PARTNERSHIP
WITHOUT BORDERS

Co-financed by the European Union

WASTE MANAGEMENT IN ROMANIA

Hungary
Slovakia
Romania
Ukraine

The project is realized with the support of the European Union (HUSKROUA/1701/LIP/006) and the support of the Ministry of Energy of Hungary. (KGF/149/2022-EM_SZERZ).

Author: Innoversity Ltd.

SZSZBMFU.HU
SZABOLCS-SZATMÁR-BEREG MEGYEI TERÜLETFEJLESZTÉSI ÉS KÖRNYEZETGAZDÁLKODÁSI ÜGYNÖKSÉG NONPROFIT KFT.

TISZA EGTC

АРР "ЗАКАРПАТТЯ"

CONTENT

THE WASTE PROBLEM IN ROMANIA

In recent decades, the economic growth of EU countries has led to an increase in living standards and consumption, especially in Eastern and Central Europe (Petrescu et al., 2022). This has also happened in Romania (Căilean Gavrilescu & Teodosiu, 2016), which has led to an increase in the amount of waste from the production and consumption of products (Nastase et al., 2019)

Romania is one of the EU countries with serious difficulties in almost all areas of waste management, including collection, transport, treatment, recovery and disposal. The management of municipal solid waste is primarily driven by European policies based on the need to protect human health and the environment and, more recently, on sustainability (Lazarevic, Aoustin, Buclet, & Brandt, 2010).

Romania is also trying to meet these EU expectations. The first National Waste Management Strategy for Romania was developed in 2003 and published in early 2004, following the transposition of European legislation on waste management and in accordance with the provisions of the Government Emergency Decree No 78/2000 on waste management adopted in 2001. The strategy covered the period 2003-2013. The strategy was based on the principle of protection of primary resources, the principle of prevention, the 'polluter pays' principle, which is linked to the principle of producer and user responsibility, the principle of substitution and the principle of proximity, which is linked to the principle of autonomy (Almasi, 2013)

The first National Waste Management Plan was also developed in 2004 to take the necessary measures to achieve the objectives of the strategy (Romania, 2004). In order to implement the National Waste Management Plan more effectively, regional waste management plans were issued in 2006 for the eight Romanian regions (Larive, 2011).

Romania, as a member of the United Nations and the European Union, has adopted the UN 2030 Agenda and the 17 Sustainable Development Goals (SDGs) it contains. The European Council endorsed this Agenda in the document "A Sustainable Future for Europe" (A/RES/70/1) on 20 June 2017. This document set out the direction that EU Member States should follow in their task of implementing the 2030 Agenda for Sustainable Development. In the case of Romania, these have been concretised in the Romania Sustainable Development Strategy 2030 document, which is a roadmap for achieving the 17 SDGs. The strategy promotes

sustainable development in Romania by focusing on the three dimensions of sustainable development: economic, social and environmental. It is a citizen-centred strategy, based on innovation, optimism and resilience, where the role of the state is to serve the needs of each citizen in a fair, efficient and balanced way, by creating a clean environment (Romania's Sustainable Development Strategy 2030, 2018)

Integrated waste management is also included in the Romanian sustainability strategy, as part of a vision of sustainable development and a manifestation of the concept of a circular economy based on recycling and conservation. In this sense, all man-made products that have become unusable are treated as raw materials in the production of other products or services.

Romania has mobilised more than €1 billion for the implementation of integrated waste management systems from European funds contracted in the 2007-2013 period (PHARE programmes, ISPA - Instrument for Structural Policies for Pre-Accession) and in the 2014-2020 period (Sectoral Operational Programme - SOP for the Environment).

The Integrated Waste Management System (SMID) is a set of processes and operators covering the territory of a county, through which municipal waste is collected, transported, sorted, treated or stored in an ecological way in accordance with EU rules.

When the plans were drawn up, the Integrated Waste Management Systems were seen as revolutionary projects that would bring Romania up to minimum hygiene standards and open a new phase in waste management in Romania, since in 2006 many municipalities in Romania had no waste management facilities and very few recycling or recovery projects.

Unfortunately, although these projects should have been operational by 2013, most of them are still not operational, due to a lack of ambition, procedural delays in public procurement procedures, or sometimes a lack of administrative capacity on the part of the authorities managing the project (Instytut Spraw Obywatelskich, 2023).

Out of 42 counties (including Bucharest), 34 counties have benefited from funding for the implementation of Integrated Waste Management System projects through the programmes of the Ministry of European Funds. The situation at the end of 2020 was as follows (https://ecologic.rec.ro/de-ce-ratam-obiectivele-asumate-in-gestionarea-deseurilor-municipale/):

- There are 16 counties with an Integrated Waste Management System: the facilities have been built and the contracts for the operation of the facilities have been signed: the

counties of Argeș, Bacău, Bistrița-Năsăud, Călărași, Covasna, Giurgiu, Hunedoara, Mureș, Neamț, Olt, Sălaj, Sibiu, Teleorman, Timis, Tulcea and Vaslui fall into this category.

- In 10 counties, SMIDs are only partially operational: not all installations are operational for various reasons, such as renovation, or because environmental permits have not been applied for or tenders for the designation of operators have not been completed: the counties of Arad, Bihor, Botoşani, Caras-Severin, Cluj, Dolj, Iasi, Mehedinti, Prahova and Suceava fall into this category.

- In 6 counties SMIDs are not operational at all. This is due to a number of reasons, including incomplete tendering procedures, the failure of the county council to grant the facilities a permit to operate, and the failure to sign contracts with the operators of the facilities. The counties of Alba, Braila, Constanta, Harghita, Maramures and Vrancea fall into this category.

- In two counties, SMIDs are at the project (planning) stage.

- Seven counties (Brasov, Buzău, Dambovita, Gorj, Ialomita, Ilfov and Satu Mare) and the Municipality of Bucharest did not receive funding for SMID projects because they have municipal waste treatment facilities. They were either set up by private sector actors, financed by their own resources, or through ISPA and Phare projects, or financed by national resources. Some of these need additional funding to be operational. For example, some operators need upgrading to become operational. Operational SMIDs sort and treat in order to recycle, recover energy and reduce the amount of waste stored. Ninety per cent of operational SMIDs have, in addition to landfills that meet standards, sorting and mechanical-biological treatment facilities and composting stations (open or closed). SMIDs are an essential step not only in improving waste management at national level, but also in starting the process of transition to a circular economy. Without ensuring the viability of Integrated Waste Management Systems, the transition to a circular economy would be much more difficult (Instytut Spraw Obywatelskich, 2023).

Another huge problem in Romania is the often illegal import of waste. Three years after China blocked the import of waste from developed countries, Romania has become a new dumping

ground for illegally imported waste, mainly from European countries (Figure 1). The smuggling of waste into Romania is a widespread phenomenon, based on the rule that allows the transfer of raw materials from one EU Member State to another.

1. Figure 1: Waste smuggled into Romania

Source: Pavalasc (2021)

All the waste that is imported into Romania in this way should be the raw material for recycling, but very often the containers contain something other than what the official documents say they should contain. In EU countries such as Germany, Belgium and Greece, the disposal of hazardous waste can cost up to €1000 per tonne. Companies are trying to cut costs by shipping waste to Romania, where profitable black market operations result in them being charged as little as €250 per tonne for taking back waste. However, instead of disposing of it in accordance with the regulations, the importing company only processes 10 percent of the waste, which is simply dumped in landfills or incinerated. Other times, smugglers pass off the imported waste as second-hand products that Romanians want to sell on the market.

According to the Romanian Environment Agency, in 2021 alone, some 3,700 tonnes of waste were smuggled into Romania in this way, including from as far away as Japan, China and Saudi Arabia. Waste imports have increased dramatically since 2018 as these countries seek landfill sites after China and several other Asian countries refused to take on more waste. However, the filtering of illegal waste is made more difficult by the legal import of materials such as plastic waste, which Romanian recycling plants buy from abroad to keep their operations running at full capacity (Pavalasc, 2021)

Illegal landfills are also a serious problem in Romania. In 2017, the European Commission decided to refer Romania to the European Court of Justice for failing to close and rehabilitate 68 illegal landfills "which pose a serious risk to human health and the environment" (Marica, 2017)

Environmental problems are often linked to social problems. Europe's largest waste-related ghetto is located in Cluj Napoca, Romania's fourth largest city. Around 1 500 people, most of them Roma, live in four different informal settlements around the Pata Rât landfill (Figure 2), 6 km from the city centre. Many of them live in makeshift shelters built from materials found in the landfill, such as cardboard, plastic or rotten wood. The majority of people in Pata Rât live in abject poverty. Some have no access to public utilities, not even electricity (https://ejatlas.org/conflict/pata-rat-landfill-cluj-napoca-romania).

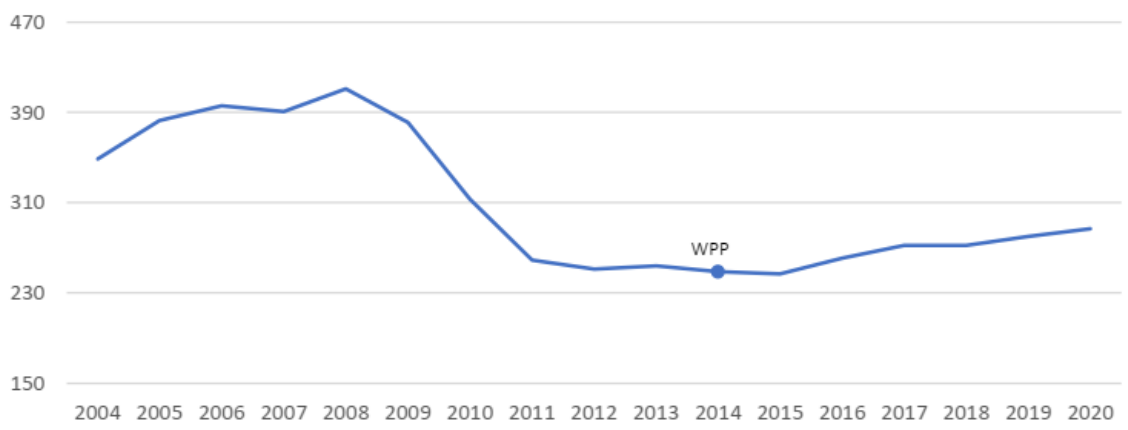
2. Figure 3: The infamous Pata Rat landfill near Cluj Napoca

Source : https://ejatlas.org/media/conflict/pata-rat-landfill-cluj-napoca-romania/Pata_rat_george_popescu_poqe_1.jpg

MUNICIPAL SOLID WASTE

Romania is among the lowest performing countries in the EU in waste management.

According to the latest study by the European Environment Agency (2023), the amount of municipal solid waste per capita in Romania has resumed its upward trend after a sharp decline. The amount of municipal waste per capita increased from 349 kg in 2004 to 411 kg in 2008 and then decreased in the following years. From 2009 onwards, a strong downward trend was observed until 2015, when the amount of municipal waste per capita decreased to 247 kg. Thereafter, a steady increase was observed, and by 2020 the amount of municipal waste per capita had increased to 287 kg (Figure 3).



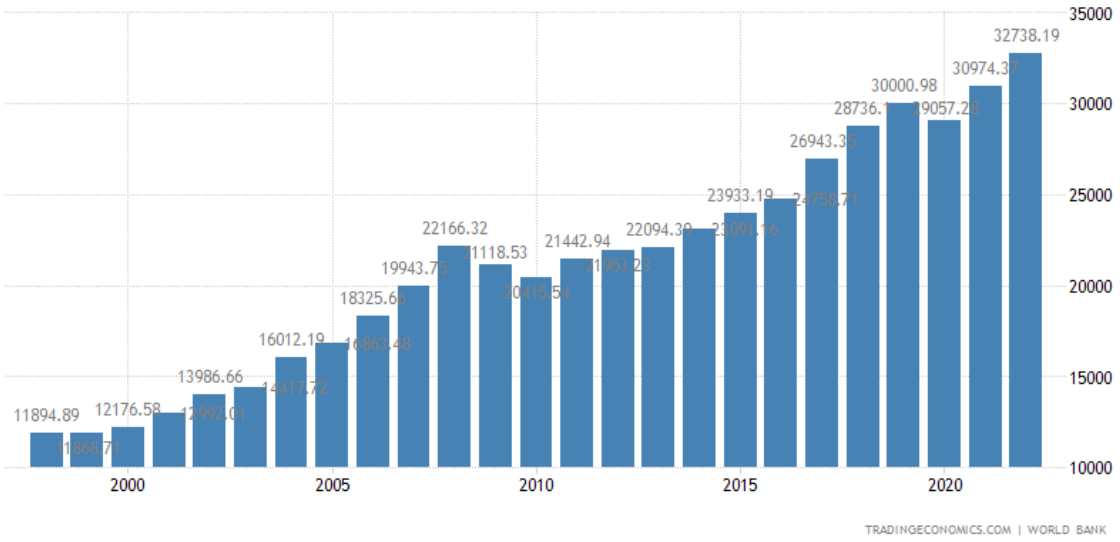
3. Municipal waste generation in Romania (kg/capita), 2004-2020

Source: European Environment Agency (2023) based on Eurostat [ENV_WASMUN]

Municipal waste generation in Romania increased by 7.6% between 2016 and 2020, from 5.1 million tonnes in 2016 to 5.5 million tonnes in 2020 (European Environment Agency, 2022), with the lowest level of waste generation in this period being reached in 2015 (247 kg per capita), one year after the entry into force of Romania's first waste prevention programme. The slight increase in the following years was influenced by a number of factors, including rising GDP, purchasing power, population and a shift in household expenditure.

