

THE ENVIRONMENTAL IMPACT OF SOCIAL ECONOMY INITIATIVES: INTEGRATING SOCIAL VALUE AND ECOLOGICAL SUSTAINABILITY

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ABSTRACT

This article critically examines the relationship between circular economy performance and the socio-institutional contexts in which waste management systems operate across selected European Union Member States. Drawing on publicly available Eurostat data for the period 2012–2022, the study analyses six core circular economy indicators, including the circular material use rate, recycling rates of municipal and packaging waste, municipal waste generation per capita, landfilling rates and material footprint per capita. Using a stratified sample of 12 EU countries, the paper provides a comparative and trend-based assessment of structural disparities between high-performing, intermediate and emerging circular economy contexts. The findings reveal pronounced regional and institutional asymmetries. While several western and northern European countries display higher circular material use and recycling rates, these outcomes co-exist with persistently high levels of waste generation and increasing system costs. Moreover, the analysis confirms that high recycling performance does not automatically translate into higher material circularity, underscoring the distinction between waste management efficiency and deeper structural transformations of production and consumption systems. The results also highlight limitations inherent in macro-level circular economy indicators, which may obscure issues such as downcycling, export of waste streams and reliance on incineration. Within this complex landscape, the role of the social economy is examined not as a dominant actor in capital-intensive waste infrastructures, but as a complementary and locally embedded facilitator of reuse, repair, refurbishment and community-based circular practices. Social economy organizations contribute primarily to upstream waste prevention and life-extension strategies, particularly in contexts where market mechanisms alone prove insufficient. However, their impact remains constrained by limited financial resources, fragmented policy support and structural market distortions, including the low price of virgin materials. By integrating macro-indicator analysis with an institutional perspective, the study offers a more nuanced understanding of circular economy transitions and the conditional role of the social economy within them. The results suggest that advancing circularity requires not only technological and regulatory measures, but also systemic economic reforms and targeted policy frameworks capable of aligning environmental, social, and market incentives.

Keywords: circular economy, sustainable development, environmental sustainability, social economy initiatives, municipal solid waste.

1 INTRODUCTION

The transition toward a greener and more resource-efficient economic model has become a central objective of European public policy, driven by increasing environmental pressures, climate change, and resource scarcity [1]. Within this context, the circular economy (CE) has emerged as a key framework aimed at decoupling economic growth from resource use and environmental degradation [2]–[6]. While much of the existing debate has focused on



technological innovation and market-driven solutions, growing attention is being paid to the role of alternative economic models that integrate social and environmental objectives [7]–[10]. The social economy, encompassing social enterprises, cooperatives, mutual organizations, and non-profit entities, represents such a model. Traditionally associated with social inclusion, employment creation, and community development, the social economy is increasingly recognized for its potential contribution to environmental sustainability [11]. Through activities such as reuse, recycling, repair services, local production, and community-based initiatives, social economy organizations can act as facilitators of circular economy practices, particularly at the local and regional levels [12]–[14].

The circular economy literature increasingly frames waste prevention, recycling, material efficiency, and life-extension strategies (reuse, repair, remanufacturing) as core mechanisms for reducing environmental pressures and decoupling economic activity from virgin resource extraction [5], [15], [16]. Empirical research commonly operationalizes CE progress through macro-level indicator sets – such as recycling rates, waste generation per capita, and measures of material circularity (e.g., circular material use rate) – to benchmark national performance and monitor policy implementation [17]–[20]. Recent methodological work emphasizes that, despite rapid proliferation of CE metrics, indicator systems remain heterogeneous and often fragmented, raising questions about conceptual coverage and comparability across studies [21], [22]. In parallel, policy-oriented indicator analyses underline the strategic relevance of CMU as a proxy for the degree to which secondary materials substitute primary raw materials at the economy-wide level, and highlight persistent disparities across EU Member States [23], [24].

