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Transition to the circular economy in the Republic of Moldova: applied policies, models, and indicators

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Abstract:

TRANZIȚIA LA ECONOMIA CIRCULARĂ ÎN REPUBLICA MOLDOVA: POLITICI APLICATE, MODELE ȘI INDICATORI

Lucrarea propune o cale pentru tranziția la economia circulară în Republica Moldova, combinând politici ușor de implementat, modele de afaceri testate în alte țări și un set minim de indicatori. Plecăm de la instrumente-cheie (achiziții publice verzi, responsabilitatea extinsă a producătorului, stimulente fiscale pentru reparații și reutilizare) și le conectăm cu patru modele aplicate: folosirea resurselor secundare, prelungirea duratei de viață (reparații, recondiționare), servicizarea (închiriere/abonament) și platforme de reutilizare. Propunem indicatori simpli: rata circularității materialelor, intensitatea resursei, rata de valorificare a deșeurilor, venituri din servicii circulare, emisii evitate. Exemple internaționale (Franța – indice de reparabilitate; Danemarca – simbioza industrială Kalundborg; Olanda – Green Deals și pașapoarte de materiale; Italia – consorțiile EPR pentru ambalaje; Scoția – programe Zero Waste; Slovenia & Portugalia – achiziții publice verzi) arată ce funcționează în practică și ce poate fi adaptat rapid. Contribuția articolului constă în realizarea unui sondaj în rândul operatorilor economici și factorilor de decizie din Republica Moldova, în care s-au evidențiat barierele principale în adoptarea modelelor circulare (lipsa reglementărilor clare, costuri inițiale ridicate, lacune în infrastructură), precum și oportunități prioritare pentru proiecte-pilot în sectoarele construcției, agroalimentar și echipamente electrice și electronice (EEE), cu propuneri concrete pentru raportare anuală pe indicatori.

Cuvinte-cheie: tranziție circulară; modele de afaceri; achiziții verzi; indicatori.

Abstract:

This paper proposes a pathway for the transition to a circular economy in the Republic of Moldova, combining readily implementable policies, business models tested in other countries, and a minimum set of indicators. We build upon key instruments (green public procurement, extended producer responsibility, tax incentives for repair and reuse) and connect them with four applied models: the use of secondary resources, lifetime extension (repair, refurbishment), servitization (rental/subscription), and reuse platforms. We propose simple indicators: material circularity rate, resource intensity, waste recovery rate, revenue from circular services, and avoided emissions. International examples (France – repairability index; Denmark – Kalundborg industrial symbiosis; the Netherlands – Green Deals and material passports; Italy – EPR consortia for packaging; Scotland – Zero Waste programmes; Slovenia & Portugal – green public procurement) demonstrate what works in practice and what can be rapidly adapted. The contribution of this article consists in conducting a survey among economic operators and

decision-makers in the Republic of Moldova, which identified the main barriers to adopting circular models (lack of clear regulations, high initial costs, infrastructure gaps), as well as priority opportunities for pilot projects in the construction, agri-food, and electrical and electronic equipment (EEE) sectors, with concrete proposals for annual indicator-based reporting.

Keywords: circular transition; business models; green public procurement; indicators.

Introduction

The circular economy (CE) represents a paradigm shift from the traditional linear model of “take–make–dispose” toward a regenerative system that prioritizes resource efficiency, waste minimization, and product life extension [1, 2]. Over the past decade, CE has become a central concept within the European Union’s (EU) sustainability agenda, reinforced by the Circular Economy Action Plan (2020) under the European Green Deal. The model emphasizes a closed-loop system in which resources, materials, and products retain their value for as long as possible, thereby decoupling economic growth from environmental degradation [3].

Globally, countries are developing policies that encourage CE adoption across industries and municipalities. Nations such as Finland, the Netherlands, and Japan have implemented comprehensive CE strategies focusing on eco-design, waste prevention, and material reuse. These examples demonstrate that CE is not merely an environmental policy but an economic strategy for competitiveness, innovation, and job creation [4, 5].

