

QUANTITATIVE ANALYSIS OF THE NONCOMPLIANT LANDFILL CONSTITUENTS

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ABSTRACT. In order to establish the nature and composition of the municipal wastes located in the municipal landfill Pata Rât, Cluj-Napoca, ten samples were collected in depth, every meter. Aiming the landfill characterization, the nature and the percentage composition of the materials was determinate.

Keywords: *waste, landfill, material, composition.*

INTRODUCTION

The aim of this work is to determine the landfill waste structure to further define the strategies concerning the waste selection and the obtained gas quantities. Studies were made on material degradation from noncompliant landfills, nearby Cluj-Napoca. We considered the analysis is influenced by waste composition distribution randomly deposited over time. The waste collection from an area of approximately 400.000 inhabitants was not done selective and the storage was mixed and uncontrolled. During the filling process, there was no plan for covering the storage and now, it is almost impossible to specify the time when the waste was disposed. The prolonged time of approximately 35 years of filling and the constituent layers resulted from the evolution of all materials and products that were stored indicate no periodicity in the composition of layers, by height. [1], [2]

This paper highlights the composition of waste stored in Pata Rât landfill. We mention that this study is the first which was achieved on this site.

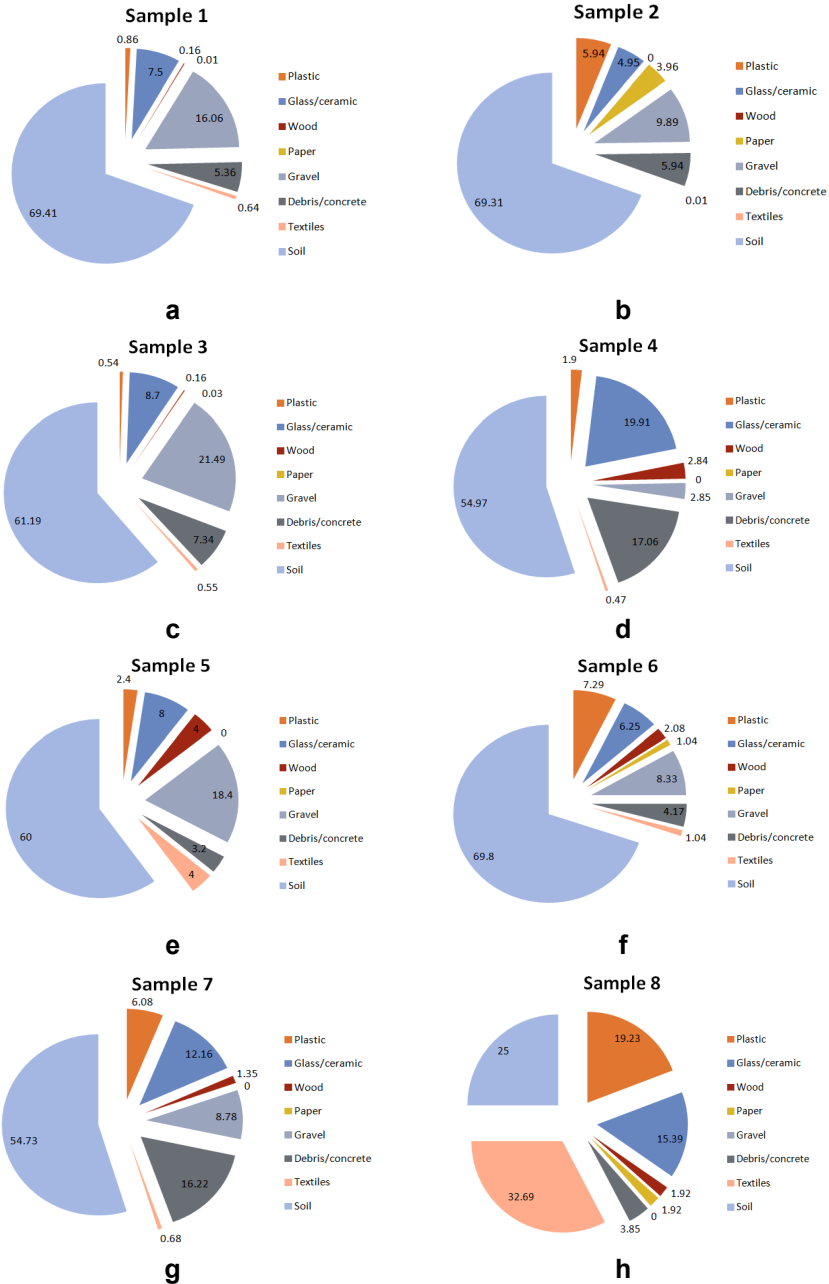
RESULTS AND DISCUSSION

Knowing the waste nature and distribution is a very important way in determining the method of landfill operation [3-8]. In order to show the more precisely as possible the waste distribution in the Pata Rât landfill we

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have analysed 10 samples collected as described. The composition variation of municipal waste is depicted in figure 1, from a to j.