At the same time, much CE academic literature still privileges industrial systems and national regulatory frameworks, paying comparatively less attention to the organizational diversity of actors implementing circular practices on the ground. This is where the social economy literature offers a complementary perspective. Research on social enterprises, cooperatives, and work-integration social enterprises (WISEs) has traditionally focused on social inclusion, employment integration, and local development, but a growing strand demonstrates that these organizations are also active in circular domains – especially reuse, repair, refurbishment, and community-based recycling services [25]–[27]. Recent empirical contributions show how work integration social enterprises (WISE) and circular social enterprises build capabilities to scale circular activities while maintaining social missions, and how circular entrepreneurship can explicitly integrate social objectives rather than treating them as externalities [8], [28]. Evidence is also emerging on cooperatives as governance structures that can embed circular practices via participation, trust, and locally anchored business models [29]–[32].

2 MATERIALS AND METHODS

Considering the above academic literature presented, the present paper addresses a key remaining gap. Studies that document circular social economy practices are frequently qualitative or sector-specific, while macro-indicator studies often remain ‘actor-blind’, leaving limited empirical linkage between systemic CE outcomes (e.g., circular material use rate, municipal waste recycling, landfilling patterns, and material footprint intensity) and the institutional and organizational presence of the social economy [33]–[35]. This article addresses the gap by combining standardized Eurostat-based circular economy indicators with a comparative, cross-country perspective, and by interpreting observed patterns through an institutional lens that recognizes social economy organizations as potential enablers of circular transitions – particularly through reuse/repair infrastructure, localized material loops, and inclusive employment models [36]–[38].



This article aims to contribute to this emerging field by examining patterns of environmental performance across selected European Union Member States, using circular economy indicators as proxies for systemic environmental outcomes. By situating these patterns within a broader institutional and socio-economic context, the paper explores how the social economy may support the transition toward a greener and more inclusive economic model.

The empirical analysis is based on publicly available data from Eurostat, focusing on six core indicators from the Circular Economy Monitoring Framework: circular material use rate, recycling rate of municipal waste, recycling rate of packaging waste, municipal waste generation per capita, landfilling rate of waste, and material footprint per capita. This study employs a stratified sample of twelve EU Member States, selected to reflect different levels of circular economy performance: high-performing countries (e.g., western and northern Europe), medium-performing countries (southern Europe), and emerging performers (central and eastern Europe). The period of analysis covers 2012–2022, ensuring temporal consistency and comparability across indicators. The methodological approach is primarily descriptive and comparative. First, arithmetic averages for the full period are calculated for each indicator and country. Second, trend analyses are conducted to capture dynamic changes over time. Finally, regional comparisons are used to highlight structural differences in circular economy performance. This approach is appropriate given the exploratory nature of the study and the focus on identifying patterns rather than establishing strict causality.

3 RESULTS AND DISCUSSION

3.1 Comparative overview

This section provides a comparative overview of circular economy performance across selected European Union Member States, based on the average values of six key indicators for the period 2012–2022. Table 1 synthesizes macro-level environmental outcomes related to material circularity, waste management, and resource use, allowing for cross-country and

Table 1: Average circular economy indicators in selected EU Member States (2012–2022).
(Source: Eurostat Data Base 2026.)

Country	Circular material use rate (%)	Recycling rate of municipal waste (%)	Recycling rate of packaging waste (%)	Municipal waste per capita (kg)	Landfilling rate of waste (%)	Material footprint per capita (t)
EU-27 countries	11.27	44.89	65.59	500.57	2.04	23.43
Austria	10.88	59.01	65.88	640.86	2.27	10.50
Belgium	18.85	54.04	81.18	510.43	2.95	4.00
Bulgaria	3.41	28.14	62.68	463.14	0.35	75.80
France	17.58	39.41	64.77	537.86	2.91	23.33
Germany	12.13	66.78	69.65	622.14	2.64	9.83
Italy	17.26	45.18	68.26	499.50	3.24	21.00
Hungary	5.88	30.88	48.99	395.36	0.99	46.00
Netherlands	27.87	53.71	74.49	521.71	4.42	2.33
Poland	9.73	28.45	52.80	324.64	0.72	26.50
Portugal	2.42	27.64	59.49	486.43	1.16	38.33
Romania	1.91	12.72	50.19	275.71	0.40	57.33
Spain	8.89	35.01	67.61	471.29	2.62	46.33



regional comparisons. By juxtaposing circular material use, recycling performance, waste generation patterns, landfilling rates, and material footprint intensity, the table offers a comprehensive picture of structural differences in the implementation of circular economy principles across the European Union. All values reported represent arithmetic averages for the period 2012–2022.

