

ANALYSIS OF SOME INDICATORS REGARDING MUNICIPAL WASTE IN ROMANIA COMPARED TO OTHER COUNTRIES IN THE EUROPEAN UNION

Bianca Eugenia LEOVEANU-SOARE¹, Ina NIMERENCO²

¹PhD Student, Bucharest University of Economic Studies

Email:bianca.soare@eam.ase.ro

² PhD Student, Bucharest University of Economic Studies

Email:ina.nimerenco@eam.ase.ro

Abstract

Municipal waste management plays an important role in environmental protection. Their incorrect management can have negative effects on the environment and human health. Thus, the analysis of municipal waste management in the period 2010-2020 in Romania compared to certain member countries of the European Union was followed. The analyzed indicators were: The amount of municipal waste generated, treated and recycled, the recycling rate and the quantity of waste disposed- landfill and other. Following the analysis, it is found that the amount of municipal waste generated had an increasing trend in Croatia, and a decreasing trend in the case of Bulgaria, Romania and Cyprus, Romania having the lowest amount generated compared to the studied countries. The amount of waste treated is in correlation with that generated, the trend being similar. The municipal waste recycling rate in all analyzed countries (Croatia, Bulgaria, Romania, Hungary, Slovakia, Greece, Cyprus) is increasing, but much lower compared to the EU target for 2020. Romania recorded the lowest recycling rate, of 13.59% in 2020, with close values being only Cyprus. In Bulgaria, Croatia and Hungary the recycling rate was over 30% in 2020, and Slovenia recorded the greatest progress from 22.5% in 2010 to 59.3% in 2020.

Keywords: *Municipal waste, environment, landfill, recycling.*

DOI: 10.24818/CAFEE/2022/11/13

Introduction

The rapid growth of the global population, the permanent increase in living standards and technological progress influence the generation of waste. Social, economic, public health and technological aspects are important concepts that should be considered in solid waste management.

The need to reduce the depletion of natural resources and climate change and to ensure a healthy living environment for the growing human society has become a global challenge that increases the demand to minimize waste generation and manage the waste effectively and sustainably on a global scale.

European waste policy focuses on reducing the negative impact of waste on the environment and human health and using it as raw material resources for the circular economy.

The amount of municipal solid waste (MSW) generated varies from year to year, with a general upward trend being recorded in recent years, determined both by the increase in population consumption and by the increase in the proportion of the population served by public sanitation services. The amount of municipal waste generated per inhabitant illustrates the level of economic development of the respective state. The challenges in this field and the need for better environmental protection in many countries around the world should determine all countries to incorporate environmental aspects into economic growth.

The purpose of the study was to analyze the evolution of some indicators regarding municipal waste in Romania compared to some countries in the European Union.

1. Literature review

The growth in population and economic activities has direct implications on the deterioration of the natural capital (Dinu et al., 2020) as all human activities (economic, social or everyday) generate large amounts of waste (Orlescu & Costescu, 2013). The population must be aware of the fact that it is imperative to prevent and reduce the production of waste, and solutions must be found for their reuse and recycling, or how they will be eliminated (Miloştean & Flori, 2019). Economic growth and technological development have increased the consumption of goods and services, as well as the amount of waste (Petrescu et al., 2022). Essentially, improper waste management is an important cause of environmental pollution and threats to human health and at the same time reflects the inefficient use of natural resources (Olaru & Zecheru, 2016).

In the current European context, member states have concerns in the field of waste management as efficiently as possible (Teodor et al., 2020). Waste management is a complex activity and treated differently in European Union (EU) countries. The general trend in the European Union is to improve all activities related to waste management, starting from the quantities of waste generated and ending with disposal (Frone et al., 2020).

In the EU, emphasis is placed on recycling, in this sense, numerous legislative acts have been developed, such as the Framework Directive 2008/98/EC. Together with waste reduction measures, waste management contributes significantly to achieving sustainable development (Izvercian & Ivascu, 2015).

