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REVIEW OF UKRAINIAN, SLOVAKIAN AND SERBIAN MUNICIPAL WASTE  
MANAGEMENT: COMPARATIVE STUDY

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**Abstract.** The Carpathian Euroregion comprises of five countries: Poland, Slovakia, Hungary, Romania and Ukraine, as the Euroregion's fifth state, aspires to join the EU. As a result, we chose to compare Slovak Republic as an EU member state and Serbia and Ukraine as candidate countries. To support waste reduction and a circular economy, European law establishes waste management principles incorporated into national legislation across all EU member states. The key document of Slovakia is the Envirostrategy 2030, which sets a target of 60 % recycling and 10 % landfilling by 2030. In 2017, Ukraine's Cabinet approved a National Waste Management Strategy for the period up to 2030, and Serbia approved a Waste Management Program in the Republic of Serbia for the period 2022 - 2031; as a crucial aspect of the EU's new growth strategy to move the EU economy toward a sustainable economic model, the research article focuses on the European Green Deal and its effects on the countries under examination. This research paper's goal is to assess the state of Serbia, Slovakia, and Ukraine focusing on the waste situation in particular. While Ukraine and Serbia have enacted legislation requiring waste separation, this is only being implemented gradually in practice, and insufficient infrastructure is another issue. Slovakia has a slightly better situation due to its more advanced infrastructure.

**Keywords:** municipal waste management, circular economy, Ukraine, Slovakia, Serbia

## 1. Introduction

The European Green Deal's goals are critical, and each European Union member (hereinafter EU) or candidate country is working to achieve them. (Marišová, Valenčíková, 2021). Because national

borders do not bind the climate, it is necessary to address its fundamental objectives outside Europe. This agreement reflects some environmental issues that have been overlooked. When countries have varying means and technologies to improve their climate position, the implementation process will differ from place to place.

## 2. Materials and Methods

The article focuses on how Slovakian, Ukrainian, and Serbian strategic documents addressing waste management should be interpreted. The understanding of the article primarily processes its theoretical underpinnings. The degree of cooperation is then evaluated using the analysis and evaluation method of these EU Member States' legislation becoming enforceable following EU law. The National Waste Management Strategy in Ukraine, the Waste Management Program in the Republic of Serbia, and the Slovak Environmental Policy Strategy are the three main areas of focus in the research article. The discussion is based on information from Eurostat and the State Statistics Service of Ukraine for the period under consideration. Data from Eurostat (evaluated period 2011–2020) were utilized in the research paper for Slovakia. From State Statistics Service of Ukraine, data for 2011–2020 were obtained; however, for Serbia, there was no data for 2020, and from the national statistical service, data was not provided. Waste generated per capita in kg, waste treatment,

disposal – incineration and energy recovery, disposal – incineration and other (D1-D7, D12) and disposal method were shown in the figures.

### 3. Results and Discussion

#### 3.1. Strategy of the Environmental Policy of the Slovak Republic until 2030 – Envirostrategy 2030

Taušová et al. (2020) state that Slovakia is currently dealing with several environmental issues, such as poor air quality, low waste recycling rates, and ecosystem preservation. Environmental problems are wreaking *havoc* on the economy, employment, and general well-being. (Sinclair et al., 2010) Furthermore, climate change has already impacted Slovakia, as it has the rest of the world, with visible consequences that will manifest in the future as environmental, economic, and health issues. (Hoffman, 2005) The environmental policy strategy that was approved in 1993 was in place for a sizable amount of time. However, because it was out of date, it could not adequately address the problems and challenges that the environment was creating. As a result, the Institute of Environmental Policy coordinated with the Ministry of the Environment of the Slovak Republic to create an innovative environmental policy strategy until 2030. By 2030, the rate of municipal waste recycling will have increased to 60 %, including preparation for re-use, and the rate of land-filling will have decreased to less than 25 % by 2035. Increased funding will be provided for green technologies, science, and research, and supermarket food waste disposal will be outlawed. However, Slovakia has a lot of room to improve how it uses its resources. The definition of food is included in the regulation no. 178/2002 called also general food law and is used also for food labelling law; for instance food is any substance or item that is intended for human consumption or that can reasonably be expected to be consumed by humans, regardless of whether it has undergone any processing. (Laziková, Rumanovská, 2021) Municipal waste landfilling in Slovakia continues to be the most prevalent waste disposal method, with one of the highest rates in the EU, while municipal waste recycling is among the lowest in the EU. Without stricter regulations, the trend toward fewer waste landfills and remarkable recycling is unlikely to change.

