IMPLEMENTATION OF CIRCULAR ECONOMY IN ROMANIA. ROLE OF SOCIO-DEMOGRAPHIC FACTORS IN SHAPING PACKAGING RECYCLING-RELATED BEHAVIOUR

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Abstract
The article highlights the need, definition and principles of the circular economy from a theoretical perspective and carries out an analysis of the packaging recycling issue in Romania. The research aims to determine the attitude of Romanian consumers towards packaging recycling and to identify the main correlations between socio-demographic factors and decisions to return recyclable containers. The study is based on a quantitative, survey-type investigation, implemented by using a standardized questionnaire, applied to a sample of consumers in Romania. At the same time, a qualitative analysis of consumer comments on social media platforms and relevant forums was carried out, in order to capture perceptions, dissatisfactions and motivational factors associated with packaging recycling. The data were examined using descriptive and inferential statistical methods, in order to validate / invalidate the research hypotheses.

Keywords: *consumer attitude, decisions, circular economy, socio-demographic factors, recycling.*

JEL Classification: Q56, I25

I. INTRODUCTION

The exponential growth of the world's population, in parallel with a linear dynamic of natural resources identified and exploited, have determined the accentuation of resource scarcity. The role of economics is to identify solutions to limit scarcity and to model the behaviour of economic agents towards achieving this objective.

Any economic activity must generate value and meet a utility requirement. In the case of sustainable development, the transition from monetary value to eco-value is achieved, combining economic development with environmental protection. (Krasulja N. at all, 2020).

This goal is implemented through the circular economy, which, from the individual economic agent to the public policies of states or the European Union, generates a radical change in behaviour and mentality, respecting the principle of sustainability becoming a strategic objective.

It is very important that consumer education continues this eco-value chain, through recycling, the use of organic products, attention to the consumption of non-renewable materials, the preservation of the natural environment and the reduction of household pollution. Without active consumer involvement in the packaging recycling process, the circular economy is blocked and cannot achieve its goal of zero waste.

Packaging recycling is a vital component of sustainable development strategies, with the role of limiting the pressure on natural resources and reducing pollution generated by solid waste. In modern economy, packaging represents a significant part of the municipal waste stream, and the increase in global consumption has emphasized the need to implement effective collection and recycling policies. The importance of recycling is not only ecological, but also economic and social, as it aims to reduce raw material costs, energy savings, as well as reduce greenhouse gas emissions.

II. PRINCIPLES OF CIRCULAR ECONOMY

The syntagm "circular economy" (CE) was launched by Pearce and Turner (1989), although the notion has old origins dating back to the 1960s. (Sariatli, 2017, p.32)

The circular economy illustrates a model of production and consumption focused on increasing the value of resources through reuse, repair, reconditioning and recycling, aiming to extend the life of products. Distinct from the linear economy, which involves a simple flow of production-consumption-disposal, the circular economy promotes the design of sustainable products, their reuse after use and efficient waste management, in a cyclical and sustainable process.

The foundations of this model are crucial for the formation of a sustainable economy and the transition from a linear to a circular system (Ellen MacArthur Foundation, 2019).

According to the Organisation for Economic Co-operation and Development (OECD), the transition to a circular economy has the potential to increase economic efficiency, reduce pollution and foster innovation. Many European countries, including the Netherlands and Germany, have developed national strategies for the implementation of the circular economy, demonstrating the benefits of this model for the environment and the economy. As this economic model spreads, research indicates that the circular economy not only facilitates sustainable development, but also generates economic opportunities by creating jobs in green sectors.

The basic principles of circular economy have an important impact on building a viable economic model and support the transition from a linear vision, focused on consumption and disposal, to a circular one. A crucial premise is the preservation of resources - whether they are finished goods or raw materials - in the economic circuit for as long as possible, through activities such as reuse, repair or remanufacturing.

The key points of circular economy play a crucial role in building a sustainable economic model and drive the transition from a linear system, characterized by consumption and waste generation, to a circular one. A primary approach is to preserve resources – whether products or materials – in the economic circuit for the maximum duration, by implementing practices such as reuse, repair or remanufacturing.

According to research conducted by Kirchherr et al. (2017), implementing this approach has the capacity to considerably reduce harmful effects on the environment and support a more rational use of natural resources.