In Romania, per capita GDP adjusted for Purchasing Power Parity (PPP) has been growing steadily since the turn of the millennium, except for crisis periods (e.g. 2009-10 and 2020), and

reached USD 32738.19 in 2022 (Figure 4). GDP per capita in Romania adjusted for PPP is 184 percent of the world average (Tradingeconomics, 2023). The upward trend in waste generation after 2015 is partly due to this.

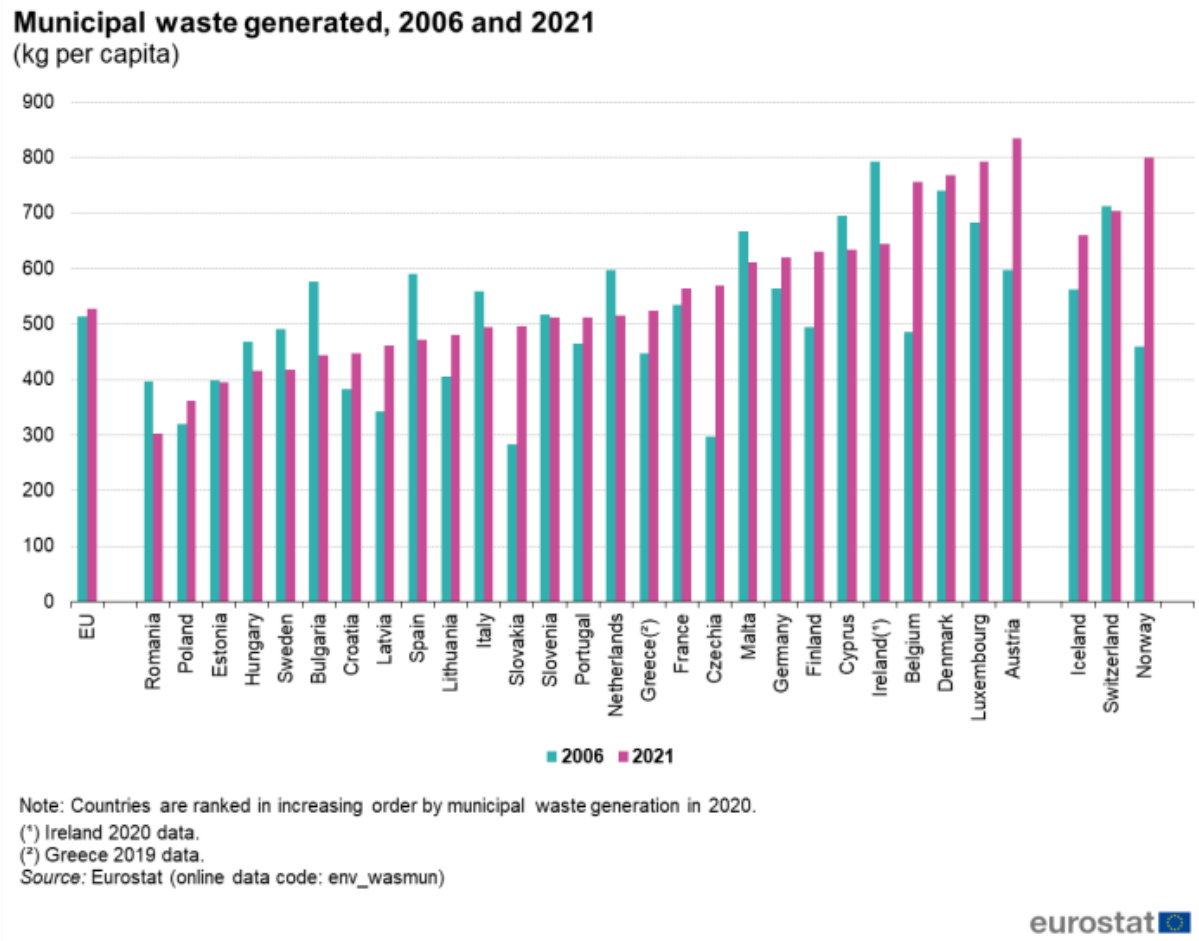


4. Figure 1 Gross domestic product per capita, PPP-adjusted, in Romania (USD), 1998-2022

Source: https://tradingeconomics.com/romania/gdp-per-capita-ppp, based on World Bank

Overall, however, municipal waste generation in Romania (280 kg/person) is below the European average (517 kg/person/year) according to 2020 data (European Environment Agency, 2023).

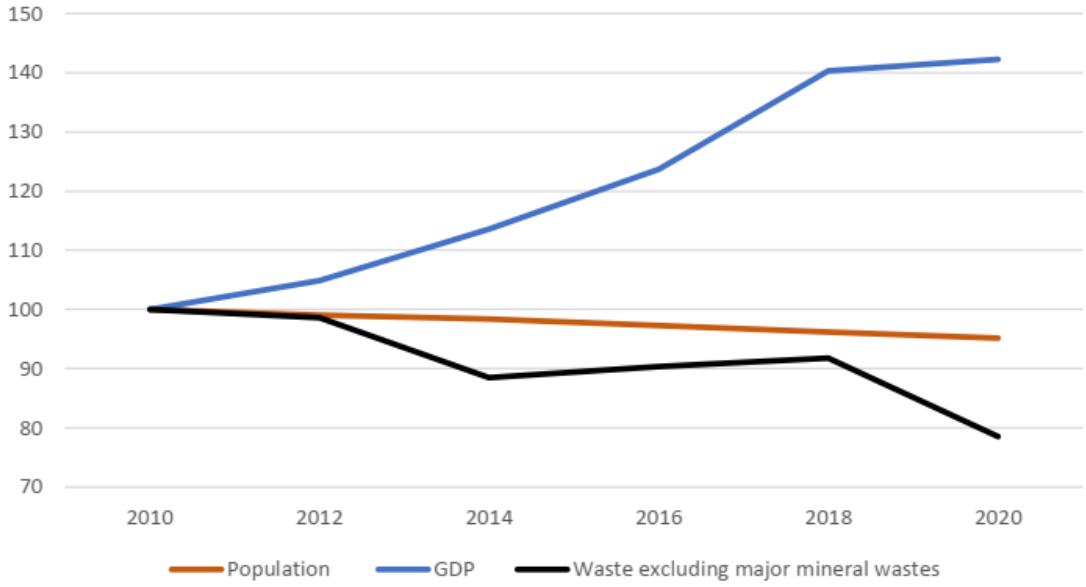
The same trend can be seen in Figure 5, which shows the evolution of municipal waste per capita in the European Union between 2006 and 2021. For Romania, the amount of waste per capita has decreased significantly over 15 years, by 94 kg by 2021. It should be noted that there has been a slight upward trend in this area in Romania in recent years. At the same time, the EU has also seen a slight increase (27 kg), as the amount of waste per capita increased from 513 kg/capita in 2006 to 530 kg/capita in 2021.



5. Figure Municipal waste in the EU 2006-2021 (kg/capita)

Source: Eurostat, 2023 (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Municipal_waste_statistics)

The amount of total waste (excluding major mineral waste) in Romania followed a strong downward trend between 2010 and 2014, followed by a slight increase between 2014 and 2018, and then a steady decrease again from 2018 onwards (Figure 6). A different trend can be observed for Romanian economic growth and GDP, which followed a strongly increasing trend between 2010 and 2020. Based on the above, it can be concluded that Romania seems to be on track to decouple total waste generation and economic growth, although a longer time series is needed to consolidate the conclusion on decoupling. However, the decoupling between population growth and total waste generation (excluding major mineral wastes) is much weaker.



6. **Figure 1 Waste (excluding major mineral wastes), GDP (main GDP aggregates, chain-linked) and population growth rate, Romania 2010-2020, (2010=100).**

Source: European Environment Agency (2023) based on Eurostat [ENV_WASGEN, NAMA_10_PC, DEMO_GIND]

The population covered by waste collection services has been steadily increasing since 2012. In 2018, 96 percent of urban areas and 79 percent of rural areas were covered by waste collection services (Table 1). At the national level, this represents a coverage of 88 percent (UNECE, 2021). However, the situation improved by 2019. In 2019, 2 percent of the urban population and 12 percent of the rural population were not covered by municipal waste collection services (European Environment Agency, 2022).

The collection and treatment of municipal solid waste is the responsibility of the local administration and can be delegated to private companies. According to the National Regulatory Authority for Public Services in Romania, 336 operators were licensed to provide waste water disposal services in 2019. Increasing waste collection coverage and the associated tariffs remains a challenge. *The population is not used to paying for* waste *collection services.* In addition, waste collection services in rural areas were previously scarce and waste volumes were lower than in urban areas. *Collecting waste only in rural areas is not economically viable and therefore less attractive to operators.*

	2012	2013	2014	2015	2016	2017	2018
Urban areas	87.00	88.98	92.26	93.67	94.50	95.90	95.58
Rural areas	60.44	66.80	69.12	71.79	75.10	79.15	79.38
National coverage	75.04	78.96	81.59	83.57	85.55	88.12	88.09

1. Table 1: Percentage of population covered by waste collection services in Romania, 2012-2018

Source: UNECE (2021) based on 2019 data from the National Environment Agency

To modernise the municipal waste management system, Romania has gradually introduced an integrated solid waste management system with the support of EU funds. The aim of these systems is to develop and integrate all the elements necessary for a functioning waste management system, including separate collection, transport, transfer, treatment and disposal of waste within a county. Typically, a single system within a county covers both urban and rural areas, aiming at financial sustainability.

The government also provides financial incentives for local authorities to organise waste collection services. At the same time, each municipality that does not provide a sanitation service contributes €10 to the Environment Fund for each tonne of municipal waste not collected (UNECE, 2021).

The Government Emergency Ordinance No 74/2018, approved by Law 31/2019, introduced measures to bring the national solid waste management system closer to the principle of integration. One of the incentive measures is the introduction of a landfill tax on the disposal of construction and demolition waste, in addition to a tax on the disposal of solid waste (officially known as "contribution to the circular economy"). Together with a programme to develop integrated management systems for solid waste in the counties, it promises to further increase coverage and integrate remote rural areas into the waste management system.

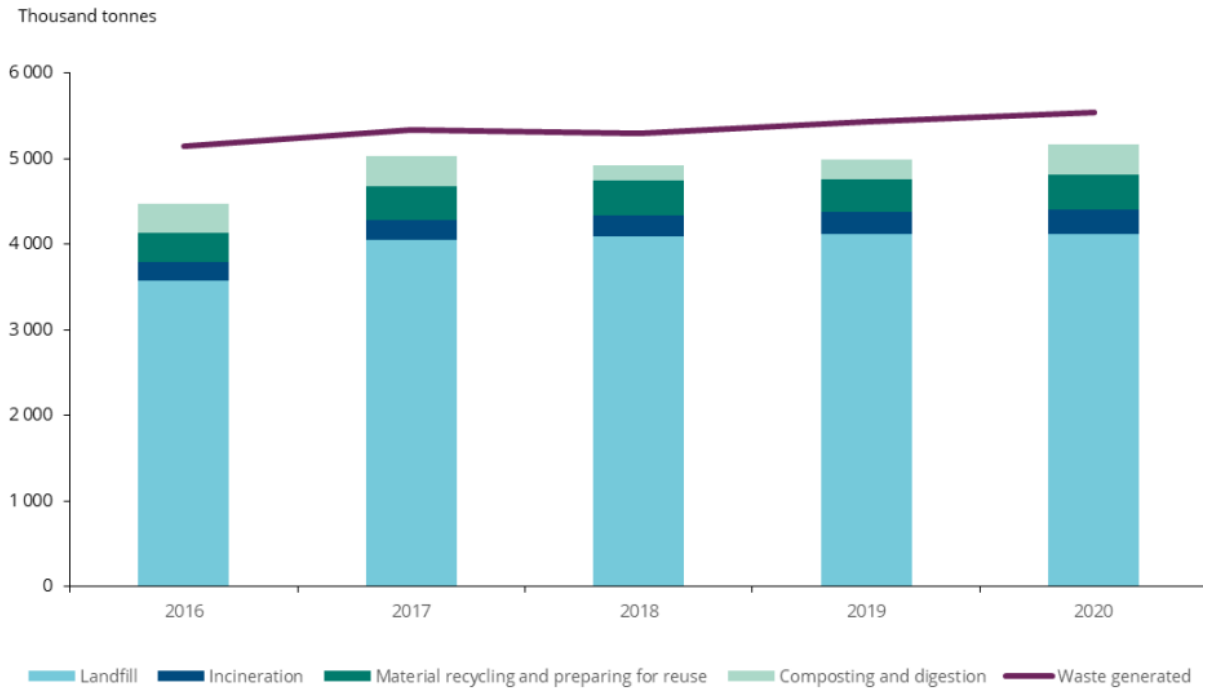
To deepen integration, the National Waste Management Plan 2018-2025 proposes further infrastructure upgrades. Most future capacity is needed in mechanical-biological treatment (970000 t/y) and anaerobic digestion (mainly biogas plants with a total capacity of 821000 t/y), followed by incineration capacities with energy recovery (173000 t/y), sorting (52000 t/y) and composting plants (27000 t/y). In addition, the transformation of waste into secondary raw

materials for material use or into products would help to create economic value from waste. This requires an economic incentive for the waste management system to integrate with industries and technologies for the recovery of waste materials, in cooperation with the research and development sectors. Creating value from waste would also improve the economic balance of waste collection in rural areas.

Landfilling is the least desirable waste management option The Landfill Directive (Directive 1999/31/EC as amended by EU Directive 2018/850/EC) requires the landfilling of municipal waste to be reduced to 10% of municipal waste generation by 2035 and introduces a ban on landfilling separately collected waste, including biodegradable waste.

Romania still relies heavily on landfilling: even more so in 2020 than in 2016. Material recycling and incineration are still limited, but are on the increase thanks to co-incineration in cement kilns. Composting/demolition is also limited (Figure 7).

