ECONOMIC THEMES (2023) 63(1): 101-118

DOI 10.2478/ethemes-2025-0006

ADVANCING THE INTEGRATION OF INFORMAL WASTE PICKERS INTO URBAN WASTE MANAGEMENT SYSTEMS: POTENTIALS AND LIMITATIONS

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UDC 628.4:331.108

Original scientific paper

Abstract: Waste management remains one of the most pressing global challenges of the 21st century, particularly in rapidly urbanizing areas. Improper handling and disposal of waste, especially hazardous materials, pose serious risks to public health and the environment, exacerbating problems in already inadequately planned urban settings. Despite the development of waste management strategies such as recycling and composting, the effectiveness of these approaches is limited without the inclusion of all key stakeholders. Informal waste pickers, especially in low- and middle-income countries, play a crucial yet underrecognized role in urban waste management by contributing significantly to waste collection, sorting, and recycling. In the Republic of Serbia, where the formal waste management system remains underdeveloped and lacks comprehensive legal and institutional frameworks, the informal sector is responsible for a substantial portion of secondary raw material recovery. However, this sector operates without legal status or systemic support. This paper presents a

comprehensive analysis of the socio-economic position of secondary waste collectors in Serbia, drawing on empirical research conducted in 2024. Special attention is given to the perceptions of informal waste collectors regarding the opportunities and constraints related to their integration into the formal waste management system. The findings highlight the potential for enhancing efficiency and sustainability in urban waste management through the formal recognition and support of informal actors.

Received: 02.02.2025
Accepted: 19.03.2025

Keywords: urban waste management, informal waste pickers, Republic of Serbia.

JEL classification: Q53, O17, J46.

1. Introduction

The collection of secondary raw materials from waste is present in countries across the world — from the most developed nations, which recycle nearly all of their waste, to the poorest, where entire communities have formed around landfills. Nevertheless, the position of informal waste pickers is rarely addressed through systematic regulation that would not only improve waste management but also enhance their economic and social status while reducing the risks of criminal activity.

According to World Bank data, around 1% of the urban population in developing countries survives by collecting raw materials from waste — which amounts to at least 15 million people. The reasons are, above all, economic in nature. Many waste pickers belong to vulnerable groups: including migrants, the unemployed, persons with disabilities, women, children, and the elderly. They often live in a hostile social environment, as society frequently marginalizes them due to the nature of their work. They work on the streets and in open dumps, in daily contact with various types of waste — including hazardous and medical waste — which poses serious health risks. However, their contribution to the cities is not immeasurable. "Informal waste pickers contribute to increasing the lifespan of landfills by lowering the quantities of waste to be disposed of, and are key economic actors in providing inputs to the recycling market with materials that would otherwise be dumped" (Dias, 2016, p.377).

This paper focuses on informal waste collectors in the Republic of Serbia. Drawing on data obtained through empirical research, the primary aim is to provide a comprehensive profile of secondary raw material collectors and to shed light on their perceptions, challenges, and expectations. The starting assumption of this research is that there is a significant gap among secondary raw material collectors between perception of their social position and the need for their work to be recognized and acknowledged by the system. Understanding these aspects is essential for informing policy and supporting their effective integration into the urban waste management system in Serbia.

2. Hierarchical waste management system with a focus on the situation in the Republic of Serbia

"Waste management involves the transportation, collection, processing, disposal or recycling of waste materials, originating from industries, manufacturing processes and municipal solid waste." (González-Sánchez, R., Alonso-Muñoz, S. & Medina-Salgado, 2023) All these activities require a structured order of implementation. Thus, waste management relies on a hierarchical approach that encompasses various stages (Figure 1). At the core of this approach is the prevention of waste generation rather than its disposal. Therefore, the hierarchical waste management system advocates for reuse, recycling, energy recovery, and only at the end of the process, the disposal of waste. In this sense, effective waste management not only involves finding proper solutions for already generated waste but also directing efforts toward minimizing waste at the production and consumption stages.