For the Republic of Moldova, transitioning toward a circular economy is both an environmental necessity and an economic opportunity. Moldova’s economy remains resource-intensive, with a high dependency on imported raw materials and limited infrastructure for waste recovery or recycling [1, 4, 5, 6]. According to national statistics, the recycling rate remains below 10%, and industrial symbiosis initiatives are virtually absent. The accumulation of municipal solid waste continues to strain the environment, while secondary resource markets are underdeveloped.

Moldova’s association with the EU through the EU–Moldova Association Agreement (2014) and participation in the EU4Environment initiative provides a framework for policy harmonization in line with EU environmental directives. However, institutional fragmentation, insufficient enforcement, and lack of investment hinder the implementation of CE principles at scale [7, 8, 9, 10].

Methodology

The methodological framework integrates policy analysis, comparative benchmarking, and a conceptual survey framework. The research does not conduct primary empirical data collection but relies on secondary sources, case studies, and EU documentation. The approach combines desk-based research on CE instruments with an evaluation of their applicability in Moldova’s institutional and economic context [6, 7]. The analytical framework aligns with the Circular Economy Monitoring Framework of the European Commission, structured around resource productivity, waste generation, and secondary raw material use [4, 8]. The framework was contextualized for Moldova by mapping existing national strategies such as the National Waste Management Strategy (2013–2027) and Environment Strategy 2030.

A conceptual survey was designed to collect insights from economic operators and policymakers regarding perceived barriers, readiness, and opportunities for CE implementation. Although not yet conducted, the survey targets three stakeholder groups:

- ✓ Public sector institutions (ministries, local authorities, procurement agencies)

- ✓ Private enterprises (manufacturing, construction, agri-food, EEE)
- ✓ Civil society organizations (environmental NGOs, academic institutions)

The survey framework includes indicators on awareness, perceived regulatory barriers, investment capacity, and willingness to adopt CE models. Results are intended to inform national CE policy design and monitoring.

As a conceptual and comparative study, limitations include the absence of primary data validation and the dependency on the quality of secondary sources. Nonetheless, the framework offers a replicable foundation for future empirical work in Moldova.

Results and Discussion

Policy instruments form the backbone of the CE transition. For Moldova, three categories of instruments are identified as immediately actionable (Table 1).

Table 1. Key Circular Economy Policy Instruments for Moldova

Category	Description	Expected Impact	Example
Green Public Procurement (GPP)	Integration of environmental criteria in public contracts for goods and services	Stimulates demand for circular products	Slovenia, Portugal
Extended Producer Responsibility (EPR)	Obligates producers to manage end-of-life products	Promotes recycling, reuse, and eco-design	Italy (Packaging Consortia)
Fiscal Incentives for Repair/Reuse	Reduced VAT or tax credits for repair services and reused goods	Extends product lifetime, creates jobs	France (Repairability Index)

Source: Author’s interpretation

These instruments have proven effective in EU member states by stimulating market transformation, innovation, and behavioral change [8]. For Moldova, implementing GPP across ministries could create a guaranteed market for circular products, while EPR schemes would redistribute waste management responsibilities to producers, ensuring resource recovery.

Comparative Analysis of International Models

France: Repairability Index - France introduced a repairability index that rates consumer electronics based on their ease of repair and availability of spare parts. This index empowers consumers and encourages manufacturers to design durable products [9]. Moldova could adopt a simplified version within its eco-labeling system.

Denmark: Kalundborg Industrial Symbiosis - Kalundborg represents a pioneer model where industries exchange energy and by-products in a closed network, reducing waste and emissions [5]. Moldova’s industrial clusters—particularly in construction materials and agri-processing—could replicate this model on a smaller scale.