While the amount of municipal waste landfilled decreased steadily by 18% between 2013 and 2016, the trend between 2017 and 2020 was no longer linear, with around 53.5 million tonnes of municipal waste going to landfill in 2020 (European Environment Agency, 2023). In addition, the average rate of municipal waste landfilling in the EU in 2020 was still 23%. However, significant disparities remain across the EU: in 2020, eight Member States still landfilled more than 50% of municipal waste, with three Member States, including Romania, reporting rates above 70%.



Explanation: light blue: landfill; blue: incineration; green: recycling and reuse; turquoise: composting and digestion; purple: waste generated (thousand tonnes)

7. Municipal waste generation and management in Romania between 2016 and 2020, in thousands of tonnes

Source: European Environment Agency, 2022

Romania's overall landfill rate in 2020 was 74.3%, so the distance to target was 64.3 percentage points. This gap is very large and it is not even clear that the trend is decreasing. So, at present, a total of 13 Member States, including Romania, are still far short of the target of sending no more than 10% of municipal waste to landfill by 2035. Bulgaria, Croatia, Cyprus, the Czech Republic, Greece, Hungary, Latvia, Malta, Poland, Portugal, Romania, Slovakia, Spain, Portugal, Bulgaria, Croatia, Cyprus, Latvia, Poland, Portugal, Romania and Slovakia have the biggest problems in this area.

In the period 2014-2020, Romania has allocated around €318 million of EU funds to household waste management, most of which was targeted at the lower parts of the waste hierarchy (European Commission, 2019).

SELECTIVE WASTE COLLECTION

Selective collection of recyclable materials from municipal solid waste remains low in Romania. Only 12.9 percent of all municipal solid waste generated in 2017 was collected selectively (Figure 8) (UNECE, 2021).

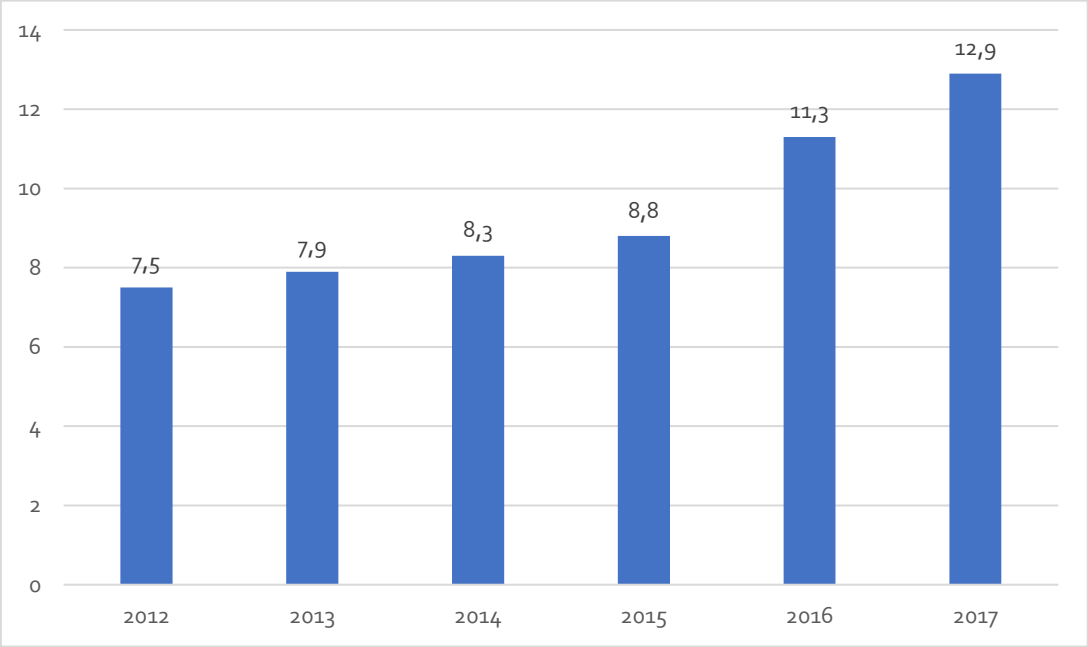


Figure 8 Separately collected waste in Romania as a % of total waste in 2012-2016

Source: own editing based on European Environment Agency (2023) UNECE 2021 data

In 2018, biodegradable waste (107 000 t) accounted for the largest amount of separately collected waste in Romania, followed by plastics (75 000 t) and paper and cardboard (64 000 t) (Figure 9).

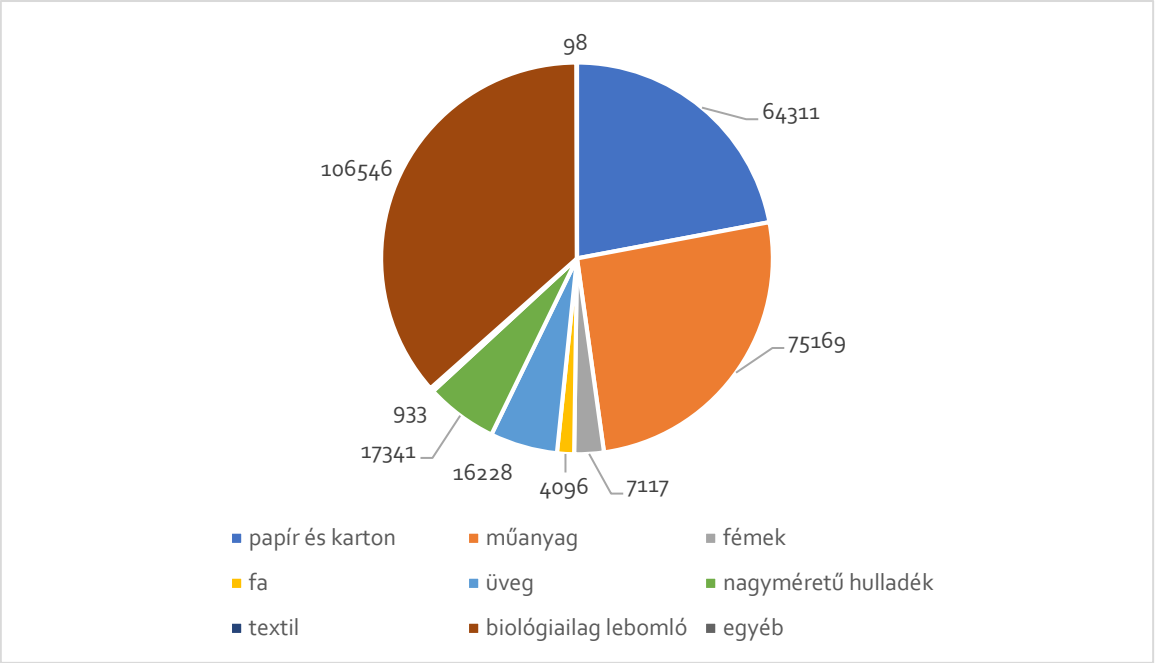


Figure 9 Distribution of separately collected waste by type in Romania in tonnes in 2018

Source: own editing based on European Environment Agency (2023) UNECE 2021 data

Another option for separating recyclable materials from municipal solid waste in Romania is the post-collection sorting of mixed waste.In 2017, 22.5 percent of the collected municipal solid waste was sorted, compared to 15 percent in 2012. A comparison of data on the proportion of municipal solid waste collected and sorted after collection in 2017 (35.6 percent) and the proportion of municipal solid waste recycled, composted or prepared for reuse (13.9 percent) shows that the yield of recyclable material from the waste collected/separated is relatively low at 40 percent. Due to the low rate of separation of recyclable materials, Romania has not reached the 2020 target of recycling 50 percent of municipal solid waste prepared for re-use/recycling. The targets of the Waste Framework Directive 2008/98/EC, as amended by Directive 2018/851/EU, are even higher: 55% of municipal waste generated should be recycled by 2025. According to the National Waste Management Plan 2018-2025, an additional capacity of 52 000 t/y is needed on top of existing facilities.

The Packaging and Packaging Waste Directive (94/62/EC, as amended by Directive (EU) 2018/852) sets targets for the recycling of packaging waste, both overall and by material, to be achieved by 2025.

Overall, the recycling rate in Romania is lagging far behind the recycling target for 2025 (55%), with significant declines in 2018 and 2019. An increase occurred in 2020, bringing the recycling rate back to the 2016-2017 level (Figure 10). The recycling rate has been stable between 11 and 14% over the last five years, including a slight decline of 2 percentage points in 2018 and 2019. The recycling rate in materials was also generally stable between 2016 and 2020. The introduction of planned waste management investments from 2017 onwards has not yet been reflected in recycling rates.

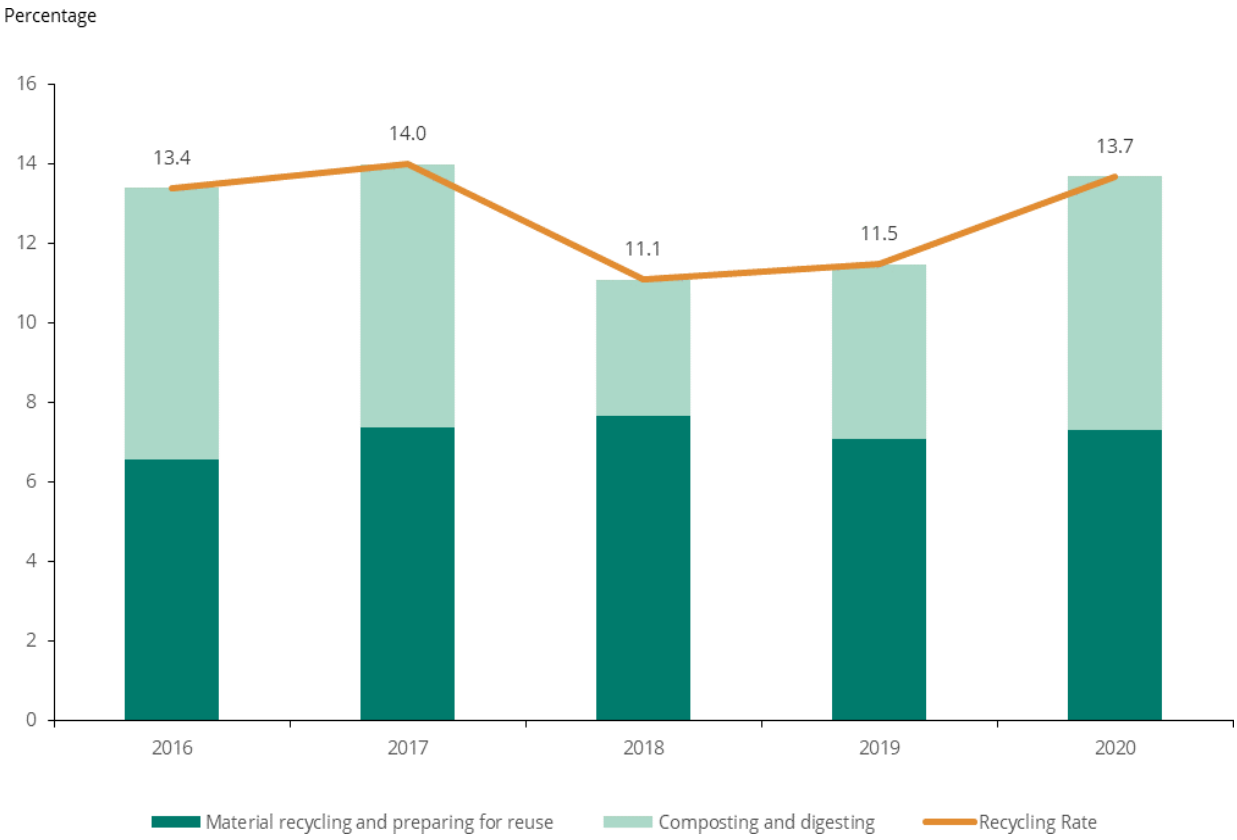


Figure 10 Recycling rate in Romania between 2016 and 2020, expressed as a percentage

Source: European Environment Agency, 2022, based on Eurostat, 2022

The actual distance from the target for the last data point is a key factor determining the probability of meeting/not meeting the target. The closer the Member State is to the target, the more likely it is to meet the target. For Romania, the recycling rate in 2020 is 13.7%, 41.3 percentage points below the recycling target of 55% in 2025. However, taking into account the impact of the new calculation rules, the assessment assumes a decrease of 5 percentage points,

as estimated by the European Environment Agency (2022), resulting in an estimated recycling rate of 8.7%, 46.3 percentage points below the target.

It is almost certain that Romania will not meet this target, but in any case a significant structural improvement would be needed to close the gap.

Convenience and coverage of separate collection systems for different fractions of household waste

Separate collection systems are key to high recycling rates and the collection of recyclable materials of the right quality. In general, the more convenient and accessible these systems are for users, the more efficient they are.

The assessment methodology distinguishes between different types of collection systems to determine the level of comfort:

- Collection points with a density of more than 5 km2,
- Collection points with a density of less than 5 km2,
- waste yards (civic amenity site)

In addition, it distinguishes between urban (densely populated), urban and suburban (moderately densely populated) and rural (sparsely populated) areas. The proportion of the population served by the different types of system is then calculated. The assessment is material-based and takes into account the different materials according to their average share in municipal waste.

For Romania, the latest data show that the share of households living in urban areas is 34.2%, the share of households living in cities and suburbs is 24% and the share of households living in rural areas is 41.8% (Eurostat, 2021).

Since the law (Emergency Ordinance) does not clearly define the separate waste collection service to be provided by local authorities to residents and does not provide for implementing measures, separate collection in Romania is limited to collection systems for recyclable materials (paper and cardboard, metals, plastics, glass). The minimum requirements for the collection of residual waste and the separate collection of recyclable materials are laid down in national legislation, including harmonised colour schemes for the different containers. As regards the convenience of separate collection systems for the public, the requirements for the

containers to be made available to the public are based on a standard issued in 1997. However, these requirements do not ensure a high rate of separate collection. It is likely that the national minimum requirements are too weak and that they are not fully implemented. The current separate collection system does not distinguish between household and non-household waste.