Figure 1: Waste management hierarchy

Source: U.S. Environmental Protection Agency, Sustainable Materials Management: Non-Hazardous Materials and Waste Management Hierarchy, https://www.epa.gov/smm/sustainable-materials-management-non-hazardous-materials-and-waste-management-hierarchy

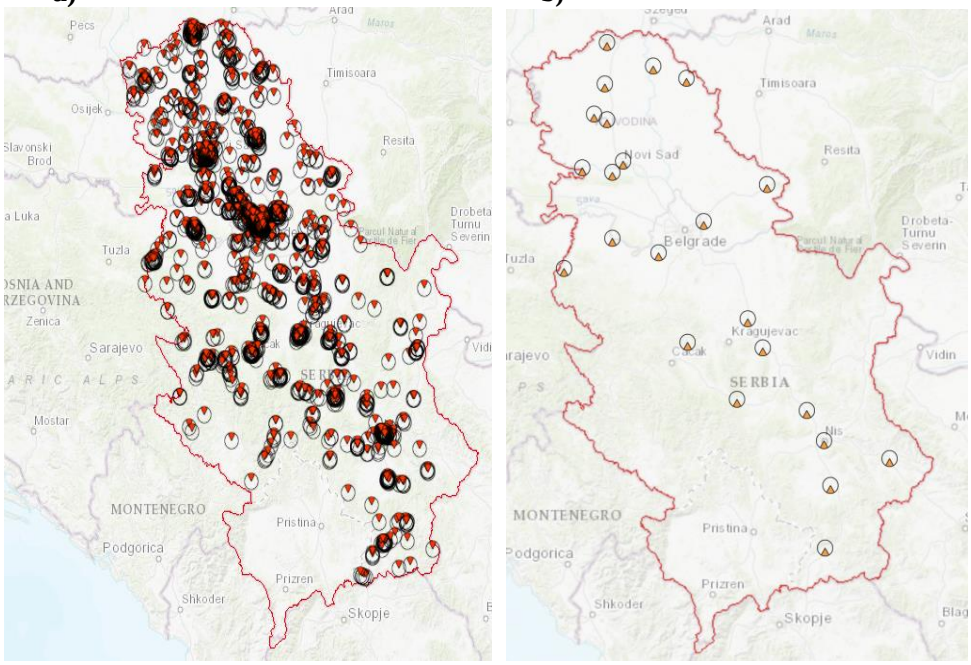
The most impactful strategies in the waste hierarchy designed to lessen or eliminate waste arise from changes in production practices or consumption behaviors (by either reducing or refusing waste). After waste is generated, the waste hierarchy strategies are prioritized. Waste that has been separated can still be utilized as a resource through practices such as reuse, recycling, or recovery, which can create organic materials or energy. If these alternatives are not feasible, the waste is either directed to a sanitary landfill or a controlled dump (which effectively regulates a significant part of emissions and leachate), or it is discarded through open dumping or incineration without proper containment or oversight. (Awino, Apitz, 2024)

This approach to waste management has been introduced in the Law on Waste Management in the Republic of Serbia. Thus, Article 6 of this Law (Law on Waste Management in the Republic of Serbia, 2023) discusses the waste management hierarchy and states that it represents the order of priorities that should be implemented in practice. According to this article of the Law: "The waste management hierarchy is applied as a prioritized order in the prevention and management of waste, through regulations and policies: prevention; preparation for reuse; recycling; other operations for recovery (reuse for the purpose of obtaining energy, etc.); disposal."

However, in the Republic of Serbia, the situation regarding urban waste management indicates serious challenges. According to current data, "the most commonly used method of waste management is landfill disposal" (Tošić, Vasović, 2020, p.89), which represents the last resort in the waste management hierarchy. This approach highlights deep structural deficiencies and inefficiencies in the organization and implementation of the waste management system in the country.

Figure 2: Waste generation and waste treatment in the Republic of Serbia

a) **b)**



Source: Republic of Serbia, Ministry of Environmental Protection, Environmental Protection Agency, West Management GIS Portal, http://77.46.150.221/nrizgis/index.html

On the Figure 2 is clear presented settlements where waste is generated (a) and settlements where waste is treated (b). Waste treatment is located only in the cities,

such as Novi Sad, Beograd, Kragujevac, Niš, Čačak. The latest estimates from the Agency for Environmental Protection indicate that only about 15% of the total generated municipal waste is recycled annually (or 17.7% in 2022). Of this, the participation of local self-governments in the recycling process is a mere 3%, while the remaining quantities come from the informal sector. These data highlight the insufficient organization and support that should be provided by local authorities and public utility companies (Republic of Serbia, Ministry for Environmental Protection, Agency for Environmental Protection, 2024).

