

CZU: 338.1(478)

EUROPEAN AND NATIONAL CHALLENGES ASSOCIATED TO CIRCULAR ECONOMY TRANSITION

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ABSTRACT. *The study refers to the transition process from a system of the linear economy to circular economy. The emphasis is on promoting the circular economy as a priority for sustainable development for Moldova. Transforming waste from an economic loss into a resource is a strategic direction in forming a sustainable economy. The research is based on empirical data analysis, economic and statistical research methods were used.*

Key words: circular economy, waste management, recycling, institutional barriers.

INTRODUCTION

Since the 1970s, the global population has doubled and the global gross domestic product increased by four times. These trends have required large amounts of natural resources to contribute to economic development and related improvements in human well-being, which have brought it around the globe. However, these gains have had an extraordinary cost to our natural environment, ultimately affecting human well-being and exacerbating inequalities within and between countries. Every European citizen consumes an average of 14 tons of raw materials per year and produces five tons of waste each year. These wastes, products and materials could be reused, repaired or recycled based on the principles of the circular economy. The objective of developing the circular economy is to distance itself from the linear model, which has predominated since the industrial revolution where the growth model based on «take-produce-use-throw» (Alcayaga, A. et al.2019). A circular economy involves minimizing waste as well as reusing, repairing, restoring and recycling existing materials and products. The implementation of a circular economy will reduce the pressure on the environment, ensure the supply of raw materials, increase competitiveness, innovation, growth and opening new working places.

The 2030 Agenda, through its 17 global objectives, brings a universal program of global action in the field of sustainable development, but also the need to find solutions to the challenges of reconfiguring the classical economic model, with direct reference to the limits or inconsistencies of the circular economy. In particular the twelfth objective of sustainable development, includes the need for the integrated promotion of environmental, social and economic elements. Moldova's activity in order to achieve this objective is related to producing a change towards a sustainable path at the level of policies, business and population. Therefore, the principles of sustainable development and procurement, as well as the efficient management of national resources, will be fully incorporated into national policy and regulation processes. Industries and businesses will be encouraged to adopt resource-efficient production and share responsibility for toxic waste and pollutants disposable. Population needs to be aware of its responsibility to consume economic goods and natural resources, reduce waste generation and increase recycling. The synergy and participation of all actors in this production-consumption chain will save and conserve natural resources and reduce the ecological damage caused by economic growth. So, identifying solutions to the challenges associated with the process of implementing and monitoring the SDGs is a new concern at the level of both developed and developing countries.

Sustainable development and the promotion of the circular economy are Moldova's development priorities. These are reflected in the main policy documents, as the National Development Strategy Moldova

2030, Energy Strategy 2030, SME Development Strategy for 2012-2020, Environmental Strategy 2014-2023, Energy Management Strategy waste in the Republic of Moldova for the years 2013-2027. They are also part of Moldova's commitments to development partners abroad. The Association Agreement with the European Union aims to ensure sustainable development and promote the green economy in in Moldova. By signing the Agreement, the Republic of Moldova undertakes to harmonize national and European legislation and to ensure the integration of environmental protection provisions, rational use of resources and energy efficiency, eco-labeling, eco-innovation, in all sectors of the national economy and social life.

MATERIAL AND METHOD

The study is based on research into various existing doctrines and concepts, research conducted so far in the field of linear economy, sustainable development, ecology and circular economy exposed in national and international research papers. The method of analysis and synthesis was used in order to follow the evolution of theoretical conceptions regarding different conceptual approaches of the circular economy. The use of the method of transition from ABSTRACT to concrete allowed us to expose the economic essence of the circular economy starting from the concept of resource limitation, linear economy, economy-environment, sustainability and circular economy. The historical method was also used to present the material in evolutionary order regarding the circular economy, and its supplementation with the logical method allowed the research of the phenomena from simple to complex for the entire historical line. The data of the National Bureau of Statistics with reference to current expenditures for environmental protection and ecological payments, formation and use of waste as well as data collected by the Association for Waste Management of the Republic of Moldova served as research sources.

