

THE LEGISLATIVE FRAMEWORK FOR CIRCULAR ECONOMY IN THE WINE INDUSTRY OF THE REPUBLIC OF MOLDOVA

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Abstract

In response to resource constraints and environmental pressures, the concept of the circular economy (CE) is becoming increasingly crucial for public policies. Adjustments in the existing regulatory framework are necessary to progress toward a circular economy, including product design, waste management, and resource efficiency. Obtaining the status of a candidate country in June 2022 reinforces Moldova's responsibility to make progress. In the communication to the European Parliament, the European Commission, the European Parliament, and the European Council regarding the Republic of Moldova's application for membership in the European Union (EU) (Brussels, June 17, 2022), it was emphasized that significant efforts, accompanied by political and financial support are needed to align domestic legislation with the EU acquis in the fields of environment and climate action. Substantial reforms are required to achieve European objectives within the European Green Deal. This paper explores the existing legal framework for the circular economy with a focus on the wine industry in Moldova. The methodology includes documentary observation, literature review, and analysis of relevant laws.

Keywords: *circular economy; legislative framework; sustainable development; wine industry*

JEL Classification: *L50; Q01.*

I. INTRODUCTION

The transition from a linear to a circular economic model is a complex and long-term process, but Moldova is still at the beginning. In this transition period, it is essential to recognize that the economic and social factors cannot be separated from the environment. Therefore, processes must be designed so that waste generation is minimized as much as possible. The transition to a circular economy is not an option but a stringent necessity. The rate at which we consume natural resources is unsustainable, posing a threat to future generations. We are currently using environmental resources as if we lived on 1.7 planets ([Global Footprint Network, 2024](#)). Developing countries started to give attention to the circular economy with the adoption of the first Circular Economy Action Plan in 2015. In 2020, the second circular economy plan was adopted with even more ambitious targets for sustainable development.

The Republic of Moldova has also made significant strides in this regard, evident through a series of documents that underscore its progress. The main document is the National Development Strategy "European Moldova 2030" (NDS2030). It guides the development directions of the Republic of Moldova, adapting international priorities, objectives, and commitments to the national context, in particular the Association Agreement with the European Union and the status of the membership request to the EU, as well as the Agenda for Sustainable Development 2030. Moldova's application for EU membership and its subsequent granting of candidate status in 2022 signifies a major step toward closer integration with the European Union. Therefore, Moldova must implement essential political, economic, and legislative reforms to meet EU standards and regulations. This also involves aligning with the objectives of the European Green Deal (EGD) and the Circular Economy Action Plan. The European Green Deal represents a renewed EU strategy to achieve the UN 2030 Agenda and the Sustainable Development Goals. It aims to transform the EU into a fair and prosperous society characterized by a modern, resource-efficient, and competitive economy. One of its key goals is to achieve net-zero greenhouse gas emissions by 2050, ensuring that economic growth is decoupled from resource use. In line with these targets, the EU is also committed to responsibly increase its greenhouse gas emission reduction target for 2030 to at least 50% and potentially up to 55% below 1990 levels ([European Commission, 2019](#)).

This ambitious plan seeks to create a sustainable future where environmental health and economic progress go hand in hand. Staff Working Document details the actions of the Green Agenda for the Western Balkans, as outlined in the European Commission's Economic and Investment Plan ([Regional Cooperation Council, 2022](#)).

It covers five key pillars:

1. climate action (decarbonization, energy, mobility),
2. circular economy (waste, recycling, sustainable production, resource efficiency),
3. biodiversity (protection and restoration),
4. pollution reduction (air, water, soil), and
5. sustainable food systems and rural development.

Regarding the transition of the Republic of Moldova to the priorities set in the EGD, it can be said that some important aspects are covered by the National Development Strategy 2030 (NDS2030), the draft of the Environment Strategy for 2024-2030, the draft law on climate action 2024 and other relevant documents. For example, issues related to climate change and the adoption of circular economy models are largely addressed by General Objective 10, which aims to ensure a healthy and safe environment, through the following specific objectives (NDS2030, 2024):

- Specific Objective 10.1: Improving the quality of water, air, and soil
- Specific Objective 10.2: Sustainable increase of forested and protected areas
- Specific Objective 10.3: Ensuring responsible consumption of natural resources
- Specific Objective 10.4: Active transition towards a green and circular economy

Despite these efforts, there are still numerous challenges that need to be addressed. One major issue is the lack of data and information needed to estimate various indicators relevant to the EGD and the Sustainable Development Goals (SDGs). This data gap hampers the ability to measure progress and identify areas that need improvement. Moreover, there is no comprehensive Circular Economy Strategy as a separate document, which is crucial for promoting sustainable production and consumption patterns.

