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PROPOSALS

Based on a comparison of waste management systems in Hungary, Slovakia, Romania and Ukraine

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АРР "ЗАКАРПАТТЯ"

CONTENT

PROPOSALS BASED ON HUNGARIAN EXPERIENCE AND GOOD PRACTICES

Based on Ukrainian data and available information, the country is currently at the same stage of preparation as Hungary was in the early 2000s. There is no uniformity in waste management systems, and there is no uniformity in the territorial coverage of public services. Many landfills are awaiting closure or review, depending on whether they remain or are closed and recultivated. However, there is a wealth of information available and available that characterises the transformation processes from the 2000s to the present, both in our country and in the Member States under review. In addition, the experiences, achievements and established systems of other Member States are available.

We can design the proposals in terms of what was, and hopefully soon will be, the ideal conditions for the pre-war and post-war period. The fact is that we do not know precisely and in advance the damage caused by the war, either to institutions, infrastructure, human losses or the waste disposal facilities that have been mentioned so far. Only in a period of peace will it be possible to develop appropriate waste management systems. In the recovery period and beyond, many issues remain to be clarified. We assume that sooner or later the country's accession to the European Union will also be on the agenda. This could have many benefits in terms of building up a proper waste management system.

The harmonisation of waste management legislation also reinforces this intention of the parties. As already mentioned, both in the Waste Management Law and in the materials that we have seen in this context (the National Waste Management Strategy and the National Waste Management Plan), the Ukrainian intention to move towards a circular economy is reflected.

This legislation shows a commitment to reducing waste generation, building a waste hierarchy, prevention and the polluter pays principle. In order to achieve these objectives, the necessary improvements have been identified as targets to be achieved in order to meet the indicators to which the commitment is committed.

The development intentions include the establishment of a proper waste registration system and the introduction of EPR fees to encourage efficient use of raw materials and inputs, which will also provide the country with resources to effectively achieve its waste management goals. Attention will be paid to the development of regional systems, the improvement of waste

collection (selective collection, incentives and public awareness), the improvement of the treatment of collected waste, which will lead to a higher recovery rate of the different waste streams.

To achieve the improvements we want to see - as has been a major boost for other member states - we will need, and may need, external help. In the presentation of waste management systems in neighbouring countries, it was already possible to see the amounts that were and are available, either before or after accession, for the partial or even complete implementation of the necessary improvements.

In addition to the funds, the necessary domestic resources should be available, depending on the intensity of the aid, but only to a much lesser extent than the amounts used.

For example, in Romania, the estimated investment needed to implement the national waste management plan is around €1,154 million. The investment needed at national level to comply with EU and national legislation, including the circular economy package, is estimated at around €2 billion. In per capita terms, this could be at least twice as much for Ukraine.

Other sources of funding may come from large companies, mainly professional investors, who want to expand and who can enter the process in a number of areas, from the provision of public services to waste recovery and treatment, to the provision of the necessary equipment.

Based on the Hungarian experience, the emergence of foreign professional investors has established a new approach in waste management, and has initiated and financed developments to varying degrees. The experience gained and the corporate culture created were thus an effective way to start the path towards development. However, this will require a stable social, environmental, economic, legal and political environment in Ukraine, which will make the country a long-term investment destination for these market players. The development of waste management models is only worth considering in the long term.

PROPOSED STEPS FOR SYSTEM DEVELOPMENT

Public service development

The proposals should be made primarily with regard to the management of municipal solid waste, because in most cases the public service companies will also be able to handle waste from industrial production. There will always be market players and competition, but a company can give stability and predictability to its profitability if it has a secure base in the municipal waste management sector.

The legislation should also include the principle of one public service provider per region and make it compulsory for the population to use public services. In Hungary, public waste service charges have been recoverable by way of taxes in the event of non-payment since 2000. This measure has resulted in a good payment behaviour and the number of non-paying customers has been minimised over time. This has provided the basis for the liquidity and stability of the companies. On this basis, a public service provider was able to make competitive offers for industrial waste in other competitive markets.

OPTIMISING THE WASTE COLLECTION SYSTEM

Waste management companies are primarily able to achieve the best value for money in a metropolitan environment. In and around large cities, waste is fairly well concentrated. As waste transport is generally most economically efficient within a 50 km radius, it is worth exploring the possibilities of providing the necessary and operational waste management facilities within a given radius of the urban environment. It will be appropriate to build a regional system around these. This is also appropriate because the more skilled workforce and the necessary infrastructure are more readily available in the vicinity of large cities. With this strategy, smaller municipalities can also be quickly connected to a collection system. Adequate collection containers and a fleet of vehicles are needed to collect the waste.

The containers are available in different sizes, from 60l to 1100 litres. The colouring can be adapted to the waste streams covered by the service. The following are the most common container colours and the types of waste collected to which they are assigned:

- Black: mixed municipal solid waste collected
- Yellow: separately collected packaging waste
- Green: green waste
- Brown: bio waste.

Vehicles for waste collection should be adapted to the structure of the municipalities so that they can move along the streets they are designed to serve, but also so that their capacity is as economical as possible.

1. Figure 17m3 waste collection vehicle with Seres type body

Source: seres.hu

Today's telecommunication sophistication can track the collection process down to the minute (GPS-based positioning, route planning and flight checking) in the future.

The primary objective is to make public waste collection available to all residents in all municipalities as soon as possible, so that by maximising coverage, we have taken the first step to tackle one of the causes of illegal waste generation.

Where and when the coverage and involvement of the population is at an appropriate level, it is worth starting education and training to raise awareness of environmental issues. A change of attitude and information is on the bucket list of strategic objectives for waste management.

It is also important to have a proper billing system and secure management of customer data. Providing quality customer service. There are also different options for payment. In smaller, poorer municipalities, public service charges can be paid by the municipalities as a lump sum instead of the population, or only as a subsidy to those in need in the form of a discount. However, the most common, and in line with the PAYT principle, is for the property owner or user to pay for the service directly. In this case, the legislation should ensure that the public service provider maintains a good payment record and that it can effectively recover in the event of non-payment.

LANDFILL CONSTRUCTION, LANDFILL RECLAMATION

In addition to improving collection, special attention should also be given to the development of regional waste treatment centres. Waste centres or treatment plants, with a minimum area of 10 hectares, with appropriate insulation and stratification, and a collection basin for leachate from the waste body, should be the central base for regions of at least 200 000 inhabitants or more. It is particularly advantageous if leachate can be treated and disposed of nearby. The site will also accommodate an appropriately sized rainwater collection and firewater storage basin. The weighing and documentation of waste delivered for treatment will also be very important for the proper operation of the system, so bridge scales for weighing transport vehicles should generally be installed near the entrance, which will monitor and record passages and weigh vehicles on entry and exit. It is advisable to size regional centres to accommodate future developments, so that the area required for such a centre can be around 20 ha. Below is an insulated, newly built landfill site.

