dusty loads

Dust has the potential to cause significant nuisance to people living close to the site and may pose a risk to the health of those working on the site, or visiting the site. The prevailing wind blows from the south west, i.e. from the sea side. Thus it is favourable condition for the residents in Kobuleti resort zone as well as for villagers in Ochkhamuri. Dust from the landfill could cause problem for people mainly in the village of Jikhanjuri. The staff working at the site is at main risk for explosion, and then for dust in higher concentrations.

**Mitigation measures**

The operational procedures and working plan will set out the requirements to minimize and control potential nuisance from dust. If a dust problem is noticed it must be immediately reported to the Site Manager or the next level of management if they are unavailable. The details of the time, date, wind speed and direction will be recorded in the site log and the Site Manager will then investigate the source of the problem and take appropriate action. Quantitative dust monitoring will be carried out in accordance with the approved dust monitoring scheme submitted in accordance with the planning consent/environmental permit. Details of all monitoring will be recorded in the site log. The site log book will be held of the life of the site. Complaints of dust from the landfill activities will be recorded in the site log with details of investigations, findings and any remedial measures taken if required. Details will be will be forwarded to the site manager.

All of the above can be avoided through good site management, use of specialist equipment and waste rejection if necessary. The Site Manager and all other employees must be vigilant and react to any new or unacceptably high dust levels at the site to prevent nuisance.

Where and when intensive earth works is carried out, the areas will be watered to eliminate the problem of dust. When it is needed, pre-treating of the dusty waste with water and spraying the active tipping area will be carried out. Other activities will be regular sweeping and spraying of surfaced site roads and seeding of capped surfaces as

[31] Final Draft BAT Guidance Note on Best Available Techniques for the Waste Sector: Landfill Activities, EPA, Ireland, 2011

soon as restoration layers are applied. Also speed limits for unpaved roads will be used to reduce the dust.

People living in the surroundings of the site will be informed by the ARA Government of the construction schedule.

**Significance of impacts**

The impact of dust during the construction phase is temporary and is deemed limited provided that mitigation measures are implemented. It is anticipated to be residual impacts from dust during operations at the site, however this is considered to be low.

### 10.1.2 Effect of waste transports and machinery

The effects of transportation are normally not a dominating environmental parameter in a waste management system, however, frequent truck transports may disturb the residents around the road during the construction and operation of the landfill.

Today around 25-30 rounds of transport vehicles dispose their waste at the Batumi and Kobuleti non-compliant landfills. In the future the amount of transports is estimated significantly to increase due to growing waste amounts.

The major part of the waste, approximately about 80 %, is transported by compacting vehicles, but also smaller vehicles are in operation. The transport fleet will in the future strive to be upgraded to serve the longer transportation distances from Batumi to Tsetskhlauri.

The number of waste transports will show hardly noticeable increase compared to the normal traffic load on the highway. Further, the access road from the highway junction to the landfill will not pass near any settlements.

Mud on roads from waste trucks may pose a potential damage to roads from truck movements.

**Mitigation measures**

Requirements for working machines emissions performance will be made in connection with the procurement of the construction works.

The access road to the site will be built from the high way to the new waste facility, and will be used for the construction period as well as during operation of the site.

Regular service and maintenance of vehicles, switching off the engines when the vehicles are not in use and minimising on-site vehicle movement will be important mitigation measures as well as marking of pedestrian/vehicle zones for traffic safety.

There shall be regular sweeping of surfaced site acces roads to prevent mud on roads to pose damage to the road from truck movements. At the paved area on site there will be a washing place for vehicles. The washing unit will be equipped with an oil trap.

There shall be regular inspections of internal and external roads.

**Significance of impacts**

Transport to and from the waste facility via the highway is expected to have a minor impact to the ambient air compared with the normal traffic load on the highway. It is expected to be impacts from transport at the site both during the construction phase and during operation. However if mitigation measures are implemented, these are considered to be low.

### 10.1.3 Landfill gas

Landfilling of organic, or partly organic waste, always results in anaerobic degradation of the waste and consequently a production of landfill gas, consisting mainly of methane and carbon dioxide. If not properly managed the gas can cause odour problems in the neighbourhood and since landfill gas is a highly potent green house gas it will also contribute to the increased level of greenhouse gases in the atmosphere. Landfill gas may also increase the risk of fires or explosions at the landfill site and surroundings.

The landfill will generate landfill gas production starting some few months after first disposal of waste and during the whole active lifetime as well as during a long period after landfilling has ended. The whole period of landfill gas generation from the site can be estimated to about 70 years or even longer.

**Mitigation measures**

To reduce the green house gas emissions and to be able to use the energy in the gas, a landfill gas extraction system will be installed within 3-5 years after the landfill operation has started. As mentioned in previos chapters the design of the gas system is in accordance with BAT and the operation of the system shall fulfill demands in gas safety regulations. The installation of the gas extraction system is a part of the Ajara Solid Waste Management (SWM) Project and investment budget. The gas extraction system will collect approximately 70-80% of the produced gas during the time the system is in operation. The gas will be utilized for production of electricity and heat. During periods when there is no utilization of the gas, it will be flared in an efficient environmental flare at the site.

The gas extraction system will prevent landfill gas to migrate through the ground in both gaseous and dissolved state and to prevent emissions to the atmosphere. Because of the pressure created in the landfill, there will be a reduction in the risk of fires or explosions due to gas migrating in to holes or caves within the landfill. Risk of odour will also be decreased after installation of the gas system.

There will at all times be a gas safety manager on duty at the site, responsible for the gas extraction system including safety measures. Handled properly, the landfill gas production and utilisation shall be viewed as a minor impact, but to following safety regulations and adherent permit regulations is of outmost importance as well as competent and well educated staff.

**Significance of impacts**

Provided that safety measures as well as complimentary mitigation measures are undertaken no significant impacts on the local environment from the gas extraction system is expected.

### 10.1.4 Smog from fires

An emission source is smoke caused by occasional fires at the landfill, if the waste is not handled properly and without daily cover. Aerosols may also be emitted and wind-blown.

**Mitigation measures**

The site will be equipped with an emergency tipping area to allow hot loads or loads that are suspected to be on fire to be inspected and dealt with in an appropriate manner before they are landfilled.

Through correct management and daily covering of the active cell, the risk of fires will be reduced as well as potential distribution of aerosols. An important operational measure is also to ensure that there are no ignition sources on the site in close proximity to combustible material.

Installation of the gas extraction system will reduce the risk of fires.

If there is a fire in the waste on the tipping face it is important to implement measures to prevent the fire to spreading to the body of the waste e.g to use inert materials, wetting the waste and dig trenches.

It is also important to ensure that there is appropriate fire fighting equipment on site to reduce the risk of people being injured and property being destroyed. Eqiupment shall be fire- and explosion protected in parts of the facility due to landfill gas safety measures. The municipal fire brigade will be informed about the responsible safety organisation, the layout of the facility and gas extraction system design.

If not handled properly this may cause a major impact and health and safety risk.

**Significance of impacts**

Provided that mitigation measures are undertaken, no significant impacts on the local environment from smog from fires is expected.

### 10.1.5 Odour

The prevailing wind blows from the south west, i.e. from the sea side. Thus it is favourable condition for the residents in Kobuleti resort zone as well for villagers in Ochkhamuri. But smell from the landfill could cause problem for people mainly in the village of Jikhanjuri.

Odour may be a significant problem for the people working in the landfill area and people living in the surroundings of the site.

The main source of odour at the site is from the handling of the waste when it is unloaded from the waste trucks at the sorting area or in the landfill cell. There might also be odour from the degradation of the organic waste (landfill gas) mainly from produced hydrogen sulphide and in rare occasions odour from the leachate ponds. Odour may also be caused by smoke from fires at the landfill, although properly managed there shall not be fires at the site.

The main wind direction is south western, which is in the direction from the landfill towards the small settlement just outside the 500 m sanitary zone. Larger settlements are located to the south (Tsetskhlauri, approximately 1 km), and south west (Ochkamuri,

approximately 1,5 km). The small settlement north west of the landfill, and hence in the main wind direction, may be impacted from smell.

**Mitigation measures**

The details of the time, date, wind speed and direction of the odour will be recorded in the site log. The Site Manager will investigate the source of the problem and take appropriate action. All details of inspection, results and any action taken will be recorded in the site log.

