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WASTE MANAGEMENT IN SLOVAKIA

Hungary
Slovakia
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Author: Innoversity Ltd.

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АРР "ЗАКАРПАТТЯ"

CONTENT

ABOUT WASTE IN GENERAL

Waste as a global problem

In many ways, our planet Earth is approaching the limits of its capacity. One such area is the destruction of the environment by human activity, which is causing severe and often irreversible damage.

The Earth is finite. So is its capacity to absorb waste and waste water. Its capacity to provide food and energy is finite. Its capacity to support increasing numbers of people is finite. And we are fast approaching the limits of the Earth's capacity to do this. Current economic practices that damage the environment in both developed and underdeveloped countries cannot continue without irreparable damage to vital global systems.

Pressures from unlimited population growth are placing demands on the natural world that may override efforts to achieve a sustainable future. If we are to stop the destruction of our environment, we must accept the limits to growth.

At most, there is only a decade or a few decades to go before the chance of averting the present threats is lost and the prospects for future human progress are immeasurably diminished (Worls Scientists' Warning to Humanity, 1992).

In 1992, a community of the world's most renowned scientists (including 71 Nobel laureates) made several proposals for possible solutions, two of which are worth mentioning:

1. We must control environmentally damaging activities to restore and protect the temporal integrity of the Earth's systems on which we depend. For example, we need to shift from fossil fuels to more benign, inexhaustible energy sources to reduce greenhouse gas emissions and pollution of our air and water. Priority must be given to developing small-scale and relatively easy-to-implement energy sources that are adapted to the needs of the third world. We must stop deforestation, the degradation and loss of agricultural land and the destruction of terrestrial and marine plant and animal species.

2. We need to manage resources that are vital for human well-being more economically. We need to prioritise the efficient use of energy, water and other materials, including expanding conservation and recycling.

The society of the 20th and 21st centuries is called the "Waste Society" due to its wasteful consumption of large amounts of water, materials and energy, resulting from an ecologically unsustainable social metabolism based on non-renewable resources (Knorr and Augustin, 2022; Marín-Beltrán et al., 2022).

The reasons for this are the rise of consumerism (Van Kerckhove, 2012; Dini, 2016), increased innovation (Maradana et al., 2019) and a linear approach to industrial development (Ginga et al., 2020).

As a consequence, waste reduces the flow of materials in society and reduces the efficiency of resource management. In the modern world, most material flows are linear, from point of generation to landfill. In such circumstances, people need to improve waste management to increase the cyclicality of material flows and reduce the amount of material used before sustainability is achieved (Zbicinski et al., 2006; Rusch et al., 2022; Spišáková et al., 2022).

The circular economy (CE) can make the acquisition and use of resources much more manageable without damaging the environment. It can also help restore biodiversity (Velenturf and Purnell, 2021; Stanescu, 2021).

Creating a circular economy is essential because its primary aim is to reduce waste. At the end of a product's life cycle, the aim is to keep its materials in the economy as much as possible. These elements can be reused productively, creating further value. Implementing measures to achieve a circular economy involves adopting practices such as reuse, repair and refurbishment, and the reuse of existing materials and products.

Turning what was once considered waste into a valuable commodity is now a recognised opportunity. There are numerous examples of companies in different industries applying this concept to specific commodities (European Parliament, 2016). Research on life cycle assessment (LCA) focuses on the topic of waste in a broad sense, covering different materials such as paper and metals as well as specific products. Waste assessment is of great importance for local authorities, given that they are usually responsible for the administration of waste assessment. The analysis of individual materials can help in the evaluation of alternatives such

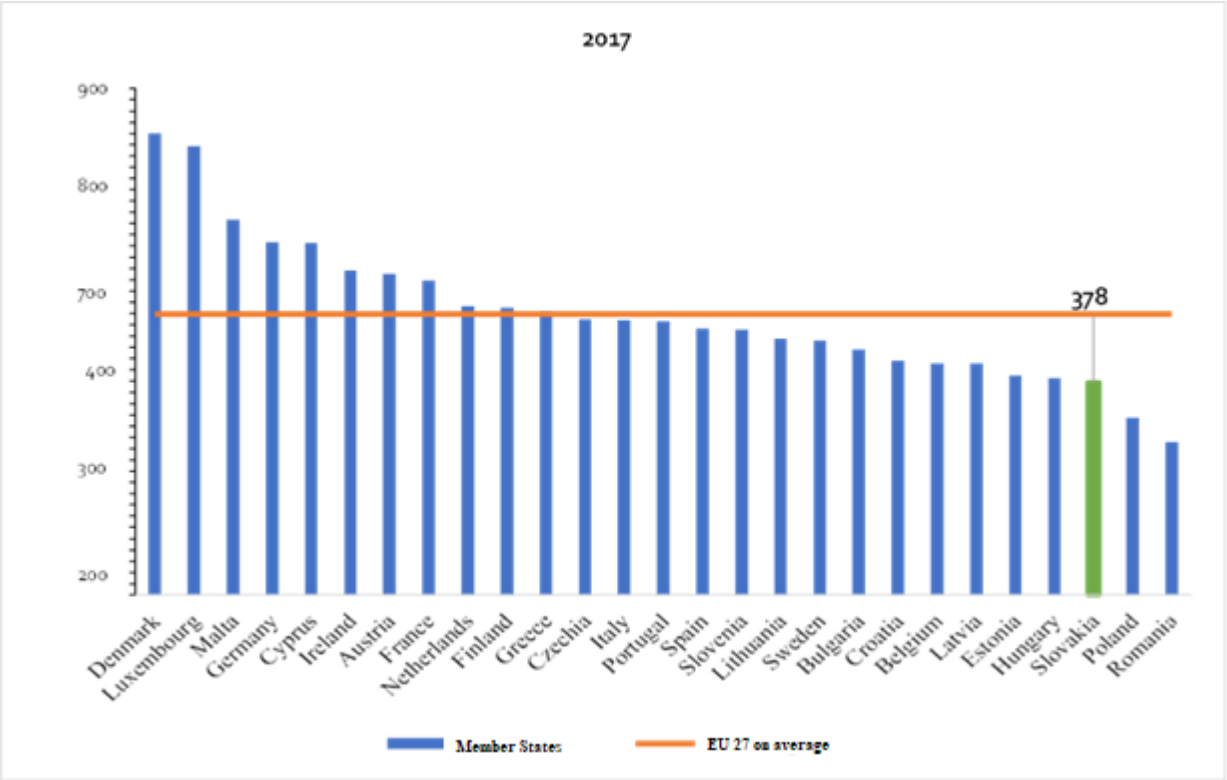
as energy production by incineration and fuel production by plastic processing (Zbicinski, 2006).

When assessing the circular economy, it is essential to take economic competition into account. In addition, the circular economy focuses on reducing the environmental impacts of production and consumption (Pires and Martinho, 2019; Smol et al., 2020). In addition to these, the management of municipal waste has long been a major issue in cities.

The waste situation in the European Union and Slovakia's position

Figure 1 shows that the average amount of municipal waste per capita in the 27 EU Member States in 2017 was 499 kg. In contrast, the total amount of municipal waste per capita in the Slovak Republic in 2017 was 378 kg, making the Slovak Republic one of the EU Member States with the lowest municipal waste generation. However, compared to 2017, in 2021, the Slovak Republic's waste generation per capita was 118 kg higher, while the average for the 27 EU Member States was 31 kg higher per capita. However, if this amount of waste is recovered or recycled, this trend does not necessarily lead to negative results. Nevertheless, the Slovak Republic has made significant "progress" in terms of waste generation per capita.

The European Commission has put a lot of effort into developing the most effective waste management strategies, particularly in the context of the world's shift towards a circular economy (Banias et al., 2020).



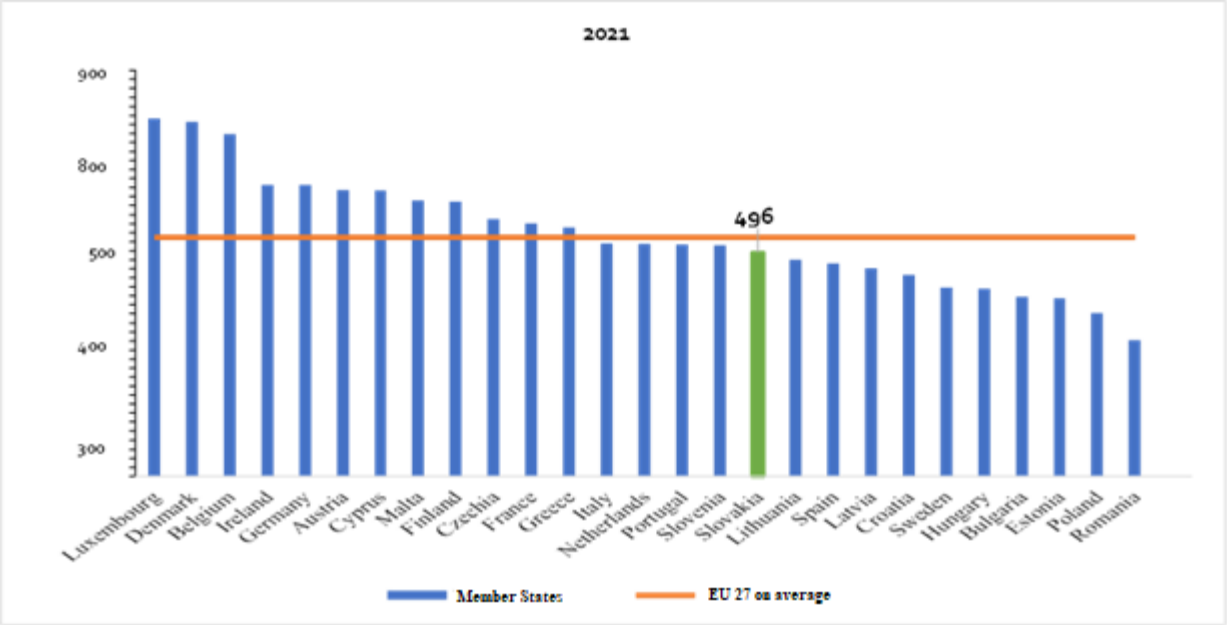


Figure 1: Municipal waste generation in the EU-27 in 2017 and 2021 (kg/capita)

Source: Valencikova-Mandel, 2023, p. 12.

The European Green Deal, a set of policy initiatives, is a goal-oriented strategy for the 27 EU Member States (Dobbs et al., 2021). In other words, climate neutrality for Europe by 2050 requires rapid emission reductions as part of the European Green Deal. Therefore, to be eligible for funding, regional and social disparities in Europe must be reduced (Wolf et al., 2021).

As Fetting (2020) acknowledges, more regulatory and non-regulatory information and action are needed to combat greenwashing. It should not be forgotten that the Circular Economy Action Plan aims to decouple resource use from economic growth. It is also important to recognise that the New Circular Economy Action Plan, adopted in March 2020, seeks to reduce waste while limiting the use of packaging, batteries, building materials and food.

Overall, in 2021, 236 801 thousand tonnes of waste will be generated in the 27 EU Member States. In 2017, the average amount of waste generated per capita in the EU was 49.9%. Luxembourg had the highest waste generation rate, 79.3% in 2021. Belgium has seen a significant increase in waste generation, from 41.6% in 2019 to 72.9% in 2020. Denmark has a remarkable waste generation rate per capita, although on a downward trajectory. Romania has the lowest municipal waste generation rate.

However, it is worth noting that this trend has been increasing in recent years. Specifically, while in 2017 the share of municipal waste generated in Romania was 27.2%, by 2021 this figure had risen to 30.2%. Poland and Estonia are among the countries that produce the least waste. The Slovak Republic is in the middle of the range, with a growing trend in waste generation.

In 2008, the Waste Framework Directive 2008/98/EC adopted the principle of the waste hierarchy. EU Member States benefited from the implementation of the Directive, which was applicable in all EU Member States. The waste management hierarchy, which proposes a priority order with prevention at the top and disposal at the bottom, has a significant impact on current waste management practices (Gharfalkar et al., 2015).

Directive 2008/98/EC, which was then transposed into national law, defined the waste hierarchy until 12 December 2010. As evidenced by Directive (EU) 2018/851, in order to achieve the targets of the Waste Hierarchy Directive, the preparation of municipal waste for re-use and recycling must increase to at least 55%, 60% and 65% by weight by 2025, 2030 and 2035 respectively.

In addition to these targets, Member States must collect textiles, hazardous waste, and bio-waste separately by 1 January 2025 and compost bio-waste by 31 December 2023.

In addition, the Landfill Directive limits the landfilling of municipal waste to 10% by 2035 (Directive 1999/31). The waste hierarchy has not changed with the adoption of Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste.

Van Ewijk and Stegemann (2016) conclude that, on the one hand, the waste management hierarchy is valuable in preventing waste from going to landfills, but on the other hand, it is insufficient to reduce the use of natural resources and negative environmental impacts.

Taelman et al. (2018) argued that a mandatory waste hierarchy is the basis of European waste law and policy. The primary objectives of the waste hierarchy are to increase and optimise the use of waste management resources while minimising environmental impacts. Therefore, according to De Feo et al. (2019), the primary function of waste management policies is essential. According to Eurostat (2023), the EU-27 countries generate an average of 530 kg of waste per capita per year, making waste generation growth a major problem.

The European Parliament Directive 2008/98/EC and the Council of Europe Decision of 19 November 2008 on waste and repealing some previous Directives require all Member States to develop a waste management programme and a waste prevention programme, which should be the basic documents for waste management from that date. This Directive has been transposed into national legislation by national legislatures and the relevant national authorities have drawn up the corresponding programmes.