2. Figure Isolated modern non-hazardous landfill, Sajókaza, Hungary

Source: Fodor Norbert: Review of the MBH plant of Sajókaza Waste Treatment Centre - University of Miskolc, Faculty of Earth Sciences, Institute of Raw Material Preparation and Environmental Process Engineering, 2016)

Technically unsuitable landfills should be closed and recultivated as soon as possible. Their assessment should start in parallel with other developments. The landfills to be closed will be recultivated in two ways. Depending on their size and geographical location, and geologically, and the waste components they contain, they can be either remediated and rehabilitated in the landscape or recultivated in situ and integrated into the landscape. Waste found in landfills destined for remediation should be transported to the nearest landfill that will be subject to in-situ reclamation and is also destined for closure. This solution will not reduce the capacity of newly built regional landfills. Where thermal recovery of the waste is possible, it may be appropriate to transfer the remediated waste to incinerators within an appropriate distance after appropriate pre-treatment.

Incinerators

In order to further improve the waste management system and reach the next stage of the waste pyramid, we need to look at waste incineration in Ukraine as a means of waste thermal recovery, which has also been mentioned. It is planned to build 4 new incinerators. Of the existing ones, only one incinerator is or has been operational, and it is not yet known whether it has been maintained because of the war.

3. Figure: Modern incinerator with an annual capacity of 560 000 tonnes in Denmark (construction cost €534 000).

Source : https://zerowasteeurope.eu/2019/11/copenhagen-incineration-plant/

It is important that incinerators are installed with appropriate filtering equipment. Incinerators can use the heat generated to produce electricity and can also use the waste heat for district heating. Waste incinerators are also typically located close to the largest, most populated cities on the basis of proximity. This way, both the waste path and the recoverable energy are used with the least loss. Ideally, where resources and affordable costs for the population allow, regional incinerators should be implemented in the largest possible number.

Waste yards

The next step in the prevention of illegal dumping is to provide for the possibility of waste disposal through waste yards, for those wastes that cannot be disposed of in the containers for municipal solid waste collection due to their size or composition.

Yards should be set up in accordance with Hungarian standards, with a minimum area of 400 m2, on a solid surface with adequate drainage. Yards should be sized taking into account the expected waste volumes and material flows and the number of people using them. Another important consideration in determining the location of yards is that, with appropriate infrastructure, the intensity of use will normally be within a 20 km radius. Another important consideration for the location of yards is that they should be located close to more densely populated areas and settlements within the radius, in order to ensure more cost-effective operation.

According to Hungarian practice, waste yards are set up by public service providers from their own resources or from tenders by municipalities or their associations. However, the operator was most often the public service provider of the area. The costs of operation and, where appropriate, of investment were included in the waste disposal fees of the municipalities using the facilities. The main types of waste that can be accepted in the yards, to a limited extent and for a limited period of time, are:

- construction and demolition waste,
- waste,
- tyre,
- electronic waste,
- cardboard,
- foil,
- glass,
- scrap metal,
- green waste,
- household hazardous waste (paint cans, oil derivatives, batteries).

Here too, for record-keeping purposes, a balanced record of the waste delivered and received must be kept, and the public service operator must ensure that it is recovered or disposed of.

Yards can usually achieve the expected quality of storage and collection by providing containers of the right size. Closed containers with a special damage-prevention floor should be provided for the storage of hazardous waste. The advantage of yards is that the public can conveniently and legally dispose of their surplus waste and other waste generated.

4. Figure: Waste yard, Szombathely, Hungary

Source :
https://www.nyugat.hu/var/improxy/bnl1Z2F0XENsYXNzZXNcRkhEUGljdHVyZQ__/pc/ff/pcff55da6afd2dbf06851795ab62ad6cd.jpg?m=1246446507

Selective waste collection as the next step in the waste pyramid

Based on the experience gained so far in the development of separate collection, the efficiency of the initial island system could be further improved by replacing or complementing it with a so-called door-to-door collection. Although the earlier cleanliness of the island system collection by material stream was indisputable, i.e. less sorting was required, it was not nearly as effective in terms of collection and diversion of packaging materials from landfill as the door-to-door collection system. The conditions for introducing the latter are, however, more costly, as shown in the waste pyramid diagram. The higher you go up the pyramid, the more costly it becomes to implement and, therefore, to maintain and operate. However, the empirical evidence in favour of efficient collection is that the more convenient it is for the population to

implement, the more efficient the system becomes over time. The disadvantage of the collection islands is that they are placed in busy public areas, but although there are about 1,500 inhabitants per island, they have to be walked to and the packaging materials already left and stored at home have to be taken away. A further operational disadvantage of the collection islands was that they were not always filled at the same rate, so that although they were emptied in a planned cycle, at certain times (summer months and around winter holidays) they had to be emptied earlier than usual if the service provider had extra capacity available. If not, selective waste islands would periodically develop into mountains of selective waste. Another disadvantage was that they opened up space for illegal dumping, so that the area around them often had to be cleared of waste that did not belong there. This in turn led to several disputes between the public service provider and the respective city authorities as to whose responsibility and cost it was to keep the islands free of inappropriate waste. It is also worth clarifying this issue if it is being considered.

5. Figure: Collection island in Törökszentmiklós (plastic, coloured glass, white glass, paper divided into fractions)

Source: tmkom.hu

As shown in Figure 5, the emptying of the collection islands requires a so-called multi-lift, crane-mounted roll-off container truck, which can only transport the waste loosely, without compaction. This collection method has a higher unit cost per tonne than the door-to-door system.

6. Figure: Collection container used in a door-to-door separate waste collection scheme

Source: behir.hu

The advantage of the door-to-door system over this is that it is much more convenient and does not require a different type of collection vehicle than the regular waste collection (refuse truck) routes. However, experience has shown that it can have the disadvantage, especially in the initial phase, that people do not or do not want to sort properly. As a consequence, the subsequent sorting of the collected waste into appropriate material streams results in much more

so-called sorting residue, mainly due to inappropriate and improperly disposed waste, which has to be disposed of separately.

The advantage of such a collection container is that it contains a mixture of different packaging waste such as: paper, plastic (PET, PP, PE, HDPE), tetrapack, aluminium cans, metal cans. Unfortunately, glass packaging waste such as bottles and jars must be collected separately in this case. An example of this is the door-to-door collection system, which can also be set up in a similar way, but in many places the collection point is either the container for the glass fraction left over from the previous collection islands or the containers (240, 770 or even 1100 litres) regularly placed on the collection routes for this purpose and at higher density. Glass collection is thus very low compared with the other fractions.

To solve this problem, it will be appropriate to introduce a Deposit Return System (DRS) for glass and plastic and metal beverage packaging waste. This has already been discussed in some countries. Current deposit return schemes range from €0.1 to €0.2 per bottle.

