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Technical paper

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ASSESSMENT OF THE NUMBER OF END-OF-LIFE VEHICLES IN THE REPUBLIC OF SERBIA

ABSTRACT: End-of-life vehicles (ELVs) represent a significant waste stream due to the large quantities of metals, plastics, glass, rubber, and hazardous materials they contain, requiring appropriate management. An efficient system for recording and tracking these vehicles provides the basis for circular economy planning and the improvement of waste management systems. This paper analyses available statistical data on the number of registered vehicles, imports of used vehicles, sales of new vehicles, and the quantities of officially recorded treated end-of-life vehicles in the Republic of Serbia. Based on the analysis, a vehicle fleet balance method was applied to estimate the number of vehicles that potentially reach the end of their service life. The results indicate a significant discrepancy between the estimated number of vehicles potentially reaching the end of their useful life and the officially reported quantities of treated ELVs, highlighting the need to improve monitoring and reporting systems.

KEYWORDS: Circular economy, End-of-life vehicles (ELV), Statistical analysis, Vehicle fleet balance, Waste management

ANALIZA I PROCENA BROJA VOZILA NA KRAJU ŽIVOTNOG VEKA U REPUBLICI SRBIJI

REZIME: Vozila na kraju životnog veka (eng. ELV - End-of-Life Vehicles) predstavljaju značajan tok otpada zbog prisustva velikih količina metala, plastike, stakla, gume i opasnih materija, što zahteva odgovarajuće upravljanje. Efikasan sistem evidencije i praćenja ovih vozila predstavlja osnovu za planiranje cirkularne ekonomije i unapređenje sistema upravljanja otpadom. U radu su analizirani raspoloživi statistički podaci o broju registrovanih vozila, uvozu upotrebljavanih vozila, prodaji novih vozila i broju zvanično tretiranih vozila u Republici Srbiji. Na osnovu sprovedene

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analize primenjena je metoda bilansa voznog parka za procenu broja vozila koja potencijalno dostižu kraj svog životnog veka. Dobijeni rezultati ukazuju na značajno odstupanje između procenjenog broja vozila koja dostižu kraj životnog veka i zvanično evidentiranih količina tretiranih otpadnih vozila, što ukazuje na potrebu za unapređenjem sistema praćenja i izveštavanja.

KLJUČNE REČI: Cirkularna ekonomija, vozila na kraju životnog veka, statistička analiza, bilans voznog parka, upravljanje otpadom

INTRODUCTION

Over the past several decades, the number of motor vehicles in the Republic of Serbia has been continuously increasing, primarily due to the growing import of used vehicles and a gradual increase in the number of newly registered vehicles. At the same time, the expansion of the vehicle fleet has also resulted in an increasing number of vehicles reaching the end of their useful life and becoming a specific waste stream.

End-of-life vehicles represent a complex waste stream containing significant quantities of secondary raw materials, as well as hazardous components such as engine oils, coolants, batteries, and other materials that require controlled collection and treatment. Consequently, the European Union (EU) has established a system encompassing the registration, deregistration, collection, depollution, dismantling, recycling, and reporting of end-of-life vehicles.

In the Republic of Serbia, a legislative framework regulating the management of this waste category has been established. However, available statistical data indicate certain discrepancies between the number of vehicles that can be considered end-of-life vehicles and the quantities officially recorded as treated. These discrepancies may result from various factors, including incomplete coverage of all ELV waste streams, informal waste management practices, or an insufficiently developed recording and monitoring system.

The aim of this research is to estimate the number of vehicles potentially reaching the end of their useful life based on available statistical data on the number of registered vehicles, imports of used vehicles, sales of new vehicles, and data on treated end-of-life vehicles. Particular attention is given to analyzing the differences between the estimated and officially recorded quantities, as well as highlighting the need for further improvement of the monitoring and tracking system for this waste category.