The National Environment Guard, which is responsible for monitoring and enforcement, often finds irregularities in service contracts. During their audits in 2020, they found that around 12% of the administrative territorial units had not implemented the separate waste collection system provided for in their service contracts. In the same year, 603 fines and 638 warnings for non-compliance were applied, indicating that in total around 39% of the administrative territorial units had not implemented separate collection, which is in line with the low recycling rates reported to Eurostat. Corrective actions with compliance deadlines have been taken and in 2022, the National Environmental Guard has introduced further inspections and control measures.

The result is that *for all materials (paper and cardboard, metals, plastics, glass, bio-waste, wood, textiles, electrical and electronic equipment), only a very small proportion of the population has access to high convenience selective waste collection services*, with a negative impact on public participation.

In relation to separate waste collection, all EU-funded integrated waste management schemes include investments to facilitate the separate collection of waste in 2 to 5 fractions, consisting of urban and rural collection points, containers/underground bins, household collection containers and composting units for rural households, as well as appropriate waste collection vehicles/transport trucks and the collection of different types of waste (large waste, hazardous household waste, etc.waste yards for hazardous waste (e.g. hazardous household waste, hazardous waste, hazardous waste, etc.).

These investments will focus on:

- Upgrading the selective collection system for recyclable waste, including public waste collection centres and preparation centres for reuse;
- The introduction of separate collection schemes for bio-waste, both for household waste and for waste of a similar nature and composition to household waste;
- Introduction of separate collection schemes for textiles, bulk waste and hazardous household waste;
- Management of separately collected waste streams.

The national recovery and resilience plan (Ministry of Investments and European Projects, 2021) includes financial support for the implementation of digitalised eco-islands (collection points) for the separate collection of paper and cardboard waste, plastic waste, metal waste, glass waste, bio-waste and residual waste from households and for serving apartment blocks. At least 7 000 digitalised eco-islands are planned to be installed by the end of 2024 and a further 13 752 by the end of 2026. In addition, the National Recovery and Resilience Plan will fund the creation of 250 civic waste collection sites for the selective collection of large waste, waste, WEEE, waste batteries, hazardous waste, construction and demolition waste by the end of 2024 and an additional 565 by the end of 2026 (EC, 2021a).

Romania is planning to increase the number of separate collection services for at least bio-waste, wood, waste electrical and electronic equipment, paper, metal, plastic and glass waste,

Separate (selective) collection system

The mandatory separate collection of non-household packaging waste fractions has been transposed into national law (Law 249/2015, Art. 2, Art. 20, para. 4). Operators holding commercial and industrial packaging and/or commercial and industrial packaging waste are obliged to:

- return the used packaging to suppliers or to economic operators designated by them in accordance with the contractual provisions; or
- deliver the packaging waste to collectors designated by organisations implementing extended producer responsibility obligations (OIREP); or
- ensure their recycling and, where recycling is not possible, their recovery by other means, through contracts with operators authorised to carry out the relevant operations, and
- to report the data.

Separation at source is mandatory for non-household paper and cardboard packaging waste, non-household ferrous metal packaging waste, non-household glass packaging waste, non-household plastic packaging waste and non-household wood packaging waste (European Environment Agency, 2022)

A recently published study (Jigani et al., 2020) investigated the behaviour of Romanian consumers in relation to selective waste collection. Based on their research results, they found that the two determinants of selective waste collection behaviour are behavioural intention and knowledge about selective collection. These can be used to implement programmes to increase consumer participation in separate waste collection. Consumer involvement can be further enhanced through the use of appropriate reward policies and the provision of consumer-friendly waste collection infrastructure. In addition, awareness campaigns to increase public responsibility can have a positive impact on consumer behaviour.

Extended producer responsibility (EPR)

Within EPR systems, tariff modulation (or eco-modulation) is a system where different tariffs are applied to different types of packaging materials and packaging types. While basic fee modulation, i.e. different fees for the main material groups, is common, advanced fee modulation can create stronger incentives for packaging producers to design products for recycling and thus create favourable conditions for achieving higher recycling rates. The level of development of fee modulation is assessed on the basis of four criteria:

- recyclability: for example, to distinguish between PET and PS, to distinguish between different colours of PET, or to distinguish between 100% cartons and laminated beverage cartons;
- sortability and confusion: for example, higher tariffs for labels and caps made from other materials that are not suitable for the main packaging recycling technologies;
- recycled content; and
- whether there is a transparent compliance audit by the producer responsibility organisation (PRO).

In Romania, the EPR system applies to the following packaging streams (both household and commercial/industrial waste):

- paper and cardboard,
- glass,
- PET,
- other plastic

- steel,
- aluminium and
- fa.

In 2022, 15 national companies were responsible for organising and operating the EPR system for packaging. Each licensed operator sets a separate tariff per type of material for commercial and industrial packaging waste and for packaging waste from municipal waste. These fees should cover the costs of collection and transport, temporary storage, sorting and, where appropriate, recycling and energy recovery of packaging waste (European Environment Agency, 2022).

Companies that place packaged products on the Romanian domestic market, either through production or import, or purchase packaged products for own use or consumption within the EU, must register with the Environmental Fund Directorate by submitting the first declaration of commitments to the Environmental Fund. The list of these operators will be published on the website of the Environment Fund's Directorate (EFA, 2022).

Under national legislation, producers have to meet the recovery targets (recycling and energy recovery). From the first year of operation, the implementation of the obligations related to the extended scheme is the responsibility of the producer for a minimum packaging volume of 10 000 tonnes and each year it is mandatory to maintain at least the same quantity of packaging material of 10 000 tonnes placed on the market in the previous year. Failure to do so will result in proportional payments to the Environmental Fund for each kilogram of non-recycled material to which the target applies. The websites of producer responsibility organisations provide information on both the tariffs applied to packaging and the quantities of packaging that become waste. When setting tariffs, a distinction is made between PET and other plastics for plastic packaging and between steel and aluminium for metal packaging. There is no information available on whether recycled content, recyclability or sortability are taken into account when setting the tariffs and the *tariffs do not appear to apply advanced tariff modulation.*

PET and other plastics, as well as steel and aluminium, are subject to differentiated tariffs, which may indicate the application of tariff modulation. However, the tariff modulation applied to plastic and metal packaging does not meet the assessment criteria. No advanced tariff modulation is applied for other packaging materials.

Bio-waste treatment

According to Article 5(2c) of the EU Landfill Directive, Member States had to ensure that by 2016 the amount of biodegradable municipal waste going to landfills was reduced to 35% of the total (by weight) amount of biodegradable municipal waste generated in 1995 or the last year before 1995 for which standardised Eurostat data are available. Romania was granted a four-year grace period in July 2016, so it should have met the target by 2020 (European Environment Agency, 2022).

Romania reported that 4.8 million tonnes of biodegradable municipal waste was generated in the 1995 reference year. Compared to the 1995 reference year, data on the amount of biodegradable municipal waste landfilled show that 44% of biodegradable waste was still landfilled in 2019 compared to the biodegradable waste generated in 1995 (EC, 2021b). *Romania has therefore not met its target to reduce the amount of biodegradable municipal waste going to landfills.*

Within municipal waste, bio-waste is the largest fraction of waste, and adequate treatment capacity must be ensured.

The assessment of whether there is sufficient capacity for municipal bio-waste management is not clear. In Romania, composting and anaerobic digestion plants generally accept not only municipal waste but also waste from other sources, such as agricultural or commercial sources. Therefore, the available capacity within the country should be sufficient to receive bio-waste from all relevant sources (EEA, 2016; Waste Model questionnaire, 2017).

In Romania, a total of 111 465 tonnes of bio-waste was collected separately in 2019: 78 207 tonnes from households and 33 258 tonnes from non-households. The available capacity to treat bio-waste (composting) is about 500 000 tonnes/year, and a further 100 000 tonnes/year of capacity was under construction.

Assuming an average share of 36% of bio-waste in the total municipal waste generated (EU average in 2017), this calculation would result in the generation of around 1.7 million tonnes of bio-waste in Romania. The available capacity to treat separately collected bio-waste would therefore only be able to handle around 27% of the amount generated. Thus, Romania will need to significantly increase its bio-waste treatment capacity in order to properly manage bio-waste

and to introduce separate collection of bio-waste by 2023, as required by the Waste Framework Directive.

Investment in increasing bio-waste collection capacity is planned under the National Recovery and Adaptation Plan (Ministry of Investment and European Projects, 2021), but its introduction is still under negotiation. The National Recovery and Resilience Plan states that "The start of selective biowaste collection on 7 000 eco-islands (fourth quarter of 2024) is linked to the start of operation of anaerobic digestion and composting facilities in preparation for funding under the Operational Programme for Sustainable Development 2021-2027. Based on the current state of preparation of investments, 30% of the anaerobic digestion and composting capacities planned in the county waste management plans are forecast to be operational by the end of 2024".

It is very likely that Romania does not have the capacity to properly manage bio-waste. However, the Operational Programme for Sustainable Development 2021-2027 foresees investments in and financial support for anaerobic digestion and composting capacities for bio-waste.

Legally binding national standards and quality management system for compost/waste

In order to create a market for compost and digestate, the compost must be of good quality so that it can be used as a soil improver or fertiliser. Legally binding standards guarantee the quality of the compost produced. The quality management system aims to manage the different elements of the production process to ensure a stable and high quality output (product), which helps to achieve the specified quality of the product.

The separate collection and management of bio-waste is still in its infancy in Romania. There is no national system to guarantee the production of high quality compost from separately collected bio-waste. Compost from biodegradable waste treatment is sold as flower substrate in small local pilot projects or used in agriculture (European Environment Agency, 2022).

Law No 181/2020 on the management of non-hazardous compostable waste will enter into force after the technical rules on composting and anaerobic digestion have been finalised. The technical rules will be reinforced by the provisions of Regulation (EU) 2019/1009 laying down rules for the placing on the market of fertilisers in the EU (Ministry of Environment, Waters and Forests, 2022).

In Romania, there are currently no legally binding national compost quality standards and no quality management system for compost produced from separately collected bio-waste. However, national quality standards (technical rules for composting and anaerobic digestion) are being developed (European Environment Agency, 2022).

LEGAL BACKGROUND

European waste management legislation has been transposed into Romanian national law through a number of laws (Ministry of Environment, Water and Forests, 2022):

- Government Emergency Ordinance. Decree 92/2021 on waste management repealed Law 211/2011 on waste management. This Emergency Ordinance transposes into national law the Waste Framework Directive, as last amended by Directive (EU) 2018/851
- Government Emergency Ordinance No 195/2005, as amended and supplemented. This is the Romanian Environmental Protection Law;
- Law No 101/2006 on hygiene, as amended. It defines the objectives, organisation and duties of the administrative territorial units, i.e. the local authorities (hereinafter referred to as local authorities). The local authorities in Romania in 2020 will comprise 216 cities, 103 municipalities (for urban areas) and 2 862 communes (for rural areas);
- Various other legal norms that apply to specific waste streams such as: packaging, waste electrical and electronic equipment, batteries, tyres, single-use plastics, deposit return schemes;
- The Environmental Protection Fund approved by Law No 105/2006, as subsequently amended and supplemented (in accordance with the provisions of Government Emergency Decree No 196/2005), sets out the economic instruments for (inter alia) waste management and landfill diversion, as well as the provisions for the management of the Fund.

Timely transposition of the Waste Framework Directive, as amended by Directive 2018/851, into national law within the required deadline is key to ensuring a waste management system that meets EU requirements.

Emergency Government Decree No 74/2018 was issued on 17 July 2018 to amend and supplement Law No 211/2011 on waste management, Law No 249/2015 on packaging and packaging waste management and Emergency Government Decree No 196/2005 on the Environmental Protection Fund. The Emergency Decree introduced a number of legislative changes, in particular in the field of packaging and packaging waste management.

Romania did not fully transpose the Waste Framework Directive (WFD) into national law until 26 August 2021, more than 12 months late.

In order to achieve high recycling rates, it is important that there are clearly defined responsibilities, implementation and support mechanisms between different organisations and management levels to meet the targets. The clearer the responsibilities for meeting targets and accountability for failure to meet targets, the greater the likelihood that targets will be met.

In Romania, the following authorities are responsible for controlling the recycling of municipal solid waste and packaging waste:

- Local administrative authorities/administrative territorial units;
- Ministry of Environment, Water and Forests;
- Ministry of Public Works, Development and Public Administration.

The National Environment Protection Guard carries out both planned inspection and monitoring activities through the general activity plan and unplanned inspection and monitoring activities ordered by the High Commissioner or the Central Environmental Protection Authority to check compliance with specific legislation on environmental protection in sensitive areas of high risk. Its main tasks and objectives are:

- identification of administrative territorial units that do not provide sanitation services;
- monitoring the implementation of separate waste collection schemes by administrative territorial units;
- the use of separate collection systems by waste producers (including the general public);
- the selective collection of collected waste; the
- monitoring the achievement of the target for the reduction of municipal waste landfilled by administrative territorial units (through the Environment Fund);
- traceability of municipal waste from generation to recovery/disposal.

The National Environmental Guard carried out 1,685 inspections in 2018-20, resulting in numerous fines and warnings. The breakdown is as follows. They also resulted in a number of corrective measures, with deadlines for compliance (Ministry of Environment, Water and Forests, 2022).

In 2022, the National Environmental Guard will start inspection and monitoring actions to monitor the development of the activities of Inter-Municipal Development Associations/inter-

municipal units, public waste operators, sorting, composting, mechanical-biological treatment operators and operators of municipal landfills.

Article 17(5) of the GEO 92/2021 on waste requires local authorities to ensure the separate collection of paper, metal, plastic and glass from municipal waste and the preparation of municipal waste for re-use and recycling.