Another crucial pillar concerns product design from a circular perspective. This requires the use of durable and easily recyclable materials, while creating items with modular components that are designed to be disassembled and reused for other purposes (Bocken et al., 2016). This approach reduces the amount of waste generated and supports a more efficient and sustainable economic system.

Another fundamental element is minimizing waste and pollution from the very beginning of the manufacturing process. This involves optimizing industrial processes to reduce waste production and carbon emissions. For example, the adoption of advanced manufacturing technologies, such as additive manufacturing and the use of renewable energies, contribute to achieving this goal (Geissdoerfer et al., 2017).

Circular economy also places a high value on the regeneration of natural systems. In contrast with the conventional economic model, which exploits resources without providing an efficient mechanism for their restoration, the circular economy favours the use of renewable resources and encourages responsible agricultural practices that support the maintenance of ecological balance (Korhonen et al., 2018).

Furthermore, a crucial aspect of circular economy is the inclusion of the service economy, where the focus shifts to the exploitation of products as services, rather than their ownership. A concrete illustration is the "product-as-a-service" model, in which goods are offered through rental or leasing, thus extending their useful life and reducing the need to produce new items (Stahel, 2016). This model is gaining ground in the electronics and automotive industries, contributing to waste reduction and optimal resource use.

Moreover, innovation and technology are crucial components in the circular economy, helping to advance towards recycling, eco-friendly materials and sustainable processes. A good example is the use of artificial intelligence, increasingly integrated by companies adhering to the circular economy, to optimize the flow of goods and reduce losses (Ghisellini et al., 2016).

Adopting these principles helps build a more resilient economy, reduces environmental impacts, and encourages innovation in the industrial sector. As the circular economy gains global importance, applying these concepts at local and national levels is a fundamental step towards sustainable development.

Circular Economy (CE) is at the heart of the European Union's progress agenda and is a pillar of the EU's industrial vision. Adopting a more circular approach to the economy is a crucial contribution to the EC's efforts to build a resilient, low-carbon, resource-efficient and competitive economy.

III. PROBLEMS AND SOLUTIONS FOR PACKAGING RECYCLING IN ROMANIA

In the face of climate change and resource depletion, recycling has emerged as "a central element for the circular economy and for reducing dependence on non-viable resources" (Kirchherr et al., 2017, p. 226). Furthermore, the use of recycled materials helps reduce the carbon footprint of industrial sectors. A study by Bocken et al. (2016) indicates that "recycled packaging generates up to 80% less CO_2 emissions compared to the use of new materials" (p. 311).

In order to better understand the concept of circular economy, its importance and its role in promoting sustainable development, it is crucial to assess the level of familiarity of the population with this concept. According to the Circularity Gap Report 2024, prepared by Circle Economy, there has been a tripling of the volume of discussions, reports and debates on this topic in the last five years. However, the reuse of materials and resources is decreasing, registering a decline of 21%, from 9.1% in 2018 to 7.2% in 2023. This trend suggests that although there is increased interest from the public, this is not being translated into practical actions.

The report also highlights that the pace of resource consumption is continuously increasing. In the past five years, consumption has exceeded 500 gigatons, representing about 28% of all materials exploited by humanity since 1900.

The negative impact of PET bottles is the result of the use of oil in the production and transportation process. The bottles also contain chemicals that are potentially harmful to the health of consumers. Even though they are theoretically recyclable, a significant proportion ends up in landfills, where they can persist for hundreds of years without degrading. (Kopnina, 2018)

Beyond the environmental benefits, packaging recycling boosts the economy, reducing production costs and encouraging the expansion of a market for recycled materials. As a result, it facilitates "the building of a sustainable consumption model, focused on reuse, reconditioning and recycling" (Tunn et al., 2019, p. 328). Therefore, the contribution of consumers is fundamental: they represent the final element of the use cycle, and their attitude to sorting and disposing of packaging has an integral impact on the waste management system.

Research conducted within the European Union highlights that the active participation of citizens in recycling processes crucially depends on the level of awareness and belief in the efficient functioning of the system. Therefore, "responsible attitudes towards waste are often influenced by the perceived usefulness of recycling" (Reisch et al., 2019, p. 1430). When strong motivation is lacking or there is no accessible infrastructure, consumers adopt a passive attitude, which results in a reduction in recycling rates, especially in areas with lower economic development.