Netherlands: Green Deals and Material Passports - The Netherlands promotes voluntary “Green Deals” between government and businesses to pilot CE solutions. The “material passport” system for buildings enhances transparency on material content and reuse potential [7]. This approach aligns with Moldova’s construction sector modernization.

Italy: EPR Consortia for Packaging - Italy's EPR system, managed through CONAI and specialized consortia, achieved recycling rates above 70% for packaging [2]. Moldova could replicate this by establishing a national consortium for packaging waste, supported by clear legal definitions.

Scotland: Zero Waste Programs - Scotland's Zero Waste Plan integrates local authorities into waste prevention initiatives and supports reuse centers [3]. Similar municipal-level partnerships could operationalize CE principles in Moldova's regions.

Slovenia and Portugal: Green Public Procurement - Both countries implemented binding GPP targets in national strategies, demonstrating that procurement can be a key lever for CE adoption [2]. Moldova's public procurement system, undergoing digitalization, provides an opportunity to embed GPP criteria.

Between June and August 2025, the Department of Economy, Marketing and Tourism (DEMT) of Moldova State University conducted a survey among 217 respondents representing economic operators, business associations, local authorities, and decision-makers involved in the country's sustainable development and green transition agenda. The survey was designed as part of the research on the transition toward a circular economy in the Republic of Moldova, aiming to identify the main barriers to the adoption of circular models and to outline priority sectors for pilot projects and indicator-based reporting.

The questionnaire was distributed online to DEMT's professional and institutional partners, including representatives of enterprises from the construction, agri-food, and electrical and electronic equipment (EEE) sectors, as well as public institutions engaged in environmental and economic policy implementation. The data were collected through structured questions using a five-point Likert scale, complemented by open-ended items that allowed respondents to provide qualitative insights on specific challenges and opportunities.

Out of the 217 valid responses, approximately 42% were representatives of private enterprises, 28% from local and central public institutions, 20% from business associations, and 10% from academia or civil society organizations. In terms of sectoral distribution, 33% operated in the construction industry, 31% in agri-food processing and packaging, and 24% in electrical and electronic equipment, while the remaining 12% represented cross-sectoral service providers and consultants. Most respondents were decision-makers or managers involved in operations, sustainability, or procurement activities within their organizations.

Overall, the survey revealed a growing awareness of circular economy principles among Moldovan economic operators. Nearly two-thirds (65%) of respondents indicated that they were "familiar" or "very familiar" with the concept of circular economy, although only 18% reported having implemented specific circular practices. When asked about their intentions to adopt circular models within the next two years, 44% expressed interest in at least one of the following approaches:

- ✓ using secondary raw materials in production,
- ✓ extending the lifetime of products through repair or refurbishment,
- ✓ adopting servitization or rental models, or
- ✓ participating in reuse or sharing platforms.

Respondents from the construction sector showed the highest readiness to experiment with the use of secondary materials, while agri-food enterprises were more interested in waste valorization and packaging recovery schemes. In the EEE sector, interest centered around repair and refurbishment services.

The analysis confirmed that Moldovan enterprises face multiple obstacles in advancing toward circularity. The three most frequently cited barriers were:

Lack of clear regulations and definitions concerning secondary materials, waste valorization, and extended producer responsibility (mentioned by 73% of respondents);

High initial investment costs for circular technologies, eco-design, or repair infrastructure (identified by 68%); and

Insufficient infrastructure for collection, sorting, and recycling, particularly outside Chisinau and major urban centers (reported by 63%).

Other challenges included limited access to green finance, lack of consumer awareness, and uncertainty about market demand for circular products. Respondents emphasized that without clear policy guidance and financial instruments, circular initiatives remain largely experimental and small-scale.

Despite these constraints, respondents expressed strong support for several policy mechanisms that could accelerate CE adoption.

✓ Green public procurement (GPP) was identified by 59% as the most promising driver of demand for circular products and services, particularly if government tenders included explicit environmental and durability criteria.