To reduce smell from the landfill, proper management and operation including daily cover including in the same time minimisation of open tipping face area are the most important measures. Complaints should be logged in the site log and receive prompt attention/ action. Monitoring will seek to establish links between odour at the site, complaints from workers and/or citizens, climatic conditions and the receipt of malodorous wastes.

The minimisation of odours spreading to the surroundings is crucial for the social acceptance of the landfill. The combined effect of the mitigating measures described above, leachate collection and treatment, gas extraction and regular covering of the waste surfaces is the most efficient method to reduce the odour to a minimum. The odour from leachate ponds will be minimized with the proposed technical solution and operation of leachate treatment, see Annex 4 for details.

With respect to the risk of odours from the discharge leachate the following should be stated:
1) Especially from “fresh” leachate, i.e. during the first years of landfill operation there will be a substantial risk for odours from leachates emanating directly from the landfill site. The reason for this is linked to the fact that a considerable amount of easily degradable matters are found in the leachate. An anaerobic decomposition of these matters may cause emissions of sulphur compounds, (mercaptanes and hydrogen sulphide). Furthermore, the presence of VFA (Volitale Fatty Acids) represents a well-known and disturbing odour factor;

2) The adequate and efficient mitigation to solve this potential problem is to safeguard a biological oxidation of the leachate. This is in this case secured in a first step aerated lagoon, with “complete” aeration device that brings the organic content down to very low levels, and also oxidise the ammonia nitrogen into nitrates.

**Significance of impacts**

The impact of odour is expected to be limited provided that the mitigation measures are followed during waste handling and landfill operations. If not, there is a risk that odour may cause a moderate negative impact for the population located north of the waste facility.

## 10.2 Noise

A potential nuisance is noise from construction as well as normal operation of the landfill (mainly from vehicles when compacting and covering waste) and transports of waste to the landfill. Noise can also come from building and construction work at the site, reversing alarms, pumps and electrical equipment.

The topography is favourable to minimise noise to the surroundings. The distance to nearby residential areas is also satisfactory as the nearest houses are located at a distance exceeding 500 m from the new landfill site.

**Mitigation measures**

The details of the time, date, wind speed and direction of the noise will be recorded in the site log. The Site Manager will investigate the source of the problem and take appropriate action. All details of inspection, results and any action taken will be recorded in the site log.

All of the sources of noise mentioned can be avoided through good site management, selection of appropriate plant and equipment, regular maintenance of equipment, bunds and positioning of equipment.

All equipment must meet all legislation and statutory guidance on noise levels both from a health and safety perspective and from an environmental nuisance view.

The impact from noise from construction vehicles (construction phase), landfill operation and transport of waste to the site (operational phase) will be mitigated by regulating the working hours of the landfill to normal working hours.

Noise at the nearby settlements will also be minimized by only allowing traffic to the landfill on the designated access road, which will pass well outside the settlements. All waste trucks shall be covered to prevent exposure to the air.

There is an existing, natural elevation north of the site which will form a natural sound barrier to the closest village.

**Significance of impacts**

The area south of the waste facility is not particularly sensitive to noise since it consists of cultivated land. However, noise may have a negative impact for the population situated north of the plant. If the current limits for noise are observed and specified precautions are followed, the impact is expected to be limited for both humans and animals.

## 10.3 Birds, vermin and insects

Birds, vermin and insects may cause a nuiscence to workers and people living close to the site.

**Mitigation measures**

As for dust, odour and noice, the details of the time, date, wind speed and direction of the distrurbance of birds, vermins, insects and rodents will be recorded in the site log. The Site Manager will investigate the source of the problem and take appropriate action. All details of inspection, results and any action taken will be recorded in the site log.

Assessment of bird scaring techniques will be implemented when species likely to be affected is specified based on experience from the site. Measures will be implemented and also for this nuisance, daily cover and control of disposed organic waste is important.

Care shall be taken to ensure that the use of insecticides does not cause environmental pollution to water, soil or air. Flora and fauna shall be protected.

Flies, vermin, insects and rodents will likely be attracted to the organic waste, why the site operator shall be aware of when the waste will be delivered and plan the site operations accordingly including prompt covering.

**Significance of impacts**

Provided that mitigation measures are undertaken, no significant impacts from birds, vermin or insects are expected.

## 10.4 Emissions to surface water

Emission of pollutants into the surface waters is not expected during the construction phase. However, there is a risk for leakage of petrol, oil and greases from working machines, which should be mitigated through regular control and maintenance of the equipment.

During operation surface water is collected at the site in three main areas:

- Paved sorting and recycling area
- Other hard surfaces (roofs, roads and pavements)
- Landscaped and natural areas.

At the ground surface of the storage area asphalt will be applied and at the sorting section with a roof concrete will be applied which will be non permeable. The purpose of the roof is that handling of temporary storage of hazardous waste or specific sorting activities will take place under it, that will protect the waste from rain. That will in turn minimize contaminated storm water from the area. Surface water from the sorting area, both asphalted and of concrete, will pass an oil trap before entering to the leachate treatment system. Materials and equipment for removing spills will be available at the site during the construction as well as operational phase. Drainage from all paved areas liable to contamination from waste shall be connected to the wastewater system.

Surface water flows from hard surfaces like roofs, site roads and pavements shall be discharged to open water courses. Surface water from landscaped and natural areas will infiltrate into the ground, overland flow will be discharged to open water courses.

Machines an equipment will be repaired and maintained in the workshop. In connection to the workshop there is a place for washing of working machines. An oiltrap will be installed at the workshop to minimize emissions to surface and groundwater.

**Mitigation measures**

The above mentioned handling and treatment will efficiently protect surface and groundwaters from pollution. The environmental permit requirements may influence the choice of mitigation measures implemented. Handled in the right manner, this shall be a minor impact, since demands on parameters and treatment methods are very strict.

**Significance of impacts**

Provided that mitigation measures are undertaken, no significant impacts on the local environment from surface waters is expected.

## 10.5 Emissions to soil and groundwater

### 10.5.1 Impacts on Soil

The main impact on soils that can be anticipated at the site is erosion. Erosion may occur both during the construction and operation of the landfill because the vegetated soil surface will be removed i.e. the reproduction of natural vegetation cover will be slowed.

The whole Georgian territory is located in an area with occasional seismic activities up to grade 8-9 earthquake intensity zone. The project site is located in seismic zone IV (Modified Mercalli Scale) in turn the design of the size and profile of the landfill cells will take into account the seismic risks. However, it should be noted that the landfill itself is regarded less sensitive to seismic activities compared to more complex infrastructure for example buildings.

**Mitigation measures**

Mitigation of these impacts can be achieved if the soil stockpiles are not constructed with steep slopes and if placed with sufficient distance from drainage collectors and channels. Areas where soil is taken should also be considered and steep slopes shall be avoided. The landfill area should be created in a way that being able to prevent the development of erosion pathways rivulets/gullies. Re-plantation of vegetation should be performed as soon as possible.

The path of the trucks can facilitate erosion therefore their movement on the area should be limited as much as possible to the stabilized roads.

**Significance of impacts**

Provided that mitigation measures are undertaken, no significant impacts on the local environment from erosion is expected.

### 10.5.2 Hydrogeology

Important observation was made during the field survey that the ground water levels were not constant but are seasonally varying and also depends on the climate cycles. The ground water levels were close to the surface in the plain areas of the landfill site. The groundwater depth varied between 0.22-1.5 m in those parts of the territory where the land surface elevation is below 30 m above the see level (asl). The ground water level became deeper in the higher zones of the landfill area, below 5 m depth.

There were inserted water lenses found during the site drillings, however, there were isolated because the soils had very low filtration capacity. Both the vertical and horizontal water movement is very limited.

The Tsetskhlauri Plain is not a groundwater recharge / discharge area. There is no shallow or intermediate aquifer under the Plain, thus, the landfill is not going to impact the groundwater recourses.

The landfill bottom construction consist of an impermeable sealing layer of natural clay, stone powder, bentonite and HDPE liner below a drainage layer for collection of leachate. The construction is in accordance with the Landfill directive and BAT for a landfill for non-

hazardous waste. This type of bottom construction will minimise the contamination risk of groundwater and soil layers underneath the landfill.