The results presented in Table 1 reveal substantial disparities in CE performance across EU Member States, reflecting different stages of structural adjustment, policy implementation, and institutional capacity. At the EU-27 level, the average circular material use rate stands at 11.27%, indicating that only a limited share of material demand is met through secondary raw materials. This aggregate figure masks pronounced national variations. Countries such as the Netherlands (27.87%), Belgium (18.85%), France (17.58%), and Italy (17.26%) exhibit significantly higher levels of material circularity, suggesting more advanced systems for material recovery and reuse. These countries also tend to combine relatively high recycling rates of municipal and packaging waste with low landfilling rates, indicating a more integrated approach to waste management. Germany stands out for its exceptionally high recycling rate of municipal waste (66.78%), although its circular material use rate remains closer to the EU average, highlighting that high recycling performance does not automatically translate into higher material circularity. In contrast, central and eastern European countries such as Romania (1.91%), Bulgaria (3.41%), Hungary (5.88%) and Portugal (2.42%) record markedly lower circular material use rates. These lower levels are often accompanied by weaker recycling performance and higher material footprints per capita, pointing to structural challenges in closing material loops. Notably, Romania and Bulgaria display very low municipal waste generation per capita, yet also register limited recycling rates, suggesting that lower waste volumes do not necessarily imply more sustainable resource use.

The material footprint indicator further reinforces regional asymmetries. Countries with higher circularity and stronger waste management systems, such as the Netherlands and Belgium, record relatively low material footprints per capita, while several emerging economies exhibit substantially higher values. Overall, the results underline a persistent east–west divide in circular economy outcomes and emphasize the importance of institutional frameworks, policy coherence, and local implementation capacity in shaping environmental performance.

3.2 Trend analysis

Beyond cross-sectional differences, the evolution of circular economy indicators over time provides important insights into the dynamics of environmental performance across EU Member States. Trend analysis for the period 2012–2022 reveals a general, albeit uneven, improvement in several key dimensions of circularity, particularly with respect to recycling rates and reductions in landfilling. Most countries included in the sample display a gradual increase in the recycling rate of municipal waste, with particularly strong and stable upward trends observed in Germany, Austria, and the Netherlands. These countries appear to have reached relatively mature stages of waste management development, characterized by high recycling levels and limited reliance on landfill disposal. In contrast, several central and eastern European countries, such as Romania, Bulgaria and Hungary, show slower and more volatile progress, suggesting structural and institutional constraints in scaling up circular practices.

The circular material use rate exhibits more heterogeneous trends. While countries such as the Netherlands and Belgium demonstrate a clear upward trajectory over the decade,



indicating increasing integration of secondary raw materials into the economy, other countries show stagnation or only marginal improvements. This divergence highlights the complexity of transitioning from recycling-oriented systems toward deeper forms of material circularity that involve redesign, reuse, and longer product life cycles. Municipal waste generation per capita follows fewer uniform patterns, reflecting differences in consumption behaviour, income levels, and demographic dynamics. In several high-income countries, waste generation remains persistently high despite improvements in recycling performance, suggesting that waste prevention remains a key challenge even in advanced circular economy contexts.