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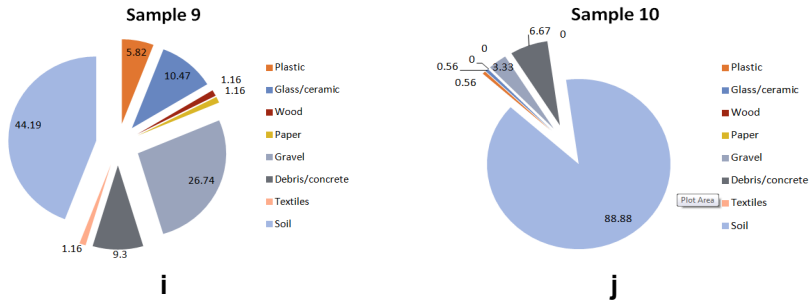


Figure 1. Material percentage variation in municipal waste samples

Analysis of samples has led to the establishment of their composition which varies as follows:

- plastic 0.56 ÷ 23% range;
- glass in 0.56 ÷ 19.91% range;
- wood in 0 ÷ 4% range;
- paper in 0 ÷ 3.96% range;
- textiles in 0 ÷ 32.69% range ;
- construction debris and concrete in 3.2 ÷ 17.06% range;
- soil in 25 ÷ 88% range.

In order to find the average composition of the waste layer, the following procedure was adopted: the minimum and the maximum values was removed from each category, then irrelevant results were excluded for establishing the results taken into account to determine the average composition and finally, averages values were calculated for each category of material. The irrelevant results had been considered as the highest maximum and the lowest minimum. [1]

After the plastic percentage from landfill was calculated, using data from Figure 1 and the above procedure, the following situation appeared: the maximum and minimum elimination (sample 3 and sample 8), the considered outcome (sample 1, sample 2, sample 4, sample 5, sample 6, sample 7, sample 9 and sample 10). The average balanced concentration is:

$$C_{A \text{ plastic}} [\%] = 3.85625\% \cong 3.86\%.$$

Similarly, the average compositions of other components was calculated. Considering the results above, the following average composition of the analysed landfill area was calculated without minimum and maximum elimination).

The results of applying this methodology are shown in Table 1:

Table 1. The municipal waste average composition in Pata Rât landfill, Cluj-Napoca

Concentration	UM	Balanced average	Average
Plastic	%	3.86	5.06
Glass/ceramics	%	9.18	9.39
Wood	%	1.21	1.37
Paper	%	0.52	0.81
Gravel	%	11.14	11.59
Debris/concrete	%	7.36	7.91
Textiles	%	1.07	4.12
Soil	%	60.45	59.75

The analysis made showed that the macroscopic recoverable materials (plastic, glass, wood, paper, textiles) has an approximate share of 20%. The inert material, (gravel and debris) has a share of approximately 20%, while the resulting waste degradation along with the soil have a share of 60%.

In this analysis, we have taken into account that the researches on municipal waste which contains also high quantities of construction and demolition waste and soil layers from the excavations and coatings. Therefore, we consider sampling in each layer cannot disregard this fact, so we propose a method to assess the potential recovery status of a non-compliant landfill.

Landfill materials can be grouped in three major parts: the recoverable component (macro); the inert component; the resulted component from biodegradable waste degradation.

In order to determine the components percentage, the following procedure was proposed: zoning the deposit according to historical known deposit activity; preliminary assessment of the areas according to their potential; establishment of potential components for analysis and evaluation at the macroscopic level; mapping of potential analysed areas; source and operating decisions analysis.

Excluding technological exploitation issues, we proposed a method for assessing the potential by determining the waste components. Considering that landfill was made randomly, the method for determining components should be based on vertical and horizontal sampling.

Vertical sampling step should be of 1-2 m and horizontal sampling step should be 10-15 m. The propose method is based on the experiment made to determine the landfill material degradation. The assumption made in the sense that there was a filling order and the corresponding specified time, was not checked by the measurements.

CONCLUSIONS

Analysing the results of municipal waste composition from noncompliant landfill nearby Cluj-Napoca, we found that we cannot draw a clear conclusion on the relationship between the values measured and the layer from which the sample had been taken. We believe that waste was not deposited successively, in an order from the bottom to the top. At the same time, the waste deposit randomly determined sequence of different compositions that cannot be characterized or assigned to a certain period of time.

We proposed a useful landfill characterization, knowing that the filling and the technological treatments were random and difficult to quantify. We made this analysis as a characterization of noncompliant landfill components.

EXPERIMENTAL SECTION

In order to determine the material composition of municipal waste from noncompliant Pata Rât landfill, Cluj-Napoca, a 10 m deep driller pit was realised and sampled every meter.

Drilling was made with a mobile drilling facility operated by SC Minesa - Research and Design Institute of Mining SA - Cluj-Napoca. [2]

Analyses were performed in the *Laboratory Testing of National Research and Development Institute for Industrial Ecology*, ECOIND, from Bucharest.

The tests made on samples for determining the composition of deposited materials were done in two stages: determination of macro characterization and the micro state of degraded waste.

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