Legislative Framework

In response to numerous problems and shortcomings in the existing legislation, the European Commission proposed a new Regulation, COM (2023) 451, on 13 July 2023, representing a fundamental reform of vehicle waste management. Following its adoption, Regulation (EU) 2026/1738 was published on 24 July 2026 and entered into force on 13 August 2026. It replaces Directives 2000/53/EC and 2005/64/EC with a single, directly applicable legal instrument. According to Regulation (EU) 2026/1738 (2026), the new legal framework covers the entire vehicle life cycle, from vehicle design to final treatment. It applies generally from 1 September 2028, with different dates specified for certain provisions.

One of the most significant changes is the introduction of mandatory requirements for the use of recycled materials in new vehicles. The Regulation requires a minimum of 15% of plastic by weight to be recycled from post-consumer plastic waste for new vehicle types approved from 1 September 2032, increasing to 25% from 1 September 2036. At least 20% of the applicable target must be achieved using plastic recycled from ELVs or from parts and components removed from vehicles during the use phase. This represents a key change compared with the previous Directive, which merely “encouraged” such practices. By creating mandatory demand for secondary raw materials, the EU not only reduces its strategic dependence on imports of primary materials but also establishes a strong and predictable market for high-quality recycled materials. This approach stimulates innovation in the recycling industry and strengthens the economic viability of the sector. The Regulation also empowers the Commission to establish targets for other materials, such as steel, aluminium, and critical raw materials, following the required assessments (Regulation (EU) 2026/1738, 2026).

To address the lack of traceability and transparency, the Regulation establishes a Digital Circularity Vehicle Passport (CVP) from 1 September 2032. The CVP will serve as a digital record containing information relevant to vehicle circularity. This tool will enable operators throughout the value chain from manufacturers to recyclers to access key information required for dismantling, reuse, and recycling. The CVP is a key digital enabler for implementing the new regulatory framework, ensuring more efficient information exchange and improved oversight (Regulation (EU) 2026/1738, 2026).

The Regulation introduces stricter requirements for the treatment of ELVs, including the mandatory removal of certain components prior to shredding, with the aim of maximizing reuse and recycling. From 1 September 2029, shredder

fractions containing non-inert waste may not be accepted in a landfill if they exceed the prescribed limit values. In terms of scope, the Regulation provides for a gradual extension to additional vehicle categories, including M2, M3, N2, N3, O and L categories from 1 September 2031, subject to the provisions specified in the Regulation (Regulation (EU) 2026/1738, 2026).

The new Regulation provides a detailed and harmonized framework for extended producer responsibility, thereby directly addressing the shortcomings of the previous Directive. The main principles are aligned with the Waste Framework Directive, meaning that producers bear full financial and organizational responsibility for managing their products at the end of their life.

Manufacturers' financial contributions will be modulated based on harmonized criteria, taking into account characteristics such as vehicle weight, type of propulsion, ease of dismantling, and the presence of hazardous substances. This mechanism creates economic incentives for manufacturers to design vehicles that are easier to recycle and contain fewer problematic materials. In addition, mechanisms for cross-border cooperation ("cross-border EPR") will be introduced to ensure that the treatment costs of a vehicle manufactured in one Member State but treated in another are appropriately covered.

The problem of missing vehicles, whereby a significant proportion of deregistered vehicles are not reported for official treatment, represents one of the major shortcomings affecting the effectiveness of the previous Directive. A key underlying cause of this problem is the economic incentive for individuals and companies to bypass official channels. The sale or illegal export of vehicles that are de facto end-of-life vehicles often generates higher returns than delivering them to an authorized treatment facility. Regulation (EU) 2026/1738 (2026) addresses this problem through vehicle-status checks, certificates of destruction, reporting and enforcement measures.

The Regulation introduces legally binding criteria for distinguishing a "used vehicle" from an ELV. This represents a key change compared with the previous non-binding guidelines, which were difficult for customs officials to apply in practice. The Regulation establishes stricter conditions for the export of used vehicles, requiring evidence that a vehicle is not an ELV and satisfies the applicable roadworthiness conditions before it may be exported from the EU. Electronic verification supports the application of these requirements at the point of export (Regulation (EU) 2026/1738, 2026).