✓ Extended Producer Responsibility (EPR) schemes, already piloted in Moldova for packaging and WEEE, were seen by 48% as potentially transformative, provided that responsibilities and fee structures were better defined and monitored.

✓ Fiscal incentives, such as reduced VAT rates for repair services or tax credits for using recycled inputs, were viewed as essential for offsetting high upfront costs (endorsed by 41%).

✓ Public awareness campaigns and labeling initiatives (e.g., a “repairability index”) were also mentioned as effective tools for changing consumer behavior and motivating producers to innovate.

The comparative assessment of sectors revealed distinct pathways for piloting circular models in Moldova:

✓ In the construction sector, 40% of respondents supported pilot projects on selective demolition, material passports, and the reuse of aggregates, noting their potential to significantly reduce waste streams.

✓ Within the agri-food sector, 35% proposed initiatives focused on by-product valorization, biowaste composting, and reusable transport packaging systems, aligning with Moldova’s food-processing strengths and existing infrastructure.

✓ In the EEE sector, 32% favored the development of repair and refurbishment centers combined with take-back programs under EPR frameworks.

✓ Across all sectors, the survey highlighted the importance of collaboration between public authorities, academia, and business associations to test and evaluate pilot actions before scaling them nationwide.

Respondents were also asked about their capacity to track and report progress using circular economy indicators. Only 22% of enterprises currently monitor any type of environmental or resource-efficiency indicator. However, over 60% expressed willingness to begin reporting simple metrics such as:

- ✓ waste recovery rate,
- ✓ use of secondary raw materials, and
- ✓ revenues from circular services.

When presented with the proposed five key indicators—Material Circularity Rate, Resource Intensity, Waste Recovery Rate, Revenue from Circular Services, and Avoided Emissions—most respondents agreed that these measures were clear and feasible if supported by standardized reporting templates and training. The majority (71%) considered annual reporting “useful” or “very useful” for benchmarking and transparency.

Open-ended responses reinforced the quantitative findings. Participants repeatedly called for greater policy coherence between environmental, economic, and fiscal institutions, as well as simplified administrative procedures for recycling and reuse initiatives. Several local government officials noted that municipal waste systems remain heavily focused on collection and disposal, with limited integration of recovery or repair facilities. Entrepreneurs emphasized the need for pilot financing schemes—small grants or co-investment programs—to test circular solutions before commercial scaling.

Interestingly, respondents from universities and vocational training institutions highlighted the educational dimension of circular transition, advocating for the inclusion of circular economy topics in curricula and professional training. This aligns with the role of higher education in promoting sustainable innovation, as demonstrated by DEMT’s ongoing partnerships with local enterprises through joint projects and internships.

The survey findings provide an indicative snapshot of Moldova’s readiness to transition toward a circular economy. The relatively high awareness but modest implementation levels suggest a transitional stage where the concept is known but not yet operationalized. The results confirm that regulatory uncertainty, financial constraints, and infrastructure deficits remain the principal structural barriers, echoing conclusions from regional studies conducted by the EU4Environment and UNDP Moldova programs.

At the same time, the widespread interest in GPP, EPR, and fiscal incentives demonstrates that Moldovan stakeholders recognize the importance of aligning national policies with European best practices. The proposed indicator framework was well received, indicating the feasibility of developing a national CE monitoring system linked to existing statistical and environmental reporting mechanisms.

Proposed Business Models for Moldova - Four CE business models are identified as most feasible for Moldova, taking into account the local market structure and consumer behavior (Figure 1).