Báreková et al. (2020) agree that biodegradable municipal waste must be separated and recovered consistently. All environmental costs, such as soil, water, air contamination, and other economic costs,

will be factored into the landfill fee. Raising landfill fees effectively encourages people to sort their trash, reduce waste, and recycle more. Over time, a higher fee has been shown to lower landfill rates, but it should be used in conjunction with other policies. In Slovakia, the cost of dumping municipal waste in a landfill is among the lowest in the EU. Municipalities will gradually introduce waste volume-based incentives for municipal waste collection. Since only a few municipalities in Slovakia have chosen quantity waste collection as a solution, municipalities will gradually introduce waste volume-based incentives for municipal waste collection. (Radvan 2016) As stated in Envirostrategy 2030, local governments will gradually adopt one of the quantity waste collection techniques. Not to forget, transitioning to a quantity waste collection system can be done in stages, starting with a flat-rate discount system based on the type of waste separation. Slovakia also wants to reduce food waste by half by 2030 meaning restaurants and grocery stores will be required to use the food in some capacity, such as donating food that complies with food safety regulations to a charitable organization. Once the food will not be fit for consumption, the food will be composted or used for energetical purposes. In that case, they will be composted or used energetically (for instance by selling at a reduced price for feeding purposes, except for the feeding of wild animals). (Strategy of the environmental policy of the Slovak Republic until 2030, 2019) As in other European member countries, such food will be sold in designated facilities. Andowski, Jarosz-Angowska (2020) say, that in Slovakia, “best before” food labels will be phased out in favor of a uniform “use by” system. If properly stored, foods that have passed their minimum durability date may still be edible. In most European countries, “minimum durability” labels have been phased out because they increase food waste. Undoubtedly, the prevention of biodegradable waste will be promoted, with a focus on biodegradable municipal waste. Moreover, a sufficient network of biodegradable kitchen and restaurant waste collection and recovery facilities will be built. (Mihai, 2016)

#### 3.2. National Waste Management Strategy in Ukraine until 2030

The “National Waste Management Strategy in Ukraine until 2030” (hereinafter Strategy) was introduced to address domestic waste issues and develop effective disposal mechanisms. The Strategy, which takes into account European waste management

methods, identifies the major state regulatory directions in the area of waste management for the ensuing decades. The Strategy pays particular attention to local and regional waste management. It includes an analysis of the current state of waste management in the region, the definition of objectives and measures, and analysis to choose the best waste management system (collection infrastructure, separate collection, treatment, and disposal), as well as the practical steps necessary for its implementation. In accordance with their respective competencies, the regional plans are agreed upon with the Ministry of the Environment and the Ministry of Regional Development. The state and local budgets will be used to fund the approved regional waste management plan.

It should be noted that based on the Association Agreement between Ukraine, of the one part, and the EU, the European Atomic Energy Community and their Member States (2017) there are 460 cities, 885 urban settlements, and 28 388 villages in Ukraine with local governments in charge of organizing the provision of household waste management services. The Ukrainian laws “On Waste” and “On Environmental Protection” are the key documents outlining the fundamentals of waste management and the top priorities in this field; in accordance with amendments to the legislation adopted in 2008–2014, the following strategic priorities for industrial development have been identified:

- the need to develop technologies and measures aimed at reducing waste generation, treatment, and recycling (including municipal industrial components);
- providing economic benefits to companies that implement these technologies and measures;
- landfill prevention;
- responsibility for the pollutant causing adverse environmental effects;

Due to this, only one-third of Ukrainians will have access to services for disposing of waste in an environmentally friendly manner. The Association Agreement between Ukraine and the EU, which was ratified on September 16, 2014, establishes a schedule for gradually aligning Ukrainian waste and resource management legislation with EU legislation and policies in an environmentally sound manner.

