Municipal Solid Waste Management



Performance Audit

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Taking into account public, economic and ecologic interests, state has to ensure safe environment to human health and support country's sustainable development.

Well-established and functional waste management system presents milestone for the state development and is an important step for the country's integration into the European Union.

Therefore, the government has to take important steps to advance waste management system on a new level.

Due to above mentioned reasons, the State Audit Office examined municipal solid waste management system in Georgia and considered problematic aspects of the system, such as waste transportation-logistics, waste service fees in regions, problematic conditions of the new, old and unregistered regional landfills. We believe, that consideration of the audit conclusions and recommendations will allow significant improvement to the present situation.

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Performance Audit of
Municipal Solid Waste Management

Performance Audit

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State Audit Office of Georgia

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Municipal Solid Waste Management

Performance Audit Report

2015

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Abbreviations

EIP	Environment Impact Permit
EIA	Environmental Impact Assessment
MSW	Municipal Solid Waste
LEPL	Legal Entity of Public Law
LLC	Limited Liability Company
CENN	Caucasus Environmental NGO Network
NGO	Non-Government Organization
EEA	European Environment Agency
EPA	US Environment Protection Agency
ICAO	International Civil Aviation Standards
SWANA	Solid Waste Association of North America
UNECE	United Nations Economic Commission for Europe

Executive Summary

Municipal solid waste disposal at the landfills is the only form of waste management in Georgia. Effective waste management system is essential, as it directly affects environment protection and human health. Waste management acquires significant role according to international standards, as it presents substantial point under the Association Agreement between Georgia and the European Union.[1]

Currently, there are 57 operative municipal landfills in the country. The majority (except of the three new landfills) are registered during the time of the Soviet Union, do not meet international standards and their terms of exploitation are expired. Competent company takes minimal steps to conduct landfill reconstruction activities in Georgia. In recent years, measures were taken to improve function of the system of waste collection and disposal in Tbilisi. Although, Tbilisi waste management system is a good example for the rest of the regions, the existing system is still in need of refinement and improvement.

The State Audit Office examined solid waste management system through important stages of waste management. Such as waste transportation-logistics, waste service fee and the problematic issues of the old, new and unregistered landfills.

The audit revealed that **there is no practice of pre-determination of waste quantity**. Without information on quantity of waste, composition of optimal waste management plan is not possible. Solid waste management plan is not based on accurate data on the most of the territory of Georgia that leads to increased costs and reduced quality of service. Without reliable information on waste volumes, waste collection and transportation system cannot be optimally determined. Therefore, **number of waste vehicles on the routes are not distributed in an optimal way**. In most cases, during the day, two different waste trucks work in two shifts. Each region has approximately the same number of routes as the waste vehicles serving this region. Distribution of vehicles are not optimal because the waste vehicles perform at least two rounds in each shift on the specific route, and after the second round, vehicle returns empty with an average of 70%.

The waste disposal system puts service fee on the agenda. **Municipalities, where waste disposal services are provided, have no "Billing" system**. Fee collection is not performed with well-formed system, which directly affects revenues of the municipal budget. Municipalities, where waste **fees are more or less collected, the rates are unfounded and do not cover actual costs that are required for cleaning**. This approach is due to the fact, that municipalities neither consider nor observe the tariff system analytically. Cost and income are not calculated based on which acceptable collection rate should be determined.

After collection and transportation, waste is disposed at the landfill. Despite the companies'[2] efforts, **the old landfills still remain source of constant pollution to environment**. Operation requirements are violated in landfills; waste is not compacted and covered every day to prevent incendiary events. **The Ministry of Environment and Natural Resources Protection of Georgia does not exercise state**

[1] EU – Georgia Association Agreement; Article 302; 2014.
[2] LLC "Solid Waste Management Company", LLC ''Sandasuptaveba".

control over compliance of environment requirements, such as prevention of air, water and soil pollution.

As for the new landfills, **landfill of Tbilisi was lunched bypassing the procedures of Environmental Impact Assessment (EIA), which is an indication of the legislative shortcomings.** Construction was carried out without fulfilling all requirements of the Environmental Impact Permit (EIP). Release from the EIA procedures resulted to leaving population uninformed. Research demonstrates that the population is dissatisfied with the location of the landfill, mainly due to odor problems. Although the distance between landfill and populated area is in compliance with the Georgian legislation, the problems are still persistent in the villages. **Moreover, the new landfills (Tbilisi and Rustavi) are constructed in violation of International Aviation Standards.** Standards are violated in Tbilisi civil airport and in Vaziani military airport. According to the International Civil Aviation Standards, landfill should be at least 13 kilometers away from the airport. New landfill of Rustavi is located 10 km away from the Tbilisi civil airport and 3.5 km away from the Vaziani military airport, while Tbilisi landfill is located 7.5 km away from the Tbilisi civil airport and 10.65 km away from Vaziani military Airport.

Due to nonexistence of waste services in rural areas, waste is disposed without control and that results to formation of natural non-registered landfills. The average quantity of waste disposed without control in nature, per year, varies between 748,096 to 988,890[3] tons. **Rural areas are not provided with the waste collection and disposal services. Accordingly, there are no waste bins and the population has to dispose waste in self-selected areas.**

A significant problem is disposal of construction waste. **There is no information on the quantity of construction waste, which determines its treatment and place of disposal.** There is no recycling and secondary use of construction waste, which would reduce quantity of construction waste and damage caused by it on a certain level.

System of penalties exist to eliminate precedence of arbitrary waste disposal. Nevertheless, the state structures do not take into consideration the fact, **that special landfill for disposal of construction waste do not exist and its disposal at the municipal landfill is inappropriate.** These puts population into difficult situation as population has to dispose construction waste under the risk of receiving an administrative fine.

In the sphere of waste management, raising public awareness presents the most important phase in terms of waste prevention and elimination. **As the current situation demonstrates, awareness-raising measures are insufficient. The measures neither have large-scale nature nor cover all target groups, or the whole territory of Georgia.** The lack of information result to rising number of natural unregistered landfills and formation of careless attitude towards waste disposal that subsequently, has a negative impact on the development of tourism industry. The later presents a priority for the state for country's economic development.

The State Audit Office discovered issues during comprehensive study of the solid waste management system that will help the authorities to establish efficiency of the sector. Based on research

[3] *See* Annex N2.

conclusions and corresponding recommendations are issued that respective authorities should take into account in order to improve the existing situation.

1. Introduction and Motivation

Municipal solid waste management is one of the most important environmental challenges in Georgia.[4] The system is greatly neglected and is under urgent need of reformation. Efficient function of the system of waste management is precondition to country's urban development and directly relates to the following aspects: better living standards,[5] protection of environment and profitability of the sector.

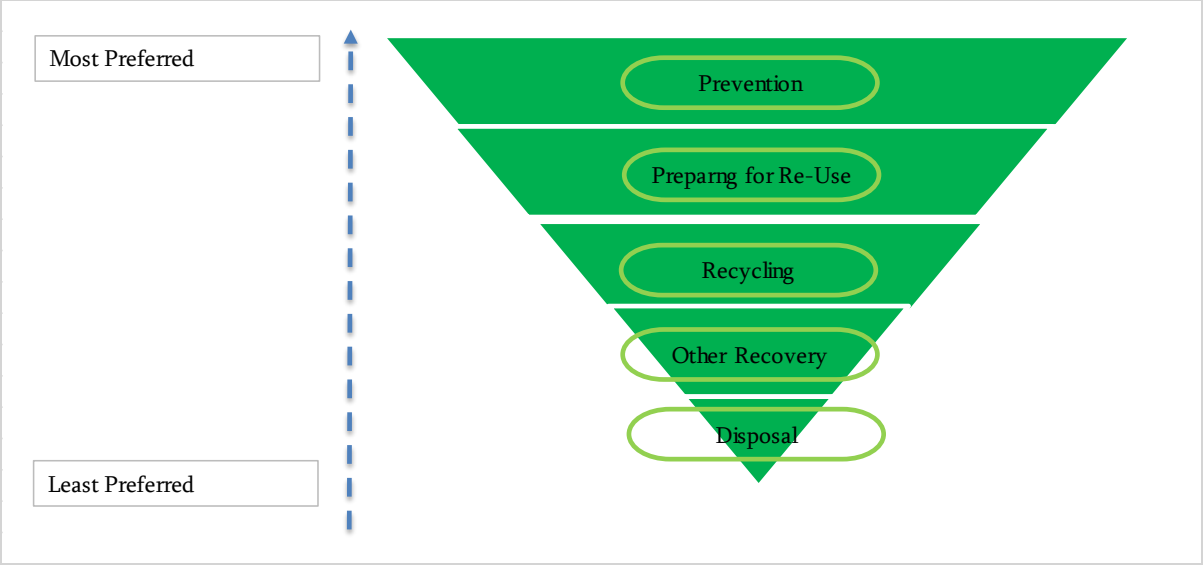
Municipal Solid Waste Management portrays an important element of the country's sustainable development and is included in the State Regional Development Strategy of 2010-2017[6]. In addition, it is an important item under the EU Association Agreement. [7] Issue of the waste management is of an actual importance for the government, non-government sector and the public, which confirms that the topic has a high priority.

Municipal Solid Waste (hereinafter – *MSW*) consists from the waste generated by human activity.[8] *MSW* is produced from sources, such as households, offices, private and public institutions. *MSW* is collected by or on behalf of the municipal authorities and is disposed through the waste management system.[9] The concept of "Waste Management" itself includes waste disposal from the source of origin until the final place of destination. In particular, the process of the waste collection, transportation, processing, disposal and monitoring of the process.[10] The core importance of the MSW management, in general, lies in correct distribution of waste in time and determination of its final destination that reduces negative effects on environment and human health.[11]

EU Waste Policy has evolved during the last 30 years in form of Euro directives, which was adopted by the European Union. Directives lay foundation of waste separation, recycling, reproduction and prepare action plans for the member states. Euro directive, which was adopted in 2008 ceases waste perception as unwanted burden and considers it as a valuable resource. The directive focuses on waste prevention and sets five step of waste management hierarchy, according to which, prevention is the most preferred option, whereas, waste disposal at the landfill an option of last resort[12] (See the scheme 1.1 below).

[4] Cleanup Georgia; *Report on Municipal Solid Waste Management in Georgia;* 2012, p. 2.
[5] Green Movement of Georgia; *Environment and Society N5 (17)*; 2011, p. 2.
[6] Resolution of Government of Georgia №172, 2010.
[7] EU-Georgia Association Agreement; Article 302; 2014.
[8] Green Movement of Georgia; *Environment and Society N5 (17);* 2011, p. 2.
[9] European Environment Agency (EEA); *Managing Municipal Solid Waste N2;* 2013, p. 7.
[10] Green Movement of Georgia; *Environment and Society N5 (17);* 2011, p. 2.
[11] Green Movement of Georgia Economic Analyses of Georgian Green Economy- on the example of the Solid Waste Management Recycling; *Environment and Society* N2 (20); 2012, p. 2.
[12] Directive 2008/98/EC of the European Parliament, Article 4, 2008.

Scheme 1.1: Waste Management Hierarchy



EU member states have duty to reduce amount of disposed waste through recycling by 2020, municipal waste should be reduced by - 50% and construction waste by - 70%.[13] From this perspective, Sweden presents one of the best practices, given it achieved recycling of waste by 49% in 2009 and only disposes 1 % of waste at the landfill.[14] In Lithuania, Latvia, Estonia, Greece and Turkey considerable number of waste is still disposed at the landfill, but the amount of waste decreased in comparison with the previous years, which can be explained by implementation of new recycling techniques.[15] For instance, Slovenia reached 30 % recycling by 2009.[16]

Practice of waste recycling is not implemented in Georgia. Accordingly, the State Audit Office examined only the current waste management system. The present system is based on least preferred methods of waste management, such as waste disposal at the landfill and burning of waste in an open space.[17] Currently, there are 57 active municipal landfills. In addition, in villages where waste management service are not supplied, spontaneous illegal dumpsites are formed (hereinafter - *unregistered landfills*). Residents dispose waste in water, riverbanks and railways. Those landfills are not fenced and animals and humans can easily access it. The waste disposed without due control has adverse health effects and pollutes water and soil.[18]

[13] *Ibid,* Article 11, (2).
[14] European Environment Agency; *Municipal Waste Management in Sweden;* 2013.
[15] European Environment Agency, http://www.eea.europa.eu/publications/managing-municipal-solid-waste.
[16] European Environment Agency; *Municipal Waste Management in Slovenia;* 2013.
[17] *Ibid.*
[18] United Nations Economic Commission for Europe (UNECE); *Environmental performance Reviews – Georgia, Second Review;* New York and Geneva; 2010, p. 112.

The Solid Waste Management system in Georgia differs according to municipalities and is subject to different accountable bodies. In Tbilisi waste management falls under the competence of the LLC “Tbilservice Group”. In regions, responsibility is shared between municipalities and the "Solid Waste Management Company". In Autonomous Republic of Adjara responsibility falls under municipalities and LLC “Sandasuptaveba”. However, the Waste Management Code adopted on January 15, 2015, under the framework of the EU Twinning Program, in the long run provides transfer of managerial rights to municipalities or a third party.

The State Audit Office has examined existing situation of solid waste management in the country and considered important parts of management system, such as waste transportation-logistics, waste collection fee, problematic issues of new, old and unregistered landfills. As a result of the problem analysis, the State Audit Office will issue relevant recommendations to enhance waste management system effectiveness.

1.1 Purpose of Audit

Purpose of the State Audit Office is to identify problems and its’ causes in the existing waste management system to issue adequate recommendations.

The State Audit Office considers as the main problem inefficient state of settings for the solid waste management, poor performance of the waste collection fee system, lack of public interest and information.

In order to examine causes of problems and develop adequate recommendations the audit team should answer the following questions:

To what extent is the waste management system well- organized and effective in Georgia?

- *To what extent is logistics system efficient in Georgia?*
- *To what extent is solid waste fee collection system well - organized in municipalities?*
- *What impact old and new landfills have on environment?*
- *To what extent is the process of elimination and prevention of unregistered landfills effective?*

The Objects of Audit are the following:

- The Ministry of Regional Development and Infrastructure of Georgia;
- LLC ”Solid Waste Management Company”;
- The Ministry of Environment and Natural Resources Protection of Georgia;
- Autonomous Republic of Adajara;
- LLC “Sandasuptaveba”;
- Tbilisi City Hall;
  LLC “Tbilservicegroup“.

To achieve purpose of answering the audit question, the State Audit Office developed audit procedures, according to which general measures and processes of the solid waste management system are examined.

1.2 Assessment Criteria

The audit team applied existing legislation that regulates issues related to the solid waste management.

Currently, the solid waste management sector is regulated by the following legislative acts:

National legislation:

- The Constitution of Georgia;
- Waste Management Code;
- Law of Georgia on Environment Protection;
- Law of Georgia on Local Self-Government;
- Law of Georgia on Ecological Examination;
- Law of Georgia on Environmental Impact Permit;
- Law of Georgia on Local Fee Collection;
- Law of Georgia on Public Health;
- Technical Regalement - " Municipal Solid Waste Landfill Construction and Operational Rules and Regulations";
- Technical Regalement - "Methodic of Environment Damage Determination and Calculation".

International Conventions:

- Stockholm Convention on Persistent Organic Pollutants;
- Convention on "Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters" (the Aarhus Convention).

An important criteria for the audit is the EU Association Agreement, according to which Georgia should harmonize in terms of waste management with European standards and thereby, fulfill its obligations.

Furthermore, an important criteria for the audit is the best practices of other countries that have sought reforms in waste management in past years. Some of these countries have already completed the construction of high-level waste landfills, which represent, from the waste management point of view, the first step towards harmonization with EU standards.[19]

[19] European Environment Agency (EEA); *Managing Municipal Solid Waste №2*; 2013, http://www.eea.europa.eu/publications/managing-municipal-solid-waste.

1.3 Scope and Methodology

To see the full picture of the waste management system the audit team has examined situation throughout the country. The State Audit Office has relied on data from period of 2012-2014 to find answer to the audit question. In order to study the issue in depth and answer the main question Audit team has applied various methodologies:

- Documentary analysis of legislation and compliance with the current situation;
- Study of the EU directives and international practices;
- Analyzes of audit reports and best practices of other countries;
- Analyses of information provided by the audit objects (strategy, action plan and financial data);
- Interviews with audit objects and interested individuals;
- Work meetings with international organizations, donors and local non-governmental organizations to analyze problems and recommendations identified by them;
- Quantitative and statistical analysis to assess and predict budget of the solid waste management system;[20]
- Send, collect and analyze surveys and questionnaires to obtain information from municipalities;
- Physical verification (assessment of landfill condition).