Dominating pollutants in the leachate from the landfill will be organic matter, partly oxygen consuming (measured as BOD and COD) and nitrogen in the form of ammonium. The ammonium content may give the impacts of oxygen consumption, as well as toxicity to water-living organisms.

**Mitigation measures**

Leakage of polluted leachate water to the ground and to the groundwater will be minimized due to the advanced bottom construction, meeting the requirements in the EC directive for landfills of non-hazardous waste. Since the site have high groundwater level and may lack a natural geological barrier in some places, an artificial geological barrier will be appliled as well as a bottom sealing as required under the EU Landfill Directive. The geological barrier will prevent leachate from reaching the ground water in the long time perspective, while the demand of the bottom sealing is to function during the active phase of the landfill. A drainage layer will be applied on top of the liner to collect the leachate for further treatment.

To mitigate any significant impacts the leachate will be collected and treated to meet required standards before discharged to the recipient. The suggested treatment is an aerobic biological treatment, with the purpose of efficient reduction of the leachate's content of oxygen consuming and other organic substances, as well as oxidation of the ammonium to nitrate-nitrogen. Thus, also the toxic effect will be reduced or virtually eliminated.

The site specific parameters for the effluent from the leachate treatment as well as further details on the treatment is given in Table 9, Chapter 6 and Annex 4. The environmental permit requirements is of course of outmost importance, and may influence the choice of mitigation measures implemented. Handled in the right manner this shall be a minor impact, since demands on parameters and treatment methods are very strict.

**Significance of impacts**

No influence on the groundwater quality is expected if the bottom construction and leachate treatment is applied properly. Supervision and control of the construction works is mandatory. The groundwater quality will be monitored by the installation of monitoring wells for sampling of groundwater at suitable positions around the landfill. Provided that mitigation measures are undertaken, no significant impacts on the ground water is expected during construction or operations.

### 10.5.3 Hydrology and flood risk

The site is traversed by a small nameless stream that flows from south-east to north-west in a meandering river bed and in a few kilometres in the north joins the River Choloki. The bottom of the stream bed is of easily eroding clay and loamy soils. There are some signs of fresh erosion, although this process is not too progressive. It is not likely to develop into essential erosive expansion. The depth of water in usual condition is 20-40 cm, in case of droughts of one month duration, the level decreases to 10 cm.

The stream shall be redirected from the landfill area and will be protected by embankments and the bottom construction against the leachate waters from the landfill.

The leachate water from the landfill will be handled in a system of sufficient capacity to handle the produced volume. Therefore, there will be no risk of flooding of leachate at the landfill. The high density of the ditches in the area indicates on low permeability of the soil because they efficiently lead away the excess waters from the land surface. The low permeability of the soil was also indicated by the number of ponds in many spots after rainy periods. The drainage system around the landfill shall be constructed to avoid the waterlogging.

There were no historical hydrological observations available to assess regarding the risk of flooding at the site. Therefore the Consultants interviewed the local people whether they experienced flooding in the past. As it was remembered, there has only been one occasion in the 1990-ies. After a long and intensive rainstorm some of the lowest parts of the plain were flooded for a short period. The low risk of floods may be confirmed by the fact that an animal farm with a large number of buildings and facilities were constructed here in the past.

**Mitigation measures**

The cell bottom will be constructed above the ground level and the cells will be protected by embankments and those will protect the landfill area from floods. On the other hand, systems as the leachate and storm water collection systems and the embankments will prevent polluted waters to leave the landfill area and pollute the surrounding surface waters.

**Significance of impacts**

Provided that mitigation measures are undertaken, there shall be no significant risk of flooding and therefore the impacts on the surroundings is expected to be low.

## 10.6 Effects on natural reserves and cultural heritage

The proposed location of the landfill is not affecting any protected, natural reserves. The proposed location of the landfill has no historical assets or buildings, according to the archaeological survey made within the current project.

**Significance of impacts**

No significant impacts on the local environment is expected.

## 10.7 Visual impacts

The visual impact on the villages of Jikhanjuri and Tsetskhlauri is not significant because of the hilly relief and some existing alleys are preventing the insight.

The relief is flat on the other side stretching from the landfill to the highway / railway line and to village Ochkhamuri but the distance is close to 2 km. Therefore the visual disturbance is not going to be significant for neither villagers or for the people travelling on the highway / railway.

**Mitigation measures**

A concrete wall of approximately 3 meters hight will be built around the landfill and planted hedges will further prevent insight. A natural forest will be planted north of the site to prevent a negative visual impact for the people living close to the site. The total area of

the planted forest will be approximately 8 hectares, of which half of the area will be outside the border of the landfill (i.e. outside the concrete wall).

**Significance of impacts**

Provided that mitigation measures are undertaken, no significant impacts on the visual impacts is expected.

*Figure 36 The view on the highway / railway line*

## 10.8 Littering

Litter causes a negative visual impact to many people, and may cause significant nuisance to people in the neighbourhood. An efficient litter control shall be proactive and can greatly reduce the escape of litter. It is important to notice that littering may cause problem in the daily work and can cause harm to the surrounding nature. But it is also an important factor in creating a facility that may be an important site to study visits, school educational programmes etc. This factor will strongly influence the impression one gets when visiting the site.

Littering from wind-blown light wastes like papers and plastics may occur, especially after strong winds. Since south west is the predominated wind direction, there is a risk that waste could reach the nearby villages of Tsetskhlauri and Jikhanjuri.

**Mitigation measures**

Littering will be mitigated through by proper management and by the daily covering of the landfill. Daily inspections and waste picking shall be implemented. Around the sorting area, a net will be installed between the roof and the ground level. The wall around the landfill will also reduce the littering of surrounding areas by windblown e.g. plastic bags. However, waste that has been spread around should be regularly collected.

**Significance of impacts**

It is anticipated to be impacts from littering from operations at the site and from transports to/from the site, however this is considered to be low.

## 10.9 Environmental Health Risks and Safety

There are health and safety risks connected with the waste facility for the workers/visitors at the site and for the population living in the vicinity of the site.

Health risks for the workers at the landfill site are normally associated with exposure to sharp, infected or toxic material at the site, contact with leachate and emissions of hazardous smoke from fires.

Other risks are the hazards for explosions and fires caused by improper management of the landfill gas. Risk for suffocation in manholes or deep excavations in the waste body is evident whenever there is a risk for landfill gas to enter.

One important risk factor is the handling of sorting and storing of hazardous waste. The waste facility is a site that accepts non-hazardous waste. However, there is always a risk that a truck enters the site with wastes containing hazardous waste. There will be a possibility to at the sorting area, under roof on concrete ground, handle, sort out and store the hazardous waste in a lockable container before transport to a treatment facility.

Vehicle movements are a risk factor for incidents in the daily work; both waste trucks as well as heavy machines will be in traffic within the site.

The number of employees will be around 15 such as management, machine operators, mechanics, guards, administration and sorting personal.

**Mitigation measures**

An Environmental Health and Safety Plan including health and safety measures to avoid accidents and injuries during work at the landfill will be developed. An EHS training programme will be performed before the operations start at the site and continuously when new staff is employed which means that all staff shall be informed about safety regulations. The training programme will include seminars and workshops to discuss risk assessment and understanding of the working situation at site.

Safety regulations shall be prepared by the Site Manager and especially focus on risks associated with handling of hazardous waste, the gas extraction system (Gas Safety Manager responsible) besides more common safety aspects on clothing, sanitary aspects, traffic etc. Handling of hazardous waste demands trained staff as chemists to be able to determine the type of waste and treatment necessary. The safe handling of hazardous waste will be the responsibility of the Site Manager.

Monitoring and reporting arrangements will be established for the EHS plan.

The personnel working with waste handling at the landfill or at the sorting area shall be equipped with proper protection gears such as cut resistant and high visibility protective clothing, gloves, safety boots, respiratory face masks, noise protection for workers near loud equipment, for workers near heavy mobile equipment also provision of hard hats and communication tools e.g. mobile telephone.

In all areas where necessary there will be easy to reach First Aid including eye wash. Immediate medical care will be provided in case of injuries and accidents.

All labour working at the site shall be properly vaccinated. All personnel shall have access to regular health examinations.

Proper covering of the landfill in combination with extraction of landfill gas are proven as effective measures to prevent fires. Regular (daily, intermediate and final) cover will reduce the risks for fire and odour spreading to atmosphere.