Furthermore, the issue of waste management was included in the coalition agreement between the parties that were members of the Ukrainian Verkhovna Rada. This document proposes the implementation of extended producer responsibility for packaging waste in accordance with the “polluter pays” principle, as

well as primary importer responsibility for the entire product life cycle, including liability (direct and/or financial) for waste disposal. The adoption of amendments and additions to the Ukrainian Electricity Act, as well as the use of landfill gas as an alternative fuel, was a big step forward.

As stated in Strategy (2021), considering the European approaches to waste management outlined in the following Directives, the following two are the main directions of state regulation in the area of waste management for the ensuing decades:

- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste, repealing certain Directives;
- Directive 1999/31/EC of 26 April 1999 on the landfill of waste;

The “On Waste” Law of Ukraine prohibits the disposal of unprocessed household waste at landfills as of January 1, 2018. Instead, it requires Ukrainian citizens to sort waste and dispose of it in fitting containers. The amount of waste disposed of annually was supposed to decrease from 95 % in 2016 to 30 % in 2030 with the help of laws and new containers, but by 2019 it had only decreased by 1.2 %. According to experts, the reason is not only that most Ukrainians are unwilling to sort waste – but on the report of unofficial statistics, only 4 % of the population recycles their waste. However, Ukraine lacks the necessary infrastructure, such as recycling facilities and appropriate waste containers close to homes. (Ukrainian National Waste Management Strategy, 2021)

### **3.3. Waste Management Program in the Republic of Serbia for the period 2022–2031**

With EU regulation, institutional bargaining, and regulation of regional agreements for the establishment of joint waste management and the construction of a single sanitary deposit at the end of the period, there is an increase in waste management regulation. Goals of Program are not expected to be met in terms of waste management, primary waste segregation and recycling, waste infrastructure, and the elimination of waste disposal for non-humanitarian landfills and waste, as well as the economy's and economic sector's economies. The implementation of this Program should be able to facilitate the development of waste management in the circular economy to develop the specific Program's objectives and measures to reduce the environmental impact of

the environment and climate change. The adoption of the Waste Management Law and the Waste Management Law (“Service Glossary of the Republic of Serbia,” Br. 36/09 and 95/18 of the Act) follows the standards of relevant EU legislation in this area. (Program upravljanja otpadom u Republici Srbiji za period 2022–2031. godine, 2022)

In accordance with Chapter (Poglavlje) 27 (2020), the Republic of Serbia has begun the process of establishing a waste management system and adapting it to EU regulations as part of its accession negotiations with the EU. The Coalition 27's seventh annual report, titled “Chapter 27 in Serbia: Progress in the World,” outlines Serbia's progress in the transfer

and primary legislation of the EU in the areas of waste, water quality, nature protection, chemical management, beekeeping, climate change, noise protection, and environmental protection.

In Fig. 1 there is a comparison of Slovakia, Serbia in Ukraine in terms of generated waste and it shows that Slovakia generates most waste, and on the other hand, Ukraine least.

In Fig. 2, there is an observation of treated waste between Slovakia, Serbia and Ukraine. During the investigated period, Slovak's and Ukrainian treatment of waste is on the rise; however, for Serbia, there was not sufficient data on waste treatment for 2019 and 2020.