Insufficient incentives at the local level and a lack of active engagement from municipal authorities in climate action efforts pose significant challenges. The shift toward a circular economy is a gradual, multi-year process that demands a systemic approach. It extends beyond any single sector or domain, permeating all aspects of the society. This transition necessitates adherence to clear principles of conducting business in harmony with society and natural resources. Given its complexity, this study will focus on examining the current regulatory framework governing the transition to a circular economy, particularly within the wine industry of the Republic of Moldova, as a pathway toward sustainable development. This sector was selected for research because it's a strategic one. Moldova's wine industry exerts a significant influence on the global wine map. According to the International Organization of Vine and Wine, in 2023, the Republic of Moldova ranked 19th in wine production (1,8 MHL) and 16th in the vineyard area (117 kha) (OIV, 2023). It is known that the wine production process generates substantial quantities of by-products and waste and without further processing, the by-products become waste, posing environmental risks.

II. ANALYSIS OF INDUSTRIAL WASTE GENERATION AND RECOVERY IN MOLDOVA

According to the National Bureau of Statistics, Moldova generated a total of 264,783.9 tonnes of waste in 2022, reflecting a notable 36.20% decrease in industrial waste generation compared to 2020. Over 50% - nearly 80% in 2020 - originated from agricultural, horticultural, aquaculture, forestry, hunting, fishing, and food preparation and processing activities. This significant proportion is attributable to Moldova's status as an agrarian-industrial state, with agriculture being a cornerstone of its economy. In 2020-2022, the total amount of waste generated in agriculture, horticulture, aquaculture, forestry, hunting, fishing, and food processing decreased significantly from 325,766.5 thousand tonnes in 2020 to 135,391.1 thousand tonnes in 2022. This represents a reduction of about 58%, indicating a substantial decrease in this sector. The share of agricultural waste in total waste decreased from 78.5% in 2020 to 51.1% in 2022.

The decrease can be attributed to factors like reduced agricultural activities due to the COVID-19 pandemic, climate change, and improvements in waste management technologies. These improvements may include more efficient recycling and reuse, and the implementation of strict environmental policies. In contrast, other sectors, such as wood processing and furniture manufacturing, saw an increase in waste from 1,807.3 thousand tonnes in 2020 to 2,741.3 thousand tonnes in 2022. The construction and demolition sector also registered a significant increase to 20,937.6 thousand tonnes in 2022.

Table 1 provides a detailed breakdown of waste generation from various sectors in the Republic of Moldova for 2020-2022.

Table 1. Industrial waste generation in Moldova

Indicators	2020	2021	2022
Total, tonnes	415,045.0	415,768.9	264,783.9
In agriculture, horticulture, aquaculture, forestry, hunting and fishing, preparation and processing of food	325,766.5	300,368.1	135,391.1
<i>Share, %</i>	<i>78.5</i>	<i>72.2</i>	<i>51.1</i>

In wood processing and manufacturing of panels and furniture, pulp, paper, and cardboard	1,807.3	2,631.3	2,741.3
In the leather, fur, and textile industry	652.1	1,562.1	1,298.1
In petroleum refining, natural gas purification, coal pyrolysis	12.7	26.8	1.0
In inorganic chemistry processes	3.1	5.5	0.1
In organic chemistry processes	229.1	34.0	6.9
In the manufacturing, formulation, distribution, and use of coating products, adhesives, sealants, and printing inks	18.7	21.0	1.9
In the photographic industry	12.5	12.9	15.1
In thermal processes	1,805.0	928.8	493.0
In chemical treatment of surfaces and coatings of metals and other materials; non-ferrous hydrometallurgy	122.8	230.3	39.3
In physical and mechanical treatment of surfaces of metals and plastic materials	373.8	795.9	479.2
Used oils and liquid fuels	139.7	262.5	142.5
Organic waste and solvents, cooling agents, and propellants	0.8	-	1.6
Packaging waste and packaging; absorbent, polishing, filtering materials, and protective clothing	2,817.8	6,100.6	4,433.1
Unspecified elsewhere in the list	1,232.0	1,519.4	26,101.8
In construction and demolition (including excavated soil from contaminated sites)	6,208.4	13,185.8	20,937.6
In healthcare or veterinary activities and/or related research	8.5	552.3	663.3
In waste treatment facilities, ex-situ wastewater treatment plants, and water preparation for human consumption and industrial use	23,936.1	19,207.0	18,130.7
Municipal (household and commerce, industry, and institutions), including separately collected fractions	49,898.1	68,324.6	53,906.3