Customs authorities will use interoperable registers and the EU Single Window Environment for Customs (which facilitates interoperability between customs and non-customs authorities through three main components: EU non-customs systems, national customs environments, and the EU customs system) to verify the validity and status of a vehicle before it leaves the EU customs territory. This measure not only helps prevent the illegal export of ELVs and the associated environmental damage in third countries but also strengthens the circular economy value chain within the EU. By reducing the number of old vehicles leaving the EU, a greater flow of raw materials and components for recycling and reuse is retained within the European market.

The Law on Waste Management (2025) regulates waste classification, waste management planning, waste management stakeholders, responsibilities and obligations in waste management, the organization of waste management, the management of special waste streams, conditions and procedures for issuing permits, transboundary movements of waste, waste reporting, financing of waste management, and supervision of waste management. Article 69 defines obligations relating to ELVs, while Article 113 provides for the continued application of by-laws adopted under the previous Act until new regulations are adopted. Under the current legislation, manufacturers/importers are required to provide information on the dismantling and appropriate treatment of vehicles that are no longer in use. The relationship between the current EU and Serbian frameworks is presented in Fig. 1.

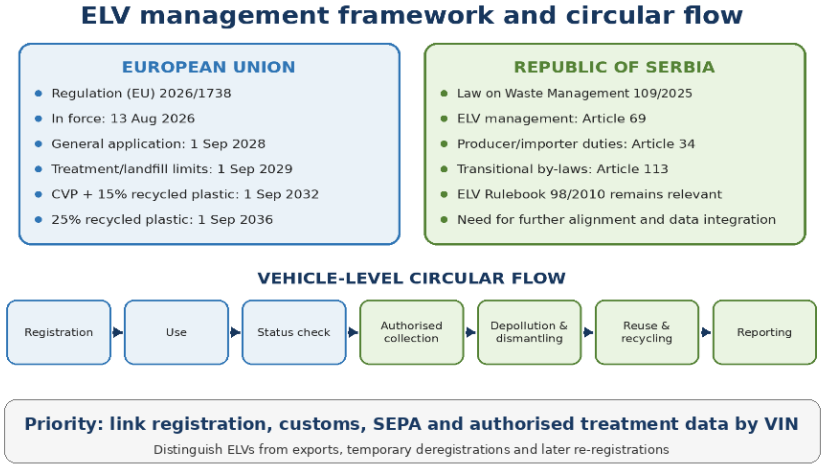


Figure 1 ELVs Management in the EU and the Republic of Serbia (From Legislation to Circular Economy)

Article 6 of the Law establishes the fundamental principles of waste management, including the principle of responsibility and the polluter pays principle. The principle of responsibility means that manufacturers, importers, distributors, and sellers of products that contribute to an increase in waste generation are responsible for the waste arising from their activities. The polluter pays principle means that the polluter bears the full costs of the consequences of its activities. Article 34 specifies responsibilities of producers and importers of products (Law on Waste Management, 2025).

Article 69 establishes provisions specifically related to the management of ELVs. Article 113 provides that, until regulations are adopted under the new Law, by-laws adopted under the previous Law on Waste Management continue to apply (Law on Waste Management, 2025).

Detailed provisions were adopted in 2010 through the Rulebook on the Method and Procedure for the Management of ELVs (Official Gazette of the Republic of Serbia, No. 98/2010). This Rulebook applies to vehicles and ELVs, including their components and materials, regardless of how the vehicle was serviced or repaired during its use and regardless of whether the vehicle is equipped with components supplied by the manufacturer or with other components installed as replacement parts (Rulebook on ELVs, 2010).