[20] *See* Annex N1 and N2.

2. General Information

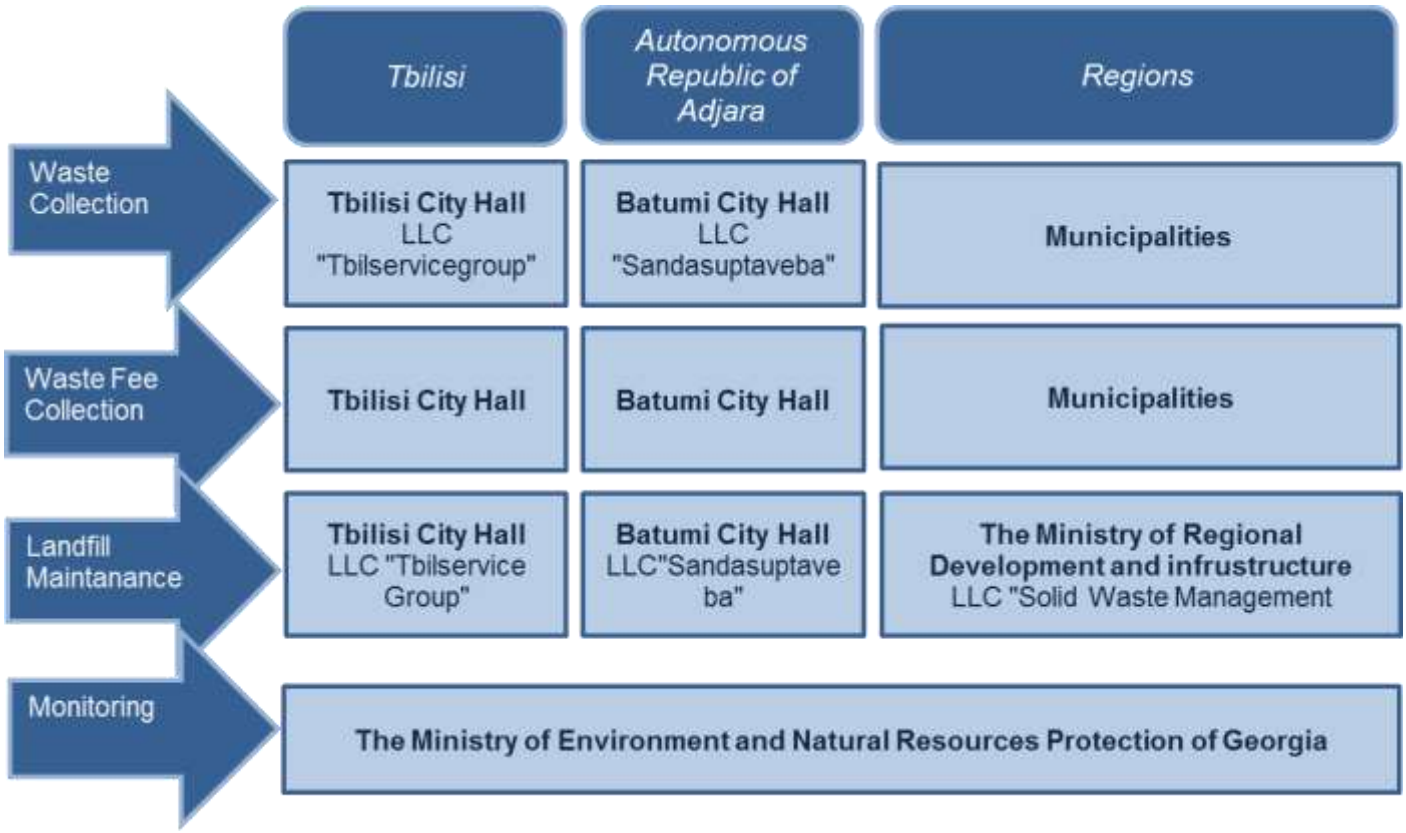
2.1 Operation and Management

There are the following project executors throughout the country in the sector of the solid waste management:

- The Ministry of Environment and Natural Resources Protection of Georgia;
- The Ministry of Regional Development and Infrastructure of Georgia;
- Municipalities;
- Tbilisi City Hall;
- Batumi City Hall.

Scheme 2.1.1: System of Waste Management

Scheme 2.1.2: Structure of Objects of Audit



2.1.1 The Ministry of Regional Development and Infrastructure of Georgia

LLC „Solid Waste Management Company“

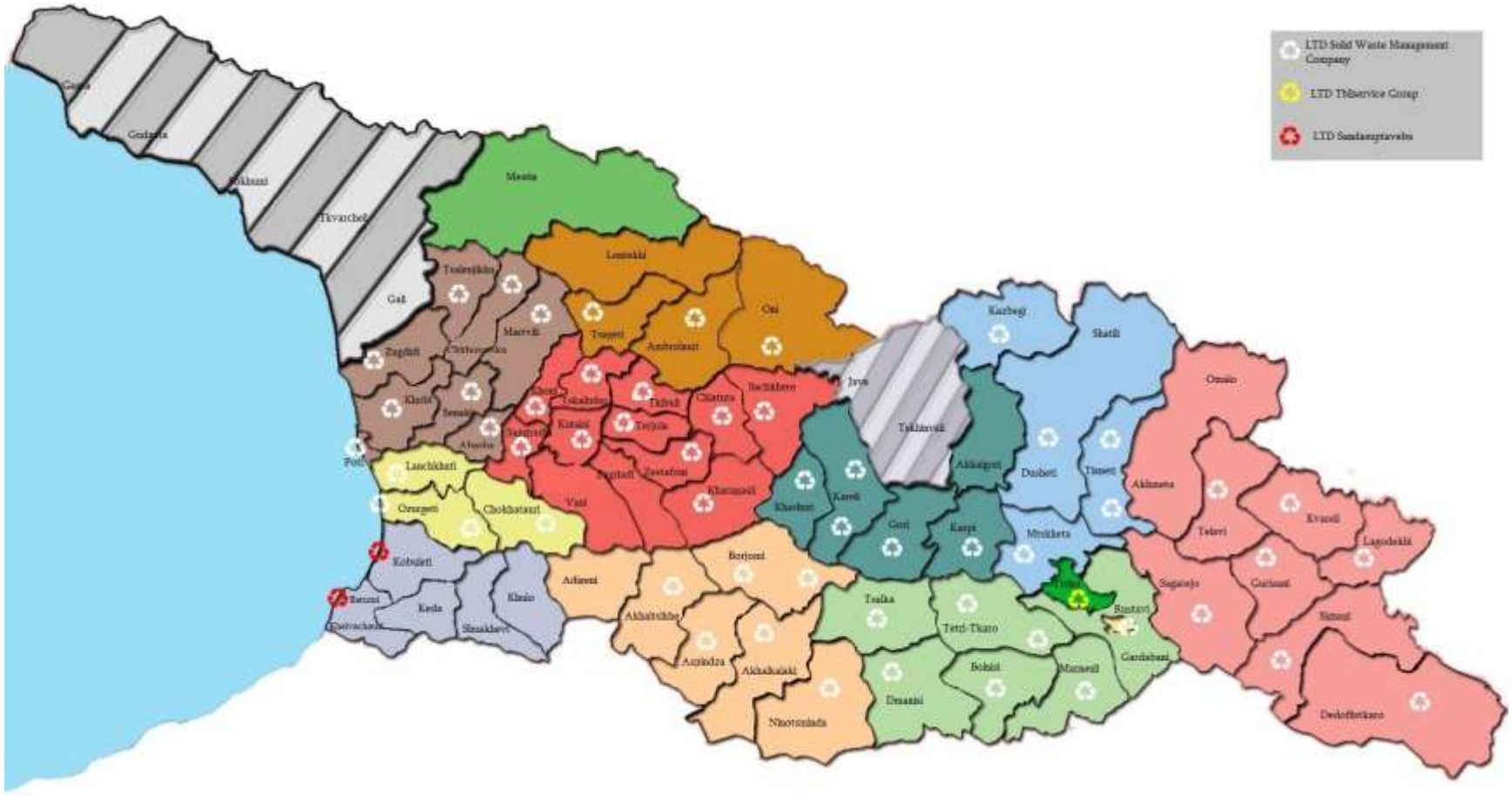
LLC “Solid Waste Management Company” (hereinafter – *the Company*) is under the system of the Ministry of Regional Development and Infrastructure of Georgia. The Company is in charge of maintenance and reconstruction of landfills of solid waste. In terms of the solid waste management the Company has the following objectives: introduction of European standards to regions, gradual shut down of municipal landfills and construction of new regional landfills: Imereti - Racha - Lechkhumi, Kvemo Svaneti 2014 – 2017, Kvemo Qartli 2014 – 2017, Mtskheta – Mtianeti, Samckhe – Javakheti, Adjara/Guria, in compliance with the European Standards.

The Company manages 51 old landfills. Transfer of new - Rustavi and Borjomi landfills are planed (See map 2.1.1.1.). Upgrade and equipment of eight landfills are already complete. In 2014, 16 heavy equipment (tractor) were purchased and two were transferred from municipalities and deployed according to regions.[21] The company has nine Regional Offices. Special kiosks are located at the landfills to control humans and domestic animals not to enter the landfill.

Throughout Georgia construction in total of eight regional landfills are planned that will comply with international standards and ensure waste disposal.

[21] Information received from LLC “Solid Waste Management Company”.

Map 2.1.1.1: Registered Landfills in Georgia



2.1.2 Tbilisi City Hall

LLC „Tbilservice Group“

LLC "TbilService Group" is under the system of Tbilisi City Hall. Under the company's scope of competences are: cleaning the capital, waste collection, transportation, neutralization and the final disposal of household waste at the landfill; liquidation of the effects of atmospheric precipitation - clean stone and rocks which are brought by rainfalls and floods (clean ways from snow falls, throw salt); operation of drainage networks in Tbilisi. The factory employs 3,600 workers. Tbilisi is served approximately by 12, 000 metal waste containers and 200 waste vehicles.

The company's main activities include cleaning the city, waste collection and disposal at the landfill. In addition, the company maintains recently opened Tbilisi landfill, which was launched in November 2010 and covers 84 ha. In addition, the Company’s is charging a physical or a legal entity with a fine in case of city pollution for prevention purposes.

Graph 2.1.2.1: Waste Management Scheme in Tbilisi

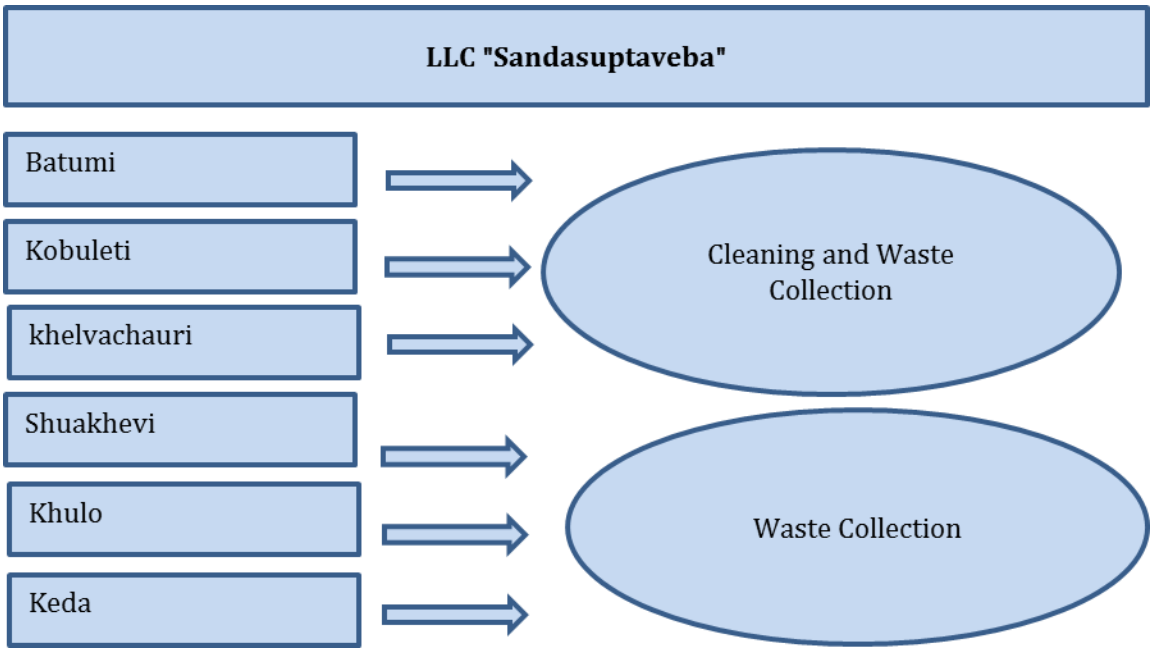
2.1.3 The Autonomous Republic of Adjara

LLC „Sandasuptaveba“

The Autonomous Republic of Adjara has two – Batumi and Kobuleti landfills. LLC “Severi” is in charge of maintenance of Batumi landfill and LLC “Sandasuptaveba” - of Kobuleti landfill. LLC “Sandasuptaveba” is under the system of Batumi City Hall. It manages waste in several directions: cleans the city, coast line, lawns, surrounding areas and green lines; waters and washes the streets; collects household waste; washes containers; neutralizes animals, restraints livestock from city; cleans streets and roadways from snow; disposes medical waste by incineration[22], deracination – desinsection; detects natural or legal persons who breach cleaning rules (pollution).

The Autonomous Republic of Adjara has six Municipalities and one city - Batumi. In case of three Municipalities the LLC “Sandasuptaveba” cleans the city and collects waste, for remaining three municipalities, the company only collects waste (See. Graph 2.1.3.1).

Graph 2.1.3.1: Waste Management System in the Autonomous Republic of Adjara



[22] Order #2 of Ministry of Environment and Natural Resources Protection of Georgia, on approval of accounted stationary objects of list of identified air pollution, 2010.

2.1.4 Self-Governing Cities - Municipalities

In self-governing cities and municipalities,[23] tender winner companies are in charge of waste disposal, which mainly engage their service on the territory of self-governing city. In most cases, rural areas do not receive waste service.

Except for main landfills[24], municipalities' do not carry out maintenance of unregistered landfills.

Tender Winner Company, which is in charge of waste management provides municipalities towns and villages (except of municipalities, where municipality self-government is in charge of waste management) with the waste management equipment and waste bins.

2.1.5 The Ministry of Environment and Natural Resources Protection of Georgia

The Ministry of Environment and Natural Resources Protection of Georgia has role of policy maker in the area of waste management. In addition, the Ministry issues permits of landfills and conducts supervision on environment protection.

As for the permit procedure, a company that serves landfill submits environment impact report to the Ministry of Environment and Natural Resources Protection of Georgia and publishes information in newspaper to inform public. The consideration of submitted report takes 50 to 60 days. After consideration, the company, which is in charge of the landfill, is given time of a year to complete environment impact document. A year later, Department of Environment Impact Permits under the system of the Ministry of Environment and Natural Resources Protection of Georgia issues within 15 days conclusion on ecological expertise, head of department signs and the Minister approves the conclusion. Further monitoring of the issued permit is under the competence of Environment Supervision Department. In case of violation of terms of the permit, sanctions are imposed.

The Ministry issued permits for construction of Tbilisi and Rustavi landfill in 2010, for Borjomi landfill - in 2012. After the Environment Impact Department has issued permit for the construction of landfills, responsibility over the landfills supervision has transferred to the Department of Environment Supervision, which carries out monitoring of compliance with the terms of the permit.

Pollution prevention activities are carried out in two directions throughout Georgia – by Rapid Reaction Group and by Inspection Division (licenses, pollution control). Tbilisi and Rustavi landfills were imposed a fine, due to operating landfill in violation of the standards set forth initially in the permit.

[23] Municipality - information received from 38 (out of 58) municipalities, information on municipalities of Autonomous Republic of Adjara are not included.

[24] Since 2012 maintenance of landfills in municipalities is carried out by LLC. "Solid Waste Management Company".

