

Problems of Recycling and Utilization of Household and Industrial Waste in the Coastline of Batumi

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Abstract. Development of the infrastructure of the Black Sea coastal zone is one of the priority directions of Georgia. In order to increase the potential of the tourism sector, it is important to improve the ecological conditions of the Black Sea and the coastline. Despite the national environmental protection programme and the current Law on Waste Management, the problem of waste management is still relevant and noteworthy. The seaport and the terminal operating in Batumi strictly protect the requirements foreseen by the "International Convention for the Prevention of Pollution from Ships (MARPOL), 1973." Moreover, the Order "Rules for Monitoring the Movement of Ships in the Territorial Sea and Harbor Waters of Georgia and the Functioning of the Information System" has been in force since 2016. The purpose of this rule is to ensure the protection of human life, safety of navigation and protection of the marine environment by using the Vessel Traffic Monitoring System in the territorial sea and access corridors to the ports; detection of potential pollution of the marine environment from ships and their prevention. But despite the mentioned regulatory actions, there is a big problem in terms of waste recycling and utilization.

The article discusses the issues that make obstacles for ensuring the compliance with environmental protection norms within the city of Batumi and its surrounding area. The authors, taking into account the international experience of obtaining biogas from waste, propose the possibility of obtaining energy from the waste of the Batumi landfill for the purpose of waste recycling and utilization.

Key Words: waste recycling, biogas, electricity

1. Introduction.

In 1993 (in Lucerne, Switzerland) the Environmental Protection Programme was adopted at the Conference of Ministers of Environmental Protection of Central and Eastern Europe, and in 1996 - the Law "On Environmental Protection", which requires the development and implementation of a national programme based on a regular, five-year period. The first National Environmental Protection programme has been operating in Georgia since 2000 [1]. The second National Programme was launched in 2010 with the coordination of the Ministry of Environmental Protection of Georgia and cooperation with all interested agencies as well as with the financial support of the Dutch government [2]. In 2017-2021, the third National Programme of Environmental Protection was active, and in 2022-2026, the fourth National Programme has been operating [3].

2. Goal of work.

One of the important points of the National Environmental Protection Programme is the introduction of a modern waste management system. The problem is complex, because of uncontrolled pollution of landscapes, coastlines; pollution of facilities with household waste and waste from small enterprises and administrative institutions. Prevention of beach pollution is especially important in the coastal zone, as it is directly reflected both in ecological safety and the effective operation of the tourism sector of the region. The article discusses the possibility of obtaining energy from the waste of the Batumi landfill for the purpose of waste processing and sale, and in the light of solving this problem, it is analyzed how beneficial it can be to introduce a household waste management system.

3. Main part.

The draft law on "Waste Management" was prepared by the Ministry of Environmental Protection in 2008. It provides the definition, classification of hazardous waste, their production, transportation, disposal, decontamination registration and control of this process. Since 2008, a pilot project for the collection, transportation and destruction of hazardous medical waste has been operating in the Adjara region [2].

Despite the current law and relevant actions, the problem of waste management is still relevant and noteworthy. Development of the infrastructure of the Black Sea coastal zone is one of the priority directions of Georgia. In order to increase the potential of the tourism sector, it is important to improve the ecological condition of the Black Sea and the coastline.

Safe operation of the harbor and marine terminal has a great impact on the ecology of the coastline in the region of Adjara.

Moreover, the Order "Rules for Monitoring the Movement of Ships in the Territorial Sea and Harbor Waters of Georgia and the Functioning of the Information System," the purpose of which is to ensure the protection of human life, safety of navigation and protection of the marine environment; increase the safety and efficiency of maritime traffic, ensure rapid response to marine incidents and cases by relevant authorities, detect potential pollution of the marine environment from ships and their prevention by using the Vessel Traffic Monitoring System in the territorial sea and access corridors to the ports, has been functioning since 2016.

Pursuant to the amendment in the International Convention - "International Convention for the Prevention of Pollution from Ships (MARPOL), 1973" [5] – considered by the Protocol of 1978, no hazardous or polluting cargo of any type may be offered for carriage or loaded on board of a ship unless the ship's captain obtains a declaration containing the information required by the regulation. The shipper is responsible for submitting the above mentioned declaration to the captain, and the shipper is also responsible for the accuracy of the information provided in the declaration form. Information regarding substances listed in Annex 1 of MARPOL must include the physico-chemical characteristics of the substances, as well as the information provided on the safety data sheet in accordance with IMO

Resolution MSC.286(86) (the information must also include emergency contact numbers for the shipper).

In the harbor of Batumi, all the rules related to the safe use of waste are applicable [4]. Solid hazardous and household waste is sorted in the harbor. Hazardous waste includes items spilled with petroleum products, out-of-order accumulators and fluorescent lamps, etc. Hazardous waste is stored in a special reservoir filled with silt of 60 cm high and drains (Fig.1), through which the contaminated water leaking from the waste flows into a special system where it is filtered. In order to remove the collected hazardous waste from the port area, a certified company (in the case of the Batumi port, it is Ltd “Severi”) is addressed.



