

## CHALLENGES OF THE MUNICIPAL SOLID WASTE MANAGEMENT IN THE REPUBLIC OF MOLDOVA

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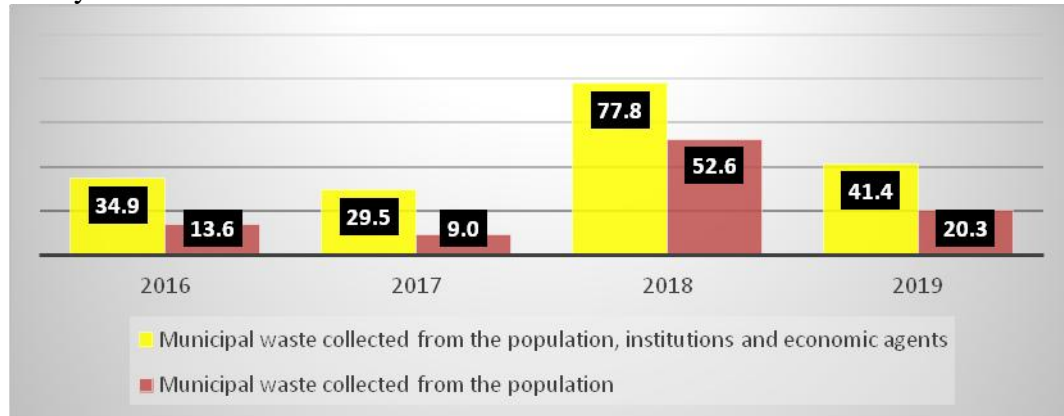
**Abstract:** Among the many environmental problems that threaten the Blue Planet, waste and garbage is a major one. With the population explosion and the revolutions in agriculture and industry, waste has exceeded the capacity of the environment to absorb and neutralize it. The worst effects of poor management of this waste are air pollution and contamination of drinking water reserves, which leads to increased incidence of disease by pathogens. In the Republic of Moldova, the waste problem remains unresolved, and a number of management issues requires a stringent intervention on behalf of public authorities. This article focusses on municipal waste problem in the Republic of Moldova, starting with problems of localities' sanitation in urban areas, waste storage condition, increase of unauthorised landfills, as well as lack of administrative capacities in elaboration and implementation of a complex program of actions for solid and liquid waste management in the country.

**Keywords:** circular economy, green economy, municipal waste, recycling, sustainable economic growth, waste hierarchy.

**JEL Classification:** Q53, Q54.

### 1. Introduction

Waste management in the Republic of Moldova represents a difficult issue both for urban and rural areas, while the problem of waste increase produced and stored in authorized and unauthorized landfills still remains unsolved both organizationally and legislatively.



**Fig. 1. Municipal waste collected from the population, institutions and economic agents, in thous. c.m.**

**Source:** made by author in base of data provided by the National Bureau of Statistics

Although the environmental protection domain in Moldova is regulated by about 35 legislative acts and over 50 Decisions of Government, the legal aspect of waste management leaves much to be desired, being necessary both the restructuring of the legal and institutional framework, as well as the creation of an integrated system of technical and ecological regulation in the fields of selective collection for recycling, recovery, disposal and waste storage. Improving waste management at the regional or local level is a difficult process, considering that in the Republic of Moldova there isn't a relevant plan of measures adjusted to the specific development of localities, as well as a constructive dialogue between authorities and the population on the choice of optimal measures in the

field of sanitation services. Before implementing the objectives of the legislative objectives, it is necessary to make a diagnosis of the current waste management system. Thus, the successful organization and implementation of an integrated waste management system at the local, or even at the national level must be achieved by understanding the institutional roles, applying effective techniques to monitor the implementation in practice of national legal requirements in the field of waste management, knowledge best practices in the field, including normative tools necessary for the organization of the integrated management system.

