Country fact sheet

Municipal waste management

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Municipal waste management in Western Balkan countries — Country profile

Serbia

Contents

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Executive summary

In Serbia, the amount of municipal solid waste (MSW) treated corresponds to the quantities collected. Serbia reports an increase of over 40 % in the total amount of MSW treated from 2015 to 2018, which can be mainly attributed to an increase in the share of the population connected to waste collection services.

In Serbia, the Law on waste management aims to transpose the EU waste legislation. Implementation is at an early stage. The Law on waste management and the Law on packaging and packaging waste are the key pieces of legislation steering municipal waste management, both being currently under revision. The national waste management strategy is an integral component of the legal framework in Serbia and has to be revised every 5 years. The new draft strategy, following the national waste management strategy 2010-2019, is expected to be adopted later in 2021. Currently, there are no quantitative recycling targets, but quantitative targets are proposed in the new draft strategy. Under the Law on waste management, the local self-government (LSG) units, including cities and municipalities, are obliged to develop regional and local waste management plans and to monitor their implementation. In 2019, 109 reports on municipal waste management were received, while 34 LSG units did not report.

The responsibility for waste management is divided between the Ministry of Agriculture and Environmental Protection (MAEP), the Serbian Environmental Protection Agency (SEPA) and the LSG units with their affiliated public utility companies (PUCs). However, in some cases the responsibilities overlap and conflicts of interest may arise: The MAEP has responsibility for enforcing environmental sanctions and inspecting the facilities for which the Department of Waste issues permits, but some permits for such facilities are issued by the LSG units, and they also inspect such facilities.

Waste treatment data collected by SEPA include the total amount of waste recycled and disposed of. These data are provided by the PUCs, which are owned and managed by the LSG units. The quality of data is poor, as many PUCs do not adhere to the prescribed methods for determining the quantities and analysing the composition of municipal waste. The reasons for this are mainly a lack of understanding of the importance of this type of analysis, difficult economic conditions in companies, lack of equipment and lack of (qualified) staff. One of the main shortcomings with respect to data on municipal waste generation is the lack of scales in most municipalities.

PUCs are responsible for organising municipal waste collection. Usually, MSW is collected through bring points, where citizens take their waste for disposal. Significant progress has been made on expanding the coverage of collection services, which is reported to be at over 85 % of the population since 2019. However, rural areas and especially municipalities located in the mountains are often not covered by regular waste collection services.

Although the Law on waste management envisages source separation of paper, glass and metal in specially marked containers, there is no systematic system for separate collection in place, and only small quantities of recyclable materials are collected. Separate collection is only practised in some cities, and in a few villages at pilot project level, usually for dry recyclables, such as PET (polyethylene terephthalate) and to a lesser extent paper and cardboard.

PUCs report that the quantities and quality of separately collected waste are low, which is due to low levels of public awareness and informal waste pickers taking out valuable materials from waste containers. They collect certain valuable materials, such as plastics, metals, paper and cardboard, batteries and waste electrical and electronic equipment (WEEE), and sell them to recyclers. Investments in separate collection and recycling facilities are hampered, inter alia, by these very active informal waste pickers, undermining the financial viability of recycling projects.

The Law on packaging and packaging waste regulates the management and reporting of packaging and packaging waste. The recently amended draft version of this law envisages the introduction of a deposit refund scheme (DRS) for disposable packaging made from plastic, glass and aluminium. To date there is only one extended producer responsibility (EPR) scheme for packaging waste in place in Serbia, with seven licensed operators. Although fees have to be paid by producers, there are no official, dedicated separate collection or EPR schemes in place for other product categories or waste streams, such as end-of-life vehicles, WEEE, batteries, motor oils and tyres, which would be required to transpose the EU directives.

The waste management system in Serbia is underfinanced. Only a few landfills request gate fees, which cover only the basic cost of managing the landfill, without making any provisions for aftercare. For waste collection, no 'pay as you throw' system is in place; households pay a fixed monthly fee for their waste collection and disposal service. These revenues cover only the collection service, while the remaining disposal costs have to be covered from other funding sources. The share of households billed ranges from 60 % in rural areas to 100 % in urban areas.