Waste management solutions that divert waste from landfills

SEPARATE WASTE COLLECTION

The introduction of separate waste collection can only be achieved if it is accompanied by the construction of separate waste sorting and baling plants. Their capacity in Hungary is generally between 5,000 and 25,000 tonnes per year, but experience shows that the emphasis is shifting towards higher capacity sorting plants, so it is worthwhile to build up the regional systems in Ukraine accordingly.

7. Figure Waste sorting hall detail

Source: greenfo.hu

In order to increase efficiency, in addition to human power, it is also worthwhile to equip such sorting systems with optical sorters, where the different types of waste can be separated with high accuracy and without human power.

The spatial location of sorting facilities can often be achieved in the most economical way in a metropolitan environment. Therefore, the principle of proximity should be taken into account when installing them. Until the sorted and baled waste is transported to recovery facilities,

appropriate storage of the resulting useful materials should be ensured, inter alia, to avoid deterioration.

MECHANICAL-BIOLOGICAL WASTE TREATMENT (MBH)

There are also several solutions for the thermal recovery of municipal solid waste that is not separated but mixed. The direct transport to incineration plants has been discussed above. Now, it is even worthwhile building retrofitted facilities next to landfills. these can be built at a significantly almost fraction of the cost of an incinerator. The system consists of passing what is traditionally known as municipal waste through a shredding and sorting line, which is essentially fully automated, and which produces RDF/SRF from the so-called light fraction that can be incinerated. This type of waste/final product can be used and burned in power plants. The efficiency of MBH plants is estimated to be able to separate up to 30% of the collected waste into combustible fractions. In addition, the sorting residue from the sorted waste can be thermally recovered to an even greater extent, thus reducing the amount of waste landfilled.

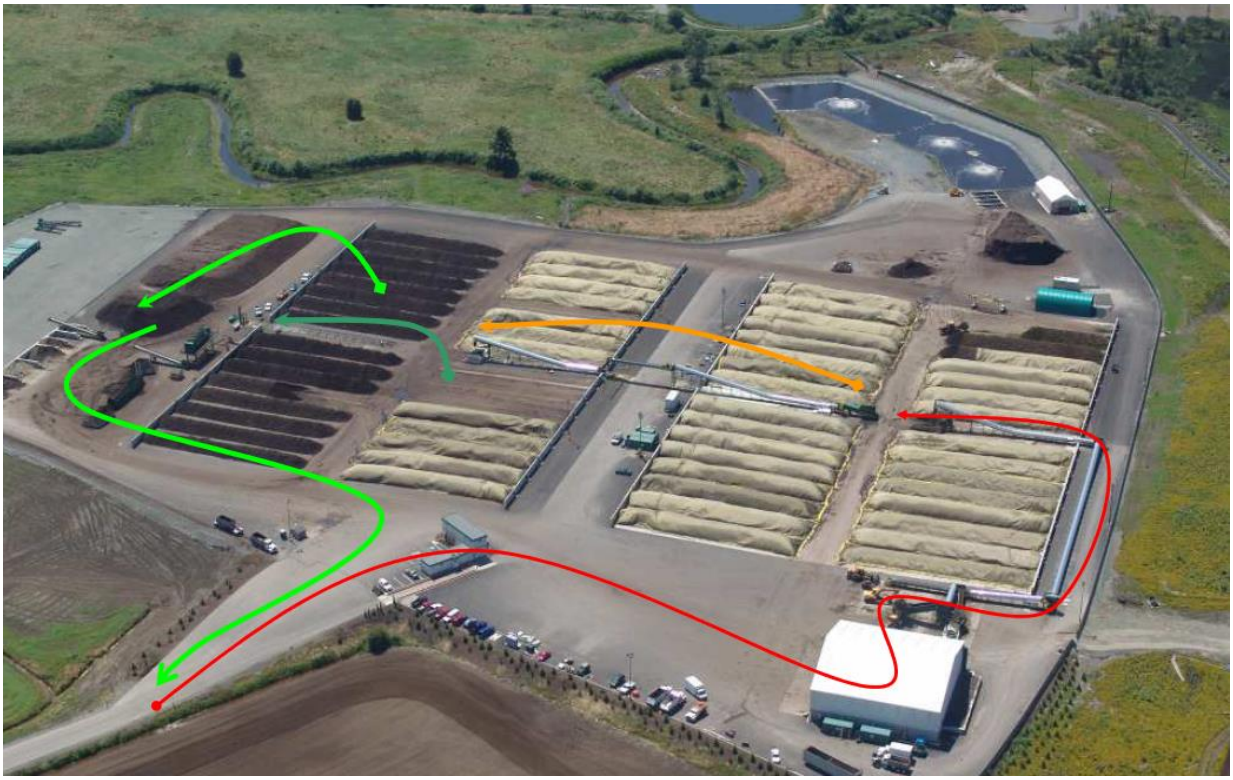
The reduction of landfilling can be effectively enforced at national level by introducing so-called landfill levies and taxes (differently from country to country). These measures, introduced at the right time, have been applied by the countries presented in the study.

COMPOSTING, BIOGAS PLANTS

Among the countries presented, there were also a number of problems in managing green waste so that it does not end up in landfills because of its organic content. This was addressed by the introduction of door-to-door collection of green waste, and later, EU requirements made it necessary to introduce the collection and treatment of food waste and bio-waste as widely as possible.

It is preferable to deal with green waste in the first place, as it is a cheaper solution. The collection method can therefore be as mentioned above, either in a special container or in collection bags, although the latter is not recommended because of the quality of the compost produced.

Composting of collected green waste can be carried out in closed or open systems. The difference between the two is that closed membrane technology can provide better control of the process and shorten the maturation time. In addition, the greenhouse gases produced by the composting process can be captured and its harmful consequences can be prevented, compared to open composting.



8. Figure: membrane composting

Source:maszesz.hu

Another alternative to industrial-scale composting is household composting, for which special composting bins can be provided. However, this is not sufficiently widespread in practice.

PROPOSALS BASED ON A COMPARISON WITH THE SLOVAK SYSTEM

In the following, we would like to set out our recommendations based on a comparison of the waste management systems in Slovakia and Ukraine.

1.) *European directives and legislation/recommendations must be taken into account and followed by all.*

- 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 2018/851/EC 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/EC of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste.

2.) *Learning from the 5-year waste management and prevention programmes.*

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.

Regional programmes should be aligned with the national waste management programme and follow its objectives. Of course, taking into account local differences.

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 (Slovak waste management programme)

The 5-year programme should set specific objectives, then designate the person or persons responsible today and set a deadline. This should also be held accountable to the person(s) responsible.