Gas safety measures shall be followed at all times at the site. Gas alarm/warning equipment in necessary conditions shall be used with test before entering into any area/pit, which is suspected to be dangerous. If risk for explosion is indicated the work place will be evacuated. Workers shall minimize direct exposure to exhaust pipes.

The area will be fenced and trespassing prevented. There will be restrict access of people to the landfill cell during landfilling operations.

Traffic routes will be planned and designed in order to minimize crossing traffic. Codes for communication between drivers and loaders or other workers shall be defined.

Incidents involving vehicles will be reduced by eliminating or keeping reversing manoeuvres to a minimum and adopting safe procedures including the correct use of warning lights, visible reversing lights, mirrors and audible reversing alarms on collection vehicles.

**Significance of impacts**

The identified health and safety risks from the construction phase and from the daily operation are expected to be acceptable both for workers/visitors at the site and for people living in the vicinity of the site, provided that the presented mitigation measures are undertaken.

## 10.10 Landfill stability and settlement

A risk when constructing a landfill is stability and settlement issues. The stability is an important factor in the whole lifespan of the landfill as well as for embankments of the leachate ponds, from construction of site base including liner system, slopes, embankments and bunds as well as the cover (landfill).

**Mitigation measures**

There will be measures to ensure landfill stability and avoid risk for erosion. Important factors that will be taken into consideration is design of slopes and geotechnical properties of the material chosen for construction of embakments, bunds, intermediate covers and final cover.

The daily landfill operations shall follow the working procedures to avoid e.g. uncontrolled landfilling without compaction or proper handling.

Settlements shall be regularly measured and reported in the monitoring programme/ annual report to authorities depending on requirements in the permit.

**Significance of impacts**

Provided that mitigation measures are undertaken, no significant impacts on the landfill stability or settlement are expected.

## 10.11 Extraction of cover material

A very important mitigation measure to prevent negative impacts from the landfill operation is to apply a daily and intermediate cover of the active landfill cell. Naturally, that implies that access to such material must be available, and of course this could form a large risk and impact if there is no such access to those materials.

**Mitigation measures**

An assessment and calculation has been carried out by the consultant of the existing quarry of soil of clay/moraine character that is located north of the landfill. The performed mass balance show that the quarry will last for both levelling of the site, embankments and bunds of the landfill as for daily cover for the planned landfill cells. If the landfill is extended, it must be included in the operations to find local quarries of cover material for a substancial period of time ahead. In the closure plan of the landfill, there shall be a calculation of the volumes of materials needed for the construction of the final cover.

**Significance of impacts**

Provided that mitigation measures are undertaken, no significant impacts on extraction of cover material is expected.

## 10.12 Closing of the landfill/after care

Final closure and after care of the site will be described in the Closure Plan for the landfill. In the closure plan, the design of the final cover will be described, as well as after care criterias. In the monitoring programme, there shall be working procedures for self-monitoring for e.g. settlement measurement, vegetation growth and monitoring of surface water run-off of areas with final cover.

**Mitigation measures**

The closure plan shall show that potential environmental effects and risks are minimized based on the design and monitoring of the closed areas.

Sufficient financial resources must be allocated for the closing of the landfill including a final cover that meets the requirements of the regulations. The provisions shall according to the Landfill directive cover a period of at least 30 years. In the BAT guidance,

recommendations for facilities with landfills of organic waste (leachate and gasforming waste) is 50 years[32].

**Significance of impacts**

A major risk is that there will be a lack of sufficient financial provision to cover the cost of closure and aftercare.

[32] Final Draft BAT Guidance Note on Best Available Techniques for the Waste Sector: Landfill Activities, EPA, Ireland, 2011

## 10.13 Cumulative impacts

The project activities will result in a number of separate impacts. The impacts are expected to have different significance. In some cases, the impacts may also be inter-dependent, so that a reduced impact in one area may result in increased impact regarding another aspect. An example could be the closure of the current landfills, which is expected to result in reduced negative environmental impact locally, and at the same time may cause economical constraints on the people currently working on the sites, sorting and picking waste fractions that can be sold.

Indirect impacts are impacts that are not directly linked to the projects, but could be expected as a result of the project. Estimating indirect and/or cumulative impacts is difficult and often includes uncertainties. However, analyzing potential cumulative impacts is important, and may help minimizing the risk of unwanted or unexpected negative impacts from the project.

**Potential indirect and/or cumulative impacts of the project include:**

- Installation of more advanced sorting facility at the new landfill site. Such a sorting facility is expected to result in increased the rate of reuse and/or recycling of material, and even further reduced risks of hazardous waste being deposited at the landfill. It may also contribute to an extended life span of the landfill, as increased sorting may reduce the amounts of waste to be disposed at the site.
- Installation of an incinerator for medical waste. The installation of such incinerator is expected to result in new waste streams containing medical waste (most probably classified as hazardous waste according to the EU Directive[33]) being transported to the site and handled at the site. This would require revised operational procedures and education of involved staff to ensure occupational health and safety, as well as the health and safety of men and women living or working in the vicinity of the site. Measures should be undertaken to minimize impacts such as emissions, odour or noise.
- Increased trust in local institutions and taxation systems. If the inhabitants of Ajara experience an improved waste handing procedure and increased environmental and social responsibility from the project owner/MoFE/Hygiena Ltd., it may result in increased trust in the public institutions. Increased trust may impact on aspects such as willingness to pay taxes or voter turnout in elections.

# 11 Potential Social Impacts

## 11.1 Risk management with regards to institutional set-up of Hygiena Ltd

There is a need for a well functioning Hygiena Ltd to fulfill work in relation to a range of areas associated with social risk management:

- Closure of the Batumi landfill
- Closure of the Kobuleti landfill

[33] Directive 2008/98/EC of 19 November 2008 on waste

- Closure of the Kobuletii OLD landfill
- Operation of Tsetskhlauri landfill

**Mitigation measures**

In order for the company to be able to act as PIU, the following requirements are needed, that are not foreseen in the documents shared so far:

- Capacity to manage large scale contracts, within both technical and on-technical areas, which includes knowledge and understanding of resettlement and economic displacement issues in relation to closeure of landfills. (PR 1 and 5)
- Capacity to manage operations in a modern and performance based manner (entails clear recruitment procedures, policies and planning for equal opportunities and anti-discrimination, internal grievance mechanism for workers (PR 2)
- Human resources (HR) capacity to to e.g. recruit and promote from an equal opportunity perspective and to be able to develop and implement policies within equal opportunities and anti-discrimination and ensure workers' rights at all levels) (PR 2)
- Capacity to ensure operations are safe for workers and for community (entails OHS policy, emergency preparedness and planning (PR 2 and PR 4)
- Capacity to ensure operations is carried out in such a way that waste pickers are not settling on or near by the new landfill (this entails internal and organised capacity to sort waste at the landfill) (PR 5)
- Has basic knowledge and train staff in cultural heritage and chance finds (for construction phase of Tsetskhlauri and closrure of existing landfills) (PR8)
- Capacity to meet customer expectations (entails grievance mechanism for customers) (PR 10)

One suggestion in the organisational chart has been the mentioning of waste pickers as 'authorised, but not employed' group. One could read this as a plan to invite waste pickers to work on the Tsetskhlauri landfill, without taking a responsibility as an employer. Waste pickers should be avoided from the on-set, by having a well functioning landfill operator who can provide formal employment opportunities. Workers right should at all times be respected and guaranteed.

Mitigation measure are further explored in the ESAP and the SEP annexed to this report.

**Significance of impacts**

Provided that mitigation measures are taken, Hygiena Ltd. can become a well functioning company that fulfill the EBRD PRs 1, 2, 3, 4, 5, 6, 8 and 10.

## 11.2 Community health and safety

Diseases are currently observed and reported that potentially are waste related, such as hepatitis A and Acute Enteric Infections (these could also stem from water). Parasites are also observed. Statistics are not currently disaggregated according to sex and age.

Potential impact on closure of Batumi and Kobuleti landfills is generally assessed as positive, especially since the diseases that these landfills spread could be potentially affecting vulnerable groups such as children, pregnant and elderly persons tend to be

more affected by waste (and water) related diseases. Women tend to be care takers of sick people and consequently, less time having to be spent on caring for sick could be a potential positive impact as well.

