Determining a Probability of the uncontrolled landfills emergence in Georgia's Rural Areas using Integrated Methodology

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Abstract

In this work, with the support of the local municipality, we've collected for each highland region the data showing: the number of population, existence of the main sources causing waste, the quantity of the dumpster, the frequency of the waste removal with the relevant technic etc. Based on all these data by applying our methodology, we count a probability of existence of the uncontrolled landfills that can exist in the particular region. We also use the pictures from a drone.

In the present research we also made a comparative analysis of our theoretical conclusion concerning the particular rural areas and the results of the real data received after the expedition on the same place.

1. Introduction

66% of the territory of Georgia is composed of high mountainous regions inhabited by 6.5% of the country's population[1]. The high mountainous regions of Georgia are characterized by relatively structural weaknesses such as non-diversified economy, outmigration, extreme poverty, underdeveloped infrastructure, limited access to health care and other public services, etc. as compared to lowland and urban regions of the country[2]. All these contribute to increased likelihood of emerging one of the most widespread problem in Georgia - illegal dumpsites which has to be addressed in a comprehensive manner. Notwithstanding the recent legal changes that have been introduced in the field of waste management, the identification of illegal dumps, development of remediation plans and elimination of illegal dumpsites are not yet carried out. The analysis of statistical data obtained from the municipalities of Georgia shows, that waste collection services are not available in many villages and despite of the existence of the State policy, the issue of illegal dumps and their negative impact on the environment is still a challenge.

Picture 1 shows the uncontrolled landfill one of the highland villages of Georgia, shot with the help of Droni

Picture 1.

2. Objectives and Methods

The theoretical approach considers determination of the likelihood of emerging illegal dumpsites based on collected statistical data using mathematical formula (1). This formula will help determine an estimated amount of uncollected wastes within the study area and the likelihood of existence/emerging an illegal dumpsite(s). For this purpose, required data will be collected for the two types of facilities: residential and commercial (restaurants, hotels, offices, trade centers, etc. if relevant). Questionnaires for community members/ personnel of commercial organizations and municipalities will be developed and used for the survey of relevant persons. Specifically, the following information will be collected: the number of population/personnel/customers,availability/frequency/ efficiency of waste collection service, the quantity of

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[1] https://1tv.ge/news/maghalmtiani-dasakhlebis-statusi-1715-dasakhlebas-maghalmtian-dasakhlebashi-mudmivad-mckhovrebi-piris-statusi-ki-237-469-moqalaqes-mienicha/

[2] http://enpard.ge/ge/wp-content/uploads/2015/05/%E1%83%A1%E1%83%90%E1%83%A5%E1%83%90%E1%83%A0%E1%83%97%E1%83%95%E1%83%94%E1%83%9A%E1%83%9D%E1%83%A1-%E1%83%A1%E1%83%9D%E1%83%A4%E1%83%9A%E1%83%98%E1%83%A1-%E1%83%92%E1%83%90%E1%83%9C%E1%83%95%E1%83%98%E1%83%97%E1%83%90%E1%83%A0%E1%83%94%E1%83%91%E1%83%98%E1%83%A1-%E1%83%A1%E1%83%A2%E1%83%A0%E1%83%90%E1%83%A2%E1%83%94%E1%83%92%E1%83%98%E1%83%90-2017-2020.pdf

waste containers (by their size), amount of wastes per capita, existence of waste re-use practice.

$$D = (AC - (Ln(L) + Sn(S)) \, fq)/AC \cdot 100\%, \quad (1)$$

where;

D–percentage of the likelihood of emerging potential illegal dumpsites;

A- amount of wastes per capita;

C- number of inhabitants;

L-capacity of large containers, kg;

n(L)- quantity of large containers, item;

S- capacity of small containers, kg;

n(S)- quantity of small containers, item;

f–frequency of waste collection (frequency of servicing by the waste truck per week), coefficient from 0 to 1;

q–efficiency of waste collection, coefficient from 0 to 1;

Obtained statistical data will be verified using an unmanned aerial vehicle (drone).

In addition, as part of the expedition, several soil samples were taken from the landfill site, in which chemical and microbiological analysis was carried out.
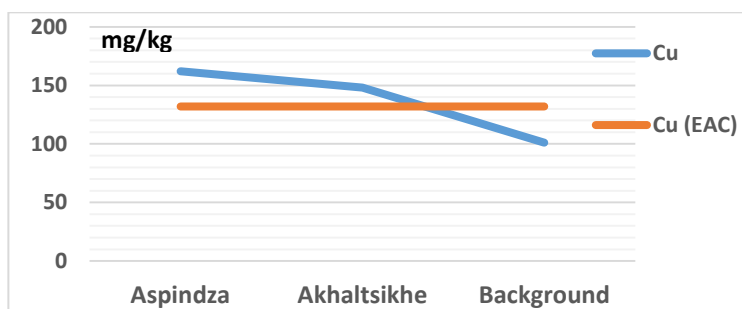
3. Conclusion

Figure 1. Cu concentration in the soil samples collected from the surrounding of the uncontrolled landfill sites in Samtskhe-Javakheti Region
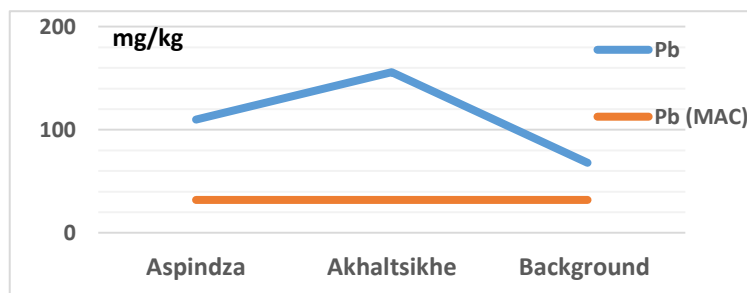

Figure 2. Pb concentration in the soil samples collected from the surrounding of the uncontrolled landfill sites in Samtskhe-Javakheti Region

As we can see, the surrounding areas of uncontrolled landfills are polluted by such toxic elements as Pb and Cu. All this suggests that the uncontrolled landfill sites not only pollute the surrounding areas and the environment, in general, but they represent rather create a significant hazard to human health. Accordingly, the surrounding areas with high levels of pollution should be immediately freed from such landfill sites.

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