If we compare these data with the recycling statistics from EU countries, it is evident that these countries have made significant progress in establishing and achieving a circular economy system. Recycling rates of municipal and packaging waste and e-waste have been slowly increasing in general, indicating a move towards a more circular economy. The overall recycling rate, i.e. the ratio between total waste generated, stood at 44% in 2022. Regarding the types of waste that are recycled, the highest recycling rate in 2022 was registered for packaging (65%), followed by municipal (49%) and e-waste (32%). (European Environment Agency, 2024)

The level of recycling of municipal waste is strongly linked to the activities and waste management systems established by local self-governments and implemented by public utility companies. The low recycling rate, at only 3%, indicates weaknesses in the organization and functionality of local waste management systems. According to estimates from the Agency for Environmental Protection of the Republic of Serbia, compared to the capacities and potentials available to local self-governments and public utility companies, this percentage is very low. The main reason for this discrepancy lies in the fact that many local self-governments have not introduced a waste separation system, which is a key component for increasing the recycling rate. (Republic of Serbia, Ministry for Environmental Protection, Agency for Environmental Protection, 2024)

Globally speaking, the most important factors influencing a poor, insufficient, and inadequate urban waste management system mainly relate to: "increasing urban population, limited financial resources without advanced technologies for waste treatment and disposal, recently adopted adequate legislation, etc." (Florina et al., 2013, p.547). In the Republic of Serbia, the causes of this problem are multifaceted. At the local level, the most common factors of poor waste management are related to the lack of technical, human, and financial capacities. Additionally, at the national level, poor data organization and the lack of strategic documents for planning and implementing legal obligations in this area contribute to further deterioration of the situation.

A significant factor contributing to the poor state of waste management in the country is the awareness of citizens regarding the importance of this issue and its associated problems. The lack of information among citizens about the significance of recycling and proper waste disposal further exacerbates the situation and

diminishes the chances for the successful implementation of adopted strategies and legal obligations in this area.

There is an urgent need for reforming the waste management system in Serbia, including the adoption of strategies to increase recycling rates, as well as the education and engagement of all stakeholders in the process, from local authorities and public enterprises to citizens.

3. Institutional framework for establishing an adequate urban waste management system in the Republic of Serbia

Waste management in the Republic of Serbia has undergone significant changes and challenges in recent years, transitioning from reliance on traditional disposal methods to efforts aimed at establishing more efficient management systems.

At the EU level, several documents have been adopted over the last decade that define common policies regarding further economic and social development, while simultaneously protecting the environment, its resources, and public health. Effective waste management for all types of waste plays an important role in these processes for achieving sustainable development. Within the framework of the EU accession negotiations, the Republic of Serbia has initiated the process of establishing a waste management system and adapting it to the goals and legal acquis of the EU through Chapter 27.

The national framework of public policy for waste management is primarily based on the Law on Waste Management (Law on Waste Management of the Republic of Serbia, 2023) and the Law on Packaging and Packaging Waste (Law on Packaging and Packaging Waste, 2018). In addition to these laws, the institutional framework is complemented by the Waste Management Program in the Republic of Serbia for the period 2022-2031, which was adopted in 2022. (Waste Management Program in the Republic of Serbia for the period 2022-2031, 2022) These documents define objectives such as waste reduction, increasing recycling rates, and improving the waste collection and transportation system. In the meantime, there have been no strategic documents for waste management, except for the Waste Management Strategy for the period 2010-2019(Waste Management Strategy for the period 2010-2019, 2010). The Strategy that expired in 2019 nonetheless served as the foundation for establishing and developing an integrated waste management system in the Republic of Serbia, which is defined and established by the latest Program. As stated in the Waste Management Program in the Republic of Serbia, “progress in the previous period was achieved in aligning waste management regulations with EU regulations, strengthening institutions, and reaching regional agreements for the establishment of joint waste management, as well as in the construction of several sanitary landfills” (Waste Management Program in the Republic of Serbia for the period 2022-2031, 2022).However, a critical assessment of the previous results of

waste management in Serbia has also been made. Specifically, the Program highlights that "the goals set by the Strategy have not been fully achieved, primarily concerning the coverage of organized waste collection, the degree of primary waste separation and recycling, infrastructure development, the cessation of waste disposal at unsanitary landfills and dumps, the application of economic instruments, and the establishment of a sustainable financing system for waste management." In the coming years, all of these goals still represent a priority, but they should be achieved to a significantly greater extent. An important task in the upcoming period is the institutional alignment with practices applied in EU countries. Specifically, the first step is the adoption and subsequent establishment of conditions for implementing a large number of directives that regulate the field of waste management. The European Union has made progress in the process of "green transition" and the shift to a circular economy, thanks to a comprehensive approach outlined in directives that lay the foundations and guidelines for the regulation and efficient functioning of various segments of waste management. The Republic of Serbia's aim is to harmonize with these legislations and gradually adapt to their implementation. This will be a tremendous challenge, a substantial task, and a very costly policy.