**Potential impact at Testskhlauri**

Potentially negative health and safety impacts at the Tsetskhlauri landfill are not adequately handled as environmental and social aspects are not taken into account.

**Mitigation measures**

Health and safety precaution at Hygiena Ltd landfill is required. These include health and safety measurements at closure of existing landfills as well as for the Tsetskhlauri landfill. please also refer to the ESAP.

Monitoring of community health and safety responsibiity must be clarified. The Consultant here proposes that the monitoring is carried out by the municipality on a predefined set of criteria (e.g. diseases and parasites related to waste), reports directly to the Ministry of Health and the Ministry of Finance and Economy of Ajara, informing and providing recommendations/orders to handling at Hygiena Ltd.

## 11.3 Land acquisition resulting in resettlement

### 11.3.1 Tsestskhlauri

The area of the Tsetskhlauri Plain including the landfill location is owned by the state but land shares are recorded under different land cadastre codes. Based on the decision of the ARA Government, the landfill area has been unified and set for new landfill in the Land Cadastre.

The resettlement zone is not limited to the physical boundaries of the landfill, but covers the zone of total sanitary protection. The sanitary protection zone is the area, which is under potential negative impact of the landfill and creates potential health hazards to the local residents. Existence of houses and land tenure for agricultural purposes within the sanitary protection zone around the landfill is inadmissible. In accordance with Georgian legislation[34], the boundaries of the sanitary protection zone shall be set at 500 m around the landfill in accordance with the above mentioned resolutions.

According to the cadastral information and the preliminary surveys of the object available on the territory of the landfill and in the zone of the sanitary protection, 2 registered private plots have been identified, one with one residential house and the other with two houses, within the 500 m bound of the sanitary zone. Accordingly, purchasing of these two private plots and the physical resettlement of the 2 families living hee will be inevitable for implementation of the project.

A total of 7 private real estates have been identified within the zone of the sanitary protection. However, the 4 dwelling houses located on these estates are located outside

[34] Order #36 of the Ministry of Labor, Health and Social Affairs of Georgia, “On Approval of Sanitary Rules and Norms of Arrangement and Operation of Polygons of Solid Household Wastes”, February 24, 2003

the sanitary zone. The owners whose plots are located within the sanitary zone but outside the landfill polygon, who have no houses in the abovementioned sanitary zone, are potentially limited in implementing the entrepreneurial activity on the abovementioned plots.

Please refer to the Resettlement Action Plan for further details.

**Mitigation measures**

Clarify in a census exactly who is affected, how they are affected so as to determine what kind of compensation is acquired.

A Stakeholder Engagement Plan should be part of mitigating social disquite, but the work foremost lies in the roling out of and implementation of the R/LRF under development and the RAP (to be developed).

**Significance of impact**

If a R/LRF/RAP and SEP is implemented according to best international practices, and Hygiena Ltd works in accordance with the recommendations to fulfill EBRDs PR, the project can have positive impacts on waste pickers and affected population in existing landfills and the new to be established.

### 11.3.2 Batumi

The Batumi landfill have dwellings/shelters that are in potential risk of being destroyed when coverage of the landfill will be carried out. This includes two shelters at the South part of the landfill as well as approximately 9 shelters at the center of the Northern part of the landfill.

There is a potential risk that some of the waste pickers living in the shelters permanently will move to the new landfill area.

**Mitigation measures**

Clarify in a census exactly who is affected, how they are affected and what kind of compensation is potentially needed and how it will be provided. Health and safety assessment/mitigations measures will include waste pickers. Explore alternative incomes and housing. Please refer to R/LRF/RAP.

For the people farming on the Southern part of the landfill or grasing cattle, dicuss how to cover the old landfill.

**Significance of impact**

The project will cause some people living permanently on the landfill to lose their homes. Since the majority of these shelters are habituated by waste pickers, the waste pickers will consequently lose their incomes. Various forms of compensation is required, such as alternative ways of incomes.

Positive impacts are expected for people farming on the Southern part of the Batumi landfill, depending on how the old landfill will be closed and covered.

## 11.4 Informal waste pickers

At the site, there is, as mentioned in Chapter 3, minimum 30 and maximum 70 waste pickers that sort out waste piles at Batumi landfill and about 10-15 people at the temporary landfill in Kobuleti. The waste pickers are predominantly men. Because of the large distance between Batumi and Tsetskhlauri there is no possibility to travel daily and the workers also would need accommodation in the new area if they are going to move there. After closure works, some of these people could potentially be employed at the old landfill and securing the monitoring equipment there.

**Mitigation measures**

Clarify in a census exactly who is affected, how they are affected and what kind of compensation is potentially needed. Exact numbers, ages etc are currently not known. Explore alternative incomes and housing. Ensure that no waste pickers are offered authorised, but not formally employed positions at the new landfill, without securing their labour rights. Please refer to R/LRF/RAP.

**Significance of impact**

The project will cause some people to lose income. Various forms of compensation is required, such as alternative ways of incomes. Please refer to R/LRF/RAP.

## 11.5 Specific gender aspects

Although gender has been integrated in the baseline analysis, the Consultant has here included a separate chapter on gender impacts and mitigation measures to ensure the matter is emphasised as appropriate. A Gender Analysis and Mainstreaming Study was completed by Oxford Policy Management in 2010. The investigations concerned differences between women and men in attitude to the waste collection systems, in employment rates in different instants of waste management, reaction to the potential new landfill in Chakvi and other issues. Though, the study was prepared when the landfill was planned in Chakvi, certain aspects are valid also for the Tsetskhlauri phase of the Project.

### 11.5.1 Household management of waste

In relation to waste management, the OPM gender study points out the predominant female responsibility to manage household waste (and any potential recycling initiatives). This is closely linked to traditional intra-household divisions of labour where the women are responsible for cleaning, cooking and other household tasks and are the main minders of children (as well as potential carers of ill or elderly household members). It is also due to the fact that managing waste in public traditionally is seen as embarrassing or even demeaning and therefore not a task that men should undertake.

**Mitigation measures**

Any education or information campaigns for behavioural change in waste management (e.g. reduction of waste, recycling, community cleanliness initiatives) needs to be specifically targeted to women who will inform the children and other members of the family. Information campaigns have also the possibility to address more strategic needs regarding intra-household division of labour. For example to support the message that

'dealing with waste is not shameful' and is the responsibility of all household members – men and women, boys and girls.

The studies supported under the Project (e.g. customer satisfaction studies and similar.) should pay close attention to gender and involve women in data collection, data analysis and ensure that gender is designated. This will enable improved information dissemination, project planning, implementation and mitigation of impacts. While improving available information this also contributes to strengthening consultation and information to the women. Please refer to SEP.

**Significance of impact**

Taking gender into account in stakeholder engagement and outreach activities has a potential positive impact on project results and future waste management.

### 11.5.2 Equal opportunities

A balanced employment policy and practice is a key tool where the current Project could contribute to gender equality and increased operational performance of the SWC.

As chapter 2 and the OPM Study state, insights from the analysis of qualitative and quantitative data has shown that women are less likely to hold senior positions and are more likely to have jobs that involve a lower salary.

**Mitigation measures**

It would be desirable to identify skilled female specialists to be employed first in the PIU. Since, the PIU personnel will be trained and transferred into Hygiena Ltd.

The permanent and stable position of women in the company management would be practically ensured if they are already skilled in the PIU. It is also likely that management with equal gender proportion would almost guarantee that more women will be employed in the practical activities.

Equal opportunities HR policies should be introduced to the company, see also ESAP PR 2 actions.

**Significance of impact**

If equal opportunities are secured at the HR policy level in relation to recruitment and promotion as well as in salaries at the level of Hygiena Ltd, the company will likely perform better as well as have positive gender equality impacts.

### 11.5.3 Gender in Resettlement and economic displacement

As was pointed out under chapter 2 (socio-econmic conditions) women are less likely to be registrered as owners of land and property and their legal rights as spouses will not be guaranteed unless marriage is registrered legally, which requires a formal registration in addition to church marriage. Women's access to their economic rights, e.g. in case of resettlement, is consequently at risk of being negatively affected and the R/LRF and RAP should take this aspect into account.