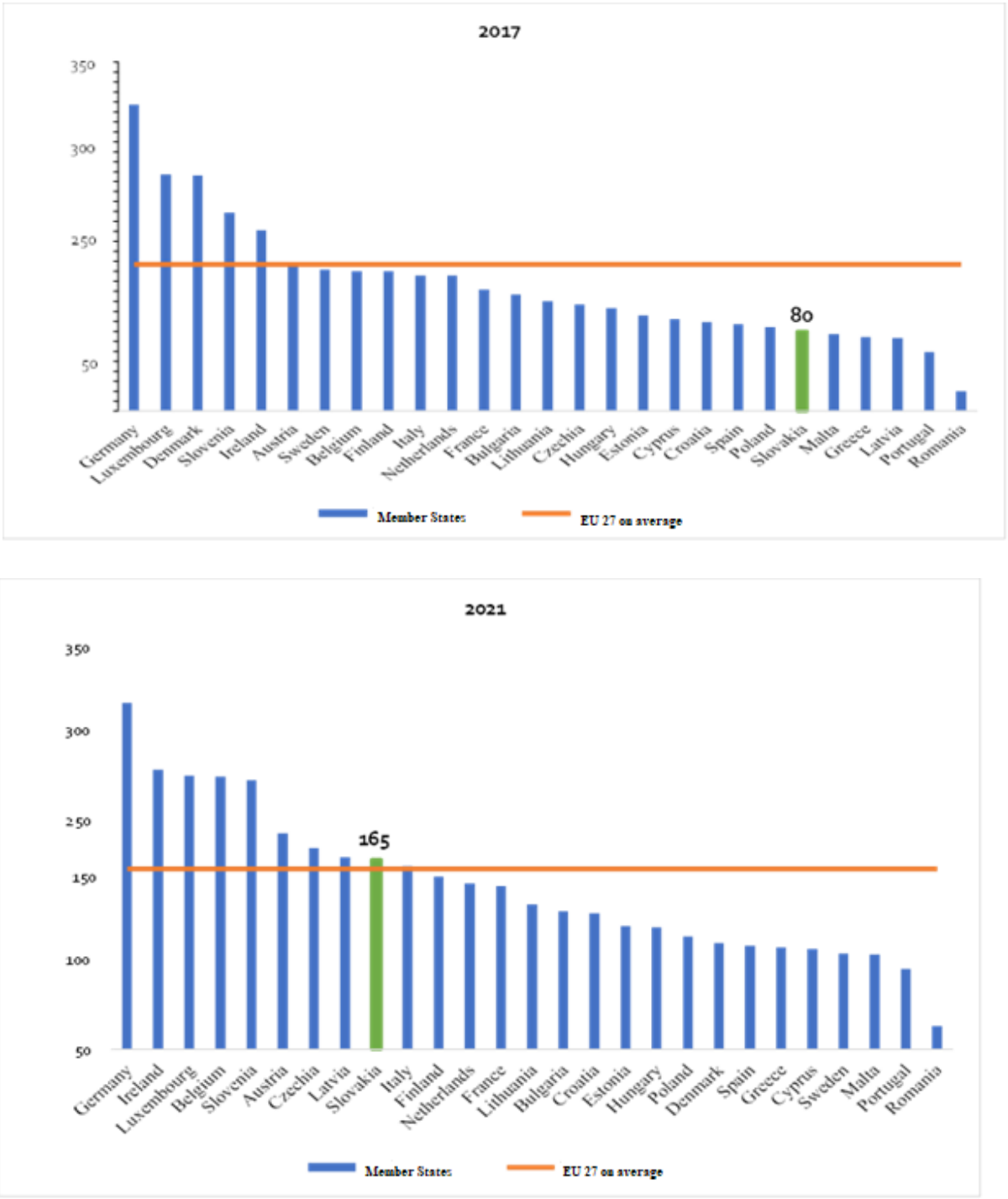


Figure 2. Recycled materials in the EU-27 in 2017 and 2021 (kg/capita)

Source: Valencikova-Mandel, 2023, p. 14.

Figure 2 shows that in 2017, the average amount of recycled material per capita in the 27 EU Member States was 147 kg. In contrast, the Slovak Republic had a recycling rate of 80 kg per capita in 2017, placing the Slovak Republic at the bottom of the European Union.

However, the situation changed significantly by 2021, when in the Slovak Republic

165 kg/year of recycled material was produced, compared to an average of 157 kg/year for the 27 EU Member States, which means that the Slovak Republic performed better than the EU average and ranked ninth out of the 27 Member States.

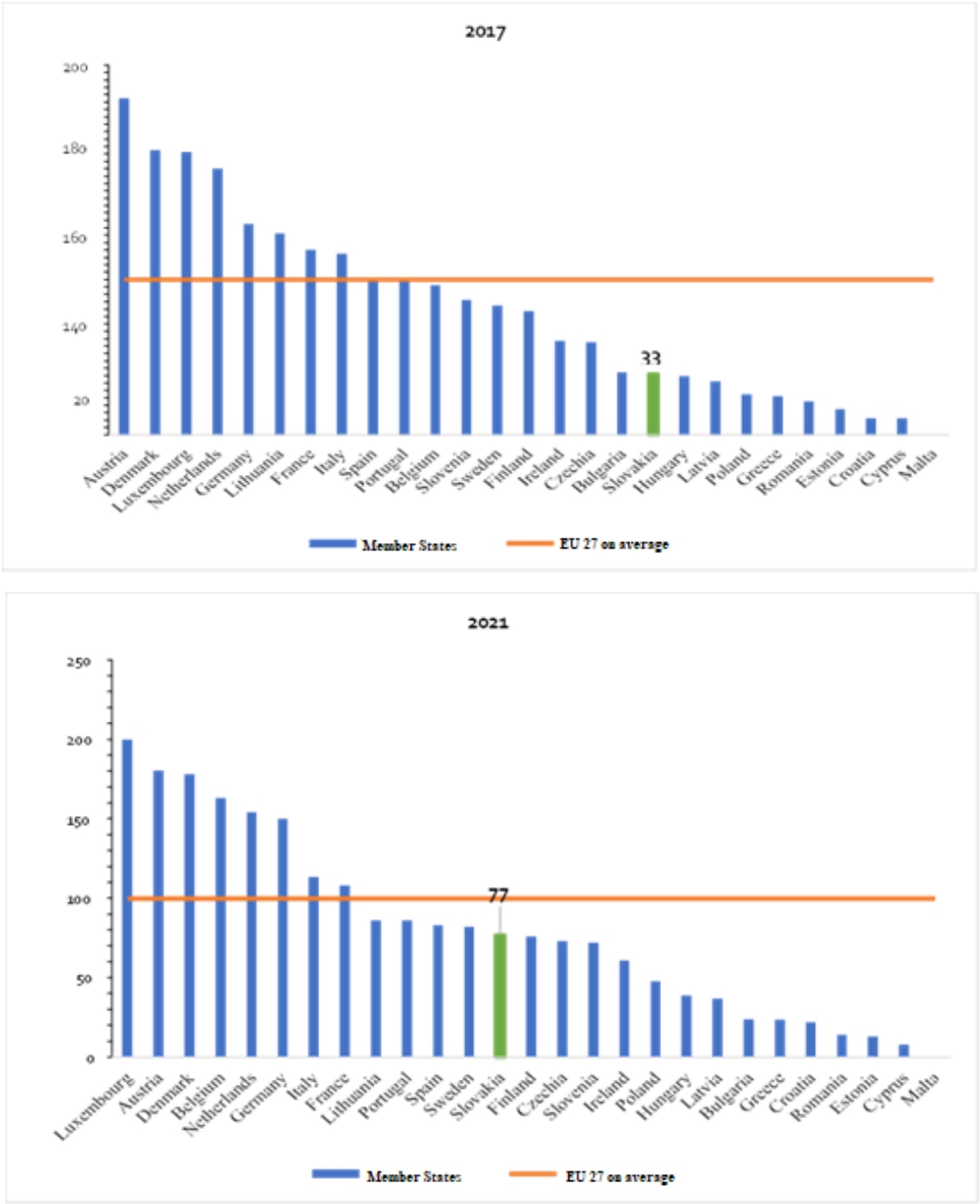


Figure 3. Recycling-composting and self-composting in the EU-27 in 2017 and 2021 (kg/capita)

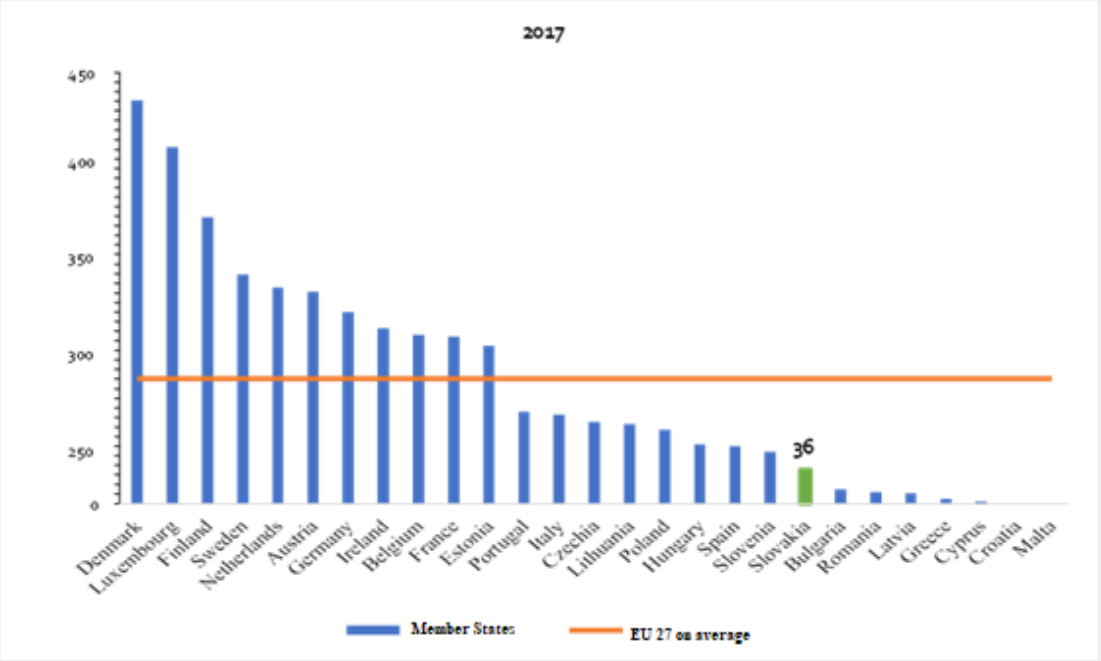
Source: Valencikova-Mandel, 2023, p. 16.

If we compare reuse-composting and self-degradation, the average for the 27 EU Member States was 84 kg/capita in 2017 and 100 kg/capita in 2021. Austria, for example, ranked first with

182 kg/capita and showed slight fluctuations over the study. Denmark and Luxembourg followed closely behind. The Slovak Republic has made greater progress since 2017 and is in the middle of the pack among Member States in terms of success rate. However, it still needs to catch up with the EU average of 100 kg per capita by 2021, and has not made significant progress since 2017 (Figure 3).

If we look at Figure 4, which compares 2017 and 2021 in terms of incineration and energy recovery for the European Union as a whole, we can see that Denmark has increased its recovery in both years. In countries with limited primary resources, such as Denmark, the recovery rate of slag is significantly higher than in countries with unlimited primary resources (Figure 4).

Research shows that people in Germany, Finland, Sweden, the Netherlands, Belgium and Denmark have the most efficient waste management systems, with almost no municipal waste going to landfills.



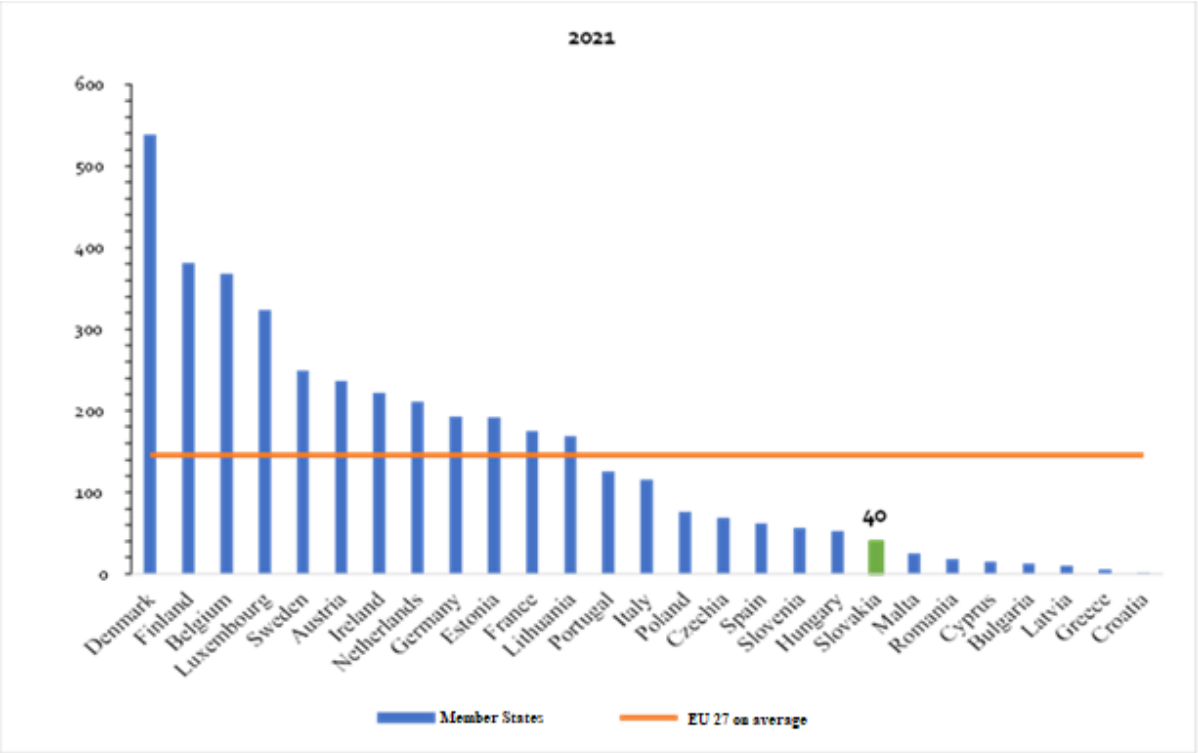
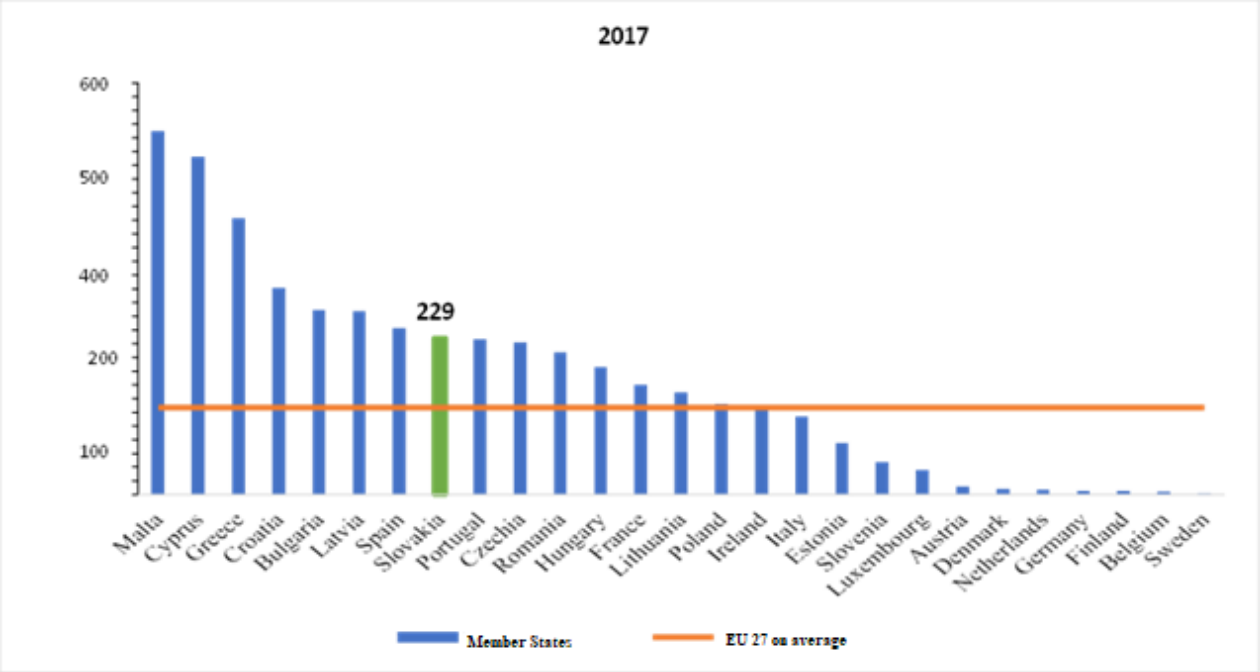


Figure 4. Disposal - incineration with energy recovery in the EU-27 in 2017 and 2021 (kg/capita)

Source: Valencikova-Mandel, 2023, p. 18.