Currently, almost all MSW collected in Serbia is landfilled, either at illegal or uncontrolled dumpsites (30 %) or at officially designated but unsanitary sites (45 %). Only an estimated 25 % of waste is sent to one of the 11 sanitary landfills, where a gate fee has to be paid. These landfills are, however, reaching the limits of their capacity and also do not operate completely in accordance with the conditions set out in the EU Landfill Directive (1999/31/EC).

Most cities and municipalities that have unsanitary landfills have adopted, or are in the process of adopting, plans for the closure and reclamation of such landfills.

There are no licensed waste incineration facilities in Serbia, but some types of waste are thermally treated in cement kilns. Only a very small share of waste is recycled; as this is mainly done by informal waste pickers, there are no official data on the exact quantities.

With respect to bio-waste, there is a pilot composting facility in Čacak with a capacity of 500 tonnes per year, set up as a public-private partnership, treating mainly garden waste from the municipality. No separate collection for food waste is in place or planned to date. A pilot project to promote home composting has been initiated. Meanwhile, no progress has been made on the treatment of hazardous waste.

To conclude, the absence of quantified targets leads to a lack of incentive to measure the performance of waste management over time in Serbia. But, even if there were such measurable targets, the lack of data, poor quality of data and non-standardised reporting would make measuring performance difficult. These data- and reporting-related issues need to be urgently tackled. Further key challenges for waste management in Serbia are related to budget deficiencies, a lack of (trained) staff, extensive informal sector activities, the poor financial viability of waste management operations, lack of investment in infrastructure, low levels of public awareness and poor enforcement of laws. These challenges are all to some extent interlinked. The large number of unsanitary landfills, with close to zero disposal costs, does not provide any incentives for recycling activities higher up the waste hierarchy. Therefore, increased efforts are needed to close Serbia's non-compliant landfills and invest in waste reduction, separation and recycling initiatives. Good progress has been made with respect to increased collection coverage, which remains one of the key LSG activities. Building on the EPR scheme for packaging waste, such schemes should also be properly implemented and monitored for end-of-life vehicles, WEEE, batteries, motor oils and tyres, as required by the EU directives.

Small steps in the right direction have been taken by planning for a DRS in the revised Law on packaging and packaging waste. However, it remains to be seen how this will be implemented. Furthermore, in the framework of municipal waste management plans, there are planned investments in waste infrastructure, such as increasing the number of containers and the number of collection vehicles and establishing new waste treatment centres. Capacity-building

and training activities on how to conduct measurements and collect and report data are also reportedly planned for the LSG units.

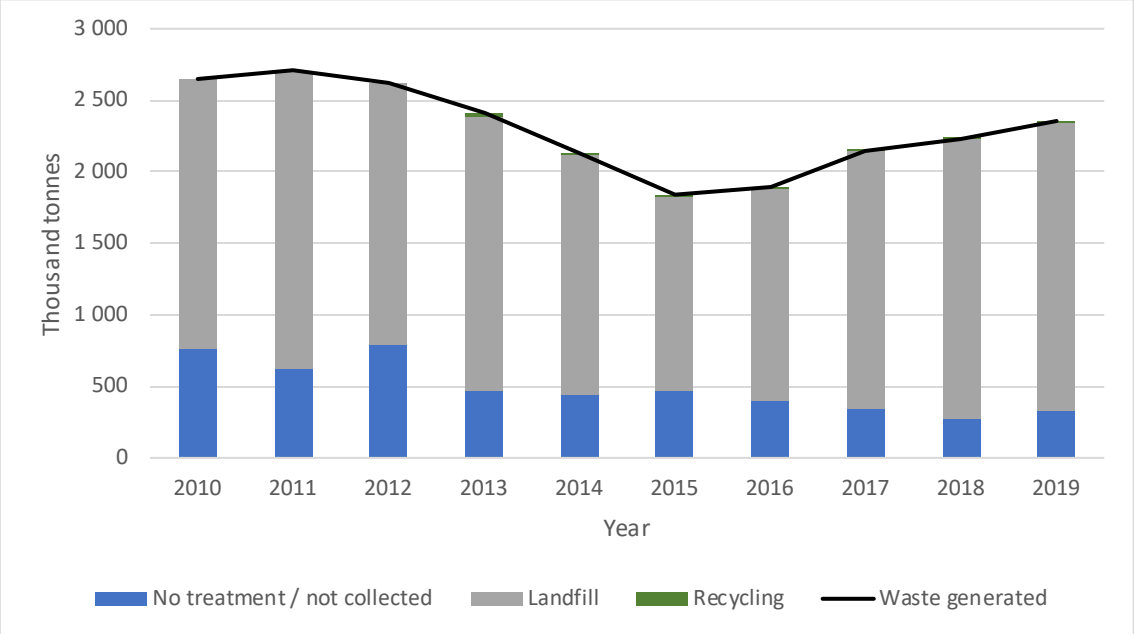
1 Municipal waste management performance