2. Objectives and measures for electrical equipment and waste

Separate collection is a prerequisite to ensure special treatment and recycling of WEEE and is necessary to achieve the required level of protection of human health and the environment (Slovak Waste Programme 2021-2025).

Targets should also be set separately for each waste category.

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 waste, hazardous waste from paints, varnishes, solvents, etc. file:///C:/Users/Tulowner/Documents/Slov%C3%A1k%20szem%C3%A9t/poh_sr_2021_2025_vestnik.pdf.

Hazardous waste should be treated as a priority, it should be defined what is included and legislation should be in place to penalise its improper disposal/storage etc. in line with EU directives.

3.) The conditions for a circular economy must be created. This is the real solution for waste management.

Creating a circular economy is essential because its primary aim is to reduce waste. At the end of a product's life cycle, they aim to keep its materials in the economy as much as possible. These elements can be reused productively, creating further value. The implementation of measures to achieve a circular economy involves the adoption of 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 many examples of companies in different industries applying this concept to specific commodities (European Parliament, 2016). Life cycle assessment (LCA) research has focused on 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 to evaluate different alternatives,

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

As Fetting (2020) acknowledges, more regulatory and non-regulatory information and action is 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.

4.) *In line with EU directives, efforts should be made to achieve the highest possible rate of diversion of municipal waste from landfills.*

The EU Landfill Directive limits the landfilling of municipal waste to 10% by 2035 (Directive 1999/31).

The primary objective of the Slovak Waste Management Programme is to divert municipal waste from landfills by 2025.

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%.

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.

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 in the Slovak Republic. The aim of the fee law is to discriminate against landfilling and to create incentives for the selective collection of municipal waste and to increase the recycling of municipal waste (https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2018/329/)

The Tariff Act regulates the process for determining the specific amount of the tariff as follows. All municipalities are 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 landfill operator 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.

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.

5) A proper IT system for waste management must be set up, without it the waste stream will become untraceable.

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.

They 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,
- data reported from the registers of manufacturers of differentiated products,
- data reported 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 (Slovak Waste Act, 2015)

Waste generation and treatment is 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.

6.) *Based on objective producer responsibility and fines for infringements, the financial basis for separate waste collection must be created.*

Reclamation Fund

The Law establishes a 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.

Municipalities are responsible for the management of mixed municipal waste, bear the additional costs and largely set the detailed rules for municipal waste management vis-à-vis households, as they adopt 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).

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 waste producer/collection container level,
- the introduction of door-to-door collection,
- promoting the sorting and composting of biodegradable waste,
- re-use centres for buildings

It includes a concrete Action Plan to implement the above.

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.

7) Continuous improvement of the environmental awareness of the population, through education, the media and the involvement of relevant professional organisations and forums.

Improving 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

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

8) The European Union has set a mid-century goal of climate neutrality by 2050, and Ukraine must immediately define the milestones to achieve it, or at least move significantly closer to it.

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.

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.

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 2050, and at least 7 MtCO2eq after accounting for removals.

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

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

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).

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.

Measures proposed to achieve climate neutrality targets in the Slovak Republic:

Increased support for the circular economy:

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

-measures to increase resource efficiency;

-supporting the emergence 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.

- more effective prevention of illegal dumping.
- 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.
- Optimising waste management logistics at municipal level.
- The need for public education, awareness and information on the need for further action in this sector.
- When updating the strategy, consider introducing a reduction target for the entire waste sector (either for 2030, 2040 or 2050), which would be in line with the 2050 climate neutrality target.

The above action plan could be very instructive for Ukraine!

9) Making statistical reporting on waste clear and transparent.

In the Slovak Republic, the negative trend in waste management continued in the period 2014-2018, with landfills continuing to account for a significant share. On average, 3.7 million tonnes of waste are landfilled annually, 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.

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 which presents data on the amount of waste generated, excluding so-called "mineral waste". These wastes are different waste streams with specific characteristics which, 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 which 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.

The waste data have been adjusted for waste collected in one country and recycled in another.

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 sector.*

As regards the management of hazardous waste, the number of activities reported under "other treatment" increased significantly in 2018.

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.

10.) The material and physical conditions for the selective collection of waste must be created and the appropriate technology must be provided.

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.

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.

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.

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 reach its municipal waste targets (set in EU law and the Waste Act) by 2020.

11.) Particular attention should be paid to construction waste and its different types, as it accounts for the largest share of waste of all waste types in the EU.

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 is considering setting targets for preparing for the re-use and recycling of construction and demolition waste and its components from different materials by 31.12.2024. 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.

The Slovak Republic's target for 2025:

Increase the preparation 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 wood 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

11) Particular attention should be paid to so-called "e-waste", as the volume of e-waste is expected to increase significantly in the near future, with the production of devices containing such materials expected to increase sharply by 2030.

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.*

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 reprocessing industry is not designed and optimised to exploit critical raw materials, which are typically found in small concentrations in complex structures.

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 2017.* Therefore, more emphasis should be put on improving the collection, sorting and recovery of waste containing significant amounts of critical raw materials.

The goals of the Slovak Republic 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.

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, ZMOS and IMS.

Deadline: December 2022

Funding of the aid

(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, recovery) or upgrading (preparation for reuse, recycling, 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: ongoing

RECOMMENDED ACTIONS

The Early Forecast Reports for Hungary, Slovakia and Romania, published by the European Commission in June 2023, contain recommendations for each country that can be used for Ukraine and are therefore part of our proposal plan.

In the case of Hungary, the Commission Staff Working Document makes the following four main recommendations for improving its waste management performance:

1) *Preparing for the reuse of municipal waste and promoting packaging reuse schemes*.
2) The planned transition of waste management to a new, uniform and national concession should be done in an *efficient and transparent* way. The transition should secure the support of key local stakeholders and proceed at a pace that allows any potential pitfalls in the process to be overcome.
3) *Extend separate collection of waste* at source to the whole country (especially separate collection of bio-waste). *Increase public awareness of* separate collection of waste and waste prevention. Introduce economic instruments such as *pay-as-you-throw schemes and increase landfill taxes to* both encourage selective collection at source and minimise the amount of waste landfilled.
4) *Further development of waste management infrastructure* linked to the higher rungs of the waste hierarchy. In particular, increasing the efficiency and treatment capacity of bio-waste and promoting home composting.

The report for Slovakia also lists four main recommendations among the measures identified as necessary to support Slovakia's efforts to improve its waste management performance.

1) *Preparing for the reuse of municipal waste and promoting packaging reuse schemes*.
2) Further reduce dependence on landfilling *by increasing landfill taxes, tackling illegal dumping* and promoting *separate collection* and treatment of *bio-waste.*
3) Further introduce and expand *the pay-as-you-throw system* for both businesses and households.

4) *Improving the quality of data on* packaging waste, *and the management system* to ensure coherent and verifiable data series.