Fig. 1 highlights pronounced structural divergences in circular economy performance across the selected EU Member States. Countries with more mature circular systems, particularly the Netherlands and Belgium, display consistently high and relatively stable levels of material circularity over the period analysed, accompanied by mildly upward long-term trends. This pattern reflects the presence of well-established policy frameworks, advanced waste management infrastructures, and the effective integration of secondary raw materials into production and consumption systems. Italy exhibits a steady upward trajectory, suggesting a gradual consolidation of circular economy practices. Although starting from a lower baseline compared to the leading countries, the sustained increase in circular material use points to progressive institutional learning and policy alignment with European circular economy objectives. In contrast, Poland and Romania remain positioned at significantly lower levels of circular material use, with limited progress and, in some years, even declining trends. These dynamics indicate persistent structural barriers, including insufficient recycling infrastructure, weaker market demand for secondary materials, and limited capacity to transform waste management improvements into higher levels of material circularity.

Overall, the figure substantiates the analysis presented are illustrating the uneven pace of the circular transition within the European Union. It reinforces the conclusion that convergence toward higher circularity remains partial and strongly conditioned by national

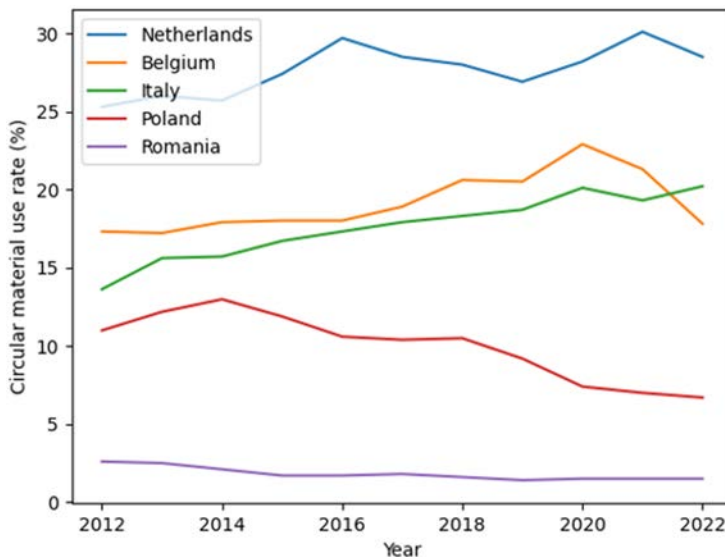


Figure 1: Trends in circular material use rate (2012–2022) for Netherlands, Belgium, Italy, Poland and Romania.



institutional capacity, investment levels, and the maturity of supporting economic ecosystems.

The scatter plot reported in Fig. 2 reveals a positive yet imperfect relationship between the recycling rate of municipal waste and the circular material use. Countries with high recycling performance, such as Germany and Austria, are positioned in the upper part of the figure; however, they do not necessarily achieve the highest levels of material circularity. This finding suggests that recycling, while a necessary component of the circular economy, is not sufficient on its own to ensure high levels of circular material use. In contrast, the Netherlands and Belgium combine relatively high recycling rates with the highest CMU values in the sample, indicating the presence of more mature systems for integrating secondary materials into the economy. These countries appear to have moved beyond an approach focused primarily on waste management, advancing instead toward economic models that emphasize reuse, repair, and the substitution of primary raw materials with secondary resources. At the lower end of the distribution, Romania, Bulgaria, and Portugal are clustered in a zone characterized by low recycling rates and limited material circularity. This positioning reflects persistent structural constraints, including underdeveloped recycling infrastructure, weak market demand for secondary materials, and limited institutional capacity to translate waste management improvements into broader circular outcomes. The observed patterns point to the need for additional institutional and investment-driven interventions in these contexts.