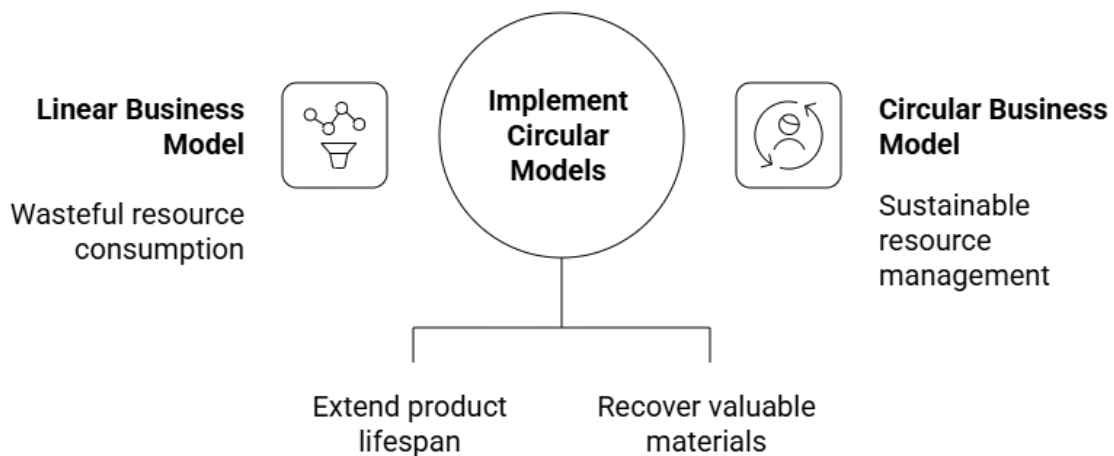


Figure 1. Conceptual pathway of circular business models for Moldova
Source: Author’s interpretation

Use of Secondary Resources: Developing markets for recycled materials, particularly in construction and packaging.

1. Lifetime Extension (Repair/Refurbishment): Encouraging service-based SMEs for repair and reconditioning.
2. Servitization (Rental/Subscription): Transition from product ownership to service models, particularly for EEE and mobility.
3. Reuse and Sharing Platforms: Digital platforms for product exchange or reuse, especially in urban centers.

These models address key challenges: low material efficiency, high waste volumes, and limited innovation in traditional sectors.

Circular Economy Indicators

To track CE transition, a compact set of indicators is proposed, adapted from the EU CE monitoring framework and OECD guidelines (Table 2).

Table 2. Proposed Circular Economy Indicators for Moldova

Indicator	Definition	Policy Relevance	Data Source
Material Circularity Rate (MCR)	Share of secondary raw materials in total material consumption	Measures circularity of the economy	National Bureau of Statistics
Resource Intensity	GDP per unit of domestic material consumption	Captures efficiency of resource use	Ministry of Economy
Waste Recovery Rate	Share of recovered waste from total generated	Evaluates waste management performance	Environmental Agency
Revenue from Circular Services	Turnover from repair, rental, and reuse services	Tracks growth of circular business sectors	Tax Agency
Avoided Emissions	CO ₂ equivalent reductions through reuse and recycling	Links CE with climate targets	Ministry of Environment

Source: Author's interpretation

These indicators offer a starting point for annual monitoring and reporting through a national CE dashboard or integrated platform.

Barriers and opportunities in the context of Republic of Moldova

The conceptual survey framework identified several key barriers:

- Regulatory uncertainty: Absence of clear definitions for “secondary materials” and lack of CE legislation.
- Financial barriers: High upfront costs for CE technologies and limited access to green finance.
- Institutional gaps: Fragmented responsibilities between ministries.
- Infrastructure deficits: Limited collection and recycling facilities outside major cities.
- Awareness and skills: Low consumer demand for circular products and insufficient technical expertise.

However, significant opportunities exist:

- EU Integration: Alignment with EU environmental acquis opens funding and technical support.
- Private Sector engagement: Emerging start-ups in recycling, eco-design, and green services.
- Digitalization: Expansion of e-commerce and sharing platforms provides a foundation for servitization.
- Education and Research: Universities can drive innovation through applied research and pilot projects.