Source: elaborated by authors according to the National Bureau of Statistics.

The presented data indicates a decline in total waste generated from 2020 to 2022, suggesting potential advancements in waste reduction practices or shifts in consumption habits. However, a corresponding decrease in total waste recovered during the same period indicates challenges in waste recovery efforts. The waste recovery rate experienced fluctuations, decreasing from 74.0% in 2020 to 59.6% in 2021 before slightly rebounding to 65.0% in 2022. This suggests varying effectiveness in waste management strategies over the years, with room for improvement to achieve higher recovery rates.

Table 2. Waste recovery rate from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing

Indicators	2020	2021	2022
Total waste generated, tonnes	415 045	415 769	264 784
Total waste recovered, tonnes	307 018	247 803	172 213
Waste recovery rate, %	74.0	59.6	65.0
Waste generated from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing, tons	325 766	300 368	135 391
Waste recovered from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing, tons	232 066	159 913	60 544
Waste recovery rate from agriculture,...food preparation and processing, %	71.2	53.2	44.7

Source: elaborated by authors according to the National Bureau of Statistics.

Sector-specific analysis reveals a significant decrease in the waste generated and recovered from agriculture, horticulture, aquaculture, forestry, hunting, fishing, food preparation, and processing sectors. Meanwhile, waste recovery in agriculture, horticulture, aquaculture, forestry, hunting, fishing, and food preparation and processing sectors lag behind that of other industries, representing 44.7 % in 2022.

The operations of businesses within the wine sector are intricately intertwined not solely with the agricultural cycle, but also with the biotechnological cycle.

Alongside the production of primary goods, significant quantities of by-products are derived. Failure to appropriately process these secondary by-products, leading them to end up in landfills, poses a considerable threat to the surrounding environment, inflicting substantial harm.

Industrial waste and secondary products occur at various stages of the wine production process. During production, by-products such as pomace (grape skins, seeds, and stems), grape stems, yeast, wine stone (tartaric acid crystals), and wine lees (residue from wine distillation) are generated. Similarly, post-consumer waste from the wine industry includes items like bottles, cardboard, film packaging, corks, and other packaging materials. After their initial use, these items can contribute to environmental pollution if not adequately recycled or disposed of. Managing the industrial by-products and post-consumer waste from the wine industry is crucial for minimizing environmental impact and promoting sustainability. Proper waste management practices are essential to mitigate the environmental consequences associated with these materials. At a global scale, the wine sector accounts for approximately 0.3% of annual greenhouse gas emissions, while the water footprint of wine production ranges from 0.5 to 20 liters per liter of wine (Trioli et al., 2015).

Table 3 provides a clear overview of the quantities of secondary products generated by wineries in the Republic of Moldova. According to the Production Declarations for 2021 provided by wineries in the Republic of Moldova, a significant quantity of by-products can be deduced: 879,773.0 dal of yeast, 38,568 tonnes of pomace, and 11,883.2 tonnes of grape stems (National Office of Vine and Wine, 2021).

Table 3. Winery by-products generated in the wine industry of the Republic of Moldova, 2021

Secondary wine product	Quantity
Yeast	879,773.0 dal
Pomace (grape marc)	38,568.0 tons
Grape Stems	11,883.2 tons

Source: Elaborated by the authors based on data provided by the National Office of Vine and Wine.

The largest share is held by grape marc, which accounts for about 15% of the processed grape mass. Therefore, it is important to examine the current management practices implemented by wineries in the Republic of Moldova regarding by-products. Unfortunately, the rate of valorization is quite low. More than 57% do not process by-products at all, while the remaining 43% process them to a lesser extent, typically below 50%.