In 2017, an average European citizen threw 127 kg of municipal waste into landfills, compared to 229 kg per capita in the Slovak Republic. In 2021, an average European citizen produced 121 kg of landfilled waste per capita, compared to 202 kg per capita in the Slovak Republic. Again, the situation has improved (Figure 5).



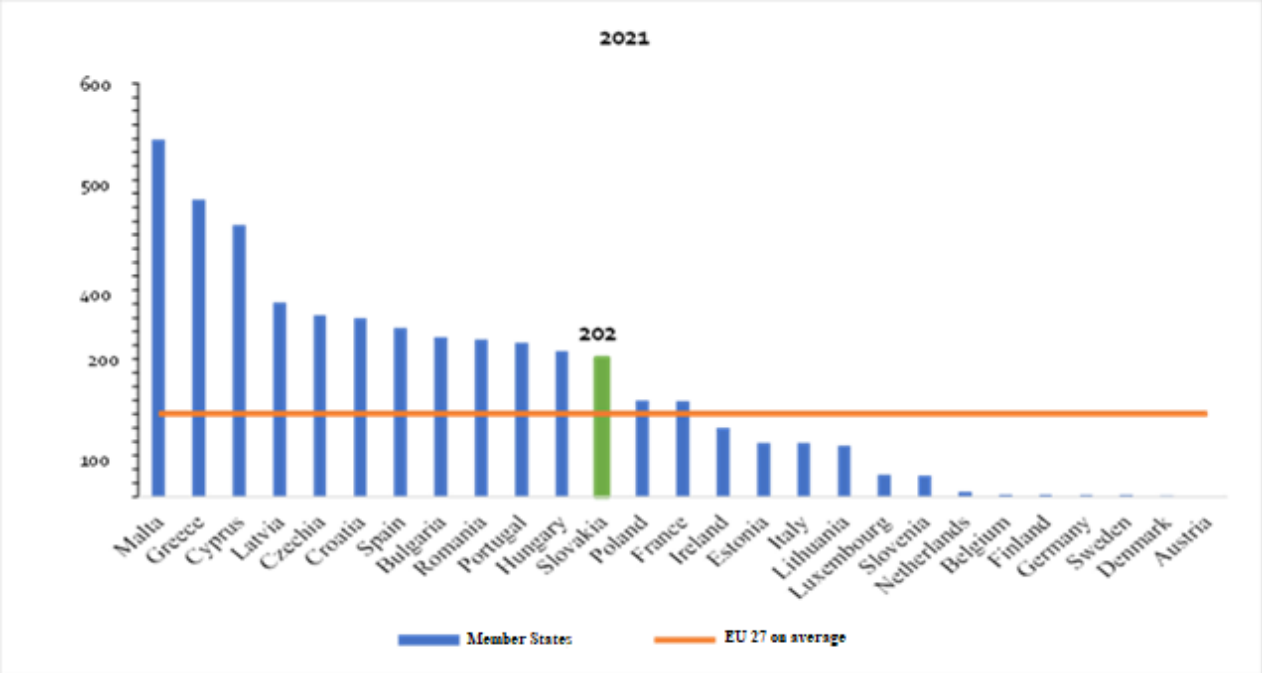


Figure 5. Disposal in landfills in the EU-27 in 2017 and 2021 (kg/capita)

Source: Valencikova-Mandel, 2023, p. 20.

Waste strategy and plans of the Slovak Republic as a Member State of the European Union

To reap the full benefits of the Circular Economy Action Plan, a key element of the European Green Deal, full implementation of EU landfill legislation is a key condition.

However, the Slovak Republic has yet to fully implement these regulations. The European Commission has made public its decision to refer the Slovak Republic to the European Court of Justice for failing to reclaim and close more landfills as notified by the European Commission, contrary to the requirements of the 1999 EU Landfill Directive.

As far as the current situation in the Slovak Republic is concerned, the relevant legislation includes the amended Decree No. 365/2015 on the establishment of a waste register, the amended Decree No. 366/2015 on the obligation to register and report, and the amended Decree No. 371/2015 on the implementation of certain provisions of the Waste Act, which is amended in accordance with the Waste Directive 2008/98/EC by Act No. 79/2015 (Waste Act). In Section 80 of the latter, the following definition of waste is included: „Municipal waste means household waste generated in the territory of a municipality by the activities of natural persons and waste of similar characteristics and composition originating from a legal person or a natural person entrepreneur, except for waste resulting from the direct carrying out of activities that constitute the business or activity of a legal person or natural person-entrepreneur; waste from households shall also include waste from immovable property used by natural persons for their individual recreation, such as gardens, holiday homes, or for the parking or storage of vehicles used for household purposes, in particular garages, garages and parking places."

In addition, the Slovak Republic has implemented a number of environmental policy standards required by EU law.

The Envirostrategy 2030, the Waste Management Programme 2021–2025 and the Waste Prevention Programme 2019–2025 are the three most important documents in the Slovak Republic related to the analysis of municipal waste efficiency.

The Waste Management Programme for 2021–2025 and the Waste Prevention Programme for 2019–2025 are important strategic documents that require the Slovak Republic to divert as much waste as possible from landfills to other methods of recycling and to reduce the amount of waste generated on its territory.

The Slovak Waste Management Programme has the primary objective of diverting municipal waste from landfills by 2025. The financing of the collection and disposal of municipal waste through the Extended Producer Responsibility (EPR) scheme is based on the levies on local municipal waste and small quantities of construction waste and has been adopted. However, the separation of municipal waste, in particular biodegradable waste such as kitchen waste, needs to be improved. Municipal waste receives the most attention, despite accounting for only a small proportion of total waste generation. This particular attention is due to the collection and treatment of municipal waste by the public sector. Marišová and Fandel (2022) noted that efforts are being made to recover waste in line with Slovak strategies.

Municipal waste is the most important waste stream in terms of origin, trends, infrastructure planning and waste policy objectives. Often overlooked and misinterpreted, municipal waste can be detrimental to the planning of processing capacities and the achievement of European recycling and landfill targets. Consequently, a consistent definition of municipal waste was one of the most significant obstacles in the adoption of the new waste package, which followed the EU's Central European Action Plan for a Circular Economy.

Lazikova and Rumanovska (2022) argue that it is irrational to inform consumers about basic information that unnecessarily takes up space on food packaging, as required by Regulation (EU) No. 1169/2011 of the European Parliament and of the Council of Europe of 25 October 2011 on the provision of food information to consumers.

The calculations show that biodegradable municipal waste is the most common component of mixed municipal waste. Following the European Union's Green Programme also obliges the Slovak Republic to improve its public administration. Therefore, in February 2019, after 26 years, the Slovak Republic adopted the Environmental Strategy 2030.

The Environment Strategy 2030 is divided into 3 parts: the first part on the green economy in relation to the circular economy, the second on waste management, and the third on energy.

As regards municipal waste, the main objectives of the Environment Strategy 2030 for a circular economy are:

-The rate of municipal waste recycling, including preparation for re-use, is expected to rise to 60% by 2030.

-By 2035, the proportion of municipal waste going to landfills will be reduced by 25%.

According to the latest data from the Statistical Office of the Slovak Republic for 2021, a high percentage of municipal waste (40.68%) will be landfilled. The annual decrease in landfilling is positive; for example, in 2011, 74.71% of municipal waste in the Slovak Republic was landfilled. Nevertheless, the Slovak Republic lags behind developed countries in waste management, where the recycling rate for municipal waste is 12th among the 27 EU countries (42.2% in 2020), compared to an EU average of 48.6%.

Although landfilling is still the dominant form of waste management, in 2020 the Slovak Republic will rank 12th with a recycling rate of 49.66%. However, the Slovak Republic will produce much less waste than other Member States: in 2021 it will produce 496 kg per capita, or 1 077 thousand tonnes of waste per year.

Overall, the results showed inequalities in municipal waste management across the EU. The amount of municipal waste generated in the EU increased in almost all Member States between 2017 and 2021.

As Gardiner and Hajek (2020) have shown in their research, the correlation between rising economic activity and increasing levels of waste generation is a major concern at global level.

Furthermore, there is a demonstrable link between household consumption and municipal waste generation in European economies. This explains why countries such as Denmark and Luxembourg are among the leading waste producers in Europe in 2017 and 2021.

In 2035, recycling and landfill rates will be a critical factor in determining whether the EU successfully achieves its targets.

The proposed reform package aims to shift the EU economy to a circular model, requiring at least 65% of municipal waste to be recycled by 2035 and limiting the amount of municipal waste going to landfill to a maximum of 10%.

Achieving these targets will be a major challenge for the Slovak Republic as they aim to achieve a landfill rate of at least 25% by 2035 as part of their waste strategies.

It will be necessary to take into account, among other things, the composition of the materials used in the production of the goods and their packaging, as well as the measures and assistance provided by the State.

In terms of people's behaviour, research by Holotová et al. (2020) shows that people are becoming more environmentally conscious.

In general, the recycling rate of materials is increasing. However, there are some barriers. In Europe, high-performance composite recycling and recovery infrastructures are needed because they are challenging to set up.

Materials such as plastics lack recycling and recovery from waste. Hsu et al. (2021) point out that plastic waste has not undergone circular treatment and needs to be exported. As a consequence, the increased amount of recyclable materials cannot be handled in European processing plants, thus necessitating the export of such materials for further processing.

In addition, waste materials and products are an additional technical barrier. This is because some materials are technically not recyclable or consist of mixed materials that are difficult to separate.

Mohammadi et al. (2019) showed that non-recyclable waste is treated in waste-to-energy plants equipped with different technologies. In developing countries, the biggest challenge is the need for formal recycling infrastructure, and in addition, certified composting needs to be developed in most countries, including the Slovak Republic.

Siebert et al. (2020) explained that the aim of promoting sustainable reuse practices is to produce high-quality compost and residual material after anaerobic digestion of biodegradable feedstock.

Municipalities must meet the criteria to obtain a quality certificate for composting. In the Slovak Republic, residents of family houses could receive garden composters and citizens of towns and cities could apply for a free brown plastic composter (Báreková et al., 2020).

Today, the majority of municipal waste is landfilled: 40.68% in 2021. In the Slovak Republic, there are currently two waste-to-energy facilities in Bratislava and Košice (Šyc et al., 2018).

Finally, as mentioned above, there are disparities in waste management across the EU-27. Malinauskaite et al. (2017) show that more capacity for waste-to-energy is needed in the eastern part of the Union and that there is potentially overcapacity in the north-western part.

Importing and exporting waste would be one way of burning waste for energy recovery; however, public opinion may limit this. The high cost of transport is also a risk. Overall, the

waste management hierarchy suggests that waste prevention, minimisation, reuse and recycling are preferable to energy recovery.

Therefore, Valenciková and Fandel (2023) suggest that Member States with high landfilling (including the Slovak Republic) and low incineration capacity should first invest in reprocessing facilities, analyse the long-term impacts of these facilities and then consider exporting waste to neighbouring countries.

It is essential that the Waste Act No. 79/2015 is further amended in order to prevent possible legal action by the European Commission in the future. (An example of such a legal case is the action brought by the European Commission before the Court of Justice of the European Union on the issue of improperly closed landfills in the Slovak Republic. The plaintiff brought legal proceedings against the Slovak Republic for non-compliance with Directive 2008/98/EC, alleging that the defendant had failed to properly manage the remediation and permanent closure of 21 disused landfills.)

Municipalities in the Slovak Republic should form several associations to jointly manage waste disposal.

In a consumer society, the amount of municipal waste generated increases as living standards rise. As waste generation techniques are most efficient at all levels, from producer to consumer, reducing waste generation is of paramount importance. While recycling encourages the development of a resource recovery framework that promotes the use of waste materials that have already been disposed of, the public still needs to understand what waste is.

But many things can be reused for different purposes. Recycling in the form of composting is more important for the Slovak Republic than other forms of recycling (especially within the municipal sector) in terms of the amount of bio-waste that can be composted. The Slovak Republic can achieve a 100% recycling rate of composting by setting up the composting process properly and this should be mandatory for all municipalities.

However, landfills are still needed for waste management, as not all waste can be recovered (materially or energetically) at present, and the creation of new landfills is prohibited by EU and Slovak legislation.

LEGAL BACKGROUND

Slovak waste law and policy objectives

The basic legal framework for waste management in the Member States of the European Union is the European Union Waste Directive. The waste management system, which is in line with the waste hierarchy set out in that Directive, is then complemented by other Directives regulating the management of selected categories of waste, in particular the WEEE, Batteries and Accumulators and Waste Batteries and Accumulators and End-of-Life Vehicles Directives (Directive 2008/98/EC).

According to the Waste Framework Directive, the waste hierarchy should be used as a priority in waste management, waste prevention, waste legislation and waste policies. In applying the waste hierarchy, Member States will take measures to encourage options that provide the best overall environmental outcome, while at the same time, Member States will use economic instruments and other measures to encourage the application of the waste hierarchy (Dufala, 2020).

In the Slovak Republic, waste management and the waste hierarchy are regulated by the Waste Act (Act No. 79/2015 Coll.), which defines this hierarchy as a binding order of waste management priorities, which may be deviated from only in certain cases and if required by law. In accordance with the waste hierarchy, additional obligations are imposed on each legal entity in relation to waste management.

In addition to the Waste Act, municipal waste management is also influenced by secondary legislation (sub-laws/laws), which are generally binding regulations of municipalities as territorial self-governing bodies, regulating the details of municipal waste management in municipalities. In these generally binding regulations, municipalities specify in detail how municipal waste is to be collected and transported, how each component of municipal waste is to be collected separately, how small construction waste and household electrical waste is to be treated, and where such waste is to be disposed of (Cepek et al. 2015).

Another important policy element is the setting of waste management targets. The Waste Framework Directive sets the following targets for Member States in the field of municipal waste:

(a) By 2020, the overall rate of preparation for reuse and recycling of household waste should be increased to at least 50 % by weight;

(b) Increase the preparation for reuse and recycling of municipal waste to at least 55% by weight by 2025;

(c) By 2030, the preparation for reuse and recycling of municipal waste should be increased to at least 60% by weight;

(d) Increase the preparation for reuse and recycling of municipal waste to at least 65% by weight by 2035. (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0098:EN:NOT)

These objectives are taken over by the Slovak Waste Act, which transposes the objectives of the Directive into national law. The minimum recovery targets are set out in the WEEE, Batteries and Accumulators and Waste Batteries and Accumulators Directives (minimum collection targets under Article 10 of the Directive) and the End-of-Life Vehicles Directive (recovery and recycling targets under Article 7 of the Directive). The waste management targets and the mandatory limit values for the above categories of waste (e.g., electrical waste, spent batteries and accumulators, end-of-life vehicles) are also regulated in Annex 3 of the Waste Act. The absence of specific measures can be seen as a practical lack of regulation, especially at the legal level, but these aspects are also covered by legislation.