Serbia, officially the Republic of Serbia, is a landlocked country with a population of 6.97 million inhabitants (2021). It occupies an area of 77 474 km^2 and consists of 119 municipalities and 26 cities. Serbia's population is fairly evenly distributed throughout the country, with 56.7 % of the total population (2021) living in urban areas (CIA, 2021). Serbia's gross domestic product per capita was USD 18 233 in 2019. The unemployment rate is 16 % (2017), which is relatively low compared with its Balkan neighbours, but still significantly higher than the European average. The youth unemployment rate is close to 28 % (2019) (CIA, 2021).

Municipal waste generation in Serbia decreased from 2.65 million tonnes of waste generated in 2010 to 1.84 million tonnes in 2015 but then increased to 2.35 million tonnes in 2019 (Figure 1.1). The reason for this fluctuation is unclear, but it might be connected to the quality of data reported, to population coverage by waste services and also in general to the economic crisis. The amounts generated correspond to 363 kg per capita in 2010 and 338 kg per capita in 2019, which is roughly 67 % of the EU average of 502 kg per capita in 2019. The country relies heavily on landfilling and only a very small share of waste is recycled.

In Serbia, data on municipal waste based on the sources from which it originates are not available, i.e. no distinction is made between household, commercial or other waste (OECD and Eurostat, 2019).

Figure 1.1 Municipal waste generation and treatment in thousand tonnes in Serbia, 2010-2019



Sources: Eurostat (2021) for 2015-2018; SEPA (2021) for 2019.

In Serbia, the amounts of treated waste are assumed to be equal to the quantities collected. The collection efficiency, i.e. the amount collected divided by the total amount of generated, increased from 71 % in 2010 to 86 % in 2019. These numbers are identical to the collection coverage (i.e. the share of population covered by waste collection services), as the amount of uncollected waste is estimated based on the number of unconnected households, as reported by the public utility companies (PUCs). The amount of uncollected waste is estimated based on data from similar municipalities and cities, namely based on their location and proximity, the level of economic development of the municipality (average income, number of employees), the

characteristics (village, agricultural area, number and type of households), and the age structure and educational qualifications of the population (OECD and Eurostat, 2019). Regular collection services are mainly offered in urban areas, while rural areas are less well served. (SEPA, 2021).

Under Serbia's Law on waste management, waste treatment data include the total amount of waste recycled and disposed of. These data are provided by the PUCs on the basis of their annual reports. Between 2015 and 2019 the reported quantities of waste treated increased by 47 %, while the amount of waste generated increased by only 28 % in the same period. The amount of recycled waste remained stable (Eurostat, 2021). The reportedly higher quantities of waste generated are probably due to an increase in the collection coverage. The significantly larger amounts of treated waste are probably because of the gradual introduction of a new methodology for data collection (SEPA, 2021).

Currently there are no known quantified waste targets in Serbia. The only quantitative targets set in the past were an increase in the collection coverage to 75 % by 2013 and an increase in the level of reuse and recycling of packaging waste to 25 % of the quantities generated (ETC/WMGE, 2018). While the target on collection coverage was achieved, there is no information on whether the latter target was achieved.