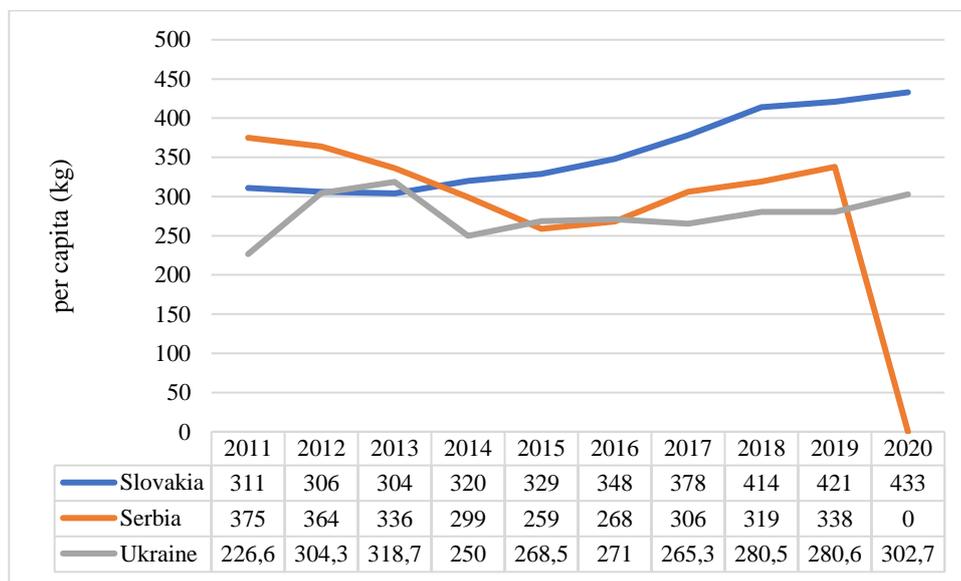


Fig. 1. Waste generated per capita (kg) (State Statistics Service of Ukraine; Eurostat (2022))