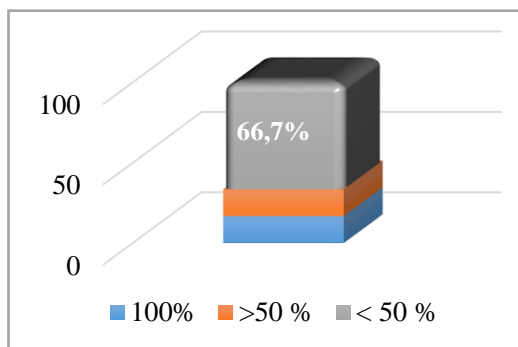


Figure 1. Processing rate of winery by-products

Source: Elaborated by the authors based on data provided by the National Office of Vine and Wine.

In response to the query regarding the handling of winemaking by-products when not processed, 2 main destinations were identified: (Bugaian et al, 2021)

1. Transport and disposal at an authorized landfill (50% of responses).
2. Sale (43% of responses).

A significant number of wineries in the Republic of Moldova continue to operate under a linear business model, neglecting to incorporate the by-products from wine production into new industrial cycles. Consequently, substantial quantities of these by-products are disposed of in landfills, resulting in significant environmental damage. Apart from the environmental advantages associated with the processing of these secondary products, there exists an economic benefit that remains largely unrecognized by many in the industry.

III. THE ANALYSIS OF EXISTING LEGISLATION PROMOTING CIRCULAR ECONOMY IN THE WINE INDUSTRY OF THE REPUBLIC OF MOLDOVA

The first law regulating the management of industrial and household waste in the Republic of Moldova, aimed at reducing and reintroducing these wastes into the economic cycle, was initially adopted under [Law No. 1347-XIII](#) on October 9, 1997, and published on March 5, 1998. This law covered essential activities such as formation, treatment, packaging, storage, transportation, neutralization, processing, and utilization of waste. In 2016, the law was repealed and replaced by Law No. 209 of July 29, 2016, concerning waste management, which came into force on December 23, 2017. It has since been amended on July 26, 2018, August 15, 2019, December 16, 2020, July 21, 2022, and most recently on March 7, 2023, under Law No. 18 of February 2, 2023.

The main purpose of the current law is to align national legislation with the European Union Directive 2008/98/EC on waste management, thereby ensuring compatibility and efficiency in resource utilization in the Republic of Moldova. Law No.209 introduced the concept of extended producer responsibility (Article 12), aiming to strengthen reuse and prevent excessive waste production. According to this legislation, all individuals or legal entities (the product manufacturer) who, in a professional capacity, design, manufacture, process, treat, sell, and/or import products are subject to the regime of extended producer responsibility. Paragraph 2 of Article 12 of the law defines the extended producer responsibility as a "set of obligations imposed on producers, either individually or collectively, for the recovery, valorization, or recycling of products at the end of their life cycle. The activities related to implementing extended producer responsibility include accepting returned products and the waste remaining after their use, as well as managing these wastes and ensuring financial provisions for these activities" ([Law No. 209, 2016](#)). Therefore, extended producer responsibility requires these entities to manage the environmental impact of their products throughout their lifecycle, from design to disposal. This includes implementing measures for product reuse, recycling, and waste reduction. By placing responsibility on producers, the law encourages sustainable practices and incentivizes the design of products that are easier to recycle and less harmful to the environment. Article 3 of the law establishes the waste hierarchy and its application method, taking into account the principles of the circular economy. This hierarchy prioritizes actions such as prevention, preparation for reuse, recycling, other forms of valorization, and disposal. Mandatory for all involved in waste management, the hierarchy aims to minimize environmental impact and promote a circular economy.

The prioritization of waste management options based on their efficiency is as follows:

1. **Prevention:** Measures to reduce the quantity and harmfulness of the generated waste, including through eco-design and product life extension.
2. **Preparation for reuse:** Actions to prepare products or components for reuse through repair, refurbishment, or redistribution.
3. **Recycling:** Processes to recover materials or energy from waste materials through recycling and composting.
4. **Other forms of valorization:** Methods such as energy recovery from waste that cannot be recycled.
5. **Disposal:** Safe and environmentally responsible disposal methods for waste that cannot be prevented, reused, recycled, or valorized.