Basic definitions of the legislation

1. *What is waste?*

Waste is any movable object or material which the holder discards, intends to discard or is required to discard in accordance with the Waste Act or specific legislation.

By-products, special waste that has reached the final stage of the waste chain, waste that has undergone a preparatory process for reuse and waste that has been transferred for recovery in the household are not waste (cf. Law No. 79/2015 on waste and on amendments and additions to certain laws (in force: 17 March 2015, https://www.torvenytar.sk/pdfRules/1492760541__,%2091_2016.pdf).

A waste stream is a group of wastes with similar characteristics, which allows them to be further treated together.

2. *Classification of waste*

The Slovak Waste Act divides waste into biodegradable, household and hazardous waste.

3**.** *Are the by-products of production considered waste?*

By-products of production are not considered waste if they meet certain conditions, e.g., the primary purpose of the production process is not to produce this material, its re-use is ensured, it can be used directly without further processing, it is generated as an integral part of the production process, etc.

4. Who is the producer or holder of the waste?

Any original producer whose activities result in waste, and anyone who treats, mixes or otherwise processes the waste, resulting in a change in the nature or composition of the waste.

The waste holder is the producer of the waste or any person in possession of the waste. A dealer or broker in waste does not become a holder if he transfers it.

5. Waste management and collection.

Waste management means the collection, transport, recovery and disposal of waste, including the supervision of such operations and the after-care of waste disposal facilities, and includes the activities of a dealer or broker. The collection of waste may involve its temporary deposit with its producer prior to further treatment, in which case it is not considered waste storage, or the collection of waste from other persons, including its preliminary sorting and temporary placement for transport to a waste treatment facility. The purchase of waste is also waste collection if it is carried out by a legal or natural person for an agreed price or other consideration.

6. Waste management facilities

Waste management facilities are waste collection facilities, waste recovery facilities, waste disposal facilities and mobile waste facilities (if operated for less than 6 months at a given location).

Landfill is an area with facilities for the disposal of waste where waste is permanently deposited on or in the ground.

7. Waste management hierarchy

The waste management hierarchy is a mandatory priority order of the following activities:

a) Preventing the generation of waste;

b) The preparation of waste for re-use;

c) Recycling of waste;

d) Other recovery of waste, such as energy recovery;

e) The disposal of waste.

8. Responsibility of the manufacturer

So-called extended producer responsibility applies to manufacturers of differentiated products (electrical equipment, batteries, batteries, packaging materials, cars, tyres and non-packaging products). Manufacturers of differentiated products are required to register and notify changes to their registration details, appoint an authorised representative, ensure the material composition and construction of the differentiated product, fulfil their duty to inform the public and the processors of the waste stream of differentiated products, etc. The costs of all these are borne by the manufacturer of the differentiated product or products.

9. Prohibitions

Waste may only be disposed of, disposed of and recovered in the place and in the manner specified by law. It is prohibited to burn household waste in open spaces or in household combustion appliances. Disposal by incineration also applies to biodegradable waste.

10. Liability for illegal dumping of waste

Any natural or legal person may report the illegal disposal of waste on immovable property to the competent state waste management authority or to the municipality in whose territory the property is located. The owner, manager or tenant of the property must report the case immediately after becoming aware of the illegal dumping of waste on his/her property. Report this fact to the authority designated by law.

11. Key obligations of the landfill operator

- Develop and keep ready approved planning documentation for landfill closure, reclamation, monitoring and care of the landfill after closure.

- Ensure that the landfill is operated by a person employed or otherwise engaged by the landfill operator who has completed at least secondary education with at least a high school diploma and has at least three years of professional experience.

- To close, reclaim, monitor, and, after closure, care for the landfill in accordance with the design documentation. The plan for the landfill closure, reclamation, monitoring, and post-closure management plan must be submitted as part of the environmental impact assessment documentation.

- The operator of a landfill shall establish a specialised financial reserve during the operation of the landfill, the assets of which shall be used for the closure, reclamation, monitoring, and post-closure safety of the landfill, as well as for emergency response to imminent emergencies or to limit the consequences of imminent or developed accidents. Operators of more than one landfill shall establish a specialised financial reserve for each landfill separately.

12. Management of hazardous waste

Do not dilute or mix:

a) Different types of hazardous waste;

(b) Hazardous and non-hazardous waste; and

(c) Hazardous waste with materials that are not waste.

The recycling and disposal of hazardous waste has priority over other waste. The operator of the hazardous waste facility must also develop an accident management plan. It must be updated whenever conditions change, but at least once every 3 years.

13. Household waste

Household waste means waste generated in households in the municipality by the activities of natural persons and waste of similar nature and composition in the possession of legal persons or natural persons-entrepreneurs, excluding waste generated in accordance with the activities of the enterprise. Household waste also includes waste from holiday homes,

holiday cottages and garages. It also includes waste from the cleaning of roads owned by the municipality and waste from parks, green areas, cemeteries, etc.

Sorted household waste collection is the activity of collecting the components of household waste separately. Waste not collected in this way is considered mixed waste. However, construction waste is subject to a fee.

Calendar-based collection is the collection of separately collected household waste components at a fixed time in accordance with the general validation ordinance of the municipality. The collection consists of placing an appropriate vehicle or collection container at the specified time, for a maximum of one day, while the municipality informs the population in advance of such collection in a manner appropriate to local conditions. The municipality is responsible for the management of household waste and construction waste generated in the municipality, except in specific cases.

Natural persons may deliver the sorted components of household waste free of charge to the collection yard:

a) Located in the territory of the municipality of which it is a taxpayer;

(b) The operation of which is ensured by an association of municipalities of which the municipality of which it is a taxpayer is a member.

14. Transboundary movements of waste

It is forbidden to import waste into the Slovak Republic for disposal, unless required by a binding international treaty. Similarly, waste generated in the territory of the Slovak Republic must be disposed of primarily in the Slovak Republic.

Prior authorisation for the cross-border shipment of waste must be obtained by submitting the relevant document to the competent ministry. The activity may only start after approval. The Ministry may refuse to issue the permit or may require a deposit.

15. IT system for waste management

The 2015 law provides for the establishment of an IT system for waste management and registration, which is intended to ensure data collection and services in this area.

The following are recorded in the IT system:

- The reported data from the records of waste holders and waste treatment operators;

- The reported data on inland shipments of hazardous waste and cross-border shipments of waste;
- The reported data from the records of operators of waste treatment facilities;
- The reported data from the registers of manufacturers of differentiated products;
- The reported data from the manufacturer's liability organisations and third party registers;
- Information on the amount of the local levy on household waste and construction waste;
- Information on penalties imposed by the public waste management authority, etc.

The IT system is obliged to notify the necessary and required data to the data subjects.

16. Public waste management authorities

These are: the Ministry, the Inspectorate, the District Office of the district headquarters and the District Office.

17. Reclamation Fund

The Law establishes the Recycling Fund, a non-public targeted fund in which funds are accumulated to support the collection, recovery and processing of special waste (tyres, packaging, electrical waste, oil, etc.). This is financed by compulsory contributions from producers to this Fund and by the revenue from fines imposed.

Problems with the Waste Act

Compliance with the waste hierarchy, the achievement of waste management targets and the implementation of measures to achieve these targets are the responsibility of many actors involved in municipal waste management. The main actors in this area are households, municipalities, producers, and organisations involved in the recovery of specific categories of waste.

Households buy products from producers and produce municipal waste after using them. Their main task in the field of municipal waste management is to separate as much municipal waste as possible and then send it to the parties responsible for further processing. In carrying out these tasks, they are constrained not only by legislation but also by specific measures in the system that either encourage or discourage them from separating municipal waste. The

achievement of municipal waste management targets depends on the separation of household waste (Dufala, 2020). Municipalities are responsible for the management of mixed municipal waste, bear the additional costs and, in contrast to households, largely determine the detailed rules for municipal waste management by adopting generally binding regulations on municipal waste management.

Another important tool available to municipalities is the setting of local charges for municipal waste and construction waste. The amount of the charge is also set in the form of a generally binding regulation (Cernanová et al. 2019).

According to Dufala, municipalities, together with the extended producer responsibility, have the possibility and scope within the framework of the legislation to determine further details of municipal waste management within the municipality in a way that significantly supports the separation of municipal waste by households. This can be done both by setting the cost of municipal waste and, in the case of producers, by setting the conditions for the collection, transport and subsequent treatment of the categories of waste collected separately. Municipalities do not make use of this possibility. Rather, they simply copy the legal framework established by the Waste Act into generally binding legislation. It is questionable whether this potential is not being exploited by municipalities due to inexperienced staff and management, financial constraints or other reasons (Dufala, 2020).

Manufacturers must take into account the environmental impacts of their products, such as future waste, at all stages of the product life cycle. Certain aspects and impacts must therefore be taken into account at the product manufacturing stage. These include in particular the use of appropriate materials that both minimise environmental impact and are suitable for the recovery process. At the same time, manufacturers have an important role to play in meeting the first point of the waste hierarchy, i.e., waste prevention. However, there is a significant problem and contradiction between the objectives of waste management and those of producers as entrepreneurs. While the goal of the waste hierarchy is to minimize waste, producers as entrepreneurs want to maximize waste (Takac, 2016). Therefore, legislation and the resulting legal instruments and policy measures play an important role in forcing or motivating producers to take waste prevention into account.

Another very important task for producers is the management of selected categories of waste (e.g., WEEE, used batteries and accumulators, packaging waste). Producers are responsible for collecting, transporting and delivering these categories of waste to treatment

facilities while bearing the costs of doing so. The organisations that process the selected categories of waste are responsible for ensuring that the waste is recovered as much as possible, thereby reducing the amount of waste. Another positive effect of their activities is the conservation of natural resources, as raw materials from waste and non-waste natural resources are used to some extent in the production of other products. At this point, the question arises as to which of these is the most important in achieving waste management objectives.

Dufala believes that they all have an important role to play, which is essential at the right stage of municipal waste management. If any one of these actors fails, the whole system becomes ineffective or inoperable. Households play an irreplaceable role in increasing the share of separated waste in the total municipal waste stream, municipalities and producers create the conditions for the separation, collection and transport of the above-mentioned components of municipal waste, and processors contribute to the reuse of waste, which provides raw materials that can be reused in production (Dufala, 2020).

This implies that the roles and responsibilities of different organisations in the field of municipal waste management are clear, but there are questions about the potential they have to achieve waste management objectives.

New law on landfill fees

Act No. 329/2018 on the amendment and supplementation of Act No. 587/2004 on Landfill Fees and the Environmental Protection Fund and on the amendment and supplementation of certain amended acts (hereinafter: the Fees Act), which replaces Act No. 17/2004 on Landfill Fees, was adopted in 2018 and entered into force on 1 January 2019 (https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2018/329/).

The new law has been adopted for several reasons: the Slovak Republic has one of the highest rates of landfilled waste in the EU, but also one of the lowest landfill fees. The aim of the Fees Act is to discriminate against landfilling and to create incentives for the selective collection of municipal waste and to increase the recycling of municipal waste.

The Fees Act regulates the process for determining the specific amount of the fee as follows. Each municipality is obliged to pay a fee for the landfilling of mixed municipal waste and large refuse. The amount of the fee to be paid for landfilling is determined by the operator

of the landfill by weighing the landfill at the landfill. Subsequently, the landfill operator calculates the fee for the landfilling of municipal waste by weighing the amount of waste and the amount of the fee for the waste, as specified in Annex 1 to Decree of the Government of the Slovak Republic No. 330/2018 on the determination of the amount of landfill fees and on the details of the redistribution of the revenues from landfill fees.

For mixed municipal waste and bulky waste landfilled, the applicable rate is determined on the basis of the level of sorting of municipal waste. The sorting level of municipal waste is calculated according to the formula in Annex 2 (Cernanová et al. 2019).

Slovak and European legislation

Slovak legislation

First, Act No. 79/2015 on waste and amendments to certain laws, as amended, shall be mentioned.

Regulations implementing the Waste Act:

- Decree of the Ministry of Environment of the Slovak Republic No. 365/2015 establishing the Waste Catalogue, amending Decree No. 365/2015 Coll.
- Decree of the Ministry of Environment of the Slovak Republic No. 366/2015 on the obligation to register and report.
- Notification of the Ministry of the Environment of the Slovak Republic No. 368/2015 Coll. on the issue of the Decree on the uniform methods of analytical control of waste.
- Decree of the Ministry of the Environment of the Slovak Republic No. 370/2015 on the rate of calculation of the contribution to the Recycling Fund, the list of products, materials and equipment for which the contribution to the Recycling Fund is payable and the details of the content of the application for the provision of funds from the Recycling Fund.
- Decree of the Ministry of Environment of the Slovak Republic No. 371/2015 implementing certain provisions of the amended Waste Act.

- Coll. of the Ministry of the Environment of the Slovak Republic No. 382/2018 on the dumping and storage of metallic mercury.
- Decree of the Ministry of Environment of the Slovak Republic No. 373/2015 on the extended responsibility of producers of reserved products and management of reserved waste streams, as amended.
- Act No. 329/2018 amending Act No. 587/2004 on waste disposal fees and the Environmental Protection Fund and amending certain laws, as amended by Act No. 111/2019.
- The Decree of the Government of the Slovak Republic No. 330/2018, which sets the rates of waste disposal fees and the details of the redistribution of the revenues from waste disposal fees.
- Act No. 514/2008 on the management of waste from the extractive industries and amending certain laws, as amended.
- Decree implementing the Act on the management of mining waste.
- Decree of the Ministry of the Environment of the Slovak Republic No. 255/2010 Coll. on the implementation of the Act on the Management of Mining Waste and on the Amendment of Certain Acts.
- Act No. 127/2006 amending Act No. 223/2001 on persistent organic pollutants and waste and amending certain laws as amended by subsequent decrees, as amended by Act No. 515/2008.
- Act No. 205/2004 on the collection, storage and dissemination of information on the environment and amending certain acts (all acts and decrees can be found in the electronic collection of laws of the Slovak Republic: Slov-Lex).

European Union legislation

- Regulation (EC) No. 1049/2001 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants (2019/1021).
- Regulation (EC) No. 1049/2001 of the European Parliament and of the Council of 14 June 2006 on shipments of waste (Regulation (EC) No. 1013/2006), as amended.

- Commission Regulation (EC) No. 1418/2007 of 29 November 2007 concerning the export for recovery of certain wastes listed in Annex III or IIIA to the Regulation to certain countries not covered by the OECD Decision on the control of transboundary movements, as amended.
- Council Regulation (EC) No. 2008/98 of the European Parliament and of the Council of 31 March 2011 establishing criteria for determining the classification of certain types of scrap metal as waste.
- Commission Regulation (EU) No. 493/2012 of 11 June 2012 laying down detailed rules for the calculation of the recycling efficiency of waste batteries and accumulators in accordance with Directive 2006/66/EC of the European Parliament and of the Council.
- Commission Directive 2008/98/EC of the European Parliament and of the Council of 10 December 2012 establishing criteria for determining whether crushed glass is waste.
- Commission Regulation (EC) No. 2008/98 of the European Parliament and of the Council of 25 July 2013 establishing criteria for the elimination of copper scrap as waste, as amended.
- Commission Regulation (EU) No. 1357/2014 of 18 December 2014 replacing Annex III to Directive 2008/98/EC of the European Parliament and of the Council on waste and repealing certain Directives.