The report for Romania also includes four key recommendations among the measures identified as necessary to support Romania's efforts to improve its waste management performance.

1) *Preparing for the reuse of municipal waste and* promoting *packaging reuse schemes.*
2) *Extend separate waste collection to the whole country*. Increase public awareness and participation in waste sorting and waste prevention. *Introduce economic instruments such as pay-as-you-throw and increase landfill taxes to both encourage separate collection and minimise the amount of waste landfilled.*
3) *Further development of waste management infrastructure* linked to the higher rungs of the waste hierarchy. In particular, increase bio-waste treatment capacity and promote home composting. Promote the use of bio-waste as fertiliser by setting national quality standards for bio-waste.
4) *Improve the data management system* to present coherent and verifiable data series.

On this basis, **our proposals for Ukraine are as** follows:

1) A new, unified and national waste management system should be developed in an efficient and transparent way.
2) Developing waste management infrastructure and improving existing infrastructure (e.g. increasing the number of incinerators, increasing the capacity to treat bio-waste).
3) Encourage the use of bio-waste as fertiliser by setting national quality standards for bio-waste.
4) Separate collection of bio-waste.
5) Preparing for the reuse of municipal waste and promoting packaging reuse schemes.
6) The introduction of separate waste collection throughout the country.

7) To raise the environmental awareness of the population, to encourage their involvement in selective waste collection and waste prevention.
8) Introduction of economic instruments and incentives (e.g. "pay-as-you-throw")
9) The imposition and subsequent increase of the landfill tax.
10) Building a new data management system, improving the existing one.
11) Preparing for the reuse of municipal waste and promoting packaging reuse schemes.
12) Extend separate collection of waste
13) Preparing for the reuse of municipal waste and promoting packaging reuse schemes.
14) Addressing the issue of illegal dumping.
15) Managing waste imports
16) Fighting corruption.

PROPOSED MEASURES TO IMPROVE WASTE MANAGEMENT PERFORMANCE

The recommendations made by the EU's Early Warning System for Hungary (SWD (2023) 189 final), Slovakia (SWD (2023) 198 final) and Romania (SWD (2023) 199 final) can be adapted to Ukraine, as the Ukrainian waste management system is in all respects lagging behind the Hungarian, Slovakian and Romanian systems.

EN - HUNGARY

Governance

1) Ensure that the planned transition to a new, uniform and national concession for waste management is carried out in an efficient and transparent manner. The transition must ensure the support and involvement of key local stakeholders and proceed at a pace that allows any potential pitfalls in the process to be overcome.

2) Addressing data quality issues, in particular issues related to the application of consistent calculation rules for municipal waste recycling rates and packaging waste recycling rates. For example, the packaging waste generated by online sales and free travellers should be taken into account.

3) National standards should be set for the quality of compost and digestate produced in bio-waste treatment plants. This could help to create a strong demand for these products for fertilisation purposes. Standards should be developed in close dialogue with farmers.

4) Setting binding targets or indicators for separate waste collection at the level of the bodies responsible for the collection and treatment of municipal waste, in order to achieve control, enforcement and higher collection rates. This could be complemented by a system of financial rewards and penalties linked to the achievement of targets and performance. To raise awareness, information on the performance of these organisations could also be made available to the public (e.g. through publication on a website).

Prevention

5) Measures to increase reuse and prevent the generation of non-recyclable municipal waste.

6) Ensure that the results of the annual monitoring of the country's waste prevention programme are widely available to the public to enhance transparency and accountability. Promote coordination between central government and local authorities to achieve EU waste prevention targets.

Selective collection

7) Hungary should develop, enforce and monitor national minimum service requirements for separate waste collection (including bio-waste). This could include, for example:

i) the type and volume of containers to be used;

(ii) the minimum and maximum frequency of collection; and

(iii) the type of vehicles that may be used for collection.

These standards must take into account the type of housing stock, climate, seasonality, etc. Hungary must ensure that the necessary infrastructure for separate collection is in place.

Waste management

8) Support the preparation for the reuse of municipal waste and the development of waste management infrastructure linked to the higher stages of the waste hierarchy. Definite plans and concrete measures are needed, for example to promote home composting and to increase the efficiency - and treatment capacity - of bio-waste to cover the full range of bio-waste generated.

Communication and awareness raising

9) Awareness-raising activities specifically targeted at different groups (e.g. households, commercial waste producers, school teachers and students) to increase participation in separate collection. Develop a series of national communication materials that: (i) target households, farmers and students for use at local level; (ii) contain clear and consistent messages; and (iii) place particular emphasis on bio-waste, home composting and proper waste management (e.g. sorting).

Extended producer responsibility and economic instruments

10) Introduce a pay-per-drop scheme for businesses and households to achieve a higher collection rate of recyclable fractions and reduce residual waste. Local authorities could be supported with guidance on how to develop incentive mechanisms and how to introduce - or learn from - pilot projects.

11) Use economic instruments (e.g. appropriate increases in landfill taxes; currently around €15 per tonne) to encourage waste management focused on the higher rungs of the waste hierarchy. This will help to make re-use, preparation for re-use and recycling economically attractive and reduce dependence on landfill. The economic incentive should be designed to be large enough to have a 'steering effect'. Landfill taxes that increase over time in line with specific targets are considered to be the most effective.

12) Increasing efforts to establish packaging reuse schemes will bring environmental benefits and help Member States meet EU packaging recycling targets.

Forrás:https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0189&qid=1698585405201

SK - SLOVAKIA

Governance

1) Setting mandatory targets or indicators for separate waste collection at the level of the bodies responsible for municipal waste collection (e.g. municipalities), in order to monitor, enforce and achieve higher collection rates. This could be complemented by a system of financial rewards and penalties linked to the achievement of such targets. Information on the performance of local authorities could also be made available to the public to raise awareness (e.g. through publication on a website).

2) Addressing data quality issues, in particular in relation to waste from packaging placed on the market and the associated recycled volumes. Fully apply the criteria set out in the Guidelines for the compilation and reporting of data on packaging and packaging waste under Decision 2005/270/EC. Conduct independent third party audits of data compiled by producers and producer responsibility organisations.

3) Close and reclaim non-compliant landfills and take action against illegal dumping and landfills. Increase enforcement capacity to control, monitor and prevent uncontrolled dumping.

Prevention

4) Take measures to increase recycling and prevent the generation of non-recyclable municipal waste.

5) Promote and support sustainable consumption models. Slovakia's waste prevention programme could be complemented by specific binding measures, such as eco-design criteria, to make products more durable. Sufficient budget should be allocated to implement waste prevention measures. Slovakia should also promote coordination between central and local government to achieve the EU waste prevention targets.