## **2. Municipal waste in the Republic of Moldova: diagnosis of the situation and main challenges**

In the Republic of Moldova the institution responsible for municipal waste management is the local public administration, which within the financial resources approved for this purpose by the local council for that budget year, is empowered to ensure the creation of an efficient system of integrated municipal waste management. According to the introductory aspects, *the Waste Management Strategy in the Republic of Moldova for 2013-2027* (hereinafter – Waste Strategy) aims to establish the indicative direction of infrastructure development activities and services necessary for proper waste management in order to protect the environment and health population. It establishes the basis for the necessary framework for the development and implementation of an integrated and socially, economically and environmentally efficient system. Sustainable development in the field of waste is based on controlled management to limit in the short term the impact on the environment caused by its disposal, and in the medium and long term to be socially acceptable and economically feasible.

The basic objectives of the current European Union waste policy, to which we should adjust the national legislative framework, suppose the prevention of waste generation and promotion of reuse, recycling and recovery to ensure environmental protection. Waste is increasingly perceived as a valuable source of raw materials for the industrial sector, with approaches such as reuse, recycling and energy recovery, the regulation of packaging waste, where the end-of-life vehicles, equipment waste, electrical and electronic waste, biodegradable waste and tires is applied. European policy focuses mainly on the separation of biodegradable waste from landfills, but also on recycling and recovery, which helps to prevent environmental pollution and reduce greenhouse gas emissions.

Through the Waste Strategy, the Government of the Republic of Moldova undertakes to develop a new legal and institutional framework for regulating waste management at the level of standards including the regulation of various waste streams and waste operations recycling, recovery and disposal, establishment of an efficient progressive institutional system.

Thus, according to the Waste Management Strategy in the Republic of Moldova for 2013-2027 at local level, environmental agencies and inspections, according to their functions, are responsible for supervising and controlling compliance with environmental legislation by local businesses, including in the waste management process. Currently, one of the responsibilities of the local public administration authorities in ensuring that the collection and transportation of solid household waste lie with the sanitation services. Unfortunately these sanitation services operate mainly in urban areas and only in some rural areas, while the rest of localities are poorly covered by these services.

So, the current structure of district councils does not include subdivisions that would ensure the implementation of environmental policy, including in the field of waste management in the administered territory and administrative management, monitoring, enforcement and enforcement of environmental legislation, by attracting investment. The

implementation of the Strategy is foreseen for the years 2013-2027, being periodically evaluated in accordance with technological progress and economic, social and environmental conditions. Thus, in the Republic of Moldova ***the main actors involved in the management and treatment of municipal waste are:***

- *the central public administration authorities*, which are responsible for the elaboration of environmental policies, but also for the monitoring of their implementation;
- *local public administration authorities*, having the role of implementing the adopted legislation, including in the organization of waste management, through the joint efforts of the authorities at regional level in solving the problems associated with waste management, by creating integrated waste management systems;
- *sanitation services in urban localities*, which will expand their activity in rural localities, benefiting from endowments with modern waste collection technique and equipment, having adequate capacities for waste disposal by storage or mechanical-biological treatment;
- *economic agents involved in waste recycling*, which will have access to secondary raw material, obtained through the selective collection of recyclable waste.

The population is the main beneficiary of the implemented legislative provisions, which according to the Waste Management Strategy, must be ensured with healthier living conditions, access to quality waste management services, information and awareness of new ways of waste management.

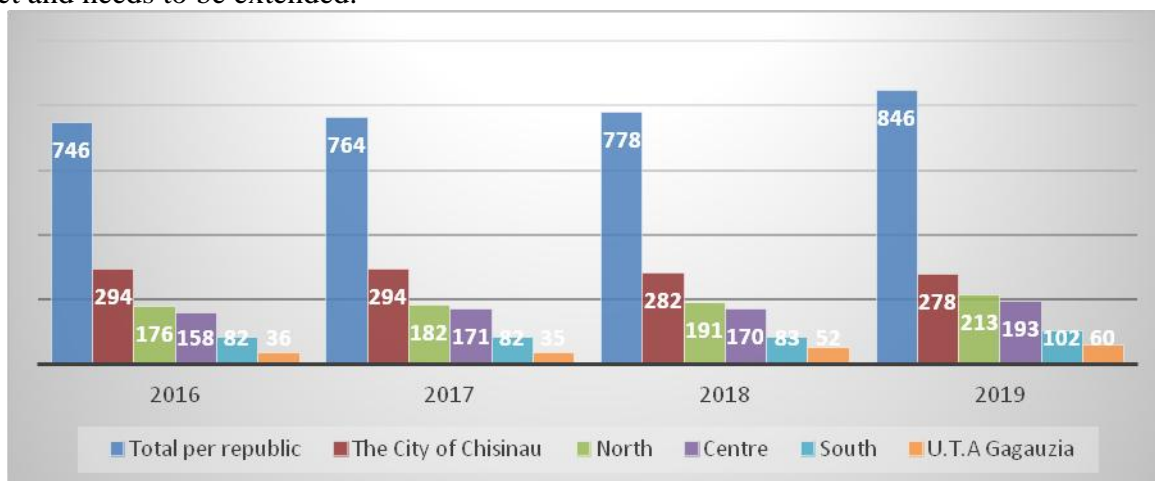
Promoting the regional approach in waste management planning is essential both to attract the necessary investments and to ensure the recovery of the high costs allocated for the implementation of the Waste Management Strategy in the Republic of Moldova for the years 2013-2027.