Fig.1. Special reservoir in Batumi port

"Batumi Sanitation Service", the institution responsible for the cleaning of the coastline area and the city in general operates according to the orders of the Minister of Environmental Protection and Agriculture of Georgia (orders: N2-772; N2-774; N2-775) [6,7,8] and regulates proper disposal of specific type of waste. This kind of waste includes: waste of tire, waste of electrical and electronic devices, waste of batteries and accumulators. This type of waste is managed by the Waste and Chemical Substances Management Department of the Ministry of Environment and Agriculture, which receives, processes, analyzes and monitors the submitted information.

250-300 tons of waste is accumulated daily in Batumi, while in summer it is even up to 400 tons. Up to 20 tons of household waste is collected from the boulevard in summer. Only 2% of the mentioned waste is subject to recycling - it is sorted into cardboard and plastic/aluminum containers (Fig.2). The mentioned containers are bought by recycling enterprises.

Hazardous medical waste (from aesthetic centers, beauty salons and medical institutions) is being actively removed in Batumi. Decontamination of medical waste is carried out according to the norms established by the legislation. Waste in hermetically protected containers is brought into the fenced and protected area by a vehicle with a special permit and equipment. Destruction is done by incineration (burning), which is completely safe, both for the environment and the people.



Fig.2. Plastic/aluminum containers

The main part of household waste is processed at the Batumi landfill. After thermal treatment, the waste falls into the sea at a depth of 800 meters.

Despite the strict implementation of the current regulations, even the presence of small waves is enough to throw up waste on the coastline, which creates discomfort for the tourists or local holiday-makers at the sea.

One of the ways to solve this problem is to activate the landfill in Tsetskhlauri.

The construction of the Tsetskhlauri landfill, announced 10 years ago, is coming to an end (Kobuleti Municipality, Tsetskhlauri village). The facility should be put into operation from 2024. The solid waste management facility is financed by the European Bank for Reconstruction and Development (EBRD (3 million)) and the Swedish International Development Agency (SIDA (4 million)) and its value is 7 million euros [10]. The new landfill is being built by the Turkish company "Goksin Insaat" and the project is being supervised by the organization "Monitoring Constantign".

The landfill is located on a total of 40 hectares (Fig. 3). Buildings necessary for the operation of the project have been built within the project. Four cells for storing waste, which are calculated for about 600 thousand tons of waste, have been arranged. In Adjara, no less than 90-95 thousand tons of waste is collected per year. The total area of the landfill cell will be 11.5 hectares, with a height of 15 meters. Waste collected in the city of Batumi, as well as in the other five municipalities of Adjara, will be placed at the new landfill.



Fig. 3. New Landfill of the Village Tsetskhlauri

Along with the filling of the cells, in the following years, 8 more new cells will be gradually arranged, where, after sorting, useless waste is disposed. Finally, it will be covered with soil. After burying useless waste, the produced liquid moves to facultative cells through special pipes, where, with the help of aerators, waste is separated from bacteria (Fig.4).



Fig. 4. The

Infrastructure of

the New Landfill in the Village Tsetskhlauri

The service life of the new landfill is estimated at 35 years (it may be reduced a little, as a device will be installed that will increase the amount of waste acceptable on the site. Before the landfill was built, the area of waste collection in Adjara had increased and, therefore, the amount of waste too).

A gas extraction system was organized on the territory of the new landfill, within which a thermal power station was arranged.

According to the experiment conducted in 2017 (With the financial support of the Union of Young Scientists and the Democracy Commission of the US Embassy, the experiment conducted in the municipality of Kedi), we can get 3-5 m³ of gas from 100 kg of organic waste, from which it is possible to get 0,87-1.45 kW of power [9]. Taking this into account, as shown in Table 1, in the case of electricity generation from the methane received at the city landfill, minimum of 2,4795 MW per month of power can be obtained. According to "Energopro Georgia" data, the installed capacity for Batumi is at least 40 MW, for Khelvachauri 4 MW, and for Kobuleti 6.7 MW. The power obtained from the thermal power plant of the landfill can make a significant contribution to the energy system of the region.

Table 1

Season (months)	A mount of waste in tons on daily basis	Amou nt of waste in tons on monthly basis	Amo unt of organic waste in tons on monthly basis	Received power on average per month KW, MW

Tourist season (X, XI, XII, I, II, III, IV)	2 50	7 500	2 850	2 479,5 kW 2, 4795 MW
Non-tourist season (V, VI, VII, VIII, IX)	4 00	12 000	3 990	3 967,2 kW 3,9672 MW

The Tsetskhlauri landfill is about 50 km away from Batumi, which will increase the cost of transportation of the waste from the city almost 6 times. Therefore, the construction of an intermediate station between Batumi and Tsetskhlauri is being considered by the consultants.

For Adjara, as one of the most important regions of tourism in Georgia, the implementation of this project is a priority in order to create high-level recreational or living environment in the background of bringing energy benefits for local or foreign tourists as well as local residents.

4. Conclusion:

1. The implementation of the Tsetskhlauri landfill project will fully solve the problem of illegal and environmentally incompatible landfills operating in the territories of Batumi and Kobuleti municipalities for decades;
2. In order to reduce waste transportation costs, it is desirable to start several similar waste recycling facilities in the region.
3. The benefits that the Tsetskhlauri waste processing facility will bring will be important for the improvement of both ecological problems and electricity supply issues of the Adjara region.

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