Selective collection

6) Develop, enforce and monitor national minimum service requirements for separate waste collection (including bio-waste). This may include, for example: i) the type and volume of containers; ii) the minimum and maximum frequency of collection; and iii) the types of vehicles that can be used for collection. These requirements should take into account the type of housing stock, climate, seasonality, etc. Ensure that the necessary infrastructure for separate collection is in place.

Waste management

7) Support the preparation for the recycling of municipal waste and the development of waste management infrastructure linked to the higher stages of the waste hierarchy. Definite plans and concrete measures are needed, for example to promote home composting and to increase the efficiency of bio-waste treatment capacity to cover the full amount of bio-waste generated. This should be accompanied by the introduction of national quality standards to produce high quality compost/fermented material. Standards could be developed in dialogue with farmers.

Communication and awareness raising

8) Maintain and strengthen awareness-raising activities specifically targeted at different groups (e.g. households, commercial waste producers, school teachers and students) to increase participation in separate waste collection. A set of national communication materials should be developed that: (i) target households, farmers and students for use at local level; (ii) contain clear and consistent messages; and (iii) place particular emphasis on bio-waste, home composting and proper waste management (e.g. sorting).

Extended producer responsibility and economic instruments

9) Extend the use of the pay-as-you-throw principle to both businesses and households to achieve higher collection rates of recyclable fractions and reduce residual waste. Local authorities could be supported with guidance on the design of incentive mechanisms.

10) Using economic instruments (e.g. raising landfill taxes to a sufficiently high level; currently between €11 and €33 per tonne of municipal waste) to encourage waste management linked to the higher rungs of the waste hierarchy. This will help make re-use, preparation for re-use and recycling economically attractive and reduce dependence on landfill. The economic incentive should be designed to be large enough to be effective and to drive waste management up the waste hierarchy. Landfill taxes that increase over time in line with specific targets are considered to be the most effective.

11) Increasing efforts to establish packaging reuse schemes will bring environmental benefits and help Member States meet EU packaging recycling targets.

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0198&qid=1698585405201

RO - ROMANIA

Governance

1) Addressing data quality issues, in particular in relation to packaging waste generated and related recycling data. This could be achieved by: i) setting up a privately-managed national clearing house authority specifically focused on packaging; or ii) establishing additional third-party verification procedures to further verify available data in an independent and transparent manner.

2) Develop and run implementation programmes for municipalities to help them organise separate collection and improve their recycling performance. In order to achieve high collection rates and ensure high quality of waste collected, municipalities should set binding targets or indicators for separate waste collection. This could be complemented by a system of financial rewards or penalties according to the performance of municipalities. To raise awareness, information on the performance of the local collection system could be made available to the public (e.g. on a website).

3) Closure and remediation of inadequate landfills and action against illegal landfills and landfills. Increase enforcement capacity to control, monitor and reduce uncontrolled dumping. This could be achieved by providing additional resources to the National Environmental Guard.

Prevention

4) Take measures to increase recycling and prevent the generation of non-recyclable municipal waste.

5) Implementation of the planned measures, including measures to achieve the 2025 waste prevention targets set out in the National Waste Prevention Plan. Promote coordination between central government and local authorities to achieve EU waste prevention targets. Ensure adequate monitoring of the implementation of waste prevention measures and allocate sufficient budgetary resources to this monitoring.

Selective collection

6) Develop, enforce and monitor national minimum service requirements for separate waste collection (including bio-waste). This could include, for example, the definition of: i) the type and volume of containers to be used; ii) the minimum and maximum frequency of collection; and iii) the type of vehicles to be used for collection. These requirements should take into account the type of housing stock, climate and seasonality, etc. Ensure that the necessary infrastructure for separate collection is in place.

Waste management

7) Promote the preparation for the reuse of municipal waste and develop waste management infrastructure that focuses on the higher rungs of the waste hierarchy. Definite plans and concrete measures are needed, for example to promote home composting and to increase bio-waste treatment capacity to cover the full range of bio-waste generated. This should be accompanied by the introduction of national quality standards to produce high quality compost/fermented material.

Communication and awareness raising

8) Awareness-raising activities specifically targeted at different groups (e.g. households, commercial waste producers, school teachers and students) to increase participation in

separate collection. Develop a set of national communication materials that: (i) target households, farmers and students for use at local level; (ii) contain clear and consistent messages; and (iii) place particular emphasis on bio-waste, home composting and proper waste management (e.g. sorting).

Extended producer responsibility and economic instruments

9) Introduce a "pay-as-you-throw" system for businesses and households, both to achieve a higher collection rate of recyclable fractions and to reduce the amount of residual waste. Local authorities could be supported with guidance on how to develop incentive mechanisms and on how to introduce and learn from pilot projects.

10) Use of economic instruments (e.g. further increases in landfill taxes at appropriate levels) to encourage waste management focused on the higher rungs of the waste hierarchy. This will help to make re-use, preparation for re-use and recycling economically attractive and reduce dependence on landfill. The economic incentive should be designed to be large enough to be effective and to move waste management up the waste hierarchy.

11) Increasing efforts to establish packaging reuse schemes will bring environmental benefits and help Member States meet EU packaging recycling targets.

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0199&qid=1698585405201

RECOMMENDATIONS BASED ON EUROPEAN GOOD PRACTICES

Below, we would like to present all the good practices from the Early Warning Reports that have been successfully implemented in the individual Member States and that could serve as a model for Ukraine. By adopting some of these good practices, Ukraine can save time and money in reforming its waste management system, which should aim at a closer alignment with the circular economy:

HUNGARY

Food Waste Prevention Centre - A national scheme to prevent food waste will be set up in 2021. This scheme, established by a Hungarian law, includes the creation of a Food Rescue Centre for this purpose. The Centre acts as a coordinating body and intermediary between food stores and various organisations to help distribute food products whose shelf life is about to expire, thus preventing waste. Food distribution organisations can be public institutions (local authorities or governments), member organisations of the Charity Council or other religious or private organisations. https://emkp.hu/

Waste paper collection in schools - This is a well-established initiative in Hungary that has been running for decades. The initiative, which takes place twice a year, encourages teachers and students to collect all waste paper generated in educational institutions. The collected waste paper is weighed on the spot and then handed over for recycling. The initiative also includes a competition, as it encourages children to strive to be the class that collects the most waste paper. https://humusz.hu/faq/ki-vallal-papirgyujtest-oktatasi-intezmenyekben

Forrás:https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0189&qid=1698585405201

SLOVAKIA

Study on improving the quality of packaging data - The Slovak Environment Agency, which is responsible for providing data to Eurostat, submitted a project proposal under

Eurostat's call for proposals "Statistics for European Green Business". The proposed project would carry out a thorough analysis of available databases, comparing existing data and estimating the proportion of "free riders" among plastic packaging producers. This study is expected to significantly improve the quality of packaging data in Slovakia.