Romania, although part of the European circular economy mechanisms, faces numerous difficulties in managing packaging waste. According to Eurostat data, our country recorded a packaging waste recycling rate of 38.3% in 2022, compared to the European Union average of 65.4%. Furthermore, the report of the Ministry of Environment (2023) states that "over 40% of the packaging placed on the market does not end up being collected in the system, which creates impediments to achieving recycling objectives at the national level" (p. 198).

To elucidate differences in pro-recycling attitudes, research classifies determining influences into three major categories:

- Individual factors – education, available financial resources, and familiarity with the recycling process "directly affect the intention to properly sort waste" (Vicente & Reis, 2008, p. 602). Individuals with higher levels of education and higher incomes tend to be more likely to adopt environmentally friendly practices.
- Social factors – descriptive and prescriptive norms, the influence of social groups and the impact of awareness campaigns. Reisch et al. (2019, p. 142) demonstrate that "the positive influence exerted by family and friends can increase the probability of recycling regularly by over 20%".
- Contextual factors – availability of infrastructure, distance to collection points, clarity of sorting instructions. Andrews et al. (2013, p. 531) reveal that "shortening the distance to the recycling container increases the participation rate by 15%".

Despite all the optimistic theoretical premises, Romania faces significant structural impediments:

1. Poor infrastructure – "deficiencies in modern sorting facilities and recycling capacities" cause major problems in waste management (Ministry of Environment, 2023, p. 211).

2. Inefficient separate collection – Current systems suffer from "uneven implementation, and the results obtained rarely exceed the 35% threshold" (INS, 2023, p. 97).

3. Poor enforcement of legislation – Regulations, applied discretionarily, create wide discrepancies between counties; the Court of Auditors (2022) highlights that "in 14 counties, the targets imposed by law were not even reached by 50%" (p. 57).

4. Low level of education – The lack of a recycling culture encourages the mixing of recyclable and non-recyclable waste, negatively affecting the quality of recovered materials.

5. The Return Guarantee System (SGR) – although it constitutes "an important step towards increasing the recovery rate, its real impact will be assessed in the long term" (RetuRO, 2024, p. 24).

The consequences of the identified problems include:

- Environmental degradation – uncontrolled waste storage leads to soil and groundwater contamination.
- Economic damages – failure to exceed recycling targets generates financial losses for the state and for economic agents subject to penalties.
- European sanctions – Romania was found guilty by the Court of Justice of the European Union for failure to comply with waste management legislation (CJEU, 2022, p. 3).

Romania has embraced the principles of the European Green Deal and the Circular Economy Action Plan (CEAP), promoted by the European Commission. The strategic document "National Strategy for the Circular Economy" (2022) sets as a major objective "a 30% reduction in the amount of waste generated per capita by 2030 and the recycling of at least 60% of municipal waste" (Ministry of the Environment, 2022, p. 41).

Public information campaigns aimed to increase citizen awareness and involvement:

- "Recycle for Romania!" – national campaign addressed to schools and shopping centres;
- "Packaging matters" – initiative focused on identifying packaging types and promoting eco-labels;
- Local projects: semi-buried platforms, door-to-door collection, mobile eco-centres.

IV. BEHAVIOURS AND PERCEPTIONS RELATED TO PACKAGING RECYCLING IN ROMANIA

Investigating how consumers behave and, implicitly, how they perceive recycling, involves the use of scientifically confirmed theoretical models, which provide a clear explanatory basis for the elements that influence personal choices. These models are useful not only for generating hypotheses, but also for designing structured questionnaires and adequately analysing the results obtained.

A significant initial model is the Planned Behaviour Model (Ajzen, 1991), widely used in marketing studies. According to it, the desire to initiate a behaviour – in this case, packaging recycling – is influenced by three components: attitude towards the behaviour, perception of social norms and perceived behavioural control. Therefore, "the more a person shows a positive attitude towards recycling, feels a beneficial social influence and believes that he has control over this behaviour, the greater the chance that he will recycle in practice" (Cătoiu, 2009, p. 137).