With regard to the management of hazardous substances, the Rulebook stipulates that, during the production of motor vehicles and spare parts or equipment for motor vehicles, measures shall be taken with the aim of:

- limiting the use of hazardous substances in vehicles and reducing their quantities as much as possible;
- designing and manufacturing new vehicles in a manner that facilitates dismantling, reuse, and treatment, particularly the recycling of ELVs, their components, and materials;
- increasing the use of recycled materials in vehicles and other products and promoting the development of markets for recycled materials.

Motor vehicles and their spare parts containing lead, mercury, cadmium, or hexavalent chromium may not be manufactured or imported, except for the materials and components listed in Annex 1 of the Rulebook.

Owner is obliged to deliver their ELV to an authorized entity engaged in the collection, transportation, storage, and/or treatment of ELVs. All such entities are required to complete the hazardous waste movement document. If the owner of an ELV is unknown, the collection and transfer of the vehicle shall be carried out by the local self-government unit. Vehicle must be accompanied by a copy of the owner's driving license, or by a report from the municipal inspection authority if the owner is unknown, or by a traffic accident report if the ELV resulted from a traffic accident.

Regarding the storage of ELVs, it is specified that dismantling may not be carried out at the storage site. Minimum technical requirements for storage facilities are prescribed. The transportation of ELVs must comply with the provisions governing the transport of hazardous waste and with the permit issued by the competent authority.

With regard to the treatment of ELVs, detailed provisions are established by the Rulebook. These include minimum requirements for treatment facilities, provisions concerning the removal of hazardous components, provisions on the separation of recyclable parts, and requirements for the removal of specific components. According to Annex 3 of the Rulebook on ELVs (2010), treatment operations must achieve the following reuse, recovery, and recycling targets:

- From 1 January 2015: reuse and recovery of at least 85% of the average mass of ELVs collected during the year, and reuse and recycling of at least 80% of their average mass.
- From 1 January 2019: reuse and recovery of at least 95% of the average mass of ELVs collected during the year, and reuse and recycling of at least 85% of their average mass.

It is also explicitly stipulated that ELVs must not be disposed of in landfills or incinerated. The obligation to pay a fee for vehicles placed on the market is prescribed by the Act on Fees for the Use of Public Goods (Official Gazette of the Republic of Serbia, No. 95/2018, as amended through No. 35/2026). Under this Act, the entity liable for the fee on products that become special waste streams after use including M1 and N1 category vehicles and three-wheeled motor vehicles, excluding motor tricycles (category L5 – heavy tricycles), in accordance with road traffic safety regulations is the manufacturer or importer that places such products on the market in the Republic of Serbia or uses them as the final consumer (Act on Fees for the Use of Public Goods, 2018).

The Act defines the basis for calculating the fee as the quantity of manufactured or imported vehicles, expressed in (kg), as specified in the vehicle type-approval documentation. It also defines the method for determining the fee, its amount, and the method of payment, as well as the obligation to maintain daily records on the quantity and type of manufactured and imported products and vehicles that become special waste streams after use, including ELVs. Based on these records, an annual report is prepared on the quantity and type of manufactured and imported vehicles placed on the market of the Republic of Serbia that will eventually become vehicles at the end of their useful life, and this report is submitted to the Serbian Environmental Protection Agency (SEPA).

Directive 2000/53/EC primarily applies to categories M1 and N1. Regulation (EU) 2026/1738 (2026) replaces that Directive from 1 September 2028 and progressively extends selected provisions to additional vehicle categories. The relevant type-approval categories are defined under Regulation (EU) 2018/858 (2018) and Regulation (EU) No. 168/2013.

MATERIALS AND METHODS

The research is based on an analysis of available statistical data on the vehicle fleet of the Republic of Serbia, data on the import of used vehicles and sales of new vehicles, as well as data on the quantities of ELVs recorded within the waste management system. The data sources included official statistical reports issued by the relevant institutions, available vehicle registration data, as well as data on the quantities of vehicles placed on the market and the quantities of end-of-life vehicles treated.