***The general objectives of the strategy are:***

- 1) development of integrated household waste management systems by harmonizing the legislative, institutional and normative framework with EU standards, based on regional approach and territorial division of the country into 8 waste management regions;
- 2) the development of regional solid waste disposal infrastructure and transfer stations, in line with the practices of EU Member States;
- 3) development of systems for the collection and treatment of specific waste streams (waste electrical equipment, rubber, batteries, etc.) by promoting / implementing the principle "responsibility of the producer".

Currently, in most town halls waste management is part of the sanitation service of localities. Thus, specialized services in waste collection and disposal exist in municipalities, in all district centers, their management being carried out in an organized way through these services, which work on a contract basis with individual generators. In the republic 168 services specialized in waste collection and disposal are activating (56 services in the urban sector and 112 services in the rural sector) (Inspectorate for Environmental protection, 2019). Analyzing the organization of the sanitation service in the country, we notice an enormous discrepancy on the urban and rural sector. The organization of the sanitation service in the municipalities is achieved at a level, although insufficient, but satisfactory, while ***in the localities there is a small number of operators providing sanitation service, but also a small number of vehicles used for sanitation works.***

For example, in Chisinau (572 km<sup>2</sup>, population - 779,339 people), according to statistics for 2020, 13 operators provide sanitation services, at the same time, being involved 278 vehicles used for sanitation works out of a total of 846 vehicles in the country (National Bureau of Statistics, 2020). If we analyze the situation in one district of the country, for example, for the entire Straseni district (area 730 km<sup>2</sup>, present population – 92052 inhabitants) according to data provided by the National Bureau of Statistics for 2018, there are used 8 vehicles for sanitation services. We consider that this number for an entire district is insufficient, and the technical endowment with necessary equipment for waste collection services needs to be improved. The degree of coverage with sanitation services in rural areas, for example, in Straseni district is 40%, which is not sufficient for a district and needs to be extended.