RESULTS AND DISCUSSIONS

There are many definitions of the concept of circular economy in the literature, which in turn can be systematized in two fundamental approaches: the first includes resource-oriented definitions, which involves a closed cycle of materials, energy and waste, which can be achieved by the reuse at product level (repair or restoration), at component level (reuse in production) and at material level (recycling) (Geng, Y. et al. 2008; Geissdoerfer, M. 2017; Zink, T. et al. 2017); the second catalogs the economically oriented ones, according to which the circular economy is an economic system based on materials reuse and natural resources conservation, focused on creating values for people and economy in each part of the system (Ingebrightsen, S. et al. 2007; Hislop, H. et al. 2011; Bastein, T. et al. 2013).

The circular economy is a component part of sustainable development, including the need to optimize resource consumption to prevent, reduce waste and promote reuse. The idea of circularity, respectively of closing the economic loop, appears outlined in 1976 in the report «The potential of substituting human labor for energy», presenting the vision of an economic loop in relation to job creation, increasing economic completeness, saving resources and preventing waste (Bastein, T. et al. 2013).

The circular economy is considered expensive, sophisticated, acceptable to developed countries, while underdeveloped countries should focus on the goals of linear economic growth, which would bring direct benefits and less efforts (Hislop, H. et al. 2011). However, due to innovation, industry 4.0 and the effect of scale, the circular economy can also be competitive in terms of economic efficiency compared to the traditional one, but also generate solutions for poor countries, such as solar panels for locations without access to energy distribution networks. At the same time, the circular economy can create new jobs due to waste processing or deeper processing of raw materials, and in pandemic conditions it would reduce the logistics chain, ensuring the sustainability of economic development through regionalization.