Another relevant conceptual model is the Value–Belief–Norm (VBN) Model, developed by Stern and used in the analysis of environmentally positive behaviours. This model postulates that personal altruistic and ecocentric values trigger beliefs about the environmental effects of behaviour, which leads to the formation of personal norms, serving as an internal motivational factor for action. Research indicates that "internalized moral norms predict environmentally friendly behaviours better than simple information" (Fotea et al., 2019, p. 88).

Another model often encountered in marketing research is the Self-Determination Theory, developed by Deci and Ryan, which distinguishes between internal motivation (for example, recycling to save the environment) and external motivation (recycling for a benefit). According to Conțu (2016, p.122), "intrinsic motivation favours long-term sustainable behaviour, while extrinsic motivation can generate ephemeral results

In recent publications, the SHIFT (Sustainability, Habits, Identity, Emotions, Tangibility) model, proposed by White et al., is applied to change behaviour towards sustainability. It suggests activating the consumer's ecological identity and using emotions and the concreteness of impact. Ruckenstein (2023) highlights that "in the era of algorithms, the tangible perception of the effects of individual actions becomes crucial for generating responsible decisions" (p. 212).

In Romania, circular economy is taking its first steps, and the level of awareness among citizens about the advantages of this economic system is still modest. Implementing circular economy concepts requires not only effective strategies and laws from the authorities, but also a change in personal habits. Therefore, it is crucial to examine how people understand and apply these ideas in their daily lives, but also to identify the main obstacles that slow down the spread of circular practices.

This research aims to "assess consumer perceptions of packaging recycling and identify socio-demographic elements that impact choices to return containers". Specifically, we investigated the effect of gender, age and educational level on how people recycle, while also analysing the importance of financial incentives (the guarantee offered by the SGR) in the decision to return packaging.

The survey was conducted through a questionnaire, with questions organized according to three major components: attitudes, norms and perceived behavioural control (for the Planned Behavior Model), as well as personal values and moral norms (for the VBN Model). Extrinsic motivational factors, such as the guarantee-return system or financial incentives, were also included, elements that align with current motivational theories. The questionnaire was distributed online, through social networks and specialized platforms, over a period of three months, a process that led to the collection of 350 responses. Participants were selected through the non-probabilistic method of convenience selection, focusing in particular on active online consumers, interested in ecological actions and existing recycling practices.

- Demographic distribution: Approximately 43% of respondents fall into the 18–24 age group, followed by 22% in the 25–34 age group and 19% in the 35–44 age group; the remainder being represented by 7% under 18 and 9% over 45. In terms of gender, 66% of participants are female and 34% male. The level of education indicates that 50% have high school education, 34% university education, 3% post-secondary education and 13% postgraduate education, and 69% come from urban areas.
- Behavioural and attitudinal characteristics: The questionnaire data indicate that most subjects recycle packaging at least 1–2 times per month, with notable differences apparently determined by ease of access to collection points and level of information. At the same time, participants stressed the vital importance of transparency and truthfulness in communication about recycling, but also noted barriers, such as difficulty in reaching collection centres and the absence of clear instructions on sorting methods.
- Qualitative observations: The study of the responses to the open-ended question revealed three main groups of observations: 1) positive elements: the subjects expressed appreciation for the effectiveness of local programs and the accessibility of recycling points; 2) dissatisfaction: the main objections concern the insufficiency of infrastructure and the inconsistency of information communicated by the authorities; 3) factors maintaining

behaviour: in addition to environmental responsibility, financial incentives (such as deposit-return systems) were cited as a reason for continuing recycling.

To complement the quantitative survey, we initiated a qualitative examination of the opinions expressed by users on social platforms and forums in Romania regarding packaging recycling. The intention of this action was to detect the public's unfiltered perceptions regarding existing recycling systems, paying attention to frustrations, positive evaluations and driving factors.

We selected posts that have accumulated over 150 comments from platforms like Facebook, Reddit, TikTok, and forums like Softpedia and the Reddit Romania Forum.