To estimate the potential number of vehicles reaching the end of their useful life, the vehicle fleet balance method was applied. The method is based on the assumption that the number of registered vehicles in a given year is determined by the number of vehicles registered in the previous year, increased by the number of newly registered vehicles (new and imported used vehicles), and reduced by the number of vehicles that have permanently or temporarily been withdrawn from service.

The estimated number of ELVs was calculated using the following equation:

$$N_{\mathrm{ELV}} = N_{\mathrm{reg,t-1}} + N_{\mathrm{import}} + N_{\mathrm{new}} - N_{\mathrm{reg,t}} \quad (1)$$

Where:

- N_{ELV} – estimated number of vehicles potentially reaching end-of-life, calculated as the residual of the vehicle fleet balance;
- $N_{\mathrm{reg,t-1}}$ – Number of Vehicles Registered in the Previous Year;
- N_{import} – Number of Imported Used Vehicles;
- N_{new} – Number of New Vehicles Placed on the Market;
- $N_{\mathrm{reg,t}}$ – Number of Vehicles Registered in the current Year.

The obtained values can be compared with the official data on the quantities of treated ELVs to assess potential discrepancies and identify possible shortcomings in the existing record-keeping system.

RESULTS AND DISCUSSION

Analysis of Vehicle Fleet Trends in the Republic of Serbia

End-of-life vehicles, or vehicles that are no longer in use, are generated in virtually all economic sectors. However, the majority of ELVs originate from private households. According to SEPA (2024), the mass of vehicles (categories M1 and N1) placed on the market in 2023 amounted to 102,973.85 t. Waste management operators reported to the SEPA that they treated 5,913 t of ELVs.

End-of-life vehicles, i.e., vehicles that are no longer roadworthy, are motor vehicles or their components that have become waste and that their owner intends to discard. According to the Waste Catalogue, ELVs are classified under group 16 01. There are no precise data on the quantities of ELVs generated annually. In the Republic of Serbia, there are approximately one million vehicles with an average age of more than 10 years. The collection and management of ELVs largely depend on supply and demand. Hazardous substances and components are not removed prior to the vehicle recycling process. Parts with positive economic value are recovered in smaller quantities, depending on their age and condition. A certain number of operators registered for metal waste recycling can meet the legal requirements for ELV recycling (Rulebook on Waste Classification, 2010; SEPA, 2024).

The first steps in the ELV treatment chain are declaring the vehicle as waste, deregistering it from the vehicle registry, and issuing a certificate of destruction. Deregistration of vehicles that have reached the end of their useful life is mandatory. General indicators for declaring a vehicle as waste include its age, emissions compliance, condition, and technical roadworthiness. According to the Law on Waste Management (2025), permits for hazardous waste management are issued only by the Ministry, the Autonomous Province of Vojvodina, or the City of Belgrade. A local self-government unit is required to arrange for the collection and delivery of an ELV, when its owner is unknown, to an entity authorized to treat such vehicles, and is entitled to recover the associated costs if the vehicle owner is subsequently identified. Local self-government units are authorized to issue permits for the collection, transport,

storage, treatment, and disposal of inert and non-hazardous waste within their territory. In addition, the City of Belgrade may issue permits for hazardous waste, including ELVs.

Data on the number of registered vehicles indicate a continuous growth of the vehicle fleet over the 2018–2024 period, Table 1. At the same time, a significant inflow of used vehicles is evident, which in most of the observed years was several times higher than the number of new vehicles entering the market. Such a market structure contributes to an increase in the average age of the vehicle fleet and, consequently, to an increase in the number of vehicles reaching the end of their useful life (Statistical Office of the Republic of Serbia, 2025).