WASTE MANAGEMENT PROGRAMMES IN THE SLOVAK REPUBLIC

Frameworks

The development of the new Waste Management Programme (WMP) has been facilitated by the adoption in March 2020 of the Action Plan for a new circular economy in Europe, which aims to significantly reduce overall waste generation by halving the amount of municipal waste that is left over and not recycled by 2030. According to the Ministry of the Environment, the primary goal of waste management in the Slovak Republic is to divert waste from landfills by 2025, especially municipal waste. Waste generation and management should aim to have the least possible negative impact on human health and the environment. The aim is to increase recycling, improve selective collection, and promote the introduction and uptake of reuse technologies (Valenciková-Marisová, 2023.)

According to the ministry, the primary objective of this chapter of the waste management plan is to increase the proportion of municipal waste collected separately to 60% by 2025 and the proportion of waste prepared for re-use and recycling to 55%.

In parallel, for municipal waste and small quantities of construction waste, the most common method of payment will be the annual flat rate, which will be the same for all residents of the municipality, regardless of the waste generated. To achieve this, the Ministry will review the rates and mechanism of municipal waste charges and will give priority to projects that promote selective municipal waste collection, pre-disposal treatment and the construction of reuse facilities.

The Waste Management Programme also monitors the current trends in the substitution of plastics with bio-plastics and sets targets for this type of waste for the first time. As this is an emerging area, the primary objective is to lay the foundations for a workable bio-waste management system.

Like bioplastics, textile waste is included in the Slovak Waste Management Programme for the first time.

The Slovak Republic has committed to recycle at least 65% by weight of all packaging waste by 2025, which is the primary objective of the waste management plan for this type of

waste. The Waste Management Plan also lists the specific materials contained in packaging waste with their respective minimum recycling targets: 50% plastic, 25% timbrt, 70% ferrous metal, 50% aluminium, 70% glass and 75% paper.

This document sets targets for nine waste streams, namely:

1. Mixed municipal waste.
2. Biodegradable waste.
3. Food waste.
4. Paper waste.
5. Solid waste.
6. Plastics and packaging.
7. Construction waste.
8. Hazardous waste.
9. Mining waste.

Relevant provisions of the Waste Act of the Slovak Republic

The Slovak Waste Act makes the following basic provisions on waste management programmes in Section 8:

A waste management programme (hereinafter referred to as "the programme") is a programme document drawn up for a given territorial unit, in accordance with the waste management hierarchy and objectives, which contains an analysis of the current state of waste management in that territorial unit, the measures to be taken to improve the environmental preparation of waste in the process of reuse, recycling, recovery and disposal, and how the programme will contribute to the achievement of the objectives and provisions of this Act (Act No. 79/2015 Coll. on waste).

Article 9 states the following in relation to the programme of the Slovak Republic:

The Slovak Republic's programme is drawn up by the Ministry, usually for a period of ten years, and mainly on the basis of input from the district offices, district offices and regional governments. The Programme of the Slovak Republic is approved by the Government after the environmental impact assessment and, once approved, the Ministry publishes it in the Official Gazette and on its website.

The programme of the Slovak Republic contains in particular

a) The current state of waste management and the expected future development of the waste streams identified;

b) Information on the types, quantities and sources of waste generated in the territory of the Slovak Republic, broken down by districts, information on waste likely to be exported from, transported through or imported into the territory of the Slovak Republic;

(c) A description of the existing waste collection systems, including waste materials and the territorial coverage of the classified waste collection;

(d) The location of waste treatment facilities;

(e) The targeting of specific waste streams and quantities at the time and the measures taken to achieve them;

(f) The targeting of the management of polychlorinated biphenyls and equipment containing polychlorinated biphenyls at the relevant time and the measures taken to achieve it;

(g) Measures to reduce the amount of biodegradable household waste going to landfills;

(h) Measures to increase the preparation of household waste for reuse and recycling;

(i) Measures to increase the preparation of construction waste from demolition for re-use and recycling;

(j) A separate chapter on the management of packaging materials and packaging waste, including the promotion of prevention measures and packaging recycling schemes;

(k) A review of the construction of new waste treatment facilities, the need to increase the capacity of existing waste treatment facilities or their closure, and the unavoidable investments necessary to meet the indicated needs;

(l) The assessment of the construction of new waste collection systems;

(m) Proposals for the construction of waste treatment facilities of supra-regional importance;

(n) An evaluation of the usefulness of the measures taken;

(o) Information on the use of campaigns to raise public awareness on waste management,

(p) The financial needs of the programme;

(q) Measures to exclude the reception of waste, in particular municipal waste suitable for recycling or other recovery operations in landfills;

(r) Measures to prevent any form of pollution of the environment from waste and to clean up the environment from all forms of waste;

(s) The appropriate qualitative and quantitative indicators and targets for the quantity of waste generated and its processing, as well as for household waste for disposal or energy recovery (Act No. 79/2015 Coll. on waste).

Waste Management Programme of the Slovak Republic for the period 2021–2025

The waste management programme of the Slovak Republic for the period 2021–2025 sets the following objectives:

The main objective of waste management in Slovakia is to divert waste, in particular municipal waste, from landfills by 2025.

The promotion of waste prevention, reuse and preparation for reuse, including through the WFD measures of the Slovak Republic for the period 2019–2025, are an integral and key part of the Slovak Republic's long-term efforts to reduce the amount of waste generated on the territory of the Slovak Republic.

In order to achieve the targets and commitments set, attention should be focused on waste streams such as WEEE, construction and demolition waste, bulky waste, biodegradable waste, textiles and bio-plastics. In cooperation with central government authorities and relevant businesses, ensure the promotion of a market for reprocessed materials from waste. The idea of pooling smaller waste management infrastructures should be pursued in the development of waste management infrastructure.

To divert waste from landfills, there should also be a focus on waste prevention, reuse, preparation for reuse and recycling, complemented by energy recovery from municipal waste in existing energy recovery facilities, for example by establishing voluntary agreements, promoting the conversion of existing waste to energy plants or establishing new energy recovery facilities. Sufficient treatment capacity should be ensured for selected types of

hazardous waste. In the context of industrial waste management, the main objective is to develop and establish a comprehensive concept for the recovery of industrial waste.

A single measure will not have sufficient impact and pressure on the system to ensure synergies and achieve the main objective. A combination of increasing landfill charges while creating the conditions for alternatives to landfilling (e.g., prevention, reuse, preparation for reuse and improvement of waste sorting rates) under the waste hierarchy is needed, appropriate financial implementation in the area of WEEE, in particular packaging and non-packaging, material recovery and increasing energy recovery from SR waste, and, in the above context, promote the shift to volume collection of municipal waste as a directly related measure.

In the use of public funds, in line with the Waste Act, the highest priority will be given to waste management activities and measures that have a demonstrable impact through higher recycling or waste prevention rates. In this case, high levels of support with low co-financing may be considered. No private investment is expected in this segment and the responsibility lies with the public sector.

This includes:

- The introduction of bulk collection;
- The introduction of electronic registration at the waste producer/collection container level;
- The introduction of door-to-door collection;
- Promoting the sorting and composting of biodegradable waste;
- Re-use centers for buildings.

It includes a concrete Action Plan to implement the above. The main tasks are:

- To introduce an incentive mechanism for the use/replacement of products made from recycled materials (including through public procurement, including green public procurement, e.g., for tyres, building materials, textiles, plastics, or subsidies, e.g. for composts made from waste). Deadline: ongoing.

- To improve public awareness of the waste management hierarchy and the possibilities of waste prevention and reuse in accordance with the PPVO 2019-2025 of the Slovak Republic (Waste Act), national waste collection, recycling and recovery, improving the awareness of local governments on waste management and training waste management organisations in the context of the circular economy. Deadline: ongoing.

- To strengthen the state supervisory bodies in the waste management sector in order to enhance the control of compliance with waste management legislation, and improve the expertise and efficiency of the state supervisory authorities' activities in the waste management sector. Deadline: ongoing

- To adopt an amendment to the Fees Act to increase landfill fees, including other changes necessary to ensure the achievement of waste management objectives. Deadline: December 2022.

- The analysis of the potential of greenhouse gas emission reduction measures in the waste sector. Deadline: 2023.

- The preparation and adoption of a legislative regulation on rules and procedures for the treatment of waste electrical and electronic equipment (WEEE) and the use of products derived from it. Deadline: December 2021.

- Initiatives should be taken to integrate sustainable development and the circular economy into primary and secondary education, either as a cross-curricular subject in certain subjects or as a separate subject. Deadline: 2022.

Low-carbon development strategy of the Slovak Republic for 2030–2050

An essential part of the vision is the horizon for the next strategic decade, which is key to achieving the 2030 climate and energy targets. It is also a key fact for Slovakia that, if no further action is taken, Slovakia will not reach the 2050 climate neutrality target. The projected emission residual is likely to be 14 MtCO2eq (carbon dioxide equivalent), which represents 80%.

If Slovakia were to decarbonise its economy in the way modelled in the scenario with additional WAM measures (the World Bank's conservative estimate is a 70% reduction in total emissions compared to 1990) under the cooperation project with the World Bank, the additional costs up to 2030 would amount to €8 billion over the whole decade.

Between 2031 and 2050 (i.e., over the next two decades), the projected costs are €196 billion more than in the reference scenario, so the average annual additional expenditure is 1.8% of GDP until 2040 and 4.2% of GDP on average per year between 2020 and 2050.

This assumes a reduction of at least 90% compared to 1990 (excluding sinks), which would mean achieving climate neutrality by 2050. Therefore, even the most ambitious decarbonisation costs would be significantly higher than the costs quantified in this strategy. The models used did not take this scenario into account, and this is one of the challenges for the future update of this strategy, which will also take into account the forthcoming EU climate neutrality strategy.

According to internal estimates of the Ministry of Finance in cooperation with the Permanent Representation of the Slovak Republic to the European Union and estimates of the Ministry of Economy and Monetary Affairs, €9.9–10.5 billion could be available for climate change action in the medium term up to 2030 from the EU budget (this figure includes only the budget up to 2027), the Modernisation Fund and the Environmental Fund. This does not include other possible funding for potential projects from the Innovation Fund. (https://www.minzp.sk/klima/nizkouhlikova-strategia/)

According to internal estimates of the Ministry of Finance of the Slovak Republic in cooperation with the Permanent Representation of the Slovak Republic to the European Union, the Slovak Republic will have €42–45 billion available for climate change measures in the long term between 2027 and 2050 from the EU budget alone, not taking into account other national and European sources.

Consistent horizontal implementation of measures in line with the mid-century climate neutrality goal and in line with this strategy will be ensured by the Slovak Government's Council for a European Green Deal and Low Carbon Transition. This horizontal coordinating body at the highest level will be endorsed together with the strategy, a sign that Slovakia is taking the low-carbon transition seriously.

The Low Carbon Strategy 2030–2050 of the Slovak Republic aims to outline a comprehensive long-term (30-year) strategic vision for the transition to a low-carbon economy, culminating in climate neutrality in 2050. The strategy sets out the key policies and actions that will lead to the achievement of the Paris Agreement's headline target of limiting the global temperature increase by the end of the century.

The low-carbon strategy aims to select and analyse cost-effective measures in terms of the scale of emission reductions and the economic and social impact.

At the European Council in December 2019, all Member States signed up to the EU's climate neutrality target for 2050, with some Member States (Sweden, Finland, Austria) opting for even more ambitious national targets. In December 2019, the European Commission presented a detailed roadmap of the key policies and measures needed to achieve climate neutrality in the European Green Deal. This agreement has become a central agenda document for the whole European Community. The agreement sets out a roadmap of key policies and actions on a range of issues, from ambitious emission reductions to investing in cutting-edge research and innovation, to transforming industry, the economy and agriculture as a whole, to protecting Europe's natural environment. The agreement also calls for a review of the above-mentioned EU emissions reduction target of -40% by 2030 (the European Commission proposes a target of -50% or -55%).

Based on the energy and macroeconomic modelling (energy sectors such as households, industry, energy and services where fuels are burned) summarised in the Low Carbon Study, as well as domestic projections and expert estimates (non-fuel burning sectors), it is estimated that Slovakia could reduce emissions by up to 80% in 2050 (compared to 1990) if all additional modelled measures are implemented. If the maximum possible LULUCF removals were taken into account, a reduction of up to 90% compared to 1990 could be calculated, which would still not be sufficient to reach the climate neutrality target. Without taking into account LULUCF removals, there would still be at least 14 MtCO2eq in 205015 (Figure 6), and at least 7 MtCO2eq after accounting for removals.

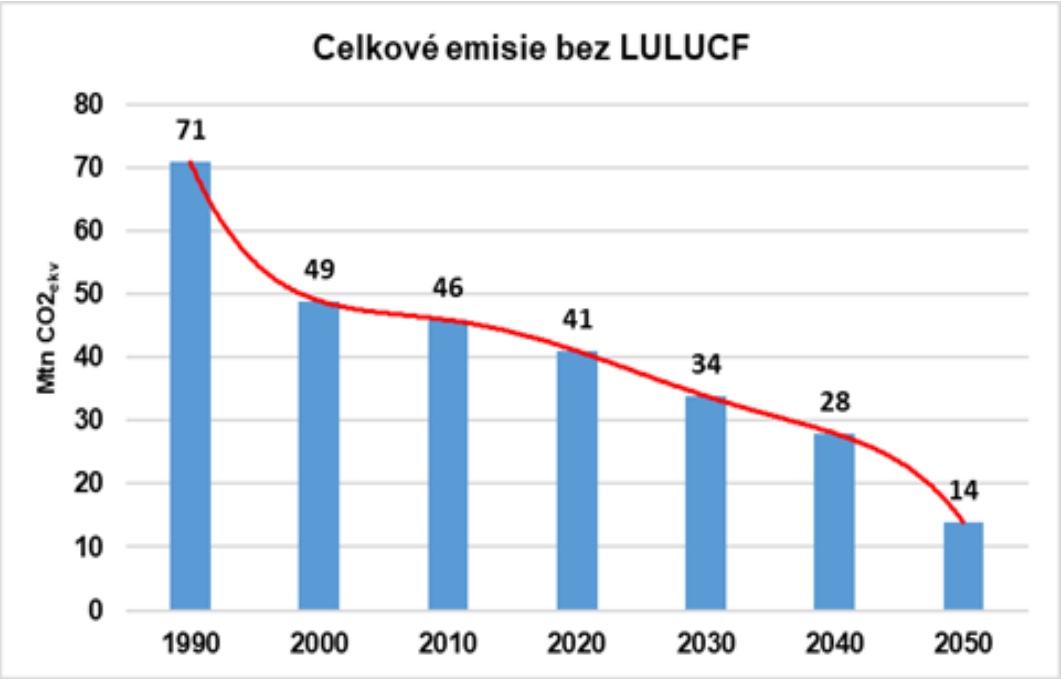


Figure 6: Estimated trajectory of emission reductions up to 2050, including historical emissions, based on domestic projections and historical emissions and expert estimates from the Ministry of Environment of the Slovak Republic

Source: SHMÚ projections (up to 2040) and after 2040, expert estimates by the Ministry of Environment of the Slovak Republic, projections based on data used in the Slovak CGE model and CPS.