**Mitigation measures**

Ensure that resettlement and economic displacement measurements monitor and register who (men/women) receives compensation and what kind of compensation.

Take into account that spouses not formally married might require special attention to ensure gender equity. Please also refer to ESAP and SEP annexed to this report.

**Significance of impact**

Potential gender discrimination unless R/LRF/RAP actively takes gender into account in negotiations with affected population.

# 12 Environmental Monitoring

## 12.1 Environmental Monitoring Programme

An environmental monitoring programme shall be established during the design phase and necessary infrastructure, e.g. monitoring wells for groundwater, shall be part of the construction works. The programme will follow the stipulated criteria in the EC directive as well as BAT Guidance. The operational manual including each operational procedure will take into consideration all parts of the monitoring programme. The permit requirements may vary from those stated below but the intention is to at least include;

- Incoming waste control
- Landfill stability and settlements
- Operational control via e.g. SCADA (supervisory control and data acquisition) which is a softeware used for monitoring and control of the waste facility e.g. leachate levels in cells, pumps, landfill gas production levels in flare and gas motor etc.
- Landfill gas control
- Point source emissions to air
- Leachate control
- Surface and groundwater monitoring
- Meteorological data (precipitation, temperature, wind direction)
- Noise, odour and litter
- Dust/ fine particles
- Flora and fauna
- Security and fires

Some general descriptions of minimum requirements are made below. The programme shall include information on what type of monitoring shall take place, the frequency for sampling and the locations of sampling points. The programme also describes the procedures for taking samples (random samples or integrated samples) and routines to follow to obtain representative samples (e.g. sampling order, washing of samplers, transports to laboratory etc.).

### 12.1.1 Incoming Waste Control

All incoming waste and other materials as well as outgoing recycled material shall be registered. All loads should be weighed; the waste should be checked in the vehicle, as far as this is possible, by a competent person, and a record made of the waste type, quantity, source and haulier.

### 12.1.2 Leachate control

The quantity of leachate shall be recorded as well as the quality of the leachate before and after treatment, see further Annex 4.

### 12.1.3 Surface and Groundwater Monitoring

The programme shall include monitoring of both surface and groundwater. Minimum three wells for groundwater shall be installed, where the well upstream is to serve as a reference for non-polluted groundwater.

Surface water quality in the nearby creek will be monitored in cross-section upstream and downstream of the landfill.

### 12.1.4 Landfill Gas Control

Relevant data for the operation of the gas extraction system shall be recorded on a daily basis. Such information is e.g. amount of gas generated and the composition of the gas, especially the methane content. In case any irregularities occur the reason shall be identified and corrected. It is e.g. important to assure that the sub-pressure in the landfill is maintained to minimise the risks for gas leaking to the atmosphere.

### 12.1.5 Environmental Reporting

The results of the monitoring activities shall be reported according the Conclusions of Ecological Expertise.

## 12.2 Construction Supervision

The Supervision shall ensure that structures and installations satisfy the quality requirements and the people's health as well as the environment protected. On the other hand, the supervision has to safeguard that the negative impacts on the people and environment are held at minimum during the construction activities.

The construction works shall be supervised according to local regulations and international practises. The international experience is especially needed for developing of special features of the project, mainly the construction of the bottom construction, leachate collection and treatment system. International expertise is also needed at a later stage, after the landfill operations started: to determine the timing and design of the installation of the gas extraction system.

# 13 Compliance with EBRD Performance Requirements

The compliance table presented in the following lists areas of specific concern. Many PR issues related to Hygiena Ltd. are reported as non-compliant, not because the MoFE have not thought of these, but because they are not yet in existence.

The PR Summary table also provides mitigation measures to reach full compliance within the project life. Such measures are further developed in the ESAP and SEP annexed to this report.

| PR-Nr. | Performance Requirement / issue | Compliance Status (actions in line with EBRD PRs) | Non-compliance status (actions that are included in the EBRD PRs, but not currently undertaken by client. | Comments / Recommendations | In ESAP/ SEP |
|---|---|---|---|---|---|
| PR 1 | Environmental and Social Appraisal and Management | | | | |
| 1.1 | E&S Appraisal | | | | |
| 1.1.1 | E&S Impact Assessment (EIA / SIA) | Project impact assessment developed within this ESIA | -- | ESIA analysis show lack of compliance with some EBRD PRs, recommendations to reach compliance are included in the ESAP and SEP | Yes |
| 1.1.2 | Definition of Mitigation Measures | Mitigation measures for project impacts defined in ESAP (appended to this report) and in ESIA PR compliance analysis. | Measures not yet adapted and implemented, no similar system available at MoFE. | Further support to Hygiena Ltd in implementation and adaptation (e.g. by MoFE and external consultant) | Yes |
| 1.1.3 | Definition of Performance Monitoring and Evaluation Measures | Measures defined in ESAP (appended to this report) and ESIA report | Measures not yet adapted and implemented, on similar system available | Further support to Hygiena Ltd in implementation and adaptation (e.g. by Ministry of Ajara and external consultant), including defining performance indicators | Yes |
| 1.1.4 | Environmental and Social Management and Monitoring Plan / System | Draft ESAP and SEP developed that partially fulfils monitoring purposes, by setting up indicators.<br><br>Management Information System under development. | Monitoring methodology should be developed | ESAP and SEP contains indicators that should be used in the Management Information system (MIS) for project monitoring.<br>Monitoring plan to be developed, that specifies methodology and frequency | Yes |
| 1.1.5 | Identification of main stakeholder groups | Identified during ESIA, presented in SEP | -- | Refer to SEP | Yes |

| PR-Nr. | Performance Requirement / issue | Compliance Status (actions in line with EBRD PRs) | Non-compliance status (actions that are included in the EBRD PRs, but not currently undertaken by client. | Comments / Recommendations | In ESAP/ SEP |
|---|---|---|---|---|---|
| 1.1.6 | Environmental, Health and Safety Policy | Safety instructions / handling procedures for some works, like handling of hazardous material, are handled at municipality (who is responsible for collection of waste) | At Hygiena Ltd, safety instruction/handling procedures are not yet developed.<br>EHS Policies absent as company is under development.<br>first-aid-trainings not yet started (mainly since Hygiena Ltd does not have staff in place) | Definition of EHS policy in line with national and EBRD requirements (e.g. during corporate development project or project implementation) | Yes |
| 1.2 | ESAP | Developed during ESIA and attached to this report. | Measures not yet adapted and implemented, no similar system available at MoFE. | Further support to Hygiena Ltd in implementation and continuous adaptation of ESAP (e.g. by MoFE and external consultant) | Yes |
| 1.3 | Organisational capacity and commitment | Organisational structure defined by Ministry.<br><br>Commitment from Ministry exist, but is partial as the Hygiena Ltd company is not yet formed, consequently affecting PIU. To remediate this a Committee has been formed to operate instead of PIU. | Hygiena Ltd not staffed.<br>No policies or procedures proposed in management in general that would improve social aspects of the company from internal to external issues.<br>No responsibility assigned for environmental management within Hygiena Ltd. (Chief Techical staff will be in charge, but not yet formally hired).<br>Social management issues are only partially assigned to staff in management positions. | Hygiena Ltd. set-up.<br>Hygiena Ltd. should take HR issues into account at the onset – not later<br>Clearly defined roles and responsibilities between Hygiena Ltd. and MoFE | Yes |
| 1.4 | Managing contractors | Experiences at Ministerial level to manage large scale contracts E&S risks of contractors and mitigation measures are defined in ESAP & SEP | Contractual capacity at level of Hygiena is not yet clear.<br>No contractor management defined and implemented<br>No staff assigned at MoFE or at Hygiena Ltd to supervise contractual matters where E and S should be taken into account. | Define clear roles and responsibilities in relation to contract management at Hygiena defined before construction and operational phase<br>Define ToRs for E and S specialist at Hygiena Ltd. | Yes |