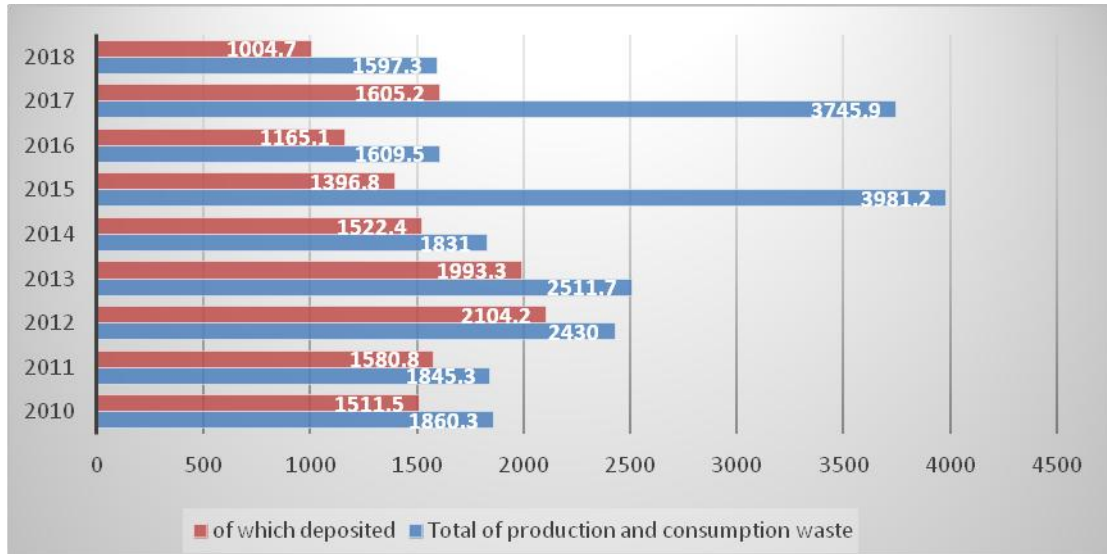


**Fig. 2. Number of vehicles used for sanitation works per country and in comparison to regions, units**

**Source:** made by author in base of data provided by the National Bureau of Statistics

It is necessary to develop the infrastructure necessary for the implementation of the principles specific to the Integrated Waste Management System. For example, in the villages, waste is accumulated from the population either in dumpsters or containers from agencies economic and public institutions, which are collected by trucks, or even tractors that are contracted by the mayor's office centrally and transported to the landfill, or authorized or unauthorized pits that are usually located at 1-2 km from the locality. Some of city halls from communes may contract a tractor, which serves the entire locality.

As a method of final waste disposal in the Republic of Moldova remains disposal by storage. In the Republic of Moldova the most widespread method of disposal of municipal waste, the volume of generation of which has increased in recent years, remains its landfill (see fig. 3). During 2015-2018 there is a stable dynamic (about 3 million m<sup>3</sup> / year), the amount of municipal waste disposed of by storage (850 thousand tons of solid household waste stored in 2015, 875 thousand tons of solid household waste stored in 2016, 925 thousand tons of solid household waste stored in 2017, 890 thousand tons of solid household waste stored in 2018). The amount of production and consumption waste disposed of by storage differs from one year to another: 1 396.8 thousand tons in 2015, 1 165.1 thousand tons in 2016, 3 475.9 thousand tons in 2017 and 1 004, 7 thousand tons in 2018. The amount of hazardous (toxic) waste shipped to landfills area: 7.7 t in 2015, 8.9 tons in 2016, 58.4 tons in 2017 and 94.7 tons in 2018. Those shipped to landfills for household waste: 17.1 tons in 2015, 98.0 tons in 2016, 620.9 tons in 2017 and 33.0 tons in 2018.

