

AN OVERVIEW ON THE MUNICIPAL SOLID WASTE MANAGEMENT IN ROMANIA

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Abstract: Municipal solid waste (MSW) is produced in large quantities all over the world, so treating them is of concern for any country. This paper aims to present an overview on municipal waste treatment operations, and also an analysis of generated, recovered and disposed MSW amounts obtained from Statistical office of the European Union (EUROSTAT). The purpose of this analysis is to make a comparison between Romania, the other Member States of the European Union and the targets set in Article 11(2) of Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste. The waste recycling rate of just 13.9% in 2017 highlights the situation Romania is facing, given that the recycling rate to be reached by 2020 is 50% by weight.

Keywords: municipal solid waste, waste treatment, recovery, disposal, recycling

1. INTRODUCTION

One of the main problems that needs special attention is the management of municipal solid waste (MSW) that are produced in a very large quantity all over the world. The way in which each country manages this waste must take into account both the protection of human health and environment [1,2]. The population must be aware that it is imperative to prevent and reduce the production of waste, secondly solutions must be found for their reuse and recycling, since ultimately will be disposed.

EU policy on waste highlight the importance of an integrated approach in waste management, which aims to reduce resource consumption and promote the application of the waste hierarchy [3,4]. Thereby, the new targets adopted by the European Commission according to Directive (EU) 2018/851 are [5]: "by 2025, the preparing for re-use and the recycling of municipal waste shall be increased to a minimum of 55 % by weight; by 2030, the preparing for re-use and the recycling of municipal waste shall be increased to a minimum of 60 % by weight, and by 2035, the preparing for re-use and the recycling of municipal waste shall be increased to a minimum of 65 % by weight".

Thus, we can see a focus on the reuse and recycling of waste, leaving aside the energy recovery and landfilling as methods of treating them.

According to EUROSTAT municipal solid waste includes all the waste collected by or on behalf of the municipal authorities and treated through the waste management system [6]. Municipal waste contains waste generated in households, as well as similar waste generated from other sources (commerce, offices buildings or public institutions). Also must be mentioned that in this category are not included municipal construction and demolition waste or waste from municipal sewage network or treatment [4,6].

The MSW collected can be subjected to the next treatment operations: incineration, recycling, composting/ digestion or disposal (landfill and other).

After selective collection, the municipal waste can be recovered for example by recycling or composting (or other biological transformation processes).

Recycling means any recovery operation by which waste is transformed into products, materials or substances to fulfill their current function or for other purposes [4].

Composting is an ecological treatment method of organic waste. Composting/anaerobic digestion can be classified as recycling if compost (or digestate) is used to enrich agricultural land or for the production of growing media [7].

The incineration can be done with and without energy recovery. If the waste are incinerated with energy recovery it falls into the category of recovery operations (R1) only if the energy efficiency of the incineration plants is greater or equal to the values specified in Annex 2 of the Waste Framework Directive; otherwise it is considered a disposal operation.

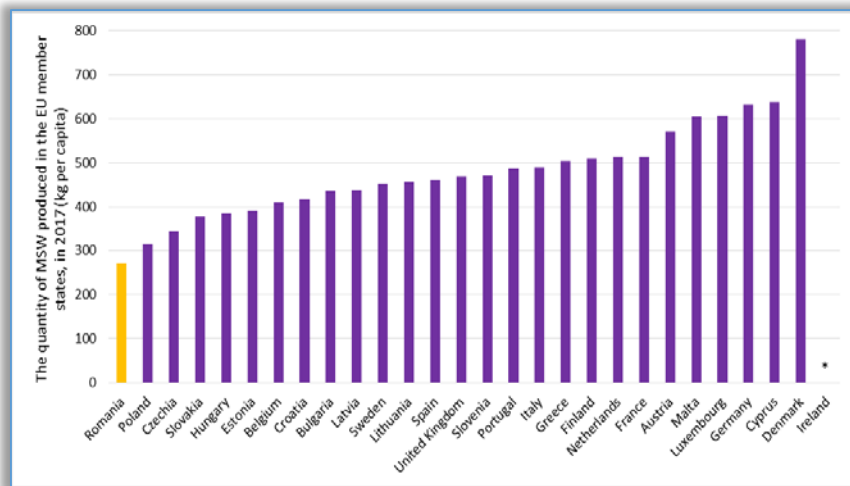
As a last option waste are sent to landfills, this being the least favorable in the waste hierarchy order of priorities. Small amounts of waste should be disposed of through this route.