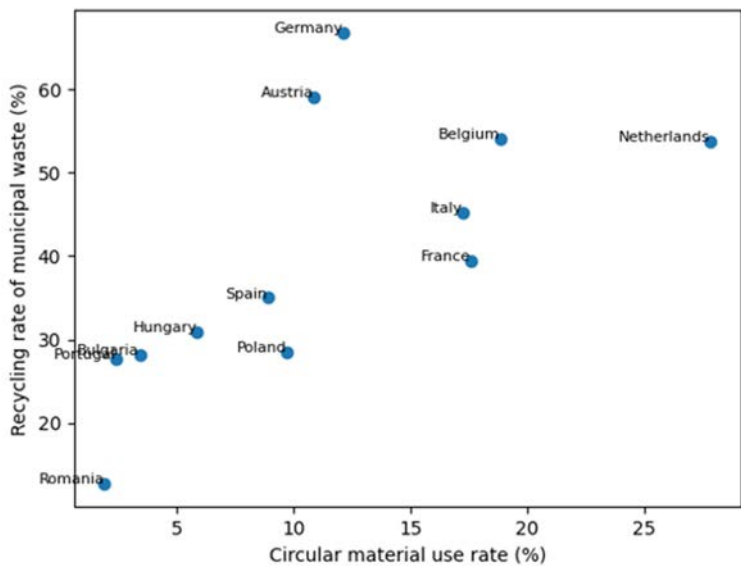


Figure 2: Circular material use rate versus Recycling rate of municipal waste.

Overall, the figure supports the argument that the transition toward a circular economy involves more than improving recycling rates alone and depends on deeper transformations of production and consumption chains. This insight provides an important conceptual link to the role of the social economy, which can facilitate reuse activities, repair services, and localized material loops, thereby contributing to a more effective and inclusive increase in circular material use.



3.3 Regional comparisons

Regional comparisons further emphasize the structural nature of differences in circular economy performance across the European Union. When countries are grouped into western/northern Europe, southern Europe, and central and eastern Europe, distinct performance profiles emerge across all six indicators. Western and northern European countries consistently outperform other regions in terms of circular material use and recycling rates, while maintaining relatively low landfilling shares. These countries also tend to exhibit lower material footprints per capita, suggesting a more efficient use of natural resources. Their performance reflects long-standing investments in environmental infrastructure, regulatory enforcement, and stakeholder engagement at multiple governance levels. Southern European countries, including Italy, Spain and Portugal, occupy an intermediate position. While recycling rates and packaging waste management have improved substantially over the period analysed, circular material use remains uneven, indicating partial adoption of circular economy principles. This group demonstrates the importance of policy alignment and regional implementation capacity in translating EU-level objectives into tangible outcomes. Central and eastern European countries show the lowest average values for circular material use and recycling, combined with higher material footprints in several cases. Although some convergence trends are observable – particularly after 2015 – the gap with western Europe remains substantial. These findings suggest that structural factors, such as industrial composition, investment capacity, and institutional maturity, continue to shape regional disparities in circular economy outcomes.

The results reported in Fig. 3 confirms the existence of a pronounced regional gap in circular economy performance across the European Union. Western and northern Europe record an average level of material circularity that is nearly twice as high as that observed in southern Europe and almost four times higher than in central and eastern Europe. This uneven distribution reflects substantial differences in institutional capacity, long-term investments in waste management and recycling infrastructure, and the overall maturity of national and regional economic ecosystems supporting circular practices. Countries in western and northern Europe benefit from more coherent policy frameworks, stronger regulatory enforcement, and higher levels of public and private investment, which collectively facilitate

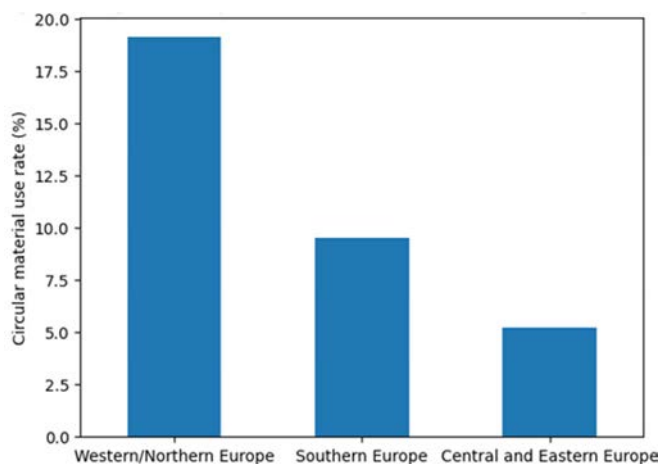


Figure 3: Regional comparison of circular material use (average 2012–2022).



the effective integration of circular economy principles into production and consumption systems. By contrast, southern European countries occupy an intermediate position, while central and eastern European countries continue to face structural constraints that limit the scaling-up of circular solutions.