Properly waste management is a key element in ensuring an efficient use of resources and the sustainable development of Romania. In this sense, increased attention is directed to municipal waste management. Municipal waste is generated in the urban environment both in households (household waste) and in commerce, small businesses, offices and institutions, (similar waste), yard and park waste, bulky waste, street waste, construction and demolition waste. Most of these solid wastes generated are not separated and therefore can be either harmful (Saleh et al., 2019).

At the European Union (EU) level, MSW generation has increased with rapid industrialization, where the amount of waste has recently increased by approximately 11% in 12 years and was expected to increase by 45% by 2020 (Ionescu et al., 2013). The EU aims to change this trend by applying prevention policies and efficient use of resources, but also by encouraging sustainable consumption. Wealthier countries tend to generate more municipal waste per person, while tourism contributes to the high generation rates in Cyprus (<https://www.eea.europa.eu/publications/municipal-waste-management-across-european-countries>).

In 2018, the most competitive country in Southeast Europe was Slovenia when referring to the degree of municipal waste recycling, and on the other hand, Romania and Croatia encountered serious issues in terms of catching up to the average of the European Union (40.3%) when analyzing the recycling rate of municipal waste compared to the target (50%) set by the Waste Framework Directive (Ignat & Constantin, 2021).

Romania is one of the countries where most of the collected municipal waste is removed/treated through storage operations, recycling and valorization being used in a very limited way (Ioana et al., 2016) and 94% of all municipal waste is thrown into landfills every year (Iacoboaia et al., 2013). In order to reduce the quantity of municipal waste while increasing the recycling rate, public authorities make efforts to develop consumer education programs for sustainable consumption. One of the main concerns of Romanian local

authorities should be to develop programs to prevent waste generation (Petrescu et al., 2022). The emphasis must be placed not only on recycling, but on prevention. Recycling requires additional energy and resources, even though it automatically prevents the use of extraction materials and extraction waste. In addition, prevention contributes to increasing resource efficiency, one of the main objectives of the circular economy (Margini et al., 2020). Also in some research studies, it was found an oscillating evolution of the total quantity of municipal waste, thus there is a need to study its influencing factors, especially because the concerns related to ensuring the sustainable development of society and the transition to a circular economy are growing, both in the European Union and worldwide (Petrescu et al., 2022). As a result of civil society's involvement in the waste management problem, there has been an increase in public awareness of the need for a more ecological and circular approach to waste management (Petrariu et al., 2021). Romania must make considerable efforts regarding the recycling rate to reach the European objective. In order to increase the recycling rate, Romania must apply techniques and technologies instead of re-introducing materials into the productive circuit (as secondary raw materials), involving the population as well. Improving the selective collection system is an essential prerequisite for achieving recycling targets (Iacoboaia et al., 2013). Selective waste collection generates raw material for reuse, recycling and energetic recovery, with a positive impact for the environment (Petrescu et al., 2022).

2. Material and methods

In order to provide an overview of the municipal waste management situation in Romania, a comparative study was carried out with some countries in South-Eastern Europe, members of the European Union: Bulgaria, Greece, Croatia, Cyprus, Hungary and Slovenia. Specific indicators in the field of waste were taken into study and analyzed comparatively, in the period 2010-2020. For Greece, there are no reported data for all indicators in 2020.

The indicators taken into study are:

- The amount of municipal waste generated (kg/capita);
- The amount of municipal waste treated (kg/capita);
- The amount of municipal waste recycled (kg/capita);
- The quantity of waste disposed landfill and other (kg/capita);
- The recycling rate.

The data were retrieved from Eurostat for 2020 in comparison with 2010.