| PR-Nr. | Performance Requirement / issue | Compliance Status (actions in line with EBRD PRs) | Non-compliance status (actions that are included in the EBRD PRs, but not currently undertaken by client. | Comments / Recommendations | In ESAP/ SEP |
|---|---|---|---|---|---|
| 1.5 | Performance monitoring and review | Monitoring procedures defined in ESAP and ESIA report. | In some aspects roles and responsibilities have not been clarified (such as in relation to monitoring of community health and safety, and resettlement and economic displacement measures process and results) | Clarification of roles and responsibilities between different ministeries and Hygiena Ltd.<br>Use of gender disaggregated statistics<br>Clarification of coordination between key stakeholders – refer to SEP | Yes |
| PR 2 | Labour and Working Conditions | | | | |
| 2.1 | Management of worker relationship | | | | |
| 2.1.1 | Human resources policy | Recruitment to management positions of Hygiena are reported to follow ministerial procedures. | No HR policy yet in place at Hygiena Ltd.<br>Salary scale and bonus system should be transparent (has not been assessed) | Implementation of a transparent salary and bonus systems<br>Development and implementation of clear and non-discriminatory recruitment procedures and policies that increase gender equality and diversity<br>Gender disaggregated statistics used to follow-up on HR policy implementation | Yes |
| 2.1.2 | Documentation and communication of working conditions | Job descriptions available for Hygiena for some positions, but are 2 years old. | Update of job descriptions necessary<br>Update of positions required so they correspond to the responsibilities of Hygiena Ltd. (e.g. if Hygiena is expected to subcontract to do resettment activities, Hygiena must have staff to draft ToRs and monitor this work)<br>Manual for daily operations/work procedures not developed | Detailed definition of job descriptions including social skills needed for each field of activity according to current / future infrastructure<br>Revise staffing list – when responsibilities of Hygiena are clarified.<br>Develop manual for daily operations/work procedures | Yes |

| PR-Nr. | Performance Requirement / issue | Compliance Status (actions in line with EBRD PRs) | Non-compliance status (actions that are included in the EBRD PRs, but not currently undertaken by client. | Comments / Recommendations | In ESAP/ SEP |
|---|---|---|---|---|---|
| 2.2 | Working conditions and terms of employment | | | | |
| 2.2.1 | Child labour | -- | -- | Should be part of company policy not to engage child labour – including zero tolerance against children picking waste | Yes |
| 2.2.2 | Forced Labour | -- | -- | Should be part of company policy against forced labour, including when subcontracting. | Yes |
| 2.2.3 | Non-discrimination and equal opportunities | -- | In general a wage gap exists between men and women in Georgia, which pose a risk when setting salaries also at Hygiena.<br>Generally men are hired for higher management positions more than women<br>Generally men are hired for manual works and as drivers, whereas women work in the administration.<br>Generally it is more difficult for women to be promoted to management positions.<br>Hygiena Ltd organisations chart indicates that waste pickers will be unauthorised workers, although not employed. | Development and implementation of clear recruitment policy and planning.<br>Annual salary revisions and adjustments of salaries according to education and experience<br>Gender disaggregated statistics used to follow-up on policy implementation.<br>Structure should have a zero tolerance against using waste pickers as workers without any access to labour rights. If waste pickers are hired they should equally benefit from their labour rights as any other employee. | Yes |
| 2.2.4 | Workers organisations | Workers have the right to get organised in Georgia | -- | Awareness raising in the context of workers' rights | Yes |

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|---|---|---|---|---|---|
| 2.2.5 | Wages, benefits and conditions of work | -- | -- | Wages and benefits should be comparable to those offered by equivalent employers in the relevant sector and region Improvement of facilities will also improve conditions of work (e.g. less overtime necessary due to better working facilities)<br>Gender disaggregated statistics used to follow-up on wages, benefits and work conditions | Yes |

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|---|---|---|---|---|---|
| 2.2.6 | Occupational Health and Safety (OHS) | Technical manager will be responsible for OHS | -- | Training Procedures and existing facilities & equipment to state of the art should be available<br>Budget allocation for health and safety (e.g. PPE) should exist<br>Special safety equipment should be available<br>Health and Safety instructions should be availableSafety trainings should take place egularly<br>Provision (and use) of personal protective equipment (PPE) should be adequate<br>Safety equipment (like gas detectors) should be available<br>Infrastructure conditions and inadequate hazard warnings should be available<br>First aid kits at SWC buildings should be available<br>Fire fighting equipment should be available | Yes |
| 2.3 | Retrenchment | -- | -- | No retrenchment foreseen | No |
| 2.4 | Grievance mechanism | Access to labour union | No internal grievance mechanism formulated<br>Policies or instructions are absent | Support for development of internal grievance structure | Yes |

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|---|---|---|---|---|---|
| 2.5 | Non-employee workers | No non-employee workers exist today | In the organisational chart for Hygiena Ltd. it would seem that waste pickers are porposed to be some kind of 'authorised but not employed waste pickers' at the new landfill. | No people should work at the landfill without access to their rights as workers.<br><br>Refer to point 1.4. contract management. Nor will any non-contracted workers without full access to their rights be employed via subcontracted companies | Yes |
| 2.6 | Supply Chain | Certificates on product itself are checked (e.g chlorine for disinfection purposes) | supply chain management policies and practices not yet in place | Supply chain policy developed in place<br>Analysis of all suppliers necessary | Yes |

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|---|---|---|---|---|---|
| PR3 | Pollution Prevention and Abatement | | | | |
| 3.1 | Pollution prevention, resource conservation and energy efficiency | Operational Manual defines management procedures to be implemented during operations, to avoid and minimise negative environmental impacts. For example: if hazardous waste enters the premises, this will be sent for proper treatment at other facilities<br>Procurement procedure (invitation to bid, contract and follow-up) will include detailed requirements during construction phase so as to avoid and minimise negative environmental impacts<br>Material for coverage will be sourced as close to the sites as possible, to minimise transport needs<br>A new company, Hygiena Ltd., will be created to undertake the project. The company will be owned by the Ministry of Finance and Economy (MoFE) | Current operations result in unsanitary waste dumping, thereby resulting in immediate risks for pollution of soil, water and ground water, odour, negative impact on landscape, and health risks. No compliance with international landfill standards (e.g. EU landfill directive). No income control. No or inadequate treatment for hazardous waste. Weak control of environmental impact, gas leachate or risks, weak or non-existing records on environmental impacts (e.g. oil spills)<br>The company Hygiena Ltd is not operational and the Project Implementation Unit is not in place. This means that the organisation expected to take responsibility for the project is currently non-existing. Following this, there is no project owner that can assure that manuals and procedures will be adhered to. Furthermore, the competence of the project owner – i.e. its capability to implement procedures and complement these where necessary - cannot be assessed | Closure of existing waste dump sites<br><br>Investment and development of a new landfill for non-hazardous waste at Tsetkhlauri, adhering to international standards<br><br>Operationalise Hygiena Ltd and the Project Implementation Unit for the project (i.e. the closure of the existing dump sites and the construction and operation of a new landfill)<br><br>Implementation of handling procedures for all types of waste<br><br>Development of environmental policy and environmental management plan for Hygiena Ltd. | Yes |

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|---|---|---|---|---|---|
| 3.2 | Solid waste | Solid waste is collected and brought to existing dumpsite, where recyclable material is separated (informally). | No plans to avoid waste generation. | Development of plans to avoid waste generation, preferably in collaboration with competent local authorities and NGO:s | Yes |
| 3.3 | Safe use and management of hazardous substances and materials | An incinerator for hazardous medical waste exists at one of the current dumpsites<br>Weak or non-existing safety routines for handling of chemicals and hazardous substances. Weak or non-existing implementation and follow-up on the routines | Current operations lack social safeguards, and people informally making a living from the existing waste dumps have poor security in terms of food, health and safety.<br>Informal waste pickers lack personal protection equipment<br>Weak handling procedures and precautions to minimize health risks | Development of proper handling procedures for all types of hazardous materials which may occur at Tsetkhlauri<br><br>Ensure only authorised and competent staff operates at the site | Yes |
| 3.4 | Emergency preparedness and response | Emergency cases are solved in an ad-hoc manner | No defined emergency procedures for Hygiena Ltd operations exist | Preparation of emergency procedures (part of EHS program) | Yes |
| 3.5 | Industrial production | No industrial production taking place | -- | -- | No |
| 3.6 | Ambient considerations | Project location alternatives evaluated during planning phase of investment<br>Pollution minimization measures included in ESAP | -- | Alternative locations were assessed in previous project phase, see ESIA | No |