Despite gradual improvements and partial convergence over time, regional disparities remain significant, underscoring the need for targeted policy interventions and capacity-building measures tailored to regional specificities.

3.4 Rising costs of waste collection and recycling system

Circular economy transitions are associated not only with environmental gains but also with rising operational costs. Across the European Union, the expansion of separate collection systems, sorting facilities, and advanced recycling technologies has led to increased municipal expenditures per capita. In several Member States, waste management fees for households have risen steadily over the past decade, reflecting infrastructure investments, compliance costs, and stricter environmental standards.

Furthermore, the economic viability of recycling markets remains sensitive to fluctuations in virgin material prices. When primary raw materials, such as virgin plastics, remain relatively cheap, the financial incentives for recycling are weakened, leading to potential downcycling rather than high-quality material recovery. This structural imbalance underscores the need for policy instruments such as extended producer responsibility schemes, eco-modulation of fees, and green public procurement mechanisms.

4 DISCUSSION AND CONCLUSIONS

From an institutional perspective, the cross-country and regional differences identified in the empirical analysis reflect substantial variations in policy frameworks, investment intensity, and governance capacity across the European Union. The results from Table 1 and the regional comparison in Fig. 3 reveal a persistent east–west divide in circular economy performance, with western and northern European countries consistently outperforming southern and central and eastern European counterparts. These patterns suggest that advanced circular outcomes are closely associated with long-term investments in waste management infrastructure, stable regulatory environments, and effective coordination across multiple levels of governance.

The trend analysis presented in Fig. 1 further indicates that countries with more mature circular systems, such as the Netherlands and Belgium, have achieved not only higher but also more stable levels of circular material use over time. In contrast, emerging economies exhibit slower progress and greater volatility, pointing to structural barriers that limit the scaling-up of circular practices. Importantly, the scatter plot analysis reported in Fig. 2 demonstrates that high recycling rates do not automatically translate into high levels of material circularity. This finding underscores the distinction between waste management performance and deeper forms of circularity that require systemic changes in production and consumption patterns.

While countries such as the Netherlands and Germany rank high on several circular economy indicators, these metrics should be interpreted with caution. High recycling or circular material use rates do not automatically imply waste reduction or overall environmental sustainability. For instance, municipal waste generation per capita remains high in several high-performing countries, indicating that consumption-driven waste volumes continue to rise.



Moreover, waste-to-energy incineration, although contributing to landfill reduction, generates bottom ash and other residues with long-term environmental risks. International waste trade and export of recyclable fractions also complicate the assessment of true environmental performance. These structural tensions highlight the limitations of relying exclusively on macro-indicators when evaluating circular economy success.

Within this institutional context, the social economy can be interpreted as a key facilitating mechanism in advancing the circular transition. Social economy organizations contribute to circular outcomes by operationalizing activities related to waste prevention, reuse, repair, and recycling at the community level, often in areas where market-based solutions remain insufficient. Their strong local embeddedness enables behavioural change, social acceptance, and the creation of localized material loops, thereby helping to convert recycling efforts into effective material circularity. This role appears particularly relevant in regions with emerging circular economy performance, where social economy actors can complement limited institutional capacity and address social and environmental needs simultaneously.

Nevertheless, the analysis also highlights persistent structural challenges that constrain the contribution of the social economy to sustainability transitions. These include limited access to finance, fragmented and uneven policy support across regions, and ongoing difficulties in measuring social and environmental impacts in an integrated manner. Addressing these barriers is essential for unlocking the full potential of the social economy as a driver of inclusive and effective circular economy outcomes. Targeted policy interventions, dedicated funding instruments, and standardized impact assessment frameworks may therefore play a crucial role in strengthening the contribution of social economy initiatives to the European green transition.