2.1 Results and discussions

The quantity of MSW produced in Romania compared to other EU countries in the period 2010-2020 is presented in figure 1. It is found that the lowest amount generated both in 2010 and in 2020 is in Romania of 313 kg/inhabitant, respectively 287 kg/inhabitant. The largest amount generated per inhabitant is in Cyprus, over 600 kg/inhabitant. Among the analyzed countries, the trend was a decreasing one in the case of Bulgaria, Cyprus and Romania, and in Croatia the trend was an increasing one, from 379 kg/inhabitant to 418 kg/inhabitant, the increase being 10%. According to the analyzed data, it is found that during the studied period, a Romanian citizen generates approximately 35% less MSW compared to Bulgaria. The increase in the amount of municipal waste generated in certain countries may be due to the increase in population, lifestyle, but also economic growth. In the countries where there is a decrease in the amount of municipal waste generated, this may be a consequence of the slowdown in economic growth, but also of their better management.

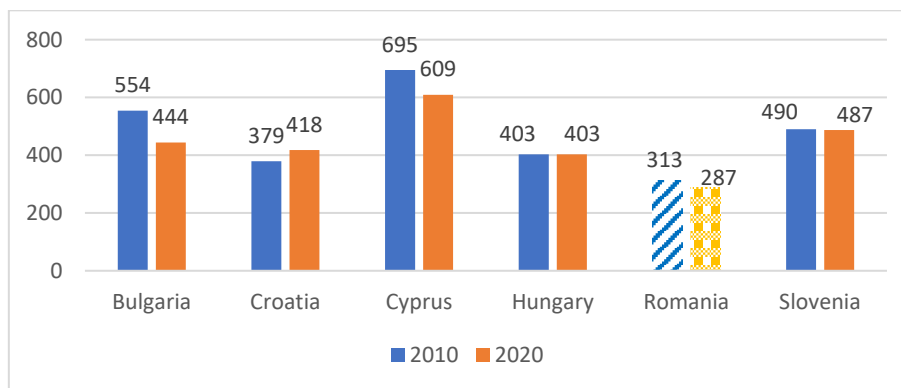


Figure 1. The amount of waste generated in Romania and some South-East European countries (kg/capita)

(Source: <https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>)

The amount of MSW treated in the South-Eastern European countries, members of the European Union in the period 2010-2020 is presented in figure 2. The quantity of municipal waste treated are in correlation with those generated. Thus, in 2010 and 2020, the lowest amount was recorded by Romania of 279 kg/capita, respectively 269 kg/capita. So, Romania treats small quantities, half of those treated in Bulgaria and Cyprus. The largest amount treated was in Cyprus both in 2010 and in anul 2020, 676 kg/capita, respectively 518 kg/capita.

According to the analyzed data, it is estimated that during the studied period, a Romanian citizen deals with approx. 50% less MSW compared to Bulgaria. Analyzing the evolution of the trend in the years under study, it was a downward in the case of Bulgaria, Cyprus, Romania and Slovenia, and a slightly upward in Croatia, while in the case of Hungary it remained at the same level. It should be noted that, in Hungary, the quantities of generated waste are treated in their entirety.

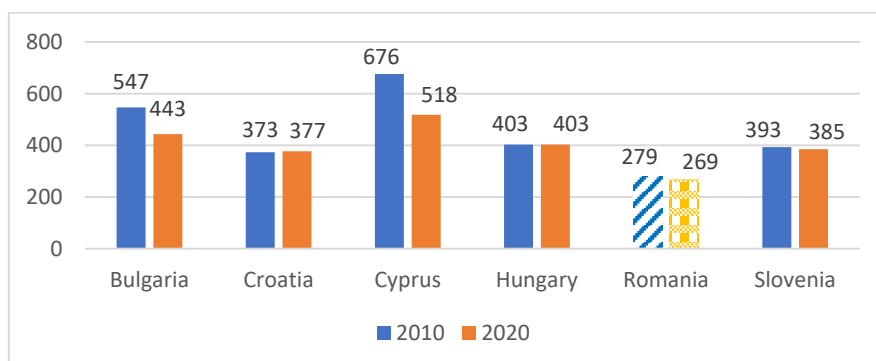


Figure 2. The amount of municipal waste treated in Romania and some South-East European countries (kg/capita)