The Waste Management Program should adopt the principles and practices that stem from several EU directives, such as: Directive 2008/98/EC of the European Parliament and Council on waste, Directive 2018/851 EU amending Directive 2008/98/EC on waste, Directive 94/62/EC on packaging and packaging waste, Directive 2000/53/EC on end-of-life vehicles, Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators, Directive 2012/19/EU on waste electrical and electronic equipment, Directive (EU) 2019/904 on reducing the impact of certain plastic products on the environment, Directive 87/217/EEC on the prevention and reduction of environmental pollution by asbestos, Directive 2010/75/EU on industrial emissions, and Directive 2009/125/EC establishing a framework for the setting of eco-design requirements for energy-related products.

To define further steps in improving the waste management system, it is essential to reflect on the achievements and trends so far. Table 1 presents the most significant indicators of municipal waste, as the most important category of waste, according to Eurostat data for the Republic of Serbia.

The *total generated municipal waste* has increased steadily over the years. The sharpest yearly increase seems to occur between 2020 and 2021, indicating a notable rise in waste generation during that period. The increase in total waste generation suggests a growing consumption rate or inadequate waste reduction strategies. The *amount of landfilled municipal waste* also shows an upward trend. However, the year 2021 stands out with a significant jump in total waste landfilled, suggesting potential changes in operational practices or policy enforcement affecting waste disposal during that period. It is notable that the increase in landfilled waste correlates with the overall increase in generated waste, indicating that most of the generated waste continues to be disposed of rather than reduced or recycled. *Waste deposited in*

sanitary landfills fluctuates significantly. It increased markedly in 2021 to 850.115 tons, peaking yet again in 2022 with an apex of 1.294.126 tons. In contrast, *waste deposited in unsanitary landfills* has generally decreased from, although there was a temporary spike in 2019. This trend indicates efforts to improve waste management practices and reduce reliance on unsanitary sites, which is positive for environmental health. The significant jump in sanitary landfill waste in 2021 could signify improvements in waste segregation or a shift in policy favoring sanitary landfilling over unsanitary methods.

Table 1. Indicators of Municipal Waste according to Eurostat

Indicator	2018	2019	2020	2021	2022	2023
Total Generated Municipal Waste [t]	2.795.296	2.827.910	2.947.497	3.021.741	3.178.770	3.095.422
Total Landfilled Municipal Waste [t]	2.223.864	2.243.661	2.341.732	2.356.432	2.457.216	2.460.777
Waste desposed in sanitary landfills [t]	439.642	500.897	558.568	850.115	1.294.126	1.201.683
Waste desposed in unsanitary landfills [t]	1.784.222	1.742.764	1.783.164	1.506.317	1.163.090	1,259,094
Percentage of municipal waste landfilled in relation to total generated waste [%]	63.83	61.63	60.5	49.85	36.59	40.68
Percentage of municipal waste in unsanitary landfills in relation to total generated waste [%]	80.23	77.68	76.15	63.92	47.33	51.17
Share of waste deposited in unsanitary landfills relative to total landfilled waste [%]	79.56	79.34	79.45	77.98	77.30	77.50

Source: Republic of Serbia, Ministry for Environmental Protection, Agency for Environmental Protection, (2024) Waste management in the Republic of Serbia during the period from 2011 to 2023, Beograd

The percentage of municipal waste landfilled in relation to total generated waste has shown a decline from 63.83% in 2018 to around 40.68% in 2023, suggesting slight improvements in waste reduction strategies over this period. The percentage of municipal waste in unsanitary landfills in relation to generated waste has decreased significantly, from 80.23% in 2018 to 51.17% in 2023, indicating positive

progress in managing waste more effectively and an emphasis on environmental safety. Conversely, the share of waste deposited in unsanitary landfills relative to total landfilled waste experienced a decline from 79.56% in 2018 to 77.5% in 2023, reinforcing the trend toward improved waste management practices and a reduction in unsanitary disposal methods.

The overall data indicates a concerning trend of increasing waste generation against the backdrop of slight improvements in waste management strategies regarding sanitary practices. The decrease in both the absolute quantity and percentage of waste disposed of in unsanitary landfills demonstrates a positive shift toward more regulated and safe waste disposal methods. Nonetheless, the rising trends in generated and landfilled waste underscore a need for enhanced waste reduction strategies, increased recycling efforts, and sustainability initiatives to manage the environmental impact of rising waste generation effectively.