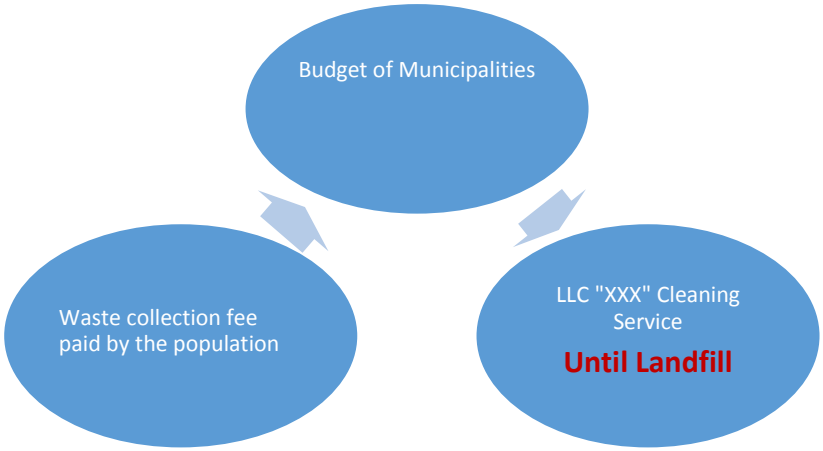
Department of Environment Supervision obtains technical support for conducting monitoring from the National Environment Agency. However, monitoring of the old landfills do not occur, as Department of Environment Supervision states, that the department has no permit based on which, supervisory activities would be carried out.

2.2 Budget Scheme of Waste Management System

2.2.1 Municipalities (Except of Tbilisi)

In municipalities, tender winner companies conduct service of cleaning and collecting solid waste. The main funding source of the company is the local budget. The municipality has a system of fee collection and the individual tariff, which goes to unified account of the budget (see. Graph 2.2.1.1).

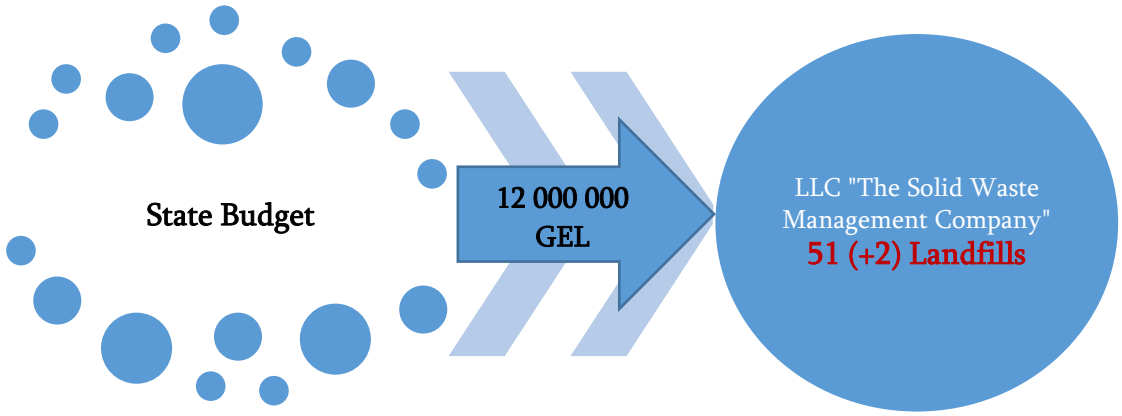
Graph 2.2.1.1: Financing Municipal Waste Services



2.2.2 LLC „ Solid Waste Management Company“

The Solid Waste Management Company (hereinafter – *the Company*) was established in April 24, 2012. 100% state-owned company management shares were transferred to the Ministry of Regional Development and Infrastructure. The Company manages 51 municipal waste landfills (except of the landfills of Tbilisi and Autonomous Republic of Adjara) throughout the country. Under the company's jurisdiction is Borjomi landfill, but the company has not commenced operating the landfill so far. Transfer of Rustavi landfill to the company is planned as well. The main source of funding for the company is the state budget. In 2013, the company received 12 million GEL from the state budget.

Graph 2.2.2.1: Budget for Landfill Maintenance

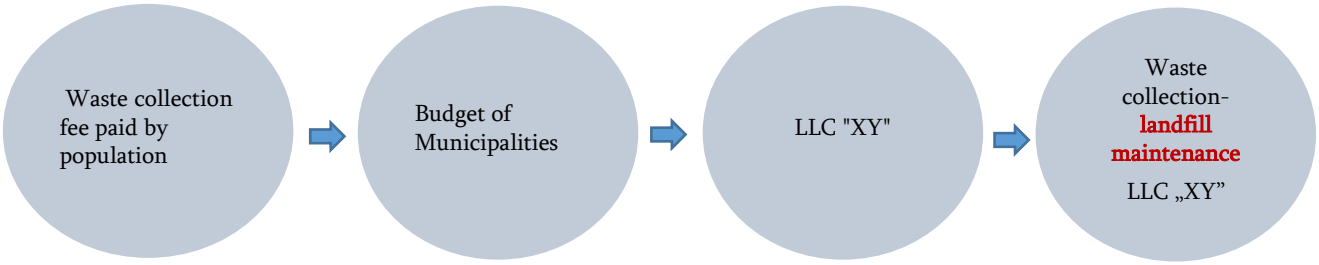


2.2.3 Tbilisi and the Autonomous Republic of Adjara

LLC. "Tbilservicegroup" provides service to Tbilisi. The company is municipal company[25] and its management rights were transferred to Tbilisi City Hall. The company received from Tbilisi Municipal Budget 39 Million GEL = in 2013 and 48, 2 GEL - in 2014.

LLC "Sandasuptaveba" which provides service to Autonomous Republic of Adjara was founded on 28 July 2006. 100% of shares of management rights were transferred to Batumi City Hall. In 2013, the fee collected under the company's contracts[26] from all the six municipalities' amounted 7,317,001 GEL (see Graph 2.2.3.1).

Graph 2.2.3.1: Scheme of waste management and financing in Tbilisi and the Autonomous Republic of Adjara

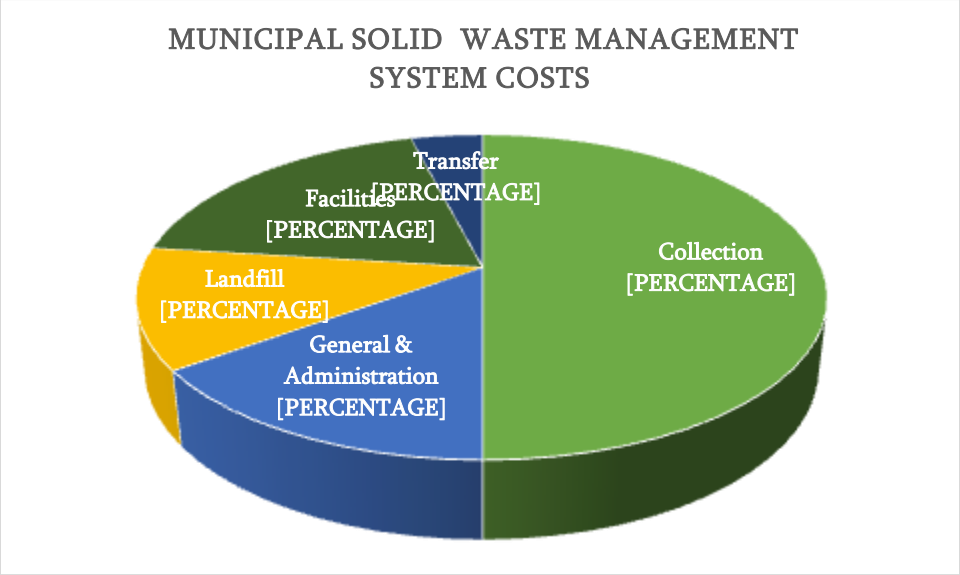


[25] Was Founded on December 1, 2006, under the resolution of government №02.13.58.
[26] Each municipality concludes a yearly contract with the LLC. "Sandasuptaveba" to provide services under procurement rules.

3. Logistics of the Solid Waste Management

Experience from waste industry demonstrates that process of waste collection and transportation is the most expensive part of the waste management system. Obviously, proper operation of the waste collection system has significant impact on waste management system's overall cost reduction. On average, costs incurred on logistics present 50% of the total expenses of the waste management system. (see Graph 3.1).

Graph 3.1: Average Costs of Waste Management System[27]



The issues to consider for developing efficient waste collection system include the following:

Goal determination – first, goals are defined, which may include identification of the waste amount, or organization of optimal distribution of waste to the landfill. The goals are reviewed periodically, in order to assess overall performance of the system and make appropriate adjustments to changes to community needs.[28]

Collection of information on amount and type of waste – for successful planning of the system, it is essential, to obtain reliable information on the amount and type of generated waste. The estimated amount of removable waste is defined based on the vehicle capacity and knowledge of expected

[27] Source: Integrated Municipal Solid Waste Management: Six Case Studies of System, Cost and Energy Use: Summary Report, SWANA, 1995, pp. 50.

[28] United States Environment Protection Agency (EPA); Decision Maker's Guide to Solid Waste Management Volume II; p. 4,5.

amount of waste. Consequently, without reliable information on amount of expected waste, it is impossible to determine distribution of equipment, area, facilities, and personnel.[29]

Public and Private Collection/Transfer – Before moving to the technical side of the waste collection system, it is necessary to assess logistics service alternatives which may be provided either by the private or by public sector. Waste collection can be conducted by municipalities or by contracted private companies. Municipalities have to carefully assess types of the logistic systems, or combination of the systems, to choose the one which the best corresponds to municipality's needs. There is no single type of collection system, which is well tailored for each municipality.[30]

Containers and vehicles – Productive system of waste collection requires performance of waste preparation and collection in a coordinated manner. The volume of containers have influence on number of vehicles and on incurred expenses. Best practice shows that municipalities adopt a resolution, which indicates usage of certain solid waste storage containers. It is important container to be suitable for required quantity and type of waste, easy to use, economical and resistant to corrosion, weather, and animals. It is necessary to locate metal or plastic containers in populated areas.[31]*Collection Frequency* – to determine collection frequency the following factors are important: costs, evaluation of expenses, expectations of consumers, waste storage duration and geographic location. Climate of the city has a significant influence on the collection frequency, as well as, the area in which waste is stored. In particular, whether the waste is in the building of the individual remains or in an open space[32]. In hot areas, frequent collection of waste is recommended, as frequent collection prevents odor and increased number of insects.[33] In addition, the influence of seasonal changes on waste generation might make it necessary to reduce the collection routes - in the period of reduced waste generation (during the winter) and to add collection routes - in the period of increased waste generation[34] (during the summer).

Collection Routes and Schedules - There are many strategies and techniques for proper operation of the solid waste logistic system. Most of the strategies are developed on common sense and fit all type of routes. However, advancement in computer technology based on route parameters create opportunities for even more optimal route selection. Since, waste collection-transportation costs are approximately 40% to 60%, in the area of waste collection and transportation the major savings can be achieved.[35]

[29] EPA; Decision Maker's Guide to Solid Waste Management, Volume II; 1995, pp. 3, 4
[30] *Ibid,* pp. 4-7.
[31] *Ibid,* pp. 4-10.
[32] *Ibid.*
[33] World Bank; Environmental Management of Urban Solid Wastes in Developing Countries a Project Guide; 1984, p. 45.
[34] EPA; Decision Maker's Guide to Solid Waste Management Volume II; 1995, pp. 4-3
[35] Roberts, B.; *Solid Waste Routing;* 2011, p. 25.

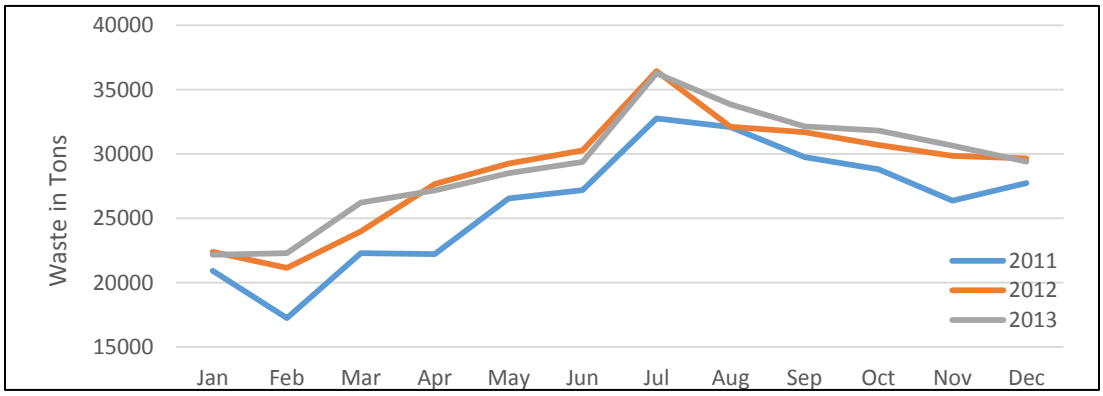
3.1 Materiality of solid waste volume establishment do not exist

Currently, in 47 out of 56 municipalities data on the amount and specifics of the generated waste do not exist. Weighing of the waste occurs at the time of entrance at the landfill and only nine big cities carry it out. Those cities are following: Telavi, Gori, Akhaltsikhe, Kutaisi, Ozurgeti, Batumi, Tbilisi, Rustavi and Borjomi.

Waste generation, is not observed on the whole territory of Georgia in order to determine exact amount of the municipal solid waste. In the above-mentioned cities, waste is weighted when it is disposed at the landfill, which is not sufficient for developing and implementing effective solid waste management plan.

Waste generation is seasonal. Survey on Tbilisi 2011-2013 cumulative waste streams, demonstrates that waste generation reaches its peak in July and is at minimum in February. To properly reflect changes in the waste volume on the number of services, it is important to analyze seasonal changes. The graph below shows the amount of waste in Tbilisi in span of years 2011-2013. (See Graph 3.1.1).

Graph 3.1.1: Waste Amount by Months in 2011-2013 (Tbilisi**)**



Without reliable data, it is impossible to develop optimal waste management plan. At present, the solid waste management plan is not based on accurate data on the most territory of Georgia, which results to increased costs and reduced quality of service. Unproductive schedules, which are developed on incorrect and incomplete data and lead to increased costs is discussed in a detail in the following subsection.

Pre-determination of waste data and subsequently, development of executive strategy would significantly simplify waste management process. Constant observation is required to verify the accurate amount of the waste, as well as, to reveal waste origin and time of generation.

3.2 Work schedules of existing vehicles are not optimally developed

In municipalities (except of Tbilisi) waste collection and transportation are not conducted based on special work schedules. Waste collection schedules exist only in Tbilisi, which is divided into 5 districts. All five districts consist from 144 routes and are distributed 134 waste trucks. One specific route is covered by one waste vehicle. Routes consist from different number of streets and vary with the distance and number of waste containers. Route schedules are same from Monday to Friday, whereas, weekend schedules are slightly different due to vehicle distribution. In general, the routes are almost identical in all five districts (see Table 3.2.1.).

Table 3.2.1: Number of Routes and Vehicles According to Districts

Schedule of Tbilisi (Monday - Friday)	Number of Routes		Number of Vehicles	Repeat of Vehicles
	1st Shift	2nd Shift		
Isani - Samgori	25	10	31	4
Vake - Saburtalo	27	9	33	3
Mtatsminda - Krtanisi	18	9	26	1
Didube - Chugureti	11	9	18	2
Gldani - Nadzaladevi	19	7	26	0
Total	100	44	134	10

Waste is collected in two shifts in Tbilisi. The 1st shift begins in morning from 7 to 8 a.m. and ends at 3 to 4 p.m., whereas, the second shift – begins at 5 to 6 p.m. and ends at 11 - 12 p.m. Number of routes, in comparison with the 1st shift, are halved in the 2nd shift, which may be an indicator for higher number of waste generation in morning.

There are 12,492 containers located through the capital. The city is equipped with four different volume containers: 1100, 240, 110, and 50 liter. The most of them are 1100 liter containers.

In the most cases observation of schedules revealed that in each shift different vehicles are used. In both shifts number of routes of each district matches, approximately, the number of waste trucks serving this district. Therefore, after the vehicle finishes the 1st shift, it does not continue collection in the 2nd shift, a new vehicle continues waste collection. For example, in district of Gldani- Nadzaladevi the 1st shift consists from 19 routes, the 2nd shift from 7 routes, the district are served in total with 26 waste trucks.