Although the Environmental Fund Directorate acts as a tax authority for green tax activities in Romania, including waste management activities, it does not provide data on individual taxpayers, including companies (producers or waste generators), public institutions, municipalities, waste transporters, waste recyclers and landfills, and does not provide consolidated data on waste generation and treatment that could be used to support monitoring progress towards the target. The obligations for the administration of the Environmental Fund are set out in Government Emergency Ordinance No 196/2005 on the Environmental Fund, as amended and supplemented. Overall, although the National Environmental Guard is successful in monitoring the implementation of the separate waste collection and other waste management obligations, it does not monitor the performance of the administrative territorial units in meeting the targets. Moreover, municipalities are not given incentives to move towards higher recycling rates.

The Ministry of European Funds and the European Investment Bank have signed an agreement (Project Advisory Support Service, PASSA) to support Romanian authorities in the administration and implementation of EU-funded solid waste projects worth €230 million for the programming period 2021-2027. This will focus on the development of integrated waste management systems to comply with existing waste management legislation and improve the operational capacity of the systems. The following types of investments are eligible: extension/improvement of selective collection of recyclable waste, bio-waste, large and textile waste (collection and transport facilities, transfer stations); extension/improvement of recycling.

On the basis of the above, it can be stated that, based on the information currently available, the *definition of responsibilities for* the achievement of the objective is *clear and financial support measures are already in place* through targeted financing from the European Investment Bank, as well as funding available from EU sources for municipalities to develop separate waste collection and recycling infrastructure. Although the National Environmental Guard monitors

contracts with waste management service providers, *enforcement mechanisms are weak* as *municipalities' performance against targets is not regularly monitored*.

Timely transposition of the Packaging and Packaging Waste Directive, as amended by Directive 2018/852, into national law within the required deadline is key to ensuring a waste management system that meets EU requirements. Directive (EU) 2018/852 has been fully transposed into Romanian legislation and Law No 249/2015 on the management of packaging and packaging waste has been promulgated, subsequently amended and completed. As the latest Government Decree No 1/2021 was only published on 16 August 2021, transposition was only completed more than 12 months after the transposition deadline of 5 July 2020.

Law 249/2015 on Packaging and Packaging Waste Management and its subsequent amendments have defined the responsibilities of producers who introduce packaged products/sales packaging for the first time on the national market, including the fulfilment of recycling and activation targets. They can fulfil these obligations under extended producer responsibility (European Environment Agency., 2022)

- individually, by managing packaging waste from their own products placed on the national market, or
- by joining a collective scheme - the Extended Producer Responsibility (EPR) scheme

If producers or schemes applying extended producer responsibility do not comply with their obligations to recycle and recover packaging waste or incinerate it in waste incineration plants with energy recovery, they will have to pay a fine to the Environmental Fund calculated on the basis of the difference between the quantities of packaging waste that meet the minimum targets and the quantities of packaging waste entrusted to be recycled or recovered or incinerated in waste incineration plants with energy recovery. However, there are indications that small collectors in Romania are evading responsibility by claiming insolvency, and foreign recyclers are not controlled by national authorities, so the veracity of the quantities recycled is highly questionable (Ramboll Group, 2021).

Romania is divided into territorial administrative units (UATs), which include counties, cities and municipalities.

The country has a total of 41 counties (Romanian: județe), which together with the capital, Bucharest, form the country's official administrative unit. They represent the country's NUTS-

3 statistical subdivisions within the European Union, and each serves as the local level of government within its borders.

In each county, a prefect represents the national government. The prefect and his administration have executive powers within the county boundaries, while limited legislative powers are vested in the county council, elected every four years in local elections. The territorial scope of the Romanian judicial system overlaps with the county boundaries, thus avoiding further complicating the division of powers within the government (https://web.archive.org/web/20110716170735/http://www.ccre.org/roumanie_en.htm).

Territorial administrative units (UATs) within Romania:

- Municipalities (including the Municipality of Bucharest): 103
- Sectors of the Bucharest municipality: 6
- Cities: 216
- Communities: 2862
- Total UATs and sectors: 322

Intercommunity development associations (IDAs) are partnerships set up by municipalities and counties in 2009 to access EU environmental funds. Individually, building a water and sewerage network in a municipality or upgrading a small town's utility system were small projects that could not receive EU funding. So mayors joined forces to create IDAs to access EU funding (Instytut Spraw Obywatelskich, 2023).

According to a guide prepared by the Ministry of Interior, territorial administrative units have the right to cooperate in order to jointly implement development projects of zonal or regional interest or to jointly provide public services, through the creation of Community Development Associations (IDAs).In 2015, there were 391 IDAs operating at national level in Romania (https://data.gov.ro/dataset/asociatii-de-dezvoltare-intercomunitara/resource/97ea986f-5a35-49a0-881e-bc84c1e69a34)

The Federation of Community Development Associations (FADI), whose scope of activity is integrated waste management, was created for cooperation and institutional development in the field of waste management in Romania. The Federation of Community Development

Associations represents all Community Development Associations on waste-related issues, with common objectives and deadlines. It also serves as a forum for information exchange and common logistics.

The division of responsibilities between municipalities and producer responsibility organisations is not fully clear and there is a lack of supportive instruments. Although enforcement mechanisms exist in principle, their effectiveness is limited (European Environment Agency, 2022).

ECONOMIC INSTRUMENTS

Taxes and/or prohibitions on the landfilling of residual or biodegradable waste

Bans and taxes on landfilling of residual waste can help to reduce the heavy reliance on residual waste treatment and thus support recycling.

After being announced several years ago, in 2019 Romania effectively introduced a national landfill tax and banned the landfilling of recyclable materials. The tax was set at 30 lei/tonne of waste (about €6/tonne) in 2019 and increased to 80 lei/tonne of waste (about €16/tonne, or about €29.2/tonne converted at purchasing power parity) in 2020, in order to reduce landfilling without differentiating between residual and biodegradable waste. There are currently no plans to further increase the landfill tax or to extend the current landfill ban on recyclable waste to other types of waste (European Environment Agency, 2022)

Tax relief creates economic incentives for recycling, but the incentive may be too limited to effectively divert waste from landfills in line with the EU landfill target.

The (low) landfill tax introduced in 2019 seems to be a step forward, although less ambitious than needed.

Taxes on the incineration of municipal waste

Taxes on the incineration of mixed municipal waste can help to move away from residual waste treatment and thus support recycling. *However, Romania does not have an incineration tax and does* not plan to introduce one as there are no municipal waste incineration plants in the country.

Operating a pay-as-you-throw (PAYT) system

PAYT fees, also known as "pay-as-you-throw" fees, are a type of economic instrument used to promote waste reduction and recycling. Using the "pay-as-you-throw" principle, households and businesses do not pay a fixed fee or tax, but a fee based on the amount of waste they produce.

"Under PAYT, households and businesses pay for waste collection and disposal services based on the amount of waste they produce. The more waste they generate, the more they pay. This encourages individuals and businesses to reduce their waste generation and increase their recycling rates, as they can save money by generating less waste.

PAYT schemes can be implemented in different ways, such as prepaid bags or stickers, variable charges depending on the size of the container, or the use of special bins with sensors that measure and record the amount of waste generated.

PAYT-based fees are used in many countries around the world, including many European countries such as the Netherlands, Belgium and Germany. They are often used in combination with other economic instruments such as landfill taxes and extended producer responsibility schemes to support the transition to a circular economy" (Szabó, 2023).

The purpose of PAYT schemes is therefore to encourage citizens to make more effort to separate waste at source. However, PAYT schemes should be designed to provide sufficient incentives for source separation to prevent citizens from depositing waste in recycling bins in order to avoid residual waste charges. Overall, PAYT usually has a positive impact on source separation and thus on recycling rates by directly involving citizens.

National waste management legislation requires local authorities to implement PAYT. PAYT implementation is based on at least one of the following elements: quantity, collection frequency, weight or individual collection bags. At the beginning of each year, the local authority, in consultation with the public waste management operator, shall establish at least one of the above implementation methods.

In 2020, 2111 (66%) of the 3181 Romanian territorial units had implemented PAYT (Ministry of Environment, Waters and Forests, 2022), i.e. Romania had a PAYT system covering 66% of the territorial units in 2020. However, it is not clear how the 66% coverage of territorial units reflects the coverage of the population.

Packaging taxes

Packaging taxes can create incentives to reduce the generation of packaging waste and/or influence the choice of packaging materials, as well as to encourage recyclability and environmentally friendly product design.

According to a study by the European Environment Agency (2022), in Romania only barrel bags are taxed. Other packaging materials are not taxed. This tax will therefore almost certainly not have a significant impact on the production or recycling of packaging.

The Romanian eco-tax is 0,15 lei (0,03 EUR) per bag, except for carrier bags made of materials that comply with the requirements of SR EN 13432:2002. The eco-tax is levied on economic operators who introduce such commercial bags on the national market and must be specifically indicated on the sales documents. Its value shall be clearly indicated at the point of sale to inform the final consumer.

The eco-tax on carrier bags only affects single-use carrier bags, i.e. only a small part of packaging, and therefore cannot be considered as a tax system that encourages environmentally friendly packaging in general.

Article 13(2) of Law 249/2015 states that "Operators selling plastic carrier bags and pouches may only sell plastic carrier bags and pouches that comply with the basic requirements for reusability of packaging set out in point 2 of Annex 2, and thus comply with the requirements for multiple reuse, with the exception of very thin plastic carrier bags and pouches."

As Romania only levies a tax on plastic carrier bags and not on other forms and materials of packaging, this type of tax does not have a significant impact on reducing packaging waste, influencing consumer choice between packaging materials, or encouraging recyclability and eco-design.

Deposit refund schemes

Deposit-fee take-back systems result in high collection rates for the packaging covered by the system and thus contribute to increasing recycling rates.

In 2018, Romania introduced a general framework for the operation of the deposit refund scheme, to be applied to reusable packaging from 2019, and the authorities were required to outline the general guidelines for the operation of the deposit refund scheme for single-use packaging from 2022.

The deposit scheme, which started on 31 March 2019, only covered reusable packaging, including only glass beverage bottles, not glass containers (e.g. jars). Currently, there is no deposit refund scheme in Romania for aluminium cans, plastic bottles, plastic crates, wooden packaging.

The legal framework for the deposit refund scheme for single-use packaging was introduced by Government Decision No 1074/2021 establishing the deposit refund scheme for single-use packaging. The introduction of the scheme is only taking place after several postponements. The original date of introduction was 1 October 2022, but this was postponed to 30 November 2023.

From 30 November 2023, consumers will have to pay a mandatory deposit of RON 0.50 (about EUR 0.1 per pack) for each bottled drink purchased. This amount will be added to the shelf price of the drink and will be clearly indicated on receipts. This fee will be refunded to the customer when the returnable packs are handed in at the collection points. At the collection points, traders are obliged to return the packaging without the consumer having to provide an invoice, but there is no geographical restriction, so packaging can be returned anywhere in Romania, regardless of where in the country the products were purchased (Kronikaonline, 2023)

The deposit charge applies to non-refillable primary packaging made of glass, plastic or metal, with a volume of between 0.1 and 3 litres, containing water, fruit juice or alcoholic beverages. To implement the new legislation, these containers will be marked with a distinctive symbol and a special bar code. Once the scheme enters into force, it will be prohibited to place on the market any product in packaging that is covered by the scheme but does not bear this information. The buyer will not receive the deposit if the packaging does not bear, show or read

the mark of membership of the deposit scheme; if the packaging is deformed, not intact, dirty or not completely empty (Kronikaonline, 2023).

The Regulation applies to so-called single-package drinks packaging, i.e. bottles, jars or aluminium cans, but not to other food packaging such as milk cartons or cans. The deposit scheme covers packaging for both domestically produced and imported products. In Romania, the scheme is prepared and managed by RetuRO (https://returosgr.ro/#home), a company set up by the Ministry of the Environment together with representatives of beer and soft drinks producers and retailers. The system will be implemented mainly through vending machines (Kronikaonline, 2023).

The proper management of the system is expected to have a direct and positive impact on collection rates, the quality of collected materials and the quality of recycled materials, creating opportunities for recycling companies and a market for recycled products (Ministry of Environment, Water and Forests, 2022).

WASTE MANAGEMENT PLAN

In December 2017, Romania adopted the National Waste Management Plan until 2025 and, at the same time, a waste prevention programme. The National Waste Management Plan sets out the investments needed up to 2025 to ensure compliance with national waste management legislation in force at the time of its preparation. The objectives and targets of the National Waste Management Plan include the achievement of the first target for the preparation of municipal waste for re-use and recycling, as required by Directive 851/2018.

The National Waste Management Plan sets out a strategy to meet targets for increasing recycling rates and diverting biodegradable waste from landfill. It focuses on the introduction of selective waste collection, including biodegradable waste, and plans for waste treatment infrastructure through municipal composting or anaerobic digestion. It also proposes a significant expansion of the network of mechanical-biological waste treatment plants, with at least one such plant per county. The plan is to adapt the plants so that they can also treat separately collected waste as residual waste generation decreases.

The national waste management plan also proposes a range of *policy instruments* to help achieve its main objectives. These instruments include:

- the delayed introduction of the landfill tax;
- the introduction of pay-as-you-throw (PAYT) schemes;
- improving the effectiveness of extended producer responsibility schemes; and
- improving reporting systems.

Although the objectives are clear and the list of measures is defined, the implementation of these instruments seems to be delayed and the Ministry of Environment, Water and Forests has not published a follow-up report on the National Waste Management Plan or the National Waste Prevention Plan.

In line with national legislation, the County Waste Management Plans and the Bucharest Waste Management Plan were updated in 2021. The update was based on the National Waste Management Plan and took into account all the objectives and targets for municipal waste in the Circular Economy Package.