Despite the progress made, Serbia faces numerous challenges in waste management. This includes low public awareness of proper waste management, a lack of effective systems for primary waste sorting, and weak cooperation among different levels of government. For the future of waste management in Serbia, it is crucial to adopt sustainable practices and strategies. This involves further developing the circular economy, where waste is viewed as a resource, as well as enhancing educational programs to raise awareness about the importance of reduction, reuse, and recycling. Additionally, investment in new technologies is needed to facilitate waste management processes and make them more efficient.

4. The role and perspective of the informal sector in waste collection in the Republic of Serbia

The informal sector in the Republic of Serbia plays a significant role in the collection and classification of waste. However, this sector is not regulated by the legislation of the Republic of Serbia and lacks legal and economic oversight. “Between 30,000 and 50,000 individual waste pickers are believed to be active in Serbia, mostly members of the Roma population but also other poor residents. The Serbian authorities report that the number of informal collectors has been growing over the years and that they are getting better organized.” (European Environment Agency, 2021) A significant increase in the number of pickers of secondary raw materials began in 2009, when a set of laws was passed in Serbia in the field of environmental protection and waste management. This legal framework has encouraged the development of the recycling industry (Birmančević, 2021, p. 42) and, in accordance with these tendencies, the expansion of the pickers of secondary raw materials and the inclusion of the informal sector in these jobs began.

The current Waste Management Program in the Republic of Serbia for the period 2022-2031 confirms this and emphasizes that the informal sector collects quality

packaging waste. The regulation and introduction of this group of informal collectors into the regulatory frameworks of the hierarchical waste management process is expected to be regulated following the adoption and implementation of EU directives. One of the important solutions pertains to the social and economic benefits that will manifest in an increase in the number of formally employed individuals, which is a key indicator of the development of the Republic of Serbia. By stimulating and organizing the recycling and reuse of materials, a hierarchical waste management system will be established, which is the goal. As stated in the Waste Management Program for the Republic of Serbia for the period 2022-2031, "this will further create opportunities for opportunities related to the collection and recycling of secondary materials."

Expectations and optimistic forecasts for the implementation of the Program point towards the creation of an environment (legal, economic, and social) that will facilitate the employment of informal waste collectors. This approach would positively impact their employment opportunities, ensuring their rights to pension insurance and indirectly promoting better sanitary management, healthcare, and ultimately aiming for a goal which is imperative in today's world: the improvement of living standards and quality of life.

The benefits would also be reflected at the level of local governments, stimulating increase employment and getting externality which reflects in better environmental conditions. Encouraging waste collectors and stimulating them has a numerous effect. "With the increasing trend towards increased efficiency, legislative frameworks and contracts should be flexible enough to allow the participation of small-scale service providers, i.e. groups of organized waste-pickers" (Moreno-Sánchez et al. 2004). One of the suggestions and a positive example from other countries, which should be considered, refers to the fact that "organized groups of informal waste pickers have more economic benefits and make everyone in the group better off than if they worked as individuals." (Espinosa-Aquino et al. 2023, p. 14)

Strengthening civil society is very important and many programs speak in favor of it. Proposals for sustainable solutions for waste management and the inclusion of informal collectors in this process refer to (ECOEmpower 2025):

- *Empowering Workers*: Aims to formalize and support informal waste pickers, providing safe and dignified working conditions.
- *Strengthening Systems*: Aims to improve waste management systems, increasing collection coverage and efficiency.
- *Cultivating Change*: Aims to implement educational programs, raising awareness and promoting responsible waste management practices.

Respecting the good practices of other countries, as well as the basic principles and goals to be achieved, the position of informal waste collectors would certainly be strengthened, but also the benefit for the entire local communities.

5. Research, results and discusion

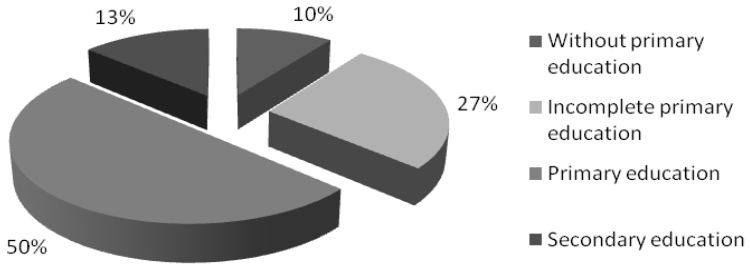
The research, as a mix of qualitative and quantitative methods of data, fact, and opinion collection, was conducted using survey and interview techniques. The sample of respondents, consisting of secondary raw material collectors, was formed using the simple random sampling technique. Considering the educational and socio-economic status of the respondents, the method applied was a guided survey.