According to paragraph (2) of Law No. 209 dated July 29, 2016, the implementation of the waste hierarchy as specified in paragraph (1) is compulsory for all parties involved in waste management. This ensures the prevention of waste generation and promotes the efficient and effective management of waste to minimize its adverse environmental effects.

These regulations are intended to foster sustainable practices and promote efficient waste management by holding producers accountable for the entire life cycle of their products. This includes responsibilities from the initial design stages to the final disposal phase. By emphasizing producer responsibility throughout the product lifecycle, the regulations aim to minimize environmental impact, encourage resource efficiency, and facilitate the transition towards a circular economy in Moldova.

To understand whether Moldovan wineries comply with current legislation, the provisions of Law No. 57 of 10-03-2006 on viticulture and wine were analyzed. Article 15 of this law stipulates the obligation for enterprises to process secondary products independently or to deliver them to specialized enterprises. According to [Law No. 57/10-03-2006](#), the by-products obtained in winemaking are grape pomace, vinas, marc, diffusion juice, picket, wine stone (tartar), cluster must, and wine lees. Winemaking by-products must be processed at wineries or other specialized enterprises from the sector ([Law No. 209, 2016](#)).

A significant number of wineries in the Republic of Moldova do not adhere to these provisions. A constructive solution to this problem, benefiting both parties (the state and economic agents), involves the creation of a partnership between the private and public sectors, establishing a national enterprise for the collection and processing of resultant secondary products. This would capitalize on potential economic and social opportunities from utilizing secondary wine products on the one hand and on the other hand, it would reduce the impact on the environment.

Furthermore, enterprises that have generated, received, collected, or processed waste are required to annually report accurate information by April 30th regarding the total activity of each waste category and their management methods. The reporting procedure is conducted through the automated information system called "Waste Management," accessible via <http://siamd.gov.md/>.

IV. THE EU WINE POLICY FRAMEWORK IN THE CONTEXT OF CIRCULAR ECONOMY

EU wine policy, integral to the Common Agricultural Policy (CAP), has evolved significantly since its inception alongside the CAP in 1962. Initially focused on production restrictions to manage supply and demand (including vine planting bans in the 1970s, vineyard removal incentives in the 1980s, and later grubbing-up schemes), subsequent revisions of the Common Market Organization (CMO) Regulation shifted towards enhancing wine quality and sector competitiveness.

The current CMO Regulation ([Regulation \(EU\) 1308/2013](#)), amended in 2018 by the CAP Amending Regulation (EU) 2021/2117, with most provisions effective since January 2023, governs wine marketing and sector operations. CAP payments to wine growers and interventions supporting the sector are outlined in the CAP Strategic Plans Regulation, with additional regulations covered under the CAP Horizontal Regulation. Specific aspects of the wine industry are further regulated through various delegated and implementing acts, alongside legislation such as the Food Information for Consumers (FIC) Regulation, Organic Production Regulation, and Regulation on the promotion of agricultural products ([Šajin, 2023](#)).

Annex VIII of the CMO Regulation, supplemented by Commission Delegated Regulation (EU) 2019/934, specifies authorized oenological practices governing procedures like enrichment, acidification, de-alcoholization, sulfur dioxide levels, sweetening, and experimental techniques. Non-compliant wine products must be disposed of, yet Member States retain the flexibility to authorize some for use in distilleries, vinegar factories, or industrial applications, guided by OIV recommendations in regulatory development.

Article 14 "Disposal of By-Products" of the Commission Delegated Regulation (EU) 2019/934 outlines ([European Commission, 2019](#)):

1. Producers must remove the by-products resulting from winemaking or any grape processing under the supervision of competent authorities of Member States, adhering to the delivery and registration requirements outlined in Article 9(1)(b) of Commission Delegated Regulation (EU) 2018/273 and Article 14(1)(b)(vii) and Article 18 of Commission Implementing Regulation (EU) 2018/274.
2. Withdrawal of by-products must occur promptly and no later than the end of the wine year in which they were generated, in compliance with relevant Union legislation, especially concerning environmental protection.
3. Member States have the discretion to exempt producers who produce no more than 50 hectoliters of wine or must be on their premises during the relevant wine year from the obligation to withdraw their by-products.