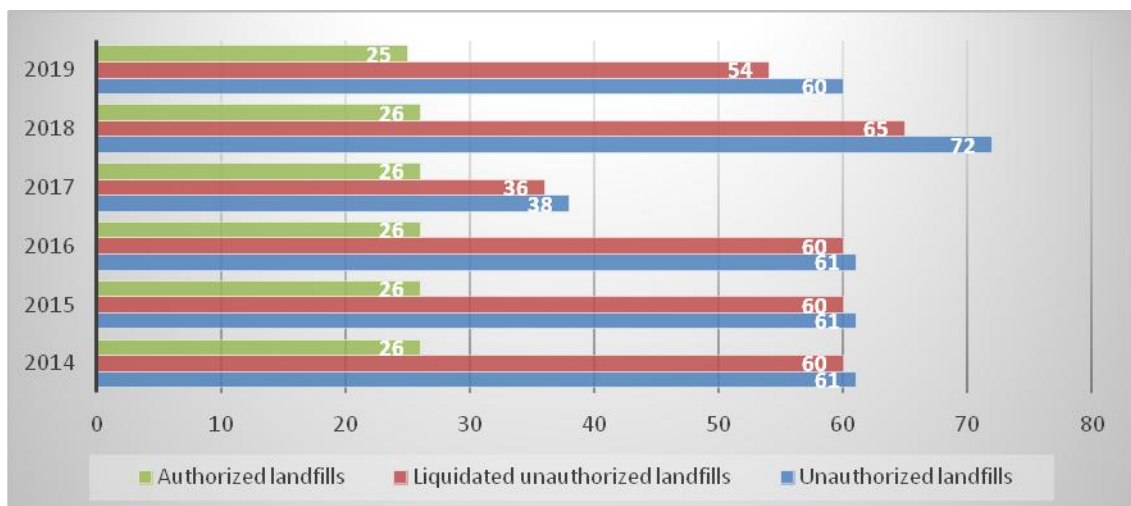


**Fig. 3. Formation and final disposal of production and consumption waste, in thou. tons**

**Source:** made by author in base of data provided by the National Bureau of Statistics

In some rural localities, the disposal and transportation of garbage to landfills, or unauthorized landfills in the locality is done individually. *In most cases, the landfills are non-compliant, since they are not equipped to ensure environmental protection*, there are no drainage and leachate drainage systems, which can lead to water leaks from and on the surface of the landfill with concentrations of pollutants (ammonium, nitrates, copper, zinc, etc.). *Non-degradable waste (plastics, metals, electronic waste, household waste) is stored without separation, together with biodegradable waste*, thus creating conditions for the solubilization of metallic parts by acidic waters generated by fermentation processes. These waters represent a "leachate" that flows uncontrollably both on the land in the vicinity of the deposits and in the neighboring stream (with temporary drainage).

At the same time, the lack of a landfill gas discharge system can lead to self-ignition and smoldering of waste and to fumes and unpleasant odors. The deposits are located variously: in silo pits or pits for animal manure, quarries, landslides affected by landslides, roadside, etc.

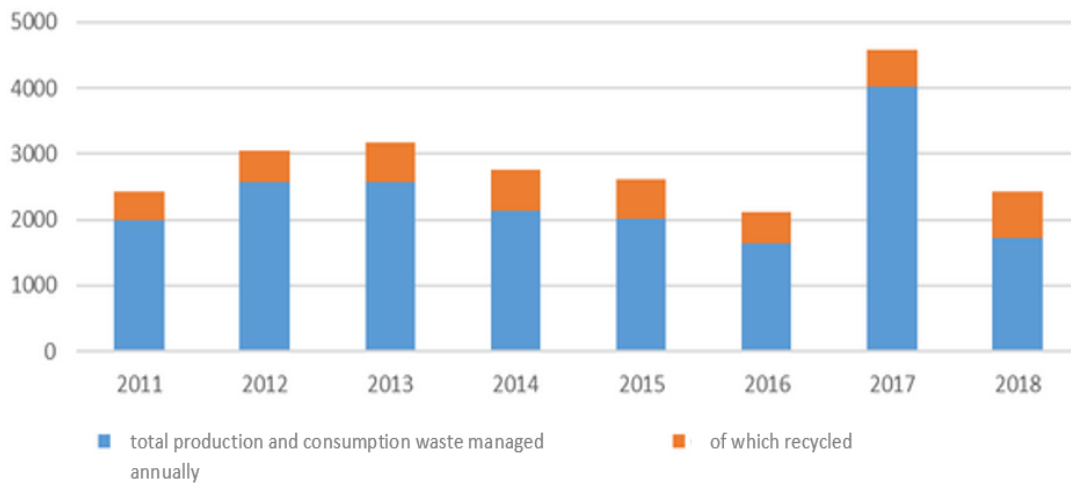


**Fig. 4. Number of unauthorized landfills vis-à-vis authorized landfills**

Source: made by author in base of data provided by the National Bureau of Statistics

Most landfills are undeveloped, and are built without a construction project. In practically all landfills the waste is stored chaotically, their compaction is missing, periodically being only piled up but not guarded. Usually, the ramps have no dams, except for some cities or communes. The record of waste and quantities transported to landfills is not kept. The landfills for waste disposal in some localities (for example, Găleşti commune, with an area of 0.6 ha) are located on the former chemical landfill. In most cases, shipments of waste to landfills are carried out individually without any evidence.

Waste recycling and recovery rates in the Republic of Moldova are still very low (fig. 5). Many recyclable and useful materials are stored together with the non-recyclable ones, thus losing a large part of their useful potential (paper, glass, metals, plastics). Being mixed and contaminated chemically and biologically, their recovery is difficult. Based on the analyzed data, it is found that rural areas do not have a viable infrastructure for selective waste collection. Only in some localities attempts are organized to collect separately plastic waste and electrical and electronic waste equipment from household waste.