The conducted research provides an empirical basis for determining the socio-economic status of informal waste pickers and identifying possibilities for their systematic inclusion in the urban waste management process. The questionnaire used in the research contained 24 questions, grouped into the following categories: demographic information, socio-economic status, social perception of the industry/sector, perceptions of improvement opportunities, and income of informal secondary raw material collectors.

The first group of questions pertains to general demographic data about the respondents: administrative district/city of residence, gender, age, and level of education. The questions addressing socio-economic status focused on the respondent's primary source of income (secondary raw material collection or other), their previous experiences and participation in programs organized by the Government of the Republic of Serbia or non-governmental organizations, as well as their assessment of their economic security. In the third group of questions, respondents shared their views on the general recognition and respect for waste pickers in society. The fourth group explores perceptions of opportunities to improve the position of secondary raw material collectors. Respondents were asked how important they believe it is for collectors to be organized and work together as a group, whether they have ever been members of any secondary raw material collectors' organization, what their experiences were if they had, whether they would consider joining such an organization in the future, and which form of organization they believe would be most effective in improving the status of collectors. The last two questions in the questionnaire concern the respondents' income, specifically, whether they are satisfied with their current earnings from collecting secondary raw materials and how they believe their income could be increased.

The sample included 298 respondents — informal waste pickers from the territory of the Republic of Serbia. The mean age of respondents was 38.46 years. Of the total number of respondents, 63.4% were men, while women made up 36.6%. In the sample of waste pickers the majority were Roma (66.4%). In addition, respondents also included Romanians (6.7%) and Vlachs (6.7%). Also, within the sample of respondents, 13.4% were persons with disabilities, and 6.7% were refugees, which together account for 20.1% of the total number of respondents. The educational structure of the surveyed waste collectors is shown in the following image.

Figure 2 Educational structure of the surveyed waste collectors



Source: https://urdataproject.com/database/

As it is shown in the Figure 2, the largest number of respondents had completed primary education (50%), followed by those with incomplete primary education (79 individuals, 26.5%) and those with no education (10.1%), while 13.4% had completed secondary education.

Table 2 The structure of respondents according to their primary source of income and received financial support

Primary source of income	Financial support from the government or non-governmental organizations				Total	
	Yes		No		Number	%
	Number	%	Number	%		
Collection of secondary raw materials	39	23.08	130	76.92	169	100.0
Social welfare	0	0.0	89	100.0	89	100.0
Other	0	0.0	40	100.0	40	100.0
Total	39	13.1	259	86.9	298	100.0

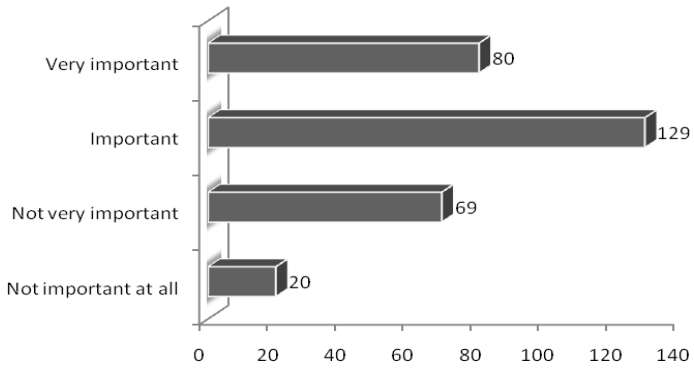
Source: https://urdataproject.com/database/

Collecting secondary raw materials represents the primary source of income for 56.7% of surveyed individuals (Table 2). Nearly one-third of respondents (30%) stated that social assistance is their main source of income. Of those, 13.1% reported having received financial support from the government.

The significance of collective action has been confirmed by 70.1% of respondents. Of these, 43.3% stated that it is important, while 26.8% said it is very important. This is further supported by the fact that more than half of the respondents (53%) reported being members of an organization for secondary raw material collectors. In the context of analyzing the potential benefits that secondary raw material collectors could gain from organizing and working in groups, respondents were allowed to select multiple answers. The following benefits of organizing and

group work were offered to the respondents: improved bargaining power with buyers, better working conditions, access to training and educational opportunities, increased recognition and respect in society and improved access to financial support.