Data quality is reported to be poor, and a number of local self-government (LSG) units do not adhere to the prescribed methods for determining the amount and composition of municipal waste. Only a very small number of PUCs performed measurements and submitted reliable data on the characteristics of municipal waste. The reasons for this are mainly a lack of understanding of the importance of this type of analysis, difficult economic conditions in companies, lack of equipment and lack of (qualified) staff to conduct the analysis by taking representative samples and separating waste fractions according to the catalogue (SEPA, 2021). One of the main shortcomings with respect to data on municipal waste generation is the lack of scales in most municipalities. Because of the lack of weighing equipment, the quantities of municipal solid waste (MSW) disposed of in landfills are estimated from the figures from similar LSG units that measured them. Hence, the quantities of waste generated is also estimated, including both collected (considered as treated waste) and uncollected waste, based on waste generation data from similar municipalities and cities. The Serbian Environmental Protection Agency (SEPA) is working on developing a new methodology to implement Commission Decision (EU) 2019/1004 on establishing rules for the calculation, verification and reporting of waste data in accordance with Directive 2008/98/EC (Waste Framework Directive) and Eurostat reporting rules (SEPA, 2021).

The Serbian authorities report that capacity-building and training activities on how to conduct measurements, collect data and report are planned for the LSG units. The written materials have already been prepared (SEPA, 2021).

To conclude, the absence of quantified targets leads to a lack of incentive to measure the performance of waste management over time in Serbia. But, even if there were such measurable targets, the lack of data, poor quality of data and non-standardised reporting would make measuring performance difficult. These data- and reporting-related issues need to be urgently tackled.

2 Legal framework, strategies and targets

In Serbia, the quantitative targets set in the EU directives have not yet been transposed into national law. But the new draft strategy that contains those targets is in the process of adoption (SEPA, 2021). Implementation is at an early stage (EC, 2019).

The Law on waste management and the Law on packaging and packaging waste are the key pieces of legislation steering municipal waste management. The revision of the former is planned for 2021. The Law on packaging and packaging waste regulates the management of and reporting on packaging and packaging waste, economic instruments such as product charges, and recovery targets for paper, plastics, glass, metal and wood packaging. For this law a draft version of the amendment is already available on the website of the Ministry of Agriculture and Environmental Protection (MAEP). This amendment, which is in the process of being adopted, would introduce a deposit refund scheme for disposable packaging made from plastic, glass and aluminium (SEPA, 2021).

The national waste management strategy is an integral component of the legal framework in Serbia. According to the Law on waste management, the waste management strategy has to be revised every 5 years. The first revision of the national waste management strategy 2010-2019 was prepared in 2014. This revision included planning for compliance with EU requirements for MSW management and set out the principles for infrastructure development and investment planning. The following revision was prepared during Serbia's EU twinning ([1]) between 2017 and 2020, which aimed to strengthen and support waste management policies in Serbia (SEPA, 2021). Currently there are no quantitative targets for waste recovery and recycling, but in the new draft strategy both quantitative short-term objectives and long-term goals are proposed, including a proposed target for recycling packaging waste of 55 %. The new draft strategy is in the process of adoption and will be included in future new laws related to waste management (SEPA, 2021).

In accordance with Article 13 of the Law on waste management, LSG units, including cities and municipalities, are obliged to develop regional and local waste management plans and to monitor their implementation (SEPA, 2021). In 2019, 109 reports on municipal waste were received via the communal waste management reporting form, KOM1, while 34 LSG units did not report. For local governments that did not fulfil their obligations SEPA estimated and assessed the MSW performance. However, in the course of 2021 and 2022 many of the LSG units' waste management plans have ceased or will cease to be valid and new ones must be adopted.

The MAEP is responsible for the development and implementation of the national waste management policy, i.e. for drafting laws, strategies and national plans for specific waste streams and for defining objectives and meeting targets. It also prepares executive regulations and technical standards for implementing waste management laws (SEPA, 2021). The MAEP approves regional waste management plans, issues permits and maintains records of them and also keeps records of other permits issued by regional and local authorities (UNECE, 2015).