(Source: <https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>)

The amount of MSW recycled in the EU member countries of South-Eastern Europe in 2010-2020 is presented in figure 3. In the countries analyzed in this study in the two years, 2010 and 2020 respectively, the trend was an increasing one, a fact that indicate the increase in

attention to recycling in the analyzed countries, the exception to this situation being Romania, which recycled in 2020 only 39 kg/ per capita, compared to 40 kg/inhabitant in 2010. In 2010, the lowest amount of 16 kg/capita was recorded in Croatia, and the highest in Bulgaria of 136 kg/capita. In 2020, the limits varied between 39 kg/capita in Romania and 289 kg/capita in Slovenia. It can be seen that Slovenia tripled the amount of recycled waste. According to the analyzed data, it is found that Romania pays very little attention to recycling, the values being far below those of the analyzed countries.

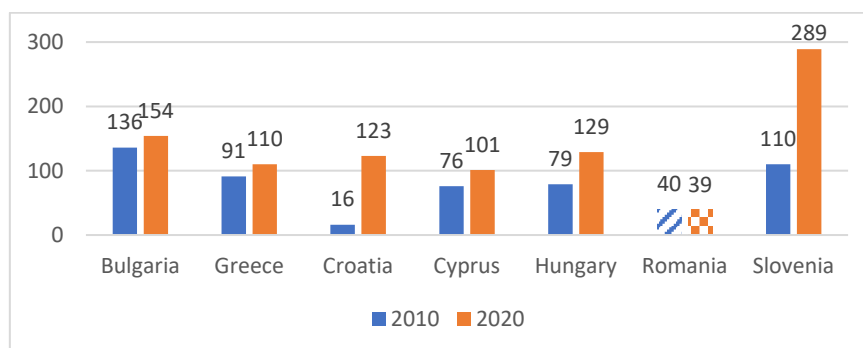


Figure 3. Recycled municipal waste in Romania and some South-East European countries (kg/capita)

(Source: <https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>)

Recycling rate of municipal waste is one of the circular economy indicators. According to figure 4, it can be seen that in the case of the analyzed countries, the recycling rate of the MSW generated is far from reaching the target proposed by the EU, of 50%. In 2020, compared to 2010, the trend is an increasing one in the case of all countries, with the exception of Greece, when no data were reported on the waste generated and treated. From the graph, it can be seen that Romania has the lowest recycling rate, of 12.78% in 2010 and 13.59% in 2020, with close values being only Cyprus. Bulgaria, Croatia and Hungary have values of the recycling above 30% rate and Slovenia recorded the greatest progress from 22.5 in year 2010 up to 59.3% in 2020. This increasing rate shows the concern for increasing the recycling rate on the part of all countries, but until the 50% target is reached, increased efforts are needed, the only exception being Slovenia which has already reached the target.

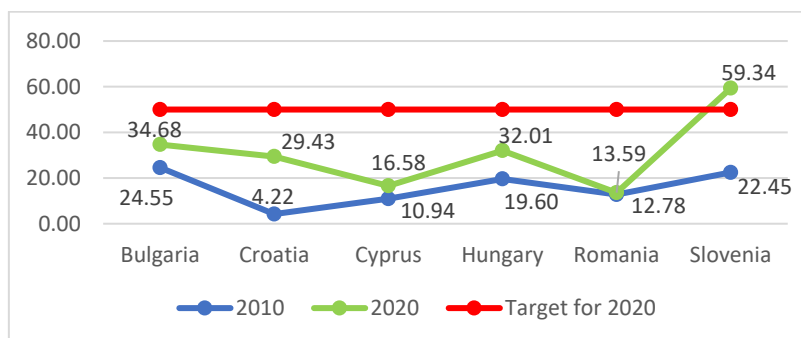


Figure 4. Recycling rate in Romania and some South-Eastern European countries (%)

(Source: own processing)

The methods of treating municipal waste are multiple, but the most used is their treatment through storage.