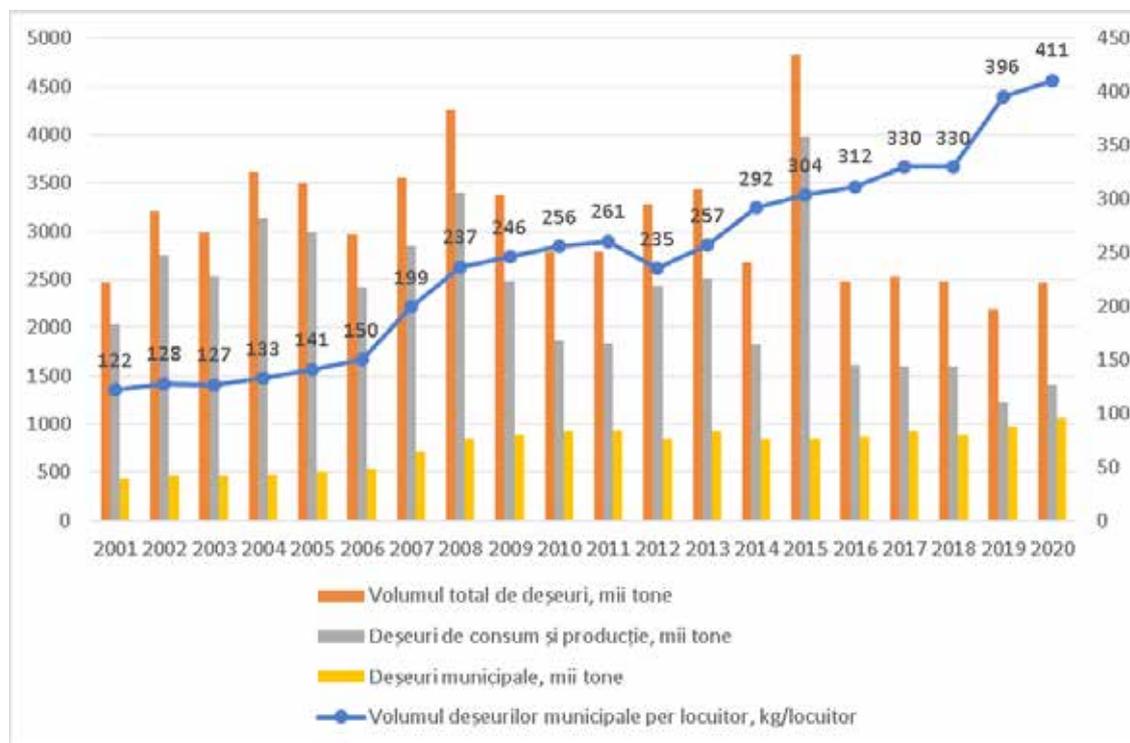


Fig. 1. Evolution of waste volume in Moldova

Source: based on data <https://e-circular.org/statistici/deseuri-generate> (accessed on 20.09.2021)

In the Republic of Moldova, the waste management activity is regulated by Law no. 209 of 29.07.2016 on waste [8], which transposes into national legislation a series of directives of the Council of Europe. Waste management raises very complex issues, which require coordinated actions from the local to the regional level, the collaboration of civil society with local authorities. The general principles of waste management are concentrated in the so-called «waste management hierarchy» as set out in the Waste Framework Directive 2008/98 / EC and apply as an order of priority in legislation and policies on waste prevention in the following descending order of priorities: prevention, preparation for reuse, recycling, other recovery operations, including energy recovery; the elimination. According to the Waste Management Strategy for 2013-2027, seven solid waste landfills, 34 transfer stations and two mechanical and biological treatment plants will be built in Moldova in Chisinau and Balti [9]. Currently, only between 60 and 90 percent of municipal household waste is covered by specialized waste collection services, while in most rural localities it is dumped without authorization.

Annually, through the sanitation services, from urban localities are transported to landfills of solid household waste about 1.1-2.2 million tons of waste [13]. A total amount of about 2.8 million tons of waste is generated from firms activity. In rural areas of Moldova, between 0.3-0.4 kg of waste per capita is generated daily and, respectively, 0.9 kg / capita / day or more in urban areas. More than a third of all waste produced in Moldova belongs to Chisinau. More than 10,000 containers for waste collection are installed in the yards of the capital. Over 2 thousand of them are for separate collection: 1360 - for plastic, 320 - for paper and another 320 - for glass [11].

The dynamics of waste in the period 2001-2015 was an ascending one, which registered a reduction trend starting with 2016, being currently maintained. The trend of municipal waste formation is overall increasing. The largest waste generator is Chisinau, where the largest number Moldova's population is concentrated. Thus, on average, in the municipality of Chisinau, per inhabitant there is about 1.5 m³ of municipal waste collected per year, compared to an average of about 0.6 m³ of waste per year at country level in calculation per one inhabitant. The responsibility for municipal waste management belongs to the local public administrations, which within the financial resources approved for this purpose by the local council for the respective year. These are empowered to ensure the creation of an efficient system of integrated municipal waste management. Nevertheless, the financial potential of local authorities is reduced.

In most town halls, the activities related to local sanitation problems, the separate waste collection are organized at a satisfactory level. Specialized services in waste collection and disposal exist in municipalities, in all district centers, waste management being carried out in an organized way through these services, which work on a contract basis with individual generators, but this system covers only 70-90% of total generators of municipal waste from urban environment. [14] A small part of rural localities, especially those close to the district centers, are served by the services organized for waste management. Rural waste differs from urban waste by morphological composition and quantity. For the population that is not served by 108 sanitation services, the amount of waste generated is calculated as follows: - 0.9 kg per place per day in urban areas and - 0.5 kg per place per day in rural areas. Thus, currently in only 148 rural localities is organized the collection and transportation of waste from specialized collection services. New sanitation services have been formed in some rural localities in the districts of Cantemir, Causeni, Dubasari, Straseni. Most of them are limited to transporting waste to landfills in those localities.