Note: Total emissions are total GHG emissions excluding LULUCF in MtCO2eq.
LULUCF = Land use, land-use change and forestry

This 80% or 90% reduction is not automatic and will require investment and changes in the economy and in the behaviour of the population.

The national targets for 2030 are based on the European targets, and for the overall reduction target, it is a collective EU-wide target, whereas Slovakia does not have a national target. In the context of climate policy, the main legislative instruments are the Directive establishing a scheme for greenhouse gas emission allowance trading within the European Union (EU ETS) and the Regulation on annual binding specific greenhouse gas emission targets (EU ETS) for the period 2021–2030 for sectors of the economy not covered by the EU ETS.

Slovakia has not set indicative milestones until 2040, and as part of the strategy update, all scenarios in the strategy that are modeled only for the final year 2040 will need to be updated and completed by 2050.

Table 1: Targets for 2030 - EU, national (Slovak Republic) and targets from/used

in WEM reference and WAM scenarios

	EU targets	National objectives of the SR	Targets used in the WEM reference scenario and GHG reductions achieved	Targets used in the WAM scenario and SP reductions achieved
Greenhouse gases (from 1990)	**Minimum -40%**		**-41% (model reduction)**	**-47 % (model reduction)**
Emissions in the ETS sector (from 2005)	**- 43 %**	**- 43 % [1]**	**-38.4% (CO2 reduction only)**	**-53.5% (CO2 reduction only)**
Greenhouse gases outside the ETS sectors (so-called non-ETS, k r. 2005)	**- 30 %**	**-12 % (-20%) [2]**	**-10% (resulting reduction according to the model)**	**-19.42 % (the result cuts models)**
Share on renewable energy sources (RES)	**32**	**19.2%**	**14.3 %**	**18.9 %**
Energy efficiency	**32.5 %**	**30.3 %**	**25 %**	**28.36 %**

Notes 1 and 2: The national targets were set in the 2030 Environment Strategy adopted in February 2019. WEM: Scenario with existing measures, WAM: Scenario with additional measures

An indicative milestone is set as a target for the strategy to achieve climate neutrality in the Slovak Republic by 2050. This target will also be enshrined in European law in 2020 (the European Commission will propose this in the European Green Deal).

Current emission reduction trends in the waste sector

The inventory of emissions from the waste sector includes direct (CH4, CO2, N2O) and indirect (NMVOC) emissions of greenhouse gases. Methane emissions are generated from solid waste landfills, biodegradable waste recovery, incineration and wastewater treatment processes. Incineration is the main source of CO2. N2O is produced during biological treatment of waste and wastewater treatment.

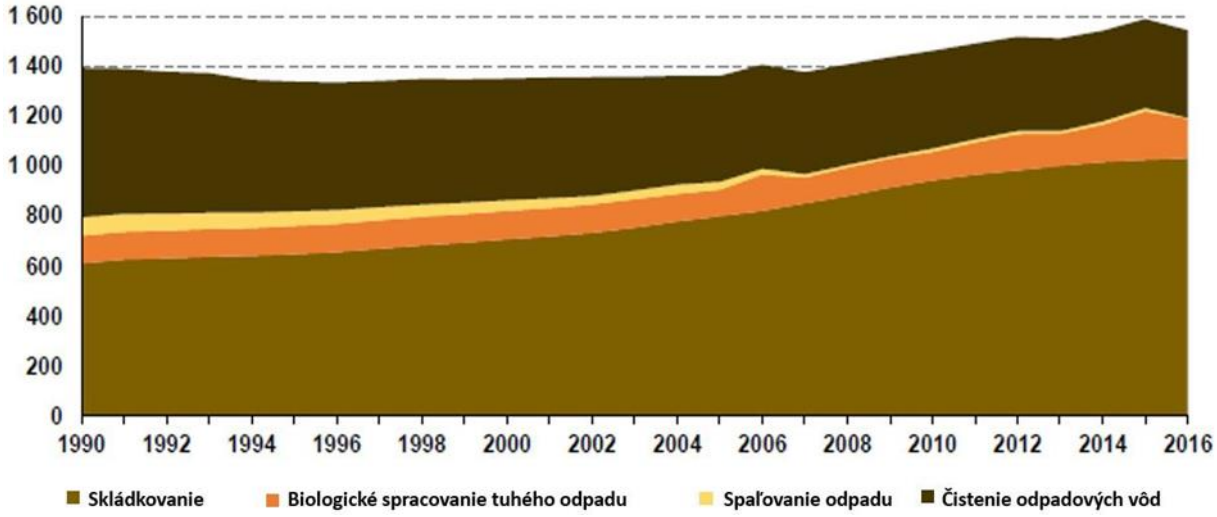


***Figure 7*: Evolution of total GHG emissions from the waste sector 1990-2016 (Gg CO2 equivalent) - by category**

Source: SHMÚ (Slovak Ministry of Environment)

Total CO2 equivalent emissions in 2016 were 1483.80 Gg, an increase of 11% compared to 1990 and a decrease of 3% compared to 2015, due to a reduction in bio-waste and waste incineration. The increase in emissions from waste disposal was offset by a decrease in emissions from wastewater treatment, while biological treatment and incineration had little impact on the overall balance of the sector.

The projections for emissions from the waste sector up to 2040 focus on activities in the municipal waste management and municipal waste water treatment sectors. These two main emission sources account for more than 80% of the estimated emissions from the waste sector.

The Reference Scenario (WEM) is based on the expectation that municipal waste management will continue to evolve as it has over the past decade. This development is characterised by the organisation of waste collection at the municipal level and an increase in the separation of recyclable materials or waste components, with landfilling as the main method of waste disposal. This development is based on the Waste Management Programme of the Slovak Republic for 2019–2025.

The assessment of the concrete measures for the interim implementation of the objectives and actions of the Waste Management Programme of the Slovak Republic 2016–2020 has shown that most of the original objectives have not been achieved. It can be assumed that in order to achieve the above objectives, existing incinerators will continue to increase their operation steadily up to their full capacity, i.e., 285 kt/y.

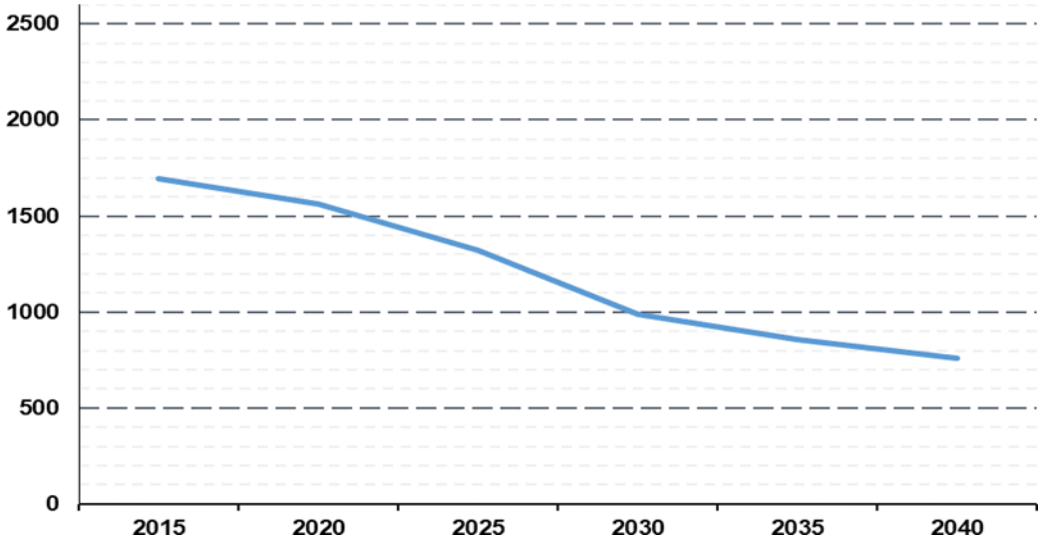


Figure 8: Projections of CO2 equivalent emissions (Gg) from the waste sector under the WEM scenario (same as WAM) up to 2040.

Source: SHMÚ

Proposed actions:

- *Increased support for the circular economy*:

  - Eco-design focused on reuse, durability, recyclability, recycled content and repairability;

  - Measures to increase resource efficiency;

  - Supporting the development of new business models based on sharing, lending or repair;

  - Reduce food waste (e.g., food can be recycled, either by donating non-perishable or past its expiry date to charity, composting, energy or other uses);

  - Waste prevention;

- Make the use of certified recycled products mandatory if they are equivalent to products made from non-renewable raw materials (e.g., at least 30%);

- The obligation to reuse purified water from waste water treatment plants, purified process water, in particular for energy purposes; water-steam applications.

- *The prevention of illegal dumping must be made more effective.*

- *Improving the selective collection of biodegradable components of municipal waste for the production of biogas from waste (e.g., from biodegradable waste and waste from waste water treatment plants), for the land application of digested material, for subsequent conversion into biogas/biomethane (e.g., for subsequent use in transport or injection into the distribution system) and for the production of electricity and heat from biogas/biomethane.*
- *Supporting SMART solutions for cities' technical services to streamline waste management.*
- *Optimisation of waste management logistics at the municipal level.*
- *The need to educate, raise awareness and inform the public about the need for further action in this sector.*
- *When updating the strategy, consider introducing a reduction target for the whole waste sector (either for 2030, 2040, or 2050), consistent with the 2050 climate neutrality target.*

STATISTICAL BACKGROUND

The European Union directives

The Waste Management Programme of the Slovak Republic is an important strategic document for waste management in the Slovak Republic for the period 2021–2025. It has been developed in line with the requirements for sustainable growth presented in the EU Action Plan for the Circular Economy published on 2 December 2015, the European Green Deal published on 11 December 2019, and the new EU Action Plan for the Circular Economy published on 11 March 2020. The content of the Waste Framework Directive of the Slovak Republic complies with the requirements of EU and Slovak legislation, in particular Act No. 79/2015 on waste and amendments and supplements to certain acts (hereinafter referred to as the Waste Act), as amended, and Decree No. 371/2015 of the Ministry of Environment of the Slovak Republic, which implements certain provisions of the Waste Act, as amended.

The Waste Act has been amended several times since its entry into force on 1 January 2016. Act No. 460/2019 amending the Waste Act is a particularly important amendment for the preparation and content of the Waste Framework Directive of the Slovak Republic. The main reason for the amendment is the transposition of the Waste Package, which had to be brought in line with the following amended EU Directives:

- Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste;

- Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste;

- Directive (EU) 2018/849 of the European Parliament and of the Council of 30 May 2018 amending Directive 2000/53/EC on end-of-life vehicles, Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators and Directive 2012/19/EU on waste electrical and electronic equipment;

- Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste.

The Waste Management Programme of the Slovak Republic for the period 2021–2025 is the sixth national programme setting out the basic requirements, objectives and measures in the field of waste management. It is based on the evaluation of the previous Waste Management Programme of the Slovak Republic for the period 2016–2020 and on the analysis of the current situation and needs of waste management in the Slovak Republic.

The structure of the Waste Framework Directive 2021–2025 of the Slovak Republic complies with the requirements of Article 28 of Directive 2008/98/EC of the European Parliament and of the Council on waste and repealing certain Directives (hereinafter referred to as the Waste Framework Directive), as amended.

Slovak data

Table 2: Structure of municipalities by population in the Slovak Republic (2018)

Number of inhabitants (village size)	Number of settlements
0 – 199	404
200 – 499	720
500 – 999	760
1 000 – 1 999	570
2 000 – 4 999	301
5 000 – 9 999	63
10 000 – 19 999	34
20 000 – 49 999	28
50 000 – 99 999	8
100 000 +	2
Total	**2890**

Source: Statistical Office of the Slovak Republic

Table 3: Distribution of land in the Slovak Republic (2018)

Type of land	% of area
Agricultural land	48.52
Forest land	41.32
Water areas	1.94
Built-up areas	4.85
Other areas	3.37
Total area	**100.00**

Source: Statistical Office of the Slovak Republic

The territory of the Slovak Republic is divided into 5 environmental quality categories according to environmental regionalisation. Comparing the situation in the five years 2010–2015 with the situation in 2016, there is a slight increase of about 2.3% in the regions with undisturbed environment. The increase in the number of regions with an undisturbed environment is due to environmental protection measures, the support given to the regions by the Environment Operational Programme for the period 2010–2015 and changes in environmental legislation.

Table 4: Regional differentiation by environmental quality (2016)

Environmental quality	Area (km)^2	% of the SR area
1 - undisturbed environmental regions	24 104	49.2
2 - moderately disturbed regions (satisfactory)	19 515	39.8
2 - regions with a disturbed environment	447	0.9
2 - severely environmentally degraded regions	640	1.3
3 - regions with a highly disturbed environment	4 328	8.8

Source: Statistical Office of the Slovak Republic

Table 5: Slovak GDP 2015–2018

Year	2015	2016	2017	2018
Slovakia's GDP in billion euros	79.1	81.2	84.9	89.4
GDP per capita in euro, current prices	14 591	14 957	15 600	16 410

Source: Statistical Office of the Slovak Republic

The Waste Management Programme of the Slovak Republic is the starting document for the development of regional waste management programmes for the period 2021–2025.

Waste generation and treatment are monitored using the RISO (Regional Waste Information System) system, which has been operational since 1995. Data for the RISO system is collected at the workplaces of the district offices through the environmental departments, which are the main data entry points for the RISO system. This data collection is based on the processing of declarations from waste producers and waste management service providers under the Waste Act.

The basic implementing regulation on the keeping of records on waste generation and management and on the fulfilment of reporting obligations is currently Decree of the Ministry of Environment of the Slovak Republic No. 366/2015 on the obligation to keep records and to report, as amended. The division of waste into different types is laid down in Decree of the Ministry of Environment of the Slovak Republic No. 365/2015 Coll, which establishes the Waste Catalogue based on the European Waste Catalogue.

Since 2005, data on the generation and treatment of municipal waste (waste group 20 according to the Waste Catalogue) have been collected free of charge on the basis of surveys carried out by the Statistical Office of the Slovak Republic in accordance with the interministerial agreement between the Ministry of Environment of the Slovak Republic and the Statistical Office of the Slovak Republic.

The Slovak Republic generated an average of 11.2 million tonnes of waste per year between 2014 and 2018. Since 2014, waste generation has increased in all monitored sectors, i.e., both the municipal and industrial sectors.