All waste streams are controlled by the MAEP's Department of Waste and responsibility for them is not spread across multiple ministries or departments. The environmental inspectorate within the MAEP has responsibility for enforcing environmental sanctions and inspecting the facilities for which the Department of Waste issues permits. Some permits, e.g. related to waste management facilities, are issued by the LSG units of the municipalities or the autonomous provinces, and they also inspect such facilities (Eunomia et al., 2017). The report by Eunomia et al. (2017) recommended that a single agency should have responsibility for all permitting and inspection activity to reduce the potential for conflicts of interest.

SEPA is responsible for the following:

- collecting data on waste management activities from the entities that collect, store and treat all waste categories;

[1] Twinning is a European Union instrument for institutional cooperation between Public Administrations of EU Member States and of beneficiary or partner countries Twinning | European Neighbourhood Policy And Enlargement Negotiations (europa.eu)

- maintaining and updating the database on waste management in the environmental protection database (SEPA, 2021);
- collecting data from the registers of issued permits, which are set up and maintained by the authorities in charge of permit issuing, namely either the MAEP or the municipalities themselves;
- collecting data on the process of implementing regional or local waste management plans;
- collecting the reports on packaging and packaging waste management from manufacturers, importers, and other companies dealing with packaging and filling, on the amounts and types of packaging and packaging waste, which it compiles in an annual report.

Data are collected by SEPA in accordance with the rulebook on the methodology for collecting data on the composition and quantities of municipal waste in the territories of the LSG units (Official Gazette of RS, No 61/2010, 14/2020).

SEPA is also working on the development of a new methodology for implementing Commission Decision (EU) 2019/1004 on establishing rules for the calculation, verification and reporting of waste data in accordance with Directive 2008/98/EC and Eurostat reporting rules. This is expected to improve the verification process (SEPA, 2021).

LSG units, including municipalities and cities, are the main actors in organising the management and treatment of municipal waste generated in their territory. They are responsible for preparing local waste management plans and other regulations on municipal waste management and for supporting their implementation. The rules are binding for all all individuals and organisations in the territory of the municipality and for others participating in relevant activities.

LSG units are also responsible for providing municipal and non-hazardous waste services and for setting fees for these services. They do this via local PUCs, which provide municipal waste collection services in the cities and municipalities of Serbia. The PUCs are owned and managed by the LSG units. To realise the collection, transport, treatment and disposal of municipal waste, LSG units prescribe internal regulations for the PUCs, which are in accordance with the Law on waste management and the Law on communal activities. Most LSG units in Serbia have one PUC while some have several. Some organise waste collection by contract with a private service provider. According to the Law on waste management, PUCs do not need to have a collection permit for the transport and storage of municipal waste. But, if they undertake any other activity in the field of waste management, they do need a permit (SEPA, 2021).

LSG units are obliged to record and report the quantities and analyse the composition of municipal waste in their territory four times a year. Data on municipal waste are submitted by the PUCs or other companies that have a contract with the LSG unit to undertake these activities (SEPA, 2021).

The main challenges in implementing the legal framework for municipal waste are related to a lack of staff and insufficient training of officials dealing with waste management, budget shortfalls, extensive informal sector activities, the poor financial viability of the waste collection system, low levels of public awareness, and generally poor enforcement of the law (e.g. failure to issue fines). The administrative capacity at the state and local levels is generally weak. The inspection services are inadequately staffed and resourced. For example, municipalities bear the legal and financial responsibility for cleaning up illegal dumpsites, but often only one staff member in each municipality is assigned to the task (Eunomia et al., 2017).

To conclude, Serbia has is a good level of alignment with the European waste management legislation, but implementation is at an early stage. Currently there are no quantitative targets for waste recovery and recycling, but they are proposed in the new draft strategy.

The responsibility for waste management is divided between the MAEP, SEPA and the LSG units along with their affiliated PUCs. However, in some cases responsibilities overlap and conflicts of interest may arise: the MAEP has the responsibility for enforcing environmental sanctions and inspecting the facilities for which the Department of Waste issues permits, but some permits for such facilities are issued by the LSG units, and they also inspect such facilities.

3 Waste fee and taxation system

In Serbia, waste management services, such as the collection and disposal of municipal waste, are paid for by users. Fees are calculated per square metre of residential or commercial space. Some municipalities base the fees on the number of household members. Waste collection and service fees for households are collected monthly by the PUCs that deal with the collection, transport and disposal of waste (SEPA, 2021).