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0198&qid=1698585405201

ROMANIA

Establish a national system for collecting and monitoring data on waste - SIATD, the Single Information and Tracking System for *Waste*, became operational on 1 January 2023. The system, which was initially piloted for 2 years for the packaging waste stream, will now also cover the data stream for electrical and electronic equipment and batteries. One of the main objectives of the system is to put in place processes that allow reliable verification of transactional waste management data. https://www.greensoft.com.ro/siatd/

Regional associations of municipalities focusing on waste management - *The* Romanian national authorities have supported the creation of development associations involving virtually all municipalities in Romania's 41 regions. This type of municipal cooperation is expected to lead to economies of scale and more efficient collection and treatment of municipal waste, including through the promotion of significant investments from EU Structural Funds in large-scale waste infrastructure assets.

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0199&qid=1698585405201

POLAND

Identification of individual waste-generating households - In 2021, legislation was introduced to allow the identification of individual waste-generating households through the labelling of containers or bags used for municipal waste collection. This has helped the country to meet its obligations for separate waste collection, especially in multi-apartment buildings (e.g. by identifying the separate accounts of each household).

Support for home composting - To support home composting, 7 partial exemptions from the waste tax were introduced in 2019 for property owners who compost their waste at home. This not only encourages home composting, but also allows for better monitoring

of this composting, as households must declare home composting to the municipality to qualify for the exemption.

Source : https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52023SC0196

CROATIA

Increasing bio-waste treatment capacity with EU funding - Croatia has received EU funding for nine composting plants under the Competitiveness and Cohesion Operational Programme 2014-2022. In addition, under the National Recovery and Resilience Plan 2021-2026, a new open call for new composting plants was launched in May 2022.

Promoting efficient and effective waste management - An online platform, "Burza otpada", allows companies to list available waste for disposal. It acts as a clearing house for supply and demand for all types of waste. The wastes listed on the platform must meet the technological criteria for certain categories of waste.

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0185&qid=1698585405201

LITVANIA

Encouraging home composting - Lithuania has improved bio-waste collection and treatment capacity by providing financial support to home composters, with more than 66,000 home composters to be provided to individual households between 2021 and 2024. The home composters will be financed from both EU and national sources.

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0188&qid=1698585405201

FINLAND

Deposit refund scheme for beverage packaging - The deposit refund scheme covers a wide range of different containers used for non-alcoholic drinks and alcoholic beverages, as well as all main packaging materials except liquid packaging paper. The high convenience of the scheme has resulted in high take-back rates (aluminium cans: 96%; plastic bottles: 92%; reusable glass bottles: 88%; other glass bottles: 97%). Although the deposit refund scheme in Finland is voluntary, it covers almost all

beverage packaging. By joining the deposit-fee scheme, beverage producers and importers are exempted from the beverage packaging tax (€0.51 per litre), but still fulfil their extended producer responsibility. This provides a strong economic incentive to join the scheme.

Wooden pallet rental system - Reuse and recycling companies buy used wooden pallets, inspect, sort and, if necessary, repair them robotically. They then sell them to continue pallet recycling. Customers are encouraged to take back and reuse pallets by renting them from service providers instead of buying them at a significantly lower price. The service provider rents the pallets and takes care of their repair and refurbishment. The service covers the whole country.

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0175&qid=1698585405201

MALTA

Campaigns to raise awareness on good waste management - *A* number of campaigns have been carried out to raise public awareness on waste prevention, waste separation, waste collection and the fight against littering. These campaigns included the production of materials for schools and pupils, such as comics on waste management (Ecohive kids: https://www.ecohive.com.mt/kids).

Developing integrated waste management infrastructure - Malta has developed a new, highly integrated waste management infrastructure. This has been achieved by expanding existing treatment capacities and building completely new treatment capacities for activities such as incineration, materials recovery, bio-waste processing, etc. This approach allows for economies of scale and significant synergies in waste management (see the Ecohive project: https://www.ecohive.com.mt/).

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0195&qid=1698585405201

SWEDEN

Landfill bans on combustible and organic waste - The Swedish bans on landfilling of combustible waste (introduced in 2002) and organic waste (introduced in 2005) have resulted in low landfill rates: less than 1% of municipal waste was landfilled in 2021. https://www.riksdagen.se/sv/dokument-och-lagar/dokument/svensk-forfattningssamling/forordning-2001512-om-deponering-av-avfall_sfs-2001-512/

Co-financing schemes for biogas plants - According to the Swedish government, a number of anaerobic digestion biogas plants have been built with the support of co-financing schemes between municipalities and the private sector. These programmes have led to (i) increased collection of food waste from businesses and households to provide feedstock for digestion plants; and (ii) the construction of treatment facilities close to the food waste collection system. Biogas is used as fuel for local transport and waste collection vehicles.

Local incentives to prevent waste - The municipality of Gothenburg has introduced specific measures to reduce waste generation within its own activities. One measure includes a target to reduce waste generation per full-time employee by 40% between 2020 and 2030, while other measures aim to prevent certain types of waste, such as food waste, electronic waste and single-use products. This has resulted in both less waste and lower costs for the municipality and households. The measures have been implemented in cooperation with staff in nursing homes, schools, kindergartens, offices, public catering facilities and apartment buildings. The work was successful and has encouraged other municipalities to adopt a similar model to the Gothenburg model.

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0200&qid=1698585405201

ESTONIA

Real-time digital data collection system - A new waste data collection and tracking system will be launched in 2025. The system will allow companies to send waste data directly to national government authorities electronically. This will reduce the

administrative burden on businesses and can support enforcement through more reliable monitoring of waste management data. The system is also expected to support implementation and policy development at ministerial level. The system will also make it easier to communicate waste management performance to the public (https://www.realtimeeconomy-bsr.eu/)

National study on key waste management issues and solutions - Following the 2018 Early Warning Report, Estonia requested and received financial support from the EU's structural reform support programme for a comprehensive analysis of its waste management system. The project was carried out by the World Bank for the period 2020-2021 and the results are now being used as a blueprint for policy action.

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0180&qid=1698585405201

BULGARIA

Regional waste management associations in municipalities - Almost all of Bulgaria's 265 municipalities have established regional waste management associations. National legislation explicitly favours cooperation in waste management, which leads to economies of scale and more efficient collection and treatment of municipal waste.

Integrated economic instruments (fees and economic incentives) - Bulgaria has a high landfill tax, with a tax reduction (fee deduction) for certain targets. Article 64 of the Bulgarian Waste Management Act provides a strong incentive for municipalities: those that meet the recycling targets for municipal waste can get up to 100% of the landfill tax paid back. This is expected to reduce the amount of waste landfilled and increase the amount of waste recycled and recovered, provided that the capacity for selective collection and recycling increases.