According to the data (Table 1), the quantities of waste vary from year to year due to the variation of waste generating activities, refurbishment, the growing concern to minimize the amount of waste generated. The largest producers of waste are concentrated in the food industry (390 thousand tons), extractive industry (251 thousand tons), animal husbandry (186 tons). About 70% of the total amount of waste formed is disposed of by landfill. The collection of recyclable waste, its transformation into secondary raw materials and their recovery is a profitable business worldwide. The energy potential of waste produced annually in the agricultural and industrial sector could make a key contribution to solving the energy and insurance problem with organic fertilizers. Cereal straw, wood sawdust, sunflower seed husks, walnut shells and other vegetable waste can be used by producers of biomass pellets and briquettes. Animal manure waste is a dangerous source of environmental pollution, but also a potential for the production of organic fertilizers and biogas through anaerobic fermentation technology.

Tabelul 1

Dynamics of waste generated by type of activities in Moldova

	Agriculture		Municipal waste		Processing industry (food)		Extractive industry		Other activities	
	Thousands tones	Share %	Thousands tones	Share %	Thousands tones	Share %	Thousands tones	Share %	Thousands tones	Share %
2001	314	12,72	441	17,87	1147	46,47	229	9,28	337	13,65
2002	328	10,23	459	14,31	1468	45,77	413	12,88	539	16,81
2003	175	5,93	457	15,48	822	27,85	876	29,67	662	21,07
2004	168	4,70	480	13,44	1060	29,68	936	26,21	927	25,96
2005	171	4,89	507	14,50	1422	40,68	436	12,47	960	27,46
2006	141	4,79	541	18,36	1212	41,14	454	15,41	598	20,3
2007	1125	31,71	716	20,18	675	19,20	437	12,03	605	17,05
2008	1215	28,64	852	2008	777	18,32	486	11,46	912	21,5
2009	104	3,09	884	26,28	420	12,49	1240	36,86	716	21,28
2010	108	3,89	921	33,71	521	18,79	397	14,32	826	29,75
2011	185	6,65	940	33,81	543	19,53	411	14,78	701	25,22
2012	212	6,49	847	25,91	536	16,40	355	10,86	1319	40,35
2013	317	9,26	927	27,07	639	18,66	214	6,25	1328	38,77
2014	279	10,21	847	31,79	706	26,50	222	8,33	617	23,16
2015	566	11,74	850	17,63	430	8,92	342	7,09	2633	54,62
2016	179	7,22	975	35,31	338	13,64	456	18,4	630	25,42
2017	216	8,6	925	36,82	364	14,49	385	15,33	622	24,76
2018	186	7,63	890	36,52	390	16,00	251	10,3	720	29,56
2019	...	...	976	44,4	...	...	...	...	1222	55,6
2020	...	...	1066	43,05	...	...	...	...	1410	56,95

Source: based on data <https://e-circular.org/statistici/deseuri-generate> (accessed on 20.09.2021)

CONCLUSIONS

The circular economy is an integral system and allows the maximum exploitation of a country's production potential, contributes to reducing the impact of economic activity on the environment by promoting sustainable economic growth capable of generating new jobs.

At national level, but also at European level, all the challenges related to the implementation and monitoring of the circular economy are related to the need to update national legislation, encouraging stakeholders to develop standards for those types of waste streams that require rules. The strategic directions for Moldova's transition to a circular economy provide for the following: reducing divergences between economic and environmental policies; stimulating research and development, business start-ups in this field; popularization of ecological culture in society; introduction of environmental standards. Some targets are stimulating and require innovative approaches at both national and European level, such as: food waste, which has set an indicative Union reduction target of 30% by 2025 and 50% by 2030. Thus, the transition towards a circular economy, as well as the practical application of its principles, is an important task for the scientific community, for the business sector, for government agencies and society as a whole.

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