The fees are collected either through a joint system including both waste and utility services in larger towns (mostly for water consumption) or separately usually in smaller towns (UNECE, 2015). The share of households billed ranges from 60 % in rural areas to 100 % in urban areas. There is no 'pay as you throw' system in place, so households pay a fixed monthly fee for the waste collection, treatment and disposal service. This flat rate varies across the LSG units (SEPA, 2021).

Funding of local government is a key issue in Serbia as a whole, and there are regular transfers of funds from the state to local governments. As for municipalities, cost recovery is a key issue: the national strategy for environmental approximation set the goal of achieving full cost recovery from user charges for municipal waste collection and management by no later than 2022 (Eunomia et al., 2017). So far, no information is available on the progress made towards achieving this objective (SEPA, 2021).

The department responsible for financial management and control within the MAEP is managing the 'Green Fund', one of the economic instruments for environmental protection. The Ministry of Finance is responsible for controlling the allocation of this budgetary fund. It is based on the 'producer responsibility/polluter pays' principle and collects fees for introducing specific products to the market, namely tyres, asbestos-containing products, batteries and accumulators, mineral oil and lubricants, and electrical and/or electronic equipment. There are also fees for packaging materials put on the market, including certain plastic bags. Furthermore, large polluters pay for the amount of hazardous waste they produce. However, the Green Fund is not used to finance municipal waste collection and treatment, as this is within the competence of the LSG units, which are obliged to finance these activities in accordance with the Law on communal activities (SEPA, 2021).

Waste disposal at the 11 sanitary landfills currently in operation is chargeable, with a gate fee that covers only the basic cost of managing the landfill, without making any provisions for upgrading or aftercare.

Articles 88 and 90 of the Law on waste management define many illegal activities related to waste management. In addition, fines for inadequate hazardous waste management are to be increased to ensure the proper management of this type of waste.

To conclude, waste management operations in Serbia lack financial viability. The waste management fees paid by citizens and companies are not enough to cover the costs incurred by municipalities, and so they need to use other funds. Because of this, municipalities have difficulty funding improvements in waste management services, such as systematic

implementation of separate collection of recyclables. This is one of the main reasons why investment in the waste management infrastructure is low.

4 Collection coverage and separate collection

According to Article 13 of the Law on waste management, LSG units, including cities and municipalities, are obliged to develop local waste management plans and to organise municipal waste collection systems, taking into account local conditions (SEPA, 2021). Usually MSW is collected by local PUCs, which are owned and managed by the LSG units, using family bins, i.e. door-to-door collection, in rural and suburban settlements and containers in more densely populated areas, i.e. bring points.

Although the Law on waste management envisages separation of paper, glass and metal into specially marked containers at source, there is no systematically organised system for separate collection in place, and only small quantities of recyclable materials are collected. Separate collection is only available in some cities and in a few villages (mostly at pilot project level in villages), usually for dry recyclables such as PET (polyethylene terephthalate) and to a lesser extent paper and cardboard (Eunomia et al., 2017).

There is no door-to-door collection of packaging waste in place, but bring points are set up by the extended producer responsibility (EPR) system operators. PUCs report that the quantity and quality of separated waste collected from households are low. Because of low levels of public awareness the quality of separately collected materials is poor, resulting in contaminated waste streams that cannot be recycled and are therefore sent to landfills. No separate collection for food waste is in place or planned to date. A pilot project to promote home composting has been initiated (SEPA, 2021).

In Serbia, there is an active informal sector collecting valuable and high-quality packaging waste and other recyclables, such as metals, paper and cardboard, from both landfills and the PUCs' containers. A large share of the waste reported by recyclers is collected by the informal sector.

According to the Packaging Waste Recycling Association, as much as 87 % of the total amount of packaging waste collected for recycling comes from the informal sector, while only 13 % is collected directly by PUCs. This practice undermines the financial viability of official waste management activities. By removing valuable waste materials from the PUCs' containers, the informal sector prevents PUCs from generating revenue from the collection of valuable recyclables. Moreover, the informal sector is not regulated by Serbian legislation. It also operates on landfills (SEPA, 2021).