Work of different vehicles in both shifts significantly increases depreciation and repair costs. Use of waste vehicle in the second shift reduces total number of vehicles for the particular region, but fuel and

wage costs remain the same. By reducing number of vehicles in the second shift results to average of 1,082,230 GEL saving per year.[36]

Table 3.2.2: Comparison of Vehicles' Annual and Reduced [37]Costs

	Depreciation (GEL)		Maintenance (GEL)		Total Expenses (GEL)		Difference (GEL)
District	Initial	Reduced	Initial	Reduced	Initial	Reduced	
Mtatsminda-Krtsanisi	664,265	460,141	206,662	151,338	3,641,818	3,382,370	259,449
Isani-Samgori	780,866	631,989	248,353	196,535	3,239,785	3,069,353	170,432
Didube-Chugureti	495,187	325,059	102,645	62,480	1,808,333	1,587,305	221,027
Gldani- Nadzaladev	644,532	460,034	148,242	101,464	2,217,820	1,986,544	231,276
Vake-Saburtalo	749,897	603,342	154,129	120,167	2,509,622	2,329,104	180,517
Sum	**3,334,747**	**2,480,565**	**860,031**	**691,983**	**13,417,378**	**12,335,148**	**1,082,230**

It should be noted that in schedules from Monday to Friday small number of vehicles are repeated in some districts in both shifts. For instance, four vehicles are repeating in Isani - Samgori, in Vake-Saburtalo - 3, in Didube - Chugureti - 2 and in Mtatsminda - Krtsanisi -1. In addition, it is important to mention, that in weekend schedule of Didube - Chughureti, those 6 vehicles out of 9 which work in 1st shift are repeated in the 2nd shift. This indicates that the work under the similar schedule is possible and the company has relevant experience.

Analysis of repair costs revealed[38] that in most cases, costs of repair for vehicles working in both shifts are similar to costs of repair of vehicles, which work only in one shift. Therefore, we conclude that by working in two shifts, repair costs for vehicles shall not increase significantly.

[36] Audit team has revealed annual expenditure of each waste truck working in Tbilisi, which includes costs of service, fuel, depreciation and salary. Hence 1,082,230 GEL is obtained by sum of 34 truck's depreciation and service costs, working in the second shift (10 truck out of 44 is repeated).
[37] Decreased cost in case of repeat of first shift trucks in the second one.
[38] Cost data are provided by LLC "Tbilservice Group".

Table 3.2.3: Comparison of Vehicle Repair Costs in Single and Double Shifts

District	Annual Waste Vehicle Repair Costs	
	Works in double shifts	Works in signle shift
Mtatsminda - Krtsanisi	13,986	12,524
Isani - Samgori	10,749	10,152
	11,068	11,147
	11,583	10,317
	8,791	8,905
Didube - Chugureti	7,558	7,164
	1,147	1,367
Vake - Saburtalo	4,279	4,281
	2,539	2,312
	3,901	3,972

In 1st and 2nd shifts poor allocation of vehicles are due to planning problems, improper distribution of vehicles and selection of the wrong timing for schedule. Observation of route schedules revealed that there are 2-3 hour intervals between the 1st and the 2nd shifts, which makes possible for the vehicle, which works in the 1st shift to prepare for the work in the 2nd shift.

It is recommendable same vehicle to repeat in both shifts. Work schedule should be planned in such a way, that one vehicle is able to work without restrictions in two shifts through the day. The Company should consider the number of resources and determine optimal points of reserve vehicles.

3.3 Analysis that determine collection frequency and vehicle distribution according to necessity do not exist

Waste collection, removal and disposal is served by approximately 12, 000 containers, 134 waste vehicles and a new landfill of village Lilo in Tbilisi. Waste is weighted with the special weighing scales, as it is disposed at the landfill. However, data collection are not conducted according to the districts, but according to vehicles at the landfill. Therefore, there are no statistics of waste volume except of Isani-

Samgori district, as the remaining four districts are served by transit station and control of volume of the received waste are not observed.

The audit revealed that waste collected in 2013, which in total amounted to (349, 949 tons) presents, only 23% of the total capacity of waste containers in both shifts (1,529,054 tons[39]). It should be noted, that in the Isani-Samgori district the same pattern was reported. In 2013 the Isani- Samgori district collected waste, (88, 980 tons) which was only 23,2% of the total capacity of waste containers (383,620). The present data can be generalized on the whole territory of Tbilisi as the filling coefficient of waste container, based on these calculation the optimal allocation of special waste vehicles throughout the city can be determined. Based on these assumptions Isani-Samgori example is discussed below, where it appears, that based on accurate information schedules and routes can be optimized.

Isani - Samgory Example

Isan – Samgori district has in total 35 routes and 31 waste trucks. In 1st shift - 25 and in 2nd shift – 10, out of these vehicles 4 waste trucks are repeated in the 2nd shift.

[39] In Tbilisi total capacity of served containers 1,529,054 tons, is calculated according to Tbilservice Group's waste trucks schedule. In the schedule are provided number and volume of served containers on each route. According to this data audit team calculated total volume of served containers - 7,645,271 m^3. Total capacity in tons is calculated by multiplication total volume by 0.2 This coefficient is the weight of 1m^3 waste. With the same calculations is obtained total capacity of served containers of Isani-Samgori region – 383,620 tons.

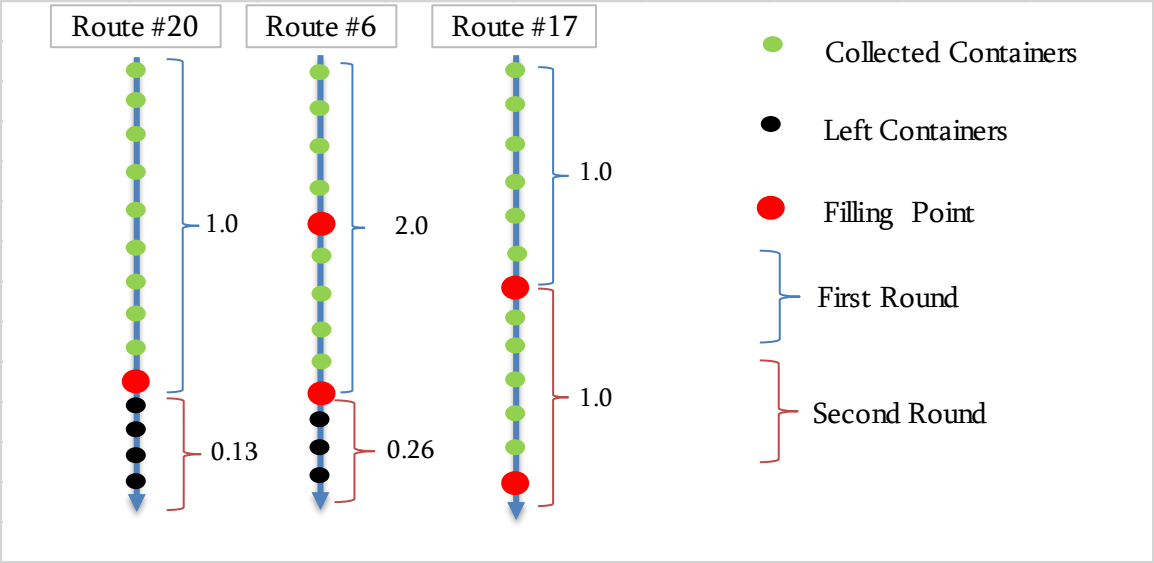
Table 3.3.1: Isani – Samgori district records of routes of 1st shift

Number of Routes	Vehicle Capacity (Ton)	Volume of Containers (m3)	23% Full Containers (m3)	Pressed in Vehicle (Ton)	Number Rounds	Amount of Waste left After the Last Round (Ton)
11	9.6	113.30	26.28	15.77	1.64	
9	12	156.02	36.19	21.71	1.81	
21	11.4	153.30	35.56	21.33	1.87	
2	7.8	105.98	24.58	14.75	1.89	
18	12	171.56	39.79	23.88	1.99	
17	10.8	155.02	35.96	21.57	2.00	
23	7.8	121.24	28.12	16.87	2.16	1.27
10	12	124.59	28.90	17.34	1.44	5.34
14	12	126.39	29.32	17.59	1.47	5.59
8	12	193.70	44.93	26.96	2.25	2.96
20	11.4	92.40	21.43	12.86	1.13	1.46
6	7.8	126.94	29.44	17.67	2.26	2.07
19	12	196.24	45.52	27.31	2.28	3.31
15	12	200.90	46.60	27.96	2.33	3.96
22	7.8	130.90	30.36	18.22	2.34	2.62
1	11.4	198.08	45.94	27.57	2.42	4.77
3	7.8	138.94	32.23	19.34	2.48	3.74
13	7.8	180.40	41.84	25.11	3.22	1.71
25	4.2	164.72	38.21	22.92	5.46	1.92
4	7.8	234.26	54.34	32.60	4.18	1.40
5	7.8	202.02	46.86	28.11	3.60	
16	9.6	255.18	59.19	35.51	3.70	
12	12	349.00	80.95	48.57	4.05	
7	7.8	322.88	74.89	44.93	5.76	
24	4.2	332.02	77.01	46.21	11.00	

Each route is allocated with waste vehicle with certain capacity and serves specific number of waste containers. These numbers are shown in the table with the total capacity of containers per route. According to the audit team calculation, Isan - Samgory district containers were filled only with 23,3% as average amount on each route. The number of route rounds, is ratio of the waste amount on each route to the vehicle capacity.

Routes are drawn optimally, where collection rounds point to, or are close to round numbers and waste amount on a route matches exactly to the existing vehicle capacity. Whereas, those collection rounds, which are not round numbers routes are non-optimal. For example, number of rounds of 20th route indicates - 1.13, which means that at a certain section of the route vehicle is filled with waste and cannot afford to reach all containers. After vehicle is filled with waste, it disposes waste at the landfill and then returns to the remaining containers. In this case, the returned waste vehicle collects remaining amount of waste, which is filled only by 13%, meaning that waste vehicle returns 87% empty. Table 3.3.1 gives graphical image of the 20th route. Also the same table shows the optimal 17th route, where collection rounds are the closest to optimal.

Graph 3.3.2: Optimal and Non-Optimal Routes



Number of route rounds may be more than one. However, each following round must be designed in a way that vehicle should return to the landfill at the end of each round full. For example, in route 6, which is shown in the graph 3.3.2, number of visiting rounds present 2.26. This means that the vehicle needs to make three rounds on entire route to collect all waste and on the third round vehicle returns 26% full.

According to described analyses, in Isan-Samgori district, in the 1st shift 14 routes can be regarded as non-optimal out of existing 25 routes, because vehicles are returning empty on average by 70% on these routes. Based on the same analyses, in Isan-Samgori district, in 2nd shift, six routes out of ten are non-optimal (see Table 3.3.3).

Table 3.3.3: Data of Routes of 2nd Shifts of Isani-Samgori District

Number of Routes	Vehicle Capacity (Ton)	Volume of Containers (m3)	23% Full Containers (m3)	Pressed in Vehicle (Ton)	Number Rounds
31	7.8	100.08	23.21	13.93	1.79
36	7.8	107.80	25.00	15.00	1.92
30	7.8	113.30	26.28	15.77	2.02
34	7.8	113.50	26.33	15.80	2.03
32	7.8	82.50	19.14	11.48	1.47
27	7.8	124.59	28.90	17.34	2.22
29	7.8	126.94	29.44	17.67	2.26
35	7.8	129.80	30.11	18.06	2.32
28	7.8	130.90	30.36	18.22	2.34
33	7.8	132.24	30.67	18.40	2.36

In 1st and 2nd shifts of Isan- Samgori district non-optimal routes are marked with green color, and the optimal routes - with blue. For optimization of the number of route rounds, the most effective way is the correct planning of the route, which is based on the exact information of the waste amount, on a particular point of time. The calculations are based on the filling level of 23,2% of the waste containers. In case of better planning it is possible to increase this data, which means that the routes should be planned in such a manner that increasingly filled containers are served by the vehicles. For example, if we increase the level of filling of the containers up to 29%[40] in Isan-Samgori district, number of non-optimal route rounds in Table 3.3.1 will become closer to optimal.

Table 3.3.4: Routes with Improved Filling Coefficient Level of 29%

[40] Audit team analysis revealed that if we increase filling level to 29% on 14 non optimal routes of Isani-Samgori, 11 ones will approach to optimal condition. Only in case of route #3 and #4 is required 27% filling level and on 20th route - 40%.

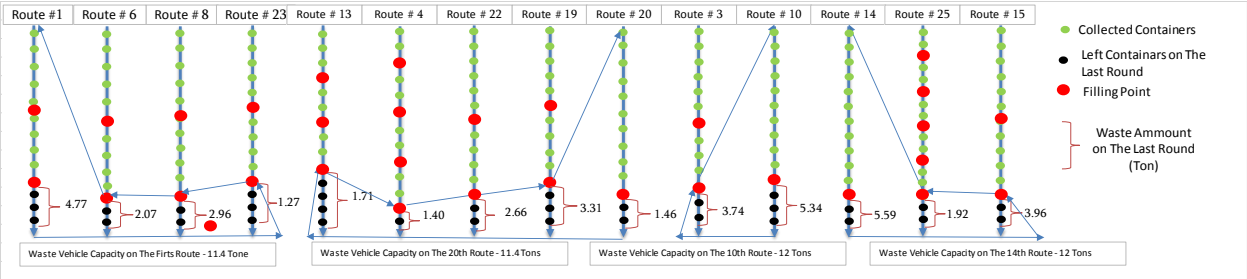
Number of Routes	Vehicle Capacity (Ton)	Volume of Containers (m3)	29% Full Containers (m3)	Pressed in Vehicle (Ton)	Number Rounds
23	7.8	121.24	35.16	21.10	2.70
10	12	124.59	36.13	21.68	1.81
14	12	126.39	36.65	21.99	1.83
8	12	193.70	56.17	33.70	2.81
20	11.4	92.40	26.80	16.08	1.41
6	7.8	126.94	36.81	22.09	2.83
19	12	196.24	56.91	34.15	2.85
15	12	200.90	58.26	34.96	2.91
22	7.8	130.90	37.96	22.78	2.92
1	11.4	198.08	57.44	34.47	3.02
3	7.8	138.94	40.29	24.18	3.10
13	7.8	180.40	52.32	31.39	4.02
25	4.2	164.72	47.77	28.66	6.82
4	7.8	234.26	67.94	40.76	5.23

Table 3.3.4 shows the routes, where rising of level of filling of containers results to achieving optimal condition of routes. In such cases, the vehicle will come back full with waste from the second round. To achieve the above mentioned condition, vehicle must start the second round when the containers are full with waste on average of 29 %.

29% - can be replaced based on individual routes, to get the optimal route rounds. For example: if we decrease the filling level of containers until 27% in route # 3 and #4, number of rounds will reach 2.89 and 2. 87, or alternatively, we can increase the vehicle capacity to reach the optimal condition of route rounds.

Non- optimal routes can be improved by various methods. The audit team chosen two options, which may prove to be the best method to solve the problem. These methods are shown in graph 3.3.5 and 3.3.6.

Graph 3.3.5: First Method of Improving Non Optimal Routes in 1st Shift of Isani – Samgori District

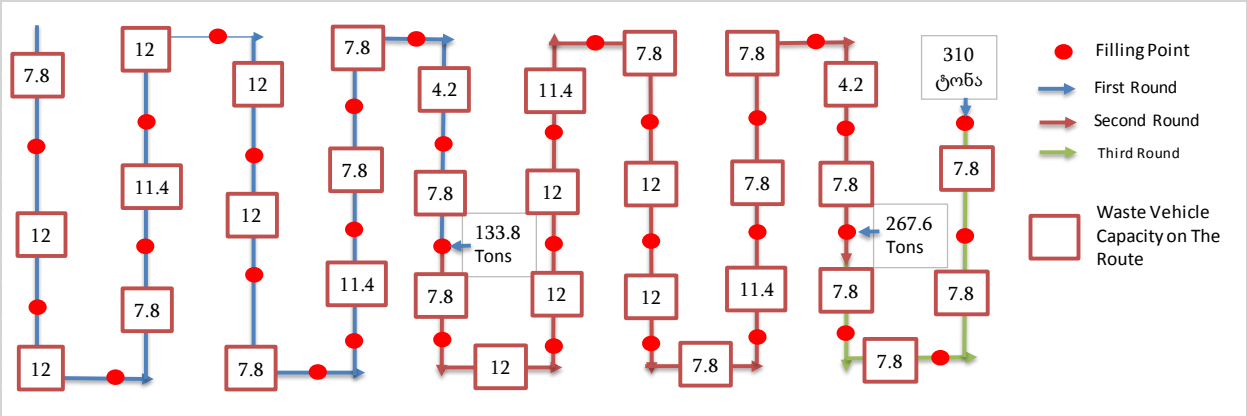


Method shown on the graph 3.3.5, indicates that vehicle from the 1st route, shall serve 6rd 8th 23th routes on 2nd rounds to collect the remaining waste and the vehicle from 20th route serves 13th, 4th, 22th, and 19th routes, vehicle from 3rd route goes to collect remaining waste from 10th route, and vehicle from 25 and 15 routes serves vehicle from 14th route to collect remaining waste on 2nd round. Accordingly, instead of 14 vehicles in the last round runs four vehicles, which hold sufficient capacity to carry remaining amount of 42.1 tons of waste.

