

# A Detailed Characterization of Household Municipal Solid Waste

Mathioudakis D.<sup>1</sup>, Papadopoulou K.<sup>1,\*</sup>, Lytras G.<sup>1</sup>, Pavlopoulos C.<sup>1</sup>, Dimopoulos N.<sup>1</sup>, Niakas S.<sup>2</sup>, Melanitou E.<sup>2</sup>, Lekkas D.<sup>3</sup>, Lyberatos G.<sup>1,4</sup>

<sup>1</sup> School of Chemical Engineering, National technical University of Athens, Iroon Polytechniou 9, Zografou, 15780, Athens, Greece

<sup>2</sup> Municipality of Halandri, Agiou Georgiou 30 & Aristidou, 15234, Halandri, Attica, Greece

<sup>3</sup> School of Environment, University of the Aegean, Mytilini, Lesvos, 81100, Greece

<sup>4</sup> Institute of Chemical Engineering Sciences (ICE-HT), Stadiou Str., Platani, 26504, Patras, Greece

\*corresponding author: e-mail: kpapado@chemeng.ntua.gr

## Abstract

Reliable data on Municipal Solid Waste composition are paramount for the development of environmentally sound, sustainable and economically viable integrated waste management systems. However, no standardized universally accepted waste characterization protocol has been developed, as there are various methodologies described in the relevant literature (Edjabou *et al.*, 2015). In the present study, a generic and easy-to-apply waste sampling and sorting approach is developed and presented. The area of interest of the characterization was the Municipality of Halandri in Attica, Greece. The MSW composition characterization was necessary for the development of an innovative waste management strategy in the Municipality (WASTE4Think, 2015). Five suitable waste collection points were identified as sampling points. In each sampling point three collection bins were located (commingled waste in green bins, recyclables in blue bins and paper & cardboard in yellow bins). The sampling points were selected in residential areas (no shops, companies etc. around). For a week - seven consecutive days - the content of the bins was collected and transported to a sorting facility, where bins' material was sorted into 40 fractions and weighted. The results indicated a recycling rate up to 75% and a level of impurities in the recycling bins (blue and yellow) no more than 12%.

**Keywords:** MSW characterization, MSW management, recycling rate

## 1. Introduction

The development of a sustainable, environmentally sound and financially feasible Municipal Solid Waste (MSW) management scheme can only be achieved if a deep knowledge of waste composition has been acquired (Bisinella *et al.*, 2017). From designing the MSW management plan to assessing its environmental and financial performance and then optimizing it, waste composition plays a paramount role since quantities and different type of materials (e.g paper, plastic, biodegradables etc.) affect the valorisation approach.

However, there are not many relevant examples in the literature that suggest a methodology on carrying out a complete MSW characterisation (Götze *et al.*, 2016).

In the present work we propose a generic methodology, based on the relevant protocol proposed by WASTE4think. The scope of the characterization was to develop a baseline understanding of the household waste composition of a municipality in which an innovative food waste source segregation scheme will be implemented.

## 2. Methodology

The current source segregation scheme of the Municipality of Halandri includes three basic Waste Collection Circuits (WCC): Recyclables (plastic, metals and glass, mainly packaging) are source separated in the blue bin, Paper & Cardboard in the yellow bin and Residual waste in the green bin. Hence, these three WCCs were included in the characterization. Five collection points were chosen as the sampling locations, based on two criteria:

- i. There should be exactly one bin of each WCC, in each sampling point.
- ii. Only residential buildings should be around the chosen points (no businesses, schools, shops, public buildings etc.)

In the morning of day 0, the bins in the selected collection points were emptied. Then for seven consecutive days the content of the bins from the selected points was collected and transported to a Material Recycling Facility (MRF) to carry out the analysis. There, each WCC was split into 8 fractions and 33 waste sub-fractions. The initial samples, as well as the different fractions were weighed each day.

### 3. Results & Discussion

The waste composition analysis performed proved that the dominant waste fraction for the households of the municipality is the biodegradables (i.e. kitchen waste,

little garden waste and prunings) followed by Paper & Cardboard and Others (Figure 1).

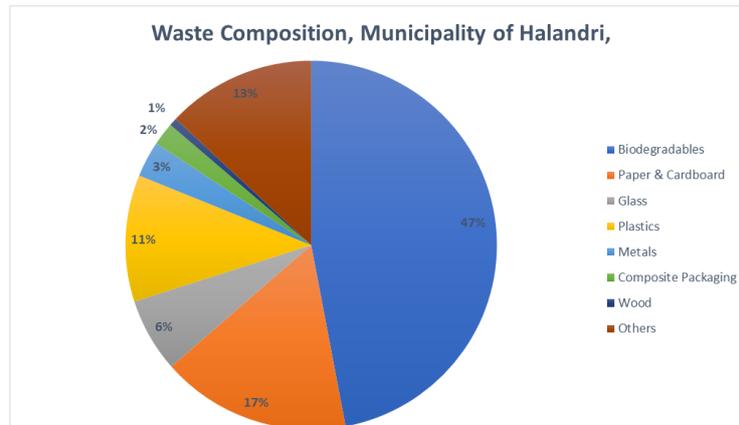


Figure 1. MSW composition, Halandri, 2018

Moreover, a household recycling rate (i.e. the percentage of recyclable materials ending up in one of the proper recycling WCC) as high as 75% was calculated. Finally,

the level of impurities in the two recycling streams was 12% for the blue bin and 5% for the yellow bin (Figure 2).

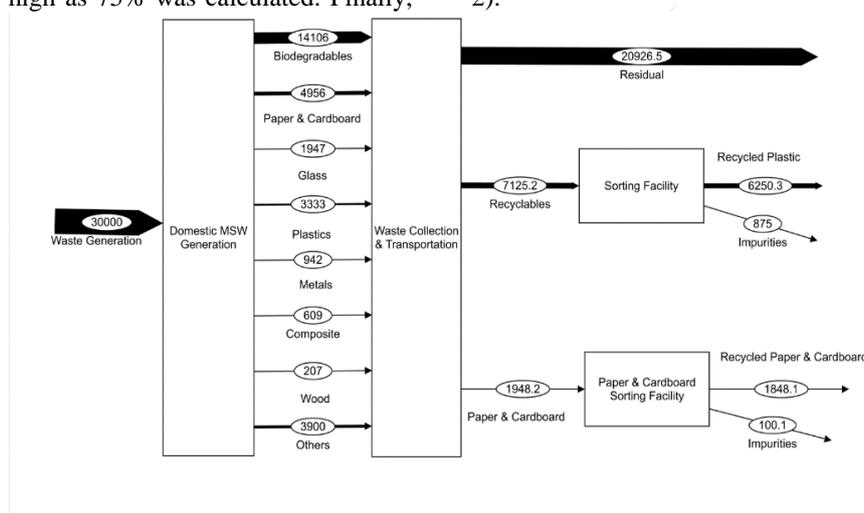


Figure 2. Household Waste Flows, Halandri, 2018

### 4. Conclusion

This study introduced a simple approach for analyzing the household MSW composition of the Municipality of Halandri. The characterization will be used as a basis for the development, assessment and optimization of an innovative waste management paradigm. Significant differences between the results of the analysis and the Greek national and regional data were observed, mainly as far as the recycling rate and the level of impurities is concerned. On the other hand, the composition of the waste agrees with the National and European data.

### References

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