Improving waste collection coverage is one of the key LSG unit activities. Serbian authorities report that the share of population covered by regular waste collection services increased from about 71 % in 2010 to 86 % in 2019. Regular collection services are mainly offered in urban areas, while rural areas are less well connected. In particular, municipalities located in mountainous rural areas are often not covered by waste collection services. The service coverage ranges from only 25 % up to 100 % in some municipalities (SEPA, 2021). Serbian authorities report that the poor waste collection situation in villages and rural areas is primarily due to a lack of local funds to develop the necessary infrastructure and waste collection systems and poor organisation of waste management services at the local level. This leads to a strong dependence on funding from external donors (SEPA, 2021).

To conclude, the waste collection coverage has increased significantly in Serbia over the past decade. However, rural areas and especially municipalities located in the mountains are often not covered by regular waste collection services.

Separate collection is only available in some cities — and in a few villages at pilot project level. The separate collection of packaging waste is carried out by EPR system operators via bring points, and some have subcontracted PUCs to organise the collection on their behalf. Informal waste pickers play an important role in collecting recyclables. The financial viability of sorting and recycling plants is undermined by the informal sector's activities.

5 Extended producer responsibility schemes

The Law on waste management introduced the principle of the producer's responsibility. This involves charging fees for putting specific product types on the market, which are then used to cover the cost of collection and recycling. Currently, such fees are applied to packaging and special waste streams, such as tyres, products containing asbestos, batteries or accumulators, mineral and synthetic oils and lubricants, electrical and electronic equipment and passenger cars (UNECE, 2015; SEPA, 2021). Moreover, producers pay fees for certain plastic bags, and large polluters pay for the amount of hazardous waste they generate (SEPA, 2021).

Since 2010, EPR schemes have applied to packaging waste in Serbia. At the moment there is only one scheme for packaging waste in place in Serbia. Seven operators have a permit for packaging waste management (SEPA, 2021). Most of the packaging material placed on the Serbian market is taken care of by these operators, who organise collection and recycling of packaging waste generated by households, businesses and industry. Some EPR system operators have subcontracted PUCs to collect packaging waste on their behalf. They are obliged to inform the public and end users about the purpose and goals of the scheme, the manner of collection and the location of the collection containers, as well as the potential for reuse and recycling of packaging waste. The fees collected from producers or importers should be used to pay for recycling operations (SEPA, 2021).

For other waste streams there are no full EPR schemes in place with operators, although laws have been passed to transpose the EU directives covering end-of-life vehicles, WEEE, batteries, motor oils and tyres, and producers have to pay fees for units put on the market (except batteries). According to the Serbian authorities, EPR schemes will be established and are being further developed in accordance with EU practice (SEPA, 2021).

To conclude, to date there is only an EPR scheme for packaging waste in place in Serbia. Although fees have to be paid by producers, there are no official dedicated separate collection or EPR schemes in place for other product categories or waste streams, such as end-of-life vehicles, WEEE, motor oils and tyres, which would be required to transpose the EU directives. It remains unclear exactly how the fees paid are used in the collection and management of these waste types.

6 Treatment infrastructure

The Serbian authorities report that there are no precise data on total MSW treatment capacity. Recycling rates are still low, with most of the separated materials collected by informal waste pickers, mainly glass, wood, paper, plastic and metals (ETC/WMGE, 2018). As shown in Figure 1.1, between 2010 and 2019 the recycling rate was around 1 % or less.

Separately collected metals from municipal sources go to smelter facilities. The collected paper and cardboard wastes are used as raw materials in domestic paper and cardboard production facilities. The collected plastic is used as a raw material in plastic production facilities. The

collected glass is exported. There is no separate collection for bio-waste in place or planned (SEPA, 2021).

However, there is a pilot composting facility in Čacak with a capacity of 500 tonnes per year, set up as a public-private partnership, treating bio-waste from the municipality, i.e. mainly garden waste. There are 300 waste operators in Serbia treating 2 million tonnes of industrial waste and MSW. Furthermore, there are seven operators with a permit for packaging waste management. The largest amount of packaging placed on the market in Serbia was taken care of by national operators (SEPA, 2021).