Figure 3 Respondents' assessment of the importance of collective/organized engagement



Source: https://urdataproject.com/database/

Table 3 Ranking list of benefits from organizing and working in groups

Rank	Benefit	% of respondents
1.	Improved access to financial support	100
2.	Increased recognition and respect	70,5
3.	Better working conditions	63,4
4.	Improved bargaining power with buyers	39,3
5.	Access to training and educational opportunities	39,3

Source: https://urdataproject.com/database

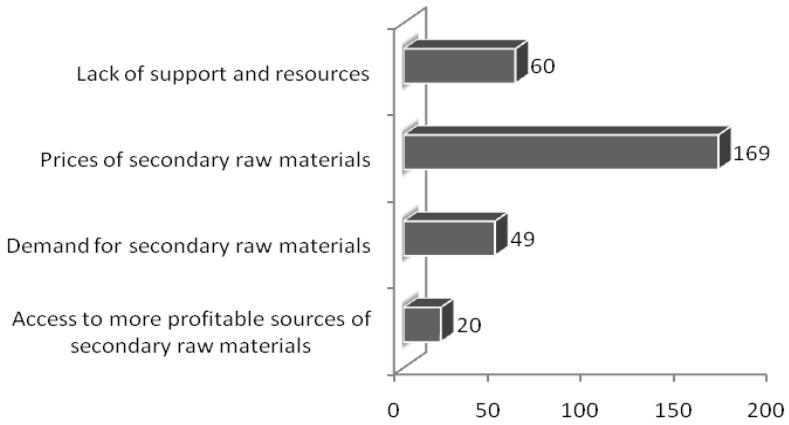
All respondents identified improved access to financial support as the most important benefit that secondary raw material collectors would gain from organizing and working in groups. Increased recognition and respect in society was also considered very important, as 70.5% of respondents selected this option. Improved bargaining power with buyers and access to training and educational opportunities were equally important to respondents, with 39.3% selecting each of these benefits.

Of the total number of respondents, nearly half (46.3%) stated they are very dissatisfied with their income. Only 6.7% of respondents reported being satisfied. As the best way to potentially increase their income, the surveyed waste collectors identified better prices for collected secondary raw materials, with 56.7% of respondents choosing this option. Easier access to better-paid sources of secondary

raw materials was considered significantly less important (23.5%), as was improved efficiency in collection and processing, which was selected by 19.8% of respondents.

A major obstacle to improving the economic status of waste pickers is lack of confidence in their ability to increase income from collecting. Specifically, 9.7% stated they are not confident at all in their abilities, while 36.6% reported low confidence. A total of 26.8% of respondents said they feel confident, and only 6.7% reported being very confident in their ability to increase income.

Figure 4 Key obstacles to increasing the income of waste pickers



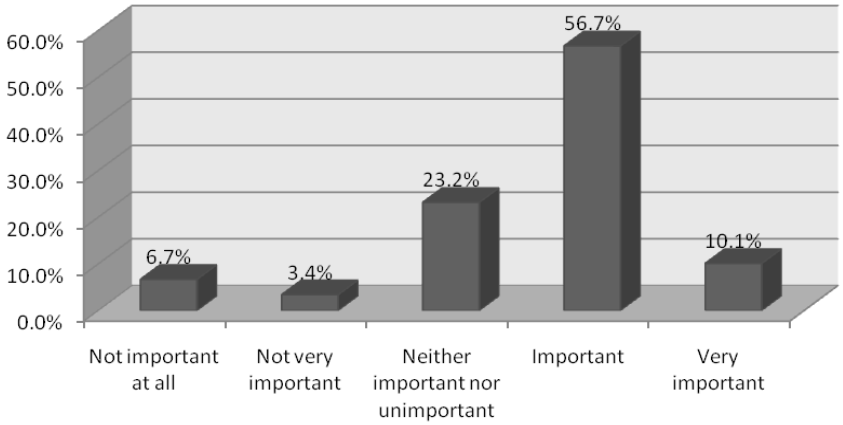
Source: https://urdataproject.com/database/

The price of secondary raw materials represents the biggest obstacle to increasing income, according to 56.7% of respondents. The next most significant obstacle is the lack of support, identified by 21.3% of respondents, followed by the demand for secondary raw materials, which 16.4% of respondents consider the main barrier.

Interviewed waste pickers rate their social status very low. Specifically, 93.6% of respondents answered that the general recognition and respect for collectors in society is below average. Of the total number of respondents, 36.2% stated that recognition is at a very low level, while 57.4% rated it as low.