Table 1 Trends in the Number of Registered Vehicles, Used Vehicle Imports, and New Vehicle Sales in the Republic of Serbia (2018–2024)

	2018	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Imported Used Vehicles	81,796	141,918	115,000	152,803	115,347	131,905	135,000
New Vehicles Sold	30,731	34,202	26,400	30,416	22,785	25,422	27,862
Registered Vehicles	1,999,771	2,083,753	2,164,818	2,235,794	2,337,498	2,389,105	2,476,419
Estimated Potential ELVs	-	92,138	60,335	112,243	36,428	105,720	75,548

Based on the presented data, it can be observed that the number of registered vehicles increased from approximately 2 million in 2018 to nearly 2.5 million in 2024. At the same time, annual imports of used vehicles ranged from approximately 80,000 to 150,000 vehicles, while the number of new vehicles was significantly lower. These indicators confirm that the renewal of the vehicle fleet relies heavily on the import of used vehicles, contributing to an increase in the number of vehicles that reach the end of their useful life within a relatively short period.

To complement the vehicle fleet data presented in Table 1, Table 2 summarizes the officially reported quantities of vehicles placed on the market and treated ELVs in the Republic of Serbia during the period 2018–2023.

In 2023, a total of 2,389,105 vehicles were registered. During 2024, 135,000 used vehicles were imported and 27,862 new vehicles were placed on the market. If these values are added (2,389,105 + 135,000 + 27,862 = 2,551,967), the resulting figure should represent the total number of registered vehicles in 2024. However, a total of 2,476,419 vehicles were registered in 2024, indicating a difference of 75,548 vehicles (2,551,967 – 2,476,419). Vehicles that were not registered for a period of one year may be considered ELVs, as defined in some EU countries.

Table 2 Data on the Quantities of Vehicles Placed on the Market and Treated ELVs

	2018	**2019**	**2020**	**2021**	**2022**	**2023**
Quantity of Vehicles Placed on the Market, (t)	113,180	137,152	157,955	178,952	187,231	102,974
Quantity of Treated ELVs, (t)	2,548	2,109	2,391	3,280	2,212	5,913

According to SEPA (2024), a total of 102,974 t of N1 (for goods $\leq$ 3.5 t) and M1 (with no more than eight seats in addition to the driver's seat) category vehicles were placed on the domestic market. Assuming an average vehicle weight of 1 t (which is a relatively conservative estimate), this corresponds to approximately 100,000 vehicles. On the other hand, waste recovery operators reported to the SEPA that they treated only 5,913 t of this type of waste, corresponding to fewer than 6,000 ELVs.

For comparison, in Croatia, out of 1,840,767 registered vehicles in 2022, a total of 37,957 ELVs and their components were collected and officially treated.

By comparing these data, it can be concluded that the data on vehicles placed on the market and treated ELVs are not adequately monitored. The lack of incentives for delivering ELVs to collection points/authorized treatment facilities appears to be the main reason for these "statistical gaps" and may also contribute to illegal treatment.

For example, the Government of the Republic of Serbia introduced an incentive scheme to stimulate the recycling market for specific waste streams (i.e., waste batteries and waste oils) and to encourage the replacement of old vehicles with new vehicles equipped with advanced environmental protection systems. In addition, FIAT (STELLANTIS), a domestic vehicle manufacturer, provided incentives for the proper management of ELVs for several years, although these incentives were not provided continuously.

The ELV take-back system is explicitly established as free of charge for consumers. Dismantling and shredding facilities finance their operations through revenues generated from recovered scrap metal, spare parts, and materials recovered for recycling, such as batteries and catalytic converters.