To implement the method shown on the Graph 3, non-optimal route should end at the filling point, and the next route should begin where the previous vehicle has left. According to current situation, in Isan-Samgori district non-optimal routes serve total amount of 101, 5 tons, total capacity of the serving vehicles are 90 Tons and 9 Routes are served with 9 vehicle serves in 2 rounds. According to above-mentioned method, it is possible to collect the 90 tons of waste on one route by one round; only one vehicle will have to make two rounds, which will collect the remaining 11, 5 tons of waste. As a result of this method, the vehicles are full with waste and productive.

To implement the method shown on the Graph 3.3.6, non-optimal route should end at the filling point, and the next route should begin where the previous vehicle left. According to current situation, in Isan-Samgori district non-optimal routes serve total amount of 310 tons, total capacity of the serving 14 vehicles are 133,8 Tons. According to existing situation, 45 rounds are made on the non-optimal routes. According to the method of audit team, if 14 waste vehicles make 2 rounds, it will be able to transport 267 tons of waste, the remaining 43 ton of waste can be removed by 4 rounds,. Thereby, the number of rounds can be reduced from 45 to 32.

Graph 3.3.6: Second Method of improving non optimal routes of 1st shift of Isani –Samgori district



Vehicles are distributed under schedules in a non-optimal way in 20 out of the existing 35 routes in Isan-Samgori district. On the mentioned routes, the vehicles have to make unproductive 2nd rounds, due to which they come back on average 70% empty. Consequently, the vehicles are engaged in unnecessary work and incur extra costs. The audit analyses revealed, non-optimal schedules in Isan – Samgori district require for the 2nd round only 4 vehicles, which is less than 10 vehicles compared to actual process.

The above-mentioned data might indicate, 1) surplus of waste containers, which is certainly caused by irrational allocation of waste containers, or 2) by non-optimal route schedules, which leads to providing service of empty and not the full containers. Non-optimal use of waste vehicle leads to unnecessary fuel costs. Analyses of Isan – Samgori example demonstrates that it is possible to optimize routes based on accurate data; as a result, the use of vehicles will fit in the most accurate way the city routes.

The audit analysis is conducted based on the calculation (23, 2% filled containers). To bring the model closer to reality, it is required to have research-based information, according to which vehicle schedules will be developed. With the accurate knowledge of the waste amount, vehicle shall be allocated on the routes not based on the number of the waste containers, but based on the waste amount on the specific route, which shall increase the effectiveness of the used technology.

Recommendations:

For the effective operation of the municipal solid waste management system, one of the most essential components is waste disposal system optimization. The "Tbilservice Group" Schedule analysis revealed that with the repeat of the first shift technically functional vehicles on the first and second shifts, the same work can be done and significant savings can be achieved. The repeat of vehicles in the first and the second shifts reduces the number of cars. The same number waste disposal is available with less appliances.

For optimizing waste disposal system a decisive role is played by the proper planning of waste routes. The analysis revealed non-optimal routes in the schedule, with the optimization of which, increase of productivity of waste vehicles is possible.

4. Waste Collection Fee in Municipalities

4.1 Imposed waste fee is not collected in municipalities

In Georgia, major funding source for collection and disposal of the municipal solid waste is municipal waste fee. The fee corresponds to the "fee for cleaning residual areas," which is set in the law, with reference to the "local collection fees".[41] According to the law, collection fee shall not exceed three GEL for physical person per month, per capita, whereas fee for legal entities and organizations are - 25 GEL per cubic meter of waste.

World practice provides different methods for collection of waste tariff, including - billing system. Billing system represents identification of exact number of residents, who are supplied with cleaning service, in order to send them electronic bills. In Georgia, such practice is introduced only to Tbilisi and Batumi. Regulation of consumers by "billing" system consists from each registered consumer's unified utility bills, including waste collection fee. In Tbilisi, revenue obtained from waste fee demonstrated, for the initial stage, the present practice is the best approach for collection of the waste fee.

International experience demonstrates that waste collection and transportation service falls under responsibility of municipalities. Municipalities are entitled to determine the amount of waste tariff and collect waste fee.

As it turns out from audit team surveys obtained from municipalities[42], return from the waste management expenses in Georgia is very low. Tender winner companies are responsible for collecting and removing waste in municipalities, their service is engaged, primarily, on the territories of municipalities.

Audit team surveys made demonstrated that in 2012 -2013 that 11 out of 51 municipalities do not have any information on the number of residents, to whom they supply the waste collection service and 19 municipalities do not have accounted information on those residents, to whom they supply the service.

In the municipalities, where waste collection services are provided, collection is carried out based on old-fashioned method, consisting of hand-filled bills and the "collector". At the time the "collector" makes his rounds, if a resident is not at home, collector neither issues the bill nor transfers it to the resident, which further reduces number of the paying customers.

In Tbilisi and Batumi situation is better than in other cities and regions. Electronic accounting system – same as the billing system determines the exact number of paying customers. Electricity Provider Company organizes the system. Every month the population receives printed all electronic utility bills per person, including - waste bills. The example shows well how the waste fee collection system works - if a person does not pay waste fee by prescribed date, he/she shall be restricted from the electricity

[41] Georgian Law on Collection Fees, Article 12^1, Para. 4.
[42] *See* Annex N1.

supply. Due to this approach, revenues gained from the waste collection fee between July and December 2013[43] in Tbilisi presents 92%, which is the best result in contrast with the other municipalities and self-governing cities.

The situation is not exemplary in the city of Batumi, because waste collection system is different than in Tbilisi, namely, waste collection fee is not attached to electricity bill. However, the collection fee is gathered based on issued electronic bill per person. Despite of the difference, in comparison with the other big cities the situation is relatively better in Batumi.

Table 4.4.1: Received revenue in comparison with accrued [44] revenue

2012 year	average number of subscribers	tariff	accrued revenue	received revenue	collection rate
Tbilisi	951,713	0.05 - 0.025 KW/H	40,255,929	39,475,185	**98%**
Batumi	97,907	1.8	2,114,791	773,018	**37%**
38 municipalities	479,621	0.2 - 2.50	2,852,047	1,209,333	**42%**

2013 year	average number of subscribers	tariff	accrued revenue	received revenue	collection rate
Tbilisi	898,422	2.5	13,476,330	12,426,040	**92%**
Batumi	93,324	1.3	1,455,854	968,686	**67%**
38 municipalities	486,251	0.2-1	2,657,729	1,231,815	**46%**

Based on the analysis, we can assume that the billing system does not exist in municipalities. Fee collection is not performed under well-established system, which directly reflects on profitability of municipality budget.

Waste collection fee system malfunctions cause inefficient budget spending in municipalities. A similar approach for the management (municipalities) indicates the formation of incorrect functions. There is possibility, in future, wholly or partially to reimburse waste cleaning and transportation costs by revenues received from the waste fees. As service area increases, so do expenses. With the increase of the service area, the number of waste collection fee payers should increase proportionally.

[43] In 2013 during 6 months waste collection fee was tied to consumption of kw/h of electricity, from June 2013 with the decision of city council the waste tariff was set to 2.50 GEL.

[44] Fee imposed for providing a service

Therefore, improved method for the waste collection fee system in municipalities should be applied, as the system is in a demand of enhancement and modernization. To achieve this, however, invention of the new mechanisms is not required, as it is possible to apply the best practice employed in Georgia.

4.2 Tariffs imposed in municipalities are unfounded and do not cover actual costs required for cleaning

Selection of funding method is of the crucial importance for the waste management system. Main goal of the funding plan is to cover expenses incurred from waste collection. According to international practice, the primary source of funding for cleaning service lies in waste collection fee paid by the residents. The tariff is determined based on costs of waste collection and removal per person.

Collection fee for municipal waste management service is fixed in Georgia and varies between 0, 2 – 2, 5 GEL on each family member per month. Exception was observed in 2012, when the waste collection fee was tied to the electricity bill and each family paid based on consumption of each kilowatt-hour of electricity. In June 2013, municipality of Tbilisi reversed the decision[45] and set the waste collection fee at 2.5 GEL per person per month. For establishing and administering cleaning service tariff, as a good example, can be used the Tariff system of the city of Tbilisi.

In Georgia major source of funding of collection and treatment of the municipal waste, is the municipal waste fee. Currently, municipalities define tariff of waste collection fee, which is of the minimum amount and can be observed from the data of the surveyed municipalities.

In the cities and regional centers, where the cleaning service is provided, waste tariff varies between 2.5 to 0.2 GEL on per month, per capita, per annum.

Table 4.2.1: Municipal Tariffs on Waste Service in 2013 (GEL)

Municipal Tariffs on Waste Service in 2013 (GEL)

[45] Decision of Tbilisi City Council № 7-22.

Municipality	*Tariff*	*Municipality*	*Tariff*	*Municipality*	*Tariff*
Tbilisi	2.5	Khashuri	0.5	Mtskheta	0.35
Batumi	1.3	Tetritskaro	0.5	Dusheti	0.34
Kobuleti	1	Sachkhere	0.5	Mestia	0.3
Borjomi	0.6	Kharagauli	0.5	Chkhorotsku	0.3
Adigeni	0.5	Aspindza	0.5	Tsalegikha	0.3
Dedoplistskaro	0.5	Lanchkhuti	0.5	Akhmeta	0.2
Zestaponi	0.5	Kutaisi	0.5	Marneuli	0.2
Lagodekhi	0.5	Martvili	0.5	Sagarejo	0.2
Tskaltubo	0.5	Telavi	0.5	Kazbegi	0.2
Ambrolauri	0.5	Zugdidi	0.5	Ninotsminda	0.2
Poti	0.5	Bagdadti	0.5	Chokhatauri	0.2
Khobi	0.5	Khelvachauri	0.45	Khulo	0.2
Qareli	0.5	Rustavi	0.4	Qeda	0.15
Chiatura	0.5	Signagi	0.4		

In municipalities, tender winner companies are responsible for the waste collection and disposal. The tender winner companies generally receive funding from the municipal budget, from which share in percentage of received/ accrued revenue is considerably low and in 2013 amounted only 12%. The table 4.2.2 includes analyses of those municipalities, which deliver the service and the estimated number of residents are accounted. Based on the analysis we conclude, in none of the municipalities of Georgia received revenues provide at least half for the funding of service coasts.

Table 4.2.2: Share of received revenues in comparison with the actual costs

2013	Subscribers	Tariff	Accrued Revenue	Agreement Amount	% Rate
Tbilisi 6 month	898,422	2.5	13,476,330	32,080,825	42%
Batumi	93,324	1.3	1,455,854	5,518,581	26%
38 municipalities	486,251	0.2-1	2,657,729	21,972,086	12%

2014	Subscribers	Tariff	Accrued Revenue	Agreement Amount	% Rate
Tbilisi 6 month	896651	2.5	26,899,530	47,999,959	56%
Batumi	95868	1.3	1,495,541	6,307,610	24%
38 municipalities	500844	0.2-1	2,792,874	17,839,486	16%

As for the legal entities, tariffs are defined according to spheres by a fixed monthly payment. According to the information from the "Tbilservice Group" some legal entities are known as the so-called "mother

subscribers", as its subscriber number is used among several legal entities. However, the tariff is being paid as one fixed subscriber number.

The analyses conducted by the audit team demonstrated that income from waste collection fee is very low and tariffs imposed by municipalities are not based on any analyses. Based on a 2014 survey of 49 [46]municipal units, eight municipalities do not have any tariff at all; from the remaining 40 municipalities 37 prescribed the tariff according to a minimum threshold.[47]

This approach is due to the fact that municipalities do not carry out tariff analysis, observation, or income assessment, based on which municipalities can calculate adequate tariff for waste collection.

Given the current situation, we can assume that the budget allocations from the state for the cleaning services is of "charitable" nature, and if in the future the correct mechanisms will not be developed, together with the increase of the service, expenses from budget funds will increase, but income received from waste fee collection will remain unchanged.

Recommendations:

- The State Audit Office considers reasonable to develop waste collection fee system in each municipality, where the waste services are provided. First, billing system should be developed, which would determine exact number of population, tariff to be paid and ensure waste fee collection.
- Each municipality that has waste service should establish reasonable tariff system for waste collection fee. The amount of fee and the scale of collection should be increased, in order to terminate, or to minimize gradually financing from the state/municipal budget.

5. Environmental Impact of the Old and New Landfills

5.1 Environmental monitoring of the old landfills are not conducted

Development of the framework legislation, as well as, general procedures and ensure planning of the waste management system, are one of the obligations, which is undertaken by Georgia under the EU Association Agreement. Therefore, maintenance of the landfills present priority for Georgia.

Maintenance of Landfill involves introduction of such mechanisms, which prevent air, water and soil pollution, as well as, spread of noise and odor and prevent disposal of the hazardous waste in the

[46] Inquiry is send to all municipalities, answer was received from 49 municipalities and 2 cities –Tbilisi and Batumi.
[47] See Annex N1.

municipal landfills. Important in terms of avoidance of odor spread air pollution is to protect landfill operation requirements, including waste disposal, compaction, and regular cover of soil.

In addition, it is necessary to completely isolate waste from environment. The humans and animals should not access the landfill without due control and the scattering of waste into environment should be avoided. To avoid scattering of light fractions into environment at the time of unloading the waste at the landfill, portable fences are made to the direction of perpendicular prevailing winds.[48]

As the "Solid waste landfill operating rules and norms" indicate, the monitoring system is turned on systematic monitoring of ambient air conditions. The content of compounds are defined, which are characteristic of biochemical process of solid waste and represent a major threat.[49]

To avoid problems, and prevent dangerous incidents, it is necessary to protect landfill operation norms and to implement environmental monitoring of landfills by landfill manager[50]. Whereas, obligation to ensure protection of environmental norms falls under the competence of the Ministry of the Environment and Natural Resources Protection of Georgia. The Ministry is the leading state institution in the waste management system. The Ministry determines state policy in the field of the waste management, issues permits on environment impact and provides monitoring of waste management for organization of monitoring of the environmental pollution.[51]

None of the Georgia's old landfills comply with international standards, and accordingly, permits are not issued.[52] Old Landfills originally were imposed obligation to obtain permits, which was later postponed until January 2010. Afterwards the deadline for obtaining a permit was delayed each year and the last deadline was January 2015. However, according to Waste Management Code, the landfill operator after approval of government decree on "Landfill construction, operation, closure and post-care" within 6 months should present compliance plan on operation of landfill in accordance with the terms and conditions.[53]

Maintenance of the 51 old registered landfills out of existing 53 old landfills is carried out by the LLC "Solid Waste Management Company," which manages the total area of 1,786,196 square meters. As the company states on 13 old landfills waste disposal is terminated. Renovation project for 8 landfills (Ambrolauri, Kutaisi, Mtskheta, Ozurgeti, Zugdidi, Telavi, Akhaltsikhe and Gori) was carried out in 2013. Special stands were erected at the landfills, where operators equipped with special cloths are placed, they control access of the humans and animals at the landfills. As for the hazardous waste entering the landfill, control can only be exercised by the company's employee's visual inspection. Landfills from only 5 cities (Telavi, Akhaltsikhe, Gori, Kutaisi, Ozurgeti) received automatic scales. The company received 13

[48] Technical Regalement - „Municipal solid waste landfill construction and operation rules and norms " Article 11, 2013.
[49] *Ibid,* Article 19.
[50] *Ibid,* Article 15.
[51] Georgian Law on Environment Protection; Article 13.
[52] Georgian law on Environment Impact Permit; Article 4, Para (e).
[53] Waste Management Code, Article 23, Paragraph 2, 2015.

out of 51 landfills already fenced, fencing of 17 landfills is complete, and fencing of the rest of the landfills is in ongoing process. In 2014, the company acquired 16 items of technology and received 2 from municipalities to protect operation norms.

Two old - Kobuleti and Batumi landfills operate in Autonomous Republic of Adjara. Kobuleti landfill is maintained by the LLC "Sandasuptaveba" and Batumi landfill by - LLC "Severi", which was transferred to the company since 2012.

None of the landfills are fenced, respectively, animals and humans are free to enter the area. Batumi landfill is located along the river, 2 km away from the sea coast, about 3 km away from the Batumi International Airport. Waste weighting scale is installed at the entrance, only one tractor operates at the landfill which disperses the waste (See Picture 5.1.1).