Mixed municipal waste in Serbia is disposed of in landfills without prior treatment. A large part of the municipal waste generated is disposed of in unsanitary landfills outside the control of PUCs, as this the cheapest option. In 2018 it was estimated that 25 % of waste was sent to one of the sanitary landfills, where gate fees have to be paid. 45 % was landfilled at registered but unsanitary municipal landfills, and about 30 % of the total waste generated ended up in uncontrolled dumpsites (ETC/WMGE, 2018). According to the Serbian authorities, the share of waste disposed of at sanitary landfills is growing every year, although the exact amounts are unknown (SEPA, 2021).

There are 11 sanitary landfills in Serbia which are, however, reaching the limits of their capacity. They do not operate completely in accordance with the conditions set out in the EU Landfill Directive. In addition to the 11 sanitary landfills, there are about 100 unsanitary municipal landfills and more than 3 000 illegal dumpsites in Serbia.

At some unsanitary landfills informal sector operators sort out some valuable materials. Most cities and municipalities that have unsanitary landfills have adopted or are in the process of adopting plans for the closure and reclamation of such landfills. These plans are adopted and implemented by the LSG units on whose territory such landfills are located (SEPA, 2021).

The three largest cities in Serbia (Belgrade, Novi Sad and Niš) are not covered by sanitary landfills. Unsanitary landfills and dumpsites are usually located in villages and rural areas. This is mainly due to a lack of funds to expand the waste collection system and poor organisation of waste management at the local level. In most municipalities the maximum capacity of existing landfills has already been reached. Therefore the draft waste management strategy to be adopted by the end of 2021 envisages ending landfilling to non-compliant landfills and dumps and reclaiming the land where they formerly operated in regions where sanitary landfills are in operation (SEPA, 2021).

Because of the high costs associated with its proper treatment, hazardous waste is reported to be sometimes disposed of along with municipal waste at unsanitary or illegal dumpsites (Eunomia et al., 2017). In the national waste management strategy 2010-2019, there was a major focus on hazardous waste, but none of these plans seems to have materialised (SEPA, 2021). There are no licensed waste incineration facilities in Serbia, but some types of waste are thermally treated in cement kilns (ETC/WMGE, 2018). In 2019, 19 tonnes of waste oil, some WEEE and hazardous waste were treated in cement kilns. In the framework of the municipal waste management plans, there are planned investments in the waste infrastructure, such as increasing the number of containers and the number of collection vehicles and establishing new waste treatment centres (SEPA, 2021).

To conclude, almost all collected MSW in Serbia is landfilled, either at illegal/uncontrolled dumpsites or at officially designated but unsanitary sites. Only about 25 % of all waste collected is disposed of in managed facilities. As disposal of waste in landfills not compliant with the EU Landfill Directive at a very low cost is still permitted, it is hard for other waste management options to become cost-competitive. The large number of unsanitary landfills with close to zero disposal costs does not provide any incentive to initiate recycling activities higher up in the waste hierarchy. Therefore, increased effort are needed to close Serbia's non-compliant landfills and

to invest in waste reduction, separation and recycling. Only a very small share of waste is recycled; as this is mainly done by informal waste pickers, there are no official data on the exact quantities. A new methodology for collecting data for reporting municipal waste data, including recycling, to Eurostat is in the final stages of revision and will take into account the requirements of Commission Implementing Decision (EU) 2019/1004.

7 Social aspects of waste management

The Serbian authorities consider proper and efficient waste management to be very important from an economic point of view. It helps to meet other national policy targets: it reduces the demand for natural resources, it reduces national and local authorities' waste management costs and it has the potential to promote social inclusion and economic development (SEPA, 2021).

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 organised (SEPA, 2021).

Abbreviations

EEA	European Environment Agency
EPR	Extended producer responsibility
ETC/WMGE	European Topic Centre on Waste and Materials in a Green Economy
LSG	Local self-government (unit)
MAEP	Ministry of Agriculture and Environmental Protection
MSW	Municipal solid waste
PUC	Public utility company
SEPA	Serbian Environmental Protection Agency
WEEE	Waste Electric and Electronic Equipment

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