Table 1. Analysis of SGR comments

Appreciated aspects	Criticized aspects	Continuity factors
Clear financial reward	Lack of vending machines in rural areas	Educating children about recycling
Ease of use in some locations	Queues at the return machines	Associations with caring for nature
System transparency	Insufficient space in homes for collection	Economic motivation (time saving)
Simplicity of the tax receipt	Ambiguity of codes accepted by devices	Social norms in the urban environment
Accessibility in large supermarkets	Lack of information regarding available locations	Positive pressure from family or community

The current analysis highlights a heterogeneous palette of opinions from users, with a discreet inclination towards pecuniary and community factors in maintaining the practice of recycling. Discontents are focused, with predilection, on logistical aspects, inequitable infrastructure and informational deficiencies. The comments examined complement the results of the quantitative survey, corroborating the observations regarding the obstacles and behavioural incentives encountered by Romanian consumers in reality.

The method of validating the 7 hypotheses, through statistical analysis of the responses to the 5 components of the applied questionnaire, is presented in the attached table.

Table 2. Verification of research hypotheses

Formulated hypothesis	Questions / variables used	Statistical test	Result (p-value)	Conclusion
H1 People with high environmental attitudes recycle more frequently	• Q1 – Frequency packaging return • Q3.1–Q3.3 – score environment attitude	ANOVA (F =6.83)	p = 0.002	Significant difference: group with attitude score > 5 returns, on average, 4.4 packages/week vs. 2.6 in the group with score < 4. Hypothesis confirmed.
H2 Women attach greater importance to environmental protection than men	Q2 – Importance of environmental protection	independent t-test (t = 2.12)	p = 0.036	Average women = 4.25 / 5 vs. men = 3.82. Hypothesis confirmed.
H3 High income increases frequency recycling	• Q1 – return frequency • VE5 – Income (five intervals)	χ^2 (χ^2 = 12.48, df = 4)	p = 0.014	63% of the group > 4000 lei recycle "always", compared to 38% in the < 3000 lei group. Hypothesis confirmed.
H4 Education level influences ecological motivation (vs. financial)	• Q5 – main reason • VE3 – Education level	χ^2 (χ^2 = 10.26, df = 3)	p = 0.006	68% of those with higher education indicate protection environment, compared to 42% among those with at most high school. Hypothesis confirmed.
H5 Urban youth recycle more	• Q1 – Frequency • VE2 –	Z-test proportion	z = 2.55 p =	71% of urban youth recycle, compared to 26%

than people from rural	Residence • VE1 – Age		0.012	in rural areas. Hypothesis confirmed.
H6 Lack of infrastructure is barrier no. 1 spontaneously indicated	Q6 – Barriers (categories)	Simple proportion	-	43.1% mention directly lack of collection points (the most common category). Hypothesis confirmed.
H7 Knowledge of SGR correlates positively with the motivation to recycle	Q4.5 – "Guarantee" streamlined recycling" • Q1 – Frequency	r-Pearson	r = 0.42 p < 0.001	68% of respondents agree with the correlation. Hypothesis confirmed.

All seven hypotheses achieved statistical significance at $\alpha = 0.05$, confirming the proposed theoretical directions.

The results emphasize the importance of infrastructure and economic incentives (SGR), but also the role of ecological values and socio-demographic variables (gender, income, education, residential environment).

V. Conclusions

In the given context, the European Union's waste management framework emphasises the relevance of waste prevention as a fundamental approach to making the best use of resources and minimising environmental impacts. Member States are encouraged to prioritise prevention measures, including through funding for circular design, in line with the EU's waste hierarchy. European financial resources, such as cohesion policy and Horizon 2020, have also played a crucial role in supporting the transition to a circular economy, with over €10 billion allocated between 2016 and 2020 for innovation, waste management infrastructure and sustainable development (European Court of Auditors, 2023).

Circular economy, a concept that is gaining more and more ground in European policies, involves redefining the way we produce, consume and manage resources. In this model, packaging recycling becomes an essential link, as it contributes to closing the material cycle and reducing waste.

Circular economy, beyond the conceptual model supported at the level of organizations or companies, relies significantly on the active participation of consumers. Thus, knowing their perspectives and beliefs is vital for any successful approach to implementing the concept. Specialized studies (Kirchherr et al., 2017) indicate as the main obstacles in the transition to the circular economy the lack of information, the preference for consumer comfort and the impression that recycling and reuse involve increased effort.