**Fig. 5. Production and consumption waste managed annually and their reuse**

Source: elaborated by author in base of data offered by the Inspectorate for Environmental Protection

According to data provided by the Inspectorate for Environmental Protection, at present 56 economic agents activate in the Republic of Moldova, which hold authorizations for the management or recovery of plastics, glass, cardboard, paper, WEEE, ferrous and non-ferrous metals (Inspectorate for Environmental Protection, 2019).

The energy potential of biodegradable waste produced annually in the agricultural and industrial sectors could play a key role in solving the energy problem. During 2019, 48 economic agents in the field of pellets and briquettes produced seasonally, which used in the production process cereal straw, sawdust wood, sunflower seed husks, walnut shells and other vegetable waste.

Animal manure is a dangerous source of environmental pollution. At the same time, the sources of biodegradable waste in the livestock sector represent the highest potential for the production of organic fertilizers and biogas by anaerobic fermentation technology, which is not used enough in domestic practice.

According to official statistical data, about 90% of the amount of municipal waste collected by the sanitation services were eliminated by storage, the selective collection being partially organized in Chisinau municipality and several district centers. For the reporting period, there were identified a series of nonconformities: Due to the separate data flows of National Bureau of Statistics and the Inspectorate for Environmental Protection, it is impossible to calculate the real recycling rate by waste categories. There are no real data on the recycling rate of municipal waste. For the reporting period, there is an increase in the recycling rate of production and consumption waste, amounting to 15.3% in 2015; of 29.8% in 2016; of 34.3% in 2017 and of 44.38% in 2018.

The same unsatisfactory situation is in the case of electrical and electronic waste. The issue of e-Waste is a global concern and challenge, most notably affecting weak or developing countries such as the Republic of Moldova, which do not have a functional system for managing this toxic waste, an infrastructure necessary for selective collection of this waste, necessary financial assistance, sufficient specialized and trained operators (recyclers) to act in an e-Waste market, including an adequate level of information and awareness among the population.

In the Republic of Moldova, the WEEE recovery industry is not developed, respectively we cannot benefit from the recovery of important quantities of raw materials. The amount of WEEE collected at national level is mostly exported to large recycling companies in Romania and other European countries (E-circular, 2020).

The only data on the amount of e-Waste generated at national level are found in the Global E-waste Monitor Report 2017 (data for 2016). Taking into account that the overall annual growth rate of the quantity of e-Waste is 3-4%, table 1 also shows the estimated evolution of the quantity generated in the Republic of Moldova for the period 2017-2020 (total and per / place). e-Waste generated in the Republic of Moldova is estimated to be about 2.2 kg per capita, or about 8000 tons - in 2019.

**Table 1. Total e-Waste generated and collected in Moldova**

Indicator	2016	2017	2018	2019	2020
Total WEEE generated (thou. kg)	6,300	6,804	7,348	7,936	8,571
Kg WEEE generated / inhabitant	1.77	1.92	2.07	2.24	2.41

**Source:** SGP. 2020. *E-Deșeuri în Republica Moldova. Studiu privind generarea și gestionarea e-Deșeurilor în mun. Chișinău*

During the years 2015-2018 there is a variable trend of formation of hazardous waste, which is decreasing from 3,722 t in 2015 to 1,510.6 tons in 2017, after which in 2018 their volume increased 2.8 times, amounting to 4,254 tons.

At the same time, according to data generalized by the National Bureau of Statistics, the average rate of recycling and reuse of hazardous (toxic) waste is about 90% of that formed (2015 - 935.4 tons recycled; 2016 - 2,277.4 tons recycled; 2017 - 6 167.9 recycled tons; 2018 - 4,582.1 recycled tons). Also, there is a sudden increase in the rate of recycling



of hazardous (toxic) waste from the amount of waste dangerous existing at the end of the year (in stock): 15% in 2015, 20.1% in 2016, 62.2% in 2017 and 59% in 2018 (NBS, 2019).