Picture 5.1.1: Strategic Objects Placed Nearby Batumi Landfill

Picture 5.1.2: Animals in territory of the Batumi Landfill

There is a plan to gradually terminate operation of the old landfills and construct eight new landfills, which should meet international standards and ensure complete waste disposal. Certain steps are taken

to solve problems of the waste collection and disposal today in Georgia, however, due to uncontrolled waste disposal, problem of environmental pollution is still very actual.

Despite of the companies' [54]efforts to maintain the old landfills, the problems remain unsettled and present constant source of pollution. Operation requirements are violated at the 22 landfills (20 - "Solid Waste Management Company", 1 - LLC "Sandasuptaveba", 1- LLC "Severi"), there is not conducted pressing, compacting and burying of waste to avoid incendiary.[55] Remaining 23 landfills are not fenced (21 – LLC "Solid Waste Management Company", 1 - LLC "Sandasuptaveba", 1- LLC "Severi".[56]

State control is not carried out by the Ministry of Environment and Natural Resources Protection of Georgia on protection of environment requirements, such as air, water and soil pollution. There is no assessment of what harm the existing situation can bring to human health of population living near the landfills and environment, in terms of damage.

Non-existence of monitoring indicates low level of fulfillment of operation norms. Approximately 80% of the landfills are located near the bank of rivers, ravines, leading to inevitable contamination of surface water. As landfills are located near agricultural lands, the scattered remnants pose a threat to agriculture. In landfills low-temperature open burning of waste is occurring spontaneously, which leads to extremely hazardous air pollutant (Dioxins and Furans) emissions.

The landfills face the following problems: Landfills were constructed in the Soviet Union and were built without a construction project. That is the reason why the landfills are not properly maintainable. Besides of the above mentioned, none of the responsible bodies are free from their obligation to comply with operation norms of the landfill.

Non-existence of monitoring activities on environment pollution is caused due to non-fulfillment of obligations by responsible authority. The Law on Environment Protection[57] directly points out obligation of the Ministry to protect and keep healthy (safe) environment and ensure the protection of the environment from harmful effects. [58]

Besides of the fact, that compliance of the old landfills with modern standards require substantial investment and accordingly, do not constitute subject matter of the audit, it is possible to improve landfill management and maintenance, by complying with the operation norms and by implementation of the relevant monitoring system, without which the results of the environmental pollution will significantly affect the population.

[54] LLC „Solid Waste Management Company", LLC „Sandasuptaveba".
[55] From the information received from the company we assume that in those landfills where there special technology is located only there is preformed every day operation norm requirements, also terminated landfills are taken into account.
[56] Information received from LLC „Solid Waste Management Company "and LLC „Sandasuptaveba".
[57] Georgian Law on Environment Protection; Article 13, 1996.
[58] Georgian Law on Environment Protection, Article 3, 5, 1996.

It is important to carry out environmental monitoring of the old landfills and to request fulfillment of at least the minimum requirements from the old landfills. Such as fencing, planting green zones along the landfill and buying radiation detectors. While on the old landfills permits are not issued and landfill operator has no obligations, from environment protection point of view, it is necessary to determine what kind of threat the existing situation of the landfills pose on human health and on environment.

5.2 The New landfills (except of Rustavi landfill) are built without due consideration of the Environment Impact Assessment (EIA)

There are many problems in terms of the solid waste management in Georgia. To settle the problems efforts are being taken. Direct contact of waste with the environment, in addition to visual and sanitarian problems causes significant damage. For example, due to leakage waters, rain falls on the waste flows into the ground and causes pollution of the ground water. The waste decompose generates methane and creates danger of fire, as well as it affects the climate.

In case of the sanitary landfill a bed is installed in the bottom, which isolates the water, to prevent leakage into the ground water. Leakage water is treated, filtered and then returned to the environment, gas emissions are controlled as well.

A landfill is considered to conform to international standards, if isolation quality, monitoring system, cell closing technologies, and during the operation proper function of cells - all the procedures are fully complied (waste compacting, pressing, overlap).

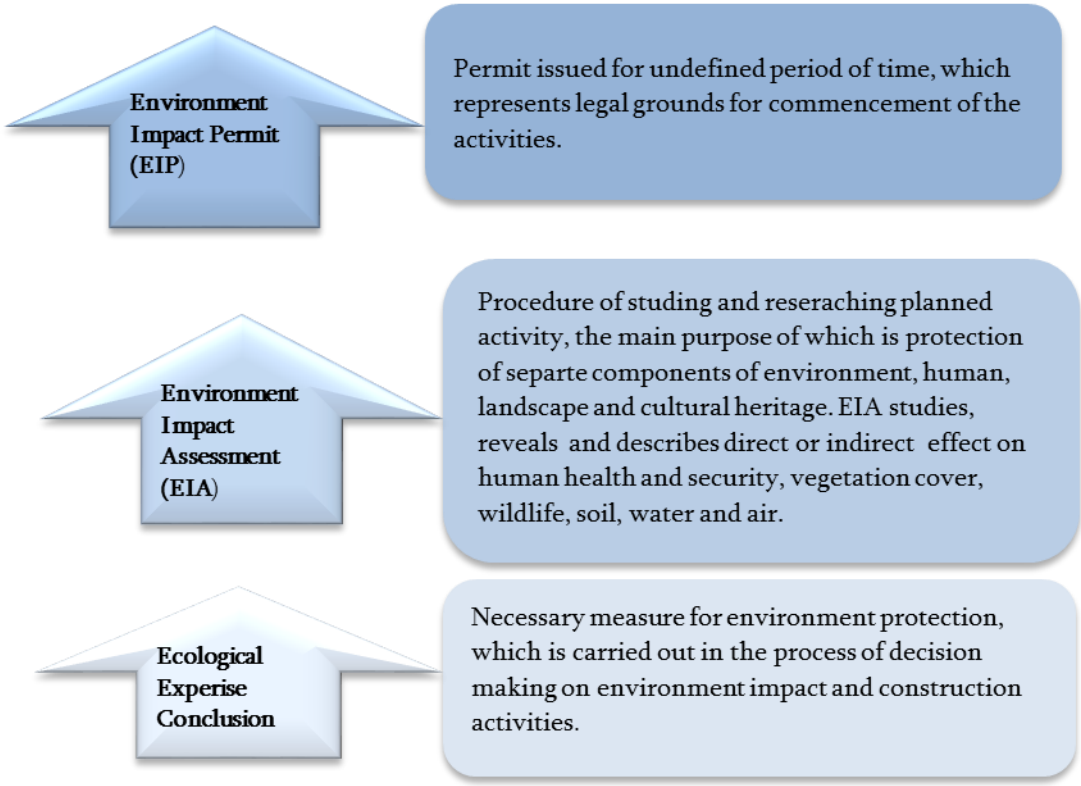
Disposal of epidemiological and chemically hazardous waste are prohibited in MSW landfills, as they have to be buried with a special technique, or receive certain method of treatment[59]. According to Georgian legislation, distance from the borderline of the landfill to the residential building should not be less than 500 meters.[60] According to the standards of the International Civil Aviation and Airport - landfill has to be located at least 13 km away from the landfill. In case the existing landfills, which are located near the airport are not closed, competent authority introduces control mechanisms in order to reduce bird attraction to the landfill. Control mechanisms present fencing of the landfill, building the retina fences, wiring the surrounding of the landfill, thus, use of different mechanisms to scatter birds.[61]

Laboratory of the company which serves the landfill exercises control of the waste. Laboratory has to systematically control factional, morphological and chemical composition of the waste, protection of the containers washing regime, air pollution, open water reservoirs and underground water pollution, dynamics compared to the control.

[59] Technichal Regalement - „ Municipal Solid Waste Landfill Construction and operation norms and rules".
[60] *Ibid,* Article 5, Para 5.
[61] International Civil Aviation Organization (ICAO), airport services manual, part 3, http://www.bazl.admin.ch/dokumentation/grundlagen/02643/02644/index.html.

Environmental Impact Assessment (hereinafter - EIA) procedures have to protect environment from adverse effects of the landfill . Legislation provides through the EIA and other relevant procedures to receive the permit.[62] EIA is issued by the Ministry of Environment and Natural Resources Protection of Georgia.

Graph 5.2.1: Procedure for Obtaining Environment Impact Permit



According to the law, the EIA procedure is scheduled to study and research activities aimed at the individual components of the environment, human, as well as landscape and cultural heritage, which will examine and identify the direct and indirect impact on human health and safety. In addition, the EIA procedures protect environment from negative impacts, as well as, provides one of the most important grounds for public involvement in the process.

The only landfill among the new landfills in Georgia, which has taken the environmental permit is the Rustavi landfill. EIA procedures necessary for obtaining the permits lasted between years of 2007-2010 and was issued on 06.11.2010.

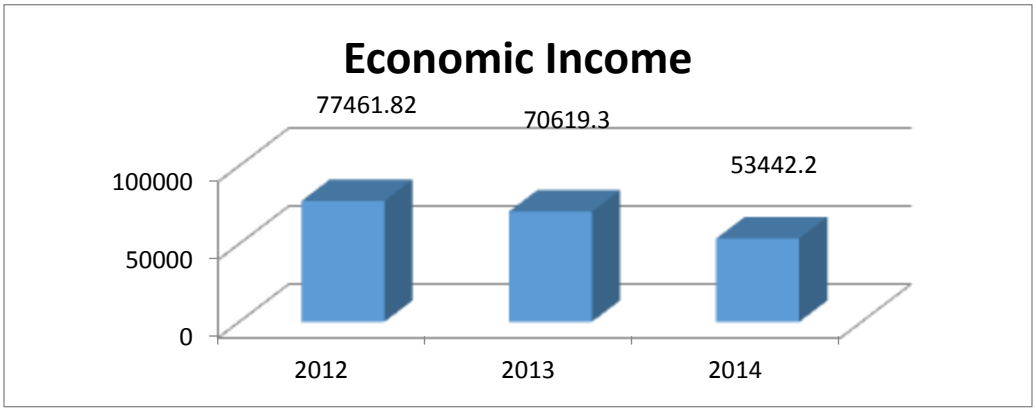
Rustavi municipal household waste landfill construction permit was issued by the Ministry of Economy and Sustainable Development and the LEPL Technical and Construction Inspection Agency.[63] Operation of the landfill was designed for 12 years and is eligible to receive a maximum of 120-130 tons of waste

[62] Georgian Law on Environmental Impact Assessment, 2007.
[63] Ministry of the Economics and Sustainable Development of Georgia, Order N01/-05, 30.10.2012.

on daily basis. The landfill is located from Tbilisi International Airport from 10 –km away and from Vaziani Military Airport 3,5 – km away.[64]

Rustavi Landfill is a good example, as the landfill has practice of waste separation and sorting, usable secondary raw materials are sold for reuse. Landfill workers sort the received waste, separate waste, recycle usable residues. After the workers weight the waste, it is placed in a special cell. Afterwards, the waste is pressed and buried under the soil layers. Landfill has its own economic income from the sold raw materials.

Graph 5.2.2: The Economic Income from Recycling at Rustavi Landfill (GEL)



As for Borjomi and Tbilisi landfill, the Minister of Environment and Natural Resources protection of Georgia exempted the projects of landfill construction from the Environment Impact Assessment (EIA).[65] EIA - release procedure is regulated by the Law on Environmental Impact Permits.[66]

Table 5.2.3: Procedures to Obtain Environment Impact Permit (EIP)

Issuance of Environment Impact Permit (EIP)	Issued	Issued	Rejected

[64] Environmental and social impact assessment report of non hazardous waste landfill near Rustavi in Georgia; 2008, p. 99.

[65] 1) Order of the Minster of Environment and Natural Resources Protection of Georgia № I - 90, on exemption from the obligation of environment impact assessment procedure for the solid waste landfill construction and operation activities in Tbilisi.
2) Order of the Minster of Environment and Natural Resources Protection of Georgia №182, on exemption from obligation of environment impact assessment procedure for the solid waste landfill construction and operation activities in landfill of Borjomi municipality. 2012.

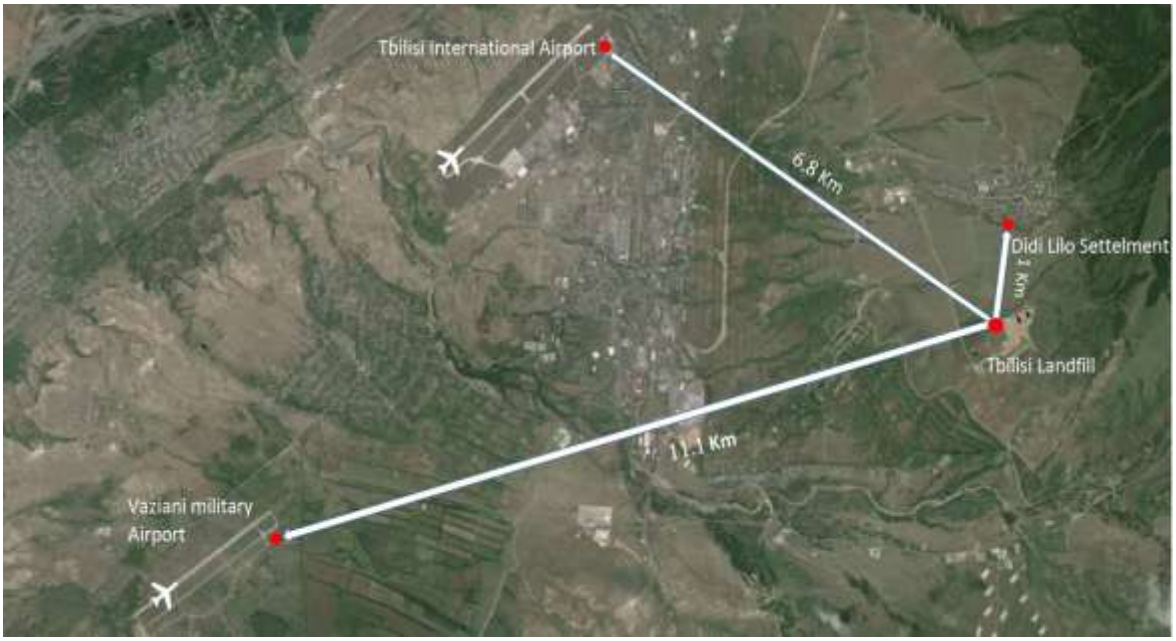
[66] Law of Georgia Environment Impact Assessment, Article 11, 2007.

Environment Impact Assessment (EIA)	Yes	Yes	No
Conclusion of Ecological Expertise	No	Yes	No

Tbilisi Landfill

Landfill of Tbilisi is located in the Gardabani district in the village of Didi Lilo. Landfill is located 7.5 km away from the Tbilisi Civil Airport and 10.65 km away from Tbilisi Military Airport and has territory of 84 ha. The Landfill construction began in March 2010 and was commissioned in November 2011, received for exploration by the Ministry of Economy and Sustainable Development of Georgia.[67] Conclusion on Ecological Expertise was issued on March 24, 2010.

Picture 5.2.4: Distance of Tbilisi Landfill from Strategic Objects



Landfill construction and opening costs for landfill cell №1 amounted to 12 million GEL and construction of the next cell - 7.8 million GEL. Terms of exploitation of the landfill is 40 - 45 years. From the data of 08.07.2014, the cell № 1 can hold 1, 100, 000 tons of waste and cell №2 – 170, 999 tons of waste.

In the territory of the landfill waste is going through the checkpoint. Vehicles undergo radiation control and check of the accompanying documents (for waste identification). After the examination and

[67] Order of Minister of Economy and Sustainable Development №121/01-05.

inspection of the documents, waste is weighed and emptied into cell of the landfill, and then the waste vehicle is re-weighed. By the time the vehicle leaves waste polygon, tires are washed and disinfected.[68]

Picture 5.2.5: Surrounding area of Tbilisi Landfill

[68] http://www.netgazeti.ge/GE/105/Life/29604/.

The Ministry of Environment and Natural Resources Protection of Georgia has charged LLC "Tbilservice Group" with a fine twice for violating the terms of the conditions of the environmental permit. First the

company was fined for violation of terms and conditions of Ecological Expertise[69], which are the following:

- Arrange green zone, plant trees along the entire perimeter of the polygon and internal roads;
- Purchase portable (hand-held) radiation detector, accompanied by the telescopic extension sensor, in addition to the new portal monitors;
- Process and present parameters of the fire dangerous areas and extreme water volume discharge report to the Ministry of Environment and Natural Resources protection of Georgia;
- Submit concentration substances of contaminated water to National Environment Agency;
- Use special equipment to scare off birds, due to proximity to the international airport and for the flight security reasons.

The fine was imposed to remedy the violations. However, "Tbilservice Group" failed to fulfill its obligations by prescribed date and was charged a fine for the second time.