The purpose of the paper is to analyze the trend of the production and treatment of municipal waste for Romania in the last two decades (1998–2017), to compare the data with those of the European Union member states and with the target imposed by the European Commission on the recycling rate.

The data used for graphical dependencies presented, regarding municipal solid waste generation, recovery, recycling and disposal, were obtained from the Statistical Office of the European Union (EUROSTAT) [8].

2. COMPARATIVE ANALYSIS ON MSW AMOUNT GENERATED, RECOVERED AND DISPOSED IN EU

Recent studies [9] indicate that the municipal solid waste production in EU member states is in close connection with their economic activity. The amount of MSW produced by the EU member states in 2017 is shown in figure 1. The smallest



amount of waste of 272 kg per capita was generated by Romania, while the largest amount, more precisely 781 kg waste per capita, by Denmark. Analyzing municipal solid waste production in Romania for a twenty year period (figure 2), can be noticed that in 2008 was reached the maximum quantity of 411 kg per capita, after which from 2009 a decrease was recorded reaching 247 kg per capita in 2015.

* Not available

Figure 1. The amount of MSW generated in EU Member States in year 2017

From the amount of waste generated a part is recycled. Figure 3 shows the quantity of MSW that Romania recycles, compared to EU average (28 countries). Romania is on the last place both in 2017 with 20 kg per capita and as an average for the analyzed period with 7 kg per capita. The largest amount of municipal solid waste recycled, as an average for the analyzed period (1998-2017), belongs to Germany (270 kg per capita) [8].

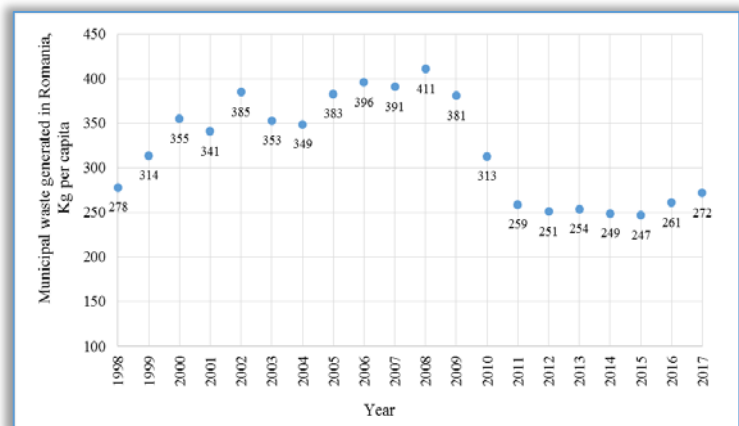


Figure 2. The amount of MSW generated in Romania in period 1998-2017

Also, the quantity of MSW recycled in Romania by operation R3 (Annex 2 - Directive 2008/98/EC), i.e. composting/digestion, is very small, only 18 kg per capita in 2017 (figure 4). By calculating the arithmetic mean value of the MSW amounts recycled by composting/anaerobic digestion over a period of 20 years, for each country, it turned out that Austria is in the first place with 202 kg per capita followed by Netherlands (143 kg per capita), and Denmark (120 kg per capita).

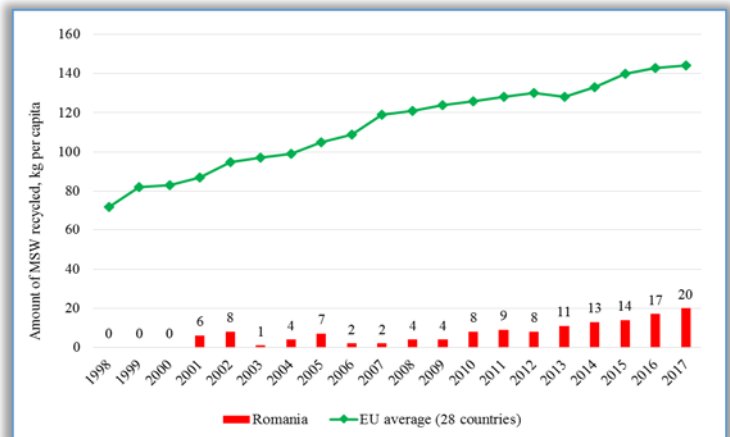


Figure 3. The amount of MSW recycled in Romania and EU average (28 countries)