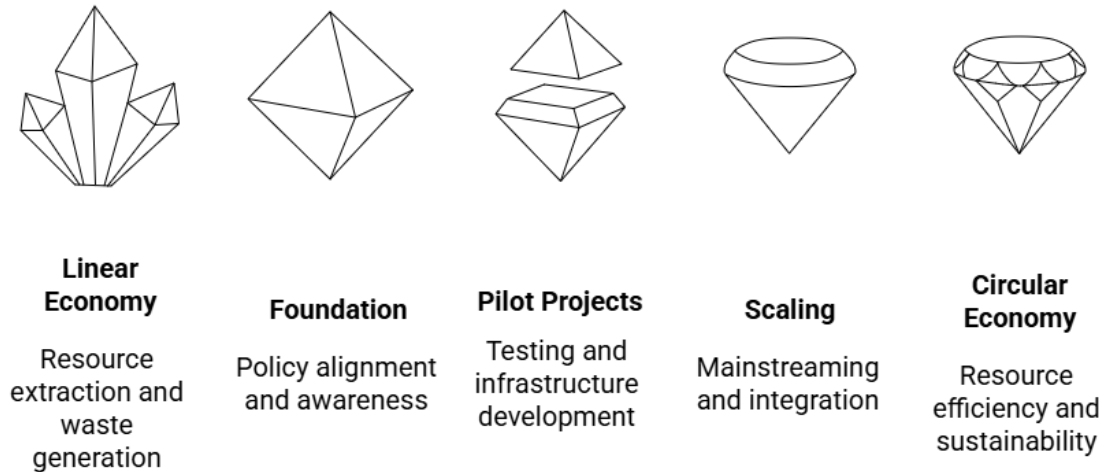


Figure 2. Circular Economy Implementation

Source: Author's interpretation

Pathway for Implementation

A phased implementation roadmap is proposed:

Phase 1 (2025–2027): Foundation and Policy Alignment

- Adopt a National Circular Economy Strategy aligned with the EU Green Deal.
- Establish legal frameworks for EPR and GPP.
- Launch awareness and capacity-building programs.

Phase 2 (2027–2030): Pilot Projects and Indicators

- Implement CE pilot projects in construction, agri-food, and EEE sectors.
- Begin annual indicator-based reporting.
- Encourage public-private partnerships for recycling infrastructure.

Phase 3 (2030–2035): Scaling and Integration

- Mainstream CE across industrial policies.
- Link CE performance indicators to national sustainable development goals (SDGs).
- Integrate CE into trade, investment, and innovation policies.

This pathway ensures that Moldova's CE transition aligns with both national development priorities and European integration objectives.

Conclusions

The transition to a circular economy in Moldova represents a multidimensional reform involving governance, market, and behavioral change. Comparative analysis shows that success depends on the simultaneous development of policy instruments, economic incentives, and monitoring systems.

Effective CE implementation requires interministerial coordination, particularly between the Ministry of Environment, Ministry of Economy, and Ministry of Finance. Developing a cross-sectoral CE council would facilitate coherence and reduce policy overlap.

The survey results underscore both the momentum and the challenges of Moldova's circular economy transition. While the concept enjoys broad support among stakeholders, translating it into practice requires regulatory clarity, infrastructural investment, and accessible financing. The active participation of 217 respondents—representing a wide spectrum of economic and institutional actors—demonstrates a shared commitment to advancing this agenda.

Moldova should prioritize “ready-to-transfer” solutions such as EPR systems (Italy), reparability indices (France), and industrial symbiosis (Denmark). These models have demonstrated tangible benefits and can be localized through pilot projects.

The proposed indicator framework ensures accountability and transparency. Linking CE indicators to national statistics will enable evidence-based policymaking and international comparability.

While challenges persist—limited funding, awareness, and infrastructure—the opportunities for innovation and EU alignment are significant. Future research should operationalize the survey framework proposed here, enabling empirical validation of CE readiness and tracking progress toward a regenerative economy.

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