Another issue for which there is currently no solution in Moldova is the problem of pollution with protective equipment used by the population during the pandemic. Microplastics have become an environmental problem in the world because they cannot be collected by filters, and when they pass through wastewater they can collect harmful bacteria that they can carry with them. Data provided by the Ministry of Health in 2018 state that, annually, medical institutions in Moldova produce approximately 8,700 tons of medical waste. Among them - infectious waste, household or human parts removed. It is not known, however, how much these figures increased during the pandemic, when the amount of equipment and utensils used by doctors became much higher, given the disposable suits, but also the exponential increase in the use of medical masks and gloves.

According to the Sanitary Regulation on the management of medical waste, approved by the Government on July 11, 2018, in the context of alignment with European standards in the field, each hospital must have a central space for temporary storage of medical waste. Furthermore, the act stipulates that the duration of storage must not exceed 48 hours in the case of hazardous waste and more than 180 hours in the case of harmless waste.

The managers of the hospitals in the country claim that they respect these norms, and during the pandemic the verification of this aspect is even more rigorous. According to the World Health Organization, the estimated operational costs for treating one kilogram of waste vary between \$ 0.13-2.2, depending on the method. In our country, the annual costs of treating this waste could reach about nine million dollars. The Ministry of Health has made a series of calculations, according to which currently, at the district level, it would be necessary to procure and install an autoclave with a capacity of 200 liters needed to treat infectious waste, the investment costs being about \$ 3.9 million.

### **3. Conclusions.**

Unfortunately, our current production and consumption systems do not offer many incentives for waste prevention and reduction. From product design and packaging to material choice, the entire value chain must be redesigned with a view to preventing waste from the outset, as the "waste" from one process can then be turned into a raw material for another. Advancing the scale of the waste hierarchy requires a common effort of all parties involved: consumers, producers, decision makers, local authorities, waste treatment units, etc. Consumers willing to sort their household waste can only recycle if the infrastructure for collecting the waste they sort is created. The reverse is also true; municipalities can recycle a larger proportion only if households sort their own waste. Ultimately, waste can only be a problem or a resource depending on how we manage it.

Sorting waste would be only part of the problem, or without the ability to process paper, plastic, sorted metal - the problem remains just as complicated. There is no point in educating people to sort waste as long as there is no infrastructure for their processing activities. The state must create this infrastructure. According to the law, LPAs must organize the waste management system in such a way that it is collected separately, a good part of it can be recycled, composted, and go to the landfill, only 3-5% of 100%. The LPAs must organize separate platforms for waste collection that are accessible and understandable for population. Also enforcement mechanisms in case of violations should be created and applied. Garbage should be thrown only on the platform and only collected separately. The entire LPA must come to the aid of economic agents to allocate space, considering that the extended responsibility of the producer should be applied.



Waste could be collected through the bins installed in each household, street containers or platforms installed in slums. Another method would be for people to collect household waste in garbage bags or collect recyclable waste, plastic, glass and paper in garbage bags, and residual waste - in the bins installed in each household. Another way is to provide for the collection of recyclable waste in containers on collection platforms, and residual waste - in the bins installed in each household. At the same time, people should be trained on the importance of waste separation, as well as on the possibilities to separate garbage.

It is important to establish an efficient selective waste collection in all localities, as well as the creation of facilities for sorting, composting and recycling of waste. Also, the waste transportation system should be improved, as well as solid household landfills at the regional level and stations for their mechanical-biological treatment should be built.

State involvement is needed to solve the waste problem. At the same time, residents should be responsible for the separate collection of waste, but also for signing contracts with waste management operators and paying the sanitation fee. Thus it is necessary to develop a methodology for calculating tariffs, taking into account the fact that at present these tariffs are developed by the local public administration, based on very old regulations, which are already outdated in time and do not reflect real costs for an adequate waste management. Even if there is legislation in the field, there is currently no clear regulation that would require every household in the Republic of Moldova to connect to the sanitation service, and local public administrations do not have the leverage to require people to pay for these services. According to a survey conducted by ABS Recycling in May 2020, which was attended by about 5,000 people, it was found that 98% agree to pay a more expensive tariff, with about five lei, for sorting.

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