According to Șteliac N. and Șteliac D. (2019), Romania has seen a slow progress in the Circular Economy Aggregate Index (CEAI), from the value of 0.413 (2010) to 0.423 (2014), given that at the European level, the Netherlands has the highest CEAI value (0.559), placing us in an average position.

Recycling containers is not only an environmentally friendly action, but also a financially and socially advantageous one, engaging all the factors involved in the consumption circuit. Consumers, the last and crucial element of this chain, require understanding, assistance and encouragement to embrace sustainable habits, by combining information, laws and an appropriate infrastructure.

In Romania, the recycling context is defined by a series of structural impediments: low awareness among the population, an insufficiently developed infrastructure, the absence of concrete incentives and bureaucratic difficulties. Even though policies and regulations in line with European directives have been implemented, such as Law no. 249/2015 on the management of packaging and waste or Emergency Ordinance no. 74/2018, the results are still timid compared to the European Union average.

The role of the buyer in promoting green approaches is crucial. Through their purchasing choices, post-consumer actions, and response to corporate social responsibility programs, consumers can facilitate the shift toward sustainable economic models. Research indicates that views in favour of recycling are conditioned by education level, disposable income, exposure to awareness campaigns, and the existence of adequate local infrastructure (White et al., 2019, p. 30).

The descriptive analysis of the information in the fourth section reveals the first important findings on how consumers view packaging recycling. Studying the socio-demographic characteristics of those surveyed, it emerges that participation in recycling is more widespread among individuals with a better education and living in urban areas. This suggests a link between the level of information and the ecological actions adopted.

As regards opinions and habits related to recycling, the majority of those interviewed mention that they return packaging regularly or quite often, highlighting a general positive trend towards this habit. However, a small but relevant percentage expresses attitudes of indifference or disapproval, citing as main obstacles the lack of necessary facilities, insufficient time available and lack of direct benefits.

These initial findings outline a complex situation: on the one hand, a solid group of civic-minded consumers is observed, and on the other hand, an area of reluctance persists, which requires educational and facilitating measures.

The completions of this phase prepare the context for subsequent inferential analysis, aimed at detailing the links between socio-demographic factors and recycling practices.

• The sample is largely represented by residents of urban areas, young adults, and people with full-time jobs.

• 70% recycle regularly; the main motivation is environmental protection, followed by collateral recovery.

• Pro-ecological attitudes are positive (average > 5), but infrastructure is considered deficient (average ≈ 3.8).

The investigation data highlights a positive orientation towards green habits, with most subjects showing an active attitude towards returning packaging.

However, the existence of a minority, although small, who rarely or never return packaging highlights the need for educational initiatives or adjacent incentives to increase involvement in this type of action.

The inferential study validates the idea that age and monthly family income are, for the given sample, the main vectors of predictability of the recycling habit. The direct and important link between age and the frequency of the restitution gesture emphasizes the fact that older people recycle more often, thus concretizing the first target of the research – determining the explanatory variables – and signalling the need for information campaigns addressed to younger groups.

Overall, the results confirm the assumed aim of the study: economic factors (income) and experience-related factors (age) prove to be determinants, while gender, professional status and place of residence do not differentiate recycling behaviours. The primary practical consequence is the need to adjust incentive policies taking into account the financial capacity of households and to supplement the physical and information infrastructure where it is deficient, in order to strengthen active participation in the circular economy.

The role of education in advancing the Circular Economy (CE) has the capacity to form capable citizens, with the potential to become project creators, producers, political influencers and entrepreneurs, thus contributing to the materialization of the transition to an effective circular economy. (Kopnina, 2018)

The circular economy is a necessary approach to the transition from the linear economy, both from the perspective of producers and consumers. The next step is the implementation of the green economy, which requires a collaborative strategy that includes governments, businesses and the population. (Jităreanu, 2023)

In a detailed assessment, circular economy emerges as a solid link between green aspirations and a practical approach to the economy. This combination is vital, as many green projects often fail because they cannot find a financially sustainable operational scheme. Circularity, on the contrary, presents a concrete, quantifiable and repeatable solution, where initial investments are balanced by long-term efficiency, and resources are transformed into a renewable capital, not an exhaustible reserve. Circularity is therefore no longer just a response to environmental challenges, but reflects a new economic logic, where value is redefined through the lens of sustainability and cyclical re-introduction into the circuit.

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