Landfill construction was carried out without Environmental Impact Assessment procedures, which indicates at the legislative shortcomings. Construction of landfills was undertaken without due fulfillment of the environment impact assessment procedures.

The new landfills (Tbilisi and Rustavi) are built near the airport in violation of the international standards. The standards are violated in Tbilisi Civil Airport and in Vaziani Military Airport.

Release of the EIA has led to not informing population. Researches show that the population is dissatisfied with the location of the landfill, due to odor problems. In addition, increased number of insects, causes deterioration of health condition. Although the distance between the landfill and the population is in compliance with the Georgian legislation, the problems still exist in the villages.[70] Birds, which are attracted to the landfill, pose a threat to the aircrafts and may cause their damage. In the Had the Environment Impact Assessment report been undertaken, all aspects of risks would be assessed including the distance between the airport and the landfill.

Unpleasant odor is caused by nonexistence of control ponds. Waste is located in an open space. Therefore, air and gas collecting technology should be installed. The mentioned problems are caused by shortcomings in legislation, which can be explained by dismissing the environmental impact assessment procedure. Dismissal of the procedure, implies that all aspects of risks at the rime of landfill construction

[69] Ecological Expertise issued by the Ministry of Environment and Natural Resources Protection of Georgia №12, Approval of decision of project of Tbilisi City Hall to dispose municipal solid waste in Tbilisi landfill and on its operation activities.
[70] https://www.youtube.com/watch?v=HKxseYxMIhE.

were not considered. In case the Environmental Impact Assessment procedure would have been complied, which is a document of a higher level than Ecological Expertise, the Company would have been working with increased commitment towards the state and the local population.

The State Audit Office is confident, that release from the IEA document creates the above mentioned problems. Constant monitoring should be continuously carried out on the new landfills, which are released from the EIA report. To eliminate the adverse effects, it is legitimate to tighten sanctions. We find reasonable EIA report on the landfill construction to no longer be avoided in the process of opening new landfills which are planned for the future.

For landfill construction in the future international aviation standards should be taken into account (distance of 13 km) should be taken into consideration, because the probability of risk occurrence is high.

Recommendations:

- The State Audit Office considers that with cooperation and support of the state structure that is in charge of state control of environment pollution, on the old landfills existing situation should be assessed. Namely, assessment should be made whether minimal requirement of landfill operation norms are fulfilled, and what threats landfill pose to human health and environment. Based on identified violation the responsible company should be obliged to improve the shortcomings. In case the shortcomings are not improved in a timely manner the sanctions should be imposed.
- The State Audit Office considers it necessary, operation norms to be complied in the old landfills in order to minimize the risk of spreading the waste into nature. The old landfills should be fenced and completely isolated to prevent animals and humans from accessing the landfill. The territory should be controlled.
- The State Audit Office Considers necessary in the process of opening new landfills in future, issuance of permit to be subject to Environment Impact Permit (EIA) and precedence of bypassing the Environmental Impact Assessment (EIA) procedure should not to be repeated. Those new landfills, which are released from Environment Impact Assessment (EIA) should be constantly monitored in order to resolve identified problems. In particular, in Tbilisi (Lilo) landfill, additional measures should be implemented to improve the health conditions of people living nearby the landfill.

6. Elimination and Prevention of Unregistered Landfills

6.1 In the most municipalities waste service is not provided to whole population

Problem of environment pollution due to uncontrolled dumping of waste is still very relevant in Georgia. Except of official registered landfills, almost all settlements have spontaneous, so-called unregistered landfills, which are formed by the population over time.

Waste collection systems are significantly important for distribution of responsibilities between the competent bodies regulated under the law. Traditionally, these activities are carried out by the competent services of the local self-government[71]. All self-governing cities and municipalities are required to develop rules on the waste disposal,[72] which defines the rights and obligations of waste management system. According to the mentioned rules waste collection and removal is under the competence of the municipalities.

According to the EU Georgia Association Agreement, Georgia accepts responsibility to protect environment. The purpose of cooperation between the EU and Georgia presents preservation, protection, development and rehabilitation of the quality of the environment, protection of human health, sustainable use of natural resources and internationally promoting regional or global challenges of environment protection, including, areas of solid waste management.

In Georgia, uncontrolled, unregistered landfills are located in ravines, channels, river banks and the streets. Unregistered landfills do not go through any special treatment and present significant source of environment pollution. The landfills are completely non-isolated from the environment, which leads domestic and wild animals, birds and fish to feeding with waste[73]. Light fractions and other harmful waste are scattered in nature without due control.

Currently, in Georgia there are around 2,000 villages, but only 480 [74] of them have waste service system. Thus, 1520 villages are left without waste removal service leading to formation of at least 1 unregistered landfill in each village. The population is engaged in "self-service" and the waste is placed in arbitrarily selected areas, some population burns waste openly.

Based on the survey conducted in municipalities[75], from the whole population of Georgia (4,483,800) the service is provided only to population of Tbilisi (1,171,200) and Batumi (160,000) from the other municipalities around 814,799 inhabitants[76].

[71] Code on Local Self-Government, Article 16 (V,Z), 2014.
[72] Rules of capital cleaning, waste management, operator selection and waste disposal, 2013.
[73] Green Alternative; Green Alternative; *Some Current Issues related to landfill construction and Management;* 2011.
[74] Information obtained from municipalities indicates that approximately 480 villages are supplied with service.
[75] See Annex N1.
[76] As the municipalities have not exact data on the number of customers, the data they provided us with is

Given that 2,337,801 people are left without service and 0.320-0.423 tons of waste are produced per person per year, we conclude, that approximately 748,096 – 988,890 tons of waste are illegally dumped in nature per year.[77]

Given that 2,452,000 people are left without service and 0.5 tons of waste are produced per person per year, we conclude, that approximately 1,282,847 tons of waste is illegally dumped in nature per year.

Table 6.1.1: Waste Dumped without Control in Nature[78]

Year	Number of Residents	With Service	Without Service	Per person-per year (Tons)	Waste dumped without control yearly (Ton)
2013	2,145,999	2,145,999[79]	2,337,801	0.320-0.423[80]	748,096 – 988,890

Waste collection and disposal services are not provided to the rural areas, there are not dislocated waste bins and the population is forced to deploy waste self -selected areas.

Spontaneously formed landfills pose significant threat to environment pollution. Particularly notable is waste disposal in natural landscapes and objects, forests, fields, rivers, valleys and polluting surface water, in addition, uncontrolled scattered household waste,[81] is detrimental to the environment, as well as to human health. Harmful substances that are formed during the combustion process, affect human health and ecosystems.

Scattered uncontrolled waste is bothersome from the aesthetic, as well as touristic perspective. Due to smell polluted natural objects lose their attractiveness. The scattered waste creates threat of spreading diseases and parasites.

It is necessary to undertake further measures for rehabilitation of treated territories and to restore territories in its original state. Participation in the process should be entrusted to the municipalities and local authorities, as well as the Ministry of Environment and Natural Resources Protection of Georgia and the Ministry of Infrastructure and Regional development of Georgia. The role of the mentioned

approximate, see Annex N 2.

[77] See Annex N2.

[78] See Annex N2.

[79] We assume that in Tbilisi and Batumi all residents are provided with the waste service, the number of residents are added who receive waste service in municipalities.

[80] Clean Up Georgia; Report on Municipal Waste Management in Georgia; 2012, p. 12, http://www.cleanup.ge/documents/report_geo.pdf

[81] Green Alternative; *Some Current Issues related to landfill construction and Management;* 2011, p.2

bodies, from the management point of view, is very important, for the prevention and elimination of hazardous unregistered landfills.

6.2 Municipalities and self-governing cities do not take action to eliminate and prevent unregistered landfills

6.2.1 Rules of regulation on construction waste do not exist

Construction waste includes demolition of buildings and the waste generated at the construction site, dug into the ground, impaired highway and similar sort of waste[82]. Disposal of construction waste at the municipal landfill is not permitted.[83]

According to international practice, large number of construction waste is reproductive. Accordingly, it is recycled and reused. For example, brick and concrete waste is an inert waste, which can be used for road construction. It should be noted, that construction waste recycling is not duty of the construction companies, recycling occurs on the basis of cooperation of the state and local government with construction and producer companies. State / local authority shall take appropriate measures to connect waste recycling, processing and construction companies to each other. This approach contributes to the productive use of materials and minimization of the construction waste.

Currently, construction waste management system presents a great challenge in Georgia, because the problem is not subject to any regulation and causes serious concern to public.

There are two categories of construction waste:

- Inert construction waste
- Non – inert construction waste

Inert waste is used for recycling or reclamation works to fill roads and river-beds, as it is not dissolved in nature, and poses constant threat. Unlike inert waste, non-inert construction waste, such as: wood materials, packaging waste and other organic materials are not suitable for reclamation and restoration and are not subject to multiple use, accordingly, it can be placed at the landfill.

Nowadays, all kinds of construction waste is illegally dumped in ravines, river beds, roads etc. Almost all settlements have functional unregistered landfills, where construction waste is disposed illegally. For example, large number of the construction waste is found in the surrounding recreational areas of Tbilisi, because trucks access the road sides without restrictions and dispose construction waste during

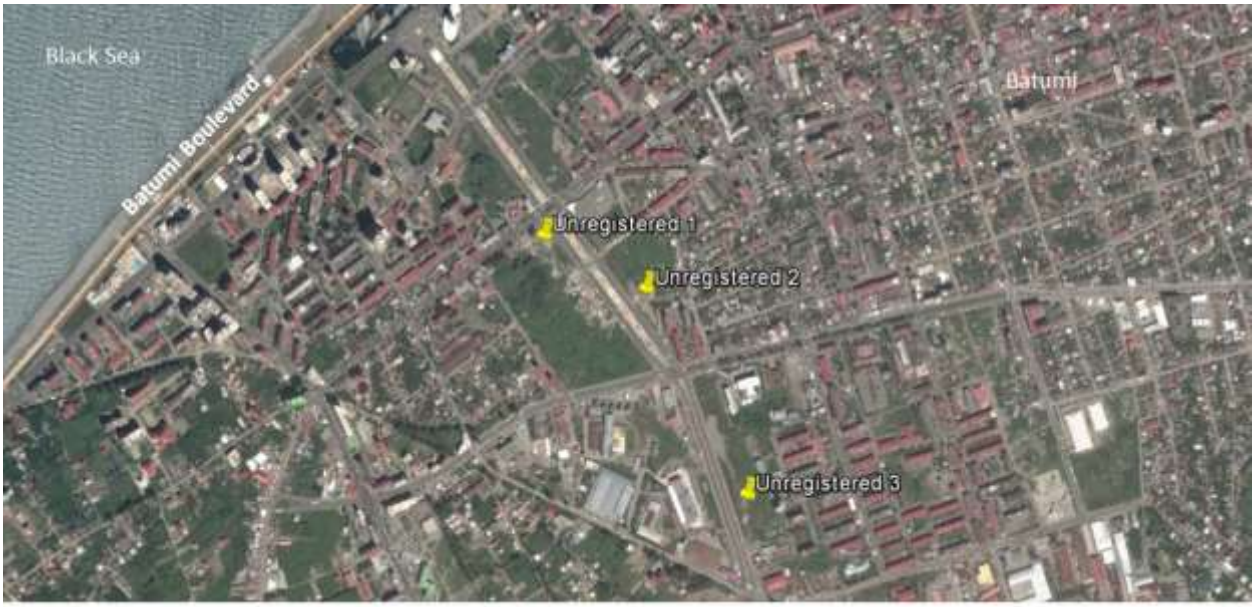
[82] Tbilisi, Batumi, Telavi, Alhmeta, Shuakhevi, Rules of capital cleaning, waste management, operator selection and waste disposal, Article 2 (g), 2014.
[83] Tbilisi, Shuakhevi, Rules of capital cleaning, waste management, operator selection and waste disposal, article 5 (6), Batumi, Akhmeta - Article 5 (3).

any time of the day. Audit team has collected only several pictures of unregistered landfills of construction waste.

Picture 6.2.1.1: Unregistered Landfills of Construction Waste around Tbilisi

As of one of the most important tourist cities - Batumi, construction waste is disposed in the middle of the city in demolished factories - where private individuals freely manage to dispose construction waste.

Picture 6.2.1.2: Unregistered Landfills of Construction Waste in Territory of City of Batumi



There is no information on the amount of construction waste, according to which its place of disposal and way of treatment can be determined. Recycling and secondary use of construction waste do not occur that can reduce amount of construction waste and minimize level of caused damage.

Construction waste which is placed in nature without control produces emissions of harmful substances and causes toxic poisoning and health deterioration. This type of substances dispense in nature and pollute air. The mentioned problems are caused due to the fact that for disposal of the construction waste special landfills do not exist, but according to the waste disposal rules,[84] it is forbidden to place construction waste in a container intended for household solid waste. The regulation of the current issue is very actual, because disposal of construction waste is a matter of concern for population. In addition, from the aesthetic point of view, uncontrolled disposal of the construction waste is not desirable. It is also important to take into account the damage that is caused by harmful substances and pollution to environment, as well as, a threat to human health.

The State Audit Office considers necessary, to solve the problem surrounding unregistered landfills, polluted and contaminated areas should be cleaned and the waste should be safely disposed in a specially selected places, which will allow residents to dispose construction waste in an appropriate place in compliance with construction waste disposal rules.

6.2.2 Supervision system of dumping construction and municipal waste at unregistered landfills needs an improvement

In framework of the Ministry of Environment and Natural Resources Protection of Georgia and the Twinning Program the "Waste Management Code" (thereinafter – the Code) was developed. The code's purpose is to establish legal basis for waste management, as well as, introduces modernized approach and European standards on waste management issues. The Code is important in terms of penalties, as it increased sanctions for the pollution of environment and imposed fines between 50 to 5000 GEL. The Code entered into force on 15 January, 2015.

In 2012-2014 years, in the period of audit, cleaning rules and penalties for violation of those rules were regulated by Administrative Code[85]. According to Administrative Code, fine for pollution of the environment, for physical persons was 200 GEL and for legal entities - 1000 GEL. Reoccurrence of an offense resulted to fine of 500 GEL - for physical persons and 3000 GEL - for legal entities.

It should be noted that strict penalties have not changed severe situation in terms of unregistered landfills, as the sole regulation is not sufficient if its essential components - compliance and enforcement

[84] Rules of capital cleaning, waste management, operator selection and waste disposal , annex 3, article 5(6) see aslo Batumi, Telavi, Alhmeta, Shuakhevi cleaning rules,

[85] Administrative Code; Article 146^{1}; 1984.

do not operate properly. To ensure compliance with the law constant monitoring should be present, especially, in the areas where waste is often disposed in an inappropriate location.

In Tbilisi, the duty of monitoring falls under the competence of LLC "Tbilservice Group". According to information provided by LLC "Tbilservice Group" in 2012 -2014 (August) -183 administrative penalties were filed and during the last three months of 2014, the number of administrative penalties increased until 323. In comparison with 2013 number of penalties in 2014 has increased four times (see Table 6.2.1.1).

Table 6.2.1.1: LLC "Tbilservice Group" Number of Administrative Fines in 2012 - 2014

Year	Number of Fines	Amount paid
2012	31	7300
2013	90	38750
2014 (Until August 26)	73	51,400
2014 (from September 1)	323	316,050

In Tbilisi, Besides of the mentioned increased number of penalties, scattered waste in parks and other surrounding areas remains evident. As of regions, monitoring of unregistered landfills do not take place. Service is only provided in municipal centers, in villages waste is disposed in unregistered landfills.

Establishment of landfill for construction waste has crucial importance. It should be noted that the Waste Management Code, as well as, Administrative Code, which was in force prior to new Waste Management Code, provide very high fines for disposal of construction waste in unregistered landfills. However, the state agencies do not take into consideration that the special landfills for the construction materials do not exist, and disposal of construction waste at municipal landfill is not accepted. This puts population into difficult situation, which has to dispose construction waste under the risk of receiving a fine.

Supervision system malfunctions, give a chance to disposing waste at unregistered landfills bypassing administrative fine. Therefore, supervision mechanisms should be improved to prevent and eliminate dumping of waste in an open space, rivers banks and valleys.

The State Audit Office considers each municipality liable for supervision of waste disposal in unregistered construction landfill, or other inappropriate location and the control on municipalities should be exercised by respective state bodies.

6.3 Public campaign to increase level of public awareness is not sufficient

Bringing public attention to prevention and elimination of waste is the fundamental first step to stimulate behavioral change in population.