The Ministry of Environment, Water and Forests, with the support of the subordinate authorities, has committed to implement the measures contained in the county waste management plans in 2022 and to take steps to ensure their fulfilment (Ministry of Environment, Water and Forests, 2022).

All 42 county waste management plans and the Bucharest waste management plan have been approved. These foresee priority investments to continue the process of compliance with EU directives and the wider transition to a circular economy. The proposed investments focus on:

- Upgrading the separate collection system for recyclable waste, including public waste collection centres and preparation centres for re-use;
- Introduction of a separate collection system for bio-waste from households and similar waste producers;
- Introduction of separate collection schemes for textiles, bulk waste and hazardous household waste;
- Management of separately collected waste streams.

As regards the management of residual waste , these planning documents do not foresee investment in municipal waste incineration, but the following will be taken into account:

- The mechanical part of the existing Mechanical Biological Waste Treatment Plant will be upgraded to ensure a high rate of sorted recyclable waste and to comply with the Malagrotta Decision;
- In case of overcapacity of the existing Mechanical Biological Waste Treatment Facilities, the mechanical part will be used for sorting of separately collected waste and the biological treatment part will be used for the treatment of separately collected bio-waste;
- The new residual waste treatment capacities will only be implemented as part of an integrated waste treatment facility that also treats separately collected bio-waste and recyclable waste, to ensure flexibility in terms of input;
- In all cases, residual waste management capacities are calculated taking into account all the objectives and targets of the plan (including the 65% recycling target and the target to reduce the amount of municipal waste landfilled to no more than 10% of the amount generated).

The investments identified in the county and Bucharest waste management plans will receive financial support from European funds, including the Large Infrastructural Operational

Programme (LIOP) 2014-2020 and the Sustainable Development Operational Programme (SDOP) 2021-2027. In addition, the National Recovery Plan, developed under the Recovery and Resilience Mechanism, foresees an investment of around €1 billion. This will complement the investments planned in the national, county and Bucharest waste management plans and will support, among others, voluntary drop-off platforms, digitalised eco-islands (for selective collection in densely populated areas), the introduction of Pay-as-you-throw (PAYT) and increased recycling capacities (Ministry of European Investment and Projects, 2021).

The closure of non-compliant landfills is high on the Romanian government's agenda, as it has already launched infringement proceedings against Romania. Romania plans to close more than 25 non-compliant municipal and industrial landfills.

The investment needed to implement the national waste management plan is estimated at around €1,154 million. The investment needed at national level to comply with EU and national legislation, including the circular economy package, is estimated at around €2 billion. Part of these financing needs will be provided from EU funds under the Sustainable Development Operational Programme (SDOP) or the Recovery and Resilience Instrument, as well as from local and national sources.

As regards separate collection, all the integrated waste management schemes financed by EU funds include investments to promote the separate collection of waste fractions 2 to 5. These schemes consist of:

- collection points equipped with containers/underground containers,
- household waste bins
- composting units for rural households,
- appropriate waste collection vehicles
- yards for the collection of different types of waste (large waste, hazardous waste from households, etc.).

According to the National Waste Management Plan, Romania will implement the following new investments:

- Expanding the separate waste collection system with the aim of increasing the collection rate to 75% in all counties, including Bucharest, by 2025;
- Outdoor green waste composting facilities in 17 counties, with an estimated total capacity of 26 800 tonnes/year;

- Expansion of sorting capacity as needed and construction of new sorting facilities in two counties with an estimated total capacity of 52 000 tonnes/year;
- Anaerobic digestion plants in 32 counties and Bucharest with an estimated total capacity of 812 000 tonnes/year;
- Mechanical-Biological Waste Treatment Plants (MBT) with bioremediation in 25 counties. The plants have an estimated total capacity of 973 000 tonnes/year.

These projections have also been incorporated into models for the 2021-2027 financing period. In Romania, the situation at the end of June 2021 was as follows:

- 20 Mechanical-Biological Waste Treatment (MBT) plants:
    - 13 were in operation, with a total capacity of 950 000 tonnes/year;
    - 7 built, with a total capacity of 740 000 tonnes/year;
- 55 composting plants:
    - 41 in operation, with a total capacity of 500 000 tonnes/year;
    - 14 built with a total capacity of 100 000 tonnes/year

According to the Romanian authorities (Ministry of Environment, Water and Forests, 2022), around 991 000 home composting units have been installed as part of the 2007-2013 SOP and 2014-2020 LIOP operational programmes (European Environment Agency, 2022). Based on an assessment by the European Environment Agency and a detailed analysis of Member States' recycling performance and waste management policies, 18 Member States, including Romania, were found to be at risk of not meeting the 55% target for preparing and recycling municipal waste for re-use by 2025: Bulgaria, Croatia, Cyprus, Estonia, Finland, France, Greece, Hungary, Ireland, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Spain, Sweden and Poland (European Environment Agency, 2023).

PACKAGING WASTE GENERATION AND MANAGEMENT

According to official reports, Romania generated nearly 1.6 million tonnes (80 kg per person) of packaging waste in 2018, well below the EU average of 174 kg per package. After a plateau period of around 50 kg/package from 2009 to 2013, packaging waste generation started to increase for all packaging waste categories, although at a slower than average rate for plastic packaging and faster than average for glass packaging (Figure 11).

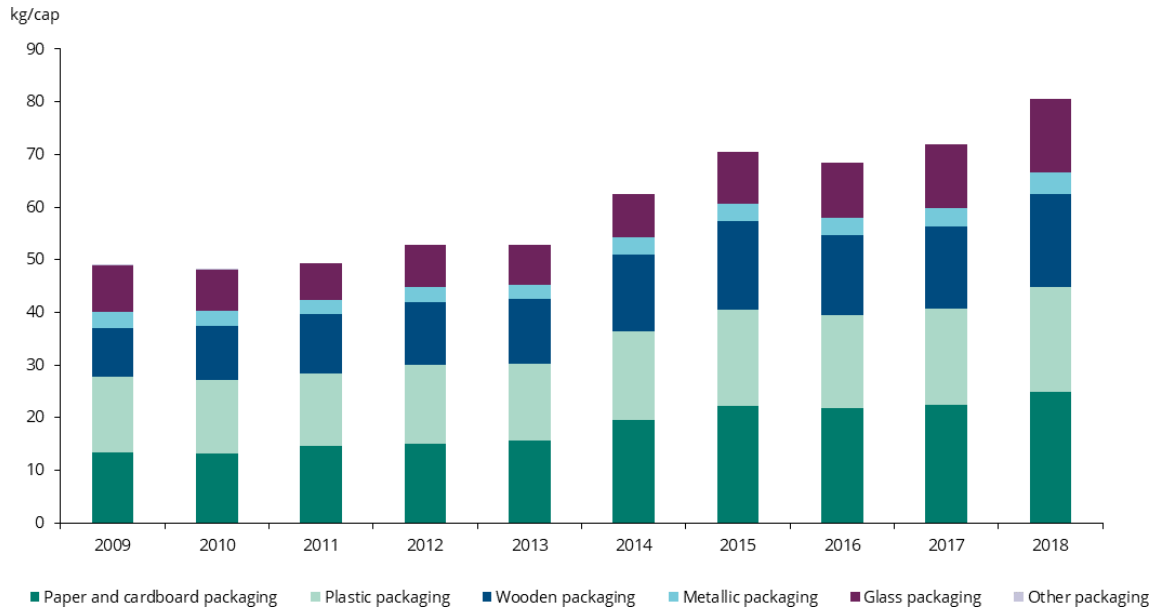


Figure 11 Packaging waste generation in Romania from 2009 to 2018, expressed in kg per capita

Source: European Environment Agency, 2022 based on Eurostat (2022)

The previous early warning report on Romania (Eunomia, 2018) mentions possible underreporting of packaging placed on the market and falsified (overstated) recycling data, and therefore proposed several recommendations to improve the reporting of packaging and packaging waste (both generation and recycling). In response to the policy recommendations made to Romania in the previous Early Warning Report, the Romanian authorities indicated that the EPR requirements of Directive 2018/851/EU have been

transposed, EPR systems are now subject to external audits and the establishment of a clearing house system for packaging waste is currently under consideration.

A good performance indicator of the efficiency of a separate collection system is the collection rate. The separate collection rate is calculated by dividing the mass of a material collected separately for recycling by the mass of the material in the total municipal waste. However, for Romania, it was not possible to calculate a collection rate due to the lack of information on the composition of residual waste (European Environment Agency, 2022)

Packaging waste recycling target

The 2025 targets set out in Article 11(2)(c) of the Waste Directive 2008/98/EC (the Waste Framework Directive) and Article 6(1)(f) of the Packaging and Packaging Waste Directive 94/62/EC (the Packaging Directive) require EU Member States to take measures to achieve at least the following:

- the preparation and recycling of municipal waste for re-use should be increased to at least 55%,
- increase recycling of all packaging waste to a minimum of 65%, and
- increase recycling of material-specific packaging waste to 75% for paper and board, 70% for glass, 50% for aluminium, 50% for plastics and 25% for wood.

Romania aims to reach the 65% recycling target for packaging waste by 2025, as well as material-specific packaging waste recycling targets.

However, according to the latest assessment by the European Environment Agency (European Environment Agency, 2023), 10 Member States, including Romania, are at risk of not reaching either the municipal waste (55%) or the total packaging waste (65%) targets to be met by 2025: Bulgaria, Croatia, Cyprus, Greece, Hungary, Lithuania, Malta, Poland, Romania, Slovakia, Croatia, Cyprus, Poland, Hungary, Malta and Slovakia.

In addition, several Member States were found to be at risk of falling short of one or more substance-specific targets. In this respect, plastic is the most critical substance for the EU as a whole. For Romania, four groups of materials, namely plastics, glass, aluminium and ferrous metal, are expected to fall short of the material-specific packaging waste targets, while paper and board and wood are expected to meet the expected and committed recycling rates (Table 2).

Plastics	Austria, Bulgaria, Bulgaria, Croatia, Cyprus, Denmark, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia, Spain and Portugal, Croatia, Ireland, Latvia, Luxembourg, Hungary, Malta, Poland, Portugal, Romania and Slovakia
Glass	Bulgaria, Croatia, Cyprus, Greece, Hungary, Lithuania, Malta, Poland, Portugal, Romania, Croatia and Poland
Aluminium	Cyprus, Czech Republic, Greece, Croatia, Malta, Portugal, Romania, Slovakia, Spain and Portugal
Ferrous metal	Denmark, Croatia, Malta, Portugal and Romania
Paper and cardboard	Croatia, Malta, Spain and Slovakia
Timber	Croatia and Malta

2. Table 1 High-risk countries for recycling rates of material-specific packaging waste below target

Source: COM/2023/304 final, https://eur-lex.europa.eu/legal-content/HU/TXT/HTML/?uri=CELEX:52023DC0304

For Romania, recycling rates for paper and board, wood and ferrous metals already exceeded the 2025 targets in 2018 (Figure 12). For glass (recycling rate 61.1%), plastics (recycling rate 43%) and aluminium packaging (recycling rate 22.8%), the distance to target was 8.9%, 7% and 27.2% respectively. In 2018, the overall packaging recycling rate was 57.9% and the distance to target was 7.1%.

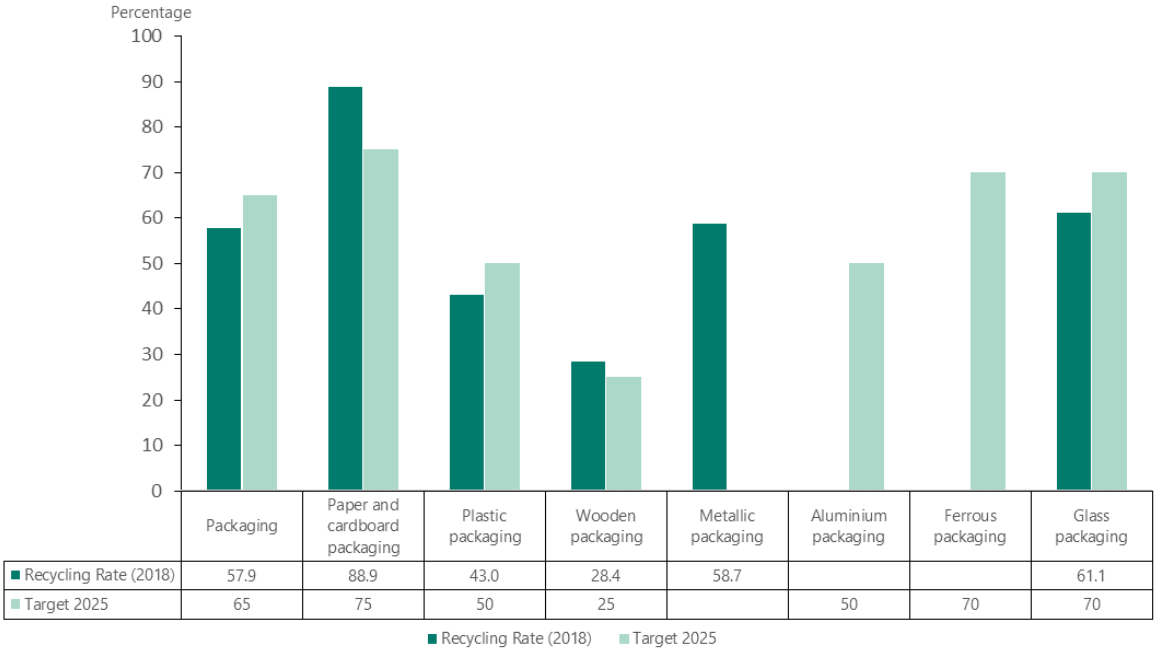


Figure 12 Material-specific packaging waste recycling rate (2018) and target Romania

Source: (European Environment Agency, 2022)

THE WASTE PREVENTION PROGRAMME

1. Objectives and priorities

The waste prevention targets of the programme include both quantitative (waste reduction) and qualitative (reduction of hazardous substances/environmental impacts) targets (European Environment Agency, 2023).