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|---|---|---|---|---|---|
| 3.7 | Greenhouse gas emissions | Weak knowledge and lack of control of GHG emissions at current dump sites. No active mitigations measures to reduce GHG emissions in place | Unclear capacity at Hygiena Ltd to develop, implement and monitor GHG emission reduction measures (technical/institutional knowledge and experience, staffing, finance)<br><br>No plans for how to minimise traffic occurring during construction phase and/or operational phase | Proper landfilling at Tsetkhlauri (incl. landfill gas collection)<br>Proper staffing and management of Hygiena Ltd.<br><br>Development of schedules and actions to reduce traffic (e.g. procurement of compactor trucks) | Yes |
| 3.8 | Pesticide use and management | No pesticides used | -- | -- | No |

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|---|---|---|---|---|---|
| PR4 | Community Health, Safety and Security | | | | |
| .1 | Community health and safety requirements | -- | Unclear responsibilities in relation to monitoring of community health and safety in affected/close communities in Tsetkhlauri.<br>Lack of equipment and infrastructure safety. Weak routines and follow-up with regards to handling, treatment and disposal of hazardous waste, leading to potential community exposure to disease.<br><br>Lack of emergency preparedness<br>no measures against unauthorized access to the city dumpsite, leading to potential community exposure to disease<br>poor knowledge of community on proper waste handling and infectious diseases | Training of staff on community safety and health (including potential disease spread).<br>Gender disaggregate statistics on trainings (e.g. who are trained, who are included in field visits)<br>Information campaign to community on waste handling and infectious diseases that spread with mismanagement (see also SEP)<br>Development of an emergency plan (including information to the population) in case of risk of diseases due to bad water quality<br>Development of proper handling, treatment and disposal - procedures for hazardous waste | Yes |

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|---|---|---|---|---|---|
| 4.2 | Site Security and Access Control | -- | Weak routines and weak control mechanisms with regards to access to current dump sites.<br>Insufficient/non-existing records at current dump sites | Closure of existing dumpsites.<br>Construction of new landfill at Tsetkhlauri for non-hazardouse waste, in accordance with international standards (e.g. fencing, entrance control, registration of incoming/outgoing waste, planned and controlled tipping, no settlements, proper staff facilities etc).<br>Operationalise Hygiena Ltd and the Project Implementation Unit. Develop and implement necessary policies, routines, documentation systems etc. Develop and implement routines for monitoring, evaluation and correction. | Yes |
| 4.3 | Prevention of disease spread caused by solid waste | Public waste collection system in place | No clear responsibility in relation to monitoring of health risks | Operationalise Hygiena Ltd and the Project Implementation Unit. Ensure that staff receives proper training to reduce risks related to solid waste management<br>Hygiena Ltd to collaborate with e.g. local authorites and NGO:s to increase public awareness and engagement in e.g. waste separation and care for the environment<br>Hygiena Ltd to identify Evaluation Criteria / Indicators for follow-up, e.g. Number of staff regularly trained about health and waste, Number of population with parasitic, bacteriological and virus diseases that have a strong correlation with poor waste management | |

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|---|---|---|---|---|---|
| PR5 | Land Acquisition, Involuntary Resettlement and Economic Displacement | | | | |
| 5.1 | General requirements | | External grievance mechanism not developed for resettlement or economic displacement. Identificaiton of PAPs does currently not include all affected (e.g. the following are not included: PAPs within sanitary zone in Tsetskhlauri, PAPs close to sanitary zone of Tsetskhlauri, PAPS living at Batumi landfill, waste pickers working at Batumi and Kobuleti landfills, PAPs utilising Tsetskhlauri landfill area). | Please refer to Resettlement/Livelyhood Restauration Framework (R/LRF) for detailed recommendations (under development)<br><br>Development of an adequate external grievance mechanism (see R/LRF/RAP) | Yes |
| 5.2 | Resettlement Action Plan (RAP) | Knowledge about Georgian legislation in relation to resettlement and economic displacement | RAP does not exist<br>No clear knowledge about the rights of waste pickers (on illegal landfills), according to EBRD standards<br>No clear knowledge about the rights in relation to resettlement, according to EBRD standards | Development of R/LRF (under development)<br>Development of RAP (after R/LRF approval) | Yes |
| PR6 | Biodiversity Conservation and Sustainable Management of Living Natural Resources | | | | |
| 6.1 | Appraisal of issues and impacts | No significant impacts on biodiversity or living natural resources | Impact on water resources due to poor waste disposal (pollution of groundwater and river). Weak environmental monitoring at current dump sites | Investments in proper waste disposal (landfill according to international standards)<br>Development and implementation of environmental monitoring plan | Yes |

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|---|---|---|---|---|---|
| 6.2 | Habitat protection and conservation. Sustainable management and use of living resources. | No known significant impacts on habitats. | As above.<br><br>Construction of Tsetkhlauri landfill and access road will claim currently existing habitats (mainly grassland). | Operation procedures at Tsetkhlauri landfill that will support habitat protection and conservation, e.g. treatment and monitoring of water, daily covering to reduce littering, collection of landfill gas etc.<br>Closure of existing dumpsites should strive to compensate for (offset) the loss of habitats at Tsetkhlauri, i.e. by supporting similar ecosystem services to be established | Yes |
| 6.3 | Biodiversity and tourism. | Proper waste management system considered important to spark tourism in the region. | Weak control of different waste streams, risk of hazardous waste not being managed/treated/disposed of in a safe and environmentally sound manner. | Implementation of proper operation procedures at Tsetkhlauri<br>Close collaboration with local authorities, local NGO:s and general public (e.g. communication, awareness raising campaigns, feedback), to ensure efficient waste collection. | Yes |
| PR7 | Indigenous Peoples | | | | |
| 7.1 | Assessment of impacts on Indigenous Peoples | No indigenous people in the project area identified | -- | Not appilicable | No |

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|---|---|---|---|---|---|
| PR8 | Cultural Heritage | | | | |
| 8.1 | Appraisal | Chance finding procedures according to Georgian law in place at Ministerial level<br><br>Ministry of culture has carried out an ocular assessment. | -- | Written chance find procedures transferred to Hygiena Ltd. staff<br>Written change find procedures to be included in sub-contracting<br>Trainings on handling of cultural heritage (involve Ministry of Culture) | Yes |
| PR9 | Financial Intermediaries | | | | |
| 9.1 | Identification of FIs | No IFs in this project | -- | Not applicable | No |
| PR10 | Information Disclosure and Stakeholder Engagement | | | | |
| 10.1 | Engagement during project preparation | | | | |
| 10.1.1 | Stakeholder identification and analysis | Stakeholders identified during ESIA. | Communication with most stakeholders only on demand. | Refer to SEP where stakeholder identification is presented.<br>Presented stakeholder engagement information disaggregated by sex (e.g. who are invited to meetings, who come, who speak). | Yes |

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|---|---|---|---|---|---|
| 10.1.2 | Stakeholder engagement plan | Developed during ESIA and attached to this report. Stakeholder engagement do take place, but in a disorganised and ad hoc manner. | -- | Ensure a process-oriented approach to SEP – continuously updating and revising the SEP<br>Build-up of a grievance structure for resettlement/economic displacement (see R/LRF) as well as for customers (see SEP) (see also paragrapf 5 in this table)<br>SEP implementation support needed under project implementation phase<br>Gender taken into account in the SEP. | Yes |
| 10.1.3 | Information disclosure | Information disclosure has taken/ take place but in a disorganised and ad hoc manner. | Lack of structures on information disclosure. | Definition and implementation of measures regarding information disclosure (to whom, when and how is information necessary?) Refer to SEP<br>Take gender into account in SEP. | Yes |
| 10.2 | Engagement during project implementation and external reporting | -- | -- | Support on implementation necessary (MoFE, external consultants).<br>Long term support in reporting issues needed for deeper management understanding (support from national MoFE and/or external consultant possible). | Yes |

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|---|---|---|---|---|---|
| 10.3 | Grievance mechanism | --. | No defined grievance procedures for resettlement and economic displacement<br>No defined grievance mechanism for customer relations (daily operations)<br>Lack of clear response mechanism for both | Development of a written external grievance procedure, including registration of all complaints in relation to:<br>- Resettlement and economic displacement<br>- Customer relations<br>Training in customer relations and outreach activities.<br>Gender disaggregated statistics used to follow-up usage of grievance mechanism | Yes |