Regarding the municipal waste disposed in landfills and other in 2010, it varied between 238 kg/capita in Romania and 600 kg/capita in Cyprus, with values over 400kg/capita being in Bulgaria (Figure 5).

In 2020, the quantities disposed in landfill in all analyzed countries decreased. The lowest amount of stored waste was recorded in Slovenia, only 33 kg/capita, while the highest amount was 408 kg/capita in Cyprus. This is due to the fact that Slovenia has a high recycling rate.

Thus, in the case of the analyzed countries, the amount in 2020 compared to 2010 had a decreasing trend. Thus, the most spectacular decrease was recorded in the case of Slovenia, from 279 kg/capita in 2010, to 33 kg/capita in 2020, a country that implements the European Union's recommendation to eliminate waste in platforms, which are sources of pollution. These reduced quantities in the case of all countries may mean that these countries opt for other methods of waste disposal or even their recycling.

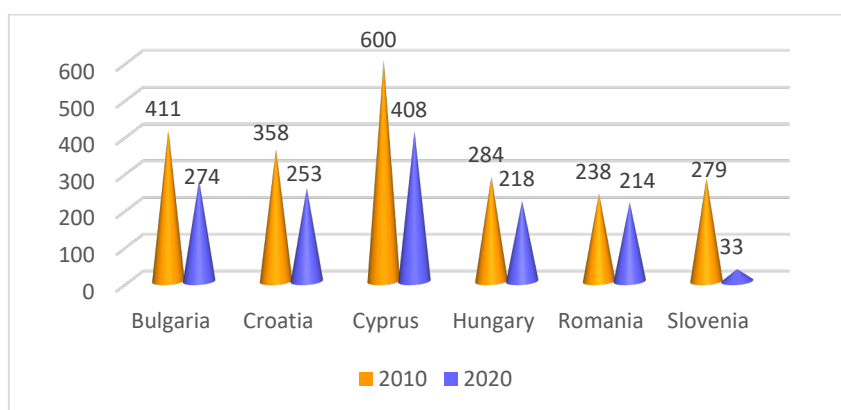


Figure 5. Disposal landfill and other in Romania and some South-Eastern European countries

(Source: <https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>)

From the data analyzed in the period 2010-2020, it can be seen that in Romania the amount of MSW disposed of in landfills is similar to that of various EU countries, in 2020 Romania throwing away 214 kg/capita (Figure 5). In Romania, waste disposal is the main municipal waste management option.

The analysis of the situation regarding waste in Romania and the countries studied shows that the interest in its management has increased, but this field still faces problems that can be addressed through well-implemented strategies. Reducing the amount of waste generated can be achieved by applying the best practices for each field.

Conclusions

From the research conducted, it can be concluded that:

- In 2020, Romania generated the lowest amount of municipal solid waste compared to the analyzed countries (272 kg per capita);
- The amount of MSW disposed (landfill and other) in Romania during the analyzed period is similar to that in the countries of south-eastern Europe, and in 2020 it represented 75% of the amount generated;

- The highest recycling rate in 2020 was recorded by Slovenia - 59%, while in Romania the recycling rate was only 13%, and shows the lack of concern for waste recycling.

- In 2020, the amount of waste disposed in all the countries listed was decreasing. The lowest amount of waste was recorded in Slovenia, only 33 kg/capita, while the highest amount was 408 kg/capita in Cyprus. So, Slovenia is the country that implements the EU recommendation for the disposal of waste in platforms.

In terms of waste management, Romania applies the European legislation, but in order to meet the imposed targets, it must make considerable efforts, particularly in regard to the reduction of the amount of municipal waste.