As was specified, the waste incinerated with energy recovery enter in the category of recovery operation (R1 [4]). Romania incinerated this way on average 9 kg waste per capita, and at the level of the European Union from 1998 until 2017 it is noticed a growing trend (EU average-28 countries from figure 5). The country that incinerates by energy recovery the largest amount of MSW, as an average over the analyzed period, is Denmark [8]. Romania began to treat the waste in this way since 2010, and in 2017 reached a total quantity of 227 thousand tonnes, which represent 12 kg per capita.

Disposal of municipal solid waste by incineration (operation D10 - Incineration on land) is one of the 15 disposal operations published in Annex 1 of Directive 2008/98/EC. The EU member countries that have resorted to this type of treatment operation in the last two decades (1998-2017) are [8]: Belgium, Germany, Spain, France, Italy, Netherlands, Poland, Slovenia, Slovakia, Finland and United Kingdom. Netherlands ranks first on average with 133 kg/capita, followed by Germany with 115 kg/capita.

It should be noted, however, that since 2013 Netherlands has not exceeded the quantity of 6 kg/capita, while Germany has decreased to the quantity of 27 kg MSW per capita incinerated in 2017.

According to the Eurostat database Romania does not dispose municipal waste by incineration (D10).

The most unfavorable option in waste treatment is disposal. Regarding the evolution of MSW disposed (landfill and other) by operations D1-D7 and D12, it is noticed in figure 6 that Romania treats through storage a large amount of waste (192 kg/capita in 2017), compared with the amount generated (272 kg/capita), so about 70.6% in 2017. For example, Netherlands sends to deposits the smallest average amount of waste namely 20 kg per capita, and in 2017 Sweden disposed (landfill and other) just 2 kg MSW per capita.

Recycling rate of municipal waste is one of the circular economy indicators, and the target set by EU for 2020 is of 50% by weight [5]. There are several countries (Germany, Slovenia, Austria, Netherlands and Belgium) that in 2017 exceeded this objective, as we can see in figure 7. Malta is on the last place with 6.7%, followed by Romania with 13.9%.

Germany should be mentioned because it has the highest recycling rate of 67.6% in 2017, according to EUROSTAT, and despite the fact that Denmark generates, on average, the largest amount of municipal solid waste has a recycling rate in 2017 of 46.3%, a value very close to the target imposed by the EU for 2020.

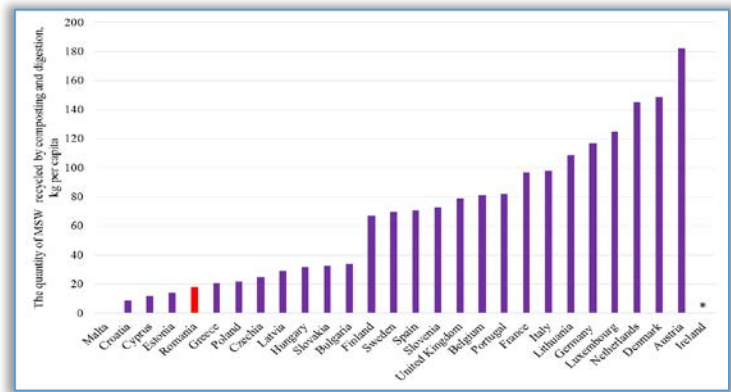


Figure 4. The amount of MSW recycled by composting/digestion in EU Member States in year 2017