This study demonstrates that circular economy indicators provide a robust and comparable empirical basis for assessing environmental performance across European Union Member States and for contextualizing the role of the social economy within the broader green transition. By combining cross-country comparisons, trend analysis, and relational evidence between recycling performance and circular material use, the analysis reveals pronounced structural and regional disparities in circular economy outcomes across the EU.

The results indicate that countries achieving higher levels of material circularity are not solely characterized by strong recycling systems, but by more comprehensive institutional environments that support the effective integration of secondary materials into production and consumption processes. The empirical findings show that advanced circular outcomes are associated with stable policy frameworks, sustained investment in infrastructure, and mature economic ecosystems capable of translating waste management performance into higher circular material use. In this context, the social economy emerges as a complementary and enabling actor, particularly through its capacity to operationalize reuse, repair, and localized circular solutions.

From a policy perspective, the findings underline the importance of integrated strategies that align circular economy objectives with social economy development. Such strategies should move beyond narrow recycling targets and address systemic dimensions of circularity, including market development for secondary materials and support for community-based circular activities. Targeted funding instruments, enabling regulatory frameworks, and public procurement policies that recognize social and environmental co-benefits can strengthen the contribution of social economy actors. Moreover, the development of standardized and integrated impact assessment tools is essential to capture both environmental and social value, thereby improving policy design and accountability.



Overall, reinforcing the linkages between circular economy policies and the social economy may enhance the effectiveness, inclusiveness, and long-term resilience of the European transition toward a sustainable and resource-efficient economic model.

As limitations and future research, despite its contributions, this study is subject to several limitations that should be acknowledged. First, the analysis relies on macro-level indicators from Eurostat, which capture systemic environmental outcomes but do not directly measure the scale, intensity, or specific activities of social economy organizations. As a result, the role of the social economy is interpreted indirectly, based on institutional and contextual associations rather than causal relationships. Second, data availability and comparability constraints limit the scope of certain indicators, particularly for landfilling rates and material footprint measures, which are not reported annually for all countries. While averages and trend analyses provide meaningful insights, they may obscure short-term dynamics or country-specific policy shifts. Third, the study adopts a primarily descriptive and comparative methodological approach. Although this is appropriate for identifying patterns and disparities, it does not allow for causal inference regarding the drivers of circular economy performance. Future research could address this limitation by employing econometric panel models, micro-level datasets, or mixed-methods approaches that combine quantitative analysis with qualitative case studies.

Future research should also seek to integrate direct indicators of the social economy, such as the density of social enterprises or employment in circular social economy activities, in order to empirically test the relationship between social economy ecosystems and circular outcomes. In addition, in-depth regional or local case studies could provide valuable insights into the mechanisms through which social economy initiatives contribute to material circularity, particularly in emerging economies. Such extensions would further strengthen the evidence base for designing inclusive and effective circular economy policies.

The empirical results presented in this study primarily reflect systemic circular economy outcomes at the macro level. However, waste management systems in most EU Member States are dominated by market-based operators, often large private or semi-public corporations. In this context, the role of the social economy must be specified more clearly.

Social economy actors do not typically operate in capital-intensive segments such as incineration facilities, hazardous waste treatment, or large-scale material recovery plants. Instead, their contribution is concentrated in upstream and mid-stream activities, including reuse centres, repair services, refurbishment workshops, second-hand markets, community composting initiatives, and awareness-building programmes.

These activities are particularly relevant for: (1) extending product lifetimes, (2) preventing waste generation, (3) facilitating behavioural change, (4) integrating vulnerable groups into circular labour markets. Thus, the social economy's contribution is structural but indirect: it strengthens waste prevention and reuse layers of the waste hierarchy, rather than dominating the end-of-pipe disposal infrastructure.

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