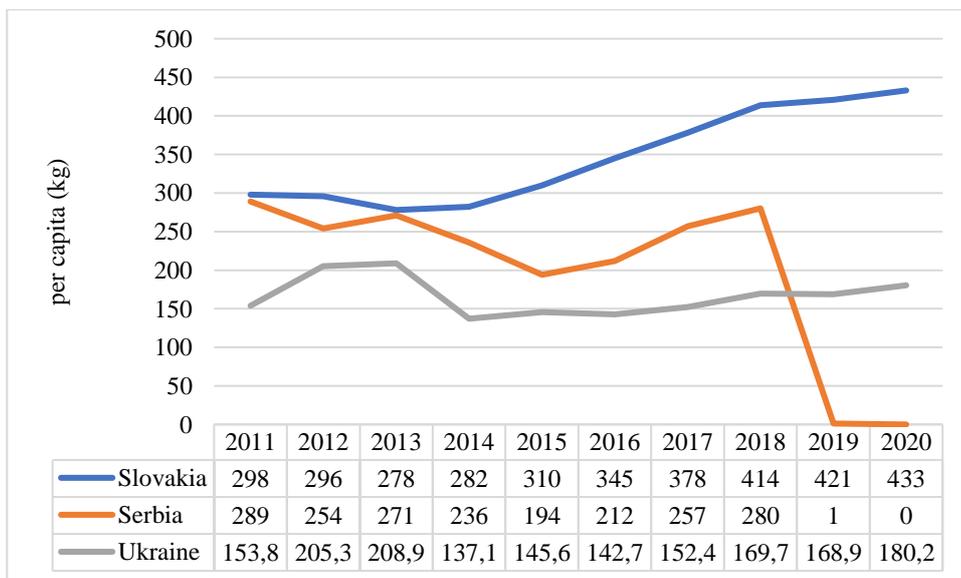


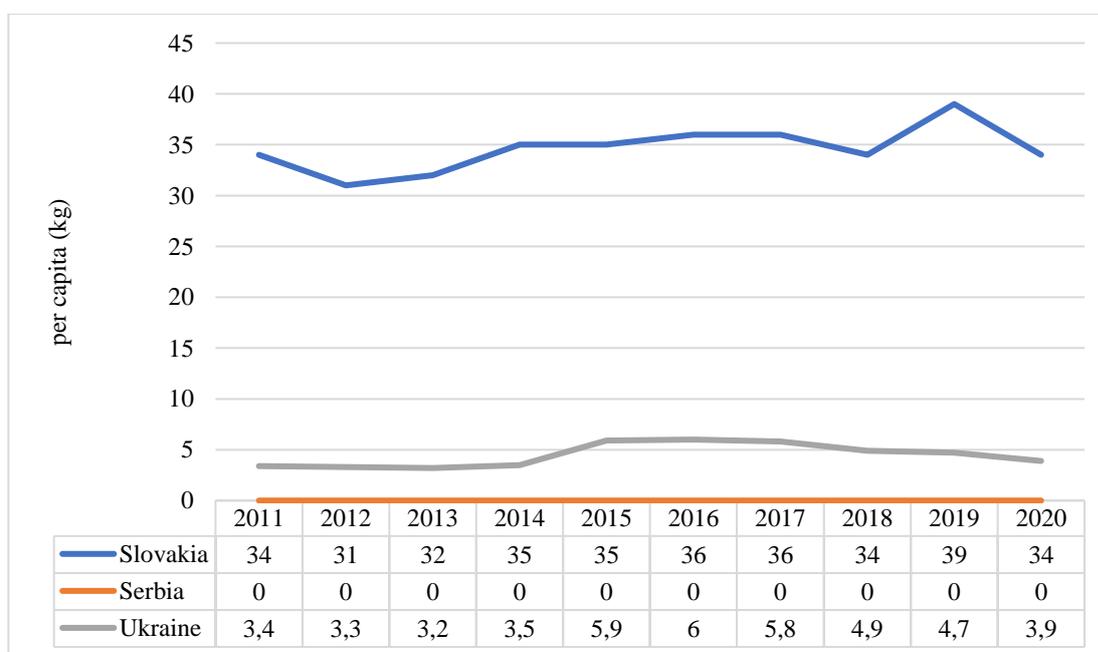
Fig. 2. Waste treatment (State Statistics Service of Ukraine; Eurostat (2022))

In Fig. 3, incineration and energy recovery implementation has not yet been applied in Serbia; however, in Slovakia, they disposed of 34 per capita (kg) of waste using incineration and energy waste, and in Ukraine, 3.9 for 2020.

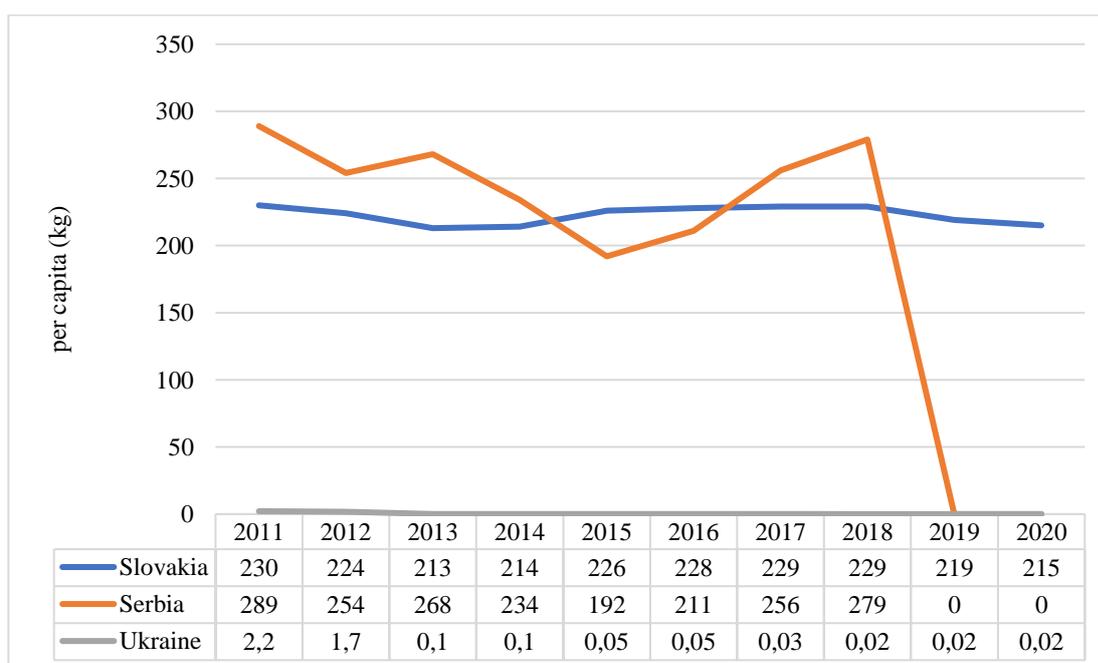
In Fig. 4, the implementation of the method of incineration and other (D1-D7, D12) has been applied

in all three countries.