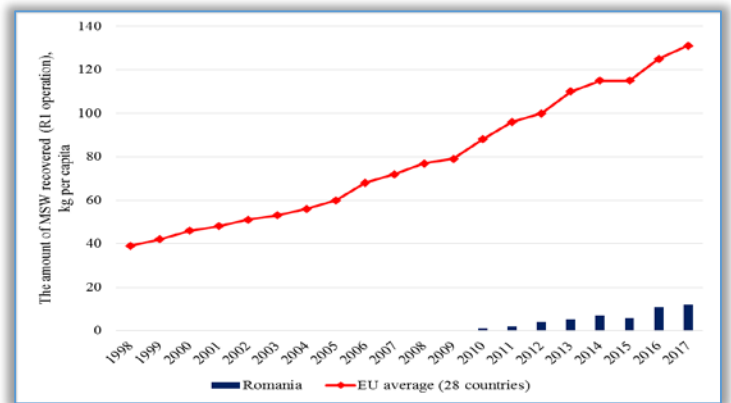


Figure 5. The amount of MSW recovered by R1 operation in Romania and EU average (28 countries)

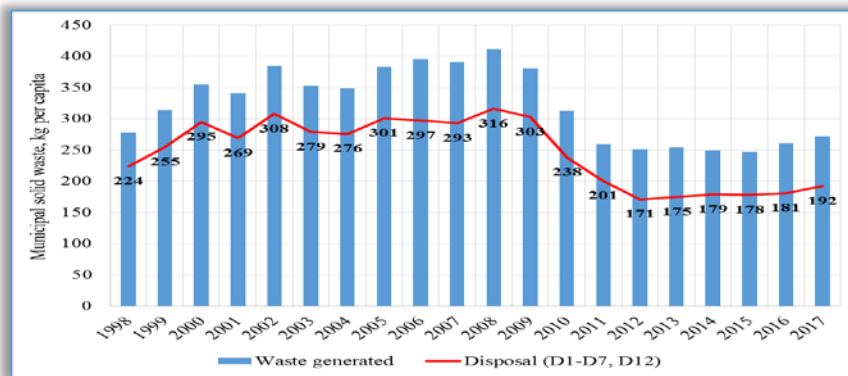


Figure 6. Amount generated vs. disposed (landfill and other) of MSW in Romania in the last two decades

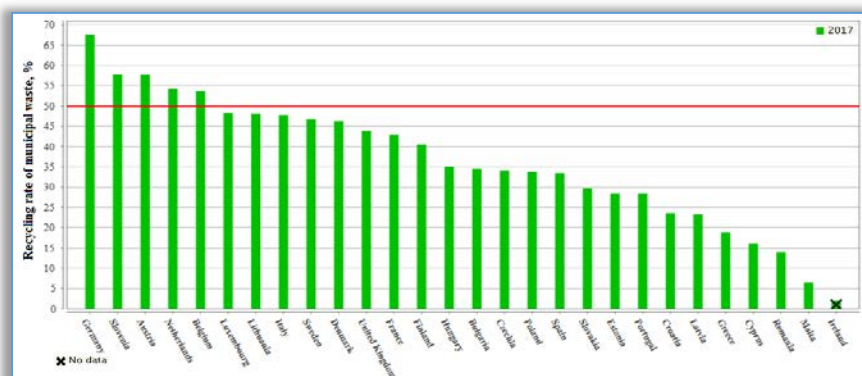


Figure 7. The recycling rate of MSW in EU Member States in year 2017 [10]

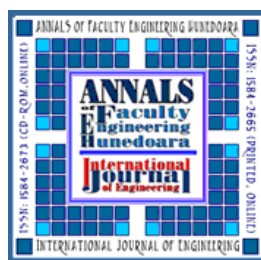
3. CONCLUSIONS

Based on the analysis performed, can be concluded:

- Romania generated in 2017 the lowest amount of municipal solid waste (272 kg per capita), compared with the EU member states;
- The quantity of MSW disposed (landfill and other) in Romania in the analyzed period has not changed much over the years, in 2017 represented 70.6% from the amount generated;
- The recycling rate of only 13.9% in 2017 shows the situation Romania is facing, given that the target to be reached by 2020 is 50% and by 2035 is 65%.

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ISSN 1584 - 2665 (printed version); ISSN 2601 - 2332 (online); ISSN-L 1584 - 2665

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