The legislative frameworks for attracting political support on environmental issues that are important from awareness raising perspective are the following: a) Constitution of Georgia;[86] b) Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters,[87] (The Aarhus Convention), which was ratified by Georgia in 2001.

a) Article 37 of the Constitution clearly defines the right of the residents to live in a healthy environment and establishes a general obligation to protect the natural and cultural resources. Moreover, the Constitution makes reference to a state's role in protecting the environment and gives everyone the right to receive complete and accurate information on the conditions of the living environment.[88]

b) The Aarhus Convention was signed in 1998 and ratified in 2001. In the framework of the Convention was established Aarhus Centre in Georgia, which aims at improving access to information on environment, public participation in the environmental impact assessment process and to participate in organizing various awareness campaigns.

The Ministry of Environment and Natural Resources Protection of Georgia established Environmental Information and Education Center (hereinafter – the Center), main purpose of which is: supporting dissemination of information on environmental issues, access to information, public participation in decision-making process, ensuring access to justice, raising public awareness and provide relevant specialists with training, requalification and education. However, there is almost no information about the activities conducted by the Center and in fact, the public is not aware of the work of the Center.

Non-government sector is involved in awareness raising process in Georgia, including non-government organizations, such as the NGO Consortium – Greens Movement, Friends of the Earth - Georgia, "Ekovizheni", "Orkisi". Consortium carry out public awareness and public waste management improvement projects with support of the Swedish Government[89]. NGO - CENN conducted awareness campaign in regional schools on waste issues. In addition, voluntary clean-up events are organized in different universities and organizations.

[86] Constitution of Georgia, Art. 37.
[87] Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters, Aarhus Denmark, 1998.
[88] Constitution of Georgia, Art. 37., Para. 4 and 5, 1995.
[89] Green Movement of Georgia; Environment and Society; №1 (24); 2014.

As practice has demonstrated, public consciousness, in terms of awareness on waste management and cleaning services is very low in Georgia. In many cases, competent authorities supply no information on potential threat to health, safety and impact on environment, or supply in a small dose. Public consciousness on the benefit of waste recycling and on saving resources is exceedingly low. Consequently, public education on proper waste management and hazardous unregistered landfills is important.

As can be seen from the practice, awareness-raising measures are not sufficient, since they do not have far-reaching nature and do not cover all target groups, as well as, the whole territory of Georgia.

Especially problematic for the country is waste dumped in tourist resorts, recreational parks, protected areas and natural reserves. Often, inhabitants leave waste in nature after excursions and picnics, which is explained by unreachability of waste bins in nature and in many touristic areas. It should be noted, that growth of tourists, contributes to increase of damage caused by uncontrolled waste dumps. As a result, tourist zones are polluted and tourism potential decreases significantly in Georgia. Improvements in eco-tourism infrastructure is necessary, particularly, installation of bins and containers in tourist areas.

In conclusion, lack of information leads to careless attitude toward waste in population and supports increase in number of unregistered landfills that have negative impact on the country. Development of tourism industry, is the priority for countries' economic growth. However, tourists are not attracted to places, where defective landfills are burning in an open space. In addition, unregistered landfills pose threat to agricultural lands and pollute soil.

Table 6.3.1: Time waste takes to dissolve into nature

Type of Waste	Time for Dissolution
Paper Napkin	2-3 Week
Banana Peel	3-4 Week
Paper Bag	1 Month
News Paper	1,5 Month
Apple	2 Month
Orange Peel	6 Month
Wool Socks	1-5 Years
Cigarette	5-10 Years
Leather Shoes	25-40 Years
Penoplastics Cup	50 Years
Rubber Tire	50-80 Years
Poliethinel Containers	50-80 Years
Alumin Cans	200-500 Years
Plastic Bottle	450 Years
Pampers	500 Years
Plastic Bag	200-1000 Years

Population is not aware of important issues of environment protection and matters of waste management. Active awareness-raising campaigns can be successfully implemented, with the use of: video, radio, print media, training and other educational tools directed at awareness-raising. Especially, effective is an attitude where focus is made on the specific waste stream and practical and easy ways are offered for solving the problem.

For raising awareness, it is important to educate children from early age. And, in the case of a particular industry, such as tourism, information and educational activities will be better implemented by selecting the special target group, such as travel guides, operators and tourists, which will contribute to raising awareness on the issues of dumping the waste in the nature.

Recommendation:

- From unregistered landfills of each village waste should be transferred to municipal landfill. Waste service should be gradually implemented in each inhabited area.
- Before the matter of construction waste is determined, special territory should be allocated to Tbilisi and Batumi to ensure safe disposal of construction waste.
- The State Audit office considers the municipalities should develop functional supervision mechanisms to monitor and fine disposal of municipal and construction waste in an inappropriate locations.
- State should take all necessary measures, to form a new attitude and approach towards waste from an early age. For the implementation of these measures, it is particularly important to raise public awareness on waste issues and active and transparent engagement of the population in decision-making processes. The public should receive thorough and complete information, both, on the threats and damages caused by improper waste management, as well as, profit-making opportunities from sustainable and proper waste management. Policy body (Ministry of Environment and Natural Resources Protection of Georgia) should ensure increase in level of public awareness and organize events to conduct awareness campaign. The campaign should aim at waste disposal and prevention.

7. Summarizing Conclusions and Recommendations

Analyses of various aspects of the waste management system demonstrated that the system is facing certain challenges. The State Audit Office identified problematic issues, in order to encourage its improvement.

The audit revealed that in Tbilisi waste collection and transportation takes place without pre-determination of waste quantity. Without having knowledge on waste quantity, it is impossible to plan the work process in an efficient way. In Tbilisi schedules of waste vehicles are non-optimal, which is primarily due to inefficient planning. With schedule optimization it is possible to make considerable savings. In addition, analyses that determine allocation of waste vehicles in accordance to necessity do not exist, the later presents a precondition of increasing efficiency of exploited resources.

In terms of waste collection fee, it is notable, that in certain municipalities imposed waste fee is not collected. Billing system does not exist and fee collection is not performed based on well- formed system, which is directly reflected on the revenue of the budget. Furthermore, in municipalities waste collection fees are unfounded and do not provide actual costs required for cleaning. Revenues obtained from the collection fees are very low in comparison with the incurred costs. The problem exists as waste service tariffs are not based on any analyses.

Landfill operation and monitoring presents a very problematic issue. Environmental monitoring of the old landfills do not occur. There is no assessment as to what threat the uncontrolled landfills pose to human health and environment. The old landfills are not requested to comply with the minimal conditions of landfill operation. The new landfills (Except of Rustavi landfill) are built without full consideration of Environment Impact Assessment (EIA), due to which negative impact on environment was not fully acknowledged and the measures for public involvement in the process were disregarded.

Especially noteworthy is difficult situation in terms of unregistered landfills. In most municipalities approved rules on waste management do not exist. Duties and obligations are not defined in waste management system and especially in matters related to cleaning and preventing unregistered landfills. Due to supervision system failure, the regular control of environment pollution take no place. The public campaign to increase level of awareness on waste issues is insufficient. In this regard especially important is active involvement of public structures.

The research revealed that parties' duties, obligations and responsibilities in the waste management system are not performed properly. In June 20, 2014 ended EU Twinning Program in cooperation with the Ministry of Environment and Natural Resources Protection of Georgia developed Waste Management Code, which entered into force on January 15, 2015. However, in accordance with the Europe Association Agreement and the European Directives, there is necessity to develop and approve waste collection and processing national strategy, action plan and the system of accounting and coordination, since, solid waste state accounting system is in a considerable low level. Practice of

prevention, separation and recycling of waste do not exist, due to which the state is losing potential revenues.

The State Audit Office considers important to react on the given recommendation and take necessary measure to improve the system by coordinated cooperation between the competent authorities.

Recommendations:

To the Ministry of Environment and Natural Resources Protection of Georgia

- The State Audit Office considers that in order to assess the existing situation in the old landfills, regular monitoring of environment should be ensured. Namely, assessment should be made whether minimal requirements of norms of landfill operation are fulfilled, and what threats landfill poses to human health and environment. Based on identified violations, the responsible company should be obliged to improve the shortcomings. In case, the shortcomings are not improved in a timely manner the sanctions should be imposed.
- The State Audit Office considers necessary that in the process of opening the new landfills, issuance of permit to be subject to Environment Impact Permit (EIA). Importantly, bypassing of the Environment Impact Assessment (EIA) procedure should not to be repeated. Those new landfills, which are released from Environment Impact Assessment (EIA) should be constantly monitored in order to resolve identified problems. In particular, additional measures should be implemented to improve the health conditions of people living nearby Tbilisi (Lilo) landfill.
- The State Audit office considers that the system of administrative penalties should be refined. Municipalities should develop functional supervision mechanisms to monitor and issue a fine for disposal of municipal and construction waste in inappropriate locations.
- State should take all necessary measures, to form a new attitude and approach towards waste from an early age. For the implementation of these measures, it is particularly important to raise public awareness on waste issues and active and transparent engagement of the population in decision-making processes. The public should receive thorough and complete information, both, on the threats and damages caused by improper waste management, as well as, profit-making possibilities from sustainable and proper waste management process. Policy body should ensure increase in level of public awareness and organize events to conduct awareness campaign, which should aim at waste disposal and prevention.

To the Ministry of Regional Development and Infrastructure of Georgia

Local Self-Governments

- Taking into account the audit recommendations, in other big cities (except of Tbilisi), where waste service is provided vehicle work schedule should be implemented in order to ensure optimal distribution of vehicles and to provide high quality services with minimal costs.
- The State Audit Office considers reasonable to develop waste collection fee system in each **Municipality**, where the waste service is provided. First, billing system should be established, which would determine exact number of population, tariff to be paid and ensures waste fee collection.
- Each **Municipality**, which has waste service, should establish reasonable tariff system for waste collection fee. The amount of fee and the scale of collection should be increased, in order to cease, or gradually minimize financing from the state/municipal budget.
- From each village, municipalities should transfer waste from unregistered landfills to municipal landfill. Waste service should be gradually implemented in each inhabited area. The **Ministry** should take respective measures to supervise and control municipalities' activities of cleaning unregistered landfills, rehabilitate treated territories and support restoration of these territories in its original state.
- The State Audit office considers that the **Municipalities** should develop functional supervision mechanisms to monitor and in case of necessity, charge a fine for disposal of municipal and construction waste in an inappropriate location.
- Before the matter of construction waste is determined, special territory should be allocated to ensure safe disposal of construction waste in the **Municipalities** (including Tbilisi and Batumi).

To LLC „Solid Waste Management Company of Georgia"

- The State Audit Office considers that the responsible company should conduct assessment of existing state of the old landfills. Namely, assessment should be made whether minimal requirement of landfill operation norms are fulfilled, and what threats landfill poses to human health and environment. Based on identified violation the responsible company should be obliged to improve the shortcomings, in case the shortcomings are not improved in a timely manner sanctions should be imposed.
- The State Audit Office considers necessary, operation norms to be complied in the old landfills in order to minimize the risk of spreading the waste into nature.
- The old landfills should be fenced and completely isolated to prevent animals and humans from accessing the landfill.

To Tbilisi City Hall

- Before the matter of construction waste is determined, the special territory should be allocated to ensure safe disposal of construction waste in the Municipalities (including Tbilisi and Batumi).

To LLC „Tbilservice Group“

- The company should carry out daily observation and statistical analysis on the amount of waste, on the basis of which should be estimated how many ton/m3 of waste is generated according to each street, by each district of Tbilisi, also, to what extant are containers filled with waste on daily basis.
- In order to optimally distribute special vehicles, the State Audit Office considers that shifts of schedules should be revised and number of waste vehicles should be optimized. Based on existing data and on conducted analysis we assume, that using same new, functional, high resourced vehicles on first and second shift, will reduce company's current cost and provide service with same volume of waste with less number of waste vehicles.
- Conducted analysis regarding daily amount of waste entering the landfill showed, that it's possible to more optimally distribute special vehicles, by taking into account the actual waste volume instead of number of containers. The State Audit Office considers that routes and schedules for vehicles should be updated in accordance with timing of rounds and necessity.
- Additional measures should be implemented to eliminate factors that have a negative effect on the health conditions of population living nearby Tbilisi (Lilo) landfill.
- The State Audit office considers that functional supervision mechanisms should develop to monitor and in case of necessity, charge a fine for disposal of municipal and construction waste in inappropriate locations.

To Batumi City Hall

- Before the matter of construction waste is determined, special territory should be allocated to ensure safe disposal of construction waste in city of Batumi.
- The State Audit office considers that functional supervision mechanisms should be developed to monitor and in case of necessity, charge a fine for disposal of municipal and construction waste in inappropriate locations.

To LLC„ Sandasuptaveba“

› Taking into account the audit recommendations, in other big cities (except of Tbilisi), where waste service is provided vehicle work schedule should be implemented, in order to ensure optimal distribution of vehicles and to provide high quality services with minimal costs.

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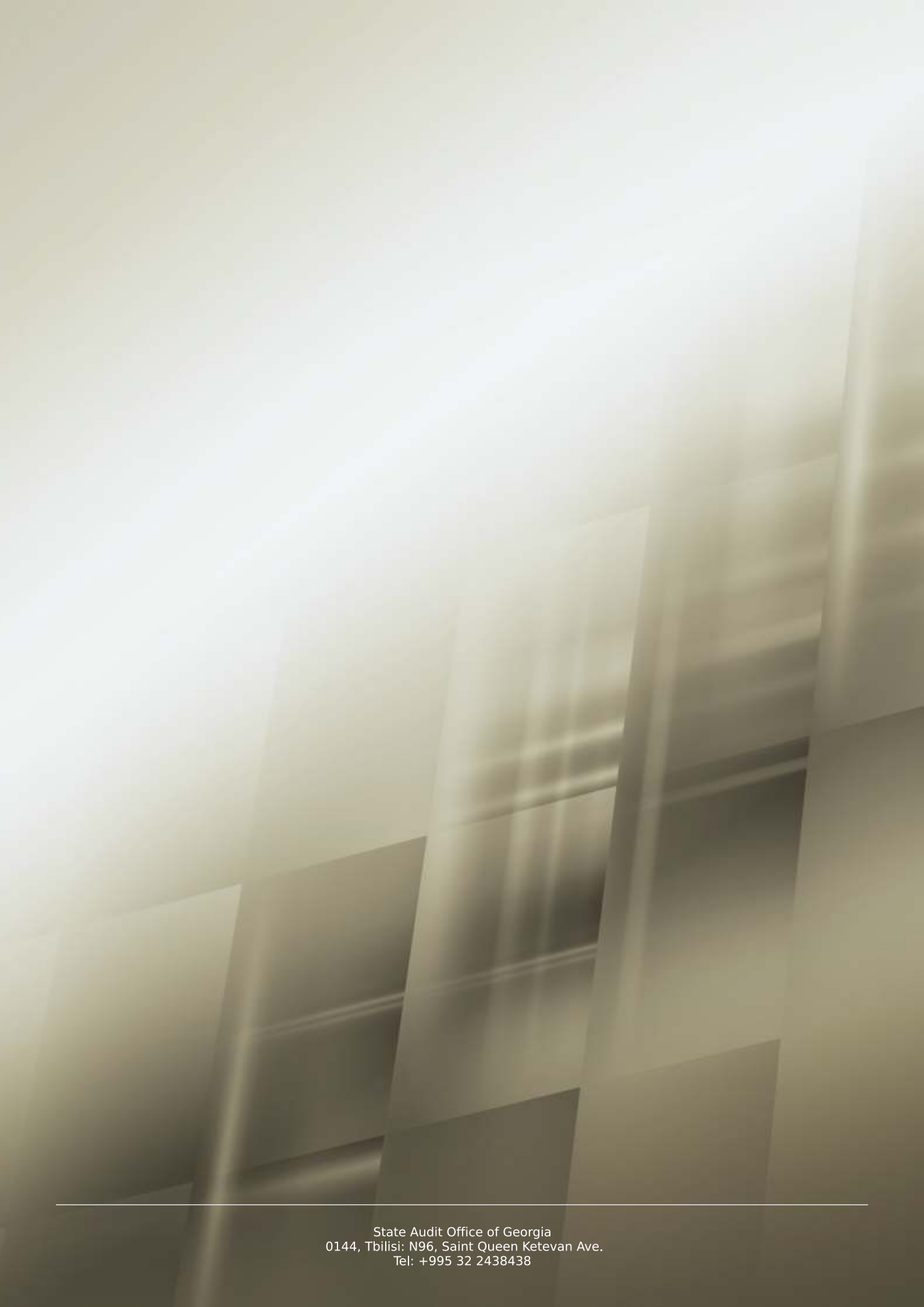

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