Table 6: Total waste generated in the Slovak Republic in 2014–2018 (t)

Waste category	2014	2015	2016	2017	2018
Municipal waste	1 830 1674	1 888 456	1 953 478	2 136 952	2 325 178
Other industrial waste	6 844 484	8 271 717	8 228 893	9 713 734	10 655 334
Industrial hazardous Waste	379 006	403 225	488 883	401 495	497 524
Total	**9 053 657**	**10 563 398**	**10 671 254**	**12 252 182**	**13 478 035**

Source: Statistical Office of the Slovak Republic

The negative trend in waste management continued between 2014 and 2018, with landfills still accounting for a significant share. On average, 3.7 million tonnes of waste are landfilled each year, although a slight decrease was observed in 2018. However, this may be due to an increase in the amount of waste reported under other activities, which represent an intermediate step in the material waste stream. In 2018, up to nearly 4 million tonnes of waste were reported under other waste management codes, showing a continuing trend compared to the previous period.

Table 7: Total waste management in the Slovak Republic 2014–2018 (t)

The way of loading	2014	2015	2016	2017	2018
Landfill	3 776 454	3 933 537	3 789 477	3 830 389	3 352 292
Other disposal	537 830	443 759	379 196	405 034	313 079
Combustion without energy conservation	59 944	47 321	36 342	47 109	40 857
Waste incineration with energy recovery	313 464	323 288	557 795	740 520	569 321
Other uses	775 252	675 958	366 038	336 403	273 159
Material recovery (recycling)	3 285 341	4 753 047	3 707 808	3 846 904	3 721 477
Other loading	305 372	386 488	1 462 130	2 973 460	3 951 851
Use of waste for landscaping			372 468	72 362	1 256 000
Total	**9 053 657**	**10 563 398**	**10 671 254**	**12 252 182**	**13 478 035**

Source: Statistical Office of the Slovak Republic

Since the 2004 reference year, EUROSTAT has collected comprehensive data every two years on waste generation and treatment in the EU Member States and other countries. In order to compare the level of waste management between countries, EUROSTAT maintains a separate indicator that presents data on the amount of waste generated, excluding so-called "mineral waste". These wastes are different waste streams with specific characteristics that, because of the quantities generated, tend to overlap with waste generation and treatment trends. Therefore, for the purpose of comparing waste management, a separate waste group is maintained that excludes mineral waste, which includes, for example, mineral construction and demolition waste, excavated soils and aggregates, and other types of mineral waste. The exclusion of these wastes significantly reduces the range of waste generated but increases the sensitivity and comparability of the indicators between countries.

Excluding mineral waste, 900 million tonnes of waste are generated in EU countries every year. The Slovak Republic produces 8 million tonnes of waste per year. The comparative indicator for waste generation is the production indicator in kg/tonne. The average EU citizen generates 1.7 tonnes of waste per year; the Slovak citizen, with an annual production of 1.5 tonnes is, among the EU average.

The indicators used by the EU to monitor the performance of Member States in the circular economy are based on six recycling indicators in the area of waste management. One of these is the recycling of all waste (i.e., industrial and municipal waste) except for some mineral waste.

Recycled waste includes waste sent for recovery other than energy recovery or backfilling. The waste data are adjusted for waste collected in one country and recycled in another. The indicator includes hazardous waste and other waste categories from all economic sectors and waste from households, including waste from waste treatment, but excludes most mineral waste. Major mineral wastes are excluded to avoid that trends in conventional waste generation are dampened by large fluctuations in waste generation in the extractive and mineral processing sectors.

According to this circular economy indicator, the Slovak Republic ranks 18th among EU Member States with a recycling rate of 44%. Of the V4 countries, only Hungary has a worse overall waste recycling rate, with the Czech Republic in 9th place and Poland in 11th. The best recycling country is Slovenia, with a recycling rate of 80%.

An important indicator of the state of waste management and the application of the waste hierarchy is the level of landfilling. Compared to recycling, this gives a different picture of the level of waste management in the context of European sustainable development policy, although the overall data on landfilling is somewhat biased. Outside the municipal sector, landfilling is strongly influenced by the structure of the national economy. However, excluding mineral waste makes landfilling data more comparable. Slovakia ranked 21st (47% of waste landfilled) among EU countries for this indicator in 2016. The country with the lowest landfill rate for this indicator is Denmark, where 3% of the waste generated was landfilled. Estonia is the worst performer, with 83% of waste landfilled.

To identify the causes of the high rate of landfilling, it is necessary to analyse the main sectors of the economy that contribute most to this negative waste management phenomenon. The main waste streams involved in landfilling are municipal waste, in particular mixed waste (MSW; see below in Chapter 2.2 on municipal waste), and large waste. Municipal waste accounts for 40% of the total landfilled waste.

Another major producer of waste going to landfills is the electricity and steel industries. These are various types of waste, such as blast furnace slag, ash, slag, etc. These three main industries together account for 81% of all waste landfilled, and diverting them from landfills is one of the biggest challenges for waste management in reducing landfills. Given the diversity of waste generated in the economy, some of which cannot be recycled or reused for energy purposes, municipal waste is the most important waste stream that can move the Slovak Republic towards more positive results in waste management.

Hazardous waste

Hazardous waste is waste that has at least one hazardous characteristic. The list of hazardous properties is contained in Commission Regulation (EU) No. 1357/2014 of 18 December 2014 replacing Annex III to the Waste Framework Directive. The Regulation identifies 15 waste properties that should be considered hazardous. The largest waste streams are chemicals, which account for 51% of all hazardous waste generated. Waste oil is the second largest (9%) and construction waste is also significant (6%).

Table 8: Hazardous waste generation in the Slovak Republic 2014–2018 (tonnes)

Waste group	2014	2015	2016	2017	2018
Chemical waste	191 284	216 533	208 931	212 657	292 107
Tired oils	33 860	29 060	33 495	29 880	47 132
Health and veterinary waste care	12 683	9 445	16 194	17 078	21 637
Recyclable waste	221	62	130	55	89
Waste containing PCBs	12	19	18	14	11
Old vehicles	1 548	991	34 736	33 271	30 284
Discarded electrical and electronic Facilities	9 033	6 864	6 834	6 521	8 065
Scrapped parts of machinery and equipment	2 758	3 326	4 779	7 259	12 948
Mixed waste	4 303	3 992	3 854	4 479	7 346
Construction and demolition waste	14 937	17 426	23 078	29 821	30 353
Other mineral waste	6 062	6 254	4 941	12 422	13 967
Waste from incineration	20 551	43 940	33 479	38 566	22 050
Soils	75 421	61 707	116 368	12 775	6 575
Waste from waste management	5 720	3 944	5 271	2 750	6 719
Solidified or stabilised Waste	5 989	5 238	3 939	3 003	12 798
SUMMARY	**384 381**	**408 799**	**496 047**	**410 551**	**512 081**

Source: Statistical Office of the Slovak Republic

The biggest emitters of hazardous waste are the steel industry, transport, the automotive industry, the production of fertilisers and nitrogen compounds, and the health sector. The treatment of end-of-life vehicles and hazardous waste management activities contribute significantly to the generation of hazardous waste.

As regards the management of hazardous waste, the number of activities reported under "other treatment" increased significantly in 2018. In absolute terms, landfilling of waste is about the same as material recovery. Incineration of hazardous waste without energy recovery has decreased significantly (almost halved) compared to the previous year.

Municipal waste

Despite the fact that municipal waste accounts for only a small proportion of total waste generation, it is the one that receives the most attention. One of the main reasons for this is that the collection and treatment of municipal waste is generally the responsibility of the public sector.

In its third assessment of the European environment (2), the European Environment Agency (EEA) states that "in most European countries, the total amount of waste continues to increase."

The definition of municipal waste is the most important of all waste streams for analysing generation, assessing trends, planning infrastructure and setting waste policy objectives. A misunderstanding of the concept of "municipal waste" can have negative economic consequences for the planning of treatment capacities and the achievement of European targets for recycling and landfill reduction.

The adoption of a common definition of municipal waste was therefore one of the main challenges in the adoption of the new "waste package" following the EU's Circular Economy Action Plan.

In view of the amendment of the Waste Framework Directive, Act No. 460/2019, amending the Waste Act with effect from 1 July 2020, also changed the definition of municipal waste. The new definition of municipal waste is broader, as it no longer includes the definition "except for waste resulting from the direct carrying out of activities that constitute the business or activity of a legal person or natural person-entrepreneur". According to Article 80(1) of the Waste Act, municipal waste is defined as:

a) „Mixed waste and separately collected household waste, including paper and cardboard, glass, metals, plastics, biodegradable municipal waste, timber, textiles, packaging, waste electrical and electronic equipment, used batteries and accumulators, and large waste, including mattresses and furniture;

(b) Mixed waste and separately collected waste from other sources, if the nature and composition of such waste is similar to household waste."

The term "mixed waste" in the Waste Act has replaced the long-standing term "mixed municipal waste", but the definition has not changed. The term "mixed municipal waste", with

catalogue number 20 03 01, has been retained in the Waste Catalogue. In practice, both terms mean the same waste.

They also adopted a negative definition of municipal waste, i.e., what is not defined as municipal waste. Municipal wastes do not include production wastes, agricultural, forestry and fisheries wastes, wastes from septic tanks, sewage networks and sewage treatment plants, including sewage sludge, old vehicles, construction wastes and demolition wastes.

The amendment to the Waste Act also introduces the concept of household waste.

One of the objectives of the European Union's waste policy is to reduce waste as part of the overall goal and to decouple economic growth from resource use and environmental impacts. Municipal waste generation is therefore an indicator of the circular economy. The Slovak Republic is one of the countries with a lower rate of municipal waste generation.

Municipal waste generation continued to grow in 2018, when it exceeded 2.3 million tonnes. Just like in 2017, metals accounted for the largest share of the increase in municipal waste generation. The volume of separated components also increased. Municipal solid waste and bulk waste generation increased only slightly. Therefore, it is necessary to illustrate the trend in municipal waste generation and to identify the important municipal waste streams that have experienced an actual increase.

On average, a resident in Slovakia generated 427 kg of municipal waste in 2018. This figure includes municipal waste after deduction of small construction waste, which is not tracked by EUROSTAT statistics and is a national specificity. On average, a citizen in Slovakia generated 434 kg of municipal waste in 2018, including small construction waste. Compared to the average of the EU28 Member States, the Slovak Republic achieves a level of 85% in municipal waste generation.

The recycling of municipal waste is an indicator of the circular economy. As regards the difficulties in meeting the targets set in the Waste Framework Directive, recycling targets are the biggest challenge for most EU Member States, including the old Member States.

In order to meet the requirements of the Waste Framework Directive and move towards a circular economy in Europe with a high level of resource efficiency, Member States have had to take the necessary measures to achieve the target set in this area. This means that for the Slovak Republic, the target was also to "increase the preparation for reuse and recycling of waste from household waste, such as paper, metal, plastic and glass, and, where possible, from

other sources, to at least 50% by weight by 2020, provided that these sources contain waste similar to household waste".

Directive 2018/851/EC of the European Parliament and of the Council amending the Waste Framework Directive sets progressively stricter targets for Member States for 2025, 2030 and 2035. The Directive allows Slovakia to postpone the deadline for reaching the targets by five years.

Despite low recycling rates, SR has made significant progress in recent years. With a recycling rate of 36%, it ranks second among the V4 countries, just behind Hungary. Germany has long been a leader in the recycling of municipal waste and is the only country to already meet the Waste Directive's 65% recycling target for 2035.

In the Slovak Republic, municipalities are obliged to introduce separate collection of municipal waste, at least for paper, plastic, metal, glass, and composite packaging materials, and biodegradable municipal waste, except for waste generated by kitchen operators. The municipality is also obliged to ensure separate collection of bulk waste, small construction waste, and waste containing harmful substances. Nevertheless, the separate collection of municipal waste is considered to be insufficient, and many municipalities do not fully comply with the legal obligation.

For completeness, it should be added that the obligation to introduce separate collection of biodegradable household waste competes with a number of exemptions from this obligation, which ultimately have a negative impact on the introduction of separate collection of biodegradable municipal waste in municipalities.

From 2023, municipalities can only apply for an exemption from this obligation if they can prove that 100% of households compost their own waste.

The municipality may also, in cooperation with the producer of electrical equipment and the producer of portable batteries and accumulators, the producer responsibility organisation or a third party, arrange for the separate collection or sites for the separate collection of e-waste and used batteries and accumulators. In cooperation with the distributor, it may organise the collection of waste tyres or provide a separate collection point for waste tyres.

Table 9: Evolution of separate collection of municipal waste components in the Slovak Republic

Waste type/waste stream	2014	2015	2016	2017	2018
Paper and cardboard (t)	63 201	67 088	72 557	86 400	105 332
Glass (t)	50 227	53 518	55 984	62 085	66 251
Plastics (t)	31 568	34 658	36 123	44 386	49 795
Metals (t)	17 803	30 833	110 269	219 591	347 275
Total (4 "dry ingredients") (t)	**162 799**	**186 097**	**274 934**	**412 461**	**568 653**
Biodegradable waste (t)	131 094	147 012	166 344	199 415	233 608
E-waste[1)] (t)	7 588	8 172	11 098	12 064	15 544
Used batteries and accumulators[2)] (t)	422	454	920	2 869	7 299
Clothing and textiles (t)	3 100	4 008	4 507	3 413	3 416
Total of all ingredients (t)	**305 003**	**345 744**	**457 803**	**630 223**	**828 521**

Source: Statistical Office of the Slovak Republic

The costs of the separate collection of components of municipal waste other than WEEE are covered by the municipality from the local charges levied on municipal waste and construction waste.

The Slovak Republic has adopted a number of measures to improve the separate collection of municipal waste. In 2018, Act No. 329/2018 on the amendment and supplementation of Act No. 587/2004 on waste disposal fees and the Environmental Protection Fund (hereinafter the "Fees Act") was adopted with effect from 1 January 2019. The aim of the Act is to make landfilling, which is the last in the waste management hierarchy, less attractive, to create incentives for the selective collection of municipal waste and to increase the recycling of municipal waste. The new fees for the disposal of WEEE and large waste, set by Government Decree 330/2018, will depend on the level of municipal waste collection in the municipality.

The preparation and adoption of the new law on charges is the result of a number of activities at Slovak and EU level, through which the Ministry of Environment of the Slovak Republic has long been warning, among other things, about the high rate of waste going to landfills and the low charges for landfilling.

At the European Commission level, this is the "Early Warning Report for Slovakia," published on 24 September 2018, in which the Commission warns of the risk that Slovakia will not be able to meet its municipal waste targets (as set out in EU law and the Waste Act) by 2020.

PLANS OF THE WASTE MANAGEMENT PROGRAMME OF THE SLOVAK REPUBLIC ON SPECIAL WASTE

Objectives and measures on hazardous waste

Hazardous waste is a significant waste stream, particularly in terms of its origin, characteristics and subsequent treatment. They are generated in various industrial sectors, but also in the municipal sector, e.g., asbestos-containing wastes, hazardous wastes from paints, varnishes, solvents, etc. file:///C:/Users/Owner/Documents/Szlov%C3%A1k%20szem%C3%A9t/poh_sr_2021_2025_vestnik.pdf.