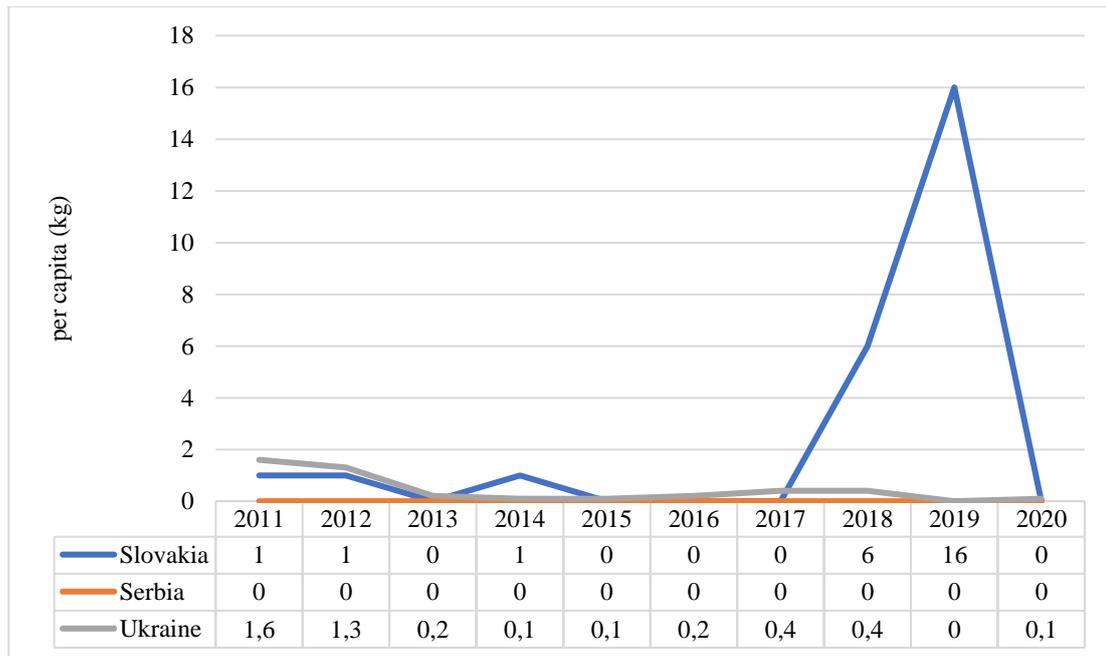
As shown in Fig. 5, the method of disposal – incineration (D10) has not been applied in Serbia, or there is not sufficient data. In Slovakia, in 2020, this method has not been implemented, and in Ukraine, 0.1 per capita in kg.



**Fig. 3.** Disposal – incineration and energy recovery (State Statistics Service of Ukraine; Eurostat (2022))



**Fig. 4.** Disposal – incineration and other (D1-D7, D12) (State Statistics Service of Ukraine; Eurostat (2022))



**Fig. 5.** Method of disposal – incineration (D10)  
(State Statistics Service of Ukraine; Eurostat (2022))

#### 4. Conclusions

Legislation and waste recovery plans in the EU are aimed at reducing waste by separating its constituents throughout the recycling process and implementation waste-to-energy method. Based on an analysis of EU legislation, they might finish their system with the necessary data and monitor compliance to enable waste sorting and recycling if selected strategies of Slovakia, Serbia, and Ukraine are carefully implemented. The situation in Slovakia in terms of waste management is more promising than in Ukraine and Serbia as they have better infrastructure, more qualified staff and are a member of the EU. A thorough investigation will be conducted in Slovakia's waste management process, based on waste Envirostrategy 2030.

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