In addition, the vast majority of respondents (83.2%) disagreed with the statement that society values the work of secondary raw material collectors. A total of 10.1% were neutral, while only 6.7% of respondents believe that society values their work. At the same time, the surveyed waste collectors believe it is very important for their work to be recognized and valued by society. Their assessments of the importance of this issue are presented in Figure 5.

Figure 5 Assessment of the importance of recognition by society



Source: https://urdataproject.com/database

More than half of all respondents believe it is important (56.7%) or very important (10.1%) for society to recognize and value the work of secondary raw material collectors. Nearly a quarter of respondents were neutral on this issue, while 10.1% considered it unimportant.

The significance of the difference in attitudes regarding how much society values the work of waste collectors and how important it is to them that their work is recognized and appreciated by society was tested using a paired samples t-test. The test results showed a significant difference in the mean values (mean difference = 1,89; t-statistics = 22.93; Sig. <0.001), confirming the gap between the actual perception of waste collectors' position and their need for recognition and improvement of their social status.

Conclusion

Based on the conducted research, it can be concluded that the majority of respondents believe that a systematic approach to organizing the work of informal secondary raw material collectors is important for improving their socio-economic status. This is further supported by the fact that most respondents were not members of any organization for such collectors, yet approximately 57% expressed interest in joining some form of organization. With this in mind, improving the organization of informal secondary raw material collectors should be based on the following principles:

- Promoting the importance of organized work among secondary raw material collectors and their association into organizations;
- Developing training programs for secondary raw material collectors focused on

organizational skills and the benefits of forming associations;
- Creating support programs for organizing and establishing collector organizations;
- Increasing access to financial resources and favorable loans for secondary raw material collectors' organizations.

In addition, in order to improve the economic status and increase the income of informal secondary raw material collectors, it is necessary to provide them with information about the locations and ways to access more profitable sources of secondary raw materials. It is also important to ensure easier access to these sources and to reduce bureaucratic procedures that may serve as barriers. At the same time, efforts must be made to improve the secondary raw materials market and stimulate greater demand for these materials.

The implementation of the above-mentioned measures could help increase the income of informal collectors, as well as overcome barriers to their inclusion in the urban waste management system. Furthermore, raising awareness that waste is a resource that can be used to produce new products would stimulate greater demand for secondary raw materials and, consequently, enhance the urban waste management process.

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UNAPREĐENJE INTEGRACIJE NEFORMALNIH SAKUPLJAČA OTPADA U SISTEM URBANOG UPRAVLJANJA OTPADOM: POTENCIJALI I OGRANIČENJA

Apstrakt: Upravljanje otpadom predstavlja jedan od najozbiljnijih globalnih izazova u XXI veku, posebno u oblastima koje se brzo urbanizuju. Nepravilno rukovanje i odlaganje otpada, naročito opasnih materijala, predstavlja ozbiljan rizik po javno zdravlje i životnu sredinu, dodatno pogoršavajući probleme u već nedovoljno planski razvijenim urbanim sredinama. Uprkos razvoju strategija za upravljanje otpadom, kao što su reciklaža i kompostiranje, efikasnost tih pristupa je ograničena ukoliko nisu uključeni svi ključni akteri. Neformalni sakupljači otpada, naročito u zemljama sa niskim i srednjim prihodima, imaju ključnu, ali nedovoljno prepoznatu ulogu u upravljanju urbanim otpadom, značajno doprinoseći sakupljanju, sortiranju i reciklaži otpada. U Republici Srbiji, gde je formalni sistem upravljanja otpadom i dalje nerazvijen i nedostaju mu sveobuhvatni pravni i institucionalni okviri, neformalni sektor je odgovoran za značajan deo povraćaja sekundarnih sirovina. Ipak, ovaj sektor funkcioniše bez pravnog statusa i sistemske podrške. U ovom radu je prikazana sveobuhvatna analiza socio-ekonomskog položaja sakupljača sekundarnih sirovina u Srbiji, zasnovana na empirijskom istraživanju sprovedenom 2024.

godine. Posebna pažnja posvećena je percepcijama neformalnih sakupljača otpada u vezi sa mogućnostima i ograničenjima njihove integracije u formalni sistem upravljanja otpadom. Rezultati ukazuju na potencijal za unapređenje efikasnosti i održivosti upravljanja urbanim otpadom kroz formalno prepoznavanje i podršku neformalnim akterima.

Ključne reči: urbano upravljanje otpadom, neformalni sakupljači otpada, Republika Srbija.

Acknowledgement: *This work was supported by the European Union's Horizon Europe research and innovation programme HORIZON-WIDERA-2021-ACCESS-02 under grant number 101059994 (acronym UR-Data).*

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