The overall aim of implementing waste prevention measures is to break the link between economic growth and the environmental impacts of waste generation. It also aims to set a global vision and strategic direction for the development of effective waste prevention measures.

The programme proposes three *strategic objectives*:

1) Reduction of the amount of municipal waste per capita by 10% by 2025 compared to 2017 (i.e. from 228 kg/person of municipal waste in 2017 to 204 kg/person in 2025).
2) Packaging waste growth should be decoupled from economic growth, i.e. packaging waste growth in 2025 should be at least 10% lower than GDP growth over the same period (2017-25) compared to the base year 2017
3) Promoting waste prevention in the wood processing, chemical, metallurgical and steel industries.

The programme covers the following *sectors:*

- Agriculture;
- construction and infrastructure;
- manufacturing industry;
- sales, retail, transport;
- households;
- private services, catering;
- public service

The programme focuses on the following *priority waste types:*

- food/organic;
- construction and demolition waste;
- hazardous waste;

- household/community waste;
- paper/cardboard;
- Packaging;
- waste electrical and electronic equipment (WEEE)/battery waste;
- production waste

The waste management plan sets out the involvement of different *target groups in the* implementation of specific measures. The main target groups are:

- consumers,
- workers in industry (especially wood, chemicals, metallurgy and steel),
- government institutions (Ministry of Environment, Ministry of Economy, Ministry of Research and Innovation),
- regional and administrative units,
- workers in waste management utilities, and
- educational institutions.

2. Objectives, indicators and monitoring

Proposed indicators

1. The following indicators have been set for target 1 (reduce per capita household waste by 10% by 2025):

- reduce household and similar waste (compared to 2017);

- a methodological guide to individual home composting;

- the number of staff from local authorities who have received training on individual composting;

- the proportion of food waste in the total household waste and the total weight of food waste;

- a study on economic incentives to reduce food waste;

- impact assessment on the use of economic incentives to reduce food waste;

- number of food waste prevention measures/controls in the catering industry;

- the number of information and awareness-raising campaigns on food waste;

- promoting an environmentally responsible consumption policy for office paper in public administrations;

- promoting a policy for the development of a system for rejecting print advertising (STOP PUBLICITATE);

- the number of campaigns to raise awareness of environmentally responsible paper consumption;

- integrating waste prevention issues into pre-university education.

2. For objective 2 (decouple the increase in packaging waste from economic growth), the following indicators were proposed:

- the growth rate of packaging waste compared to 2017;

- the growth rate of primary packaging volumes of soft drinks, mineral water and beer compared to 2017;

- the number of information and awareness-raising campaigns for producers and consumers.

- the number of consumers (e.g. encouraging the use of reusable packaging and reducing the consumption of single-use plastic bags).

3. For Objective 3 - to promote the prevention of waste generation in the wood, chemical, metallurgical and steel industries - the following indicators have been set:

- the number of voluntary agreements in the wood, chemicals, metallurgy and steel industries;

- the number of research projects to identify new pure substances.

- developing technologies for the wood, chemical, metallurgical and steel industries.

Quantitative targets:

- Reduction of the amount of household waste per capita by 10% by 2025 compared to 2017 (i.e. reduction of municipal waste from 228 kg/capita in 2017 to 204 kg/capita in 2025).
- Decoupling the growth of packaging waste from economic growth (i.e. packaging waste growth should be at least 10% lower than GDP growth over the same period between 2017 and 2025).

Monitoring

There are several monitoring measures for waste management. For example, for the period 2018-2020, the Interministerial Committee will prepare a monitoring report containing information on the implementation of priority management measures for municipal waste management.

Evaluation

The National Waste Management Programme is the first planning document for waste prevention at national level in Romania. Therefore, there is no set of measures on how to evaluate and monitor the implementation of the results. Many of the waste prevention measures are recent and have not yet been evaluated.

3. *Preventive measures*

Means the implementation of preventive measures as referred to in Article 9.

Waste streams for which prevention measures are in place or most of which are required by legislation:

- Measures to prevent the generation of municipal waste;
- Measures to prevent food waste;
- Measures to prevent the generation of packaging waste;
- Measures to prevent the generation of waste electrical and electronic equipment;
- Measures to prevent the generation of waste batteries and accumulators.
- Green public procurement

Specific waste prevention measures

The National Waste Management Plan (2018) also includes a number of specific preventive measures.

1) *Promoting and supporting sustainable consumption models*
    a. Measures to reduce municipal waste per capita by 10% by 2025
        1. Action 3.1: Support and develop existing measures for individual composting of bio-waste.
        2. Action 2: Halve food waste by 2025 compared to 2018.
        3. Action 3: Prevent the generation of waste printing paper
        4. Action 2: Introduce waste prevention topics into the pre-university school curriculum.
    b. Measures related to the objective of decoupling the growth of packaging waste from economic growth:
        - Action 5: Reduce the quantity/volume of packaged products with the same purpose or use.
2) Encourage the design, manufacture and use of products that are *resource efficient, durable* (including lifetime and lack of planned obsolescence), *repairable, reusable and upgradeable*.
    a. Measures related to the objective of decoupling the growth of packaging waste from economic growth:
        1. Action 3: Optimise packaging through design/redesign and the way products are packaged.

            1.1: Use fewer resources by using thinner packaging materials

            1.2: Use of environmentally friendly packaging materials

            1.3: Eliminate over-packaging of cosmetics, toothpastes and toothpastes where possible

            1.4: Appropriate packaging to ensure that as many products as possible are packed in the transport unit (pallets, containers).
    b. Measures to prevent waste electrical and electronic equipment
        2. Action 2: Eco-design of electrical and electronic equipment to facilitate repair and re-use and to achieve sustainable products.

3) Encourage the re-use of products and the establishment of schemes to promote repair and re-use activities, in particular for electrical and electronic equipment, textiles and furniture, packaging and construction materials and products.
    a. Action 1: Increase the amount of primary reusable packaging for soft drinks, mineral waters and beers by at least 50% in 2020 and at least 100% in 2025 compared to 2017.
        - 1.1: The introduction of a uniform insert value for soft drinks, mineral waters and beer for each type of primary packaging in Law 249/2015.
        - 1.2 Allow consumers to choose the type of primary packaging (reusable or disposable) for soft drinks, mineral waters and beer.
        - Action 1.3: Inform consumers about the importance and environmental impact of their choice of primary packaging (reusable or disposable) for soft drinks, mineral waters and beers
    b. Measure 2: Prevention of waste electrical and electronic equipment (WEEE)
        - 2.1: Establish a register of existing repairers containing information on the type of WEEE accepted.
        - 2.2: Encourage the repair of defective electrical and electronic equipment or parts thereof, i.e. financial support and expansion of existing repair centres, including information to consumers.
4) Where appropriate and without prejudice to intellectual property rights, the availability of spare parts, instructions, technical information or other tools, equipment or software allowing the repair and re-use of products without affecting their quality and safety shall be encouraged.
    a. Measures to prevent waste electrical and electronic equipment
        - 1: Encourage the repair of faulty electrical and electronic equipment or parts thereof, i.e. financial support and expansion of existing repair centres, including information to consumers about these centres
5) Reducing waste from industrial production, mineral extraction, manufacturing, construction and demolition processes, taking into account best available techniques.
    a. Measures on waste from wood processing and the chemical, metal and steel industries
        - 1: Voluntary agreements with the wood, chemical, metal and steel industries.

- 2: To promote research and development to identify new clean technologies in the chemical, wood, metal and steel industries.

b. Industrial waste prevention measures
    - 1: Establish and implement a programme to prevent and reduce waste from our own activities and from any products produced.
    - 2: Enter into voluntary agreements with industry to raise awareness and encourage waste prevention (both in terms of quantity and quality).

6) Reduce food waste in primary production, processing and manufacturing, retail and other food distribution, restaurants and food service, and households, contributing to the UN Sustainable Development Goal of reducing global food consumption per capita by 50%. Reducing food waste at retail and consumer level and along production and supply chains by 2030.
    a. Measures to reduce municipal waste per capita by 10% by 2025
        - 1: Halve the amount of food wasted by 2025 compared to 2018.
            - Analysing the share of food waste in total household waste
            - Conduct expert studies to prohibit the fixing of a minimum shelf life for certain categories of goods and inform the public about the importance of the shelf life of products.
            - Obliging public authorities to set up a control procedure against food waste in the catering sector under their control, and applying the principle of "food waste prevention" in public procurement.
            - Continue information and awareness-raising campaigns

7) To promote the reduction of the content of hazardous substances in substances and products, without prejudice to harmonised legal requirements established at Union level for such substances and products, and to ensure that, from 5 January 2021, the supplier of an article as defined in Article 3(33) of Regulation (EC) No 1907/2006 of the European Parliament and of the Council provides information to the European Chemicals Agency in accordance with Article 33(1) of that Regulation.
    a. Measures to prevent the generation of waste batteries and accumulators
        - 1: Restrict and reduce the use of hazardous substances in the manufacture of batteries and accumulators
        - 2: Promote research programmes to replace hazardous substances with substances that have less impact on human health and the environment.
    b. Measures for end-of-life vehicles

- 1: Restrict and reduce the use of hazardous substances in vehicle production from the design phase onwards.

c. Measures to prevent the generation of healthcare waste
   - 1: To reduce the amount of hazardous health care waste generated by establishing and applying separate collection criteria in line with the legal provisions on hazardous waste.

8) Information campaigns to prevent littering and raise awareness about littering.
   a. Measures to reduce municipal waste per capita by 10% by 2025
      - 1: Halve the amount of food wasted by 2025 compared to 2018.
        - Implement information and awareness campaigns on food waste
      - 2: Preventing the generation of printed paper waste
        - Running awareness campaigns on the environmental impact of paper printing.
      - 3: Organise information and awareness-raising campaigns on prevention for both producers and consumers. Produce guides on eco-design and cleaner production. Informing and raising awareness among consumers about the purchase of reusable packaging products and reducing the use of thin plastic bags and sacks. Information and awareness-raising campaigns should be carried out in cooperation with retailers.

Link to the circular economy

Waste prevention is an integral part of the transition towards a circular economy. It reduces the input of natural resources into the economy and the effort needed to collect and recycle waste.

Approaches to creating a circular economy are often closely linked to waste prevention. In the following section, we will describe the circular strategies that appear in the Romanian waste prevention programme.

- Eco-design:
  a. Application of eco-design requirements to facilitate the re-use and management of WEEE
- Repair, refurbishment and remanufacturing:

    a. Encourage the reuse and/or repair of defective products or their parts, in particular through educational, economic, logistical or other measures.
    b. Renovation and re-commissioning of hazardous waste treatment facilities on the premises of existing businesses.
- Recycling (reuse)
    a. Increasing readiness for re-use and recycling through the waste hierarchy
- Economic incentives and financing
    a. Economic incentives for manufacturers to market more environmentally friendly products and support for recycling and recovery schemes (e.g. for packaging, batteries, electrical and electronic equipment, vehicles)
- Eco-innovation
    a. At the request of the responsible economic operators, the Romanian Ministry of Economy proposes to the State Authority for Research and Development scientific research, technological development and innovation programmes on the production, composition, reusability and recoverability of packaging, as well as on the optimisation of packaging and packaging design, in order to reduce packaging waste.
- Management, skills and knowledge
    a. Reduction of specific material consumption per packaging and product type.
    b. Priority management measures in the field of municipal waste management, contributing in particular to the planned capacity utilisation of the integrated waste management system projects in the near future

Circular economy models are currently not part of the waste prevention programme.

Food waste prevention

Food wastage is one of the most important problems of our time (Theodoridis & Zacharatos, 2022). Wastage of food produced for human consumption is associated with problems such as climate change, biodiversity loss, water loss, soil degradation and hunger (Thyberg & Tonjes, 2016).

The largest amount of food waste is generated in West Asia (2020 data): 110 kg per person per year (Scherhaufer et al., 2018) In the EU, in 2020, about 127 kg of food waste per capita was

generated. 55% of food waste was generated in households, which translates to 70 kg per inhabitant (Eurostat, 2023).

According to the results of the 2019 survey of the MaiMultVerde Association's grassroots project "Romania against food waste" (România împotriva risipei de hrană), Romanians waste around 6,000 tonnes of food per day, which is the equivalent of one portion of food for every Romanian resident. This means that more than 2.2 billion kilograms of food are landfilled in Romania every year, which represents a significant environmental burden. The largest share of food waste is generated by households (49%), followed by industrial processes (37%), while the retail sector (7%) and the agricultural sector (5%) contribute the least to food waste in Romania (Chereji et al., 2023). Of particular concern is that Romanians spend on average more than 40% of their household income on food (Cantaragiu, 2019).

Romania is committed to meeting SDG target 12.3 to halve per capita food waste at retail and consumer level and reduce food losses along food production and supply chains by 2030.

To achieve this, the Romanian Law 217/2016 on the reduction of food waste (amended in 2018) includes a number of measures to reduce food waste throughout the food supply chain. Following its evaluation in 2019, the law was amended to facilitate the donation of surplus food by simplifying donation contracts and clarifying the types of food business operators that can donate food. Donated food is exempted from value added tax (VAT) if it is donated within 10 days before the expiry of the minimum durability period.

The Romanian Ministry of Agriculture and Rural Development (MADR) takes initiatives to educate consumers about food waste and wastage, such as awareness-raising campaigns, school activities, seminars and training, events, etc.

The Ministry of Agriculture and Rural Development is partnering with the Ministry of Education to launch the "You can protect the planet! Let's Start Reducing Food Waste Together" information campaign to educate and inform school children about the economic, social and environmental impacts of food waste. Following an agreement with the UN Food and Agriculture Organization, the "Do Good: Save Food - Educating Future Generations for a Food Waste Free World" educational materials have been translated into Romanian (European Commission, 2023).