Financial incentives exist for companies adopting sustainable and nature-friendly practices. Like other farms, vineyards qualify for decoupled direct payments funded by the European Agricultural Guarantee Fund (EAGF). According to EU regulations, these payments include basic income support for sustainability, primarily based on eligible hectares; complementary redistributive income support for sustainability, aimed at smaller farms; and additional income support for young farmers. The Basic Income Support Scheme (BISS) is the EU's main farmer income support program, to promote sustainable agricultural practices and enable farmers to maintain viable livelihoods through their farming activities. Payments under the BISS program depend on the number of hectares of land each beneficiary is entitled to cultivate. The indicative financial allocation to ISS (2023-2027) is reflected in Table 3. ([European Commission, 2023](#))

Table 4. Indicative financial allocation to BISS

MS	BISS ('000 EUR)	BISS (share of DP)	average BISS/ha
Belgium-Wallonia	402 425	30%	143
Belgium-Flanders	564 622	54%	143
Bulgaria	1 991 340	48%	101
Czechia	1 274 906	31%	67
Denmark	3 096 130	75%	227
Germany	13 517 917	61%	147
Estonia	526 952	52%	110
Ireland	3 642 474	61%	165
Greece	4 274 575	49%	214
Spain	12 305 844	51%	128
France	16 524 522	48%	130
Croatia	712 063	38%	130

Italy	8 451 602	48%	167
Cyprus	155 219	65%	233
Latvia	853 280	50%	90
Lithuania	1 135 097	38%	82
Luxembourg	80 297	49%	132
Hungary	3 618 150	55%	147
Malta	18 154	42%	638
Netherlands	1 692 610	57%	180
Austria	2 387 972	70%	189
Poland	8 204 635	47%	120
Portugal	1 572 757	45%	81
Romania	4 822 415	49%	101
Slovenia	414 451	62%	184
Slovakia	943 344	47%	104
Finland	1 478 197	57%	130
Sweden	2 035 534	59%	138
EU-27	96 697 483	51%	134

Source: European Commission, 2023

Table 4 shows that Malta is in first place with 638 BISS/ha, well above the EU average, and the Czechia is below average with 67 BISS/ha.

V. CONCLUSIONS

The following key remarks of the present study can be drawn:

1. While Moldova faces challenges in transitioning to a circular economy, its legislative initiatives and strategic frameworks demonstrate a commitment to sustainable development. Collaborative efforts, supported by EU accession processes and international partnerships, will be pivotal in overcoming these challenges and achieving long-term environmental and economic sustainability in the wine industry and beyond.
2. The shift towards a circular economy is no longer a choice but an urgent imperative in the context of climate change and the depletion of natural resources. Moldova's international commitment to embrace circular economy principles requires aligning its legislation and practices with EU standards, particularly now, when it was granted a candidate country status. Comprehensive legislative reforms are crucial across all priority sectors, especially in waste management and resource efficiency.
3. Although Moldova has made legislative progress regarding the transition to a circular economy and sustainable development, many reforms still need to be implemented in this regard. The main document outlining priorities aligned with the European Green Deal is the National Development Strategy 2030 and draft laws on climate action. Responsible authorities must monitor the implementation of these legislative provisions to ensure they are more than just paper commitments.
4. In the wine industry, significant quantities of by-products such as pomace and grape stems are generated annually. Despite legal requirements for their processing or disposal, many wineries fail to comply, highlighting gaps in enforcement and industry practices. The Extended Producer Responsibility under current waste management laws of the Republic of Moldova is a positive step. It mandates producers to manage environmental impacts throughout a product's lifecycle, fostering sustainable practices and supporting circular economy goals. But to work properly, it requires robust enforcement mechanisms, adequate infrastructure, widespread public awareness, and effective monitoring. These elements are essential to ensure compliance with regulations, track progress, and evaluate the effectiveness of initiatives aimed at advancing Moldova's environmental goals.
5. The EU's regulatory framework, such as the Common Agricultural Policy (CAP) and specific regulations governing winemaking by-products, provides benchmarks for Moldova's legislative efforts. Integration with the EU's Circular Economy Action Plan presents opportunities for Moldova, including access to EU financial support and collaboration frameworks.

ACKNOWLEDGMENT

This study was developed within the framework of the Subprogram for Research on Ensuring Sustainable Development and Increasing the Competitiveness of the Republic of Moldova in the European Context, with the program code 020408.

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