Household hazardous waste should be collected separately in order to avoid contamination of municipal waste with hazardous waste components that could reduce the quality of recycling and to ensure environmentally sound management of this hazardous waste.

In this context, there are already specific obligations for the collection of electrical and electronic equipment and waste batteries and accumulators from households. In 2018, the majority of hazardous waste generation in the Slovak Republic came from chemicals, while other groups accounted for a much smaller share of hazardous waste generation. Only about 17% of hazardous waste was materially recycled in 2018, but up to 45% of hazardous waste was reported as "other treatment". The proper management of hazardous waste is also a problem in the EU and data on its management is partly lacking.

In the Slovak Republic, only partial data are available due to the lack of monitoring of material flows. Therefore, it is necessary to establish an electronic register of hazardous waste, thus strengthening the mechanisms for registration and traceability.

Pending the improvement of the inventory, the focus should be on the available options for the management of hazardous waste in the Slovak Republic, and in particular on promoting environmentally sound management of hazardous waste. Raising awareness about the hazardous properties of hazardous waste for the environment and human health is very important, and it is therefore necessary to raise the awareness of the population of the Slovak Republic about the hazardous properties of hazardous waste and its proper management. Due

to the characteristics of certain categories of hazardous waste generated by industry that cannot be materially recovered (the whole process of material recovery would be energy-intensive and have a negative impact on the environment), attention should also be paid to the modernisation of existing facilities or the construction of new facilities exclusively for the energy recovery of hazardous waste that meet the highest environmental standards.

Target for 2025: Increase the amount of hazardous waste recovered in the Slovak Republic. *Measures:*

- Identify reporting gaps in the management of hazardous waste.
  Responsible: Ministry of Environment of the Slovak Republic.
  Deadline: December 2022.
- Promote research, development and innovation in new technologies to reduce hazardous substances in value cycles and in new technologies for hazardous waste management.
  Responsible: the Ministry of Education, Science and Higher Education of the Slovak Republic, the Ministry of Economy in cooperation with universities and colleges, scientific research institutions and the business sector.
  Deadline: ongoing.
- An analysis of hazardous waste treatment facilities in the Slovak Republic and neighbouring countries, including sanitary and veterinary waste, depending on the origin and characteristics of this waste, and the capacities required for the functional use of the facilities in each region, depending on the amount and nature of the waste.
  Responsible: the Ministry of Environment of the Slovak Republic in cooperation with the relevant associations of waste producers and processors.
  Deadline: December 2022.
- Developing a strategic plan for the disposal of hazardous waste facilities at regional level, taking into account needs and capacities, in line with the results of action O.63.
  Responsible: the Ministry of Environment of the Slovak Republic in cooperation with the relevant associations of waste producers and processors.
  Deadline: within 12 months of the end of the analysis under this measure.
- Support for the financing of BAT-compliant hazardous waste treatment technologies.
  Responsible: Ministry of the Environment, Ministry of Economy, depending on the electoral lines. Deadline: ongoing.

Objectives and measures for electrical equipment and waste

Separate collection is a prerequisite for ensuring specific treatment and recycling of WEEE and is necessary to achieve the required level of protection of human health and the environment.

Consumers should actively contribute to the success of separate waste collection. One of the main tools for e-waste collection is a system that allows e-waste to be transferred in several ways, either in a collection yard, through take-back or mobile collection. Very small e-waste (up to 25 cm) is collected in containers placed in office buildings or other suitable locations. On the negative side, producer responsibility organisations do not carry out sufficient and effective information campaigns on e-waste collection.

Further legislative developments in the European Union are expected to follow the new EU Action Plan for a Circular Economy, published under the title "*Towards a cleaner and more competitive Europe"*.

To address the current challenges, the Commission *will present an Electronics in the Circular Economy initiative* to activate existing and new instruments.

In line with the new sustainable product policy framework, the initiative will promote, for example, longer product life cycles, durability, repairability and upgradability. However, the implementation of these new measures may have an impact on the e-waste collection target. The current recycling industry is not designed and optimised to recover critical raw materials, which are typically found in small concentrations in complex structures. Nevertheless, some critical raw materials are recovered, but losses are high at the various stages of collection and processing. This should be addressed, and an effective mechanism for the recovery of critical raw materials from waste should be established, also following the Commission Communication COM(2020) 474 final on the EU inventory of critical raw materials in 2017. Therefore, more emphasis should be put on improving the collection, sorting, and recovery of waste containing significant amounts of critical raw materials.

Target for 2025:

The target for e-waste collection in 2021 and subsequent years is a weight equal to at least 65% of the average weight of electrical equipment put on the market in the Slovak Republic in the previous three years.

Table 10: Minimum recovery and recycling targets for e-waste

Category	Evaluation rate	Reuse preparation and recycling rates
1. Heat exchange equipment	**85 %**	**80 %**
2. Screens, monitors and equipment incorporating a screen with a surface area greater than 100 cm^2	**80 %**	**70 %**
3. Light sources	-	**80 %**(*)
4. Large equipment (any external dimension greater than 50 cm), including but not limited to: household appliances; information and communication technology equipment; consumer electronics; lighting equipment; audio or video reproduction equipment, musical equipment; electrical equipment	**85 %**	**80 %**
Electronic tools; toys, recreational and sports equipment; medical devices; control and regulating equipment; automatic machines; electrical power generating equipment. To do this Categories 1–3 do not include equipment in categories 1–3.		
5. Small appliances (external dimensions not exceeding 50 cm), including but not limited to: household appliances household devices; consumer electronics; lamps; sound or video reproducing apparatus, musical equipment; electrical and electronic tools; toys, leisure and sports equipment; medical equipment; control and monitoring apparatus; vending machines; apparatus for generating electricity. This category does not include equipment in categories 1, 3 and 6.	**75 %**	**55 %**
6. Small IT and telecommunication sequipment (external size not greater than 50 cm)	**75 %**	**55 %**

Source: https://vo.minzp.sk/files/sekcia-enviromentalneho-hodnotenia-riadenia/odpady-a-obaly/registre-a-zoznamy/poh_sr_2021_2025_vestnik.pdf

Measures:

- Assess the feasibility of introducing a unified information campaign system within the RHI.

Responsible: the Ministry of Environment of the Slovak Republic, in cooperation with the manufacturers of the reserved products, who fulfil their reserved obligations individually, in cooperation with ZMOS and IMS.

Deadline: December 2022-

Funding:

(a) Technologies for the treatment (preparation for re-use, recycling and recovery) of waste photovoltaic panels that meet BAT requirements;

(b) Technologies for the recovery of e-waste (e.g., plastics) for which there is no or insufficient capacity on the territory of the Slovak Republic;

(c) Projects for the construction (preparation for reuse, recycling, and recovery), or upgrading (preparation for reuse, recycling, and recovery) of existing e-waste treatment facilities, including critical raw materials, in compliance with BAT (Best Available Techniques).

Responsible: Ministry of the Environment, Ministry of Economy, depending on the electoral lines.

Deadline: continuous.

Targets for batteries and accumulators and used batteries and accumulators

In 2021, the European Union plans to adopt a new regulatory framework for batteries and accumulators and waste batteries and accumulators, based on an evaluation of the functioning of Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC, as amended.

The Directive thus reflects the current situation of batteries and accumulators and waste batteries and accumulators in the EU Member States, while responding to the rapid technological developments in the production of batteries and accumulators and their widespread use in everyday life. Under the new EU Action Plan for the Circular Economy, the new regulatory framework for batteries and accumulators and waste batteries and accumulators will focus on, among other changes and adjustments:

- New, stricter rules on recycled content and measures to improve collection and recycling rates for all batteries and accumulators;

- Ensuring the recovery of valuable materials, especially critical raw materials, and providing guidance to consumers;

- Dealing with non-rechargeable batteries and accumulators in order to phase out their use where alternatives exist;

- Sustainability and transparency requirements for battery and accumulator production, taking into account, for example, the carbon footprint, ethical sourcing of raw materials and security of supply;

- Promoting reuse and recycling;

- A more precise breakdown of battery and accumulator types;

- Batteries and accumulators used as power supplies in the automotive industry.

Target for 2025:

Adopt a new regulatory framework for batteries and accumulators through appropriate waste management legislation.

For used batteries and accumulators, the minimum recycling efficiencies required by the European Union must be achieved:

(a) An average of 90% by weight of lead-acid batteries and accumulators, including the highest technically feasible recycling of lead content without excessive costs;

(b) An average of 75% by weight of nickel-cadmium batteries and accumulators, including the maximum technically feasible recovery of the cadmium content without excessive costs;

(c) 60%of the average weight of the other batteries and accumulators used;

for each battery and accumulator collected, to ensure that they are processed by an authorised processor on a continuous basis.

Measures:

- To adapt the management of batteries and accumulators and the framework to the conditions of the new regulatory framework for batteries and accumulators and used batteries and accumulators.

Responsible: Ministry of Environment of the Slovak Republic

Deadline: after the entry into force of the new regulatory framework for batteries and accumulators and spent batteries and accumulators.

- To raise citizens' awareness of the importance of collecting used portable batteries and accumulators.

Responsible: the Ministry of the Environment of the Slovak Republic in cooperation with producer responsibility organisations, producers fulfilling their obligations individually and third parties.

Deadline: ongoing.

- To support the financing of technologies for the advanced recycling and treatment of used batteries and accumulators used as propulsion units in the automotive industry that meet BAT requirements.

Responsible: Ministry of the Environment, Ministry of Health, depending on the electoral lines.

Deadline: ongoing.

- Support for research and development projects for the recycling and recovery of new types of batteries and accumulators that become waste, or used batteries and accumulators for which recycling and recovery are currently problematic.

Responsible: the Ministry of Education, Science and Higher Education of the Slovak Republic in cooperation with universities and colleges, research and development institutions and the business sector.

Deadline: ongoing.

Targets and measures for waste tyres

New management targets have been set for the period up to 31 December 2025 in the context of the continuing development of the scrap tyre sector.

Target for 2025:

- Reach a minimum recycling rate of 75% of waste tyres by 31 December 2025.
- Energy recovery rate of 24% of the total weight of tyres placed on the market.
- The possibility to dispose of waste tyres in other ways is set at a maximum of 1%.

Measures:

- Amend the definition of tyre manufacturer in the Waste Act to cover the scope of the Green Directive.

Responsible: Ministry of Environment of the Slovak Republic.

Deadline: following the amendment of the Waste Act

- To promote research, development, new technologies and innovation in the field of waste tyre management.

Responsible: the Ministry of Education and Science, the Ministry of Economy and Science, in cooperation with scientific research institutions, the business sector, universities and colleges.

Deadline: ongoing.

- Consider amending the concept of market share in the Waste Act.

Responsible: Ministry of Environment of the Slovak Republic.

Deadline: amendment of the waste law.

- Support for the financing of projects for the construction of recycling facilities for the treatment of waste tyres with a diameter of more than 400 mm or for the upgrading of existing recycling facilities to BAT.

Responsible: Ministry of Environment of the Slovak Republic.

Deadline: ongoing.

- Investigate the possibility of banning the landfilling of bicycle tyres and tyres with an outside diameter of more than 400 mm.

Responsible: Ministry of Environment of the Slovak Republic.

Deadline: amendment of the waste law.

Objectives and measures for construction and demolition waste

According to the European Commission's new EU Circular Economy Action Plan for 2020, the construction sector is responsible for more than 35% of all waste generated in the EU, greenhouse gas emissions account for 5–12% of total national greenhouse gas emissions and the construction sector also requires large amounts of primary raw materials.

In order to realise this potential, the European Commission plans to launch a new comprehensive strategy for a sustainable built environment and will consider setting targets for preparing for the re-use and recycling of construction and demolition waste and its various material components by 31 December 2024. Particular attention should be paid to insulation materials, which are generating an increasing waste stream.

Under the Waste Framework Directive, all EU Member States must take measures to promote selective dismantling to enable the removal and safe management of hazardous materials and facilitate re-use and recycling, while ensuring that sorting systems for construction and demolition waste are put in place.

In the coming period, the Slovak Republic should focus on increasing its preparation for the reuse and recycling of construction waste, which is not satisfactory, and on efforts to promote selective demolition.

Target for 2025:

Increase the readiness for reuse and recycling of construction waste to 70%, including backfilling.

Measures:

- Analysis of organic and non-organic carbon containing construction waste for recycling and recovery.

Responsible: the Ministry of Environment of the Slovak Republic in cooperation with the Ministry of Environment of the Slovak Republic.

Deadline: December 2023.

- Promote the financing of technologies/projects aimed at the reuse of construction waste into higher added value products using recycled raw materials. Do not support the financing of technologies for the shredding of construction and demolition waste.

Responsible: Ministry of Environment of the Slovak Republic.

Deadline: ongoing.

- Evaluation of the implementation of timber waste standards in the context of the waste hierarchy in relation to waste management activities.

Responsible: Ministry of Environment of the Slovak Republic.

Deadline: 2024 December.

Objectives and measures for packaging and non-packaging materials

The "waste package" sets new targets in this area for 2025 and 2030, which have been transposed into national legislation**.**

As an EU Member State, Slovakia must recycle at least 65% of packaging waste by 2025. The minimum recycling targets for each material in packaging waste are: plastics 50%, timber 25%, ferrous metals 70%, aluminium 50%, glass 70% and paper 75%.

These are feedstocks for which meeting recycling targets is currently not a problem, and they are significantly under-performing. In order to reduce WEEE and increase the sorting and

recycling rates of municipal waste, the collection and recycling of cardboard-based composite packaging could also be targeted as a specific target in the future.

It should be noted, however, that according to analyses carried out between 2016 and 2019 by the non-profit organisations Friends of the Earth - SPZ, the Institute for Circular Economy and JRK Slovensko s.r.o., around 28% of packaging and non-packaging waste is still generated in complex housing construction and around 26% in individual housing construction. There is a need to further reduce the number of landfills of this type of waste and to improve selective collection, especially at municipal level. At the same time, the recycling capacity for plastic waste should be reviewed in line with EU targets.

The RoHS system for packaging and non-packaging materials has undergone a number of changes since its introduction. Despite these legislative changes, there are systemic shortcomings. It is therefore appropriate to consider rebuilding the system in the context of its application practice.

The aim of RoHS is quite simple: to limit the use of the following ten hazardous substances and the maximum mass concentration allowed in homogeneous substances:

- Lead (0,1 %)
- Mercury (0,1 %)
- Cadmium (0,01 %)
- Hexavalent chromium (0,1 %)
- Polybrominated biphenyls (PBB) (0,1 %)
- Polybrominated diphenyl ethers (PBDEs) (0,1 %)
- Bis(2-ethylhexyl) phthalate (DEHP) (0,1 %)
- Butyl benzyl phthalate (BBP) (0,1 %)
- Dibutyl phthalate (DBP) (0,1 %)
- Diisobutyl phthalate (DIBP) (0,1 %)

Given the differences between the extended liability and the complexity of the system, it is therefore advisable to consider separating these reserved flows in a separate legal provision. This idea is also supported by the introduction of a deposit charge for disposable beverage packaging, which will have a significant impact on the separate collection of packaging and non-packaging waste and provide an appropriate opportunity to reform the functioning of the recycling system.

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