STATISTICS AND DATA ON WASTE

Romania is by far the EU Member State with the lowest amount of municipal waste per capita. This may be partly due to economic factors and cultural norms, but the possibility that it is also due to unreliable data reporting cannot be excluded. The National Waste Management Plan also identifies problems with the quality of data on waste management (Ministerul mediului apelor si padurilor, 2021).

As far as the data collection system for waste is concerned, problems certainly exist at the moment, but in the future, well-structured and valid statistical information should be collected once an EU-compatible methodology for all waste streams is introduced. To this end, Romania intends to operate an integrated online registration system in the future. Another reason for the current problems is that reports on waste management are generally not prepared by designated and trained persons. Romania currently has a few waste reporting systems managed by the National Environmental Agency, the Environmental Fund and the administration. However, the lack of an integrated online registration system does not allow for cross-checking of reported data, for example between producer and operator, transporter and recipient, and sharing of common data sources between institutions. Such a system is currently not yet in place in Romania. This task falls to the Ministry of Environment and Forests (UNECE, 2021).

The National Environment Agency collects and manages data on the generation and collection of municipal solid waste. The National Environment Agency uses online questionnaires to collect information reported by different types of companies, such as waste producers, companies licensed to collect and treat waste and sanitation companies. The National Environment Agency validates, evaluates and processes the data according to the different reporting requirements (NEPA: https://www.anpm.ro/documents/12220/2051950/RI-+eng.pdf/5fde4419-91f1-4192-998f-fdab4ff83b60

The National Environment Agency is a public body with legal personality, funded from the state budget, which intervenes in the framework of EU and international cooperation to protect the environment and enforce legislation. The National Environment Agency monitors changes in the state of the environment in Romania in accordance with its mandate under the implementation plans negotiated with the European Commission during EU enlargement.

Data on packaging placed on the market or recycled or co-incinerated is provided by producers for their common systems for the placing on the market (POM) and recovery of packaging materials (Producer Responsibility Organisation (PRO)). As packaging placed on the market is subject to a green tax, it encourages under-reporting of quantities placed on the market and over-estimation of quantities recovered.

The Romanian Environmental Fund Directorate (EFA), the body responsible for green taxation, has recently adopted a traceability software, but it is still under development. It currently lacks important data flows, such as recovered packaging waste from households, or combined waste streams for the multi-beneficiary Producer Responsibility Organisations, and some important reporting and dashboarding functions (European Environment Agency, 2022 based on Ecologic, 2022a and SIATD, 2022). The Romanian Minister of Environment, Water and Forestry recently noted that the waste traceability system is not functioning properly and needs further work (Ecologic, 2022b).

The National Environment Protection Agency (NEPA) collects data from municipalities and collectors, but does not distinguish between packaging and non-packaging, so this approach does not allow for a comparison with data from the Environmental Fund Administration (EFA).

Romania reports data on packaging waste generation based on information collected from producer responsibility organisations, excluding free consumption, private imports/exports, units subject to de minimis rules or otherwise exempted from reporting, and estimates of imports/exports via the internet (Eurostat, 2020b).

The Eunomia (2018) report for Romania identified under-reporting of packaging placed on the market and fabrication (embellishment) of recycling data, and resulted in a number of recommendations to improve reporting on packaging and packaging waste. The Romanian authorities have indicated that in response to these recommendations, the EPR requirements of Directive 2018/851/EU have been transposed into Romanian law, EPR systems are now subject to external audit and the establishment of a clearing house system is currently being investigated.

The establishment of a national system for collecting and monitoring data on waste is a good practice in Romania.The SIATD, a single system for data collection and traceability, started operating on 1 January 2023. The system, which was initially piloted for 2 years for the packaging waste stream, will now also cover the data flows for electrical and electronic

equipment and batteries. One of the main objectives of the system is to put in place processes to enable reliable verification of transactional waste management data (SWD, 2023)

BIBLIOGRAPHY

Almași, A. M. (2013). Municipal waste management in Romania. European Environment Agency (EEA) under its 2012 work programme as a contribution to the EEA's work on waste implementation. Retrieved from www.eea.europa.eu/publications

Cantaragiu, R. (2019) Corporate social entrepreneurship initiatives against food waste - The case of Lidl in Romania. Proceedings of the International Conference on Business Excellence, 13(1), 505-514. https://doi.org/10.2478/picbe-2019-0044

Chereji, A.-I., Chiurciu, I.-A., Popa, A., Chereji, I., & Iorga, A.-M. (2023). Consumer Behaviour Regarding Food Waste in Romania, Rural versus Urban. Agronomy, 13(2), 571. https://doi.org/10.3390/agronomy13020571

COM/2023/304 final, REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS identifying Member States at risk of not meeting the 2025 preparing for re-use and recycling target for municipal waste, the 2025 recycling target for packaging waste and the 2035 municipal waste landfilling reduction target, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023DC0304

De ce ratăm obiectivele asumate în gestionarea deșeurilor municipale - Ecologic. (2021, April 14). https://ecologic.rec.ro/de-ce-ratam-obiectivele-asumate-in-gestionarea-deseurilor-municipale/

EC, 2021a, ANNEX to the Proposal for a Council Implementing Decision on the approval of the assessment of the recovery and resilience plan for Romania, (https://gov.ro/fisiere/stiri_fisiere/Annex_to_the__Proposal_for_a_Council_Implementig_Dec i sion.pdf).

Ecologic, 2022a, 'Ecologic' (https://ecologic.rec.ro/lorand-arpad-fulop-cand-schimbi-sasepresedinti-in-doi-ani-este-clar-ca-lucrurile-nu-pot-functiona/).

Ecologic, 2022b, 'Ecologic' (https://ecologic.rec.ro/barna-tanczos-actualul-sistem-informaticde-asigurare-a-trasabilitatii-deseurilor-nu-este-performant-si-este-cert-ca-trebuie-schimbat/).

EFA, 2022, 'List of economic operators to Law no. 249/2015' (https://www.afm.ro/taxe_lista_operatori_economici-legea_249_2015.php)

Environmental performance reviews: Romania : third review (2021). United Nations. https://unece.org/sites/default/files/2021-12/ECE_CEP_189_0.pdf

Eunomia, 2018, Study to Identify Member States at Risk of Non-Compliance with the 2020 Target of the Waste Framework Directive and to Follow-up Phase 1 and 2 of the Compliance Promotion Exercise, Early Warning Report: Romania.

Ministry of European Investment and Projects, 2021, Ministerul Investițiilor și Proiectelor Europene, 2021, Planul Național de Redresare și Reziliență al României aprobat de Consiliul UE, (https://mfe.gov.ro/pnrr/). Romanian National Recovery and Resilience Plan approved by the Council of the EU, (https://mfe.gov.ro/pnrr/, 2021

European Commission (2019), Directorate-General for Environment, Study on investment needs in the waste sector and on the financing of municipal waste management in Member States, Publications Office, 2019, https://data.europa.eu/doi/10.2779/769124

European Commission. (2023). European Food Loss and Waste Prevention Hub - Explore the Member States Initiatives. https://ec.europa.eu/food/safety/food_waste/eu-food-loss-waste-prevention-hub/eu-member-state-page/show/RO

European Commission. Directorate General for Environment., EY., PlanMiljø., ACR+., RWA., & Öko Institut. (2020). Guidance for separate collection of municipal waste. Publications Office. https://data.europa.eu/doi/10.2779/691513

European Environment Agency. (2022). Early warning assessment related to the 2025 targets for municipal waste and packaging waste Romania [File]. https://www.eea.europa.eu/publications/many-eu-member-states/romania/view

European Environment Agency. (2023). Many EU Member States not on track to meet recycling targets for municipal waste and packaging waste. Publications Office. https://data.europa.eu/doi/10.2800/403485

European Environment Agency (2023) Waste Prevention Country Profile - Romania,

Eurostat (2023a). Food waste and food waste prevention - estimates. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Food_waste_and_food_waste_prevention_-_estimates

Eurostat (2023b). Municipal waste statistics. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Municipal_waste_statistics

Eurostat. (2023c). Waste management indicators. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_management_indicators

How waste management works in Romania. (n.d.-a). Retrieved 25 October 2023, from https://instytutsprawobywatelskich.pl/how-waste-management-works-in-romania/

http://www.anpm.ro/planul_national_de_gestionare_a_deseurilor-8218

Instytut Spraw Obywatelskich (2023). How waste management works in Romania, https://instytutsprawobywatelskich.pl/how-waste-management-works-in-romania/

Jigani, A.-I., Delcea, C., & Ioanăș, C. (2020) Consumers' Behavior in Selective Waste Collection: a Case Study Regarding the Determinants from Romania. Sustainability, 12(16), 6527. https://doi.org/10.3390/su12166527

Kronikaonline. (2023). Fifty-billion-dollar environmental awareness: what to know about the soon-to-be-introduced deposit-fee scheme. https://kronikaonline.ro/gazdasag/otvenbanisokkal-elocsalt-kornyezettudatossag-tudnivalok-a-hamarosan-eletbe-lepo-betetdijas-rendszerrol

Landfill Directive, Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste, https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A31999L0031

Larive Romania IBD SRL (2011). 'Waste management research in Romania' http://www.dutchromaniannetwork.nl/pdf_files/Waste%20management%20research%20in%20Roma nia_0.pdf

Many EU Member States not on track to meet recycling targets for municipal waste and packaging waste - European Environment Agency. (n.d.). [Briefing]. Retrieved 24 October 2023, from https://www.eea.europa.eu/publications/many-eu-member-states/many-eu-member-states-not

Marica.I (2017, February 15). European Commission takes Romania to the EU Court of Justice over illegal landfills. Romania Insider. https://www.romania-insider.com/european-commission-takes-romania-eu-court-justice-illegal-landfills.

Ministry of Environment, Waters and Forests, 2022, Information and comments provided to the EEA by the Ministry of Environment, Waters and Forests during the review of this assessment by e-mail dated 29 April 2022

Nastase, C., Chașovschi, C. E., State, M., & Scutariu, A.-L. (2019). MUNICIPAL WASTE MANAGEMENT IN ROMANIA IN THE CONTEXT OF THE EU. A STAKEHOLDERS' PERSPECTIVE. Technological and Economic Development of Economy, 25(5), 850-876. https://doi.org/10.3846/tede.2019.10295

National Waste Management Plan - Romania (2018), Official Gazette of Romania (Monitorul Oficial al Romaniei, Partea I, nr. 11), http://www.mmediu.ro/categorie/documente-de-planificare-pngd-pjgd/239

Packaging Directive , European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste, https://eur-lex.europa.eu/legal-content/en/ALL/?uri=celex%3A31994L0062

Pavalasc, M. (2021, August 29). How Romania Turned Into An Illegal Dumping Ground For EU Waste. Radio Free Europe/Radio Liberty. https://www.rferl.org/a/romania-garbage-asia-european-union/31429822.html

Petrescu, I.-E., Lombardi, M., Lădaru, G.-R., Munteanu, R. A., Istudor, M., & Tărășilă, G. A. (2022) Influence of the Total Consumption of Households on Municipal Waste Quantity in Romania. Sustainability, 14(14), 8828. https://doi.org/10.3390/su14148828

RetuRO (2023) https://returosgr.ro/#home

Rodino, S., Butu, M., & Ion, R. (2019). Waste management system in Romania - status and development for bioeconomy. International Symposium 'The Environmental and The Industry', SIMI 2019, 293-300. https://doi.org/10.21698/simi.2019.fp37

Romania (2004) 'National Waste Management Plan'

Romania's SUSTAINABLE DEVELOPMENT Strategy 2030 (2018) Bucureşti : Paideia, 2018, ISBN 978-606-748-262-1, https://faolex.fao.org/docs/pdf/rom195029.pdf

Scherhaufer, S., Moates, G., Hartikainen, H., Waldron, K., & Obersteiner, G. (2018). Environmental impacts of food waste in Europe. Waste Management, 77, 98-113. https://doi.org/10.1016/j.wasman.2018.04.038

SIATD, 2022, 'SIATD' (https://siatd.afm.ro/siatd/).

SWD (2023) 199 final EUROPEAN COMMISSION, COMMISSION STAFF WORKING DOCUMENT, The early warning report for Romania. Report From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions identifying Member States at risk of not meeting the 2025 preparing for re-use and recycling target for municipal waste, the 2025 recycling target for packaging waste and the 2035 municipal waste landfilling reduction target, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=SWD:2023:199:FIN

Szabó D. (2023, May 7). The Hungarian way of life and with it economic growth is smouldering in the Carpathian Mountains. Portfolio.hu. https://www.portfolio.hu/gazdasag/20230507/a-karpatok-gyurujeben-parazslik-el-a-magyar-eletmod-es-vele-a-gazdasagi-novekedes-613324

Theodoridis, P. K., & Zacharatos, T. V. (2022). Food waste during Covid- 19 lockdown period and consumer behaviour - The case of Greece. Socio-Economic Planning Sciences, 83, 101338. https://doi.org/10.1016/j.seps.2022.101338

Thyberg, K. L., & Tonjes, D. J. (2016). Drivers of food waste and their implications for sustainable policy development. Resources, Conservation and Recycling, 106, 110-123. https://doi.org/10.1016/j.resconrec.2015.11.016

Tradingeconomics. (2023). Romania GDP per capita PPP - 2023 Data - 2024 Forecast - 1990-2022 Historical - Chart. https://tradingeconomics.com/romania/gdp-per-capita-ppp

UNECE (2021), ENVIRONMENTAL PERFORMANCE REVIEWS ROMANIA Third Review, ECE/CEP/189, United Nations Publication, Geneva, 2021, ISBN: 978-92-1-117278-2, ISSN: 1020-4563

Waste Framework Directive , Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, ELI: http://data.europa.eu/eli/dir/2008/98/2018-07-05