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0176&qid=1698585405201

GREECE

"Implementing the circular economy in Greece" LIFE project - A national project to reduce the amount of municipal waste going to landfills and to promote waste prevention and recycling. The project includes activities such as the establishment of re-use centres in three municipalities, the promotion and monitoring of food waste prevention, capacity building of stakeholders, and information and awareness-raising events to change the behaviour of citizens and local communities (https://circulargreece.gr/)

Waste recycling and prevention programme on a small island - This "Just Go Zero" recycling and prevention programme was launched in December 2021 on Tilos Island. Although it involved a small community (around 800 inhabitants), it has triggered a major cultural change in waste prevention and citizen participation. After less than a year, more than 85% of municipal waste has been recycled or composted. The project has also contributed to raising awareness among the local population about the importance of good waste management (https://www.justgozero.com/tilos-the-first-zero-waste-island/).

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0182&qid=1698585405201

PORTUGAL

Packaging taxes and a ban on free carrier bags - In Portugal, a packaging tax will be imposed on single-use takeaway and takeaway food packaging. A tax of €0.30 per single-use package will be levied from 1 July 2022 on packaging made of plastic or of several materials in combination with plastic, and from 1 January 2023 on packaging made of aluminium or of aluminium in combination with several materials. Portugal plans to extend the existing tax not only to single-use packaging made of plastic or aluminium, but also to packaging made of any material. From July 2021, the distribution of free carrier bags of any material and of any thickness will be prohibited to avoid the marketing of unnecessary packaging.

Home and community composting - In northern Portugal, a home composting project has been developed in municipalities in cooperation with Lipor, the municipal association for waste management.In 2020, 15 818 composting machines were distributed and 6 343 tonnes of bio-waste were composted locally. https://www.lipor.pt/en/awareness/home-and-community-composting/composting-2/

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0197&qid=1698585405201

CIPRUS

National plan to promote the use of compost from bio-waste - This scheme provides substantial financial support to farmers who apply a minimum amount of compost from bio-waste on their land (€1 600 per hectare for cereals and €1 200 per hectare for other crops). Potential beneficiaries include all farm owners with more than 0.3 hectares. The programme is financed by the country's Common Agricultural Policy Strategic Plan 2023-2027.

Waste Reduction Programme for the Tourism Sector - "Municipal Waste Reduction Programme for Limassol and Paphos coastal hotels and related tourism infrastructure" is a project for local authorities with coastal hotels and tourism infrastructure. Its aim is to establish a system of waste separation at source and separate collection of recyclable and organic waste from large waste producers (e.g. hotels, tourist complexes, restaurants, leisure centres and institutions).

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0197&qid=1698585405201

SPAIN

Promoting high-performance recycling systems (EU Technical Support Instrument (TSI) project) - The project aims to improve the circular economy at local level and promotes the dissemination of best practices among municipalities to improve recycling, collection and treatment systems. The activities envisaged include assessing relevant policy options and making recommendations for the implementation of high performance recycling schemes, disseminating knowledge and expertise, supporting

local organisations and assisting relevant authorities in implementing the proposed measures.

The introduction of pay-as-you-throw schemes - In Spain, projects are underway in several municipalities to apply differentiated waste charges reflecting the amount of waste generated. For example, Zaldibia (Guipúzcoa) uses different sized bins depending on the amount of waste collected, Esporles (Mallorca) has a system that charges for additional bags of waste collected by citizens, and Argentona (Barcelona) has a pay-per-bag system, which allows a higher charge for residual waste for both household and commercial waste, and in the province of Castellón, municipal associations apply a reduction of the extra-municipal collection and treatment fee for waste destined for public recovery.

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0183&qid=1698585405201

IRELAND

The important role of producer responsibility organisations in awareness raising and communication - Producer responsibility organisations must carry out national education programmes and awareness raising activities specific to their waste streams in order to obtain an operating licence. These campaigns should be run across all existing and emerging media platforms and their effectiveness should be continuously monitored. Organisations are also encouraged to cooperate in these campaigns.

Circular Economy Communication Campaign - A national circular economy education and awareness campaign was launched through print, radio and social media to promote the concept of circular economy to the general public. This includes showcasing 'circular heroes', individuals, businesses and organisations who illustrate the circular economy in practical ways through their own stories. The campaign will be followed by more targeted campaigns focusing on specific demographic groups, material flows and economic activities. https://www.gov.ie/en/campaigns/a7976-circular-economy/

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0181&qid=1698585405201

FRANCE

National focus on Extended Producer Responsibility (EPR) - New EPR schemes have been developed to promote the recycling of new products between 2021 and 2025 (professional packaging, construction products or materials used in construction, toys, sports and leisure equipment, DIY and gardening products, sanitary textiles, fishing gear and cigarette butts). Therefore, 25 product lines will be covered by the EPR scheme by 2025. In addition to manufacturers, other parties (such as local authorities, environmental associations, waste prevention and management service providers and the state) may also participate in the governance of the EPR sectors.

Waste prevention - The Waste Prevention Act 2020 introduced a number of measures to prevent waste generation. One of these measures is the financing, under EPR schemes, of producers for the repair and recycling of certain products (electrical and electronic equipment, furniture, textiles, etc.). The financing is reserved for social and solidarity economy enterprises. In addition, consumers have access to a reparability index which allows them to choose electrical and electronic equipment that is easier to repair. Other measures include labelling products with information on recycled content and recyclability.

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0184&qid=1698585405201

LATVIA

Raising public awareness on good waste management - Latvia has created a fully user-friendly website that gives the public free access to information on both the location of sorting facilities across the country and good practices on waste sorting. https://skiroviegli.lv/

Improving the selective waste collection system - Latvia used the EU LIFE programme to fund the "Waste to Resource IP" project to strengthen regional sustainability and circularity. The project aims to implement the country's national waste management

plan for 2021-2028. It is a very large-scale project aimed at improving the selective waste collection system by piloting complex management approaches for priority waste streams (including the safe disposal of certain types of hazardous waste). The project also includes a number of awareness-raising activities for the general public. https://lifeprogramma.lv/en/about-life

Forrás: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0187&qid=1698585405201

SUMMARY

The waste management systems described in the study should be implemented in Ukraine as soon as possible. It is important to generate the necessary resources. Ensuring the right expertise. The process of development in these Member States has also taken decades. The study provides an opportunity for guidance, showing that there is room for improvement. Ukraine should follow this path, taking into account the experience of other countries. The more developed a country's economy is, the more waste it generates, since the level of consumption determines the level of waste generation. The level of waste generation forces economic operators to build up progressive waste management systems. In the past, sustainable development was the watchword for the development of these systems, and today it is the transition to a circular economy. Ukraine now has the opportunity to enter the development of waste management systems at a level where the latest solutions can be found. It should strive to apply the BAT (Best Available Technology) principle, not only in the development of the public waste management system, but also in the post-war reconstruction of the country.

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