References

1. Dinu, M.; Pătărlăgeanu, S.R.; Petrariu, R.; Constantin, M.; Potcovaru, A.-M. Empowering Sustainable Consumer Behavior in the EU by Consolidating the Roles of Waste Recycling and Energy Productivity. *Sustainability* 2020, *12*, 9794.
2. Frone Dumitru Florin, Frone Simona, Platon Victor, Constantinescu Andreea. (2020). Green economy prerequisites of waste management, *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, Vol. 20, Issue 4, PRINT ISSN 2284-7995, E-ISSN 2285-3952.
3. Iacoboaia, Cristina & Luca, Oana & Petrescu, Florian. (2013). An analysis of Romania's municipal waste within the European context. *Theoretical and Empirical Researches in Urban Management*. 8. 73-84.
4. Ignat, R.; Constantin, M. (2021). Biowaste recycling as a solution towards a greener economy in the European Union. International Scientific Conference *Sustainable Agriculture and Rural Development Thematic Proceeding*. Belgrade, Serbia, ISBN-978-86-6269-096-8 ISBN (e-book)-978-86-6269-097-5.
5. Ioana Adrian, Istrate Florina Eliza, Buzatu Mihai, Petrescu Mircea Ionuț, Semenescu Augustin, Sohaciu Mirela. (2016). Analysis of collecting and recycling of some waste categories in Romania. *U.P.B. Sci. Bull., Series B*, Vol. 78, Iss. 2, 2016, ISSN 1454-2331.
6. Ionescu, G., Rada, E.C., Ragazzi, M., Marculescu, C., Badrea A., Apostol, T., (2013). Integrated municipal solid waste scenario model using advanced pretreatment and waste to energy processes, *Energy Conversion and Management* 76, 1083-1092.
7. Izvercian, Monica & Ivascu, Larisa. (2015). Waste Management in the Context of Sustainable Development: Case Study in Romania. *Procedia Economics and Finance*. 26. 717-721. 10.1016/S2212-5671(15)00825-4.
8. Magrini Chiara, D'Addato Filippo, Bonoli Alessandra. (2020). Municipal solid waste prevention: A review of market-based instruments in six European Union countries. *Waste Management & Research*, Vol. 38(1) Supplement 3-22
9. Miloștean Daniela, Flori Mihaela. (2019). An overview on the municipal solid waste management in Romania. *Annals of Faculty Engineering Hunedoara – International Journal of Engineering*, Tome XVII, Fascicule 4.
10. Olaru Bianca Georgiana, Zecheru Vasile. (2016). The waste recycling in Romania. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, Vol. 16, Issue 3, 2016, PRINT ISSN 2284-7995, E-ISSN 2285-3952.
11. Orlescu, Constantin & Costescu, Ioana-Alina. (2013). Solid waste management in Romania: Current and future issues. *Environmental Engineering and Management Journal*. 12. 891-899. 10.30638/eemj.2013.110.

12. Petrariu, R.; Constantin, M.; Dinu, M.; Pătărlăgeanu, S.R.; Deaconu, M.E. Water, Energy, Food, Waste Nexus: Between Synergy and Trade-Offs in Romania Based on Entrepreneurship and Economic Performance. *Energies* 2021, *14*, 5172.
13. Petrescu, Irina-Elena & Lombardi, Mariarosaria & Lădaru, Georgiana-Raluca & Munteanu, Răzvan & Istudor, Mihai & Tărășilă, Georgiana. (2022). Influence of the Total Consumption of Households on Municipal Waste Quantity in Romania. *Sustainability*. 14. 8828. 10.3390/su14148828.
14. Saleh, Hosam & Koller, Martin. (2019). Introductory Chapter: Municipal Solid Waste. 10.5772/intechopen.84757.
15. <https://www.eea.europa.eu/publications/municipal-waste-management-across-european-countries>
16. Teodor Cristian; Carmen Lenuta Trica; Raluca Ignat & Raluca-Mihaela Dracea. (2020). Good Practices of Efficient Packaging Waste Management, *The Amfiteatru Economic Journal*, 2, (55), 937.