Identified Reasons for Non-Compliance with Applicable Regulations:

- Trading of used vehicles within Republic of Serbia and subsequent re-registration in the destination city.
- Cases in which a used vehicle is delivered to Serbia (possibly with the intention of the exporter that it will be repaired, sold, and re-registered), but is ultimately not re-registered at the destination and eventually becomes an ELV. For such cases, there are no provisions ensuring the exchange of data on the appropriate treatment of the vehicle between the competent authorities of the countries involved.
- Temporary deregistration/suspension of registration: loss of traceability of the vehicle owner and the absence of incentives or penalty mechanisms that would encourage the owner to comply with legal requirements. Consequently, the owner is not required to submit export documentation or a Certificate of Destruction to the relevant authorities, as doing so does not provide any tangible benefit to the owner.
- Illegal dismantling at informal “car scrapyards.” Informal dismantlers seek to maximize their revenue from ELVs, while shredding facilities are absent in many unregulated waste-management systems. Informal dismantlers apply inadequate technological and professional practices during ELV dismantling and dispose of waste in an uncontrolled manner. This creates environmental and occupational problems and reduces the overall efficiency of ELV dismantling.
- Lack of incentives to make the delivery of ELVs to collection points/authorized treatment facilities more attractive.

From our perspective, the intensive application of digital technologies makes a significant contribution to improving and organizing waste collection and recycling systems (Bošković et al. 2024).

On the other hand, the process is becoming increasingly complex due to the growing number of vehicles, the diversity of propulsion systems, such as natural gas and electric vehicles, and other requirements associated with modern smart cities (Bošković et al. 2026; Milojević et al. 2025).

Estimation of the Number of ELVs

Using the vehicle fleet balance method, the number of vehicles that ceased to be part of the vehicle registration system during 2024 was estimated. The results indicate that the number of such vehicles was approximately 75,500, representing the potential number of vehicles that reached the end of their life, Table 1.

The obtained result does not represent exclusively the number of ELVs, but rather an estimate of the number of vehicles that have exited the registration system and may represent vehicles at the end of their life. Some of these vehicles may have been exported, temporarily deregistered, or returned to service; however, the obtained value provides a useful indicator of the magnitude of this waste stream.

Generally, a comparison of the estimated quantities with the number of vehicles officially recorded within the ELV management system reveals a significant discrepancy. Although the available data indicate a substantial gap between the estimated number of potential ELVs and the officially reported quantities of treated ELVs, a direct coverage rate cannot be calculated because the datasets differ in units and reporting periods. Such a discrepancy indicates that a proportion of vehicles is not covered by the official recording system, which may be attributable to informal dismantling, the sale of individual parts, unregulated handling, or other forms of vehicle disposal that are not captured by statistical reporting.

The vehicle fleet balance provides a first-order indication of the potential magnitude of the ELV stream, although the estimate remains subject to uncertainty. Although this method does not allow for the precise identification of each individual vehicle, it represents a useful tool for estimating the magnitude of the waste stream under conditions of limited data availability.

The differences between the estimated and officially recorded quantities indicate the need to improve the system for tracking the movement of vehicles from the time of deregistration to their final treatment. Establishing an integrated information system and enhancing cooperation among relevant institutions would enable the collection of more reliable data, which is particularly important for planning the capacity of treatment facilities and achieving circular economy objectives.

CONCLUSIONS

The analysis indicates that, although the Republic of Serbia has established a legislative framework for the management of end-of-life vehicles that is broadly aligned with European legislation, discrepancies remain between

the estimated number of vehicles potentially reaching the end of their useful life and the quantities officially recorded as treated. These discrepancies highlight the need to further improve the registration, traceability, reporting, and monitoring of ELVs throughout their entire life cycle. Strengthening these mechanisms, together with the gradual harmonization of Serbian legislation with the evolving EU regulatory framework, is essential for more effective ELV management and the development of a circular economy in Serbia.

The paper presents an estimation of the quantities of ELVs in the Republic of Serbia using a vehicle fleet balance method based on available statistical data. The analysis shows that the estimated number of vehicles leaving service significantly exceeds the number of vehicles covered by the official treatment system.

The obtained results indicate discrepancies between the estimated and recorded quantities, highlighting the need for further improvements in the systems for recording, tracking, and reporting on ELVs. The proposed approach can serve as a simple indicator for estimating the quantities of ELVs and as a basis for future research and the development of more reliable estimation methods.

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